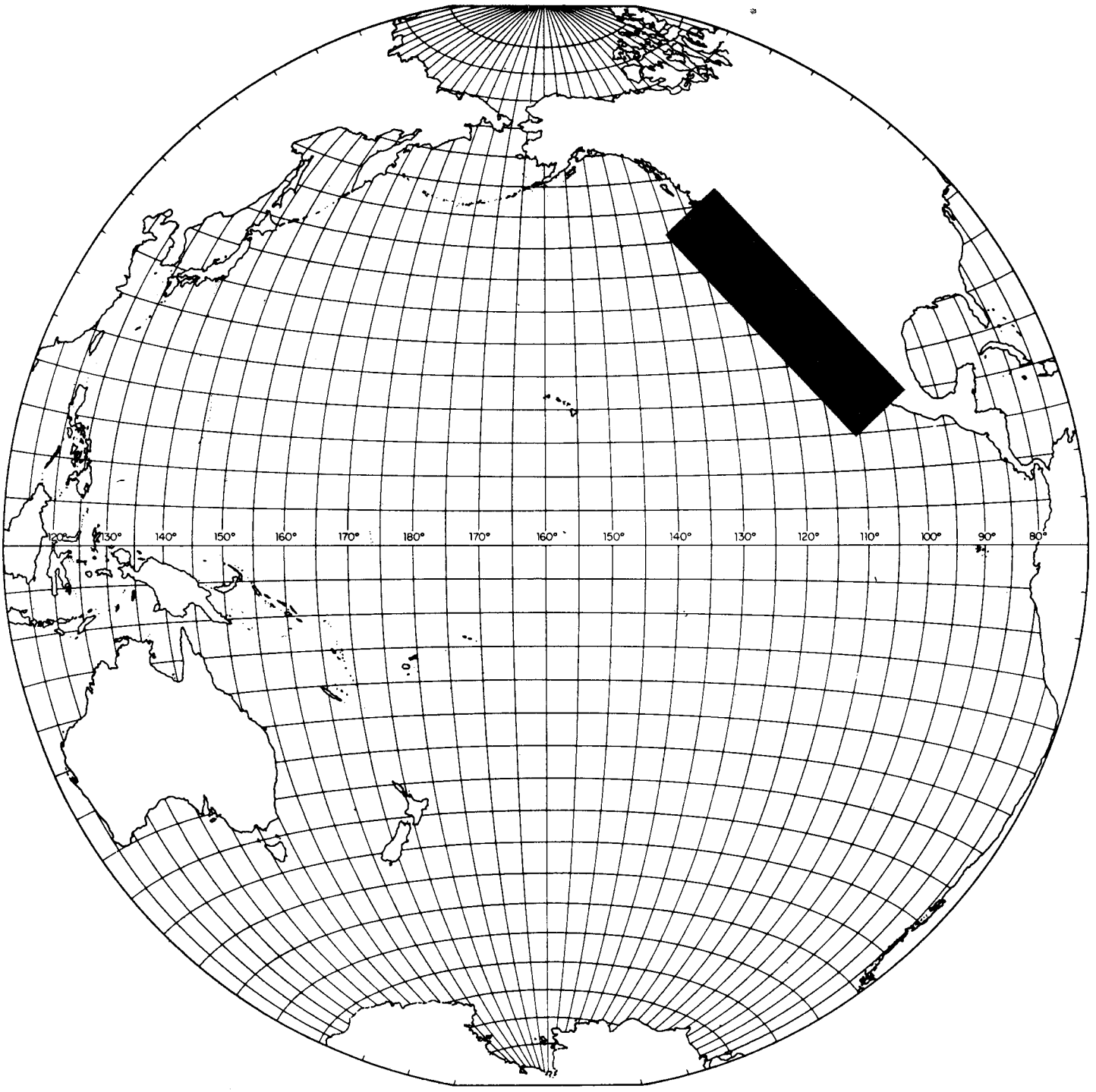
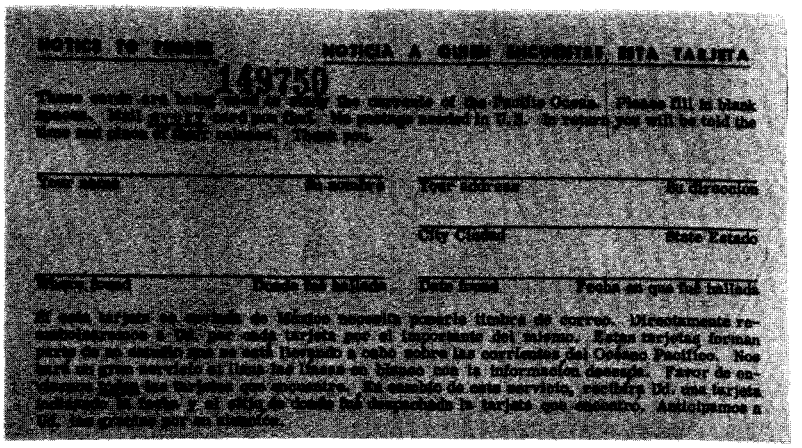
STATE OF CALIFORNIA
MARINE RESEARCH COMMITTEE



CALIFORNIA COOPERATIVE OCEANIC FISHERIES INVESTIGATIONS

ATLAS No. 16



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Al otro lado de esta tarjeta encontrará espacio para hacer su anuncio. Directamente relacionado a Ud. por esta tarjeta por el tamaño del anuncio. Estas tarjetas forman parte de un estudio que se está llevando a cabo sobre las corrientes del Océano Pacífico. Nos sería de gran necesidad si Ud. las llenara en blanco con la información deseada. Favor de enviarnos estas tarjetas por correo. En cambio de este servicio, recibirá Ud. una tarjeta postal de Suiza, y en cinco días recibirá la tarjeta que mandó. Agradecemos a Ud. su gentileza por su atención.

We note with sadness the passing of

Hans T. Klein on 7 September 1972

an editor and a founder of

the CalCOFI Atlas series

CALIFORNIA COOPERATIVE OCEANIC FISHERIES INVESTIGATIONS

Atlas No. 16

STATE OF CALIFORNIA
MARINE RESEARCH COMMITTEE

Cooperating Agencies:
CALIFORNIA ACADEMY OF SCIENCES
CALIFORNIA DEPARTMENT OF FISH AND GAME
STANFORD UNIVERSITY, HOPKINS MARINE STATION
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, NATIONAL MARINE FISHERIES SERVICE
UNIVERSITY OF CALIFORNIA, SCRIPPS INSTITUTION OF OCEANOGRAPHY

June, 1972

THE CALCOFI ATLAS SERIES

This is the sixteenth in a series of atlases containing data on the hydrography and plankton from the region of the California Current. The field work was carried out by the California Cooperative Oceanic Fisheries Investigations,[1] a program sponsored by the State of California under the direction of the State's Marine Research Committee. The cooperating agencies in the program are:

California Academy of Sciences
California Department of Fish and Game
Stanford University, Hopkins Marine Station
National Oceanic and Atmospheric Administration, National Marine Fisheries Service[2]
University of California, Scripps Institution of Oceanography

CalCOFI atlases[3] are issued as individual units as they become available. They provide processed physical, chemical and biological measurements of the California Current region. Each number may contain one or more contributions. A general description of the CalCOFI program with its objectives appears in the preface of Atlas No. 2.

This atlas was prepared by the Data Collection and Processing Group of the Marine Life Research Program, Scripps Institution of Oceanography.

CalCOFI Atlas Editorial Staff:

Abraham Fleminger, Hans T. Klein and John G. Wyllie, Editors

CalCOFI atlases in this series, through June 1972, are:

No. 1. Anonymous, 1963. CalCOFI atlas of 10-meter temperatures and salinities 1949 through 1959.

No. 2. Fleminger, A., 1964. Distributional atlas of calanoid copepods in the California Current region, Part I.

No. 3. Alvariño, A., 1965. Distributional atlas of Chaetognatha in the California Current region.

No. 4. Wyllie, J. G., 1966. Geostrophic flow of the California Current at the surface and at 200 meters.

No. 5. Brinton, E., 1967. Distributional atlas of Euphausiacea (Crustacea) in the California Current region, Part I.

No. 6. McGowan, J. A., 1967. Distributional atlas of pelagic molluscs in the California Current region.

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No. 9. Kramer, D., and E. H. Ahlstrom, 1968. Distributional atlas of fish larvae in the California Current region: Northern Anchovy, *Engraulis mordax* Girard, 1951 through 1965.

No. 10. Isaacs, J. D., A. Fleminger and J. K. Miller, 1969. Distributional atlas of zooplankton biomass in the California Current region, Spring and Fall 1955-1959.

No. 11. Ahlstrom, E. H., 1969. Distributional atlas of fish larvae in the California Current region: jack mackerel, *Trachurus symmetricus,* and Pacific hake, *Merluccius productus,* 1951 through 1966.

No. 12 Kramer, D., 1970. Distributional atlas of fish eggs and larvae in the California Current region: Pacific sardine, *Sardinops caerulea* (Girard), 1951 through 1966.

No. 13. Smith, P. E., 1971. Distributional atlas of zooplankton volume in the California Current region, 1951 through 1966.

No. 14. Isaacs, J. D., A. Fleminger and J. K. Miller, 1969. Distributional atlas of zooplankton biomass in the California Current region: Winter 1955-1959.

No. 15. Wyllie, J. G., and R. J. Lynn, 1971. Distribution of temperature and salinity at 10 meters, 1960-1969 and mean temperature, salinity and oxygen at 150 meters, 1950-1968 in the California Current.

No. 16. Crowe, F. J. and R. A. Schwartzlose, 1972. Release and recovery records of drift bottles in the California Current region, 1955 through 1971.

[1]Usually abbreviated CalCOFI, sometimes CALCOFI or CCOFI.
[2]Formerly called U. S. Fish and Wildlife Service, Bureau of Commercial Fisheries.
[3]For citation this issue in the series should be referred to as CalCOFI Atlas No. 16.

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RELEASE AND RECOVERY RECORDS OF DRIFT BOTTLES IN THE CALIFORNIA CURRENT REGION 1955 THROUGH 1971

Fred J. Crowe and Richard A. Schwartzlose

CalCOFI Atlas No. 16

A. Fleminger, H. T. Klein and J. G. Wyllie, Editors
Data Collection and Processing Group
Marine Life Research Program
Scripps Institution of Oceanography
La Jolla, California

June, 1972

RELEASE AND RECOVERY RECORDS OF DRIFT BOTTLES IN THE CALIFORNIA CURRENT REGION 1955 THROUGH 1971

Fred J. Crowe and Richard A. Schwartzlose

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INTRODUCTION

The results from drift bottle studies of inshore currents on the Pacific coast of British Columbia, Oregon, California and Baja California [Tibby, 1939; Dodimead & Hollister, 1958; Fofonoff, 1960; Schwartzlose, 1963; Wyatt, *et al.*, 1971; Badan, 1972] demonstrate their usefulness as indicators of the direction of surface flow. For example, few other data show as clearly the presence of the Davidson countercurrent during the late fall and winter months [Schwartzlose, 1963].

In late 1954 Scripps Institution of Oceanography's component of CalCOFI, the Marine Life Research Group, began using drift bottles to study seasonal variation in the inshore portion of the California Current. During the intervening 17 years 148,384 drift bottles were released and approximately 3.4 percent [4,995] were recovered.

DRIFT BOTTLE SPECIFICATIONS

Several sizes of drift bottles have been used by the CalCOFI program. All were of clear heavy glass and ranged in capacity from 4 to 6 ounces. A pre-addressed reply card [prepaid when mailed in the U.S.] sealed inside each bottle describes the program in English and Spanish and requests the finder to record the location, date and hour of recovery on the card and return it to Scripps Institution of Oceanography. After inserting the card in the bottle, sand is added to ballast the bottle so that it will float with no more than one inch of the neck extending above the surface of the water. The bottles are closed with a cork and sealed with wax. Each person returning a card is sent a letter of acknowledgment stating the date and place the bottle was released.

In December of 1966 plastic drift cards were released in addition to our normal complement of drift bottles at CalCOFI stations. The corrosive action of seawater quickly destroyed the metal staples used to assemble the drift cards. Moreover, there was suspected wind "wafting" of the lightweight plastic cards across the sea surface. Returns from drift cards were less satisfactory as compared to drift bottles from the same stations.

RELEASE AREAS

The areas dealt with month by month differ somewhat due to variations in the northern and southern extent of individual CalCOFI cruises.

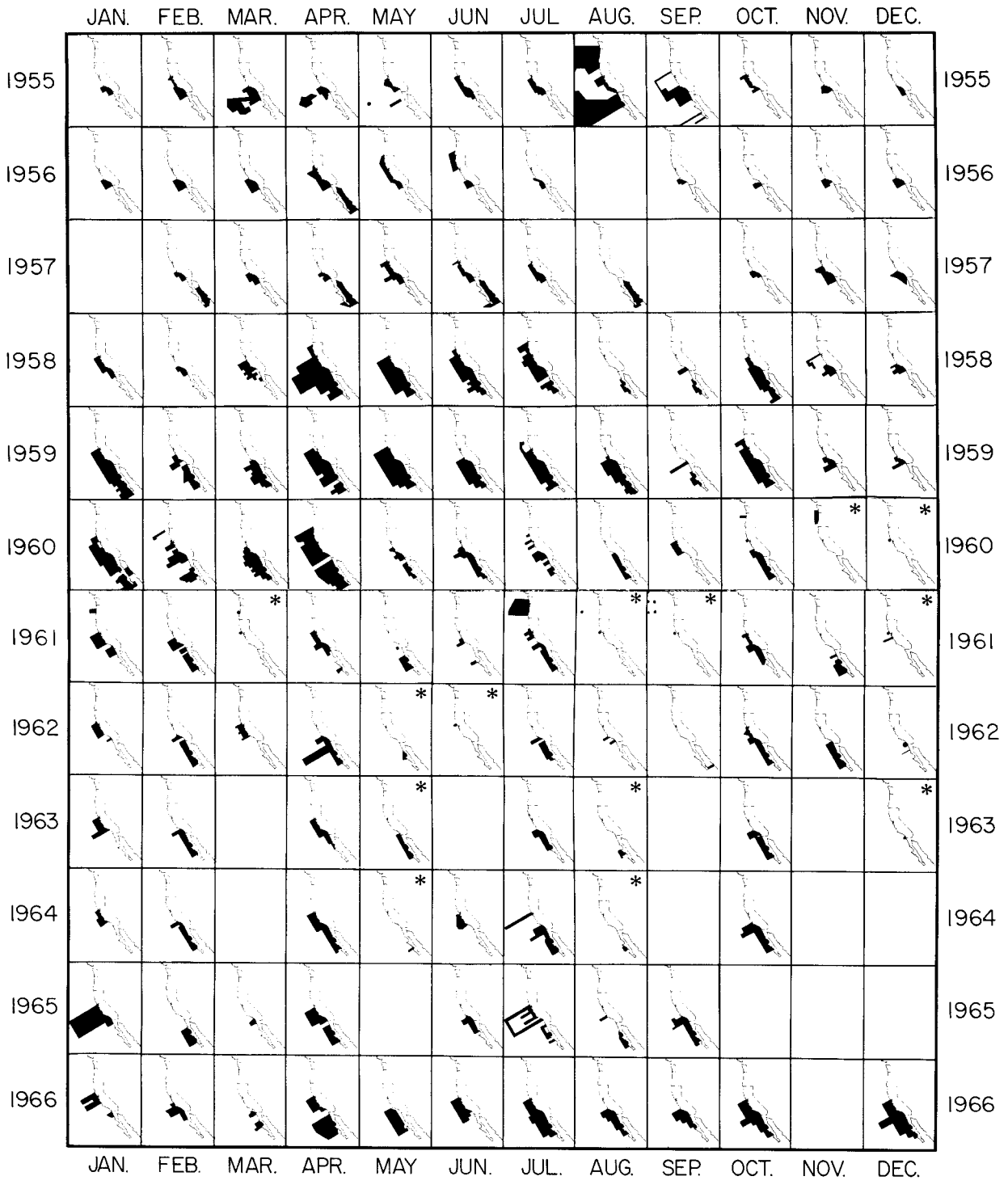
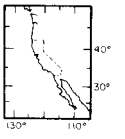


Figure 1. Monthly summary of areas in which drift bottles were released during CalCOFI cruises between 1955 and 1966. Asterisks denote months with no recoveries.



Figures 1 and 2 summarize the release areas by months and years that are presented in this atlas. Months marked with an asterisk indicate no recoveries were made. It should be noted that most of these months were also characterized by the release of relatively few drift bottles.

Normally twelve bottles were released on each prescribed station of the cruise pattern. Otherwise, the number released is indicated adjacent to the station dot.

DRIFT BOTTLE RETURNS

The percentage of recovered drift bottles varied from zero for some months to as high at 23.0 percent. The average is about 3.4 percent. Table 1 presents a complete monthly listing of the number of stations at which drift bottles were released, the number of releases, the number of finds and the percentage recovered for the month. The percentage recovered also appears on the individual monthly charts.

The northern-most return was from Montague Island, Alaska [August 1968], the southern-most came from an area just north of Acapulco, Mexico [May 1959], and the western-most return was from the island of Hawaii [September 1969].

THE CHARTS

The charts in this atlas are somewhat dif ferent from those in previous CalCOFI atlases. Data are grouped by months rather than by cruises. Consequently there are months in which two sets of releases were made at one or more stations because two separate cruises occupied the station during that month.

Release points are designated by a dot or by a circle with a letter in it [Fig. 3]. Circles with a letter represent the stations from which returns were received. Stations indicated only by a dot represent the release of 12 drift bottles and no returns. A number accompanying the station dot or a shaded area indicates the number of drift bottles when it differed from the usual 12. An arrow attached to the lettered circle shows the direction in which to look for returns from the station. Returns for a particular station will be listed by the same letter appearing in the station circle and an arrow or line

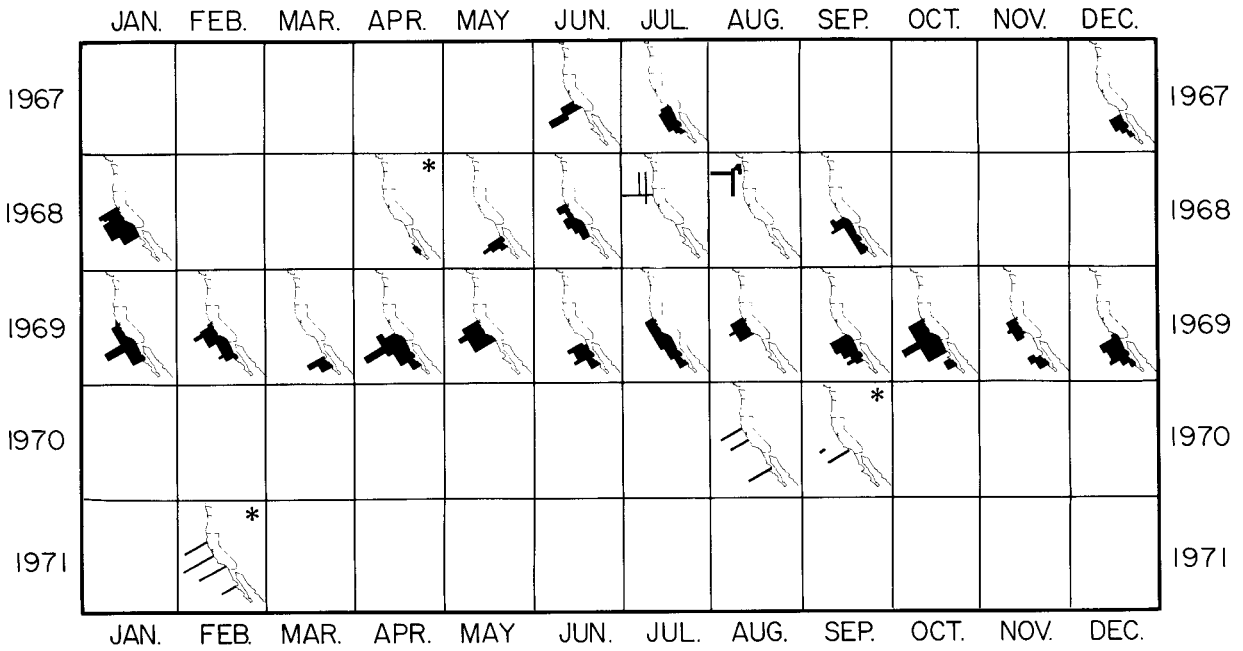


Figure 2. Monthly summary of areas in which drift bottles were released during CalCOFI cruises between 1967 and 1971. Asterisks denote months with no recoveries.

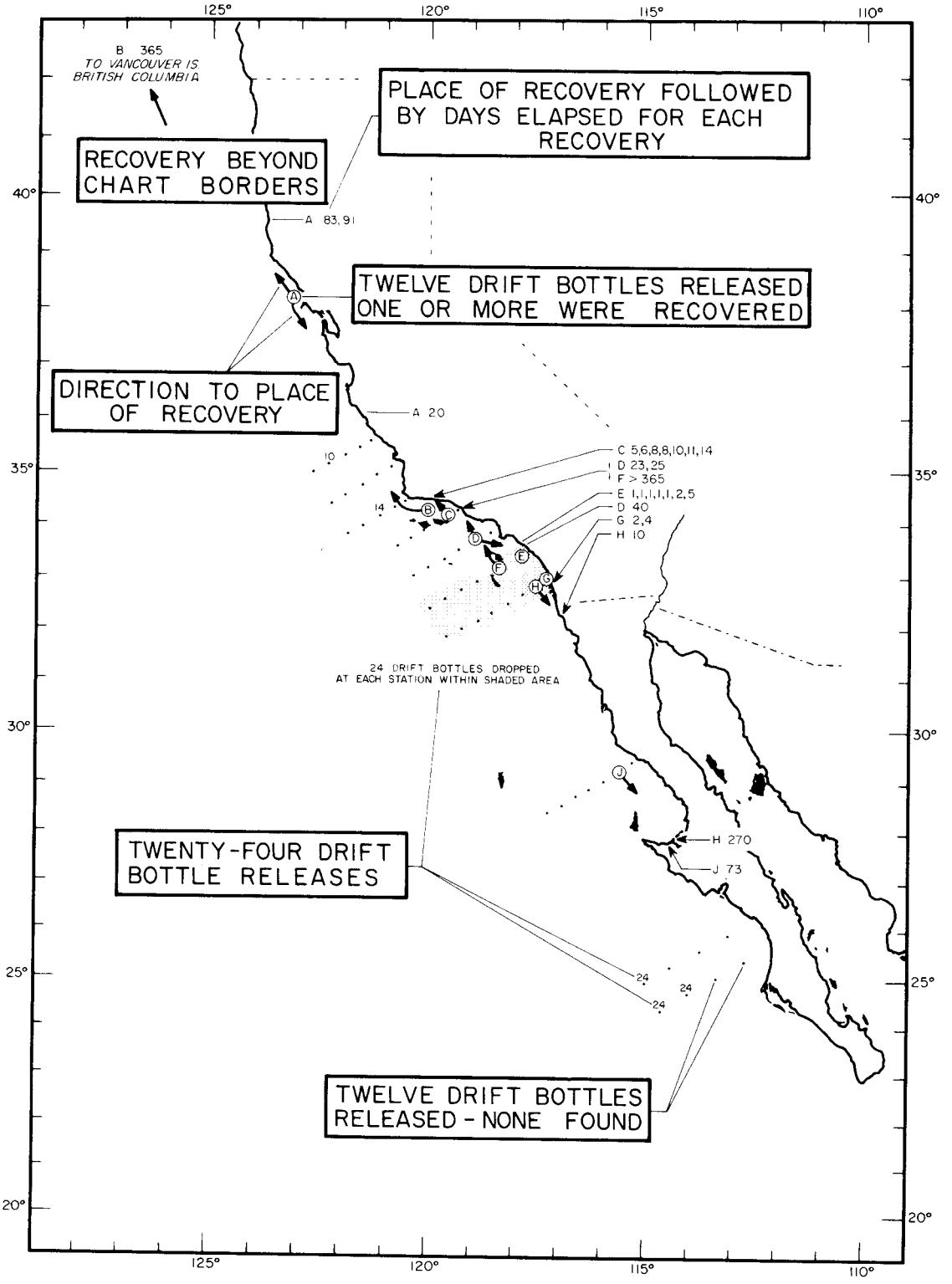


Figure 3. Example of the notational system used on the charts in this atlas.

extending to the point of recovery at the shoreline. The letter "I" has not been used to avoid confusion with the number one. When the number of stations showing returns exceeds 25 in any one month, the additional stations are denoted by lower case letters beginning the alphabetical sequence anew. At the recovery point the number following the station letter indicates the number of days elapsing between the time of release and the time of recovery. When more than one return is available for a given release at one station, the days elapsed for each return are indicated separately after the letter identifying the station. Some charts have an insert with an area enlarged to show complex or unusual returns.

One uncontrollable factor influencing the frequency of drift bottle recoveries and interpretation of the results is the intensity of human traffic along the coastline. A population density chart of the California coast is presented [Fig. 4] as an aid to judging the distribution and elapsed time of returns. The population data is based on the national census of 1960 [Anon., 1970]. For Baja California only the location of cities, towns, and settlements are shown, this being a very sparsely settled region.

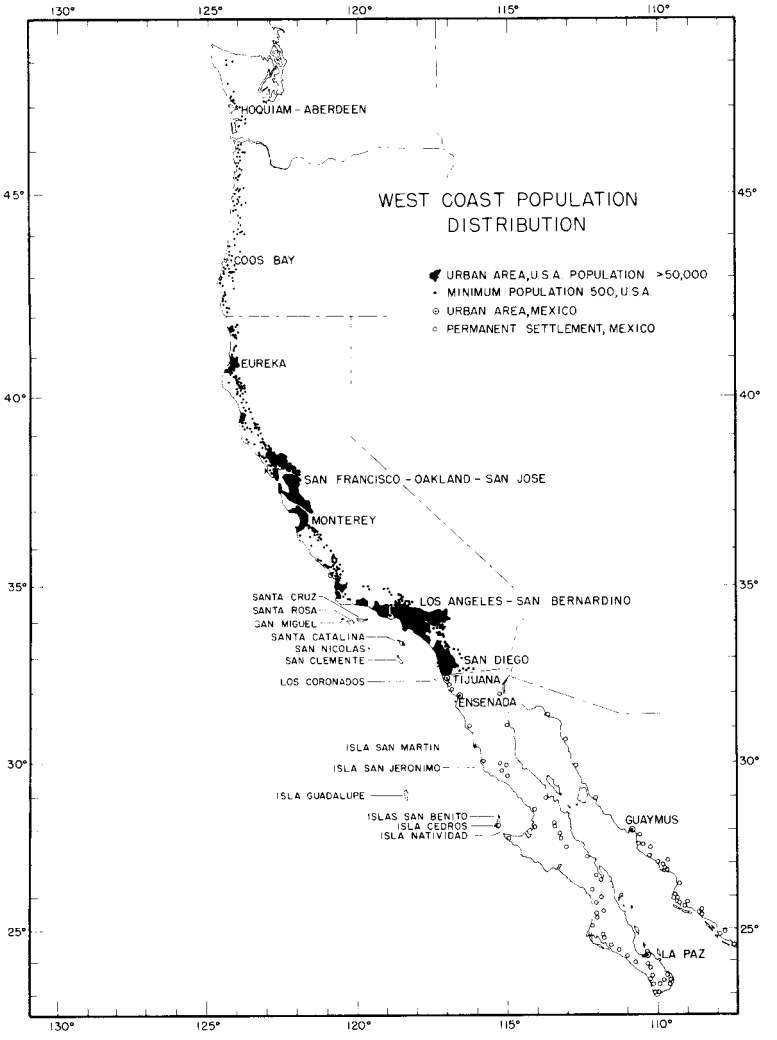


Figure 4. Population density along the west coast of the United States and locations of permanent settlements in Baja California.

TABLE 1

	Number of Stations	Number of Releases	Number of Recoveries	% Returned
1955				
Jan.	35	260	22	8.5
Feb.	90	656	71	10.8
Mar.	65	787	45	5.7
Apr.	106	846	20	2.4
May	39	1212	30	2.5
June	63	752	42	5.6
July	51	610	32	5.2
Aug.	153	1464	32	2.2
Sept.	87	1626	122	7.5
Oct.	12	140	4	2.9
Nov.	61	971	120	12.4
Dec.	16	204	20	9.8
1956				
Jan.	28	336	23	6.8
Feb.	55	516	15	2.9
Mar.	29	348	38	10.9
Apr.	92	937	77	8.2
May	70	912	26	2.8
June	41	492	38	7.7
July	33	540	32	5.9
Aug.	—	—	—	—
Sept.	12	144	17	11.8
Oct.	24	444	52	11.7
Nov.	17	204	12	5.9
Dec.	29	360	16	4.4
1957				
Jan.	—	—	—	—
Feb.	59	844	38	4.5
Mar.	31	372	32	8.6
Apr.	73	876	82	9.4
May	62	764	59	7.7
June	86	1032	83	8.0
July	50	600	59	9.8
Aug.	37	444	23	5.2
Sept.	—	—	—	—
Oct.	21	252	25	9.9
Nov.	49	768	82	10.7
Dec.	26	492	47	9.6
1958				
Jan.	42	576	82	14.2
Feb.	48	576	14	2.4
Mar.	69	825	48	5.8
Apr.	200	2471	47	1.9
May	156	1968	51	2.6
June	141	1692	57	3.4
July	199	2450	62	2.5
Aug.	38	456	12	2.6
Sept.	57	1092	47	4.3
Oct.	243	5832	101	1.7
Nov.	57	1366	55	4.0
Dec.	46	1104	43	3.9
1959				
Jan.	248	4584	108	2.4
Feb.	140	2093	24	1.1
Mar.	119	1413	33	2.3
Apr.	190	2321	50	2.2
May	143	1716	79	4.6
June	162	2028	100	4.9
July	194	2317	81	3.5
Aug.	185	2129	46	2.2
Sept.	67	806	27	3.3
Oct.	217	2611	30	1.1
Nov.	43	646	7	1.1
Dec.	57	827	15	1.8
1960				
Jan.	270	3240	62	1.9
Feb.	201	2412	49	2.0
Mar.	179	2531	25	1.0
Apr.	282	3509	68	1.9
May	94	1139	70	6.1
June	116	1404	38	2.7
July	89	1128	61	5.4
Aug.	64	816	35	4.3
Sept.	23	288	24	8.3
Oct.	90	1127	31	2.8
Nov.	16	192	0	0
Dec.	2	24	0	0
1961				
Jan.	38	456	25	5.5
Feb.	100	1235	12	1.0
Mar.	7	84	0	0
Apr.	81	1054	31	2.9
May	51	696	9	1.3
June	14	262	11	4.2
July	126	1584	70	4.4
Aug.	2	24	0	0
Sept.	38	169	0	0
Oct.	80	960	44	4.6
Nov.	49	612	5	0.8
Dec.	63	749	0	0
1962				
Jan.	31	395	37	9.4
Feb.	100	1200	33	2.8
Mar.	26	312	6	1.9
Apr.	112	1344	36	2.7
May	4	84	0	0
June	—	—	—	—
July	82	996	17	1.7
Aug.	11	132	3	2.3
Sept.	8	96	2	2.1
Oct.	87	1044	35	3.4
Nov.	37	443	4	0.9
Dec.	18	186	3	1.6
1963				
Jan.	37	444	14	3.2
Feb.	86	1032	19	1.8
Mar.	—	—	—	—
Apr.	68	875	75	8.8
May	62	744	0	0

TABLE 1 (continued)

	Number of Stations	Number of Releases	Number of Recoveries	% Returned
June	—	—	—	—
July	72	864	50	5.8
Aug.	19	228	0	0
Sept.	—	—	—	—
Oct.	101	1188	20	1.7
Nov.	—	—	—	—
Dec.	2	24	0	0
1964				
Jan.	65	780	12	1.5
Feb.	106	1270	21	1.7
Mar.	—	—	—	—
Apr.	124	1488	51	3.4
May	3	36	0	0
June	80	972	43	4.4
July	109	1320	123	9.3
Aug.	10	120	0	0
Sept.	10	120	0	0
Oct.	114	1368	115	8.4
Nov.	—	—	—	—
Dec.	—	—	—	—
1965				
Jan.	84	1004	39	3.9
Feb.	59	732	3	0.4
Mar.	9	108	25	23.0
Apr.	142	1704	90	5.3
May	—	—	—	—
June	42	504	30	6.0
July	73	876	30	3.4
Aug.	40	920	22	2.4
Sept.	106	1268	44	3.5
Oct.	—	—	—	—
Nov.	—	—	—	—
Dec.	—	—	—	—
1966				
Jan.	25	300	2	6.7
Feb.	61	960	37	3.9
Mar.	34	408	20	4.9
Apr.	92	1104	14	1.3
May	80	1020	12	1.2
June	76	912	30	3.3
July	138	1680	21	1.2
Aug.	93	1116	21	1.9
Sept.	68	816	16	2.0
Oct.	122	1461	35	2.4
Nov.	—	—	—	—
Dec.	125	2553	30	1.2
1967				
Jan.	—	—	—	—
Feb.	—	—	—	—
Mar.	—	—	—	—
Apr.	—	—	—	—
May	—	—	—	—
June	35	420	30	7.1
July	62	756	19	2.5
Aug.	—	—	—	—
Sept.	—	—	—	—
Oct.	—	—	—	—
Nov.	—	—	—	—
Dec.	45	538	4	0.7
1968				
Jan.	80	959	23	2.4
Feb.	—	—	—	—
Mar.	—	—	—	—
Apr.	12	144	0	0
May	20	312	4	1.3
June.	81	984	15	1.5
July	12	144	1	0.7
Aug.	27	216	11	5.1
Sept.	79	1043	5	0.5
Oct.	—	—	—	—
Nov.	—	—	—	—
Dec.	—	—	—	—
1969				
Jan.	94	1127	61	5.4
Feb.	92	1104	31	2.8
Mar.	27	343	1	0.3
Apr.	113	1404	32	2.3
May	68	816	29	3.6
June	77	1020	25	2.4
July	153	1932	24	1.2
Aug.	50	600	27	4.5
Sept.	79	1043	5	0.5
Oct.	136	1727	42	2.4
Nov.	80	956	36	3.8
Dec.	82	1068	14	1.3
1970				
Jan.	—	—	—	—
Feb.	—	—	—	—
Mar.	—	—	—	—
Apr.	—	—	—	—
May	—	—	—	—
June	—	—	—	—
July	—	—	—	—
Aug.	8	96	1	1.0
Sept.	12	144	0	0.0
Oct.	—	—	—	—
Nov.	—	—	—	—
Dec.	—	—	—	—
1971				
Jan.	—	—	—	—
Feb.	8	94	0	0.0
Mar.	10	118	0	0.0
Apr.	—	—	—	—
May	—	—	—	—
June	2	46	0	0.0
July	—	—	—	—
Aug.	—	—	—	—
Sept.	—	—	—	—
Oct.	—	—	—	—
Nov.	—	—	—	—
Dec.	—	—	—	—

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January

February

March

April

May

June

July

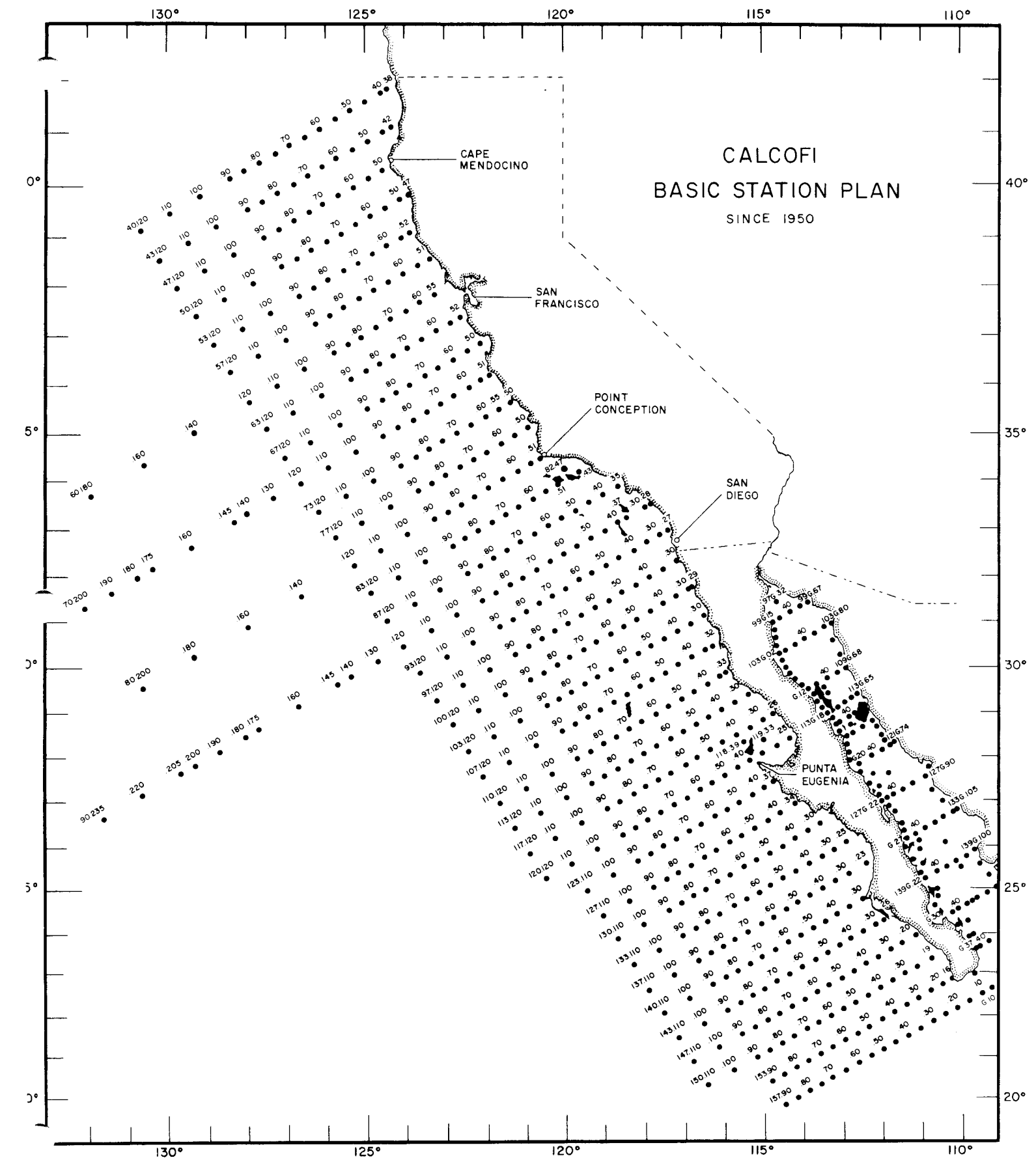
August

September

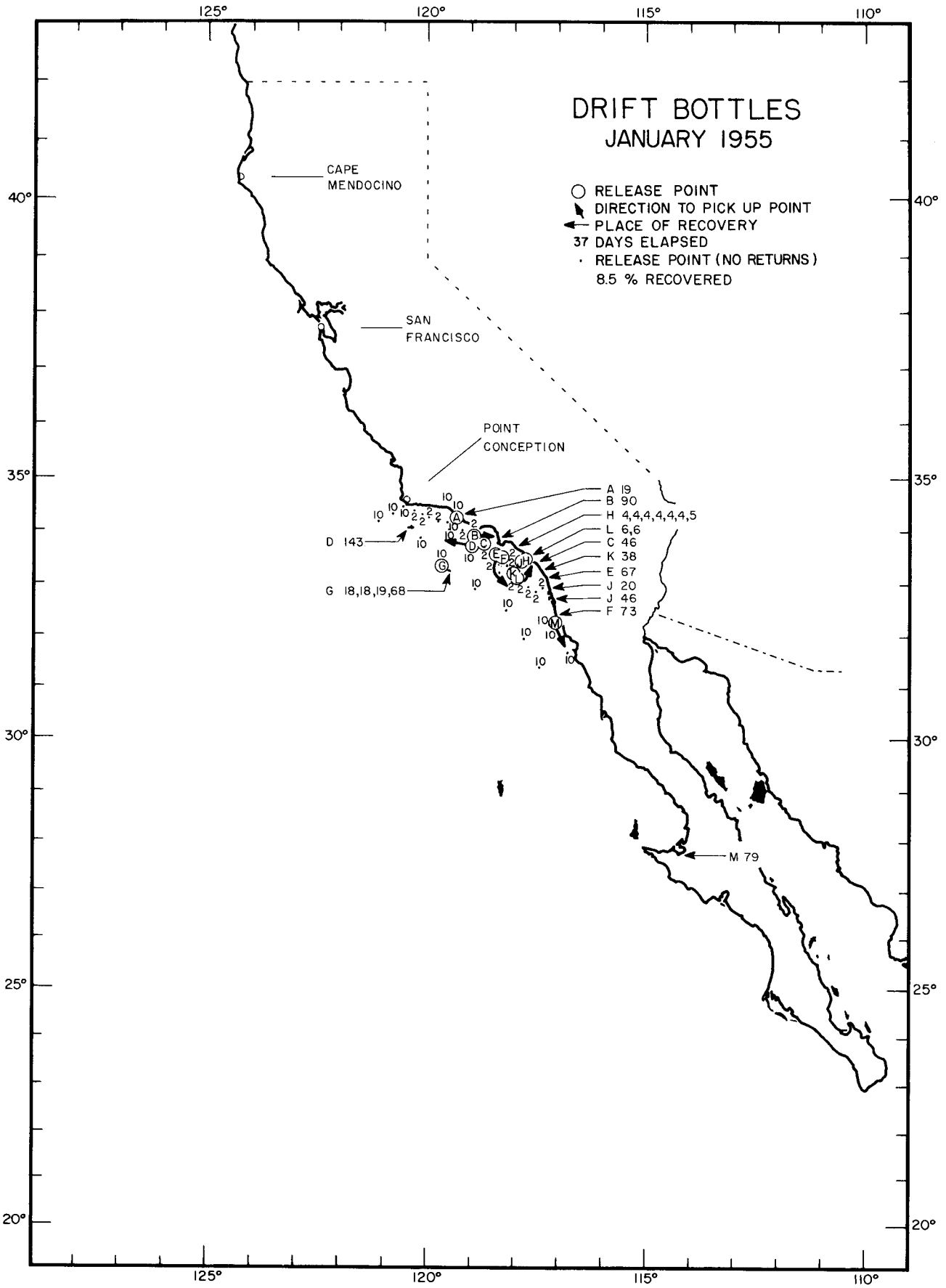
October

November

December



CALCOFI
BASIC STATION PLAN
SINCE 1950



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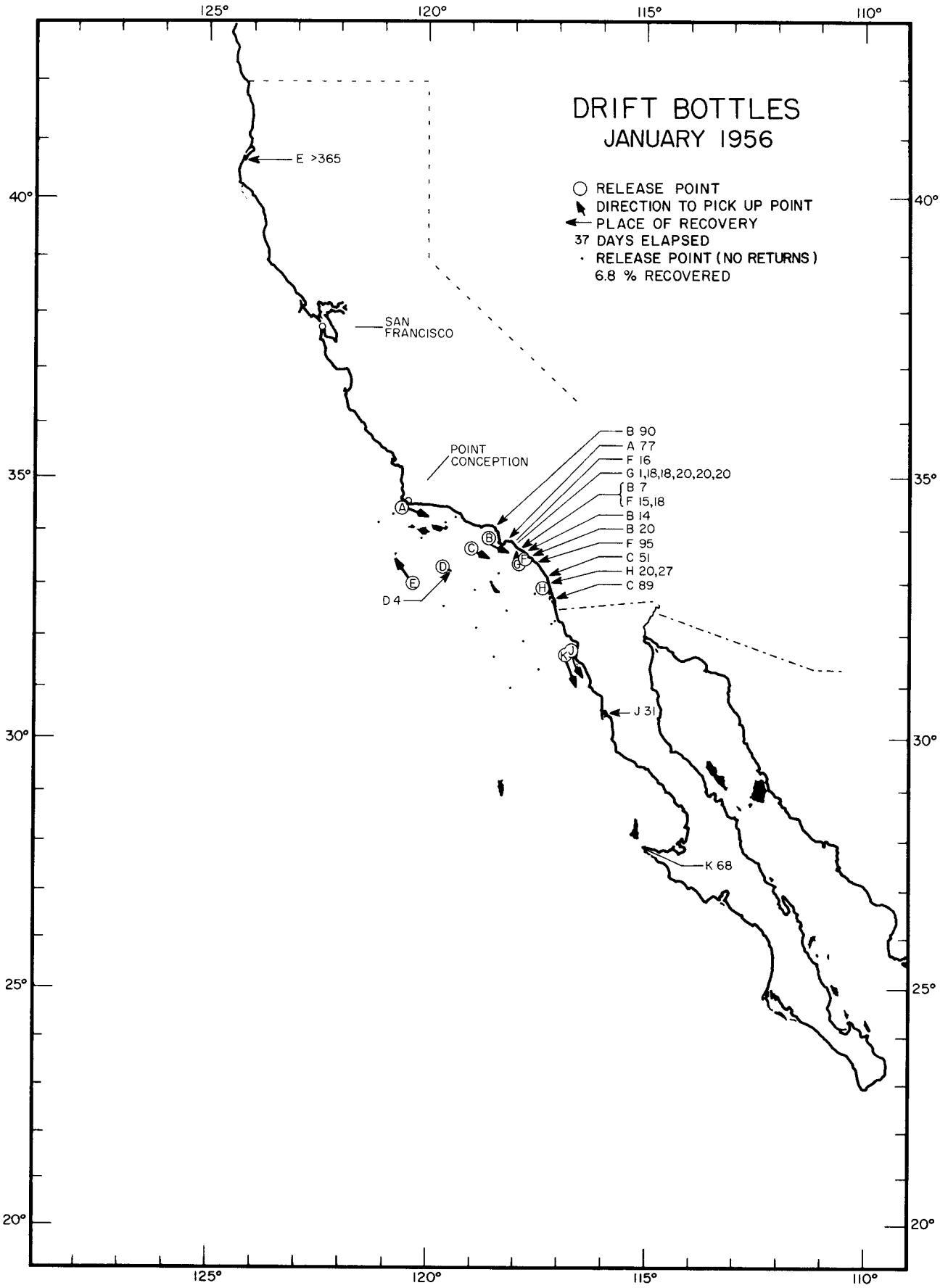

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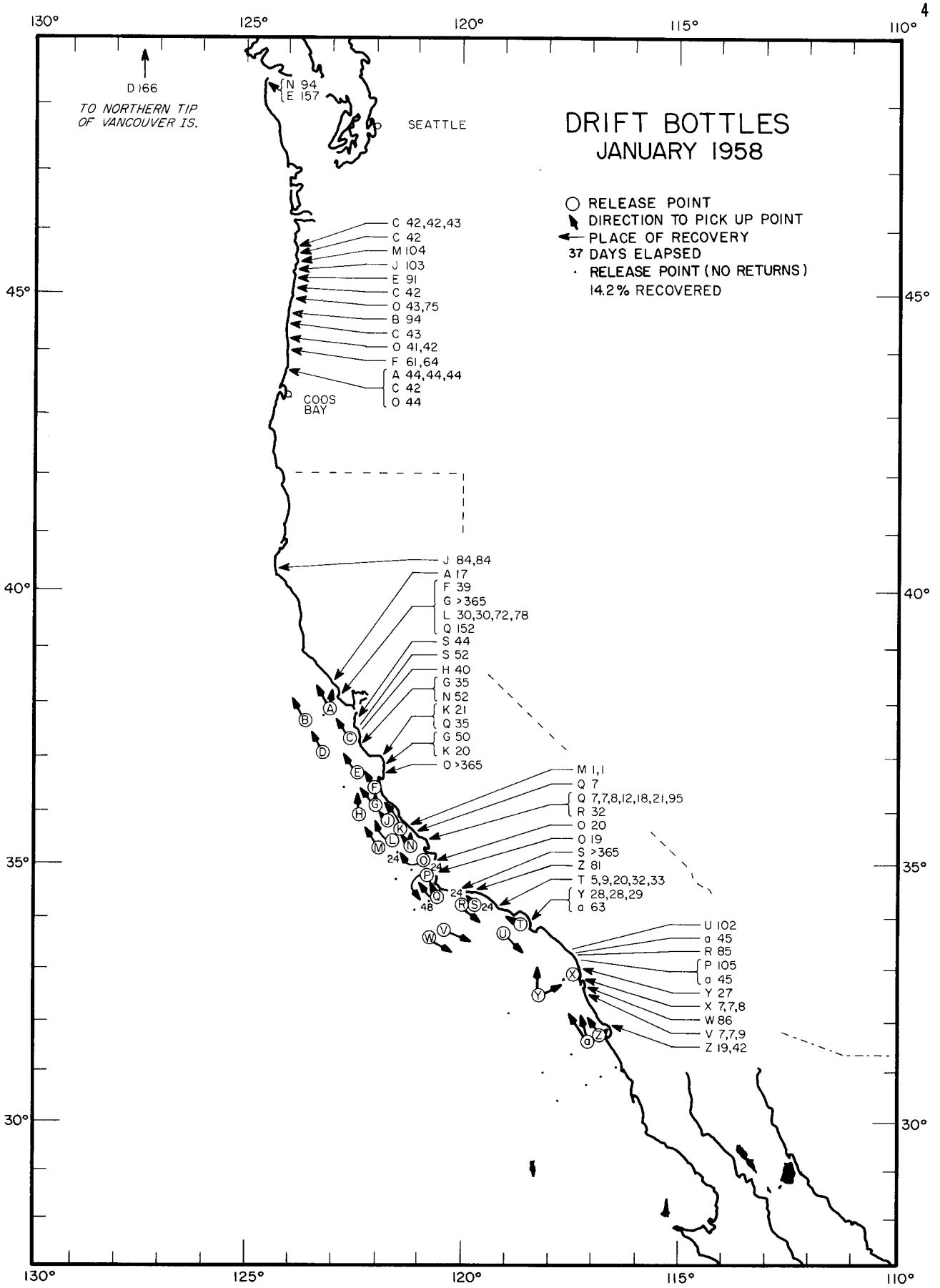

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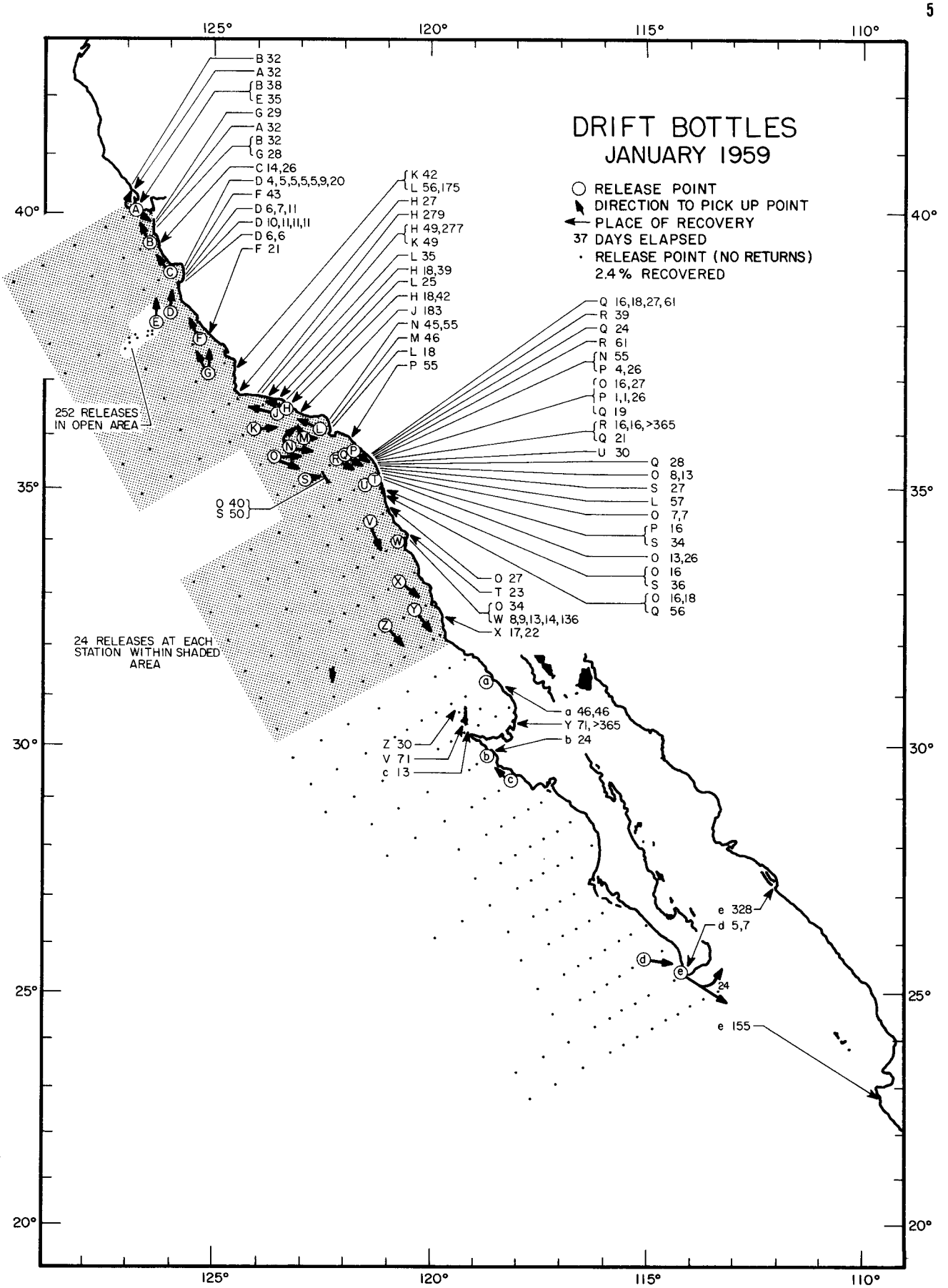

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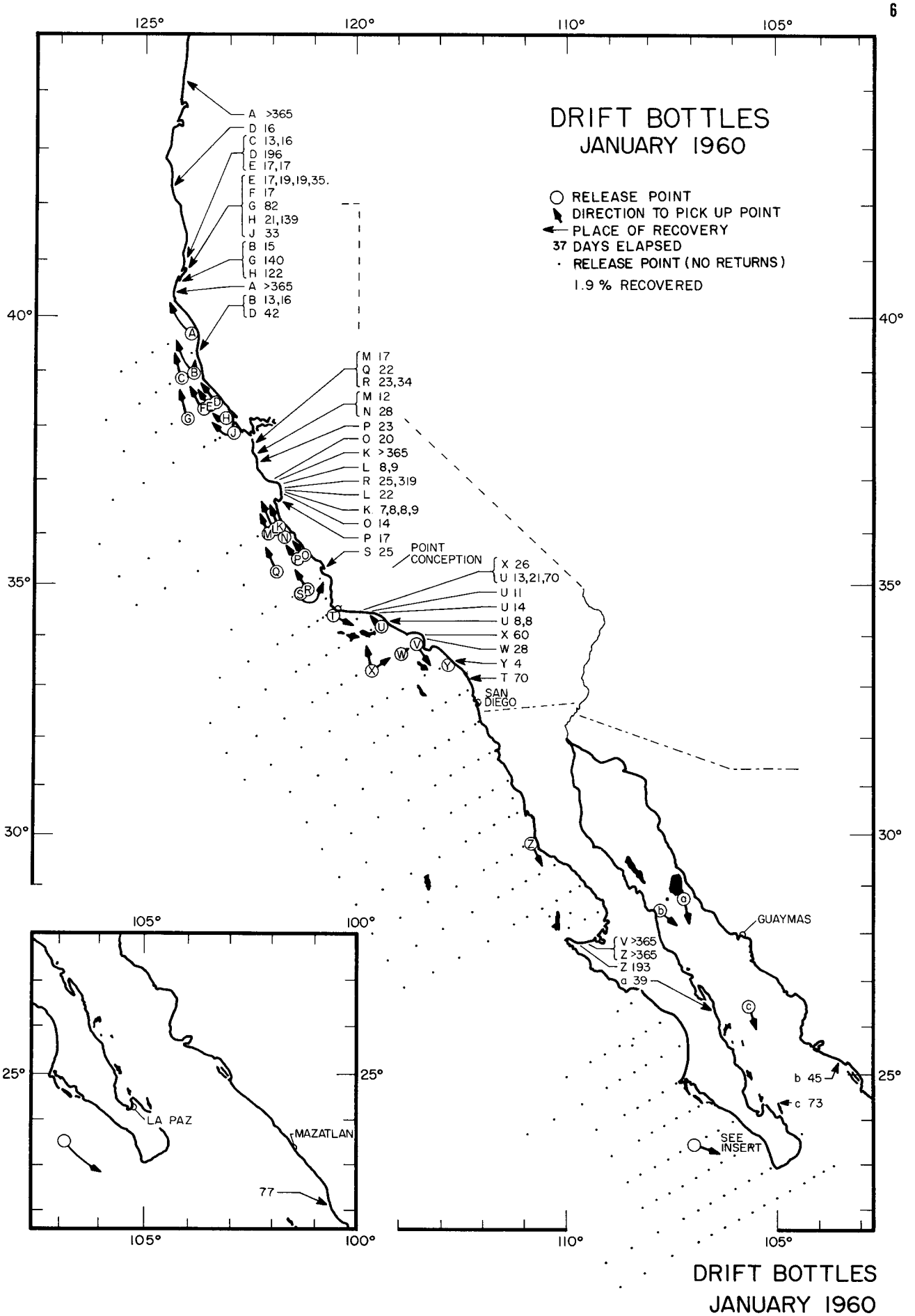

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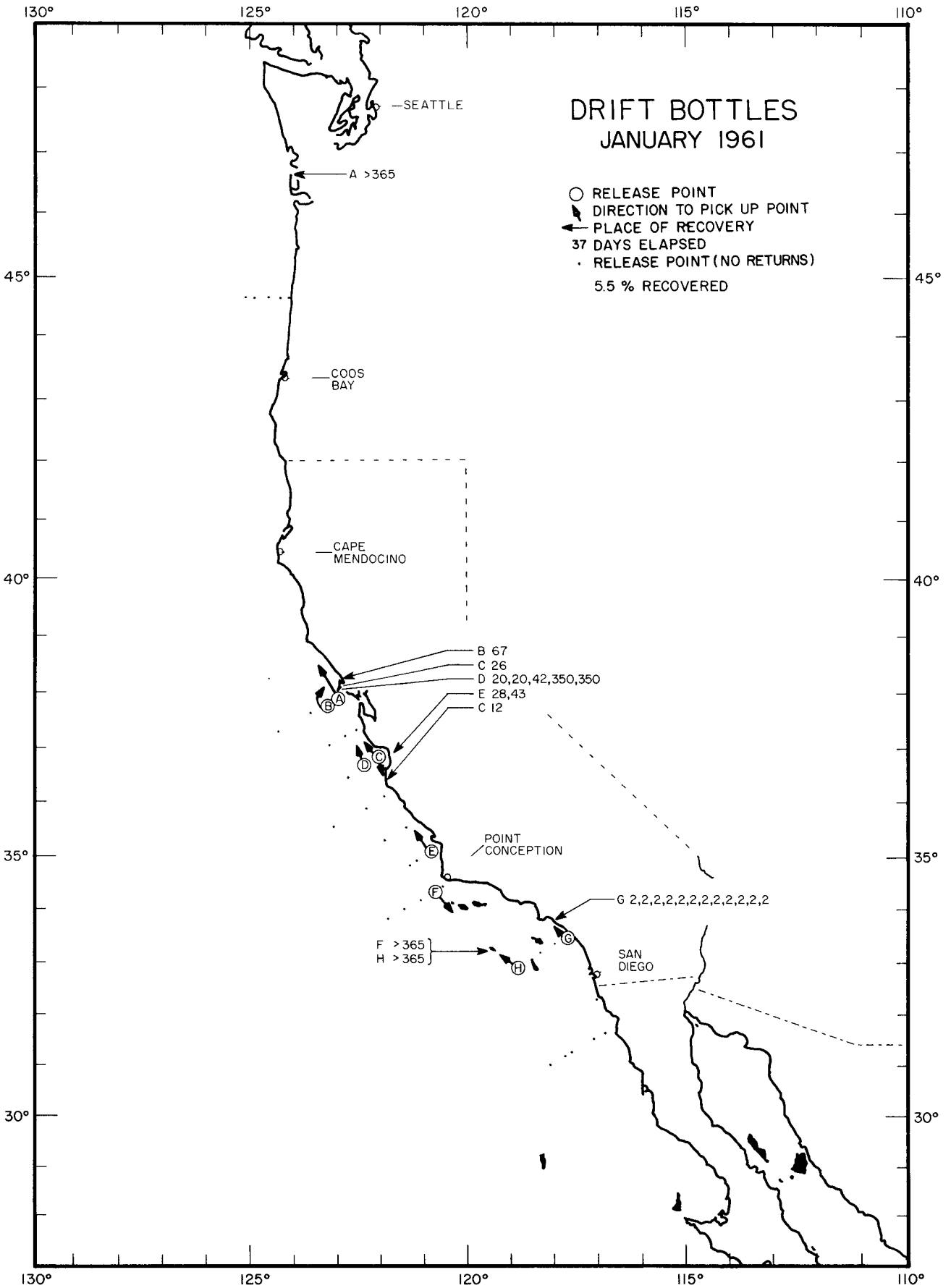
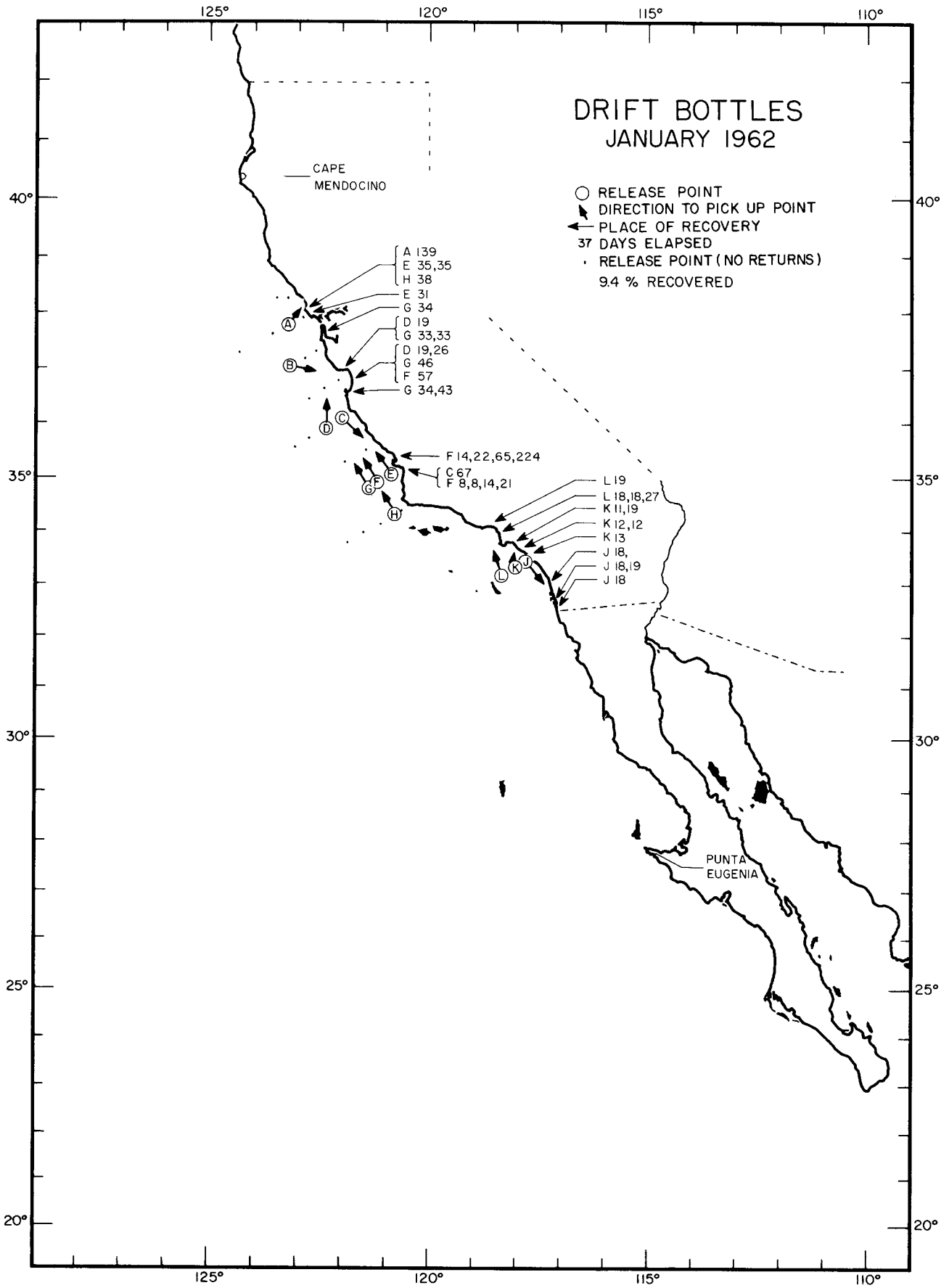
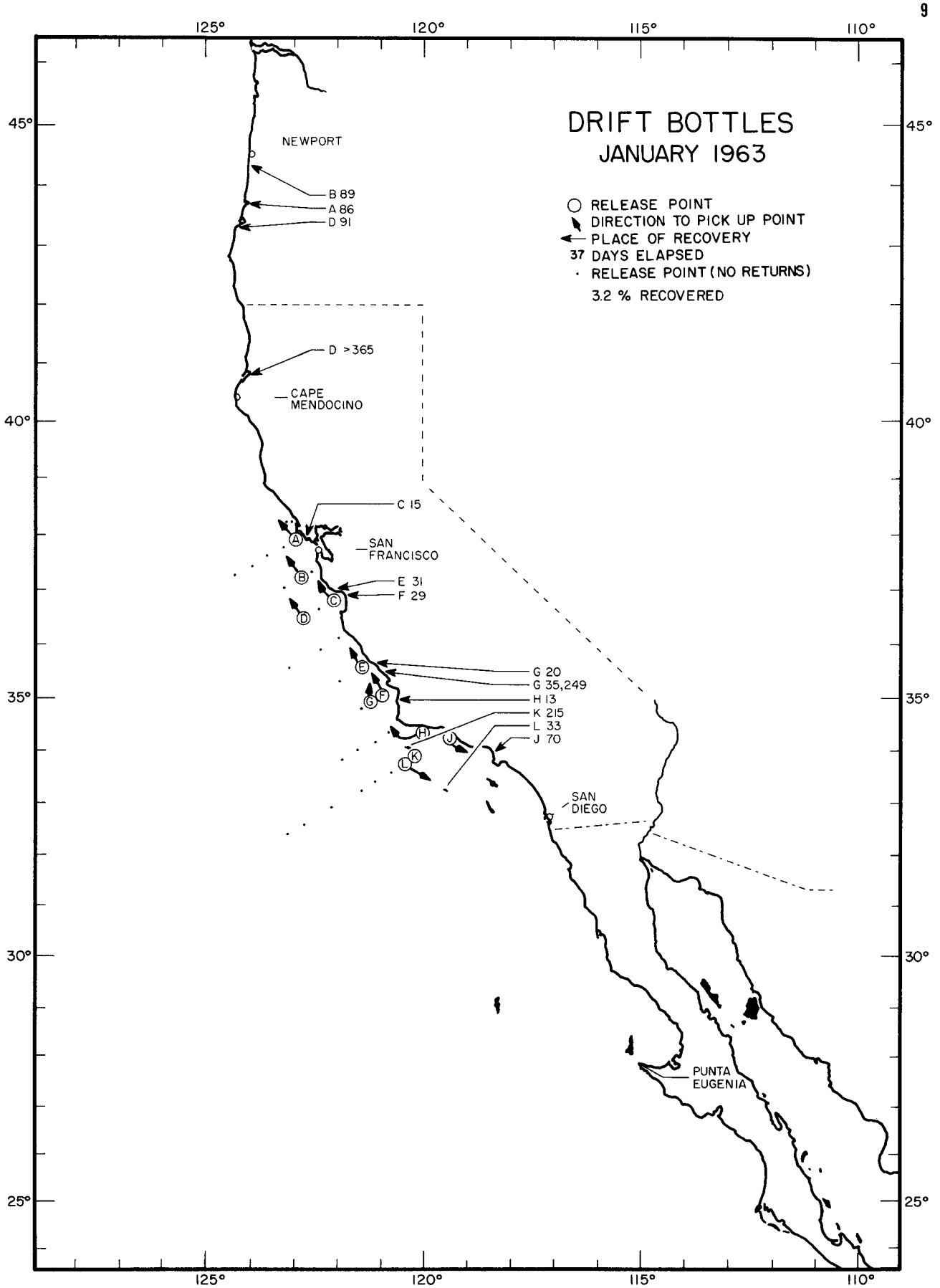


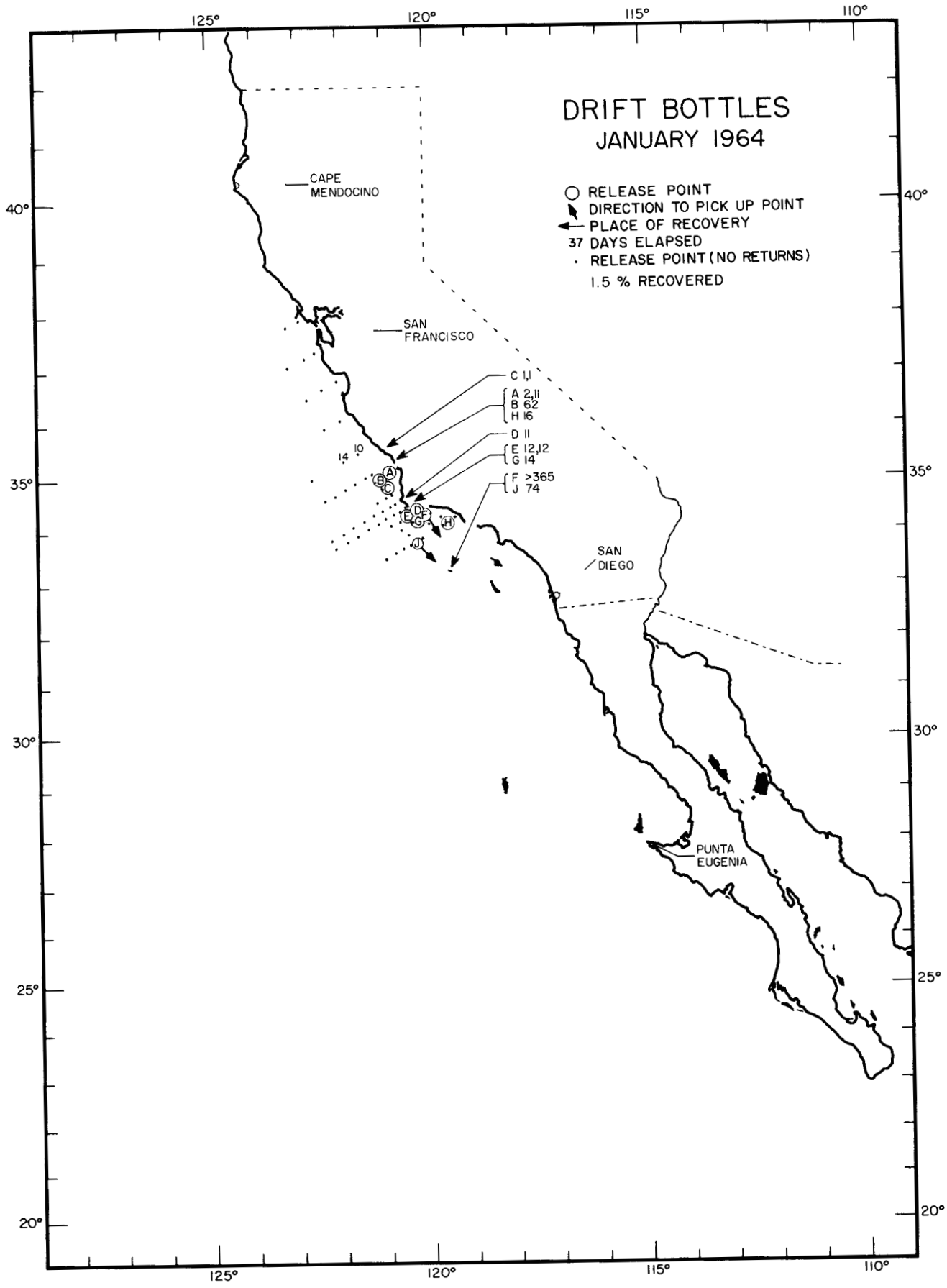
DRIFT BOTTLES
JANUARY 1961



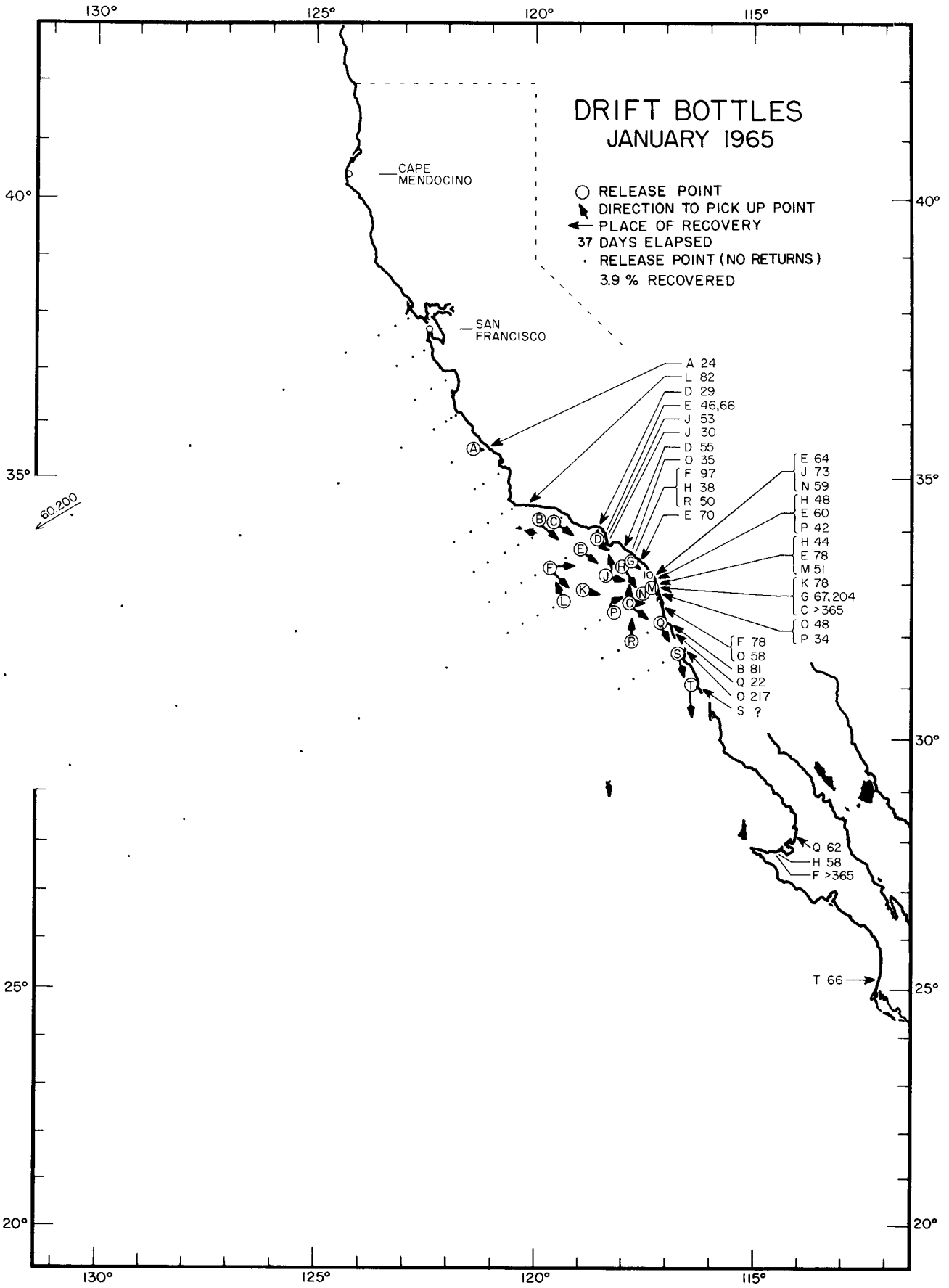
DRIFT BOTTLES
JANUARY 1962



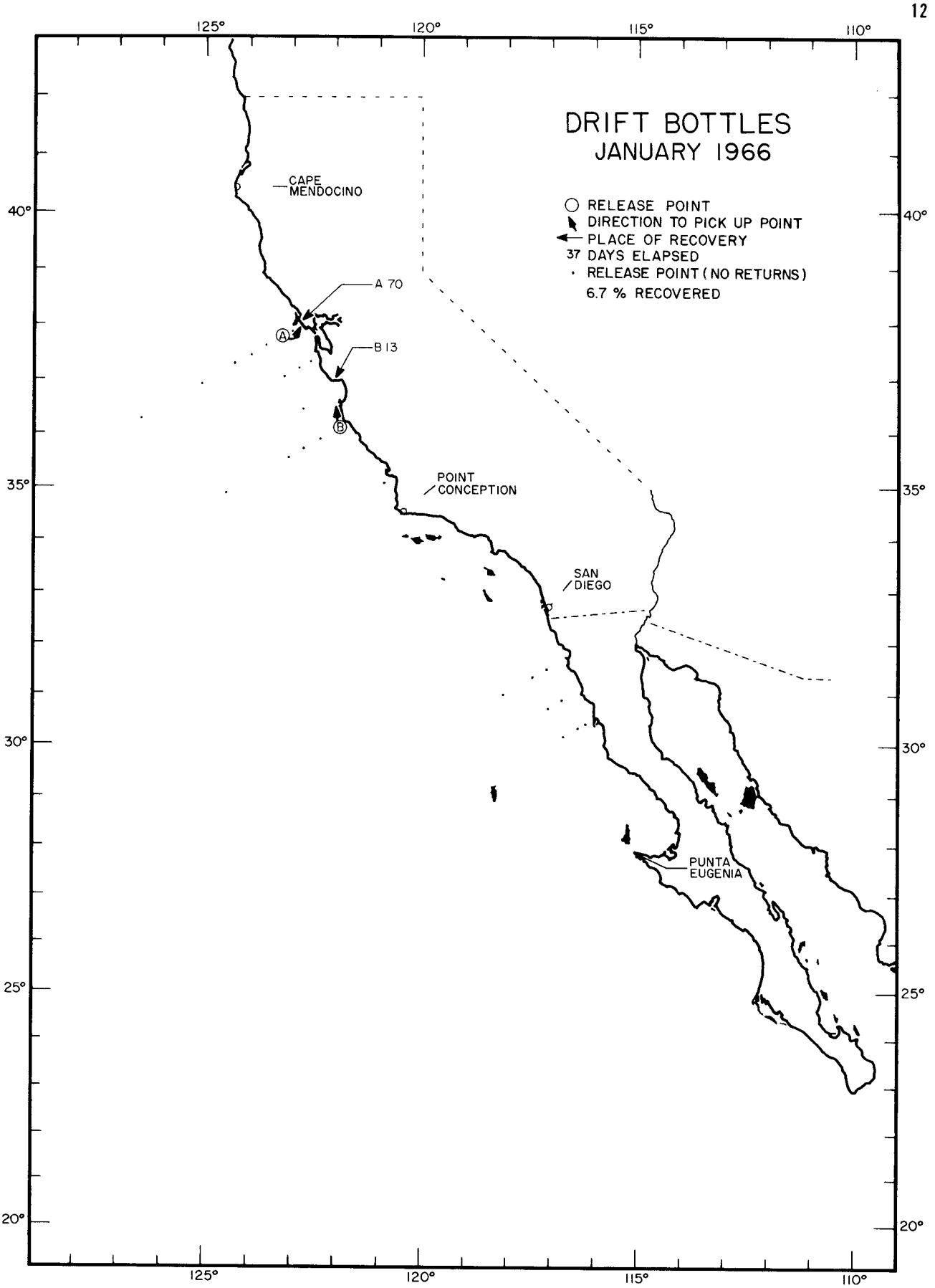
DRIFT BOTTLES
JANUARY 1963



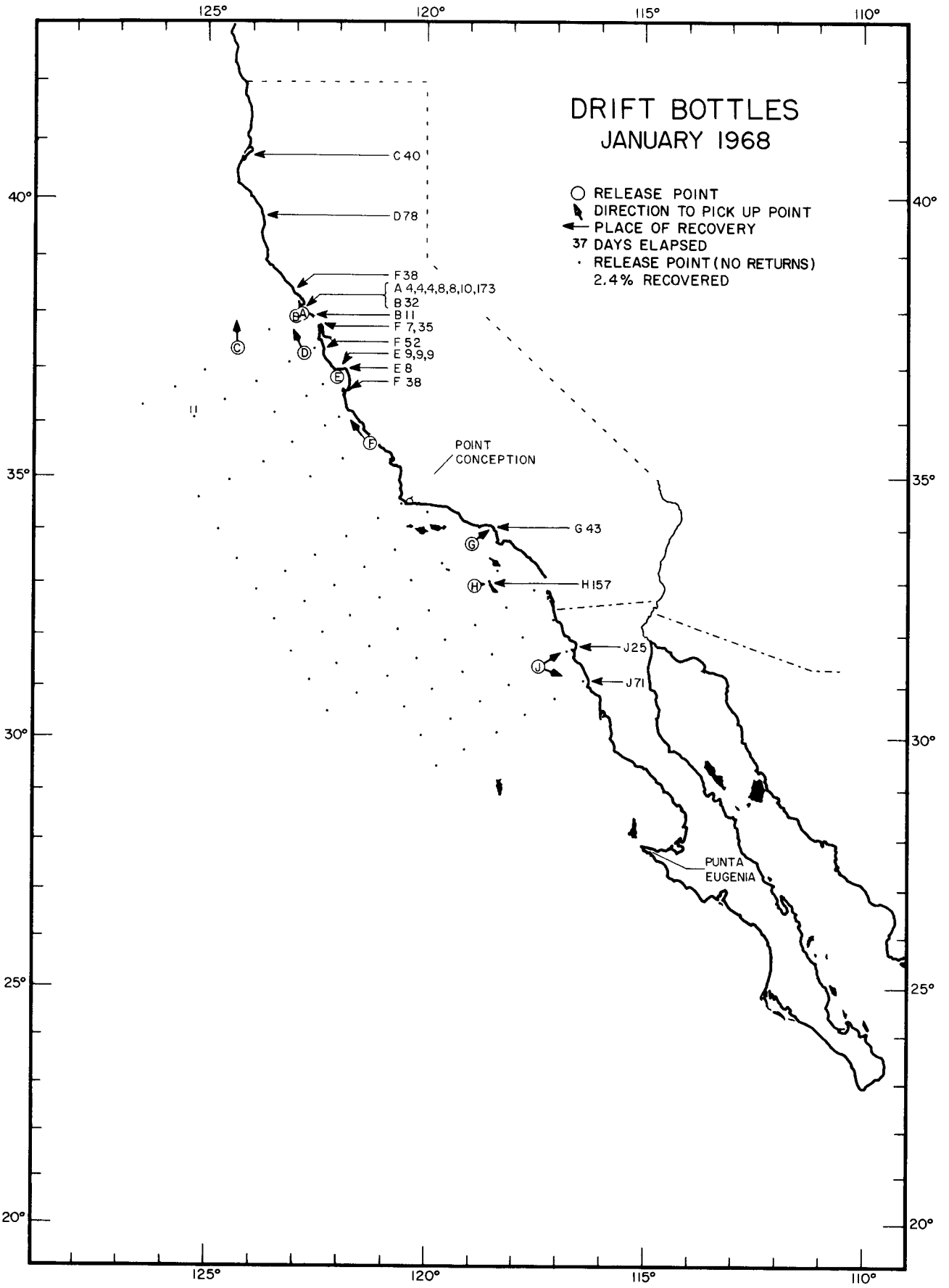
DRIFT BOTTLES
JANUARY 1964



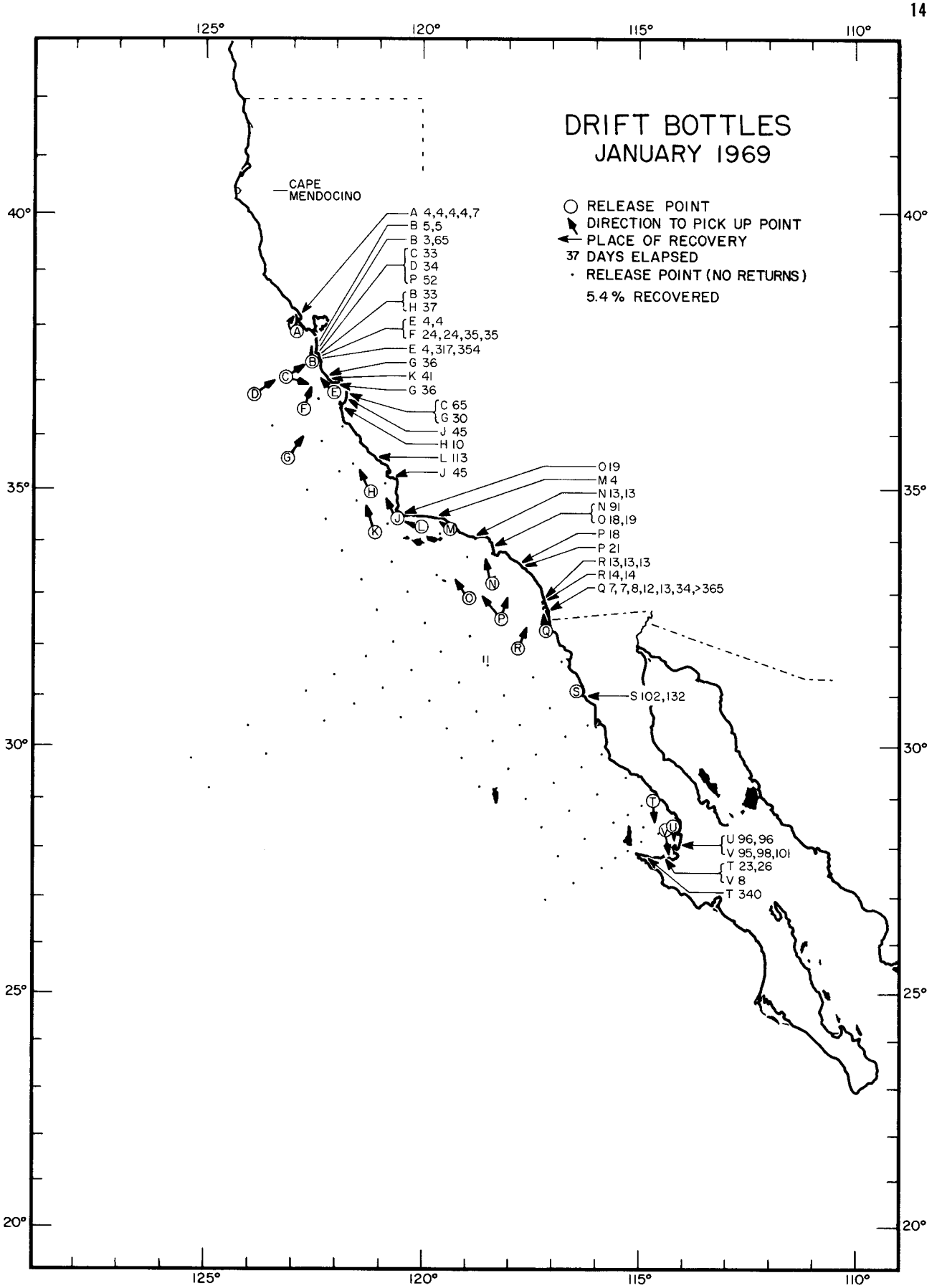
DRIFT BOTTLES
JANUARY 1965



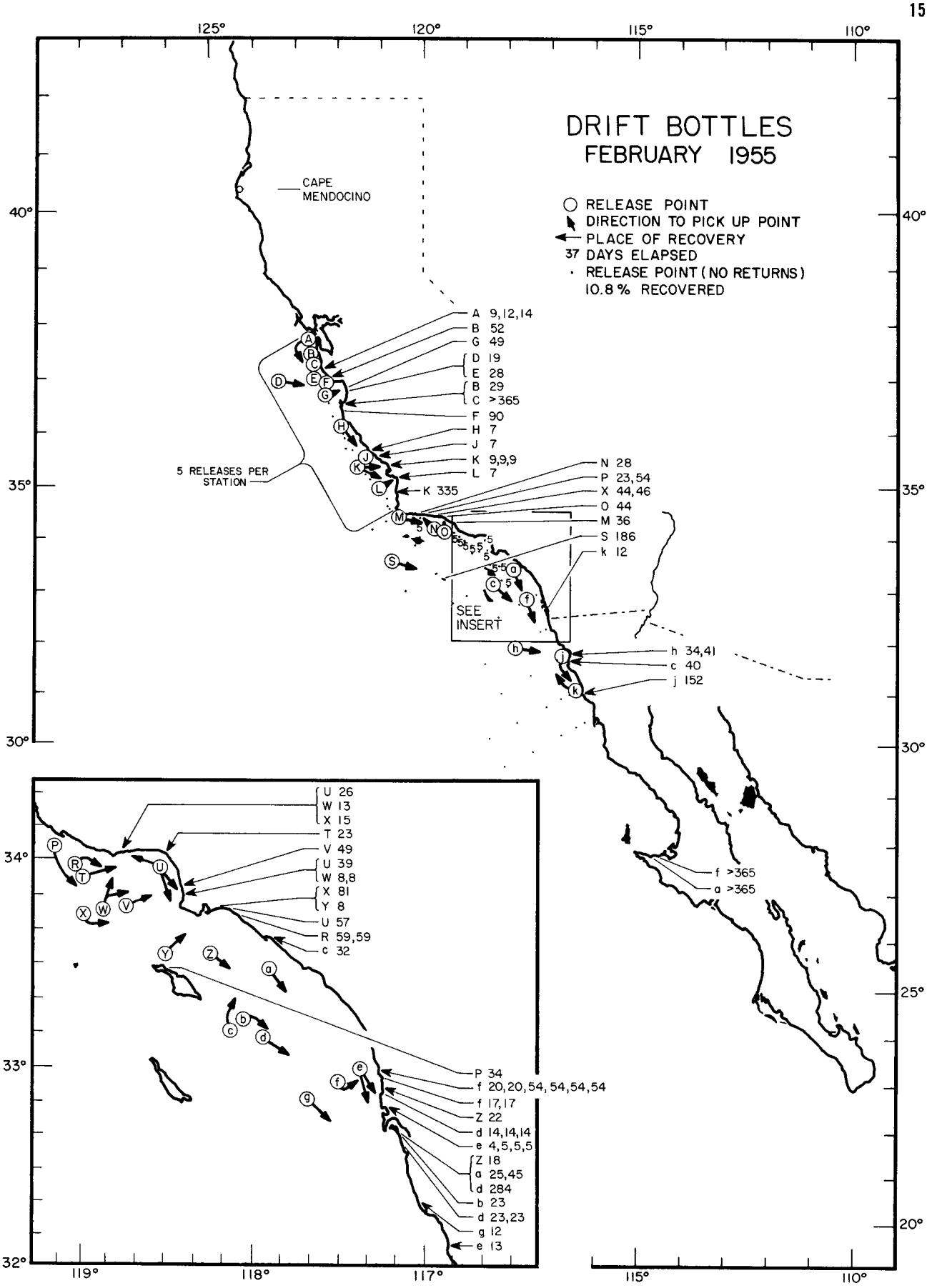
DRIFT BOTTLES
JANUARY 1966



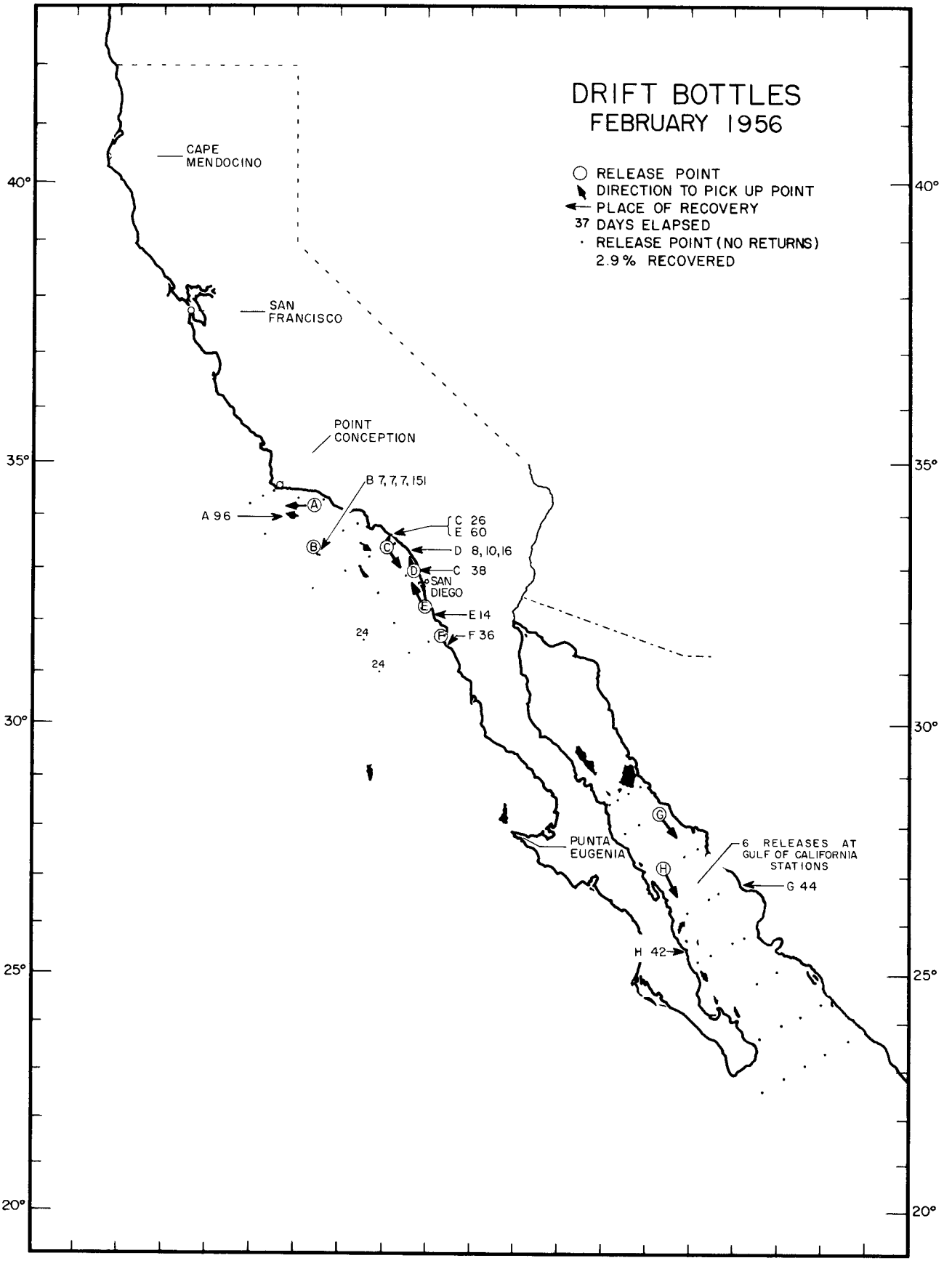
DRIFT BOTTLES
JANUARY 1968



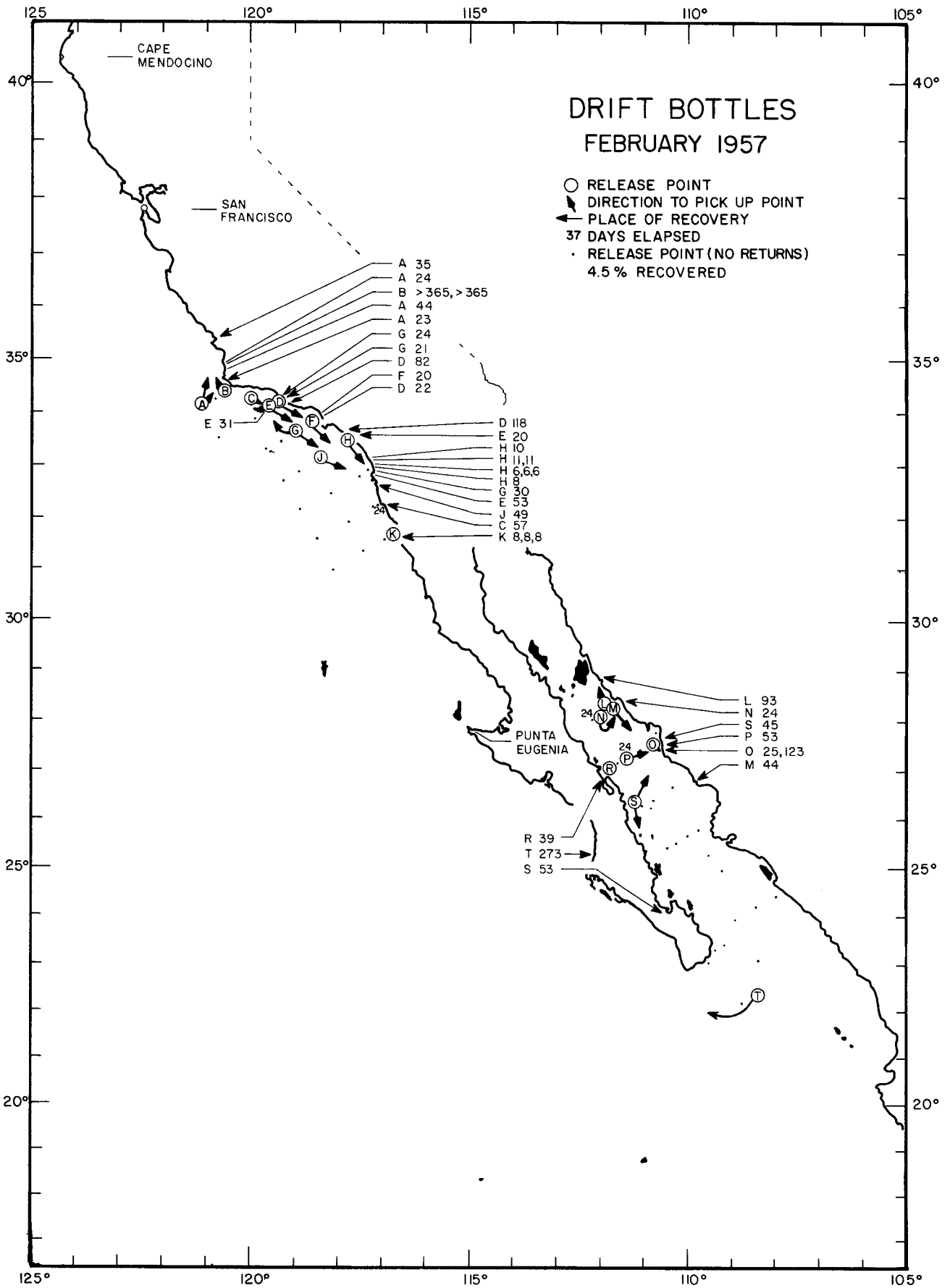
DRIFT BOTTLES
JANUARY 1969



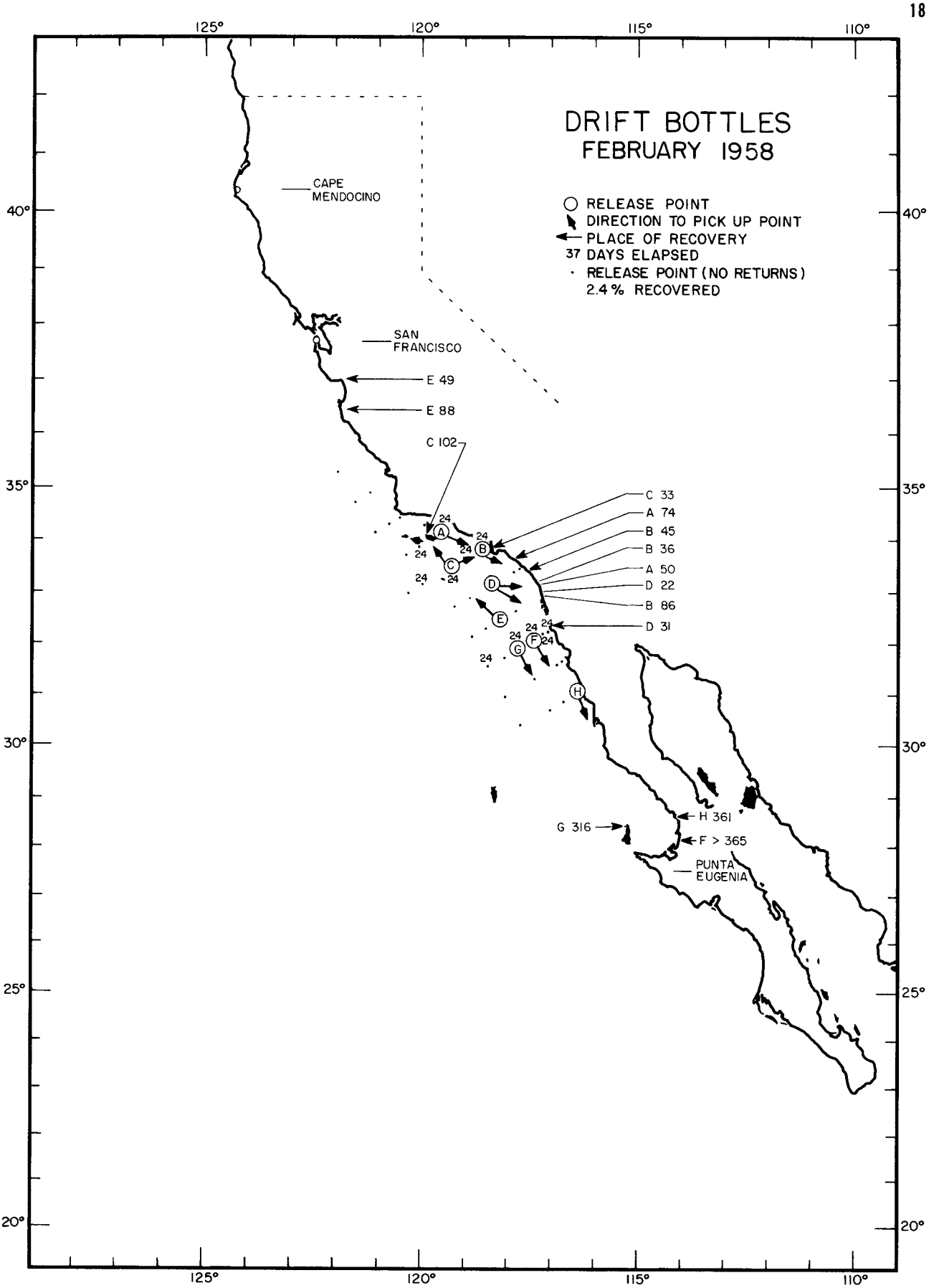
DRIFT BOTTLES
FEBRUARY 1955



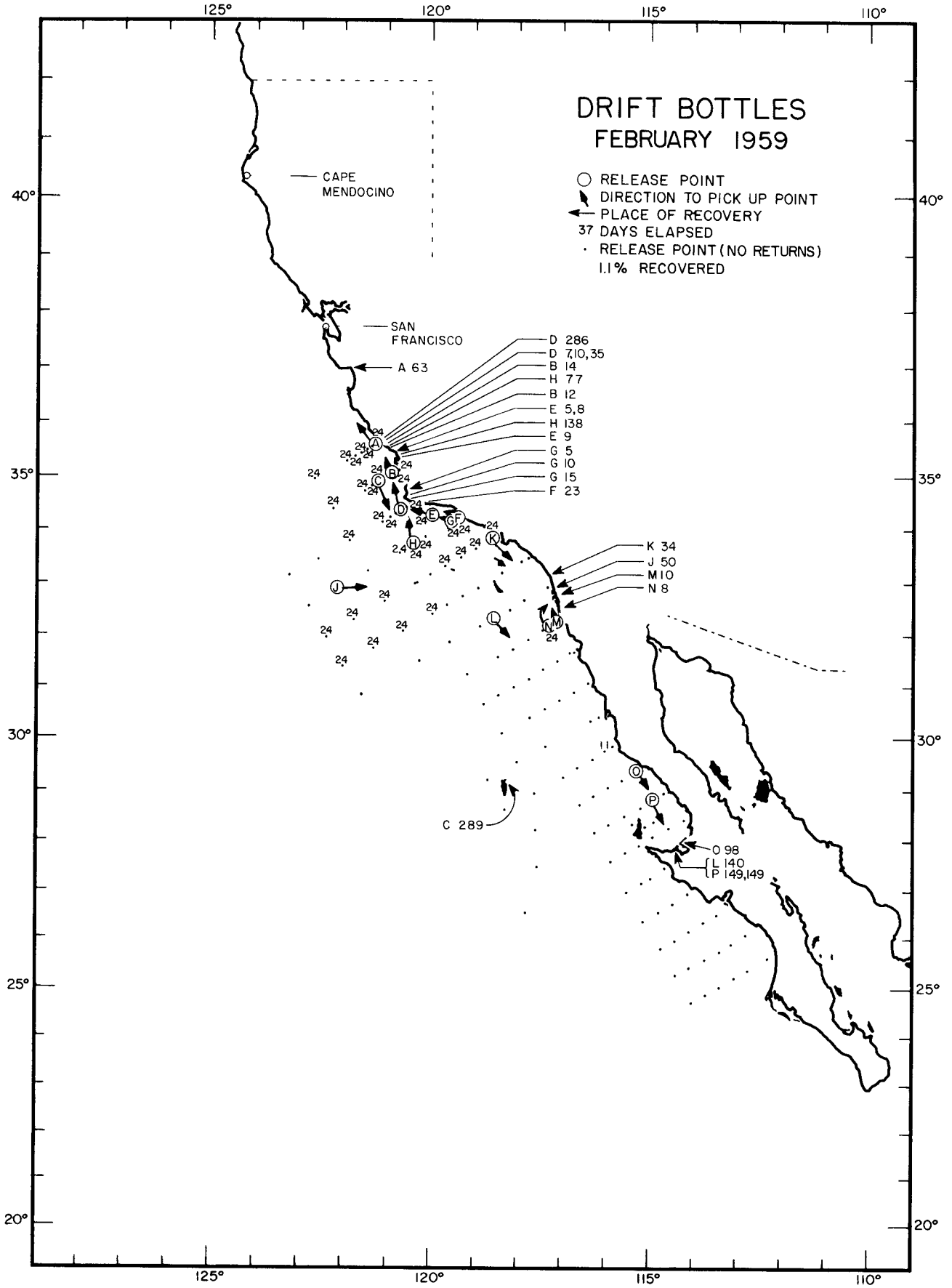
DRIFT BOTTLES
FEBRUARY 1956



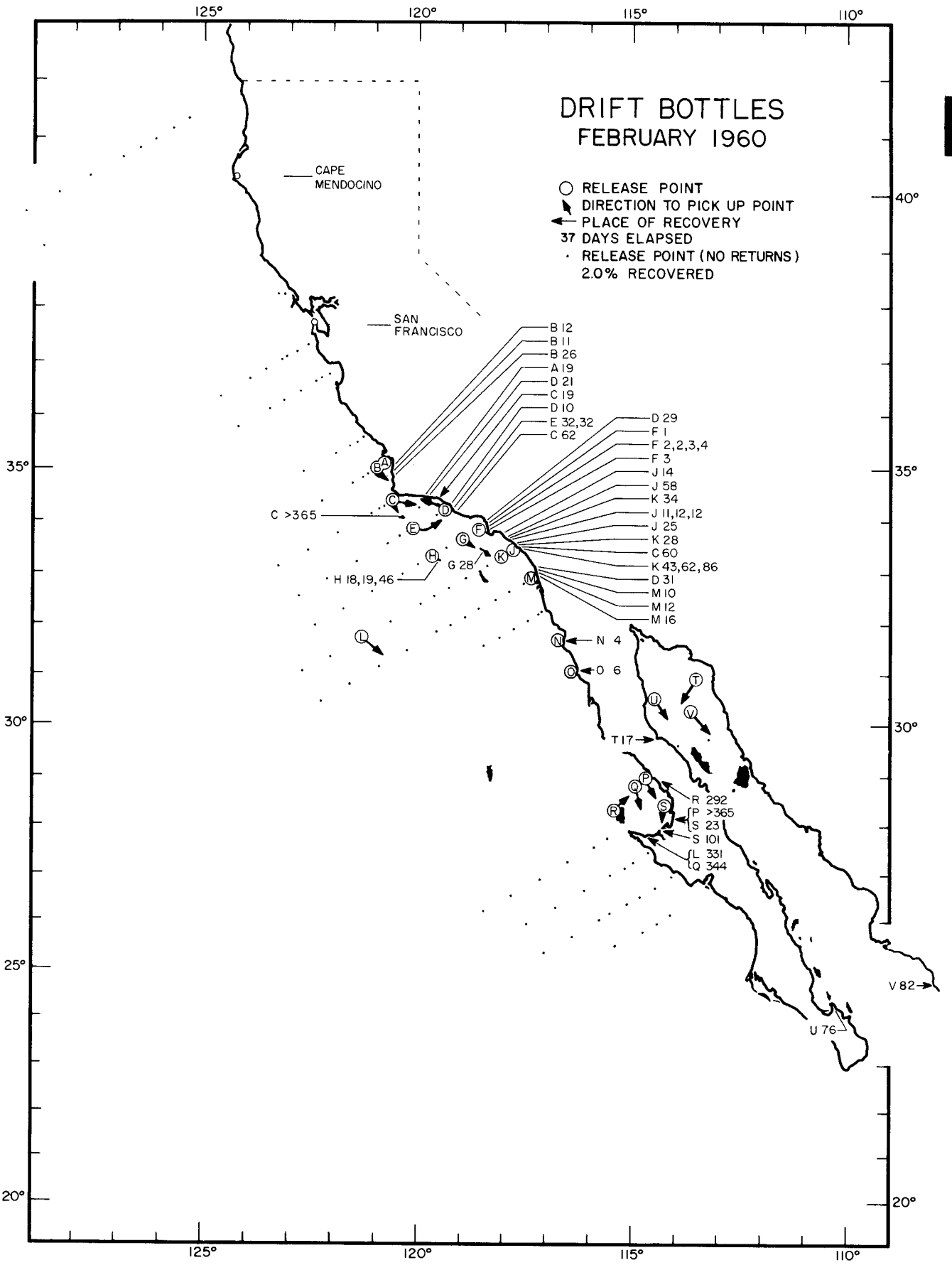
DRIFT BOTTLES
FEBRUARY 1957



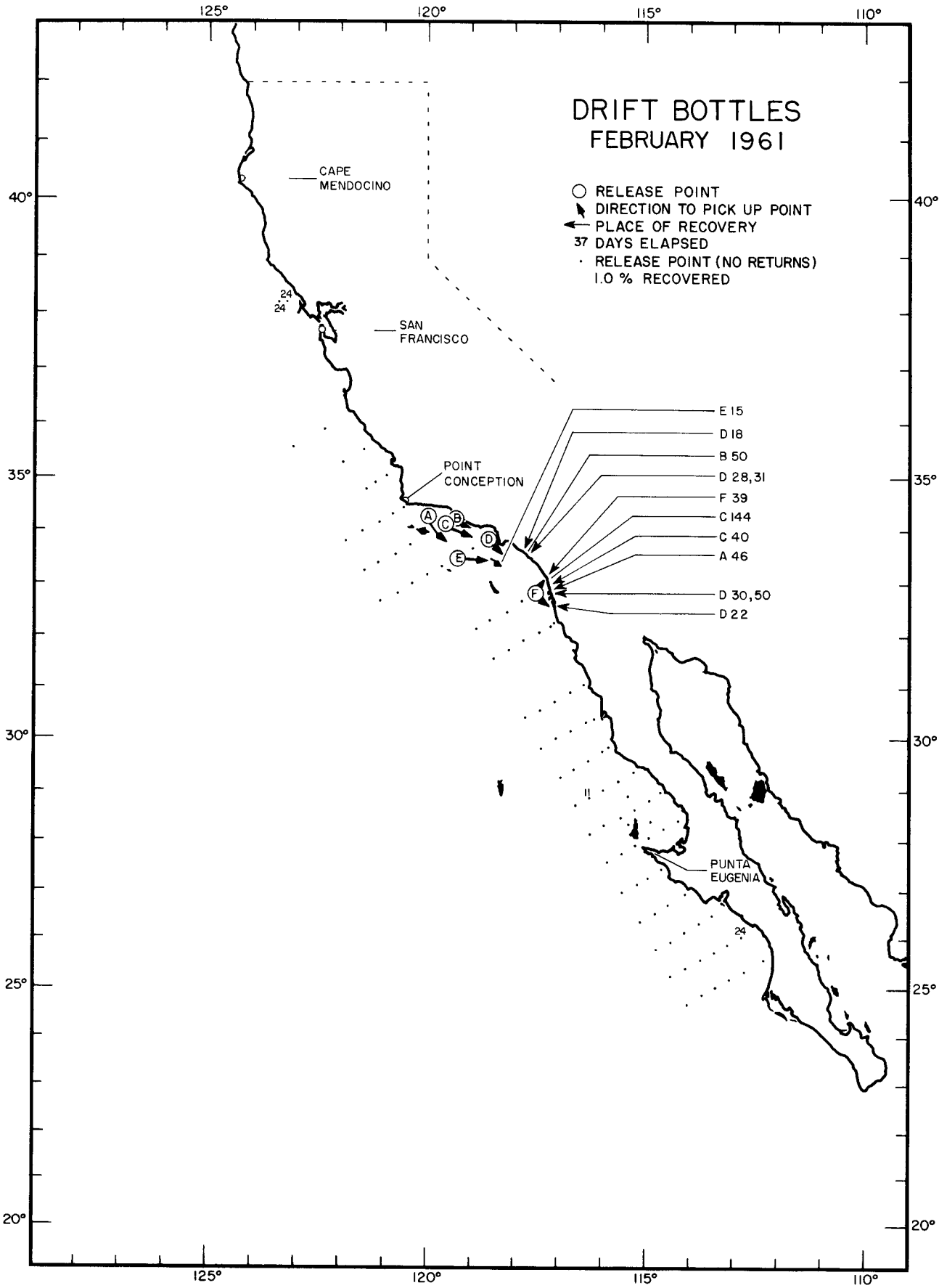
DRIFT BOTTLES
FEBRUARY 1958



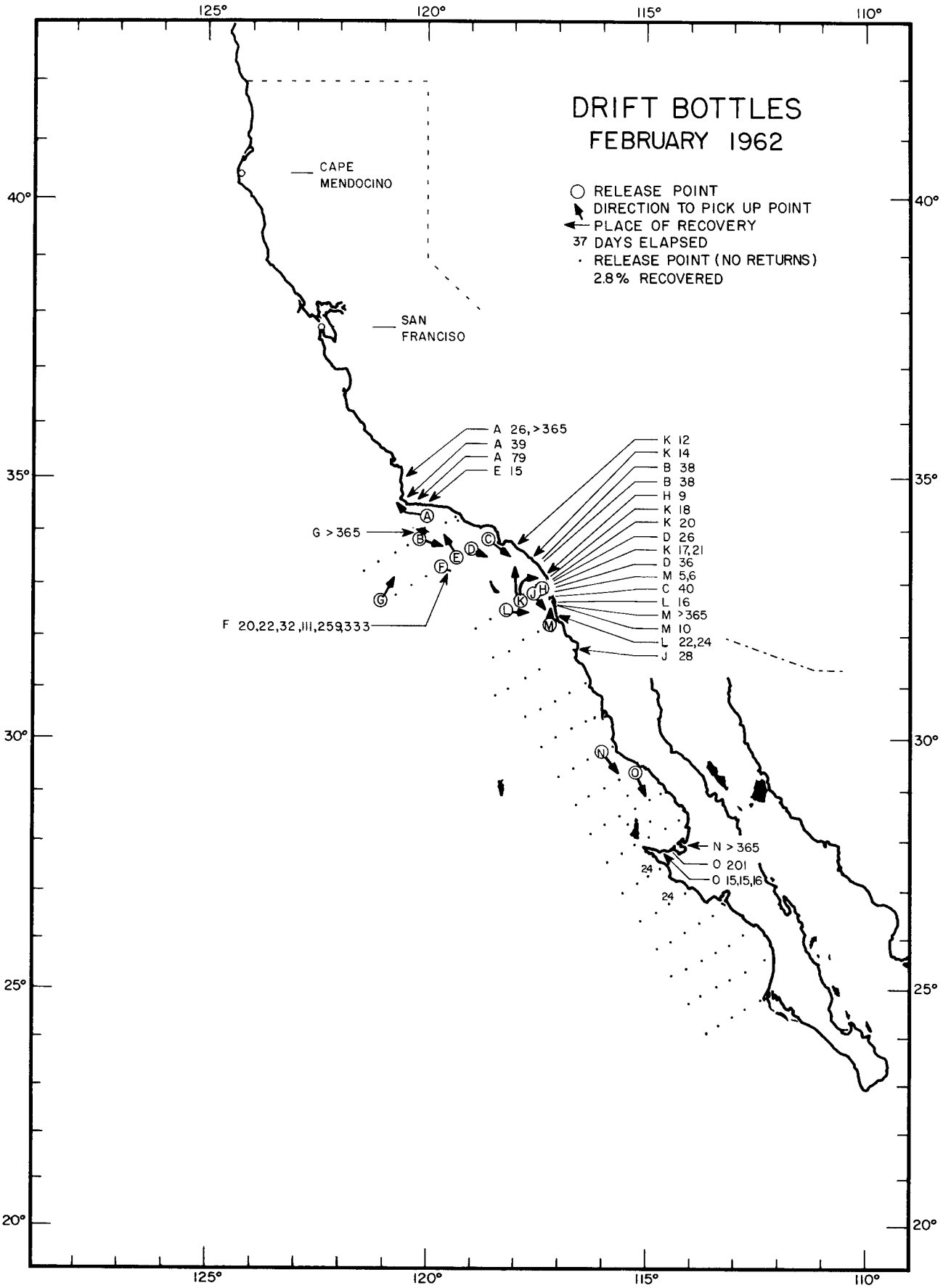
DRIFT BOTTLES
FEBRUARY 1959



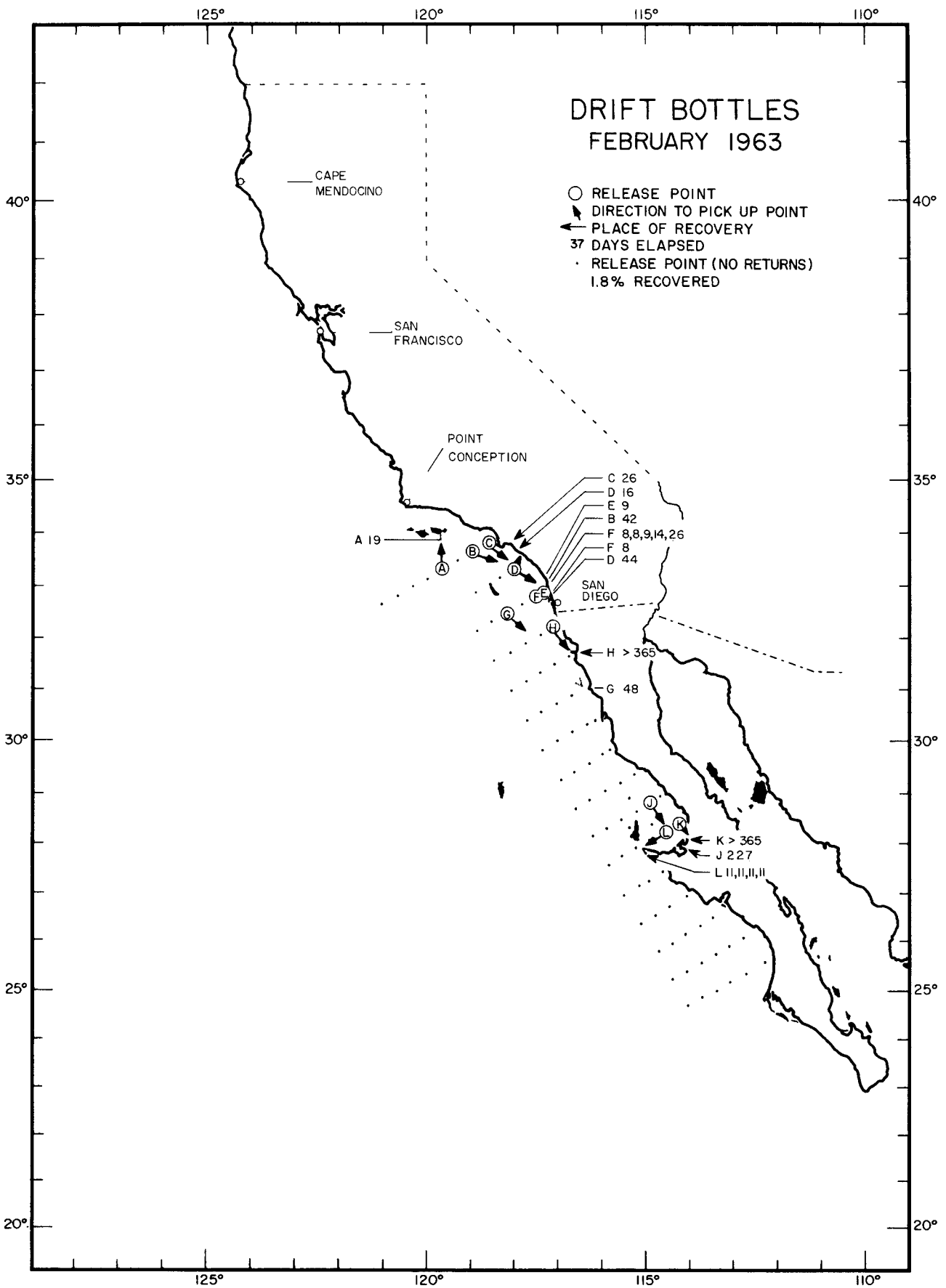
DRIFT BOTTLES
FEBRUARY 1960



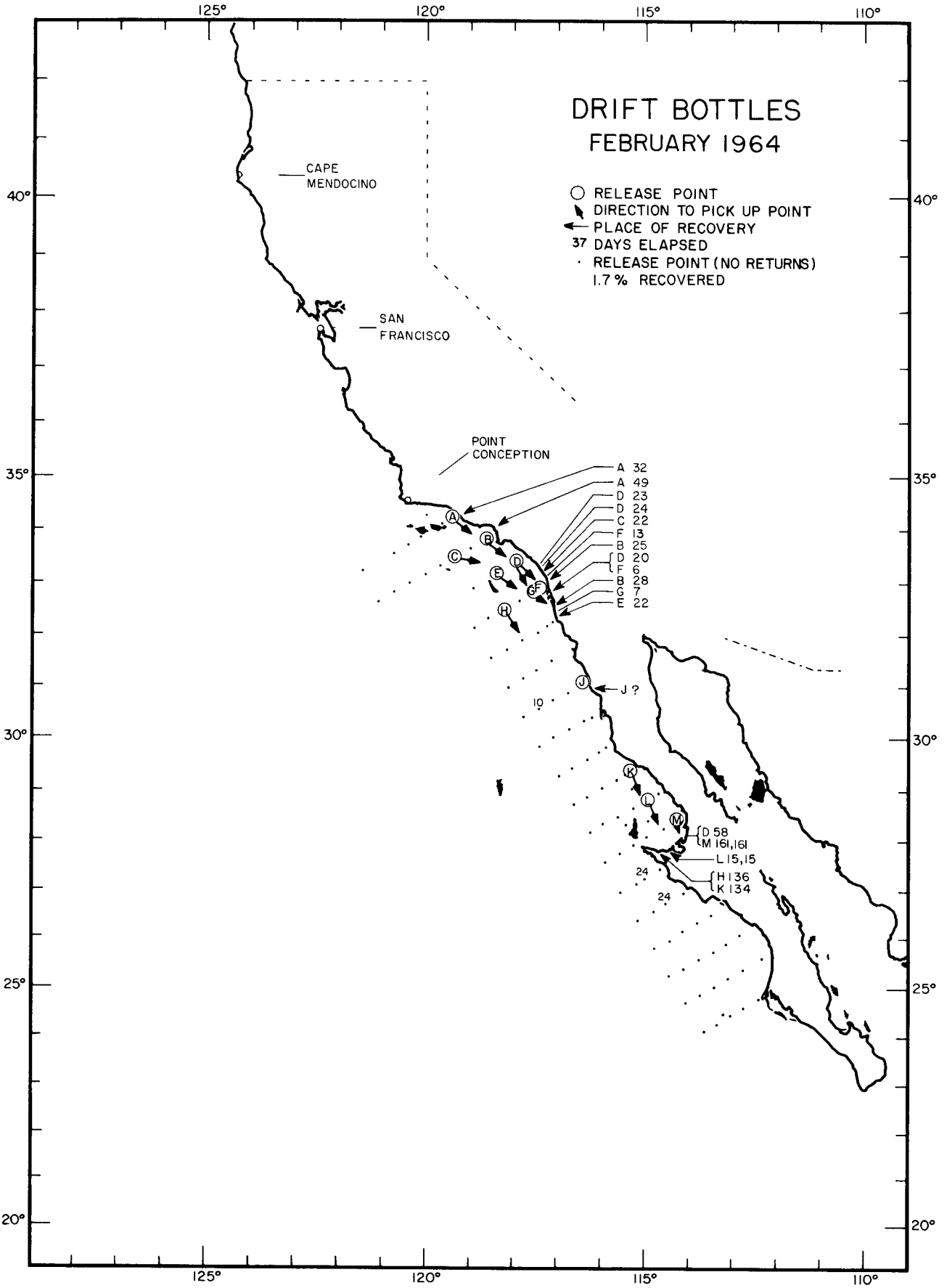
DRIFT BOTTLES
FEBRUARY 1961



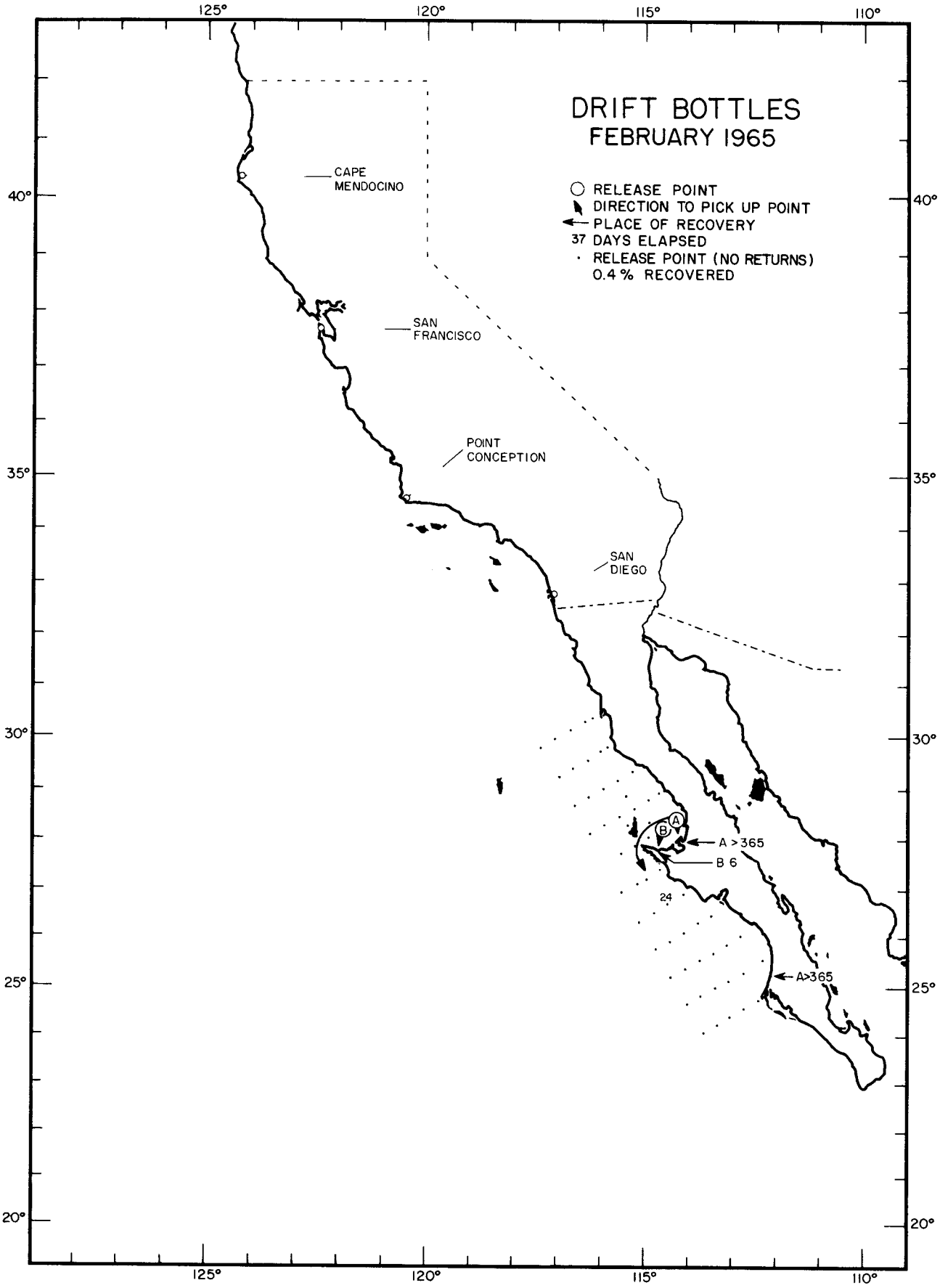
DRIFT BOTTLES
FEBRUARY 1962



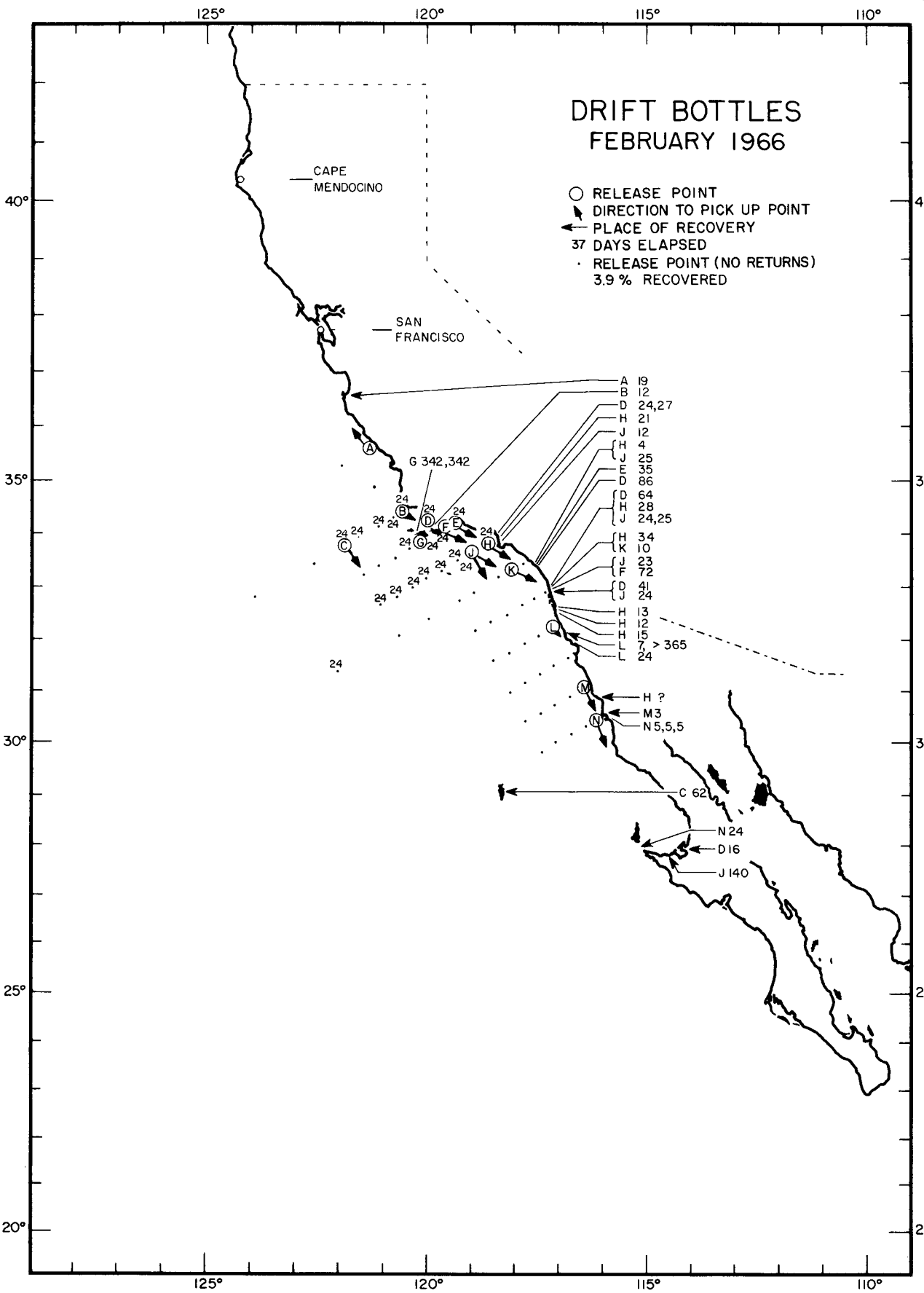
DRIFT BOTTLES
FEBRUARY 1963



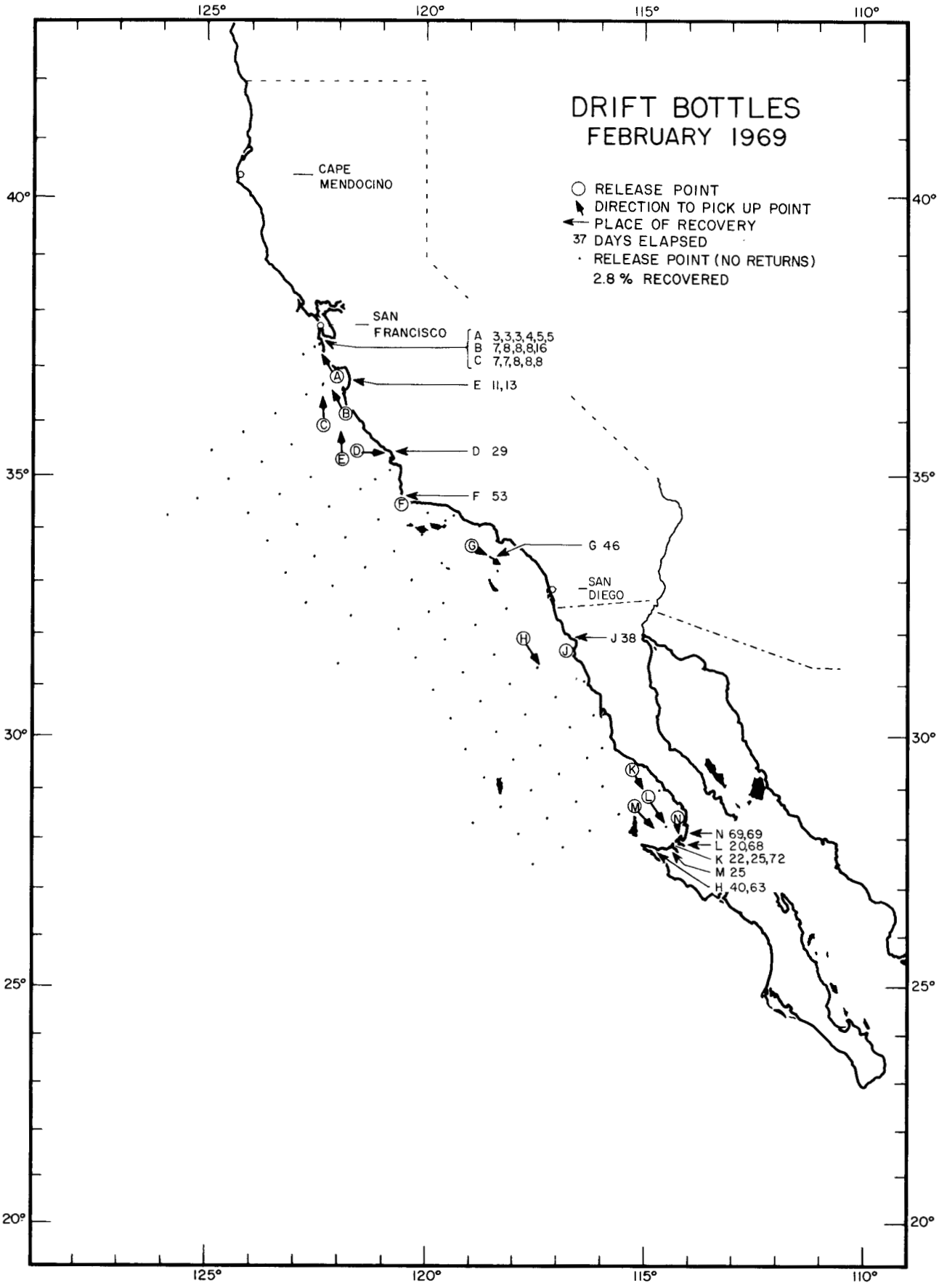
DRIFT BOTTLES
FEBRUARY 1964



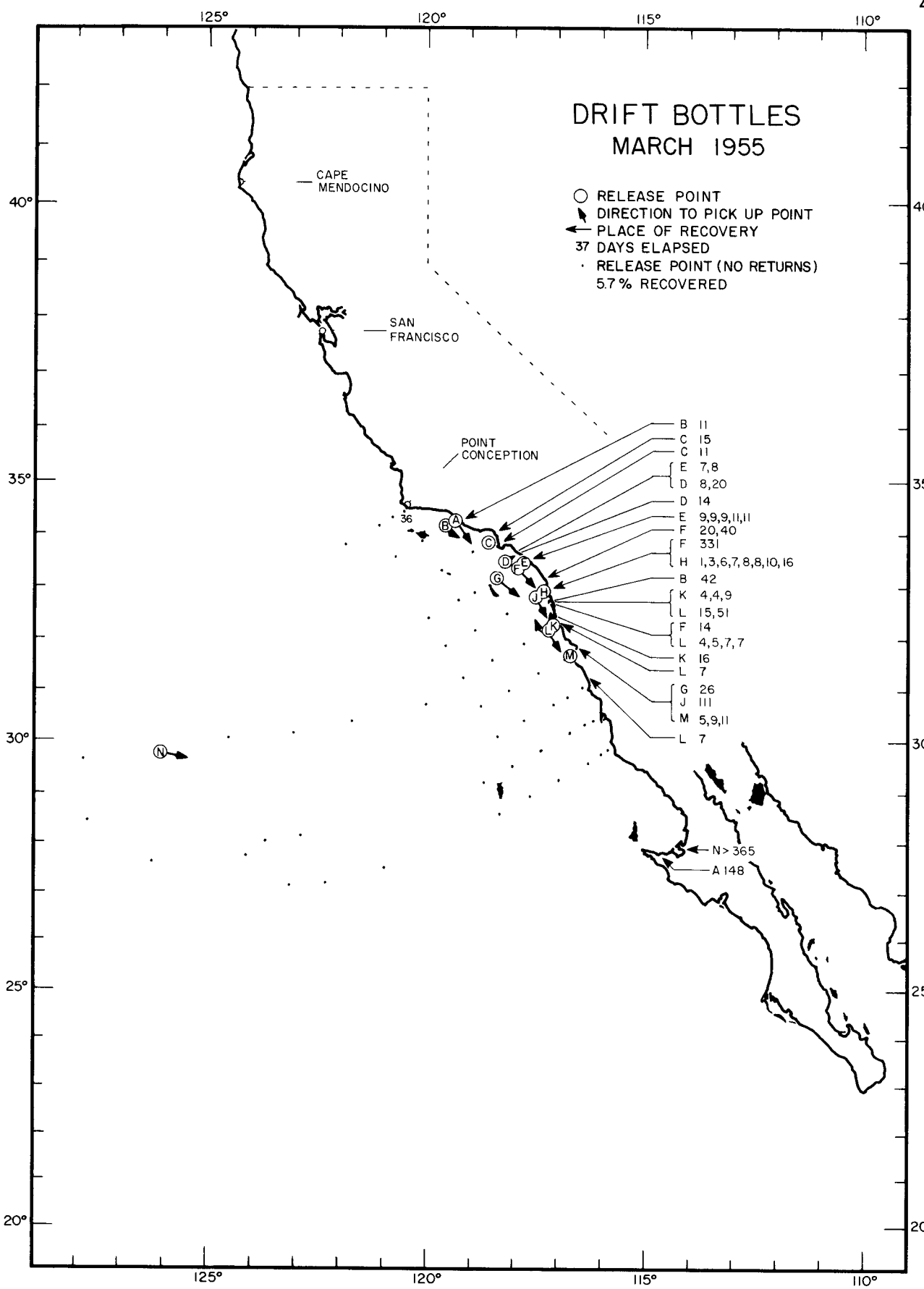
DRIFT BOTTLES
FEBRUARY 1965



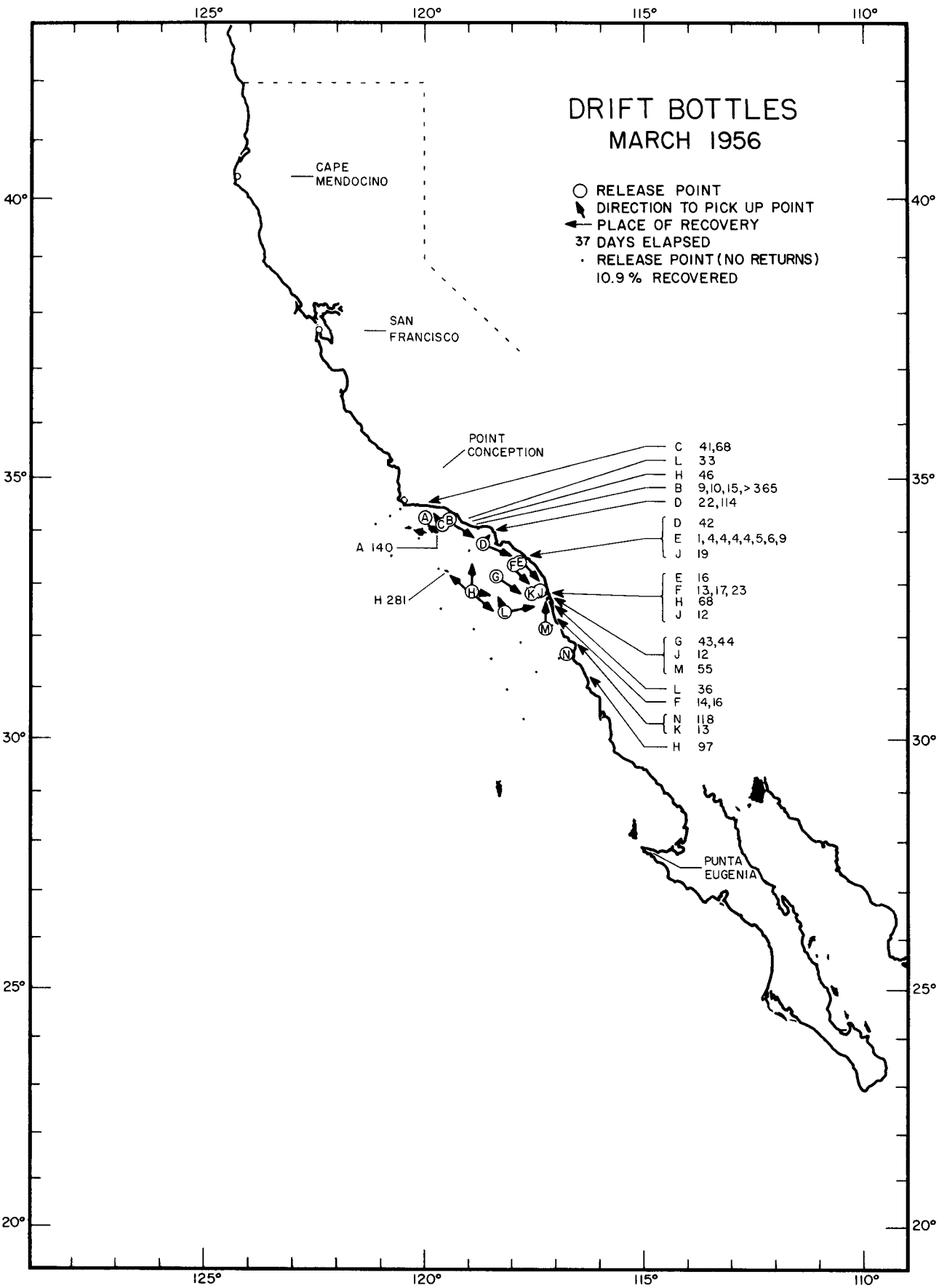
DRIFT BOTTLES
FEBRUARY 1966



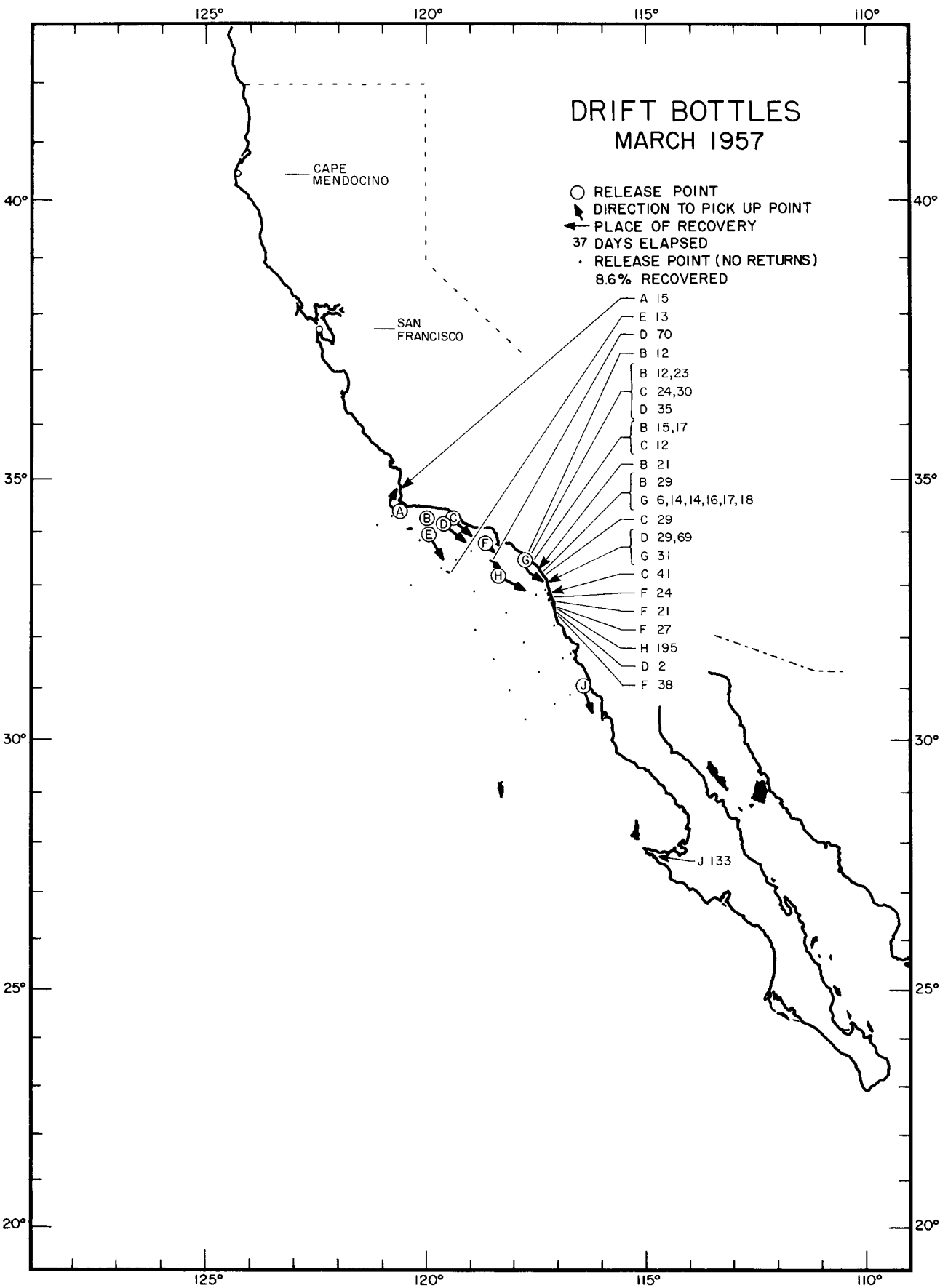
DRIFT BOTTLES
FEBRUARY 1969



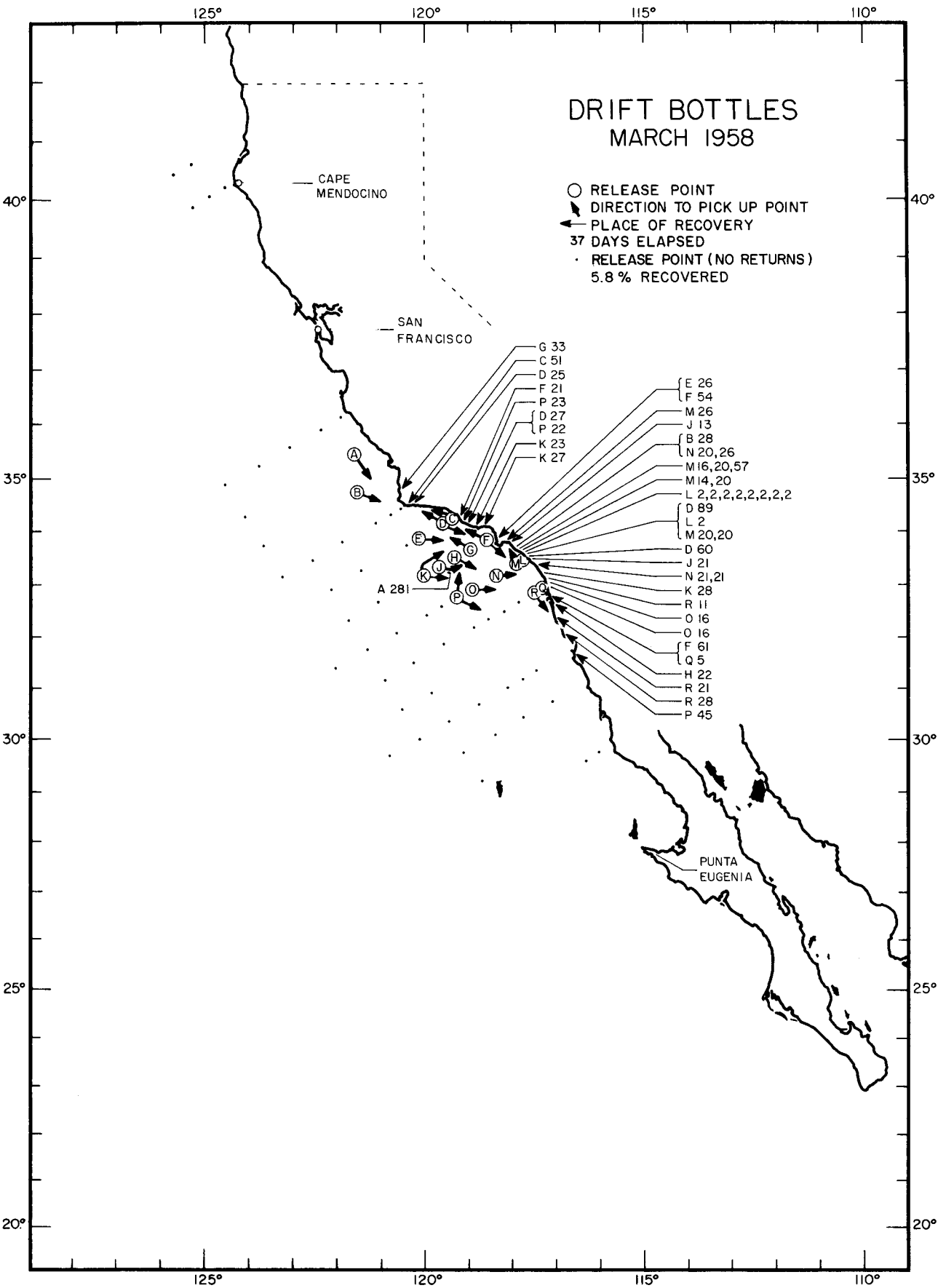
DRIFT BOTTLES
MARCH 1955



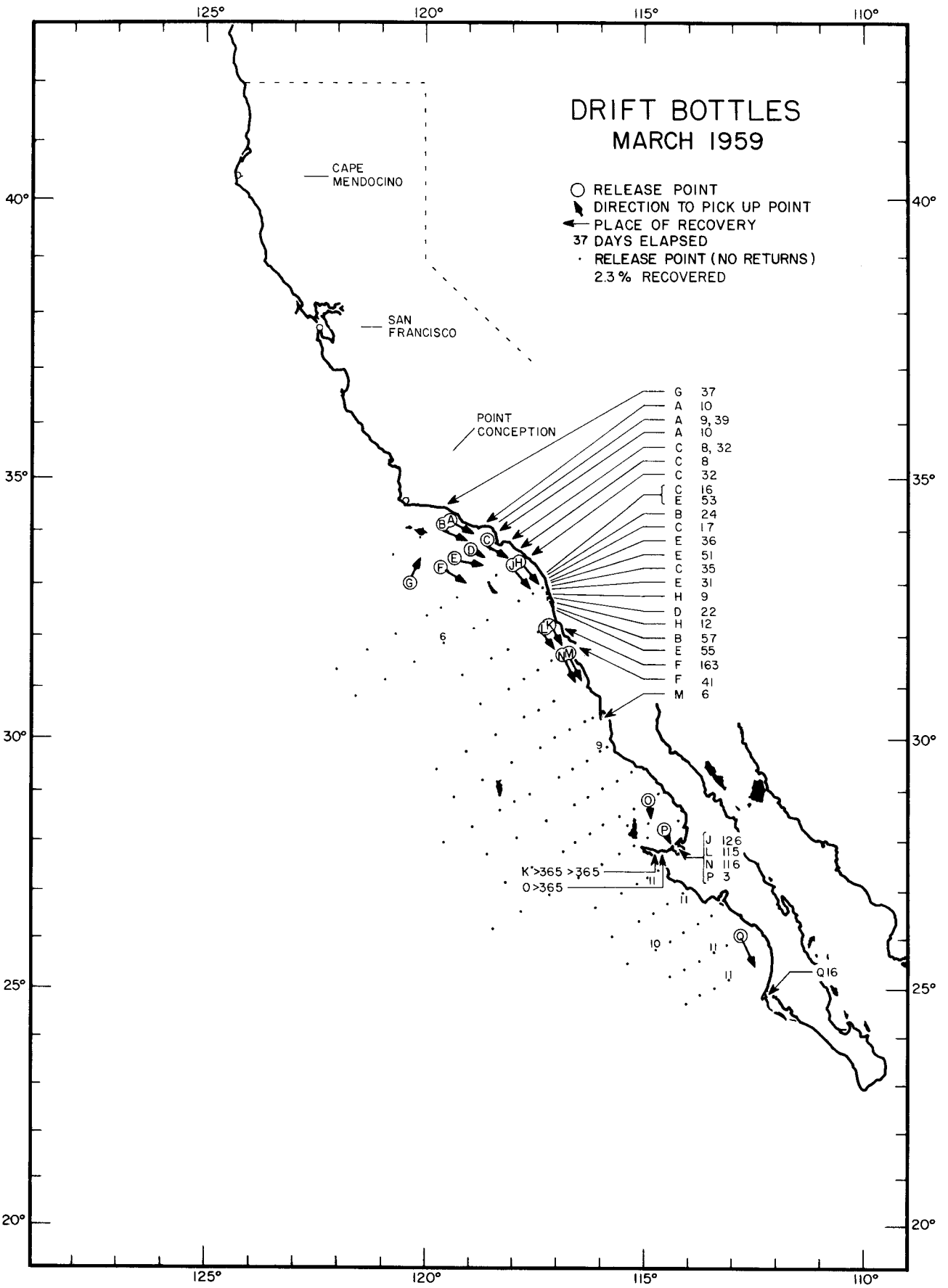
DRIFT BOTTLES
MARCH 1956



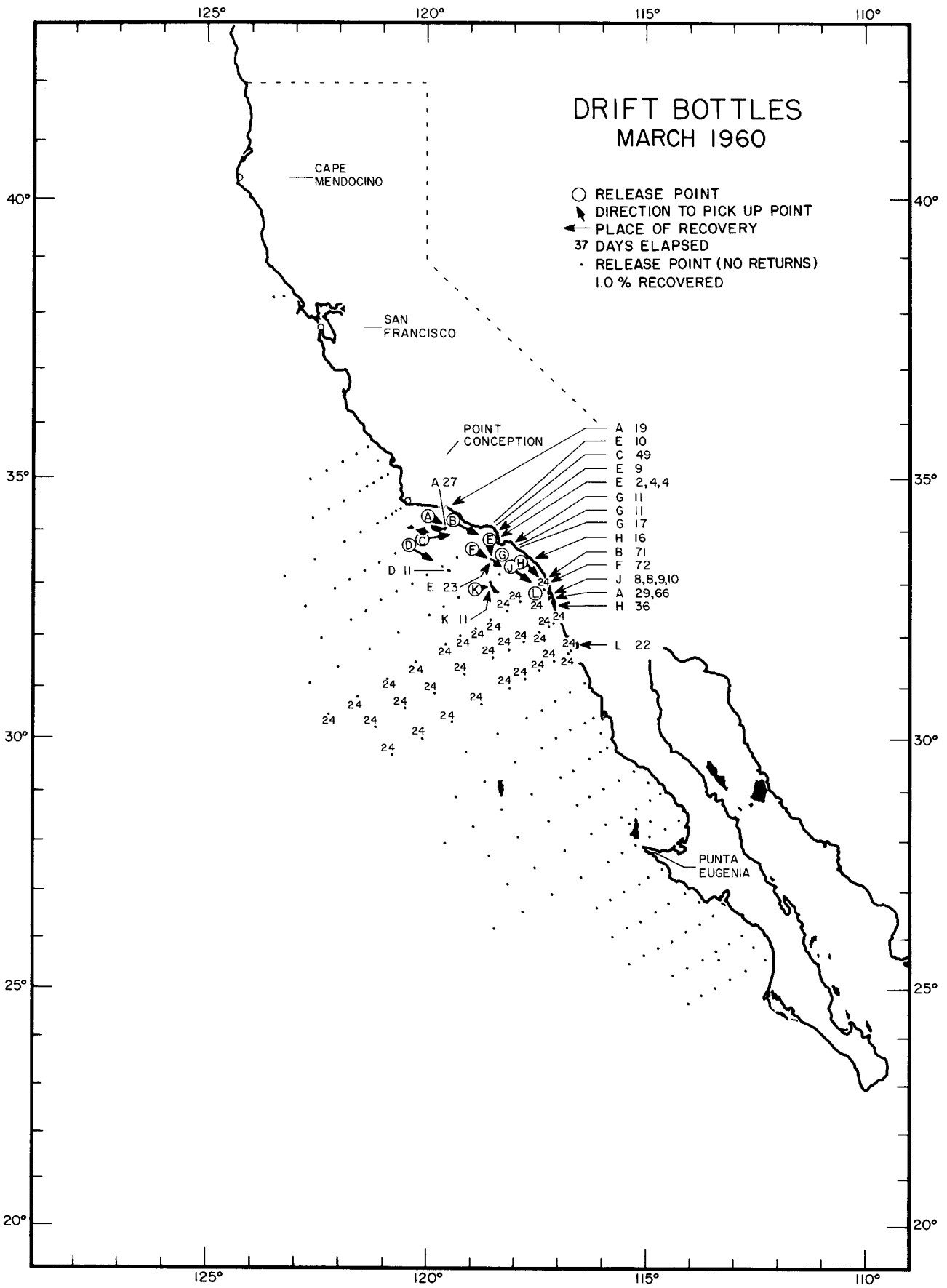
DRIFT BOTTLES
MARCH 1957



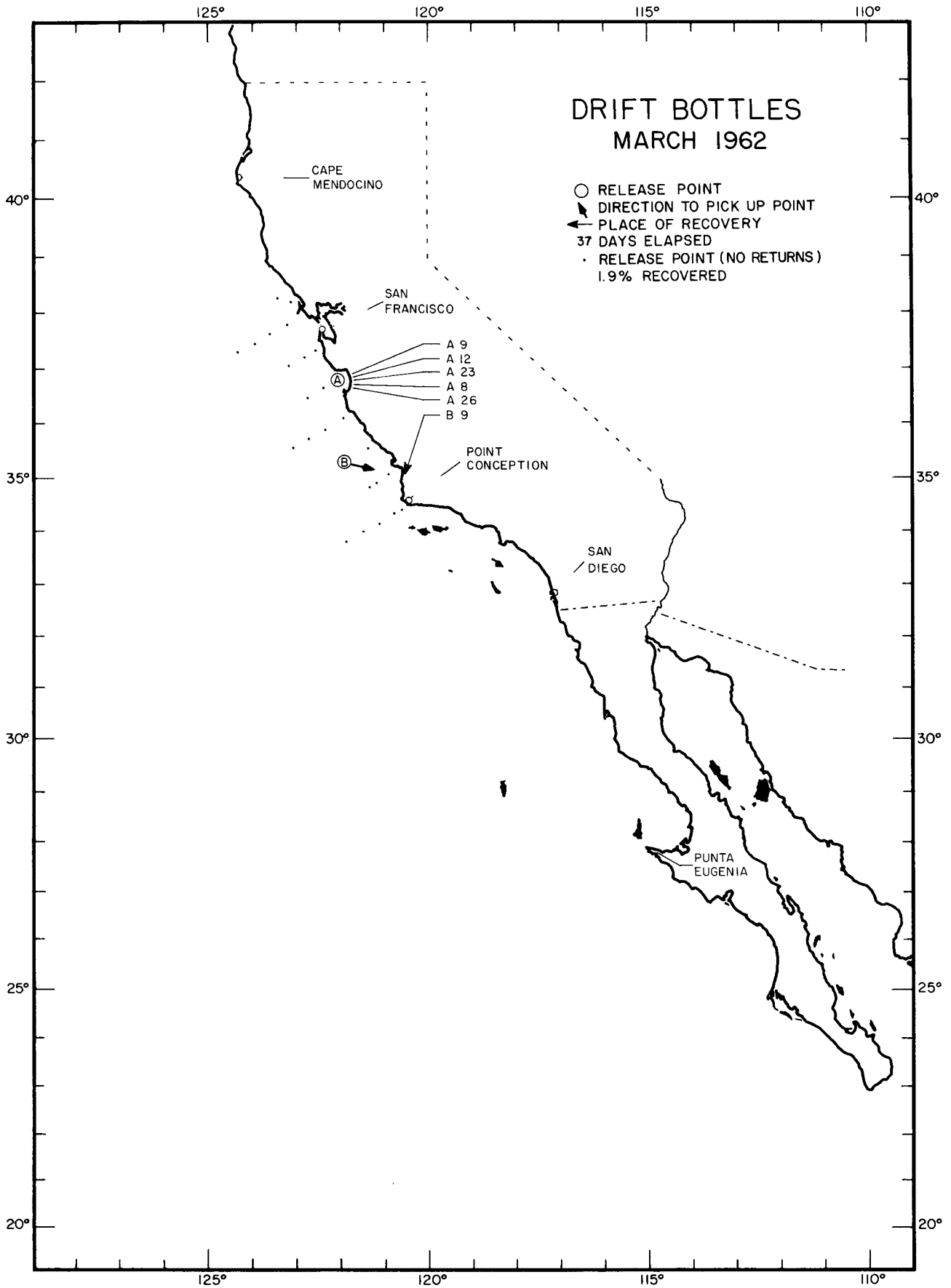
DRIFT BOTTLES
MARCH 1958



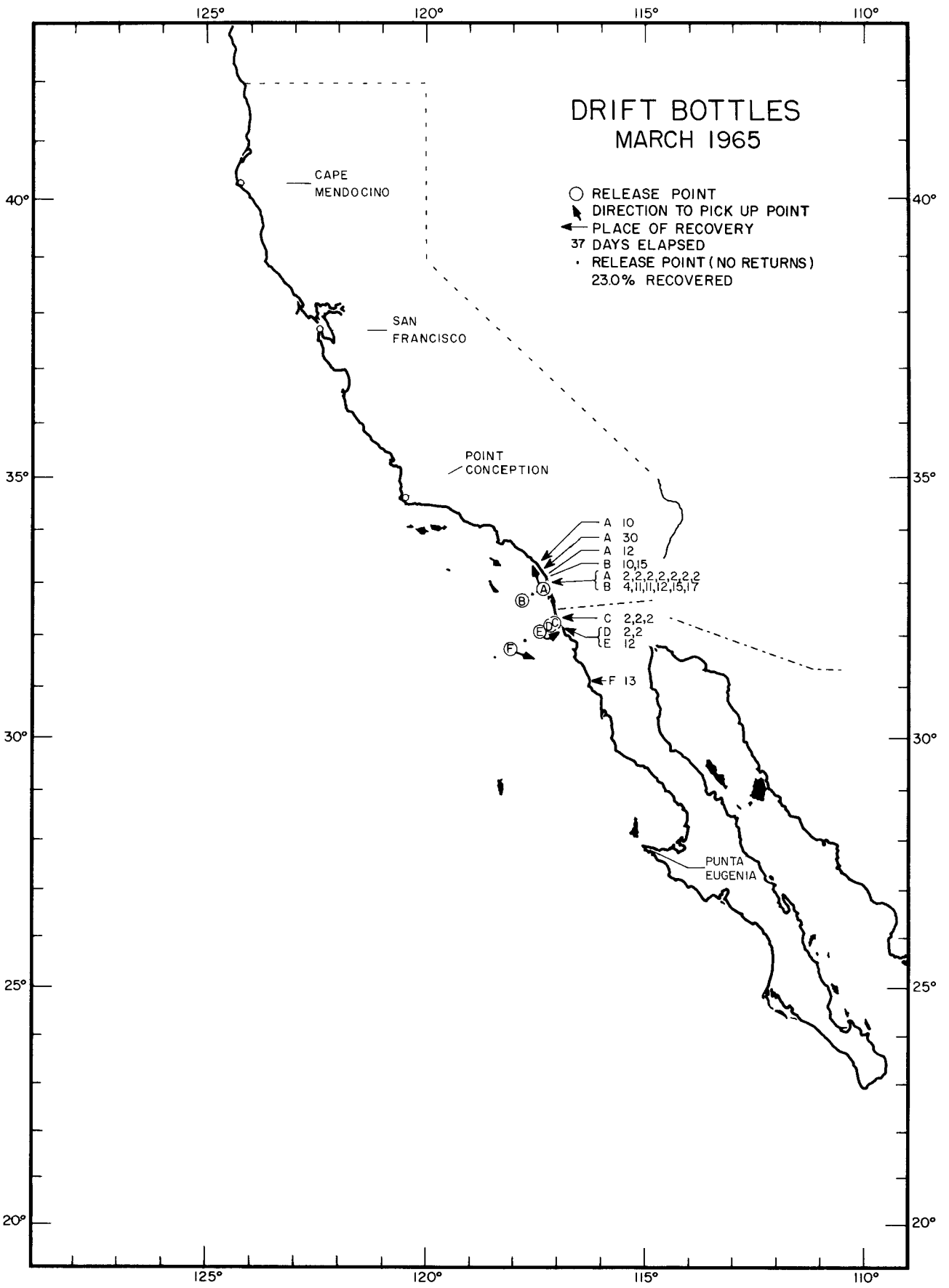
DRIFT BOTTLES
MARCH 1959



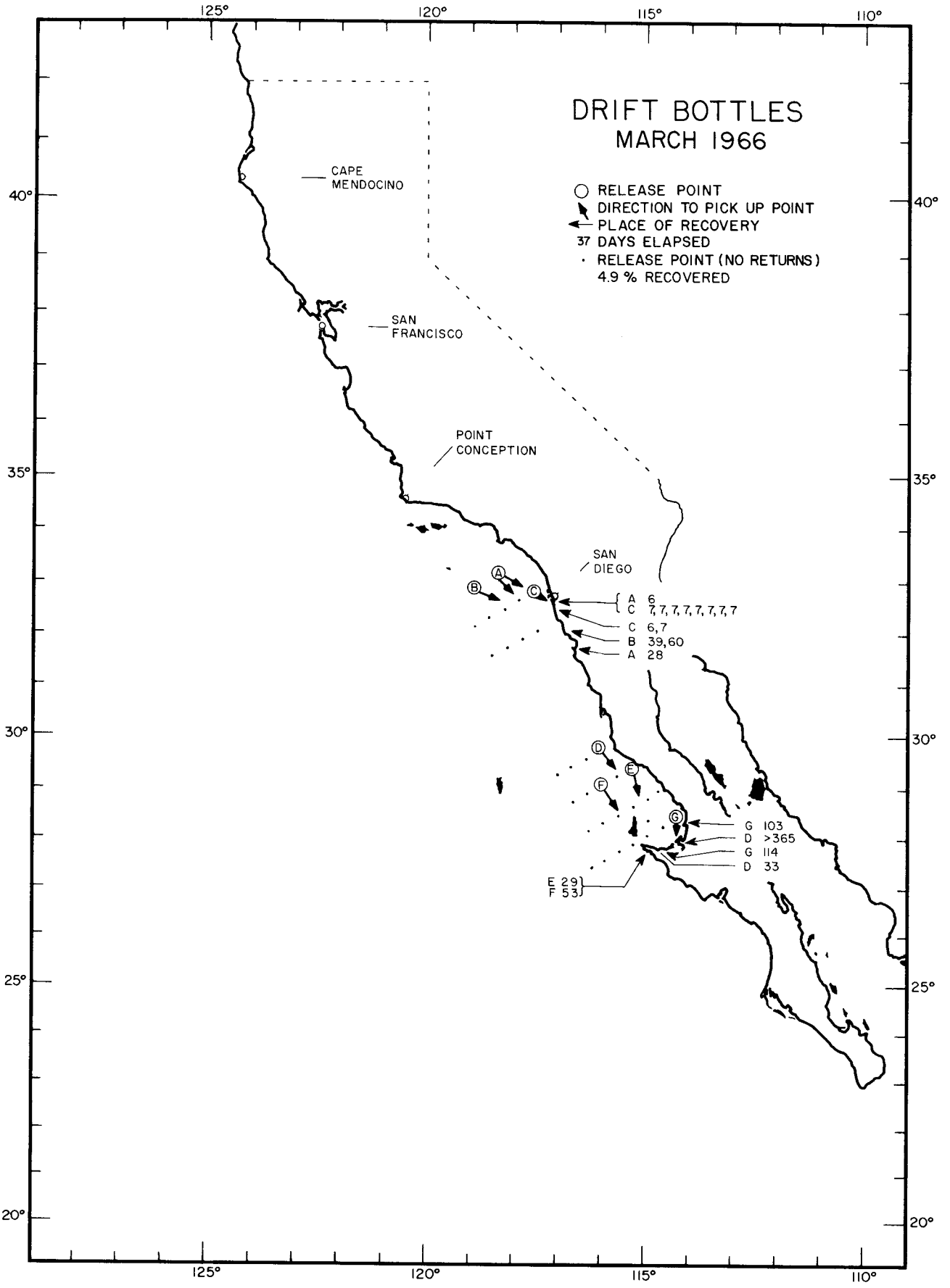
DRIFT BOTTLES
MARCH 1960



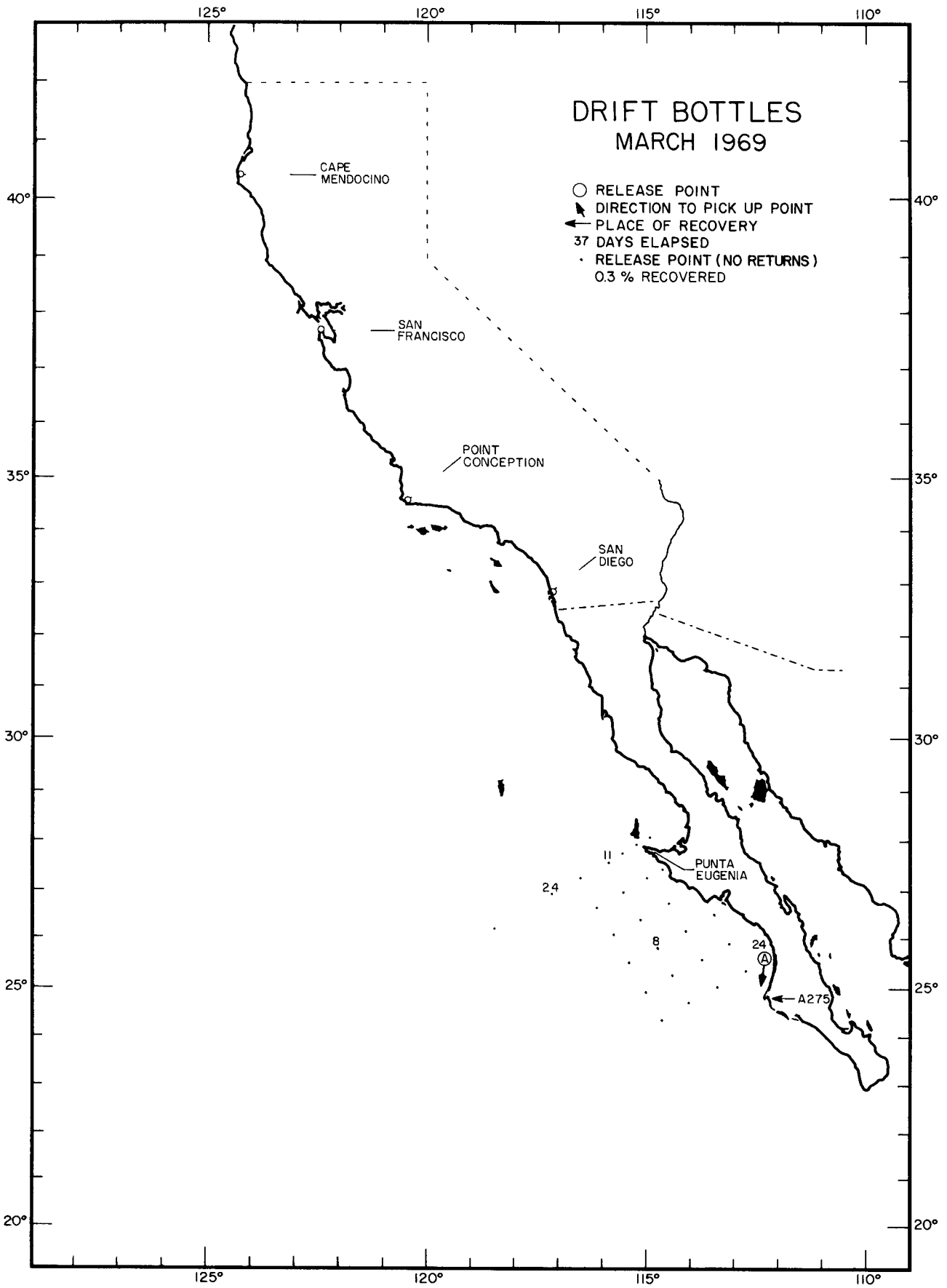
DRIFT BOTTLES
MARCH 1962



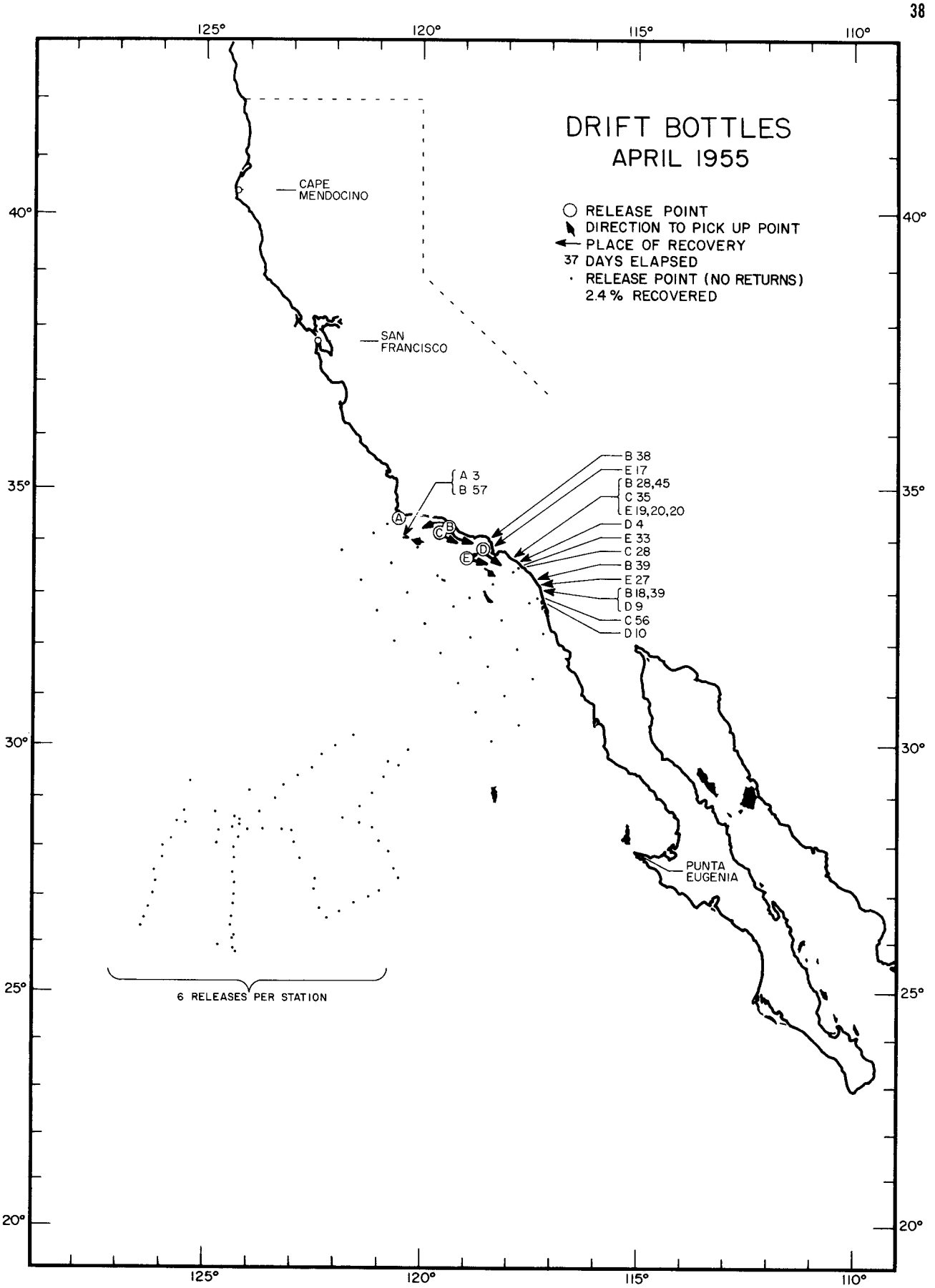
DRIFT BOTTLES
MARCH 1965



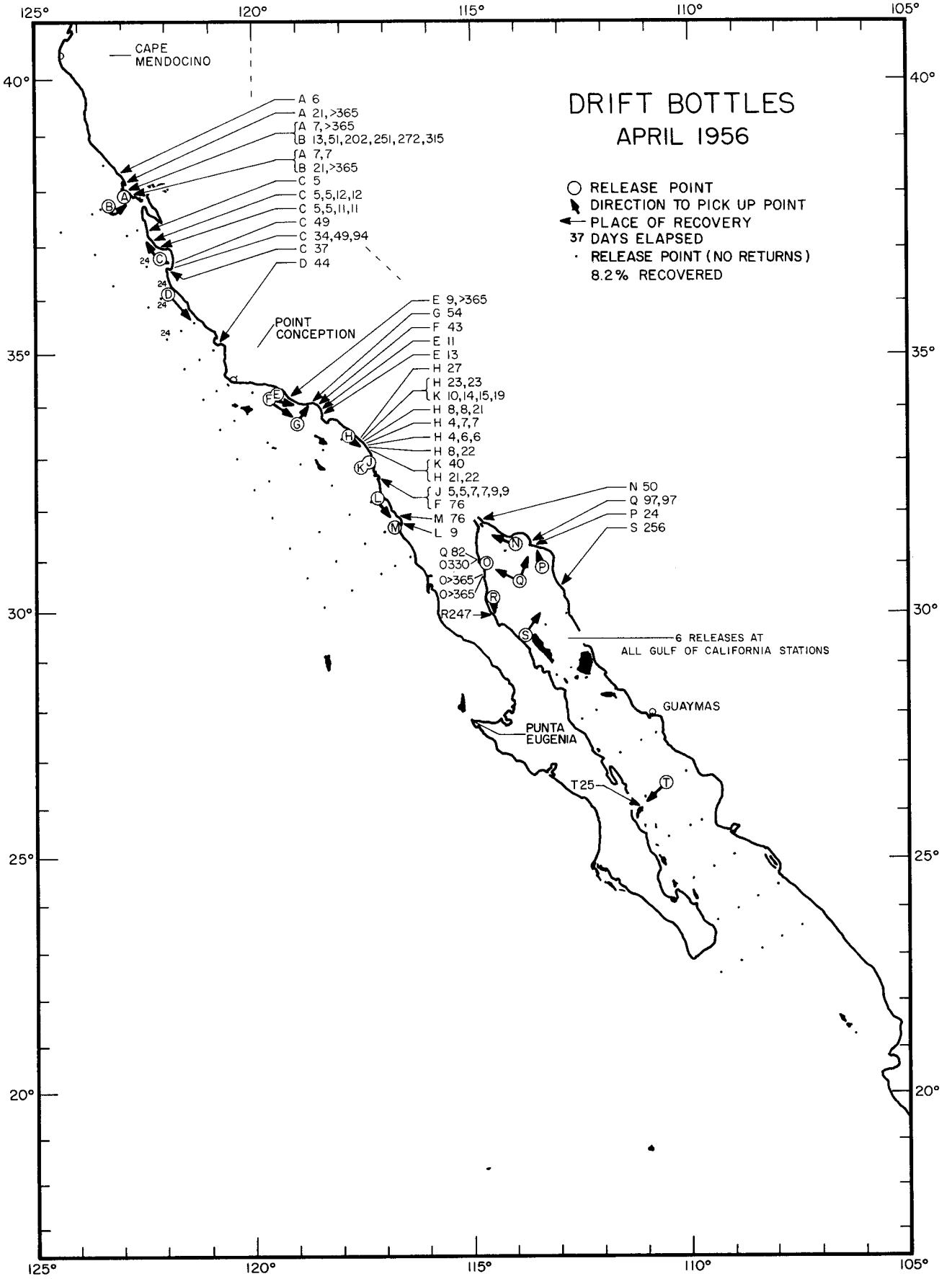
DRIFT BOTTLES
MARCH 1966



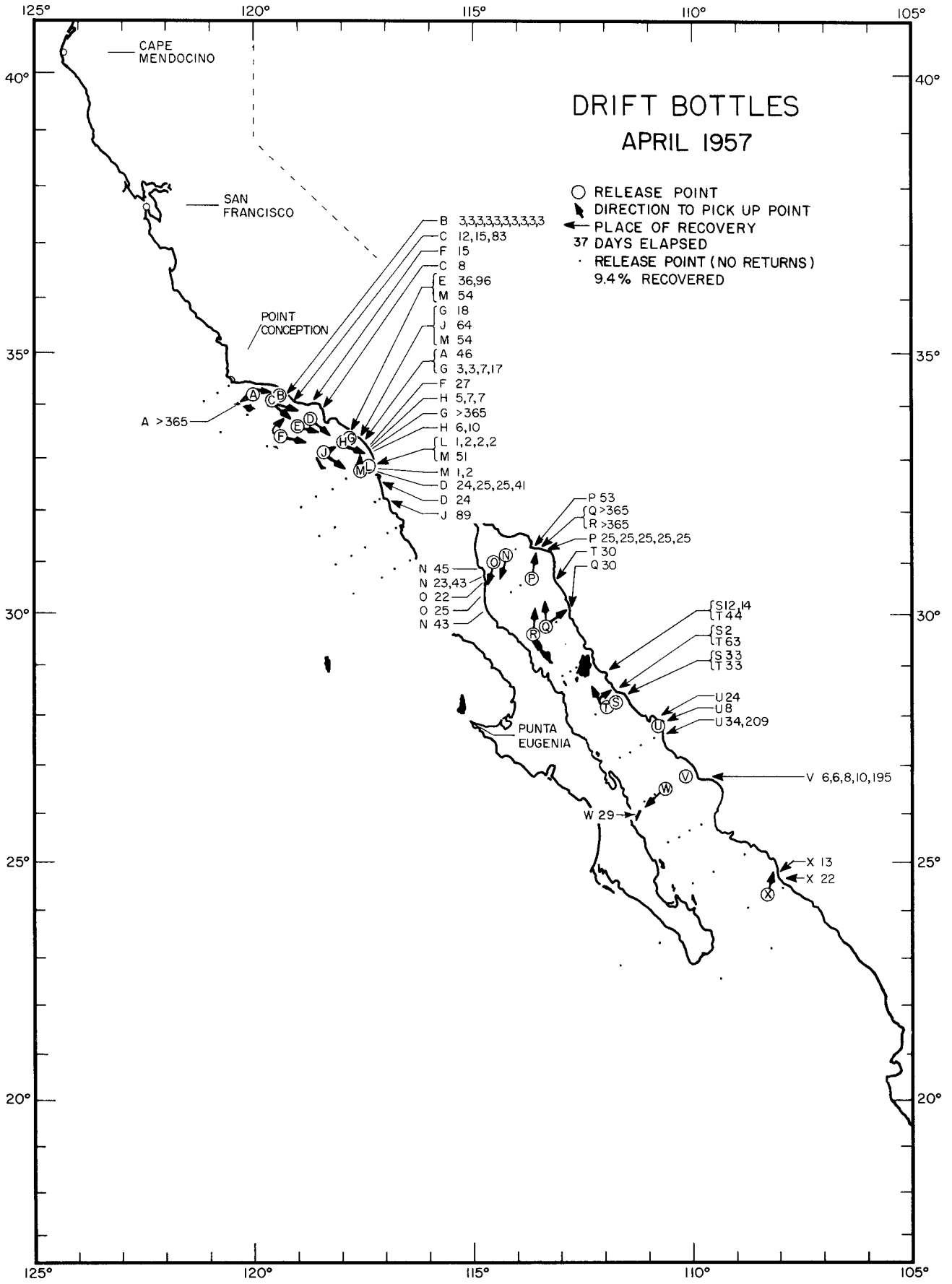
DRIFT BOTTLES
MARCH 1969



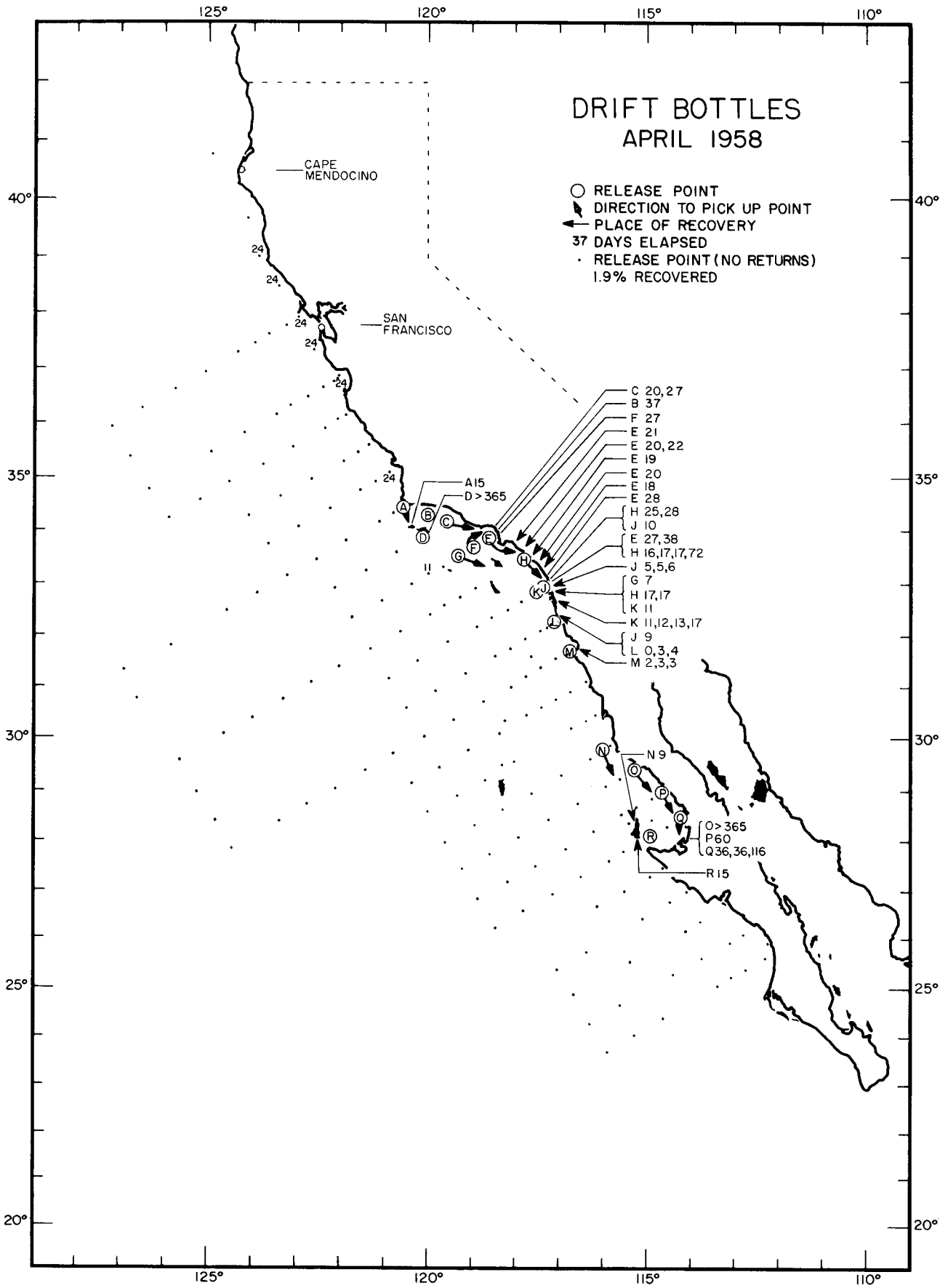
DRIFT BOTTLES
APRIL 1955



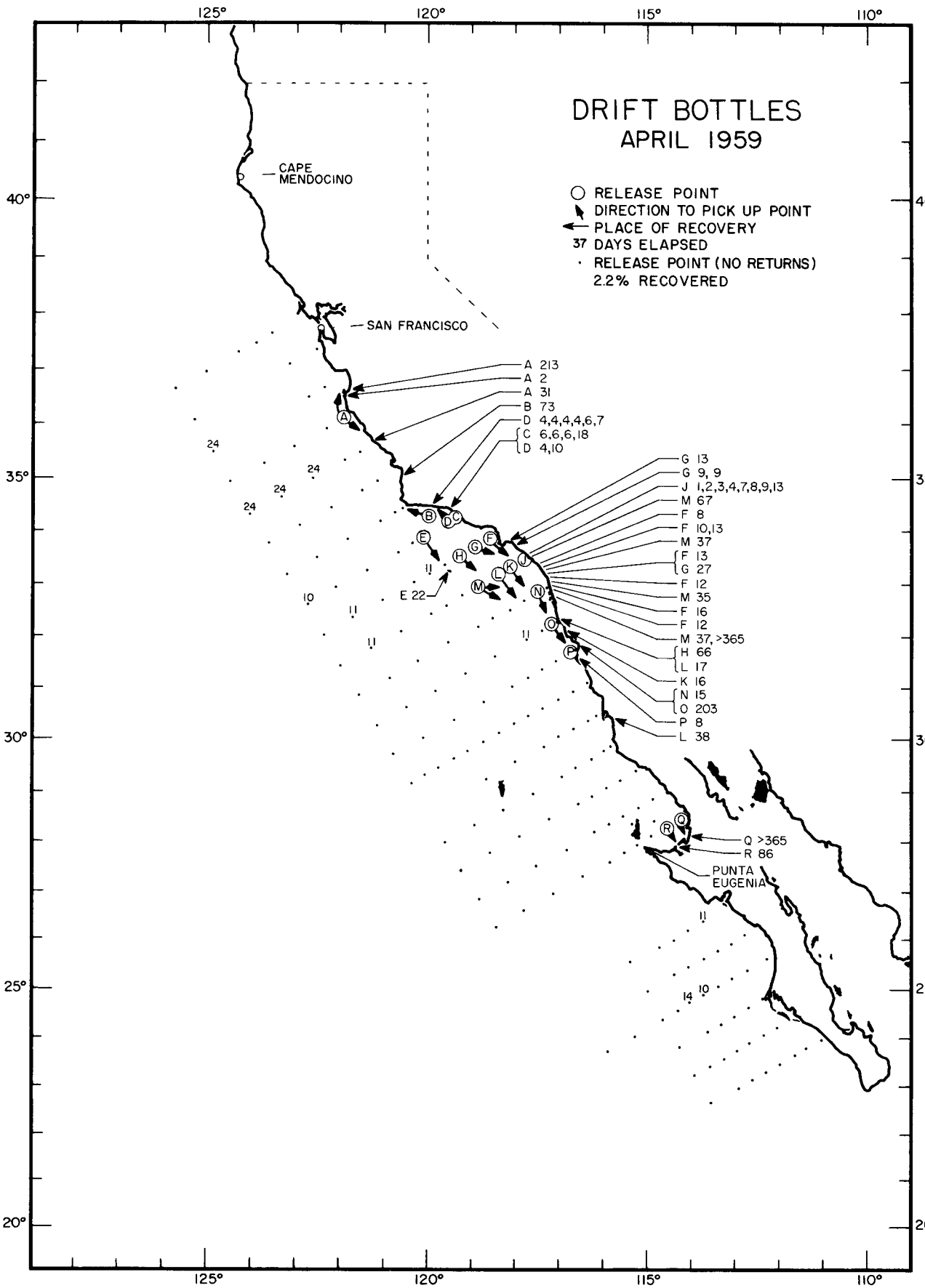
DRIFT BOTTLES
APRIL 1956



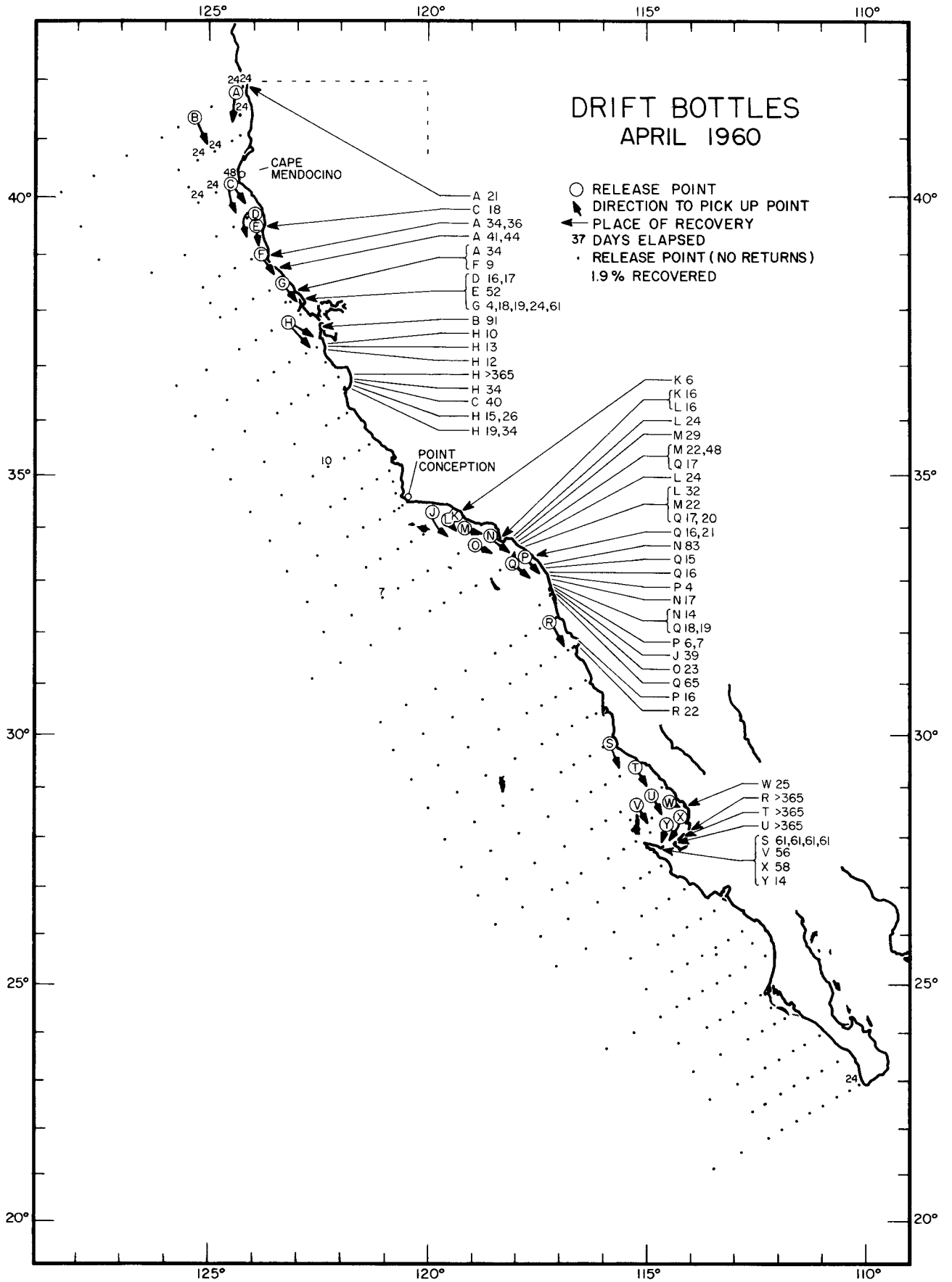
DRIFT BOTTLES
APRIL 1957



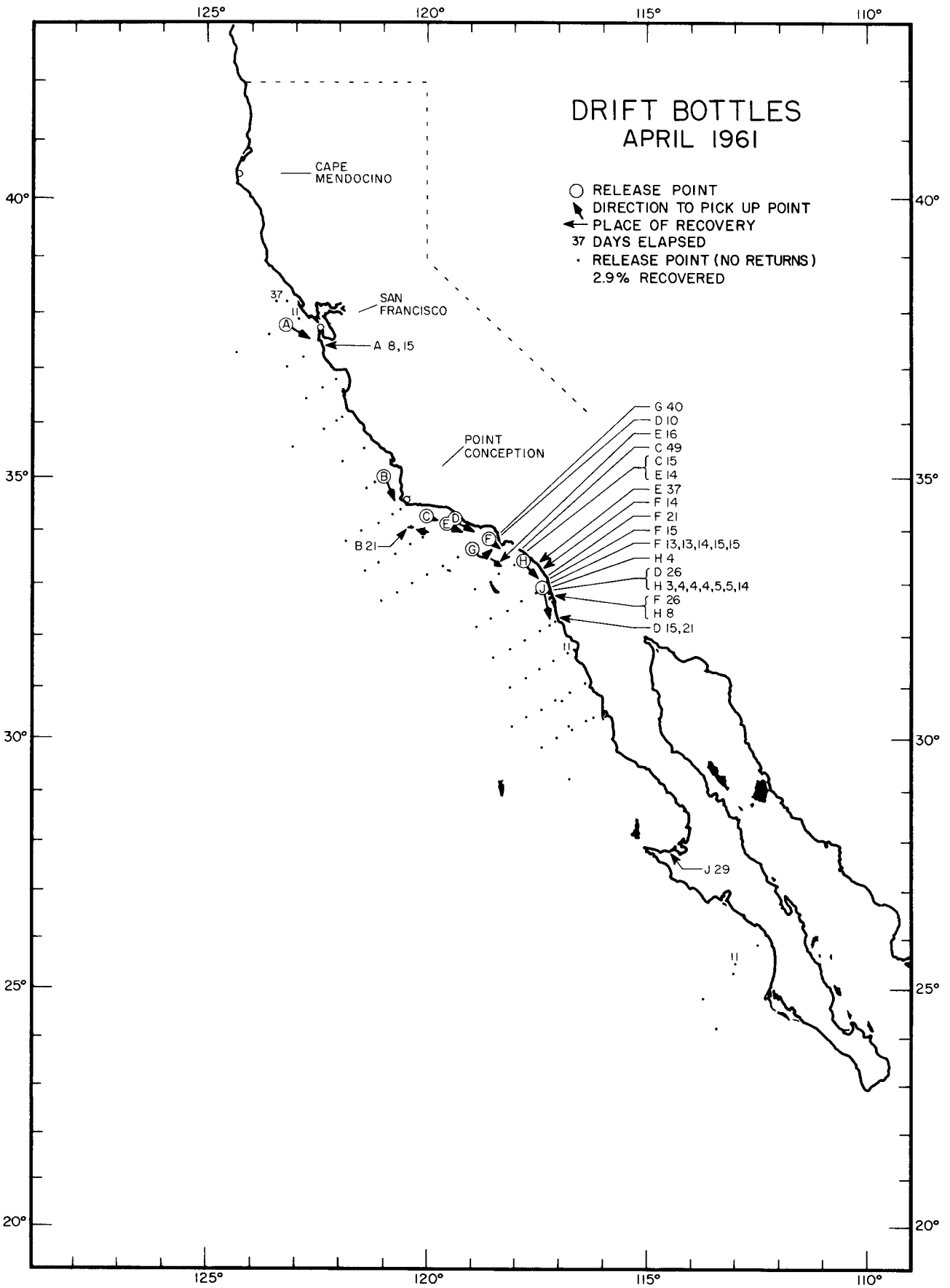
DRIFT BOTTLES
APRIL 1958



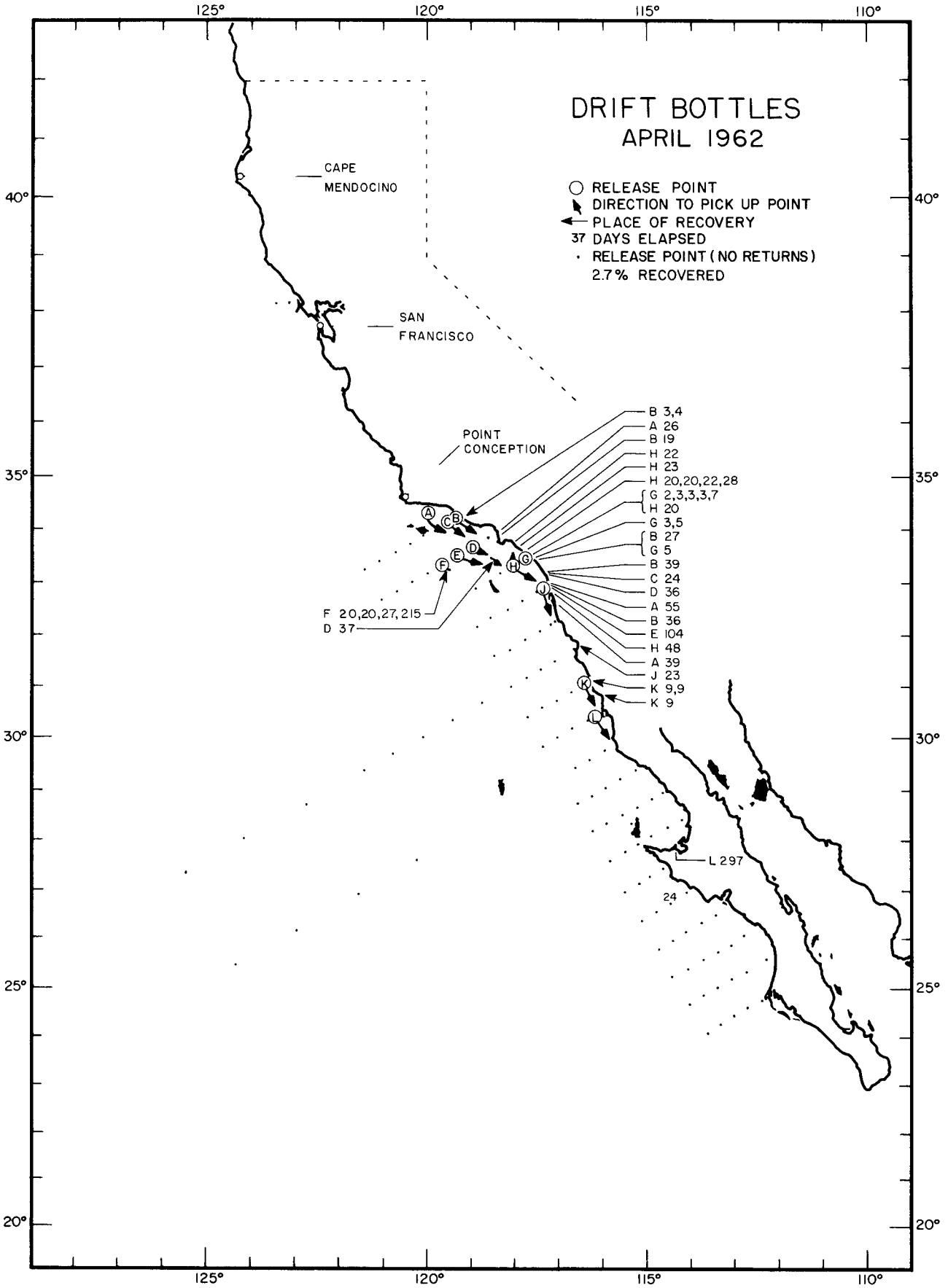
DRIFT BOTTLES
APRIL 1959



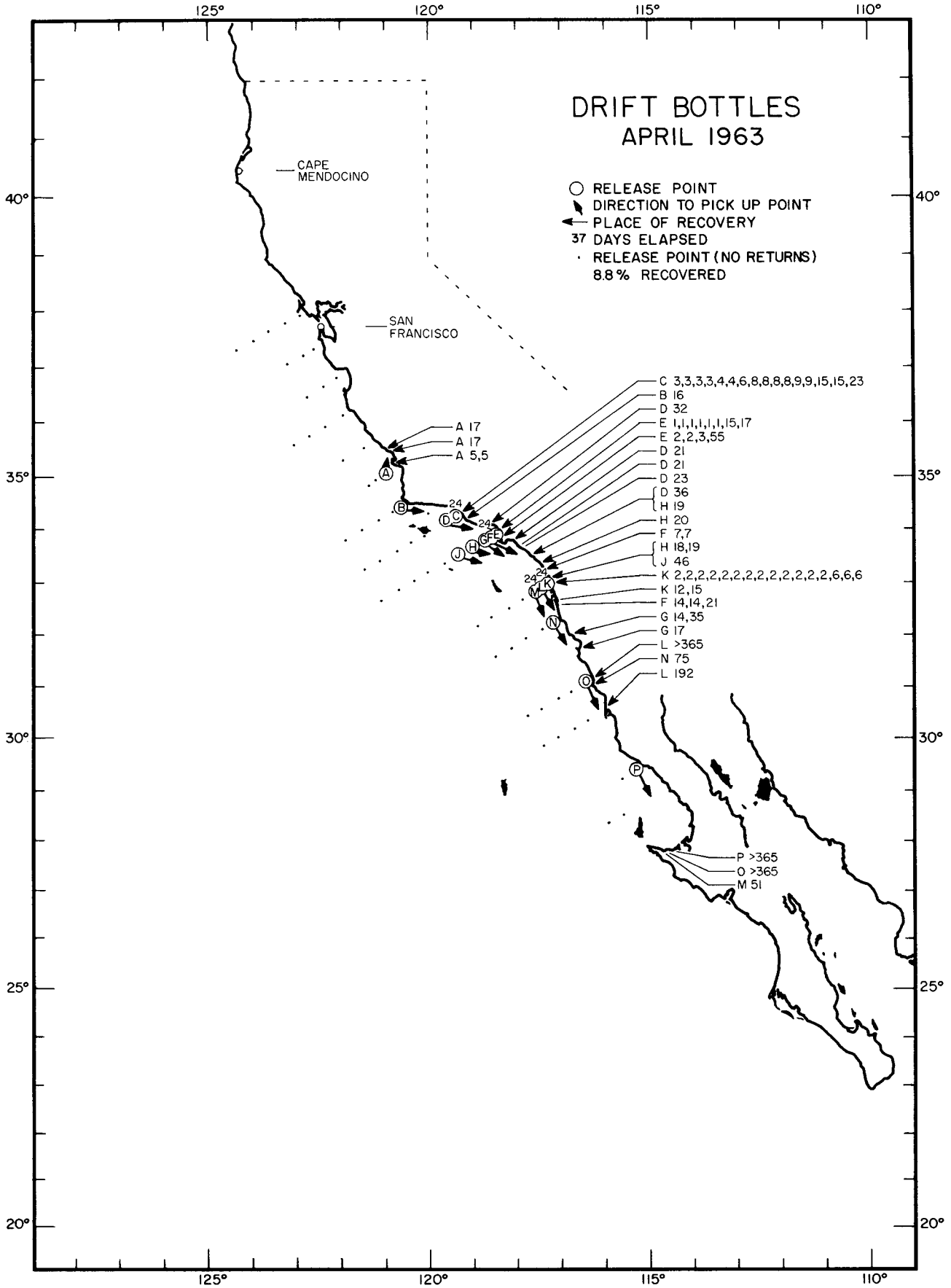
DRIFT BOTTLES
APRIL 1960



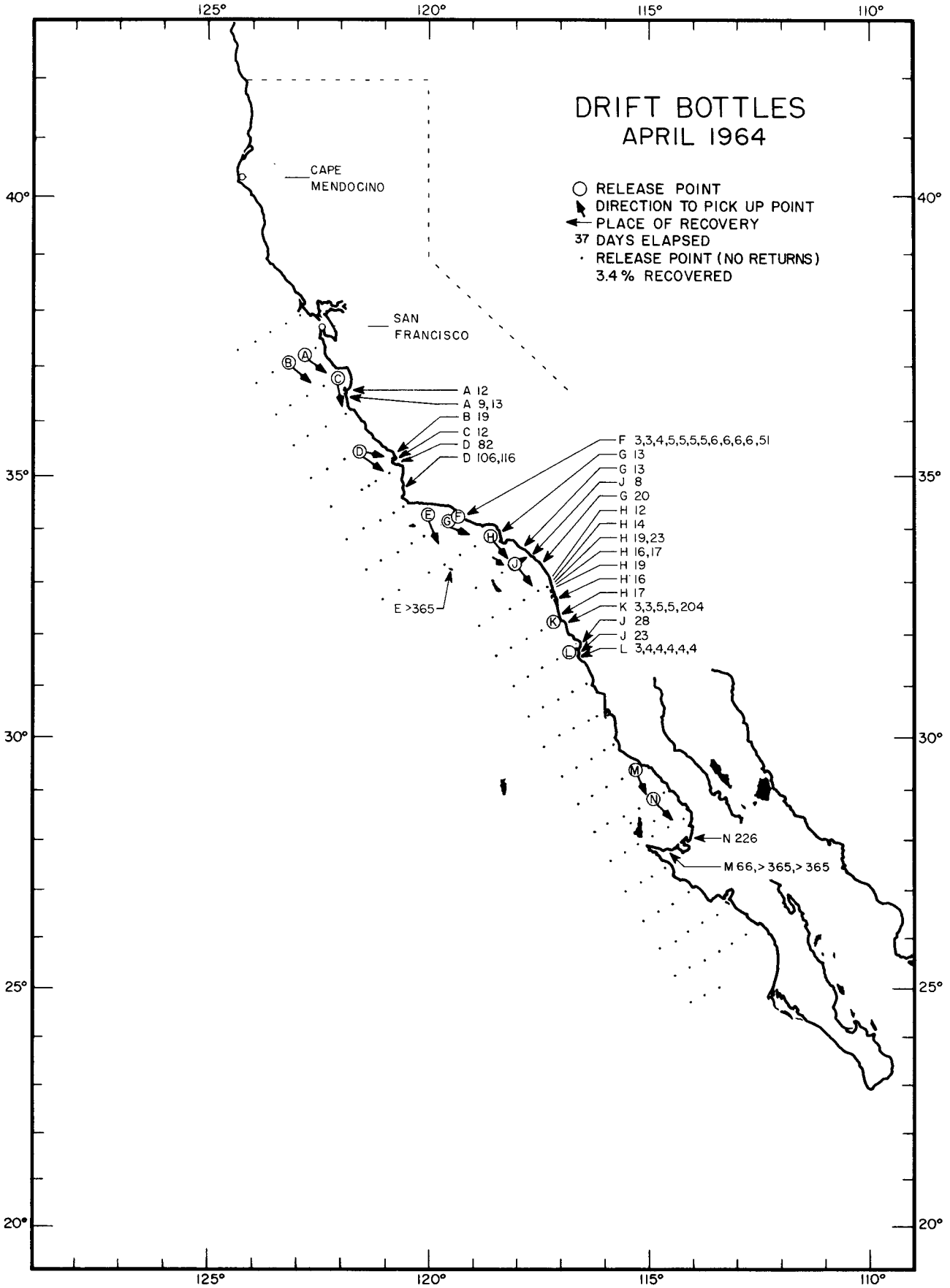
DRIFT BOTTLES
APRIL 1961



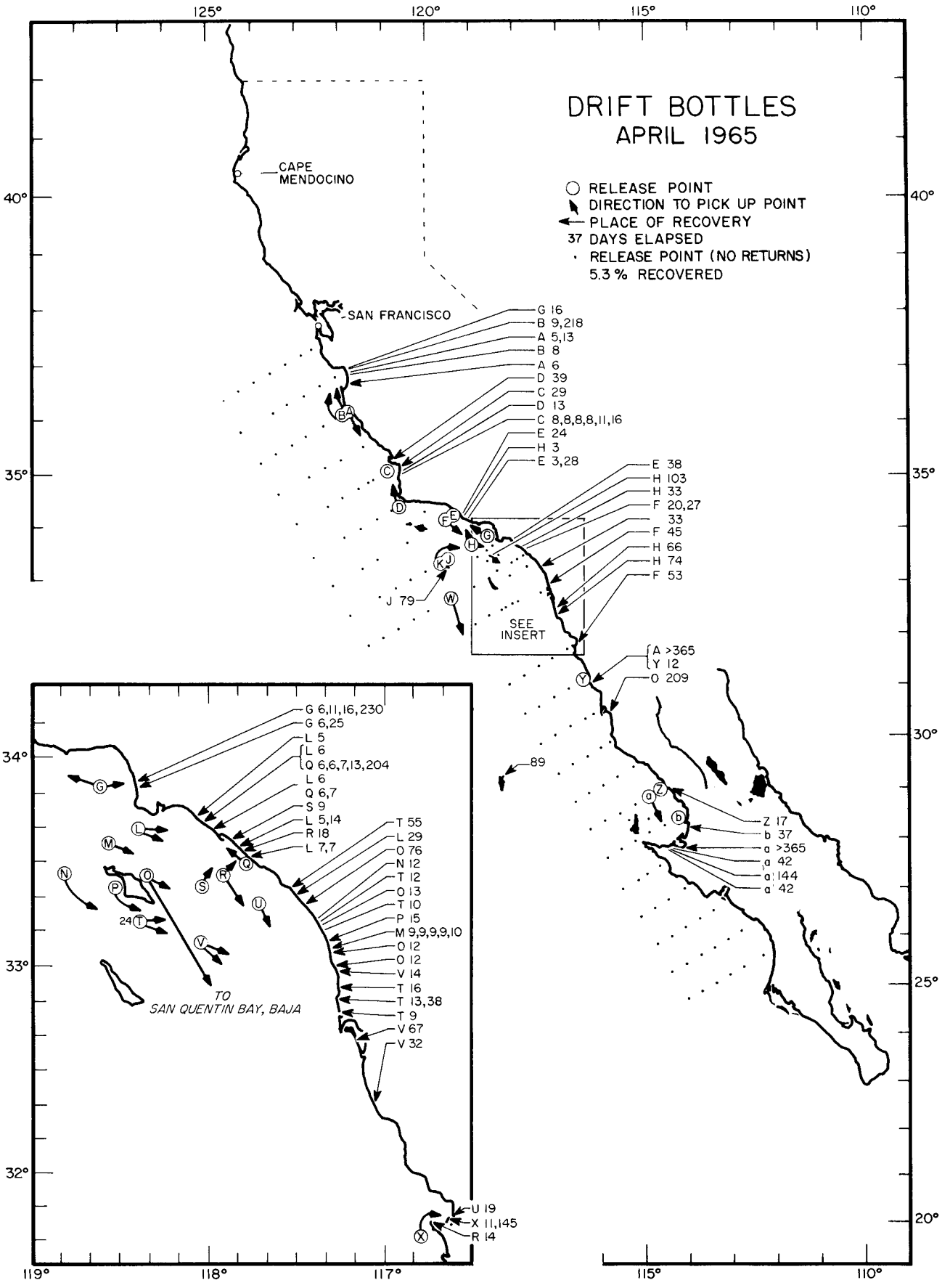
DRIFT BOTTLES
APRIL 1962



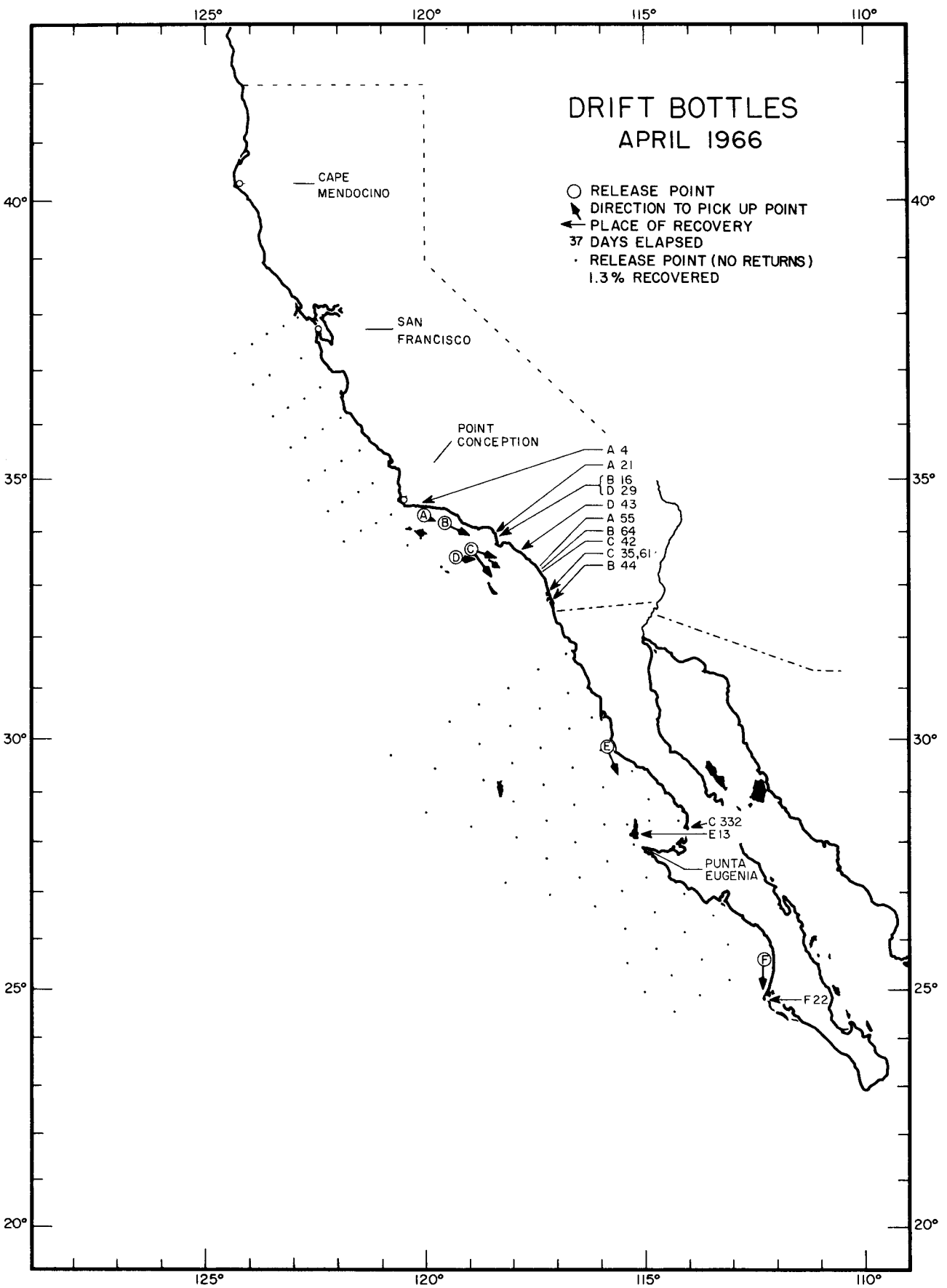
DRIFT BOTTLES
APRIL 1963



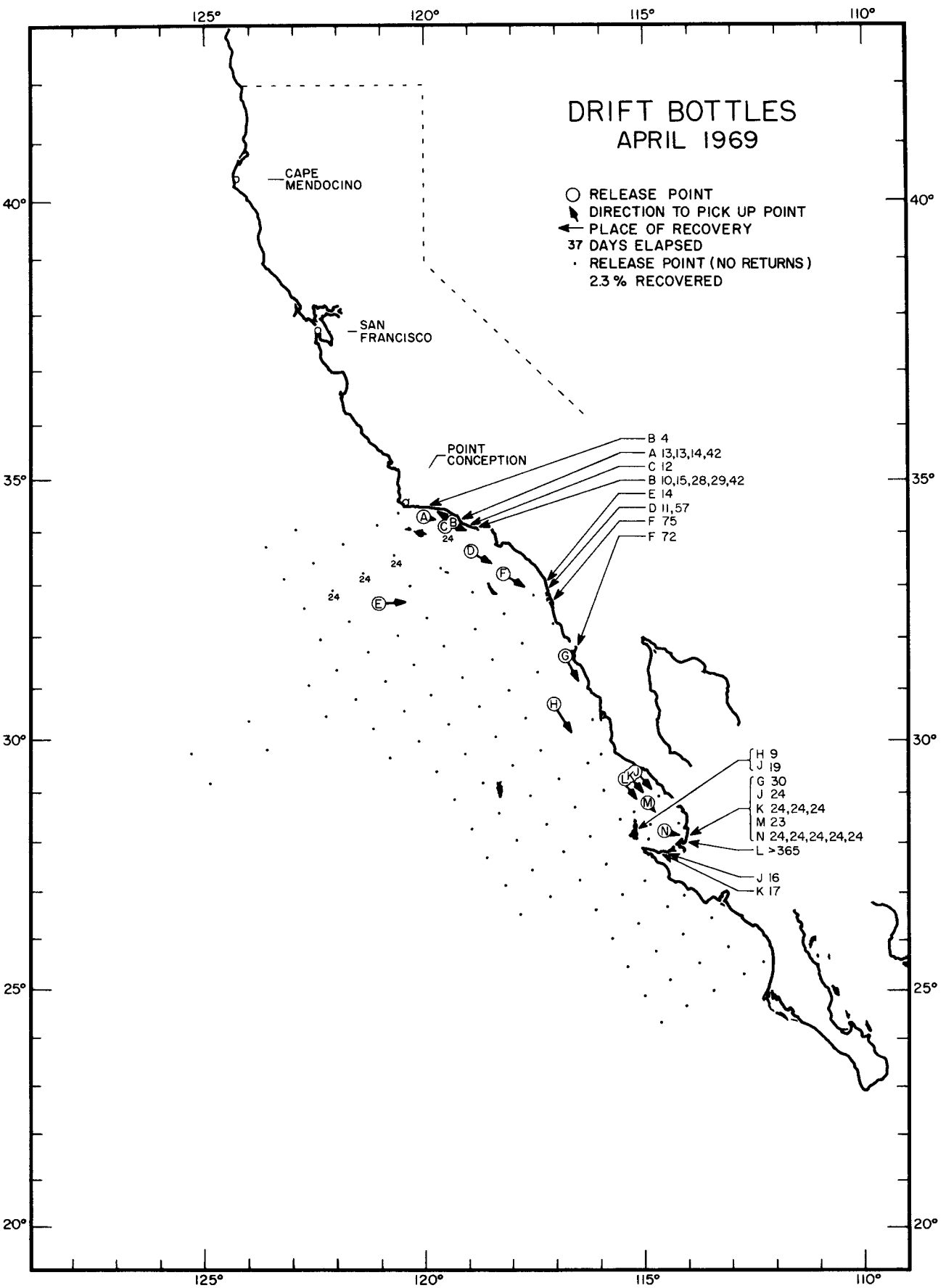
DRIFT BOTTLES
APRIL 1964



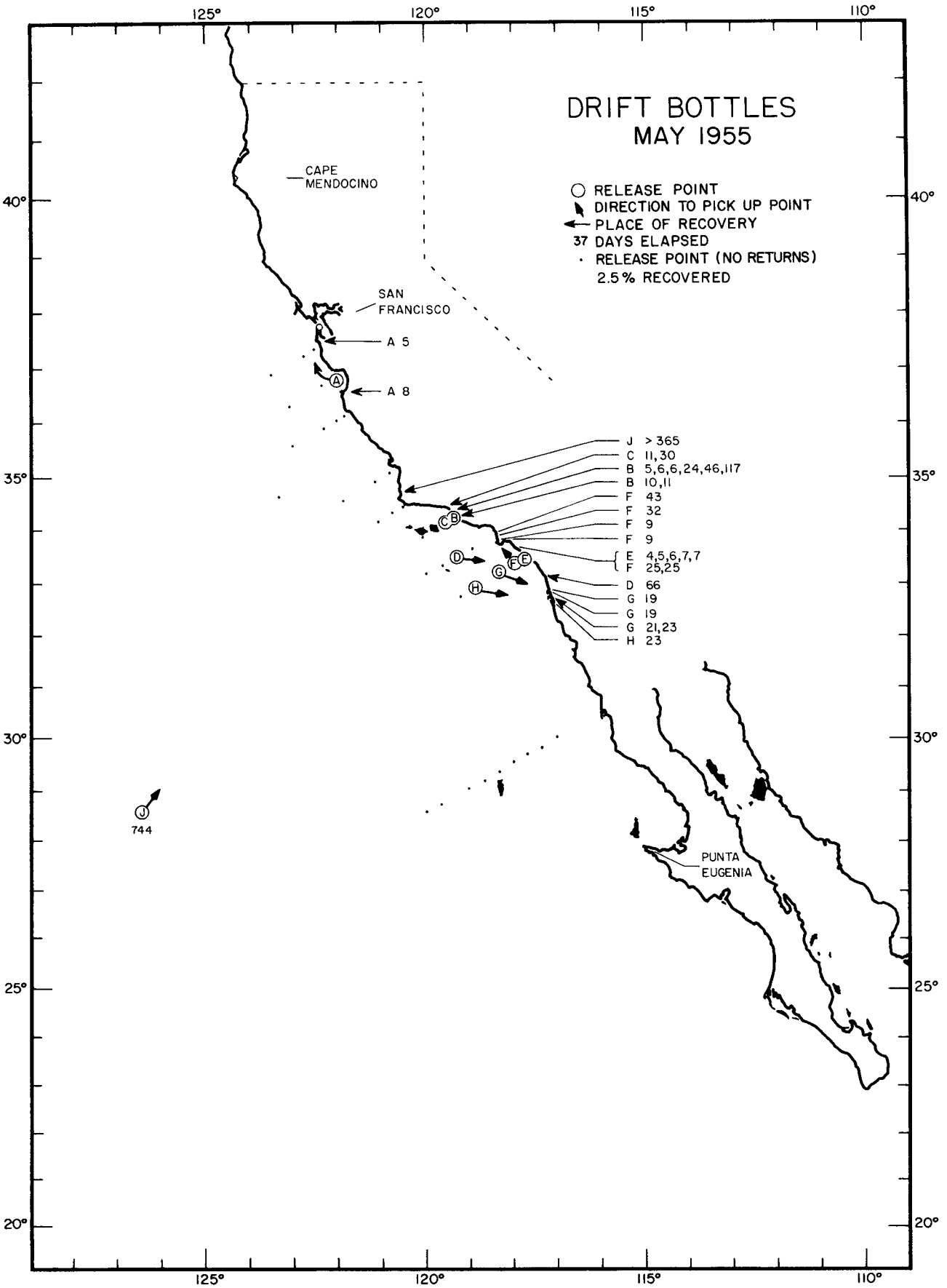
DRIFT BOTTLES
APRIL 1965



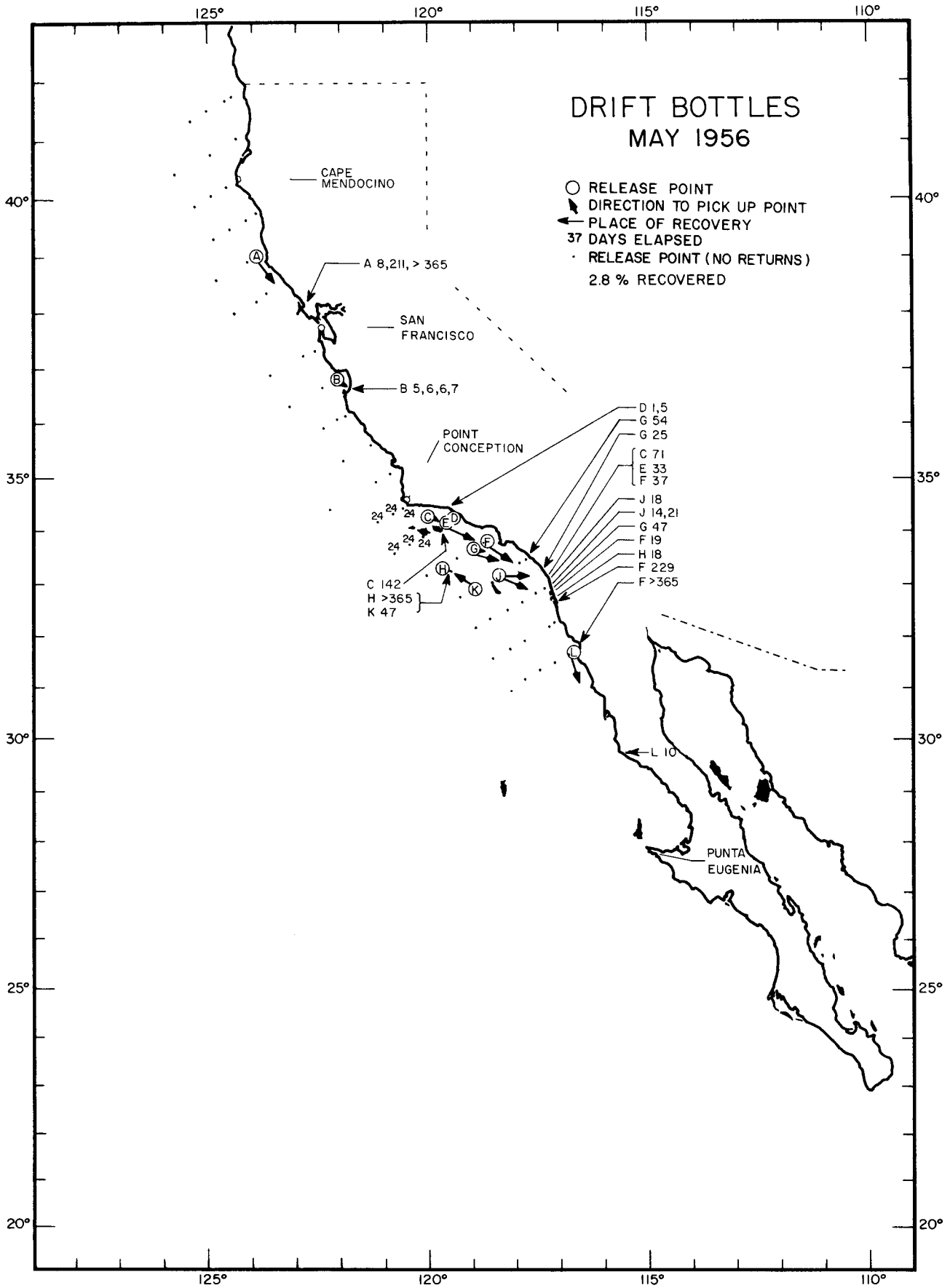
DRIFT BOTTLES
APRIL 1966



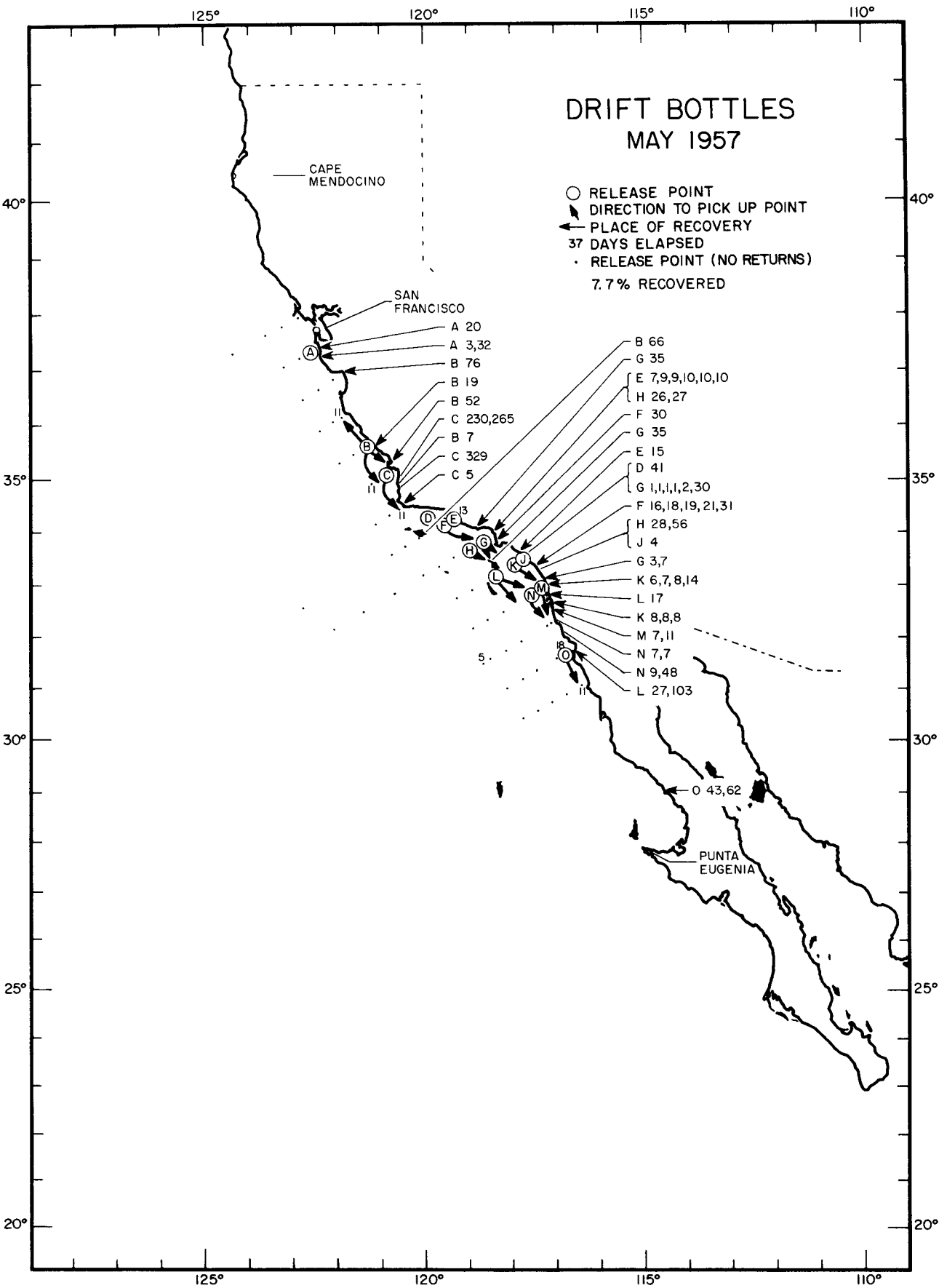
DRIFT BOTTLES
APRIL 1969



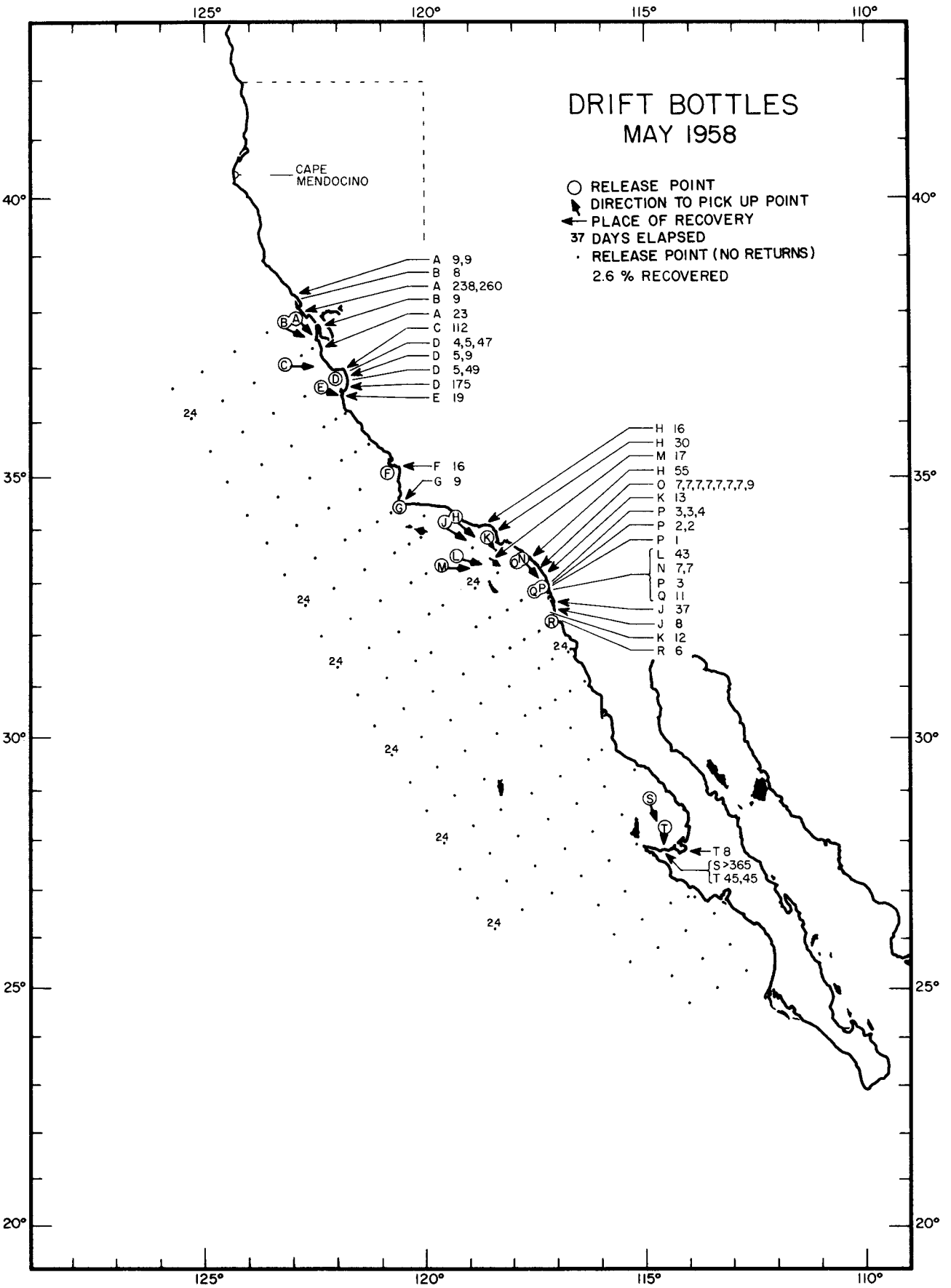
DRIFT BOTTLES
MAY 1955



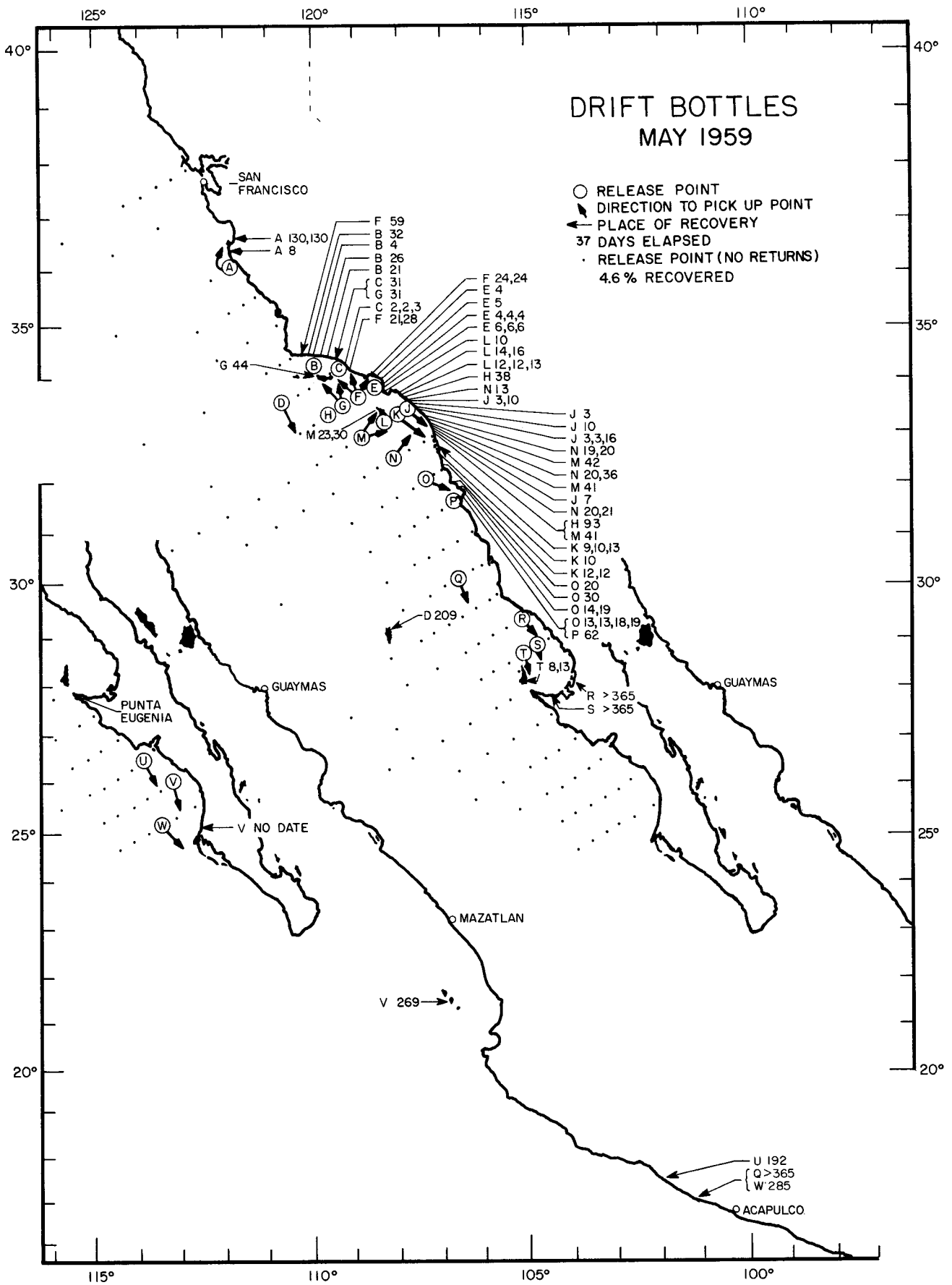
DRIFT BOTTLES
MAY 1956



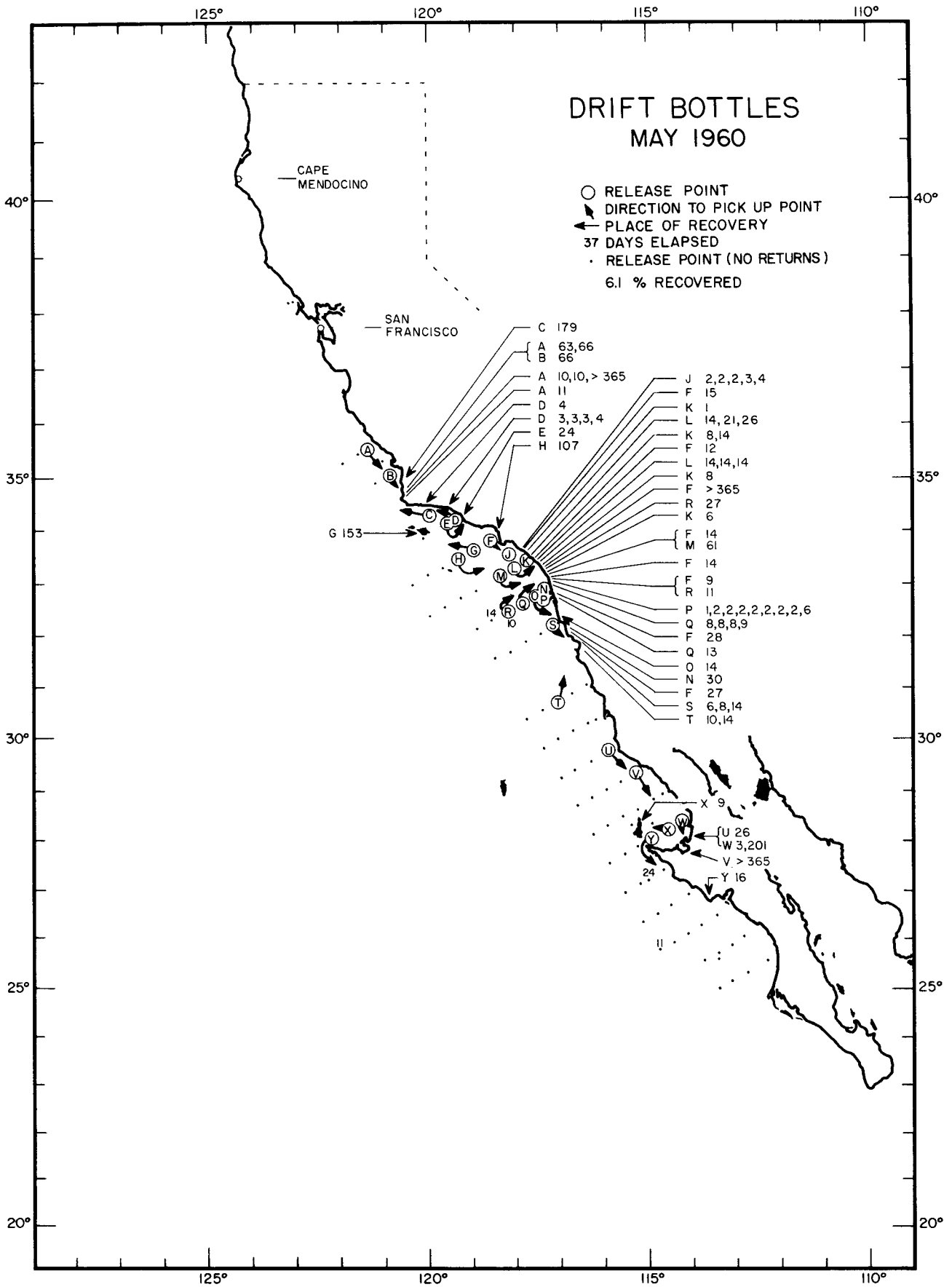
DRIFT BOTTLES
MAY 1957



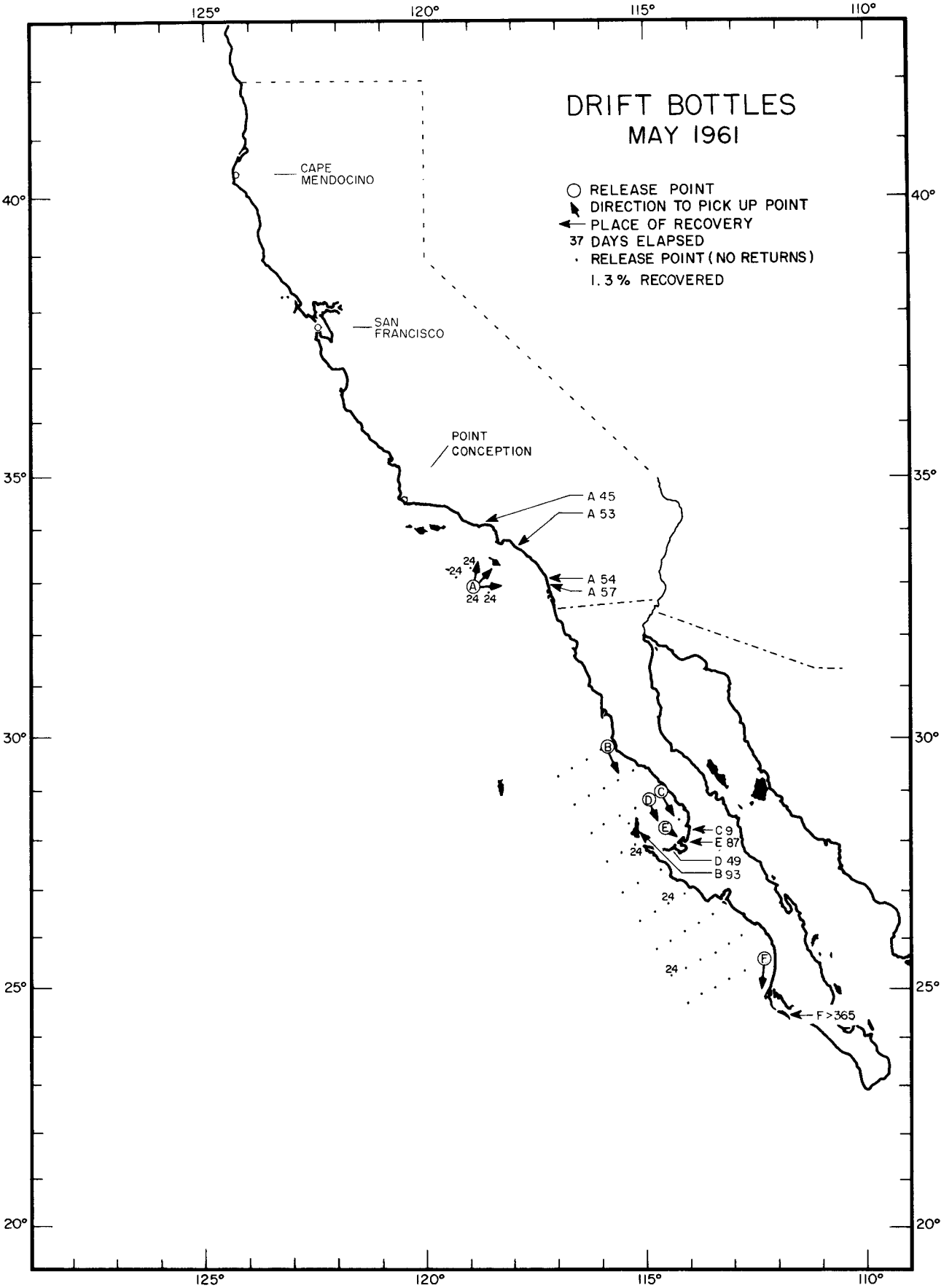
DRIFT BOTTLES
MAY 1958



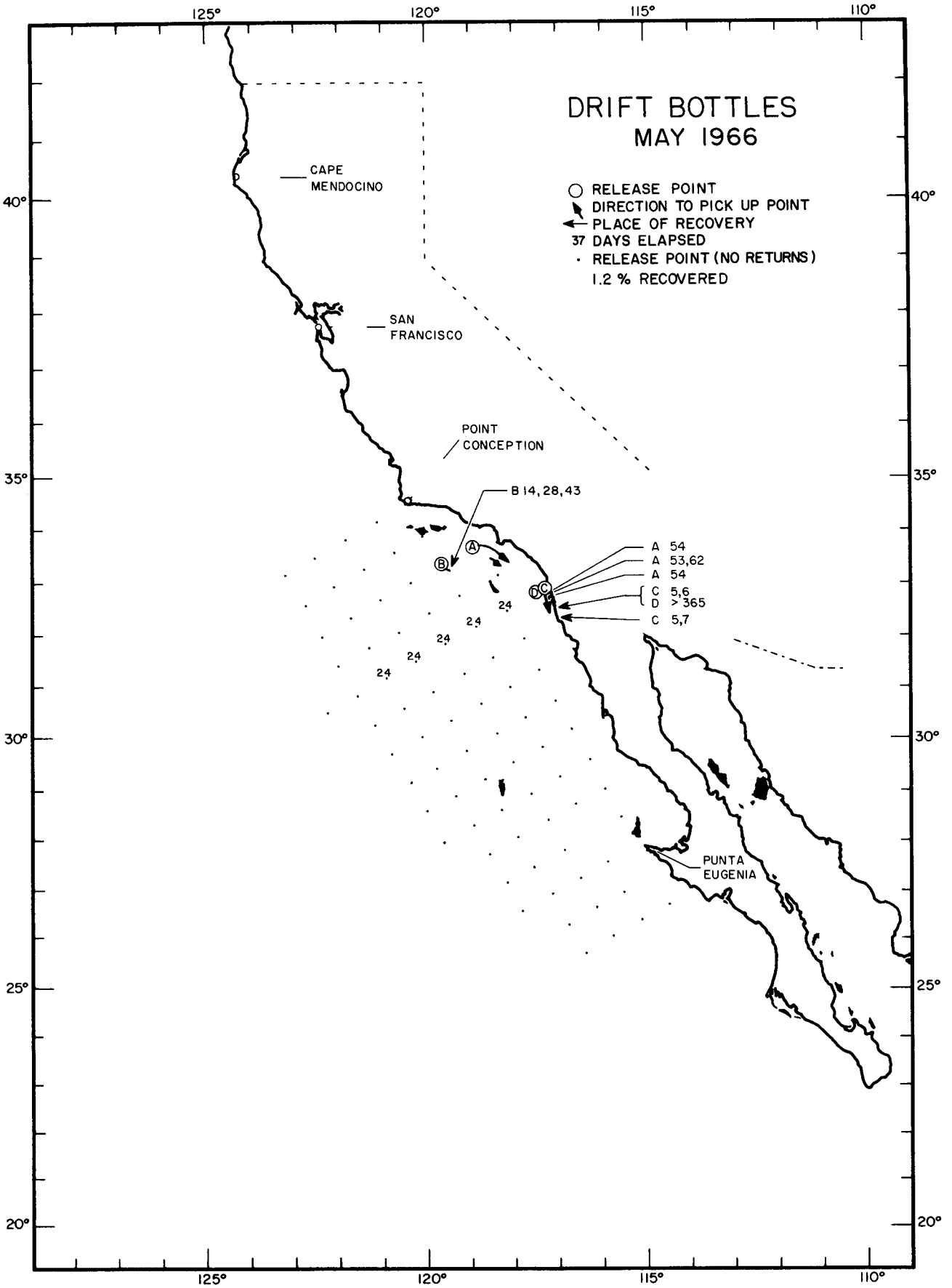
DRIFT BOTTLES
MAY 1959



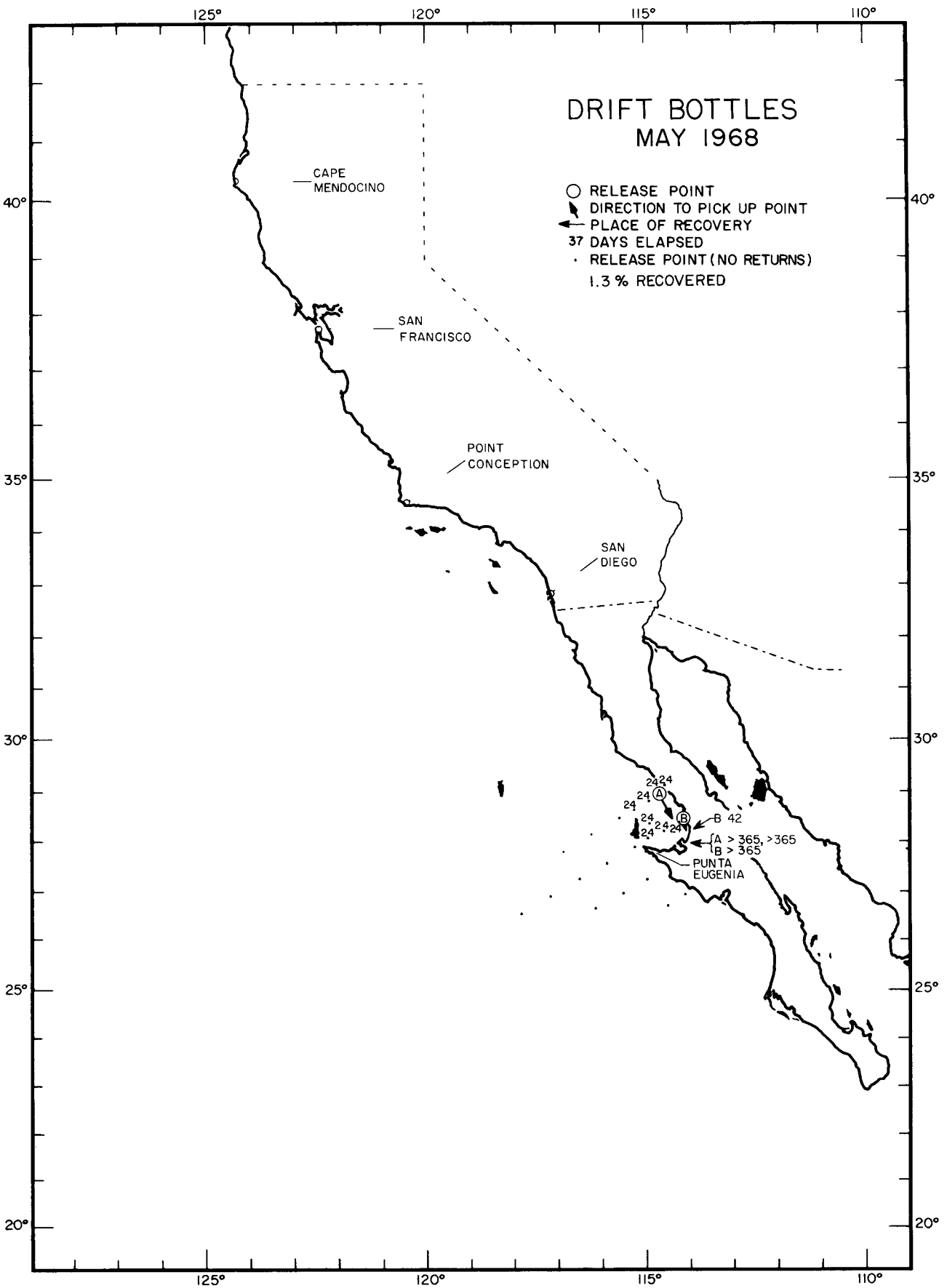
DRIFT BOTTLES
MAY 1960



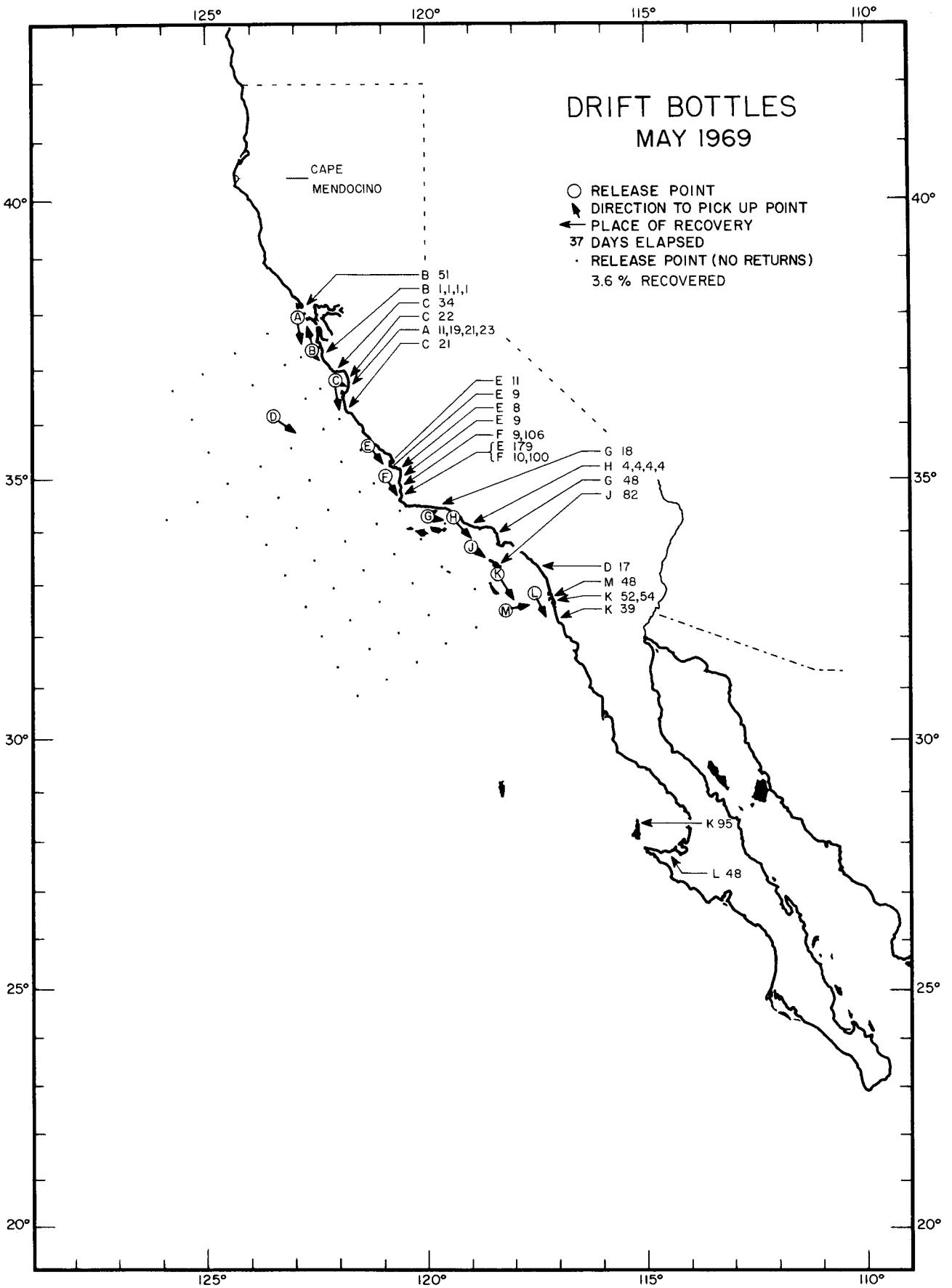
DRIFT BOTTLES
MAY 1961



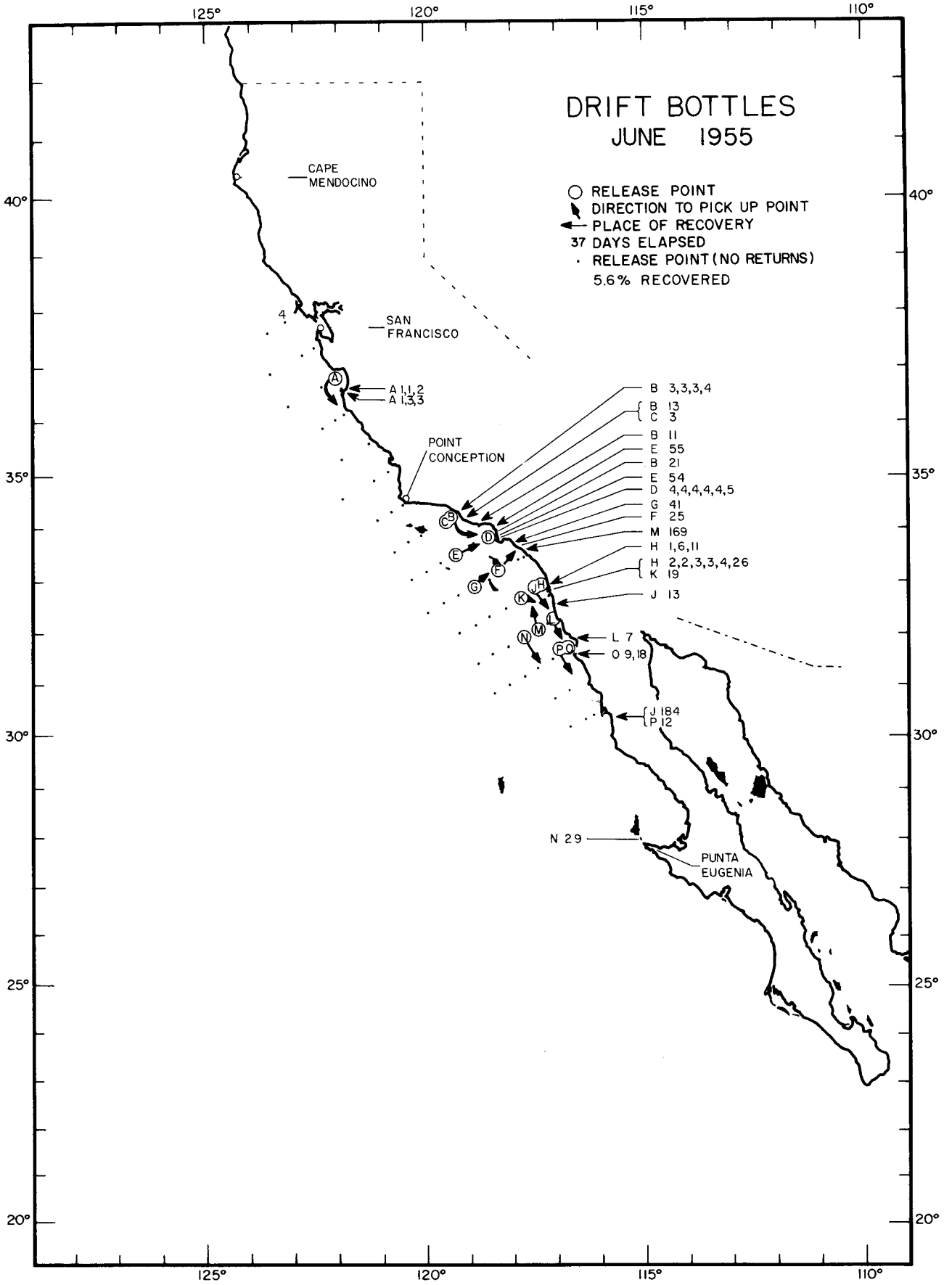
DRIFT BOTTLES
MAY 1966



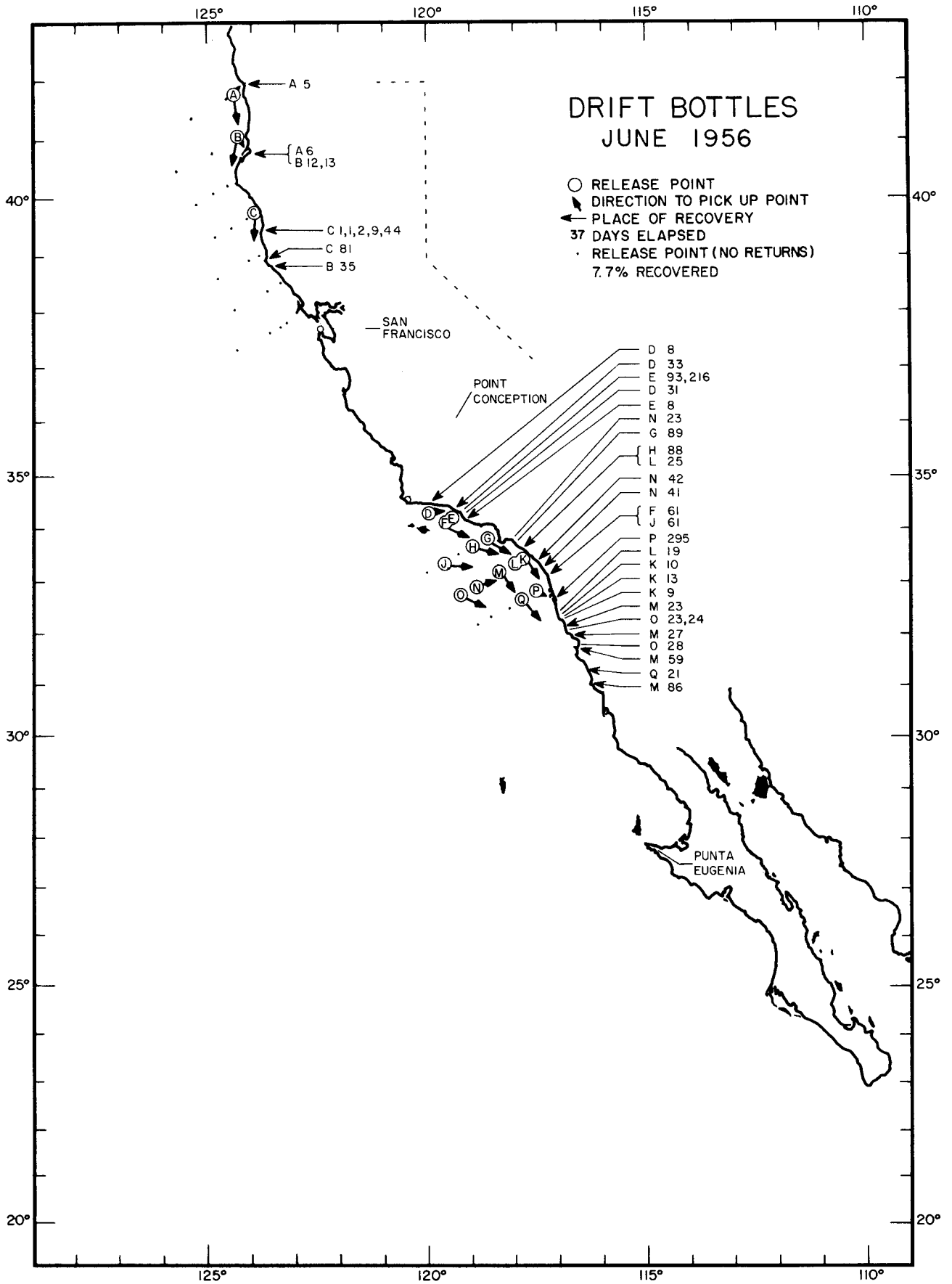
DRIFT BOTTLES
MAY 1968



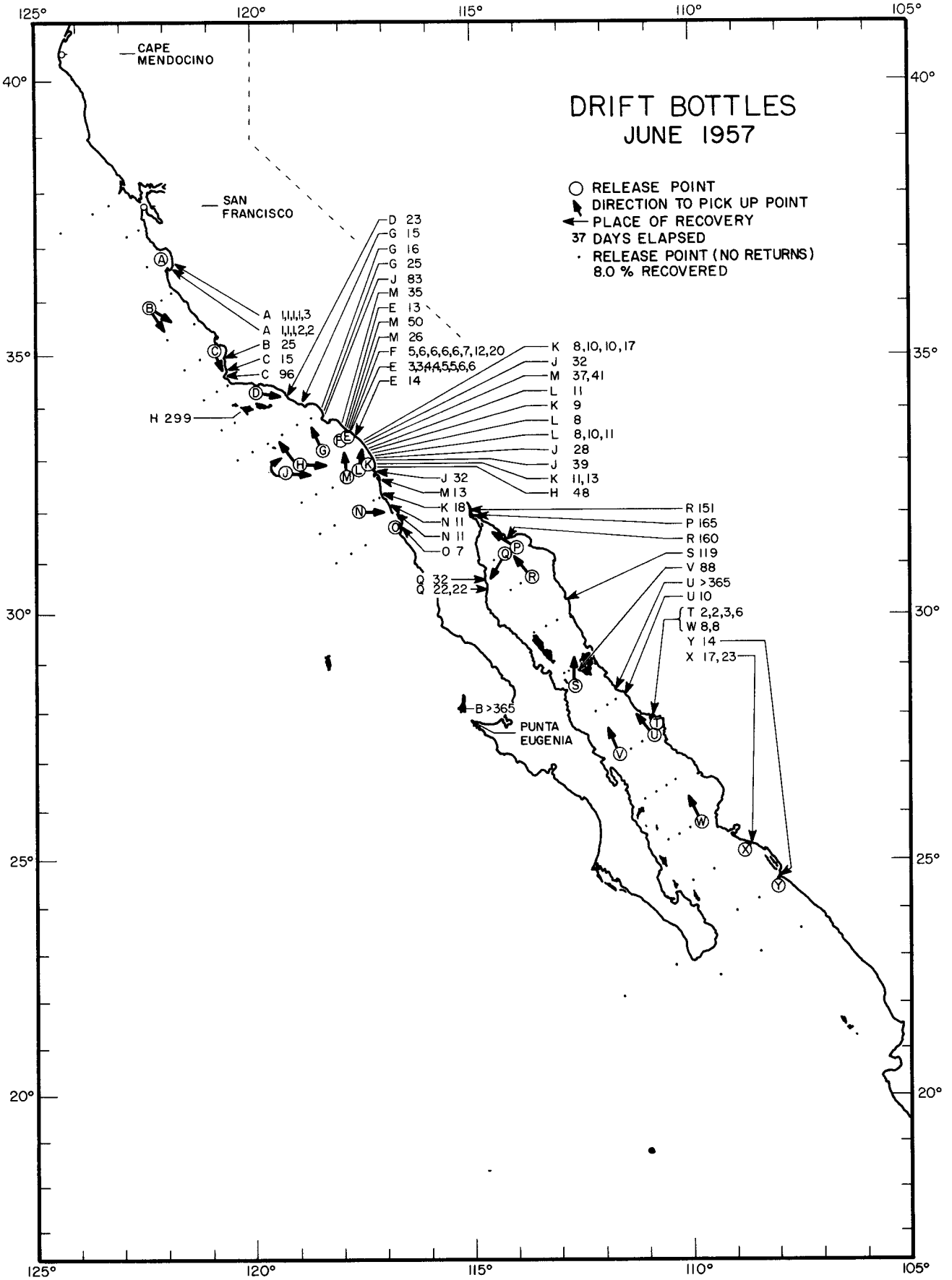
DRIFT BOTTLES
MAY 1969



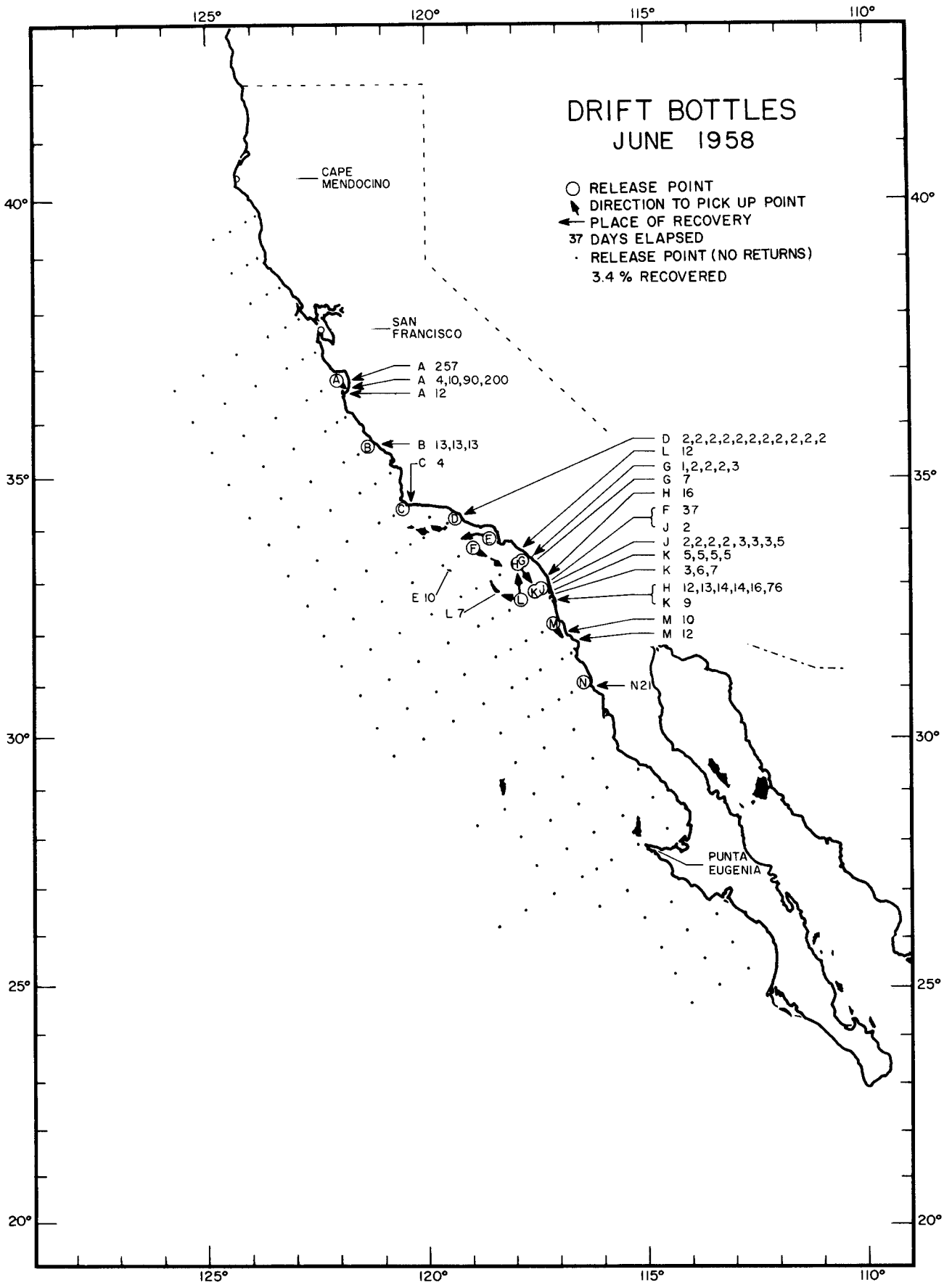
DRIFT BOTTLES
JUNE 1955



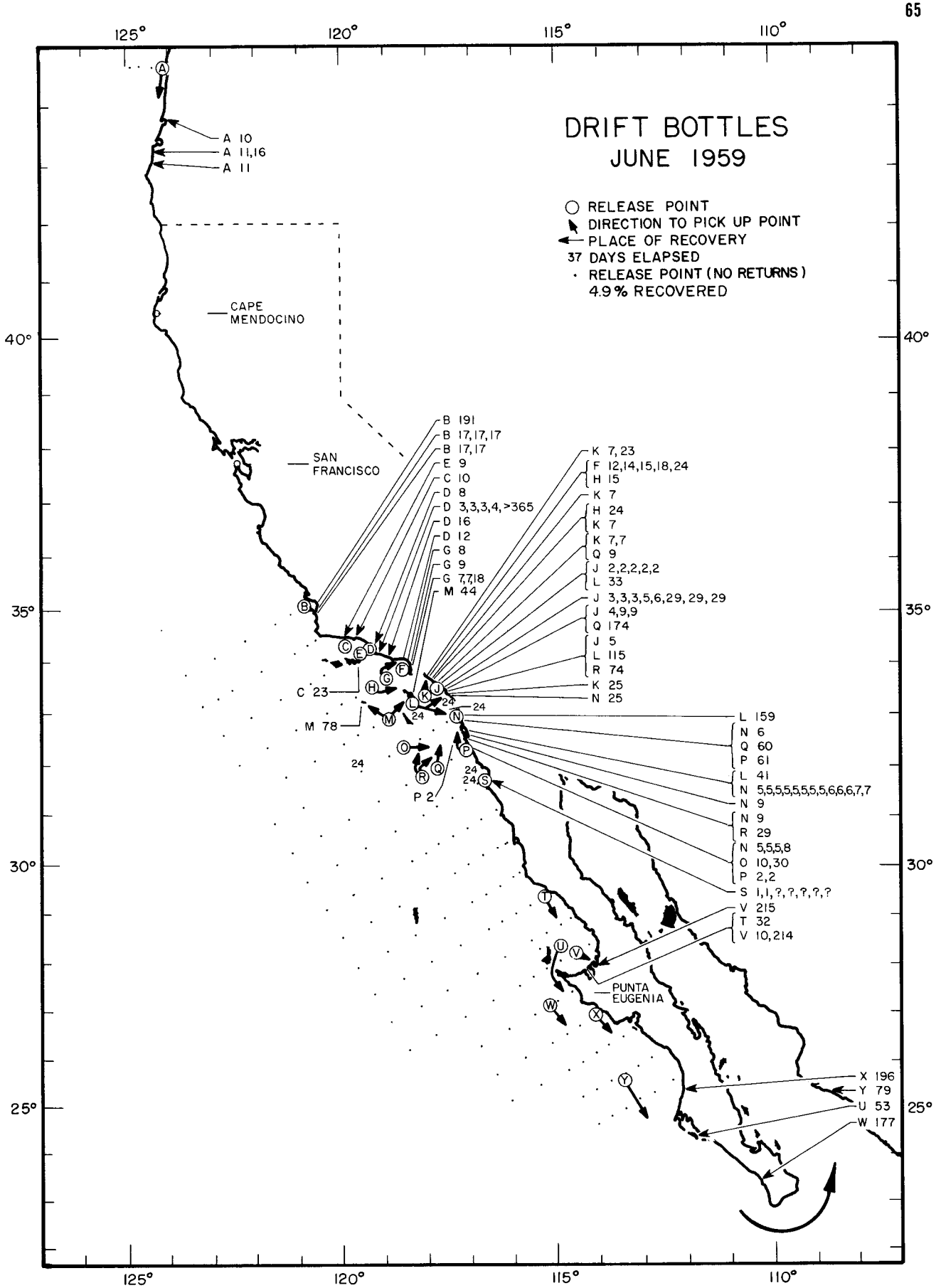
DRIFT BOTTLES
JUNE 1956



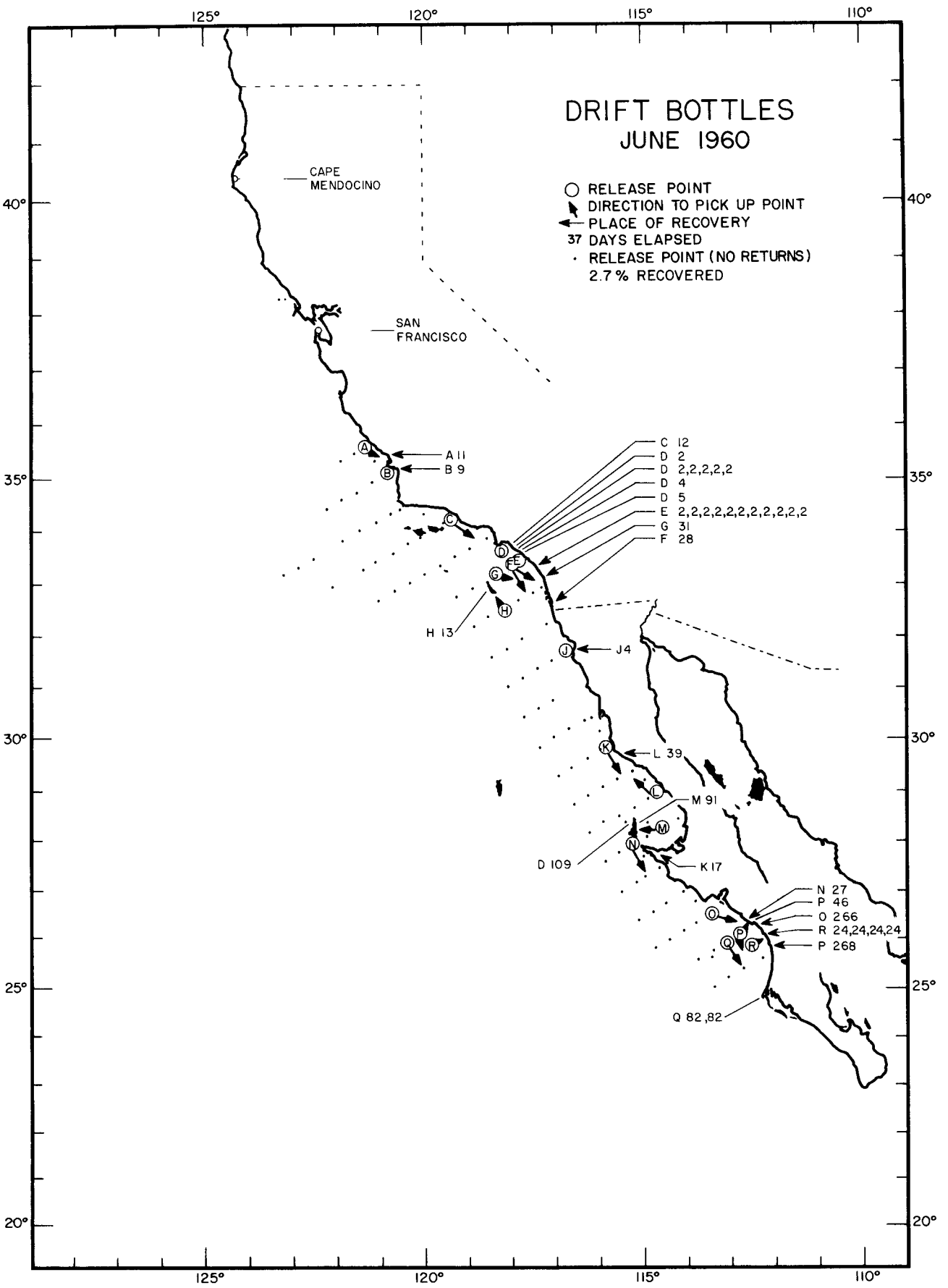
DRIFT BOTTLES
JUNE 1957



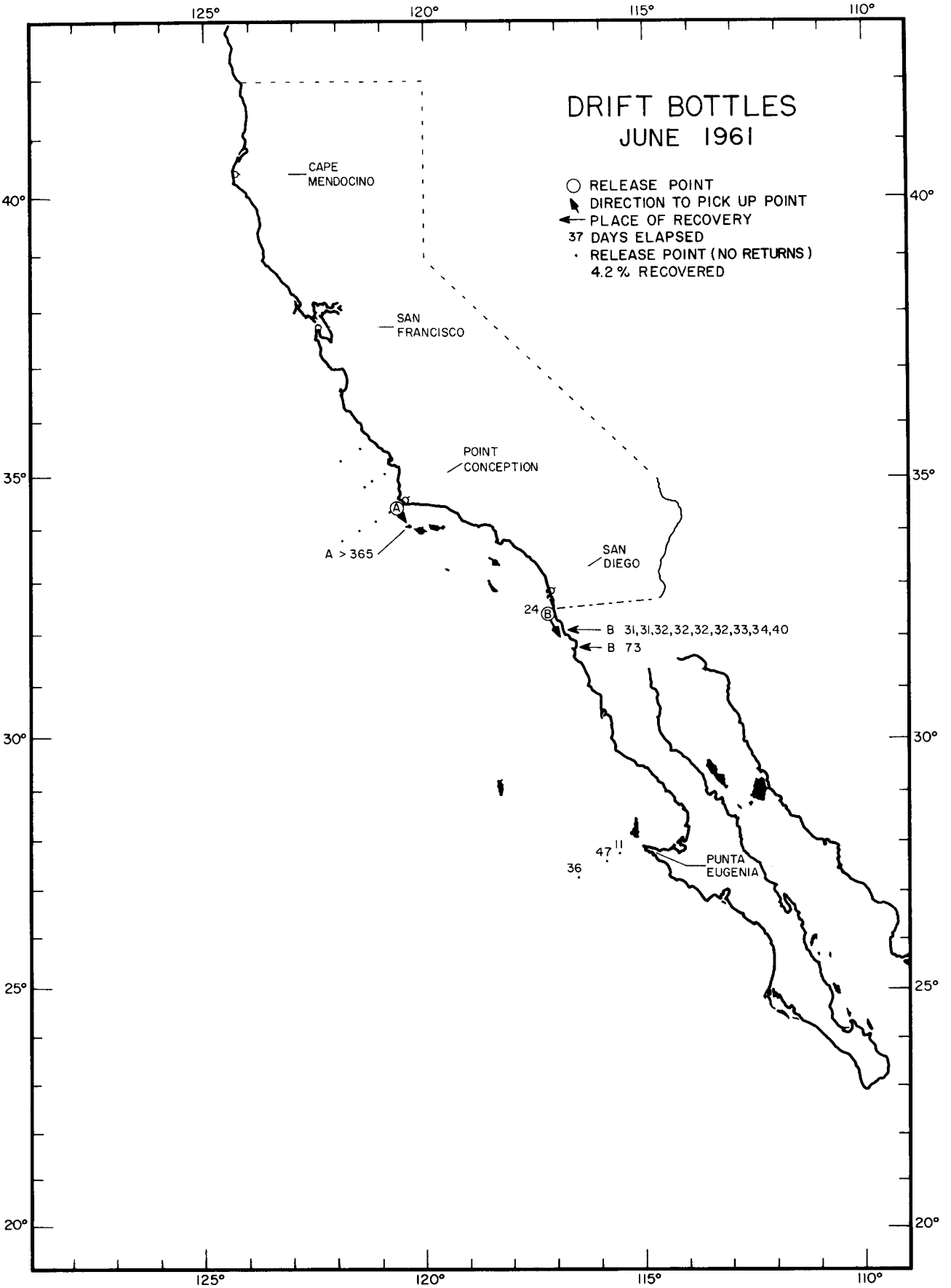
DRIFT BOTTLES
JUNE 1958



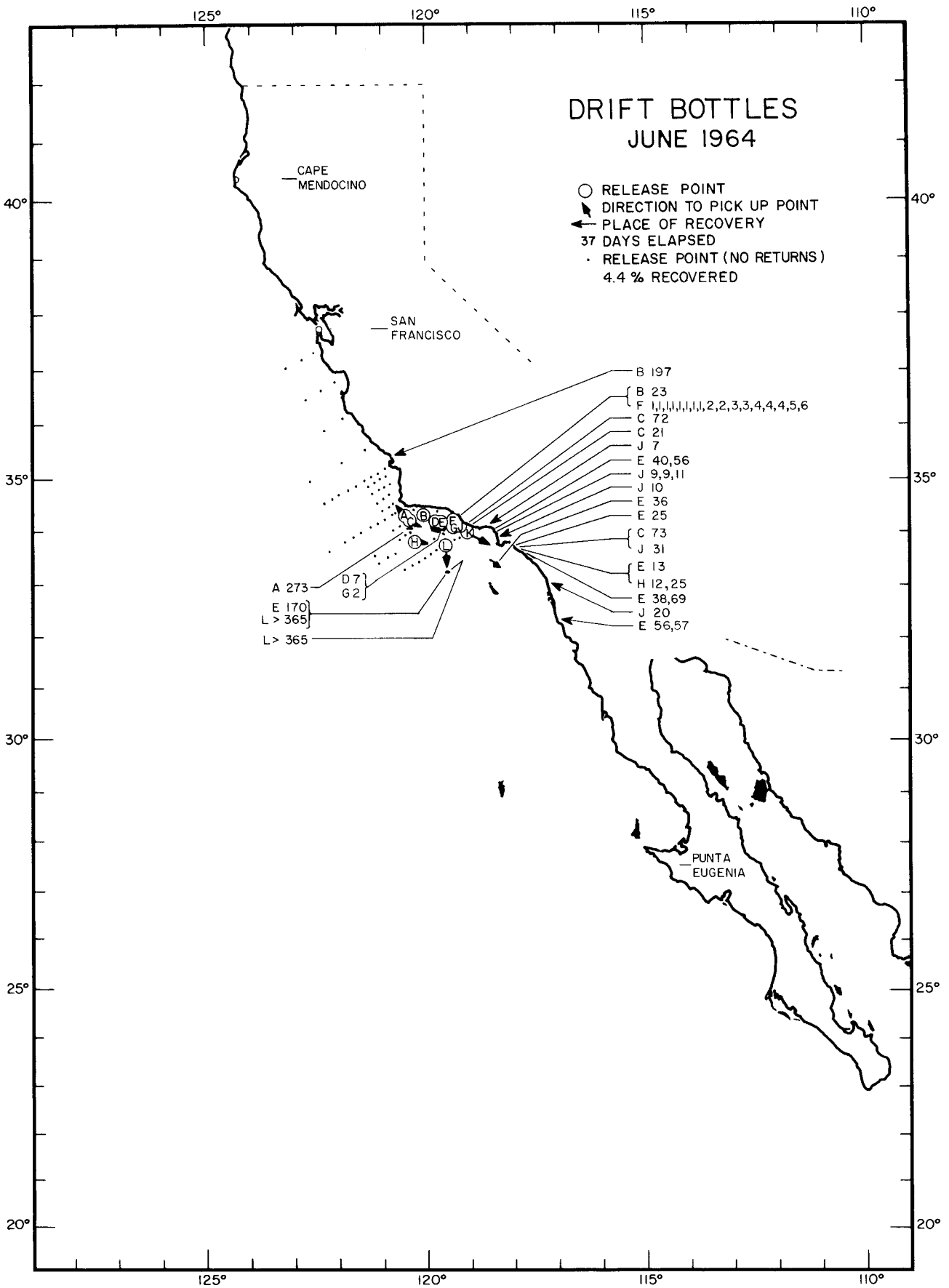
DRIFT BOTTLES
JUNE 1959



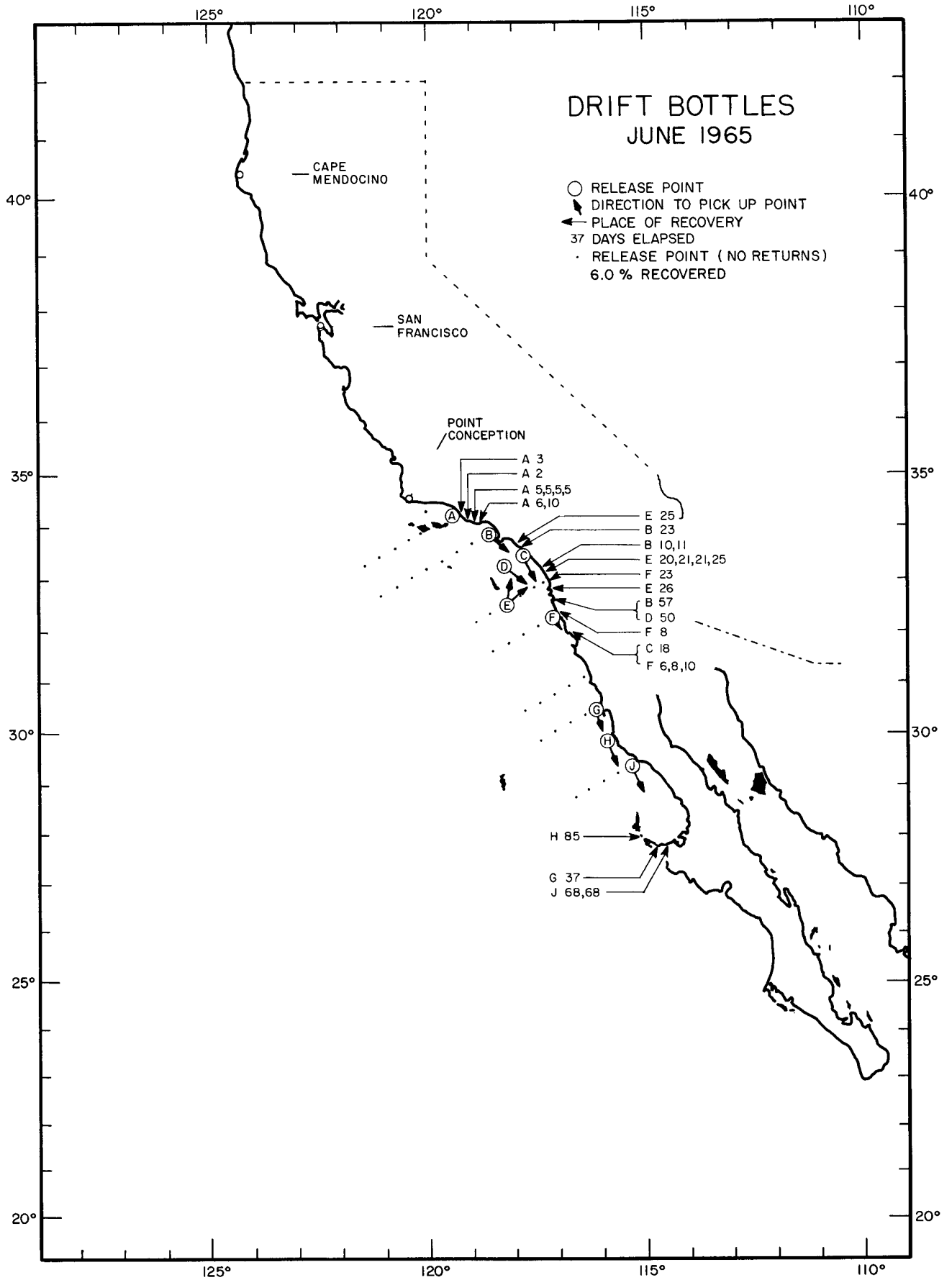
DRIFT BOTTLES
JUNE 1960



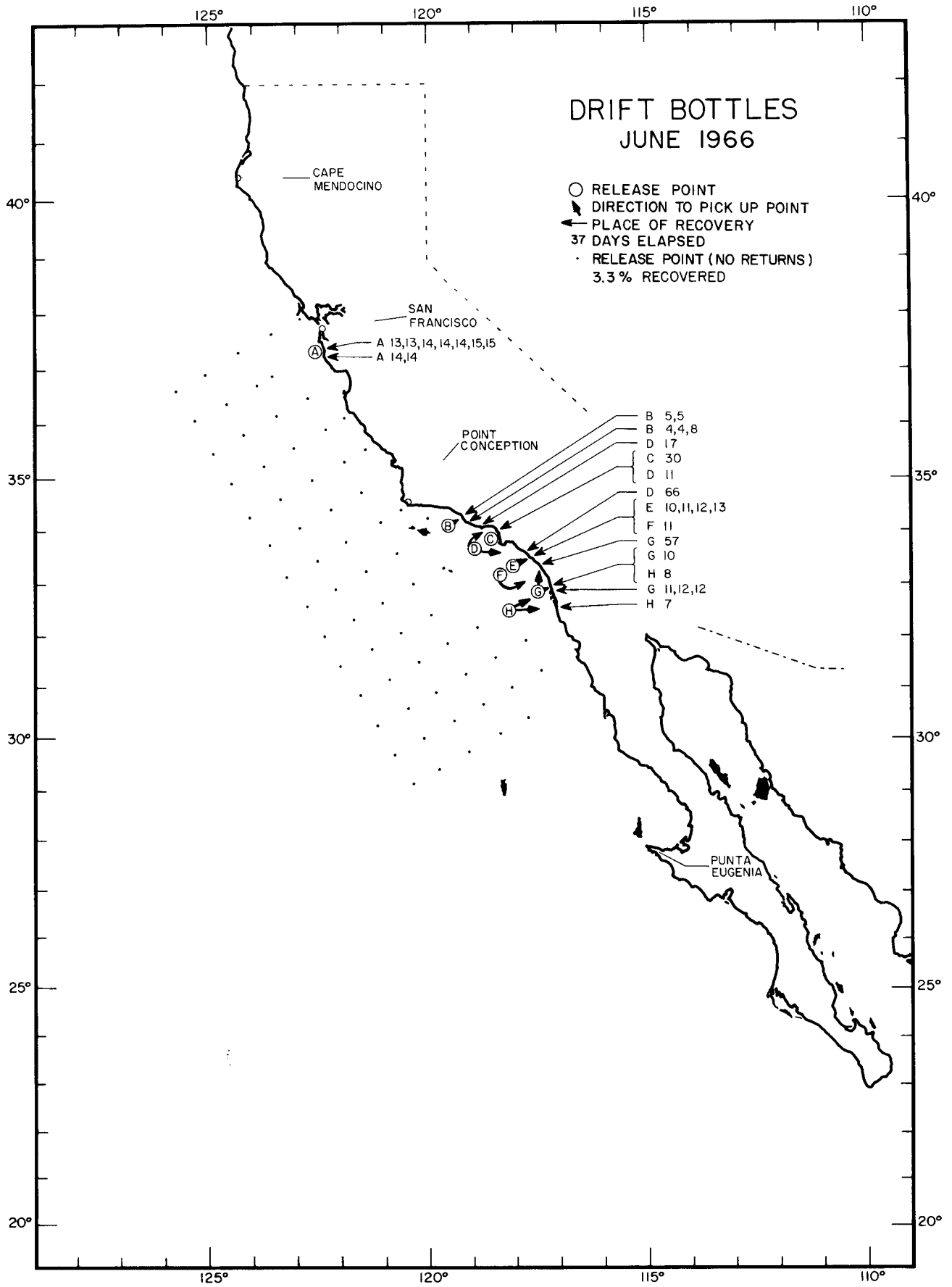
DRIFT BOTTLES
JUNE 1961



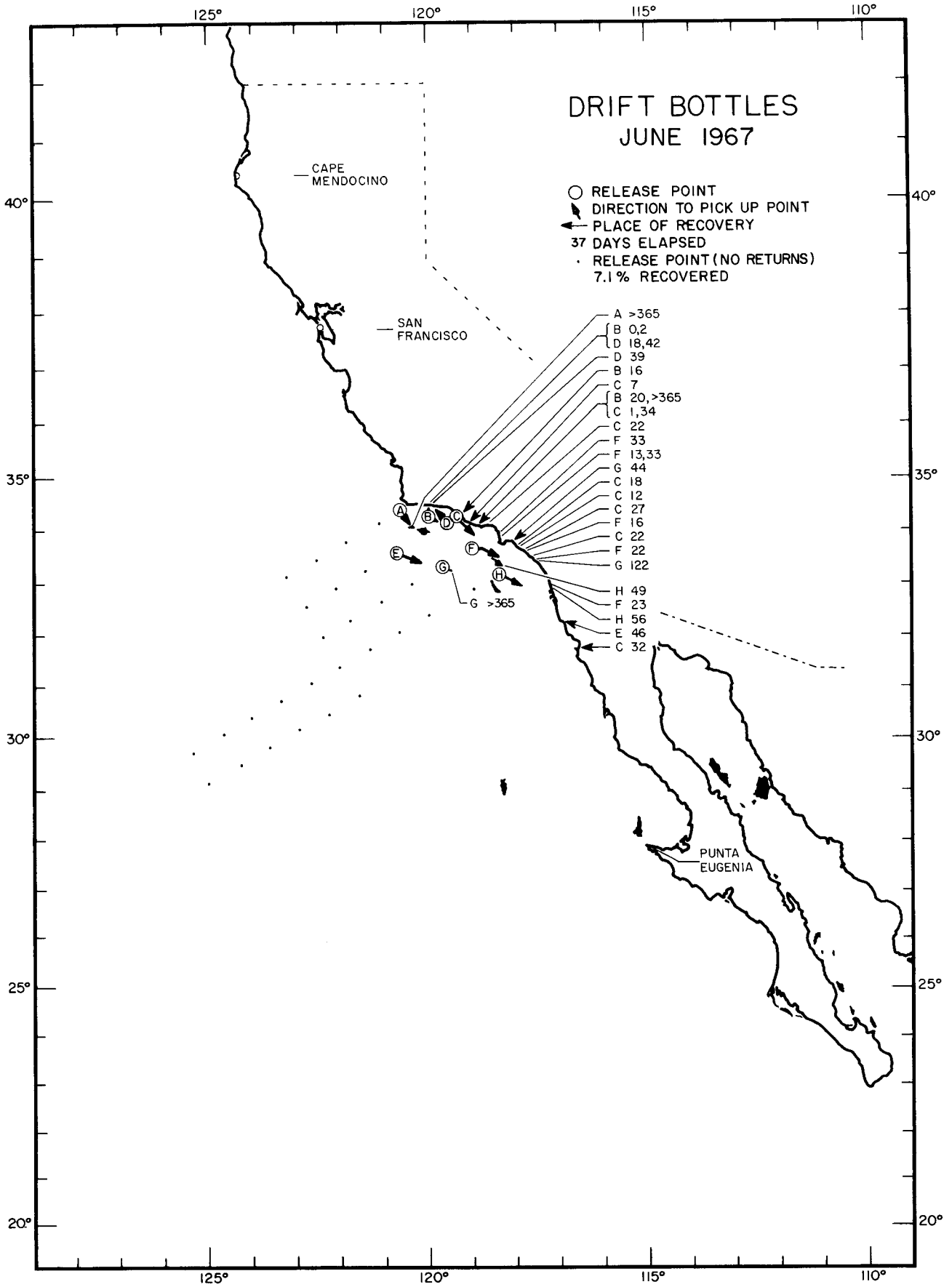
DRIFT BOTTLES
JUNE 1964



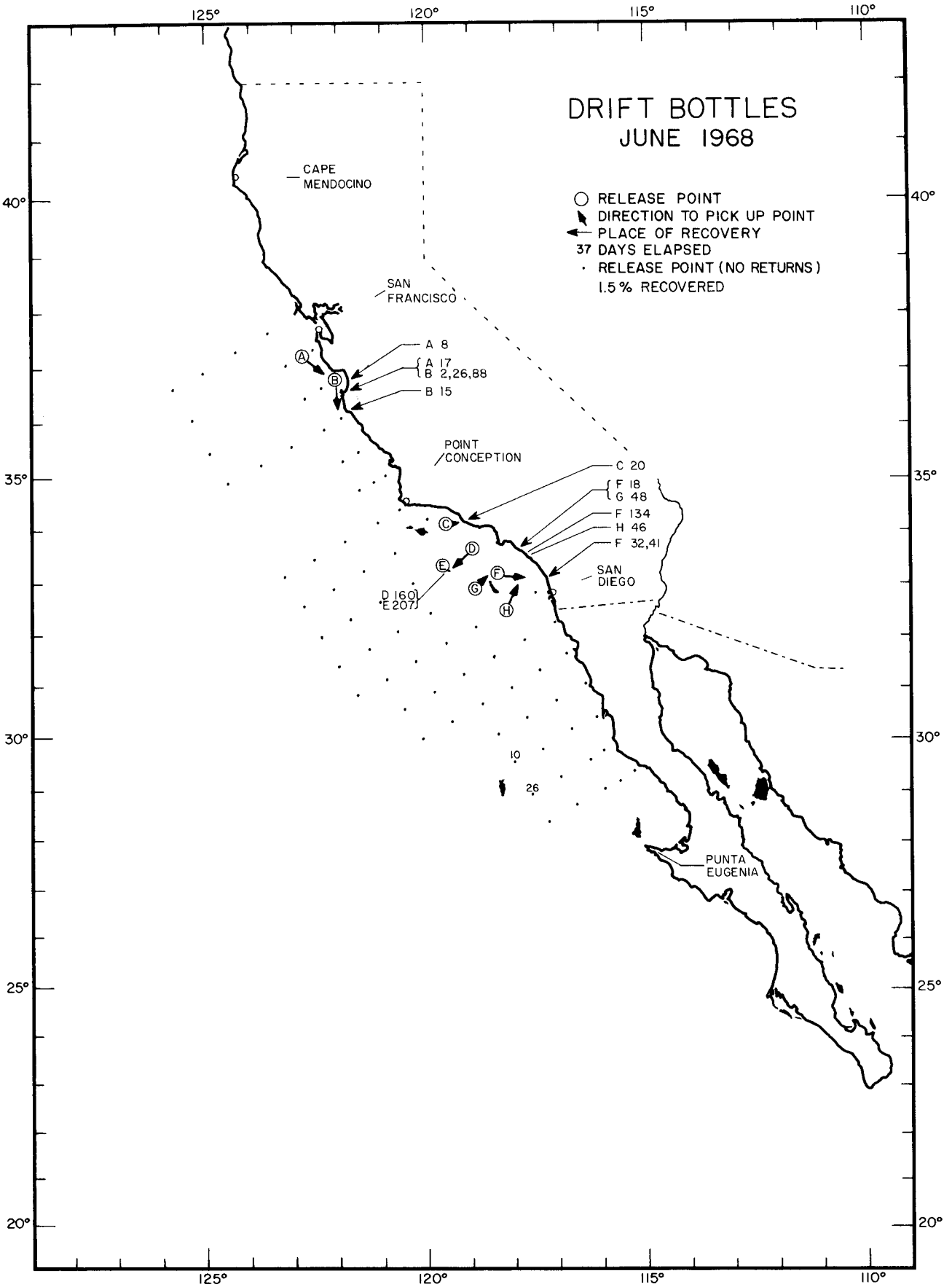
DRIFT BOTTLES
JUNE 1965



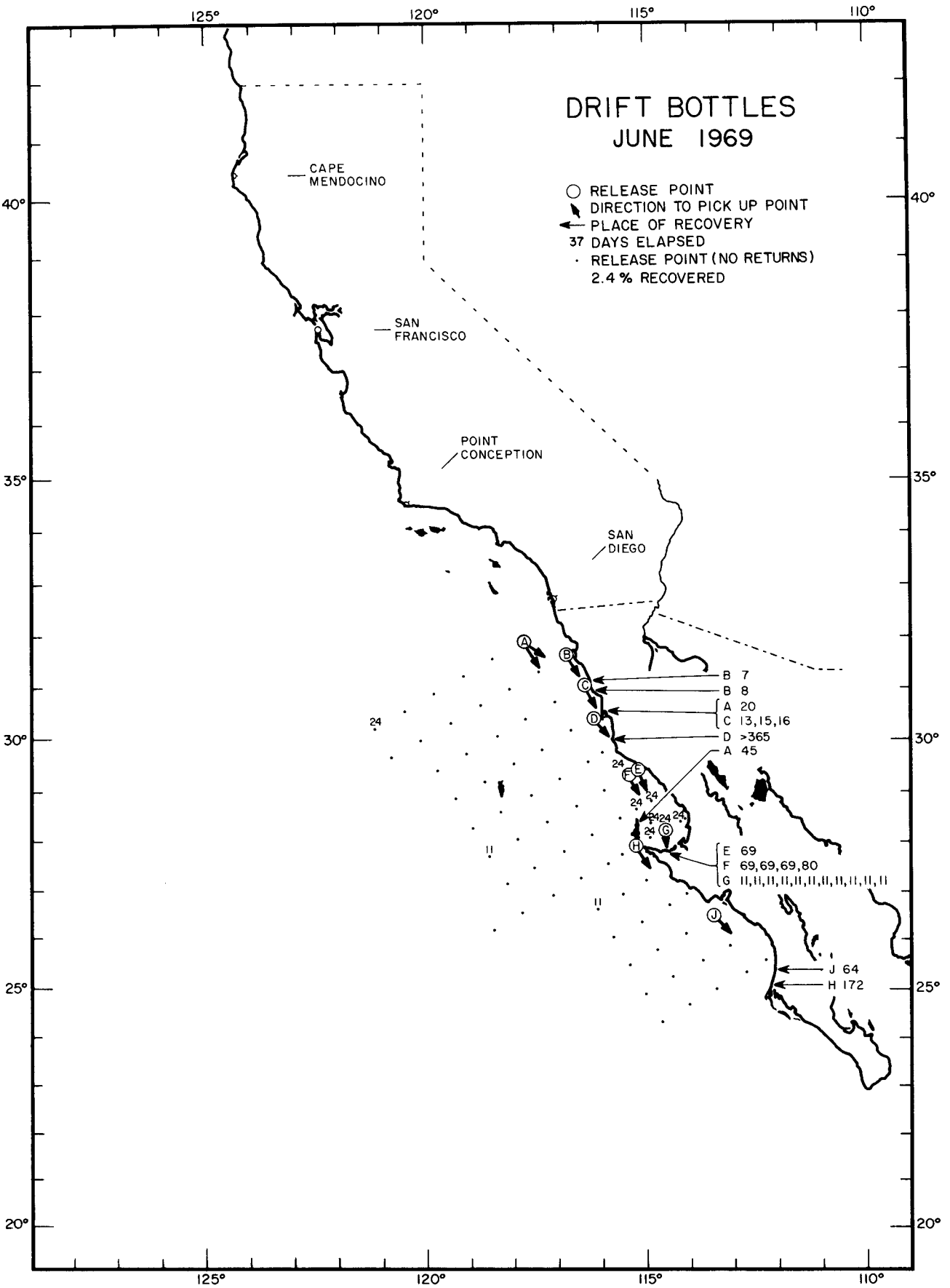
DRIFT BOTTLES
JUNE 1966



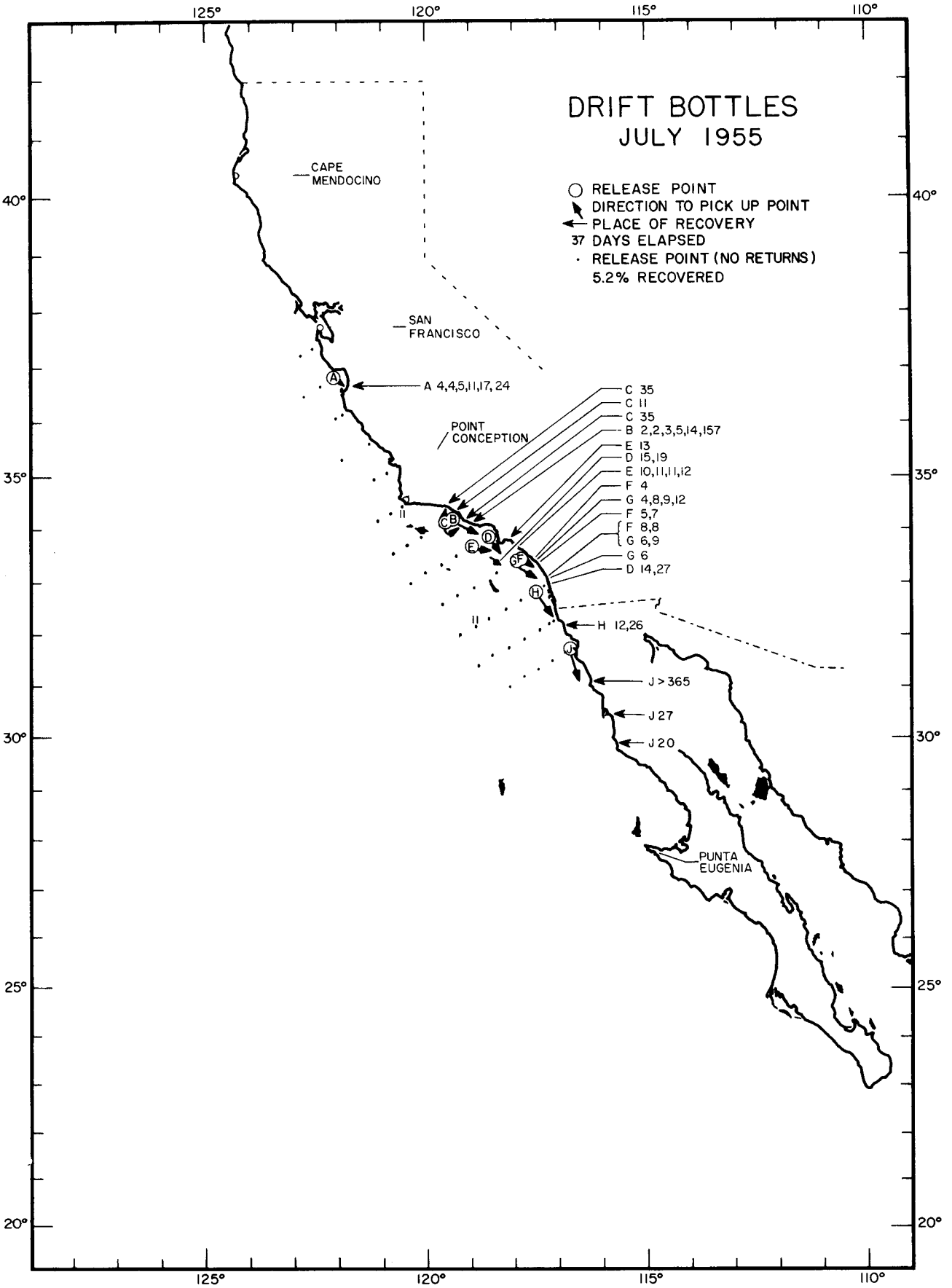
DRIFT BOTTLES
JUNE 1967



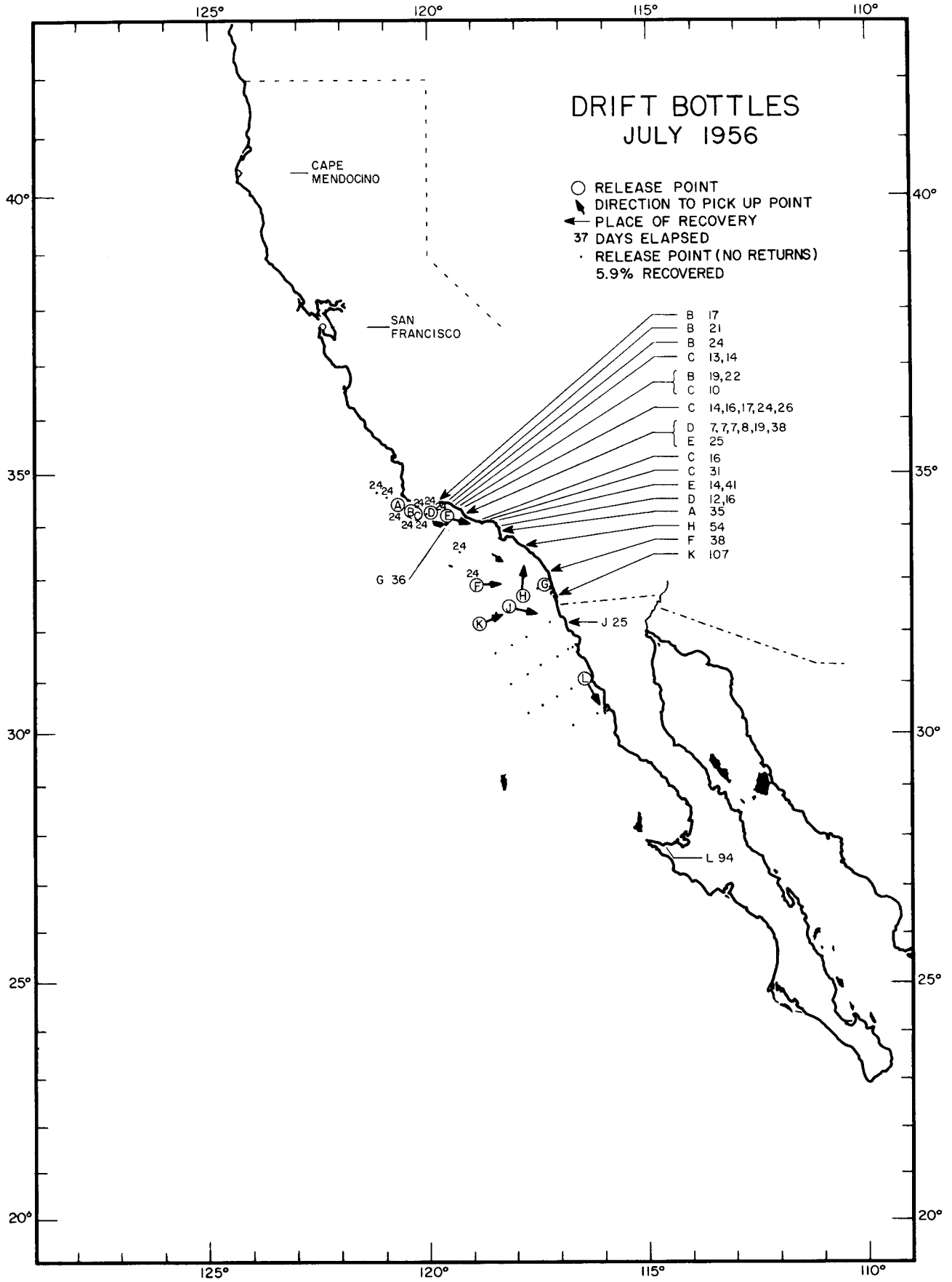
DRIFT BOTTLES
JUNE 1968



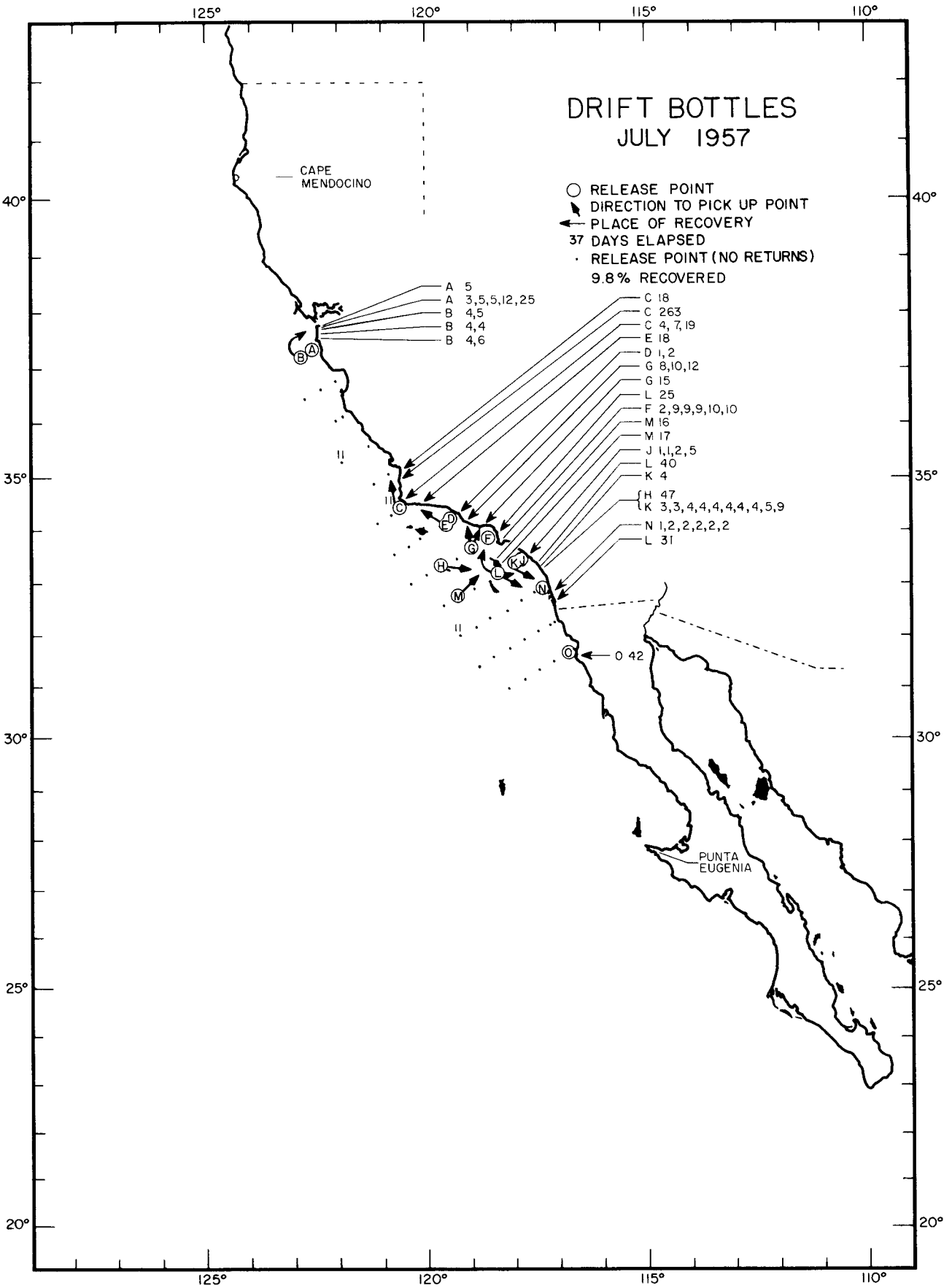
DRIFT BOTTLES
JUNE 1969



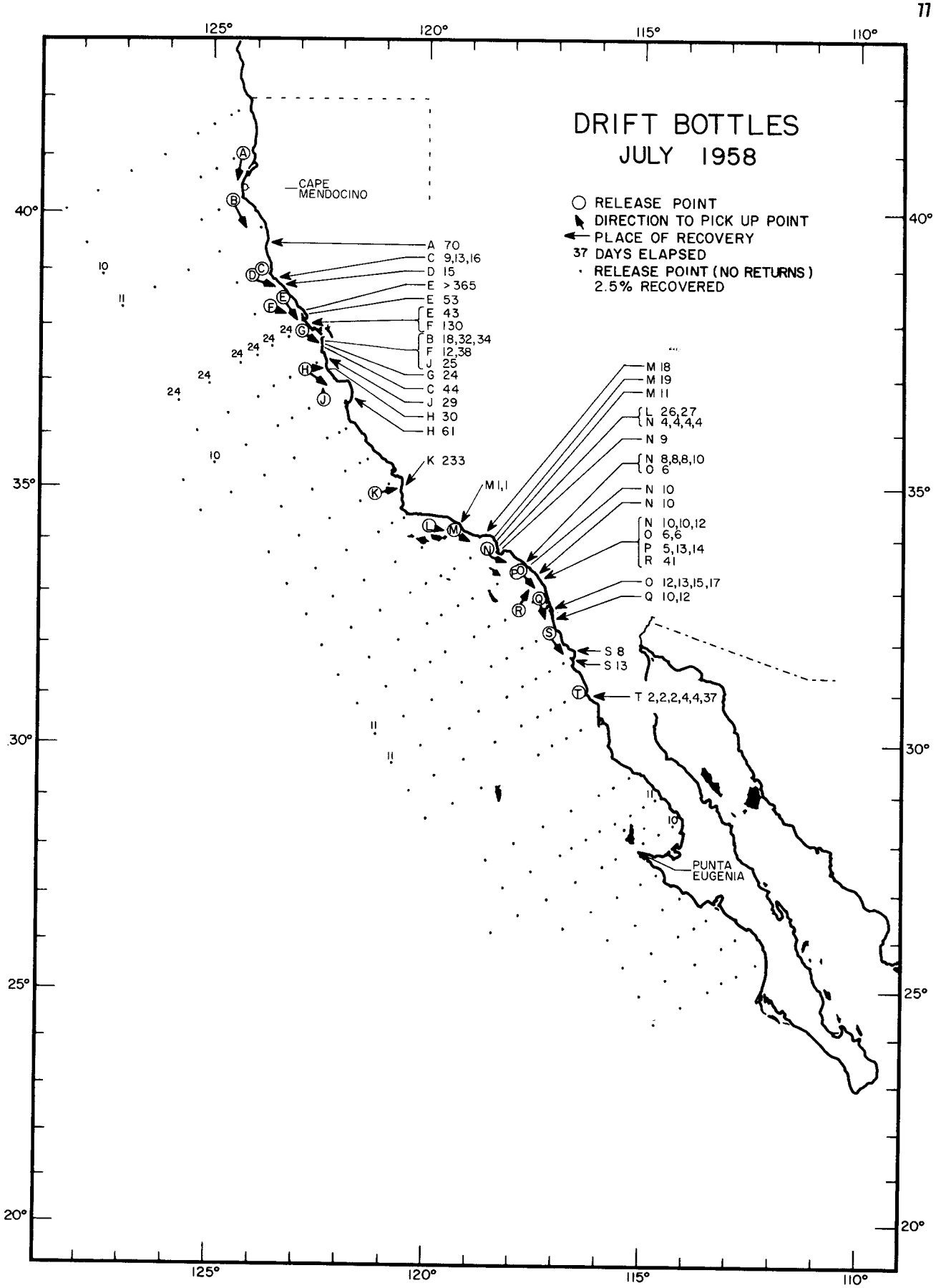
DRIFT BOTTLES
JULY 1955



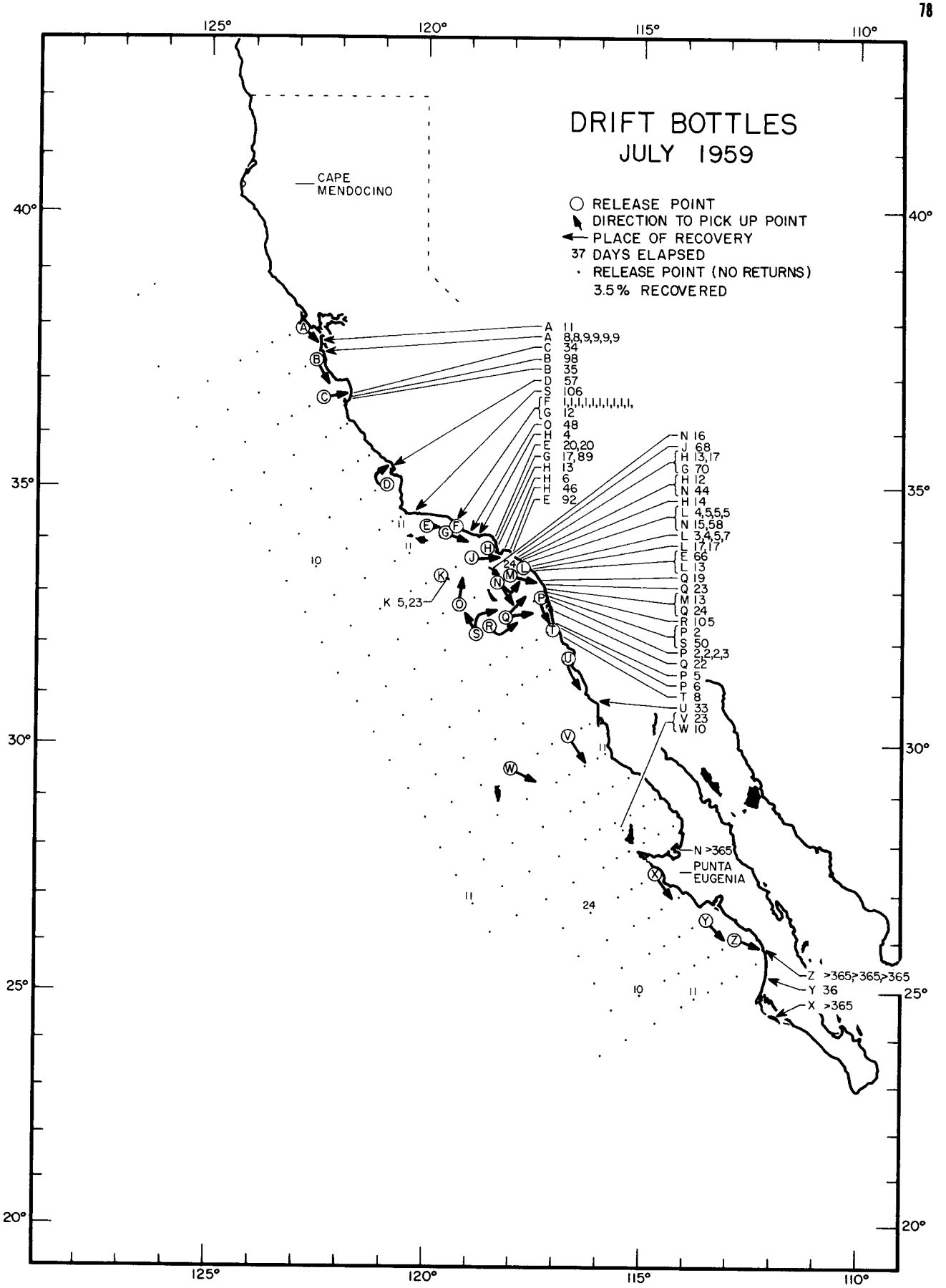
DRIFT BOTTLES
JULY 1956



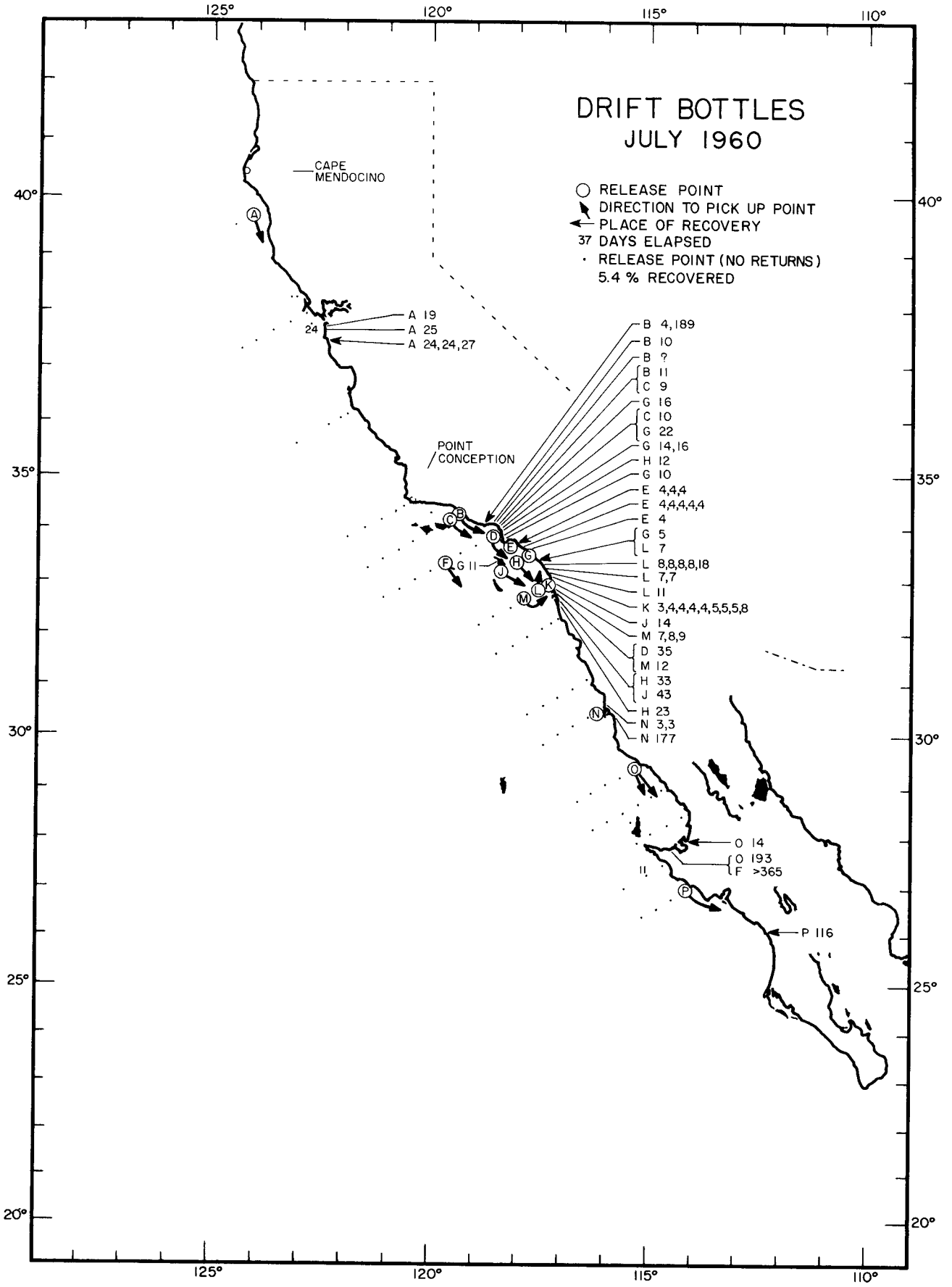
DRIFT BOTTLES
JULY 1957



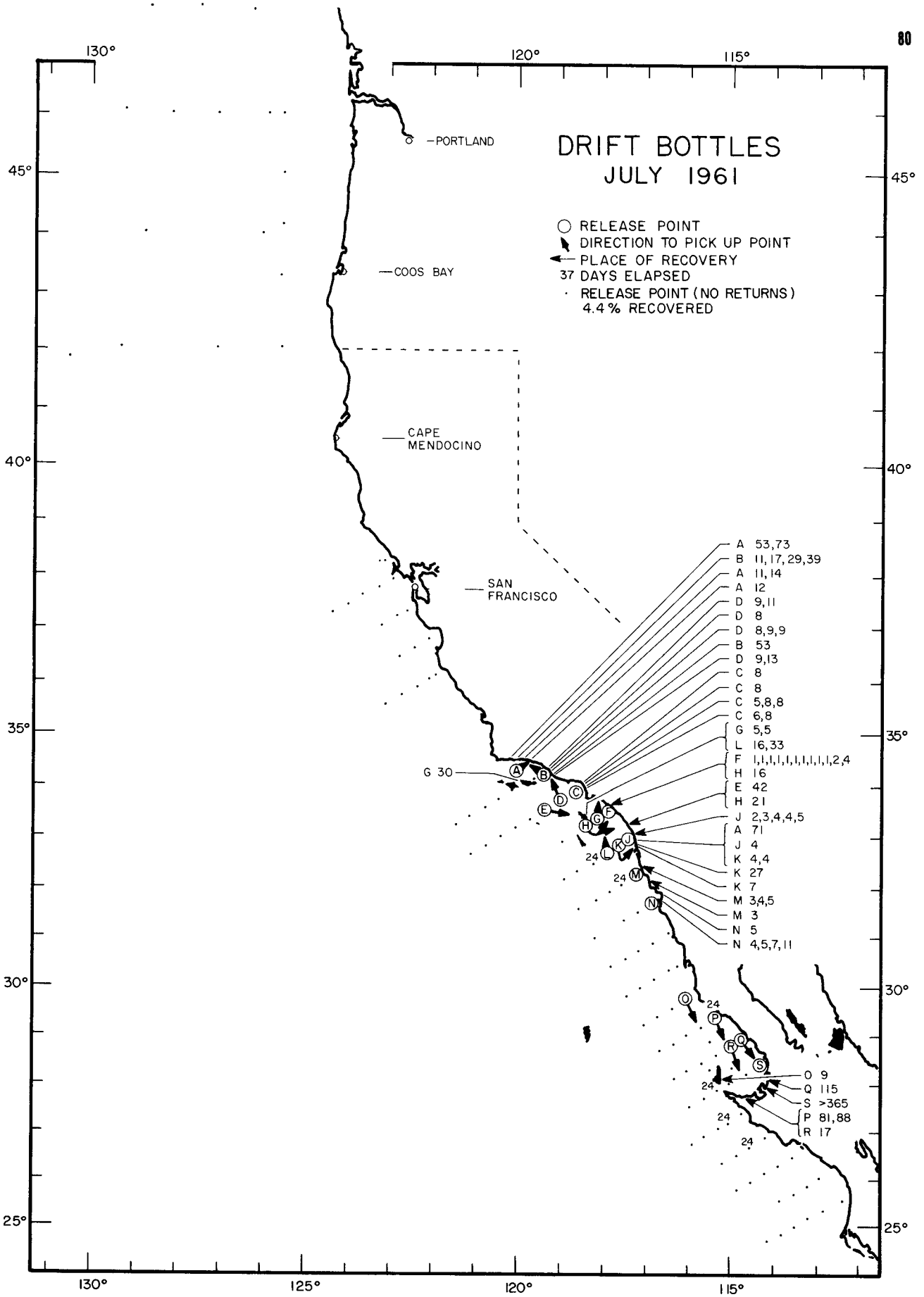
DRIFT BOTTLES
JULY 1958



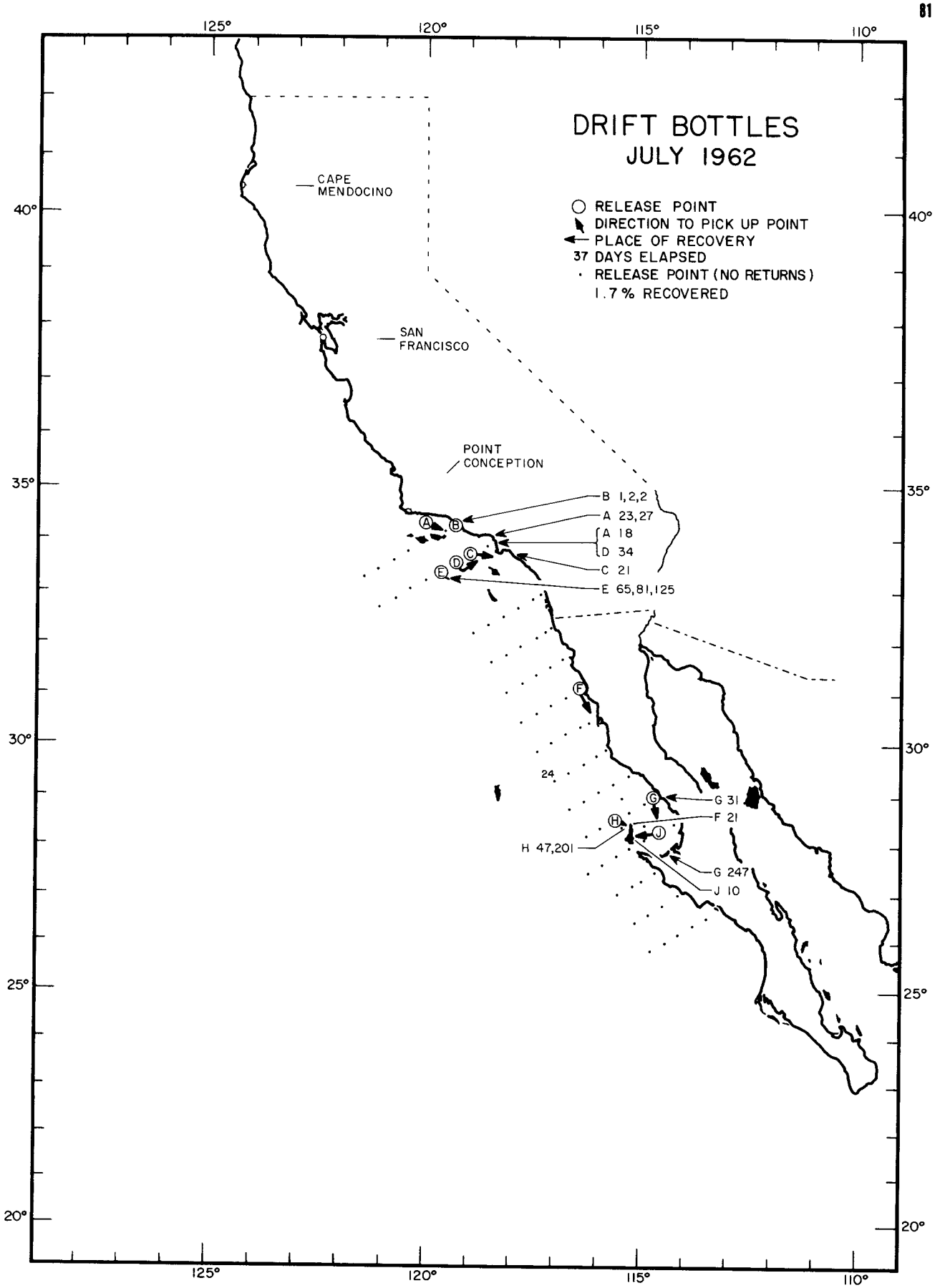
DRIFT BOTTLES
JULY 1959



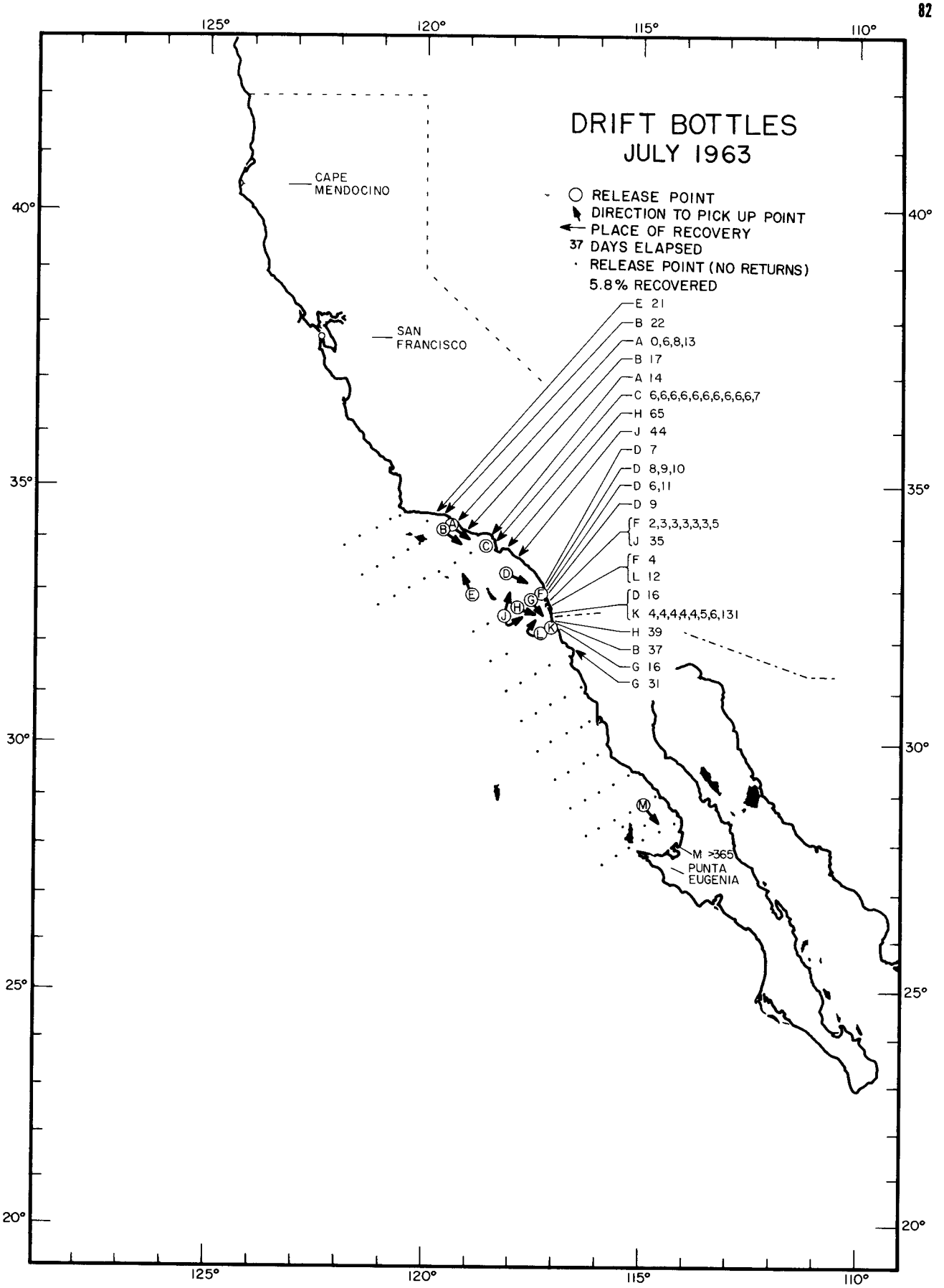
DRIFT BOTTLES
JULY 1960



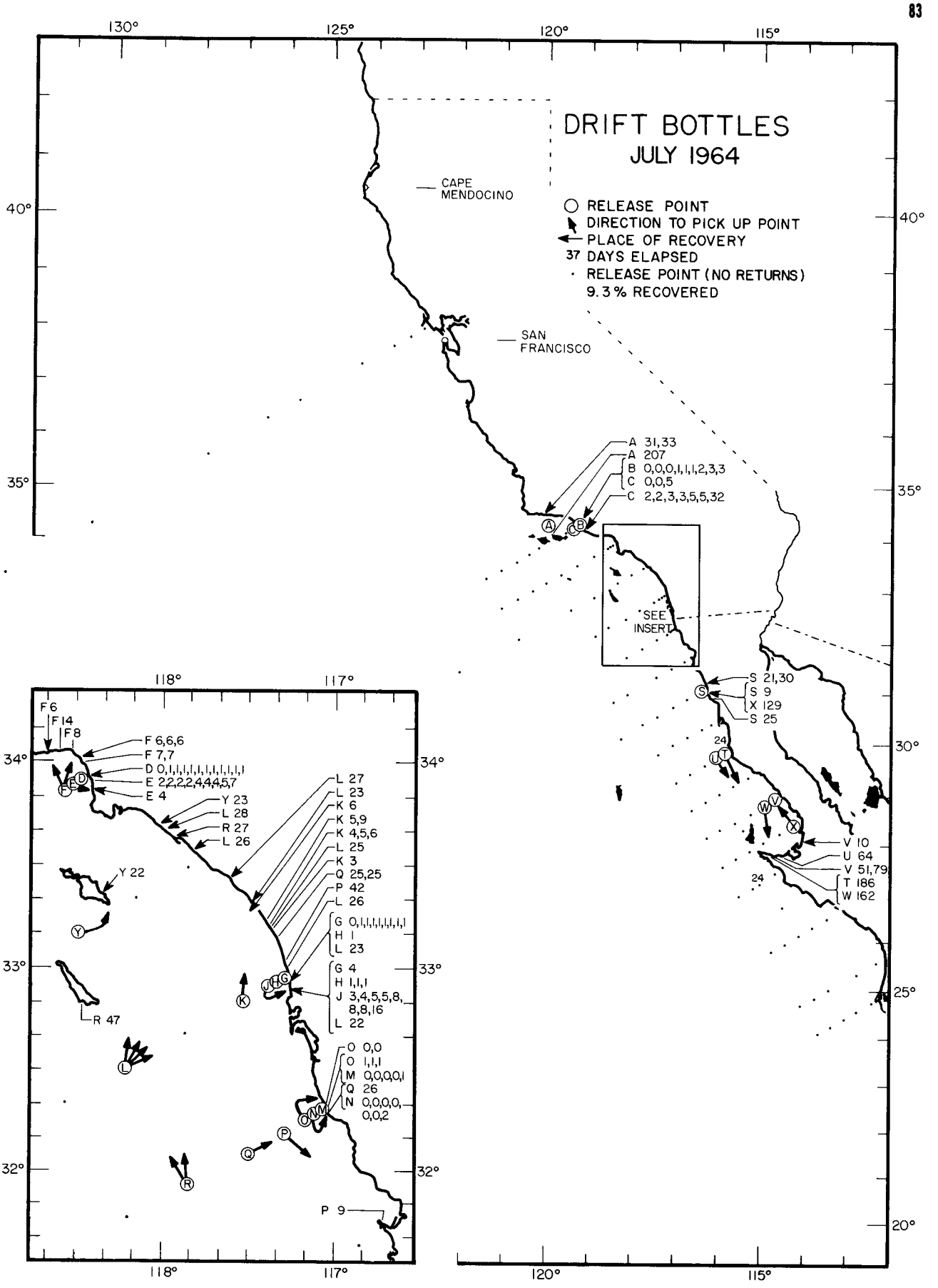
DRIFT BOTTLES
JULY 1961



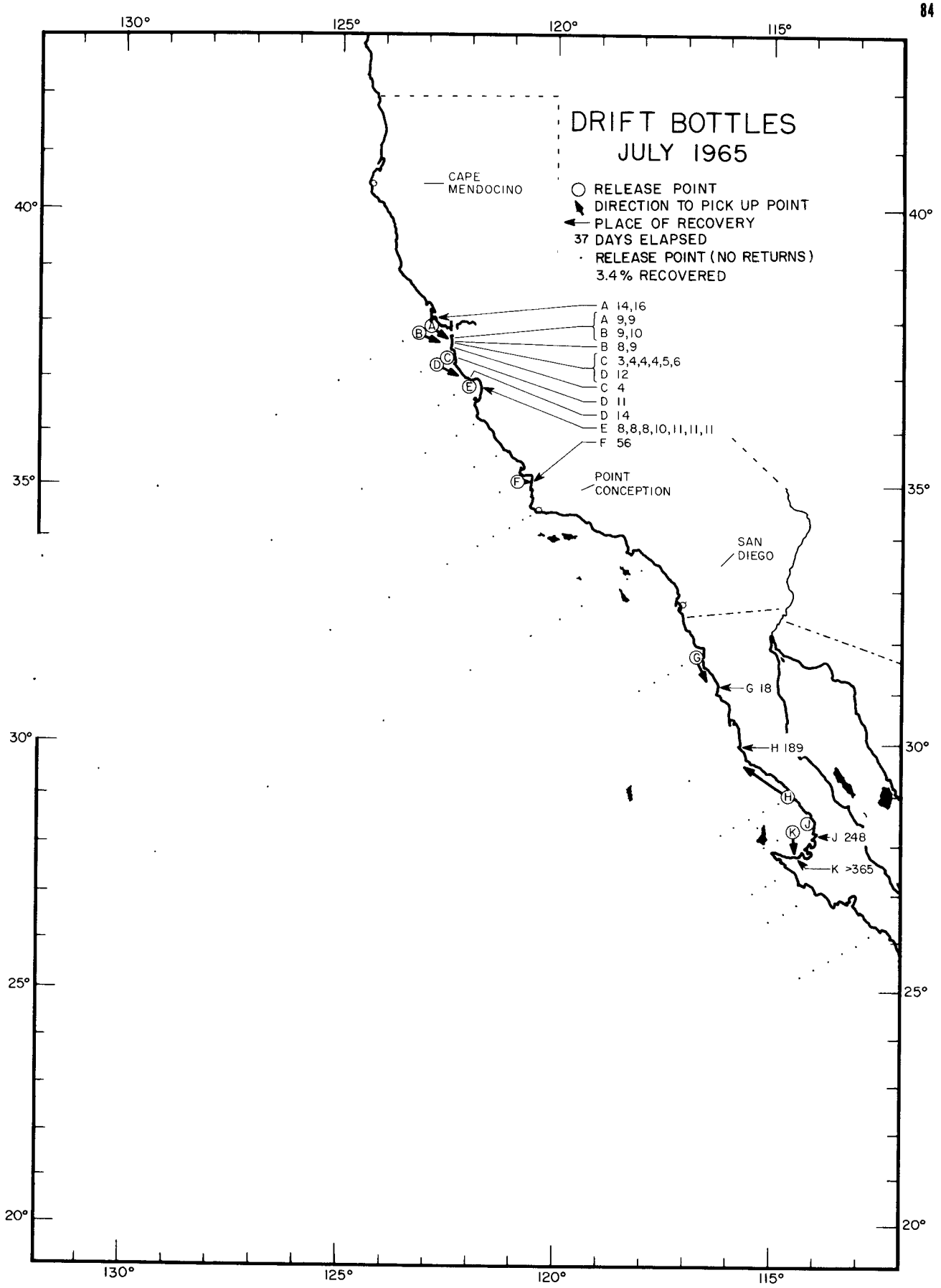
DRIFT BOTTLES
JULY 1962



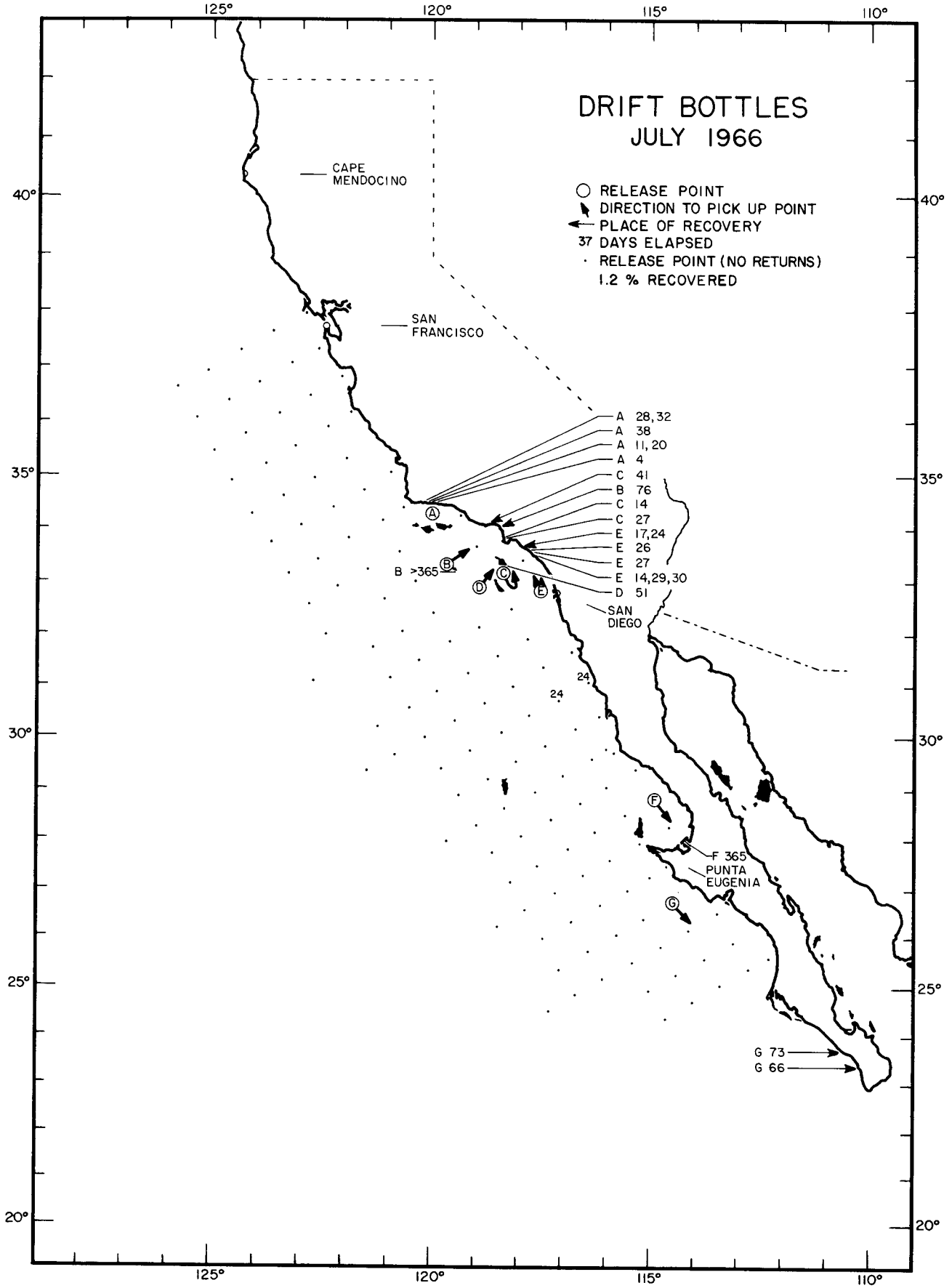
DRIFT BOTTLES
JULY 1963



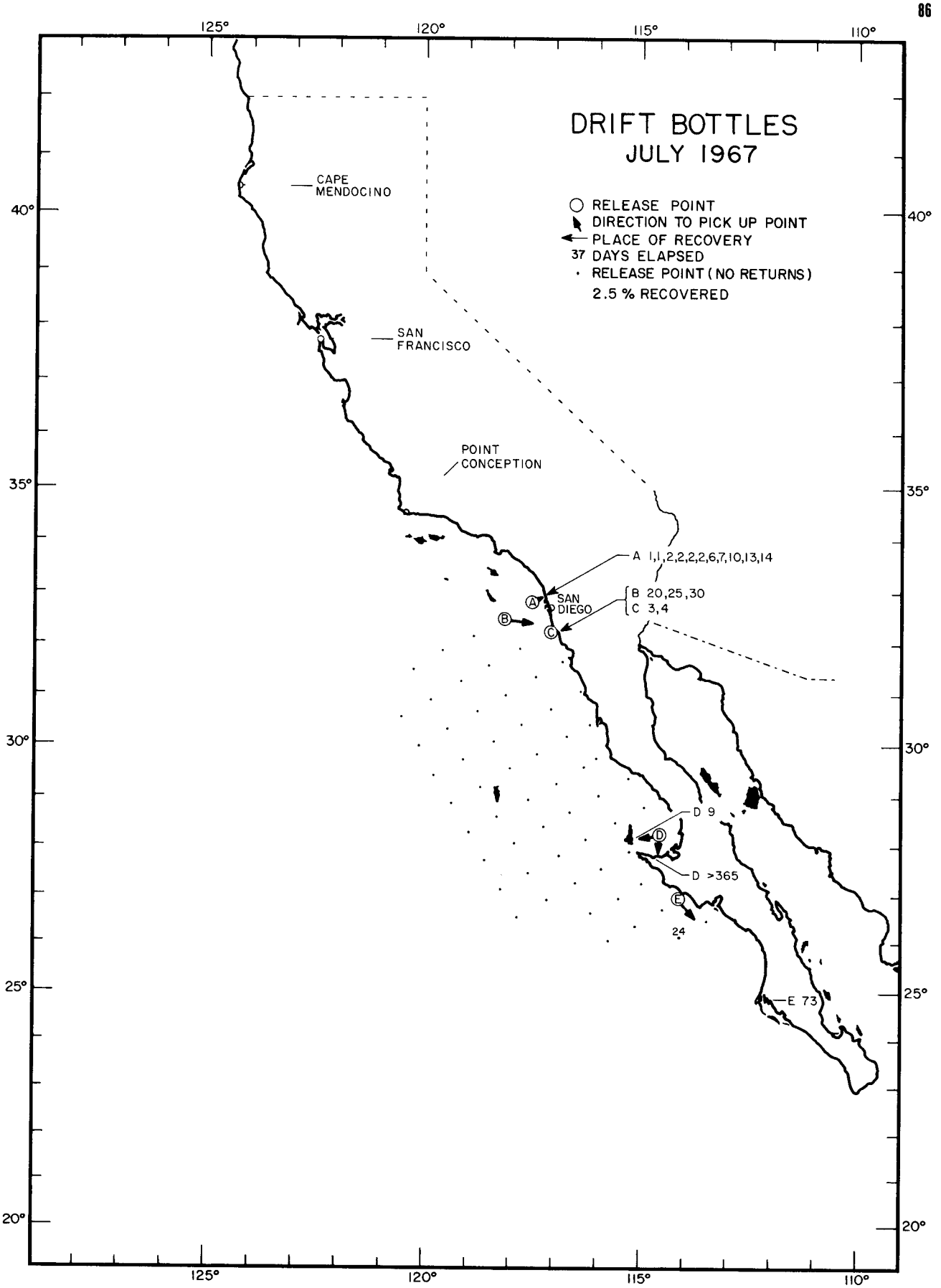
DRIFT BOTTLES
JULY 1964



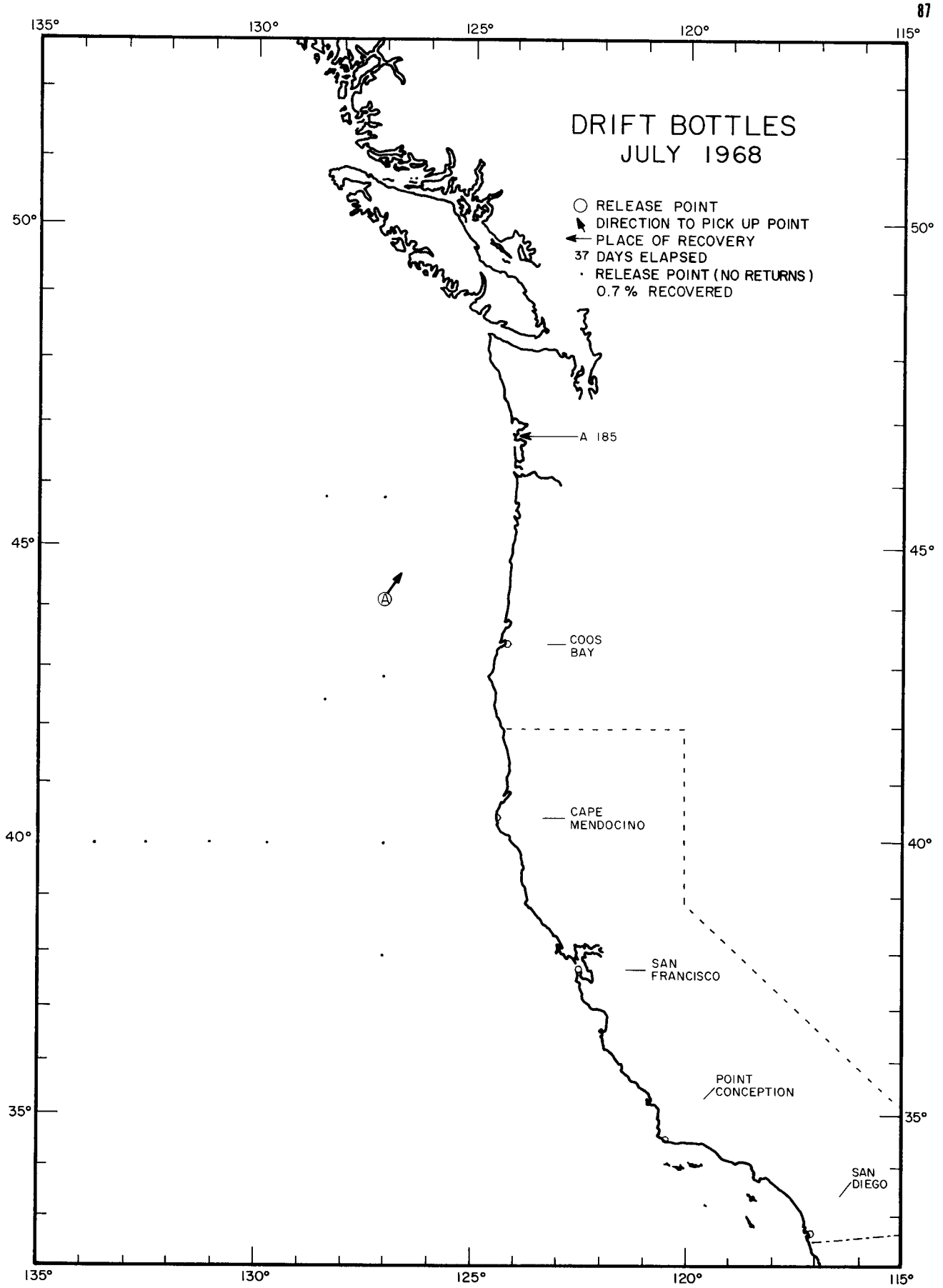
DRIFT BOTTLES
JULY 1965



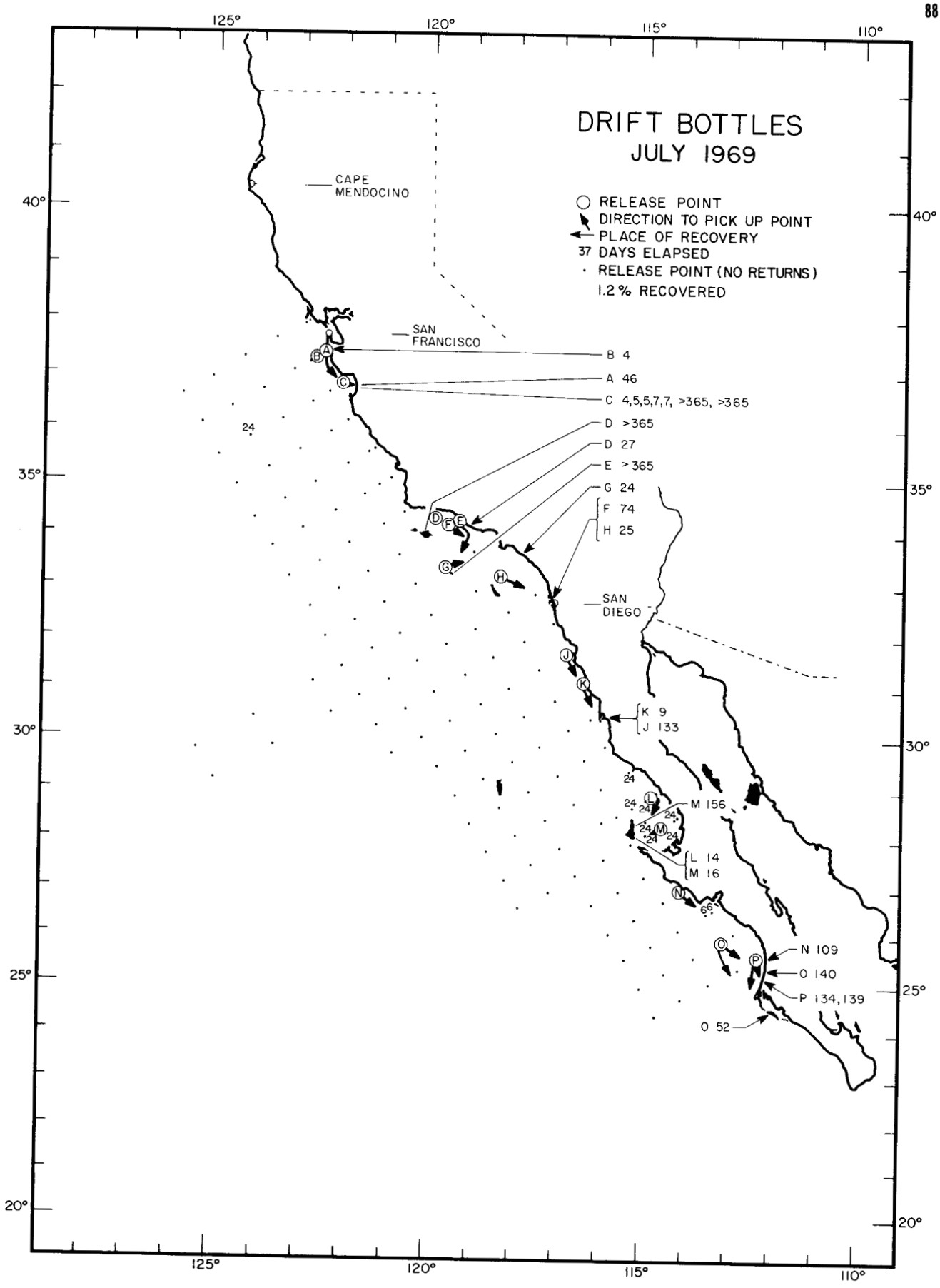
DRIFT BOTTLES
JULY 1966



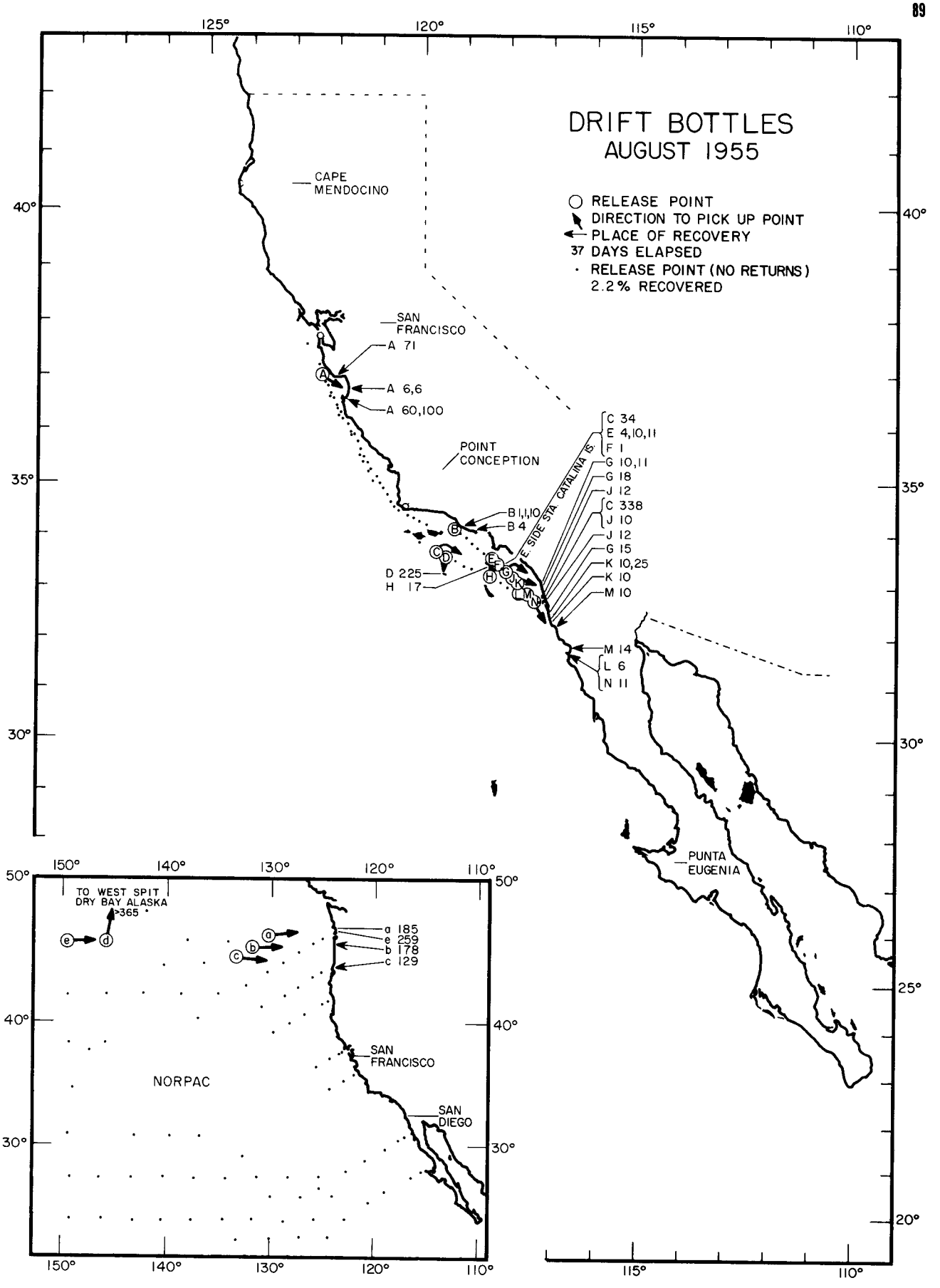
DRIFT BOTTLES
JULY 1967



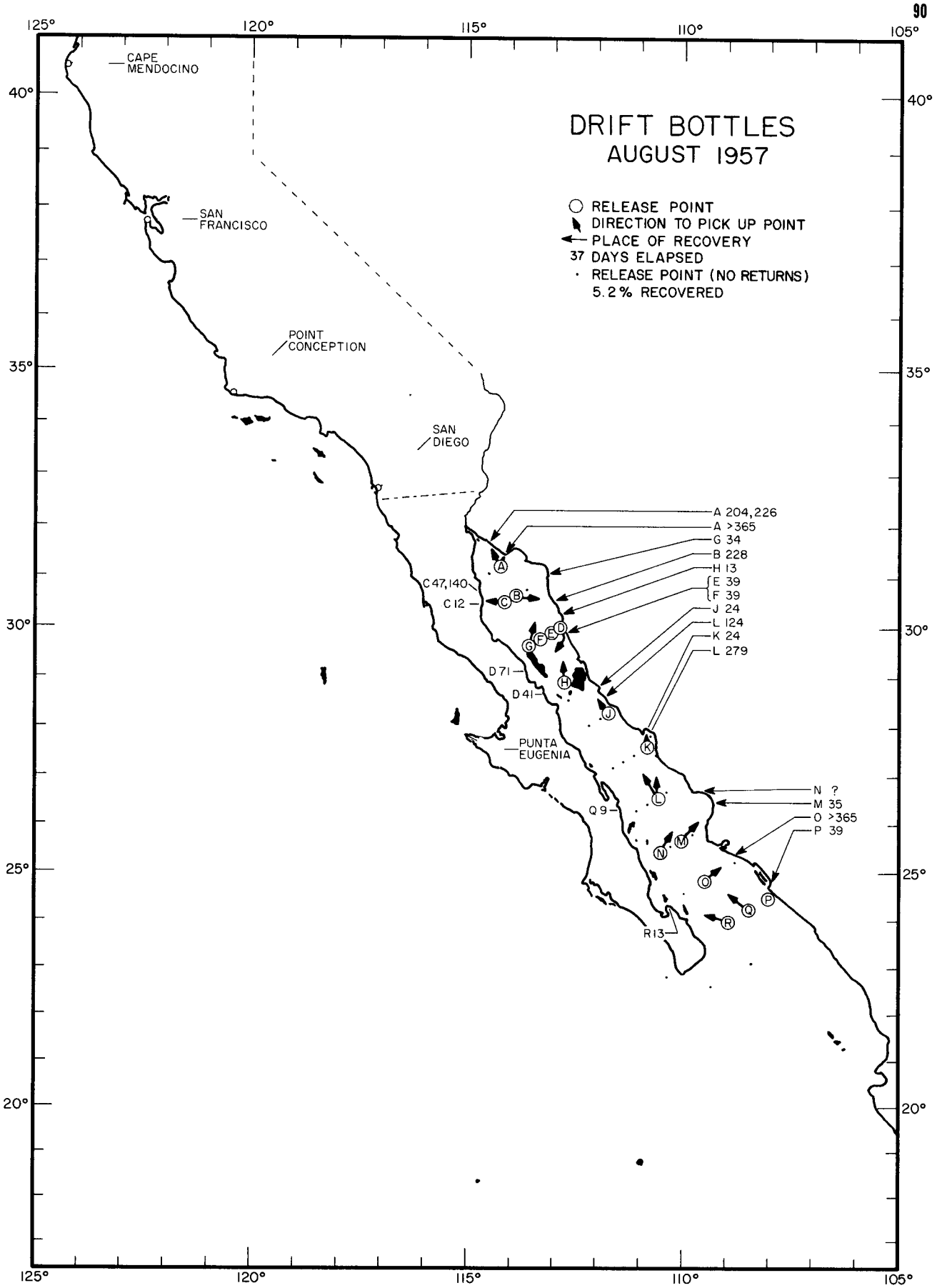
DRIFT BOTTLES
JULY 1968



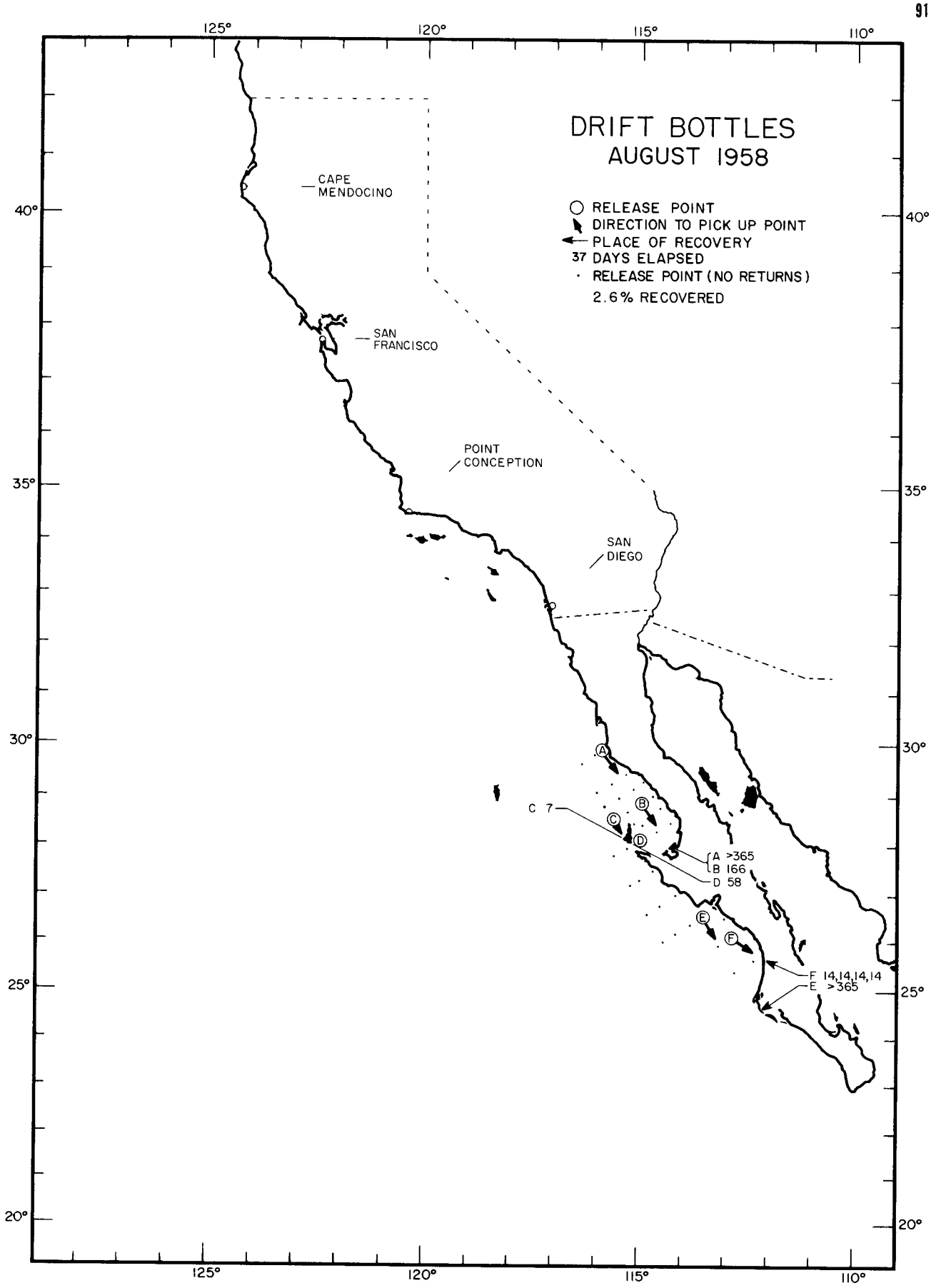
DRIFT BOTTLES
JULY 1969



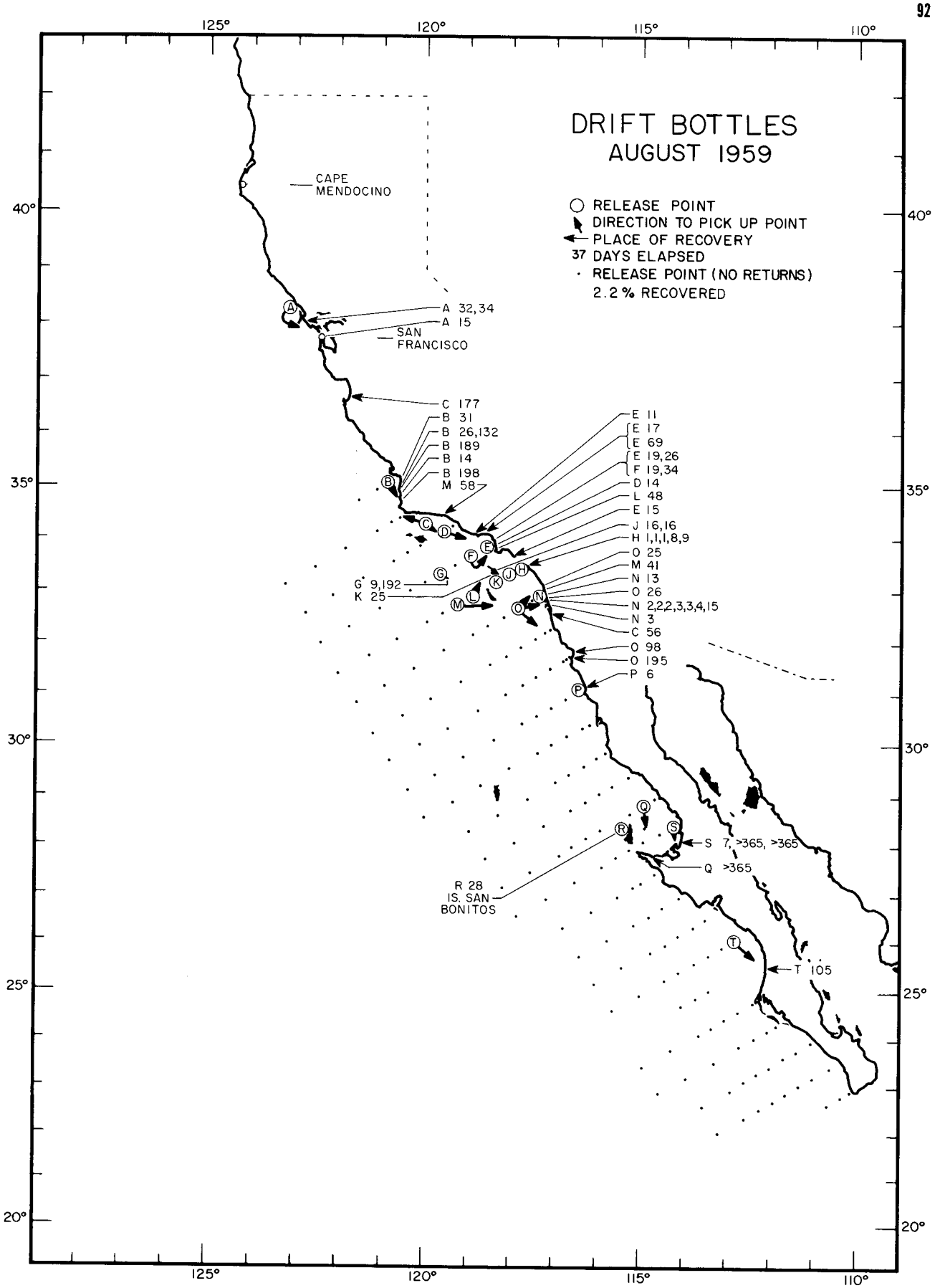
DRIFT BOTTLES
AUGUST 1955



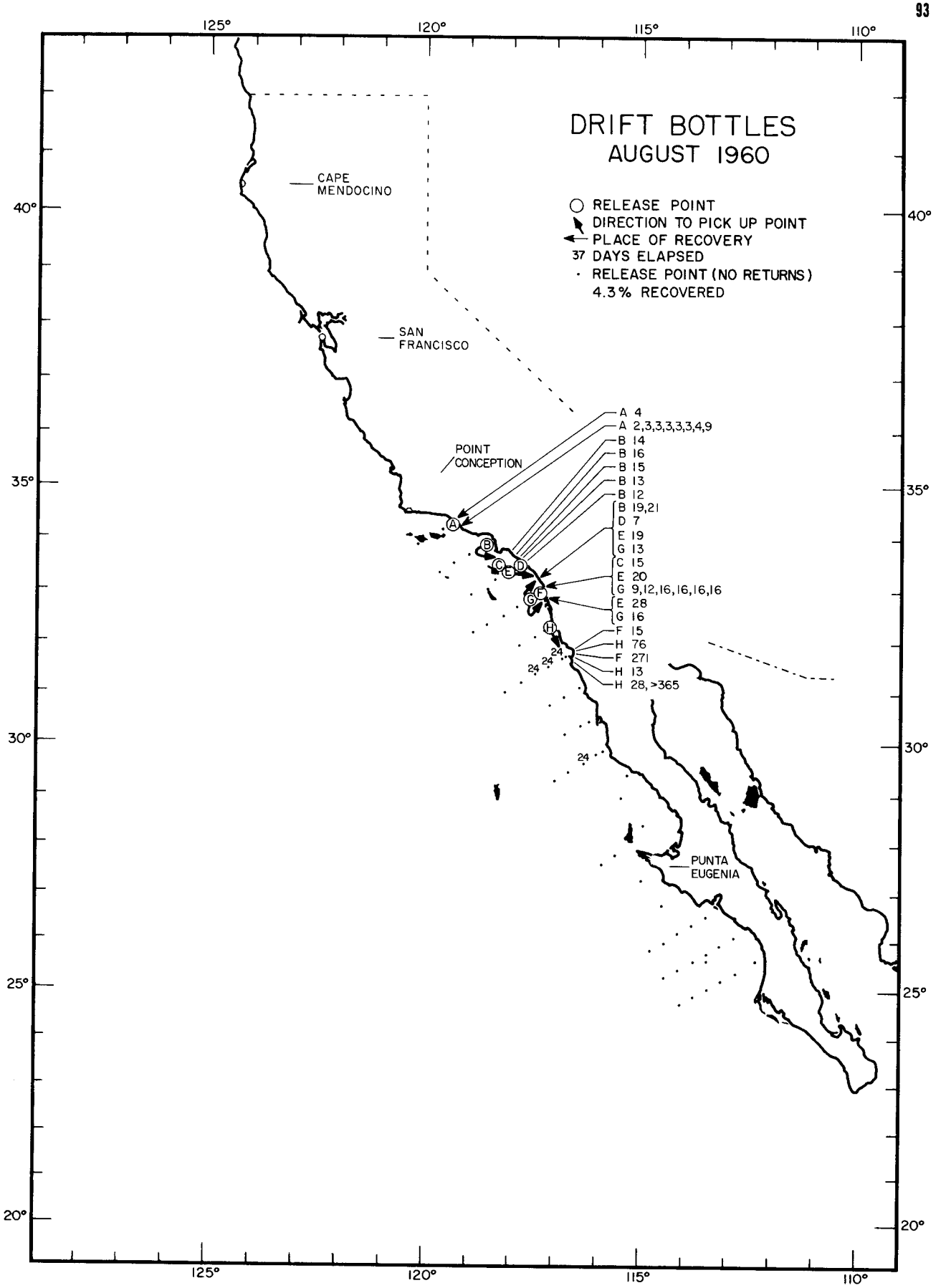
DRIFT BOTTLES
AUGUST 1957



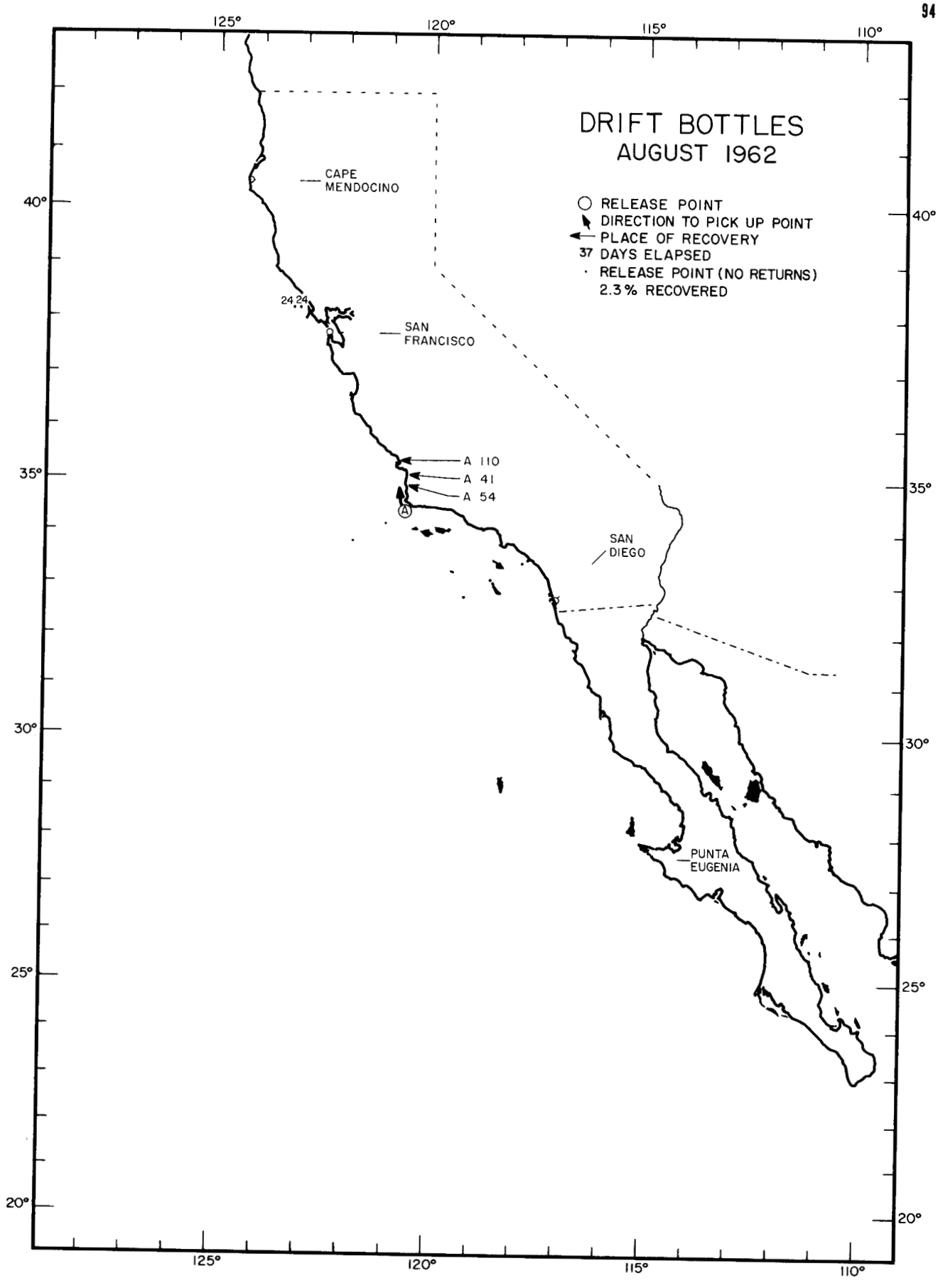
DRIFT BOTTLES
AUGUST 1958



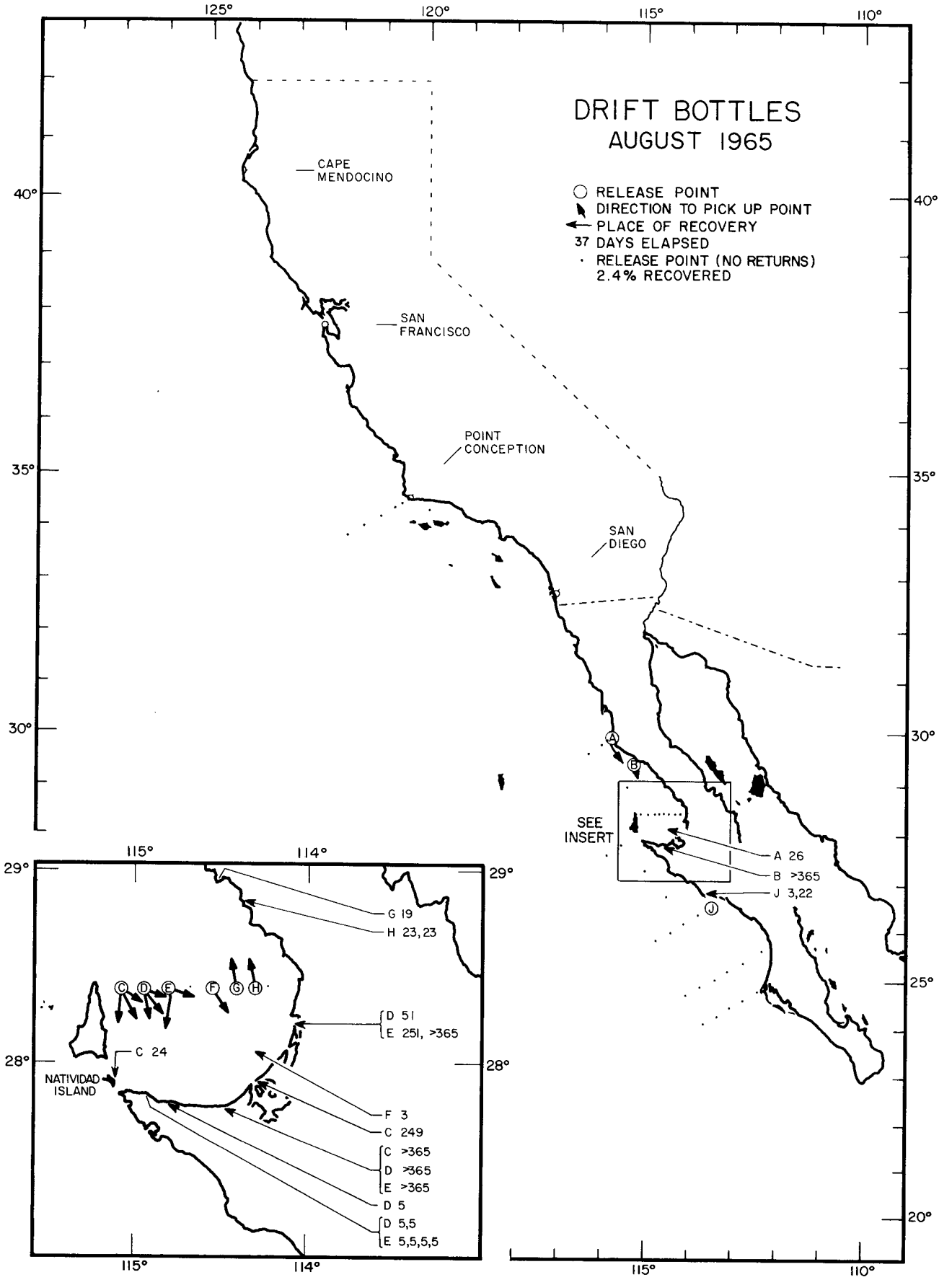
DRIFT BOTTLES
AUGUST 1959



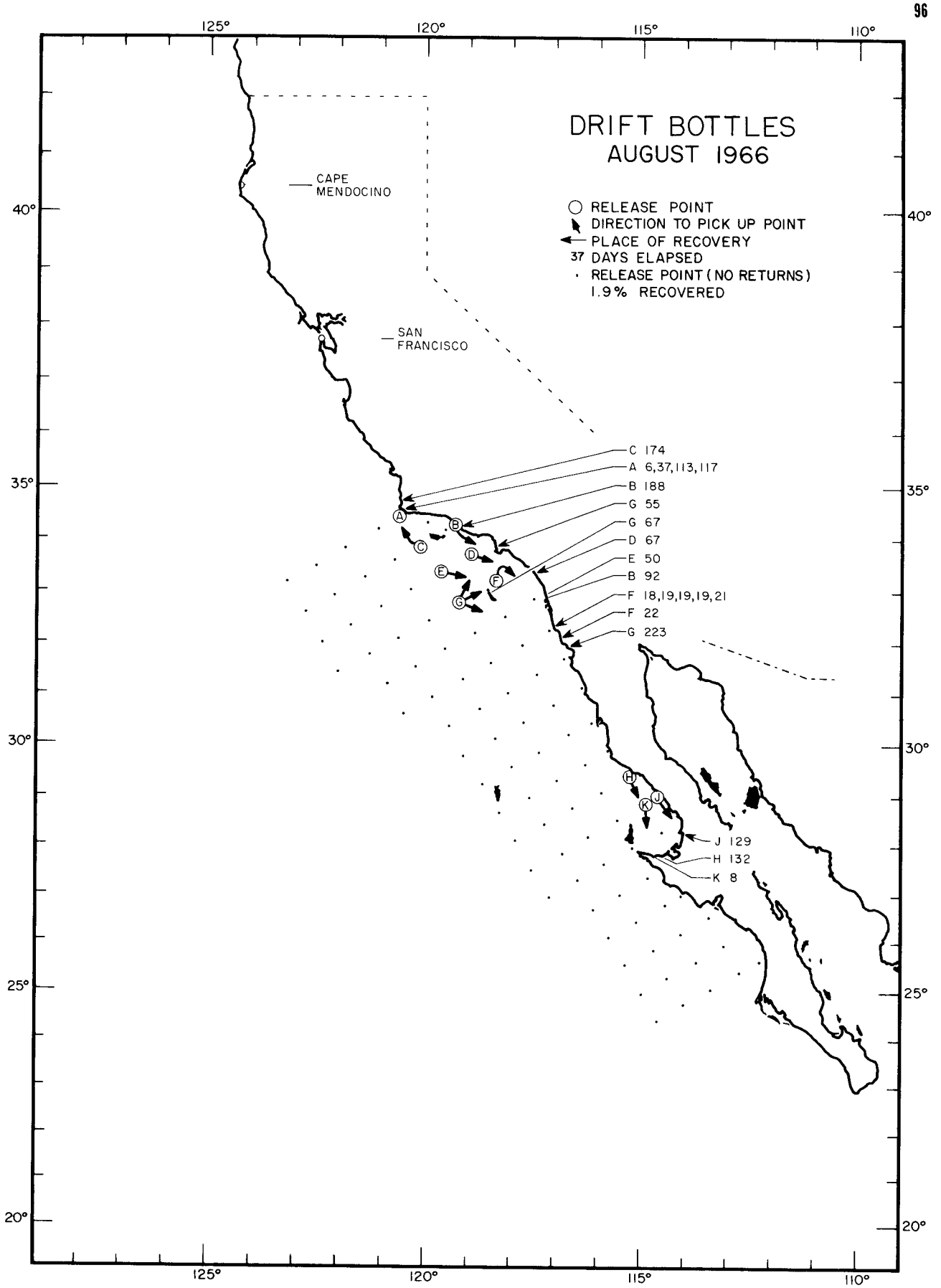
DRIFT BOTTLES
AUGUST 1960



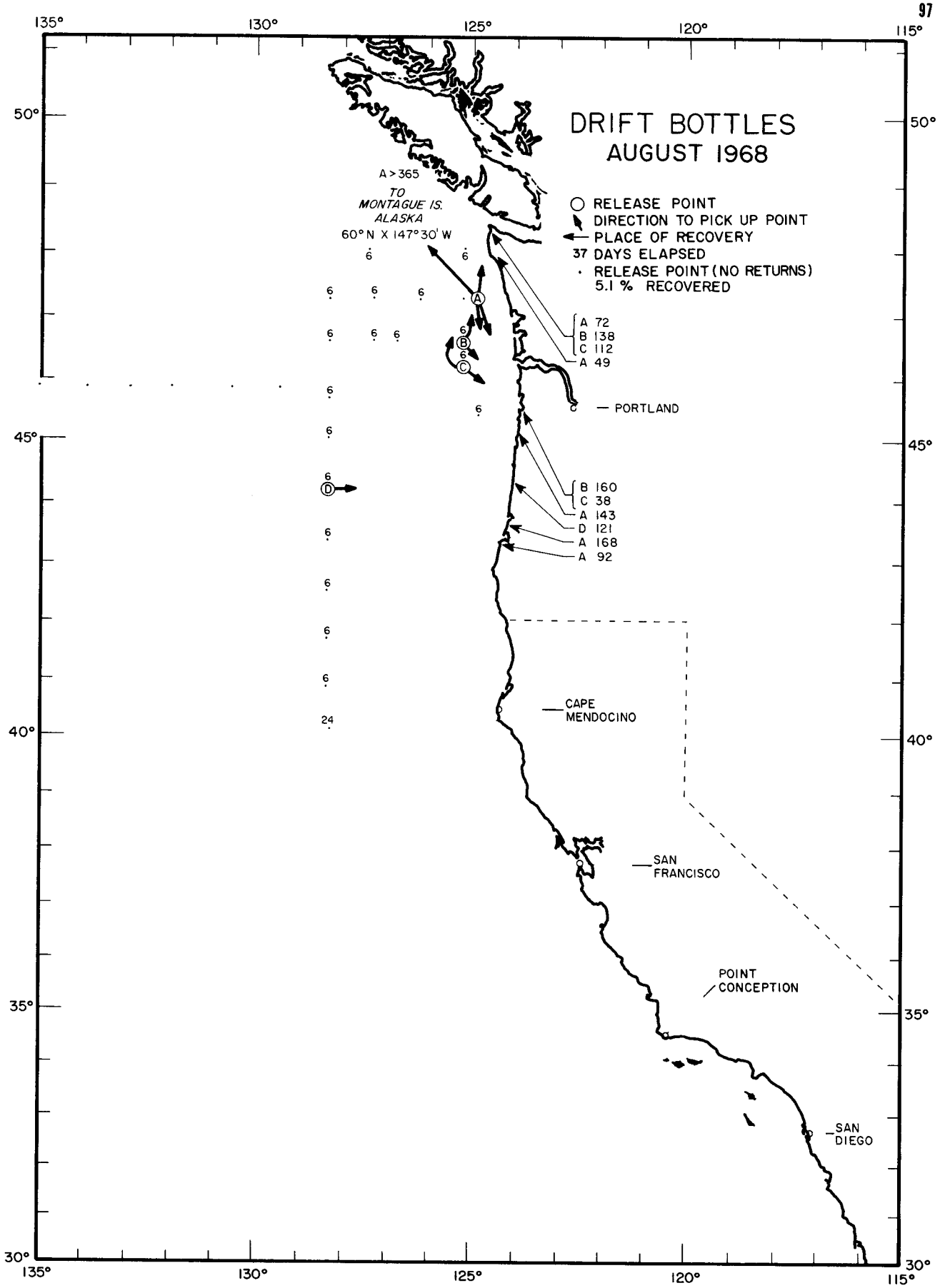
DRIFT BOTTLES
AUGUST 1962



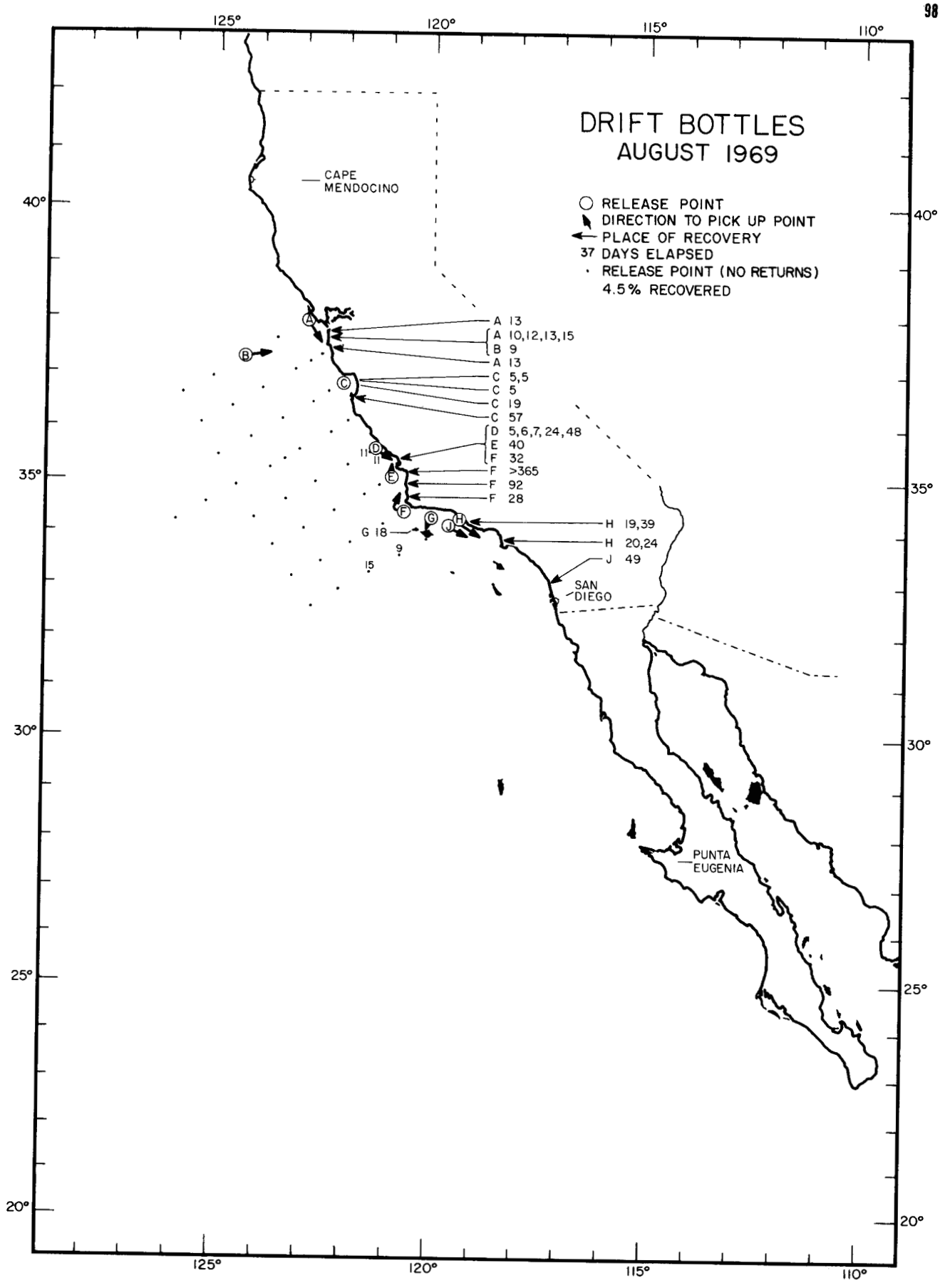
DRIFT BOTTLES
AUGUST 1965



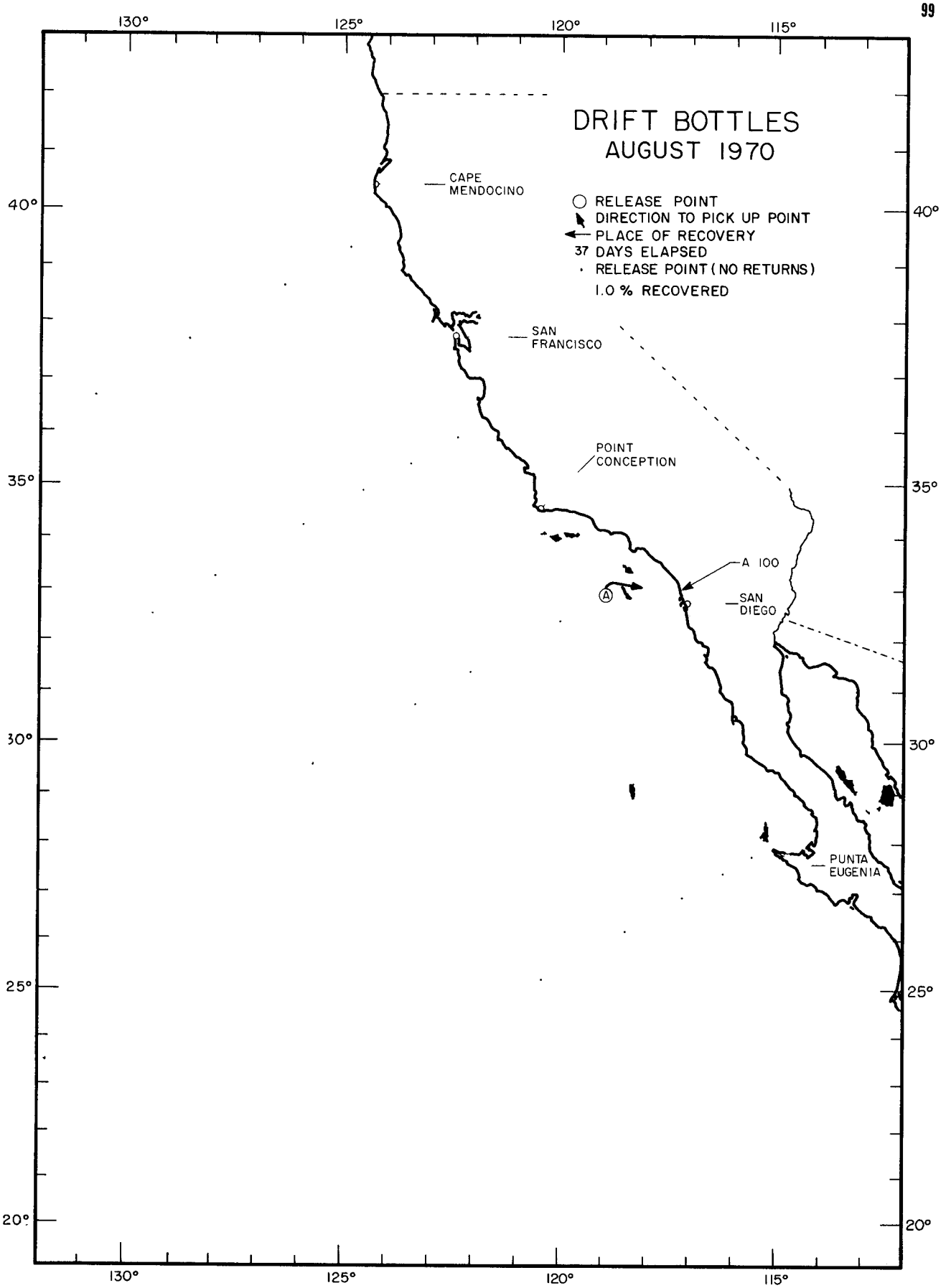
DRIFT BOTTLES
AUGUST 1966



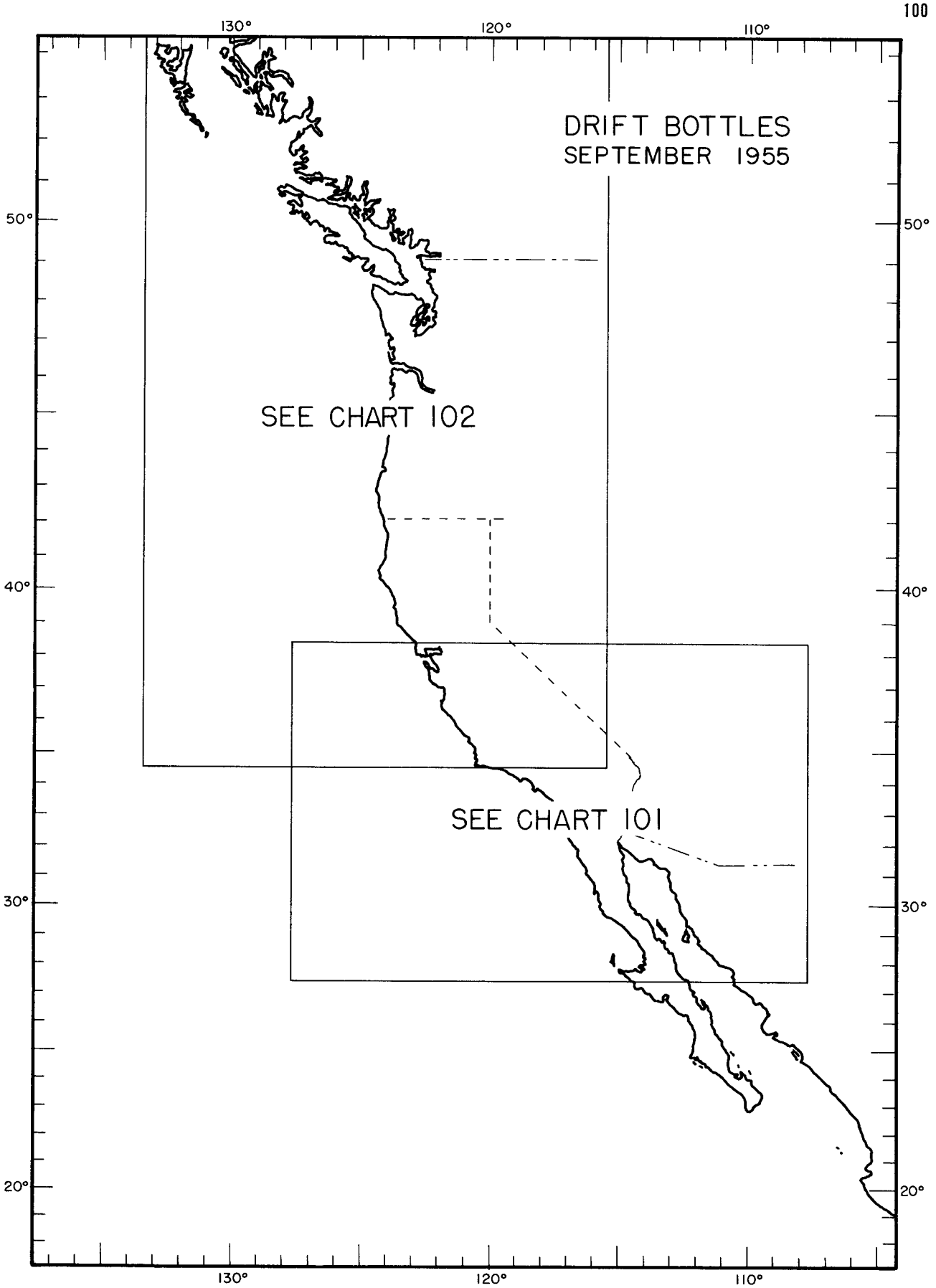
DRIFT BOTTLES
AUGUST 1968



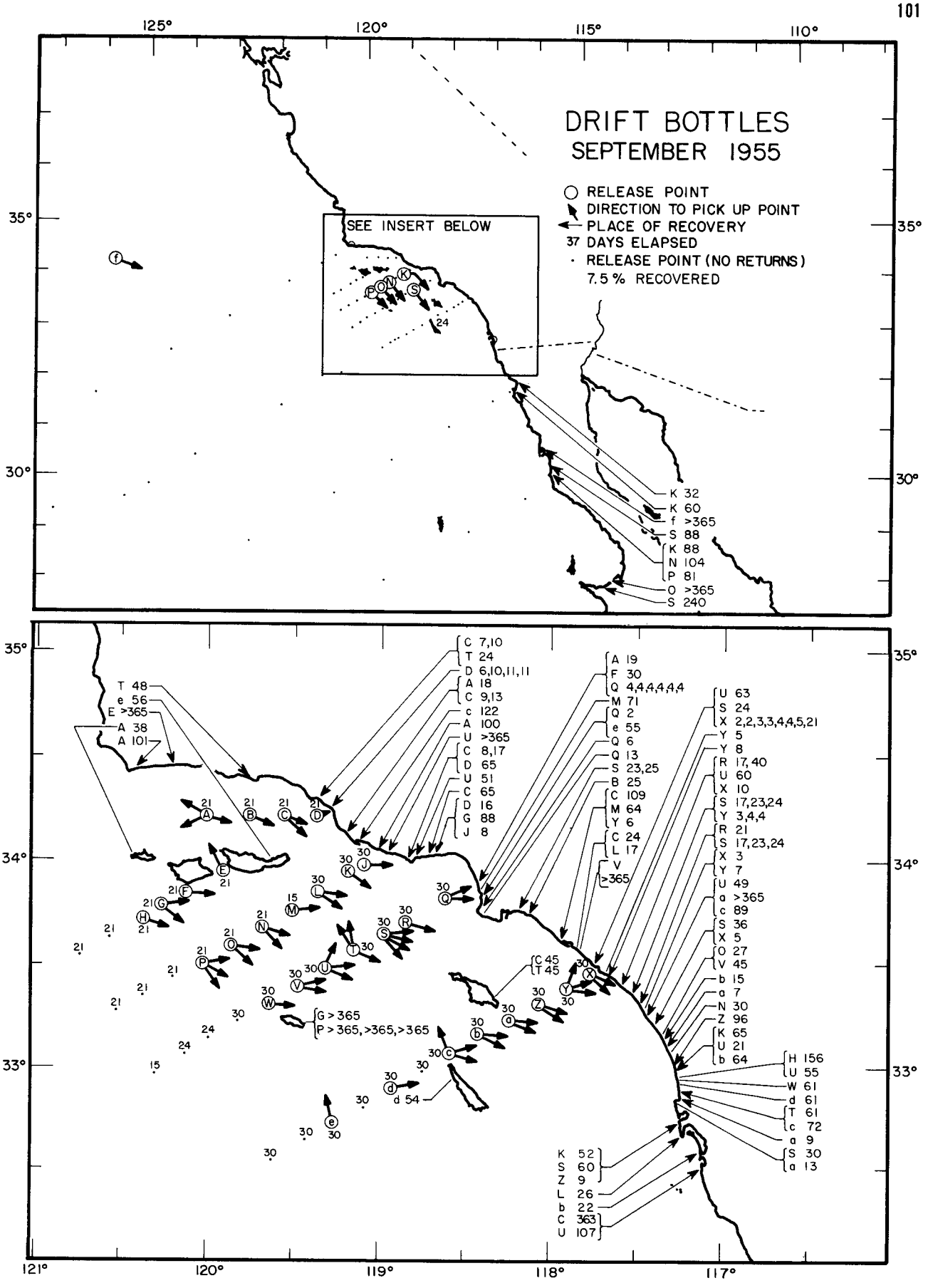
DRIFT BOTTLES
AUGUST 1969



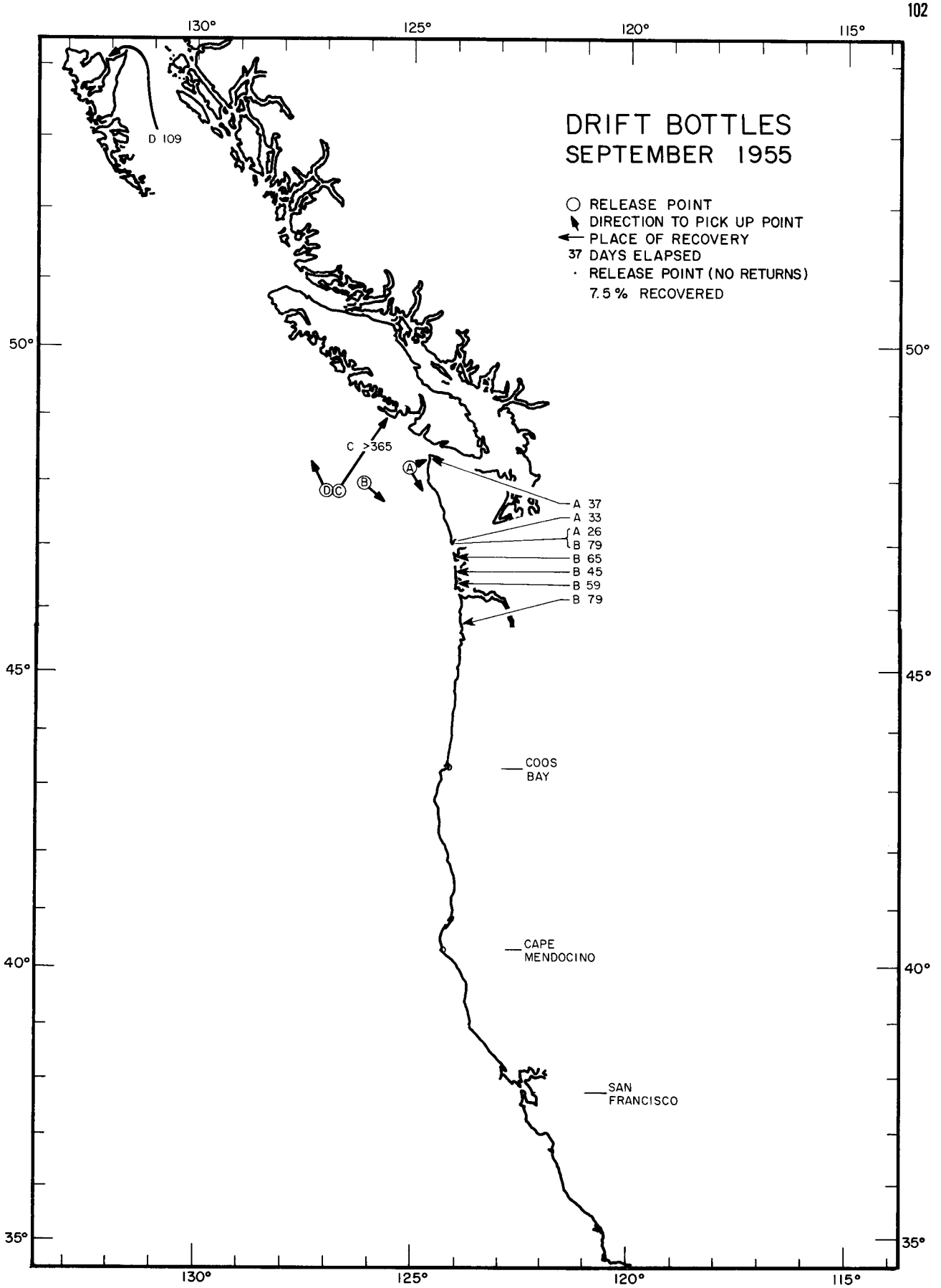
DRIFT BOTTLES
AUGUST 1970



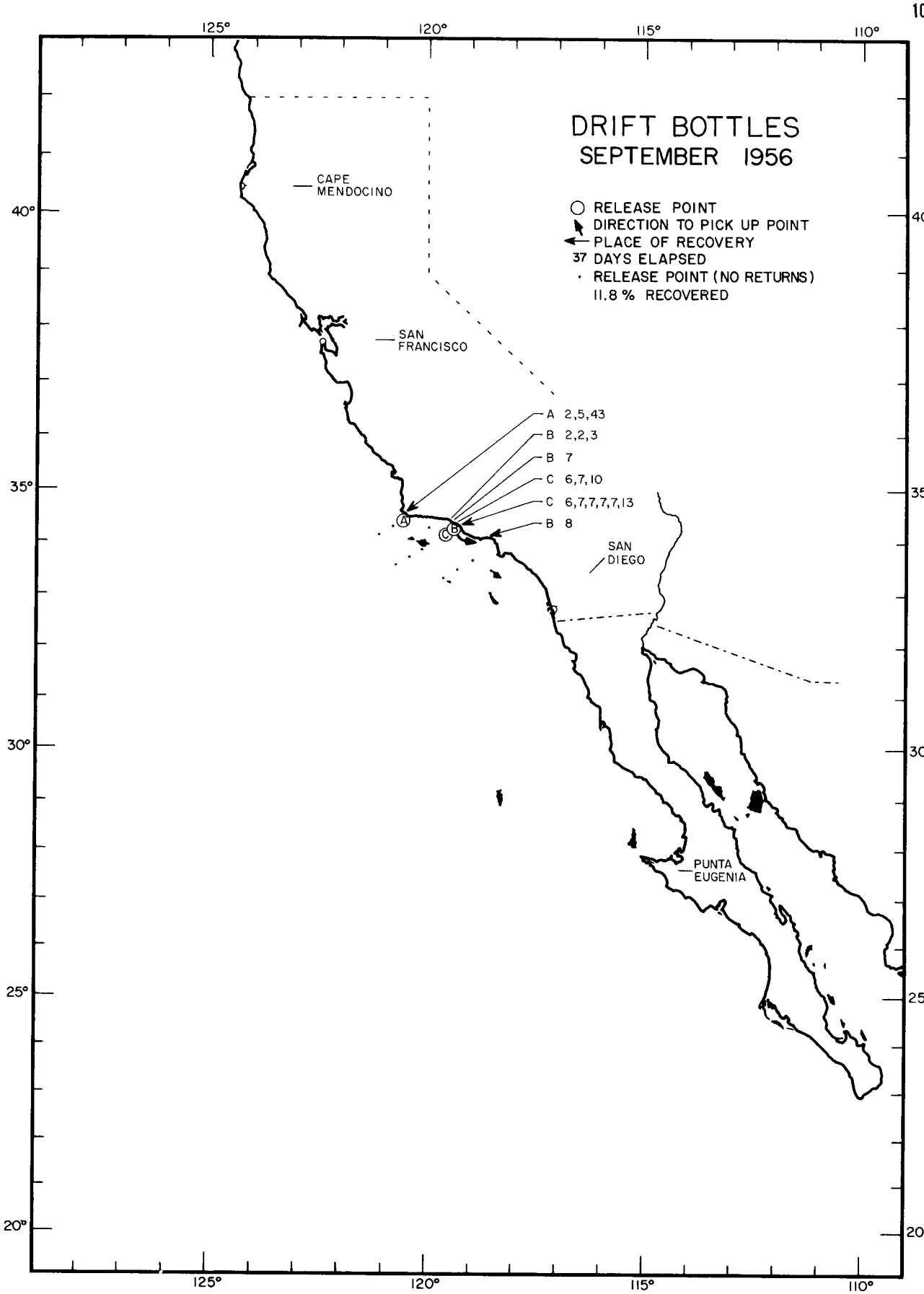
DRIFT BOTTLES
SEPTEMBER 1955



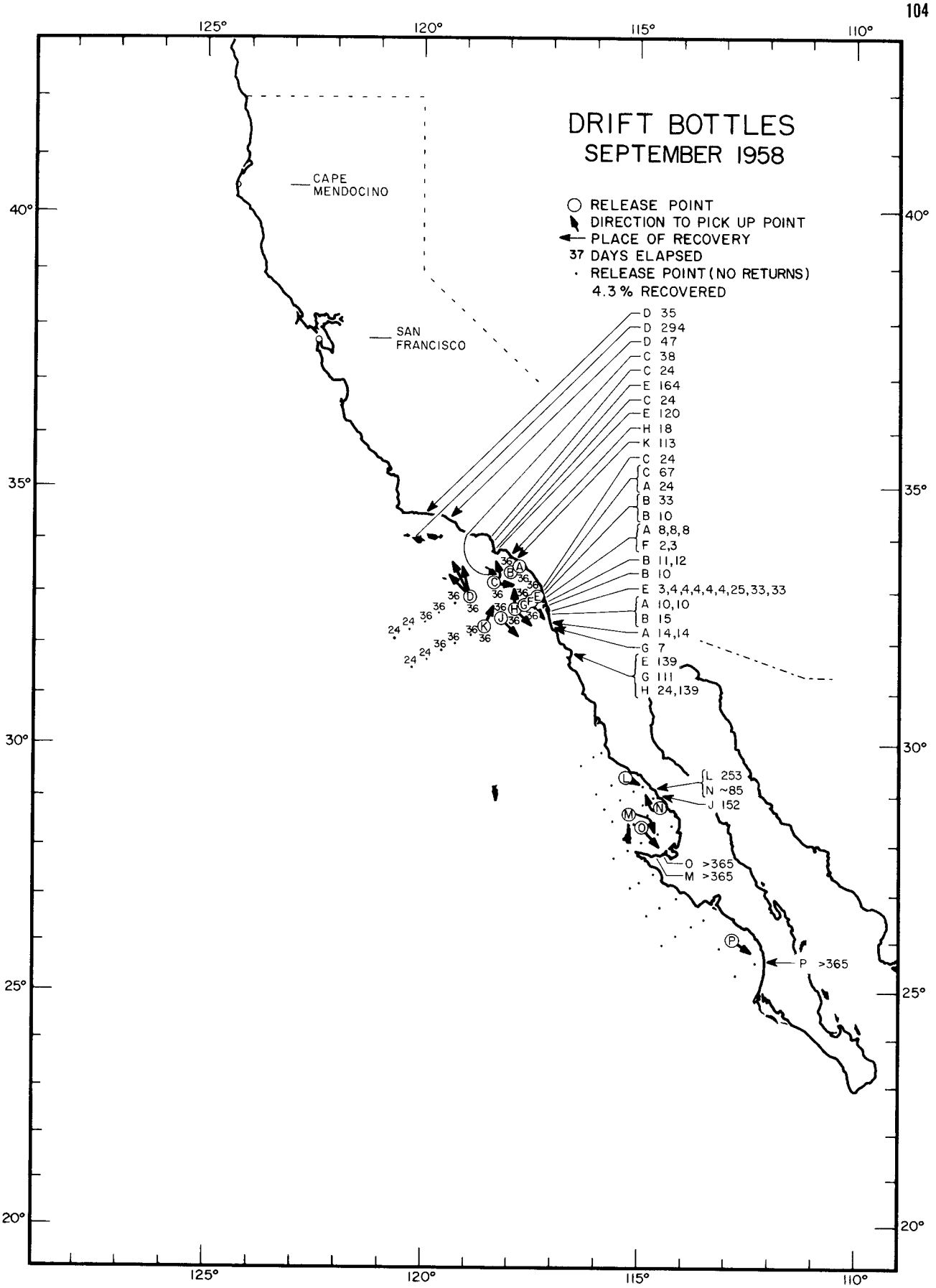
DRIFT BOTTLES
SEPTEMBER 1955



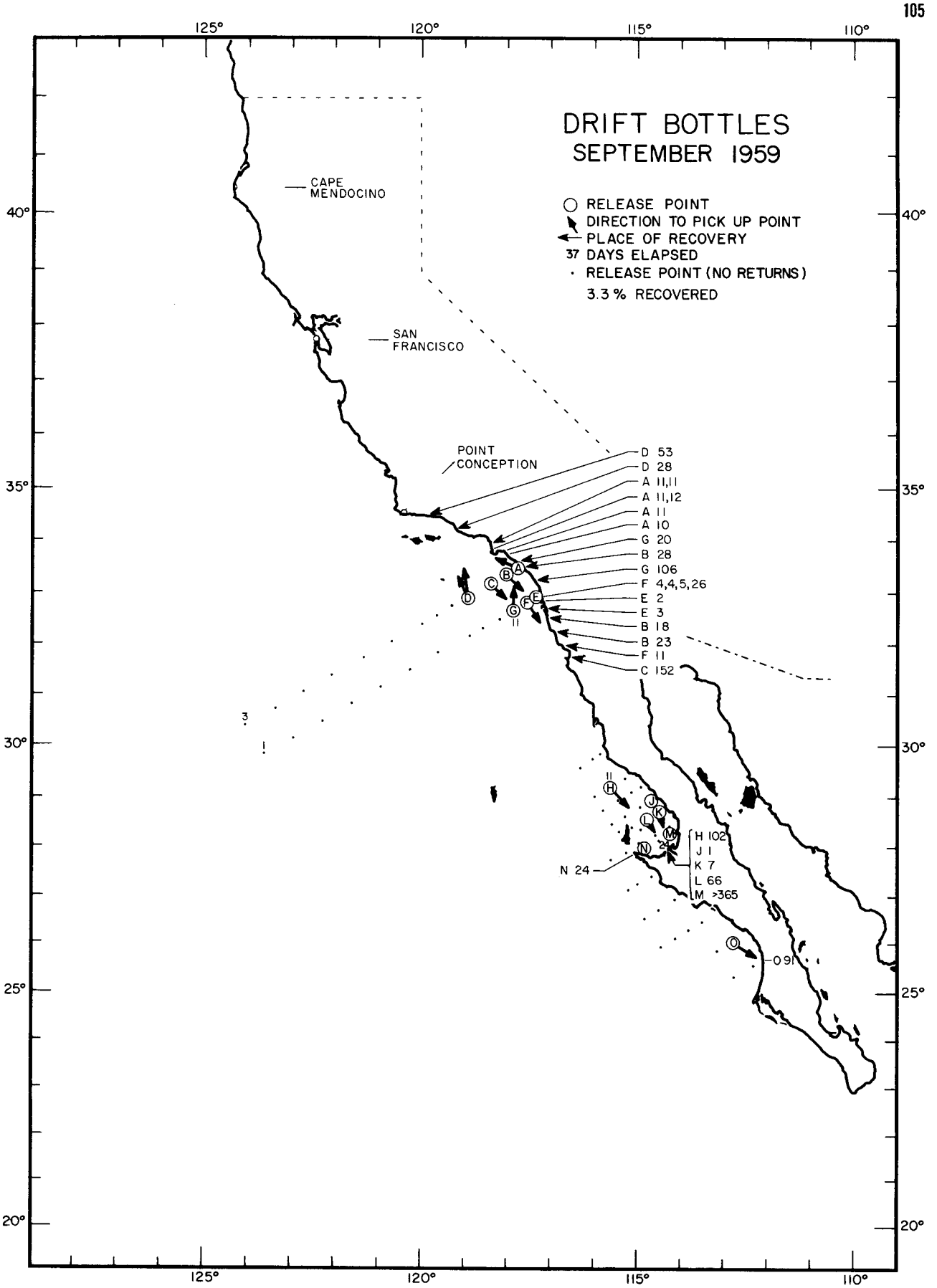
DRIFT BOTTLES
SEPTEMBER 1955



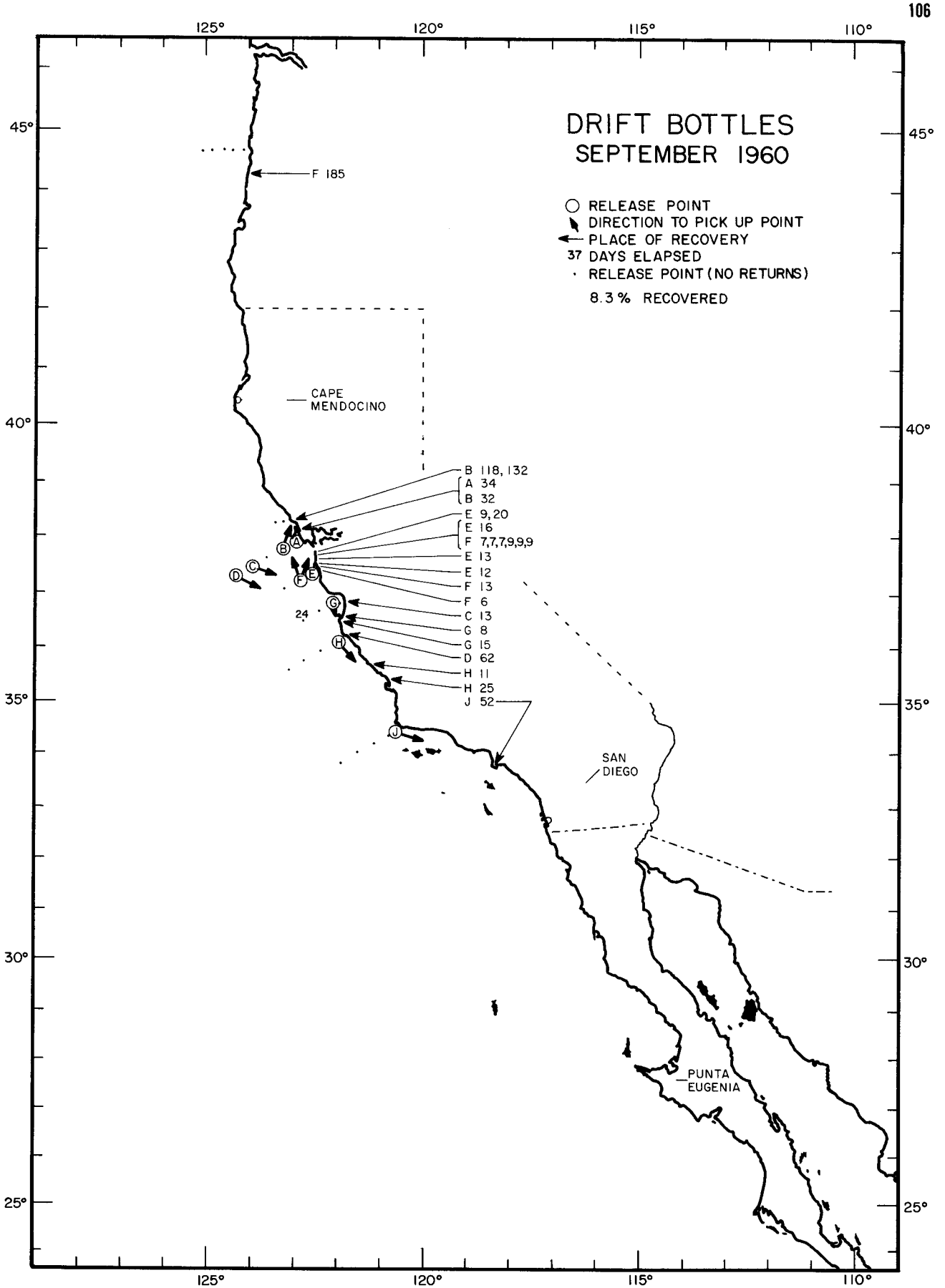
DRIFT BOTTLES
SEPTEMBER 1956



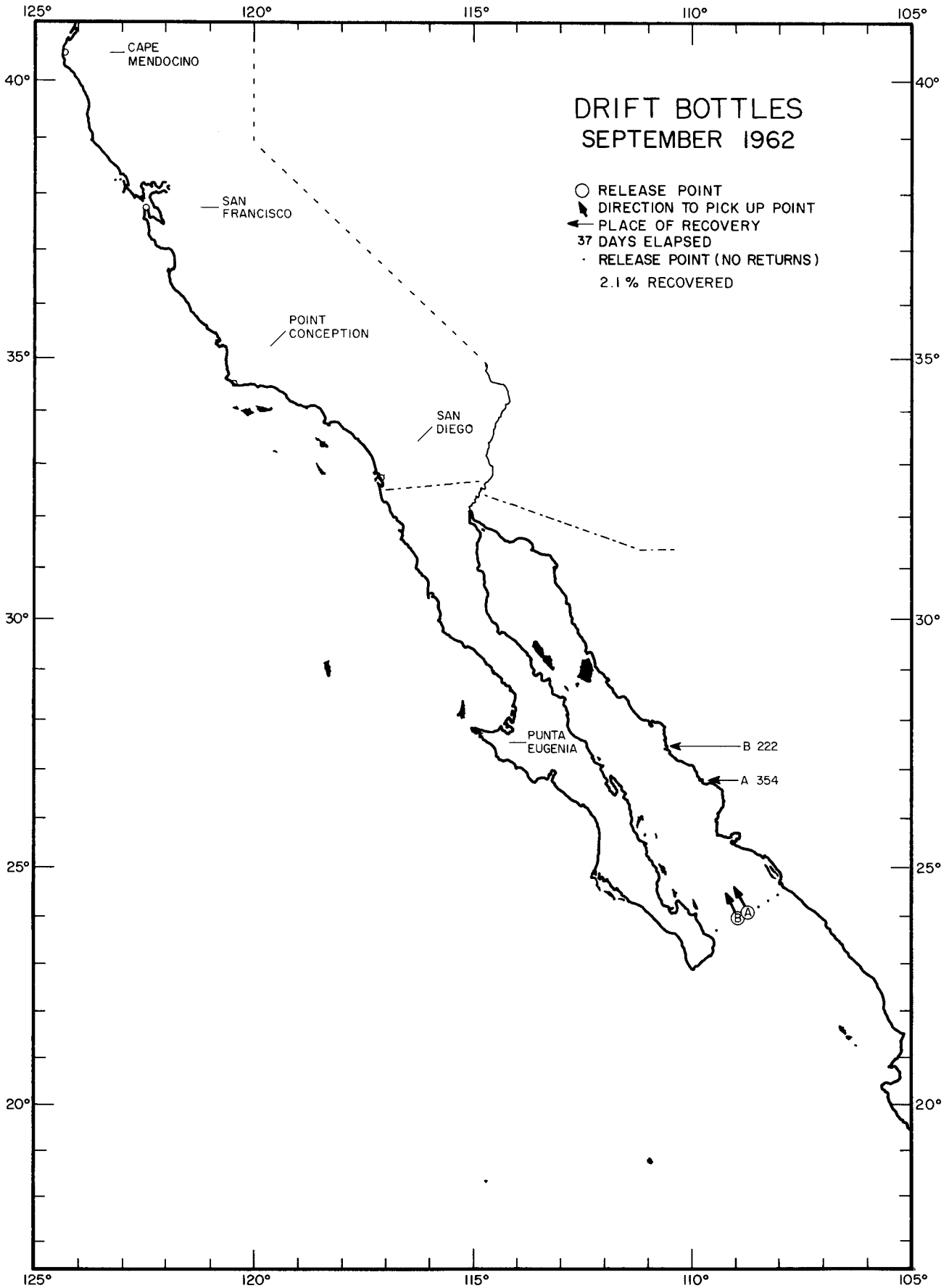
DRIFT BOTTLES
SEPTEMBER 1958



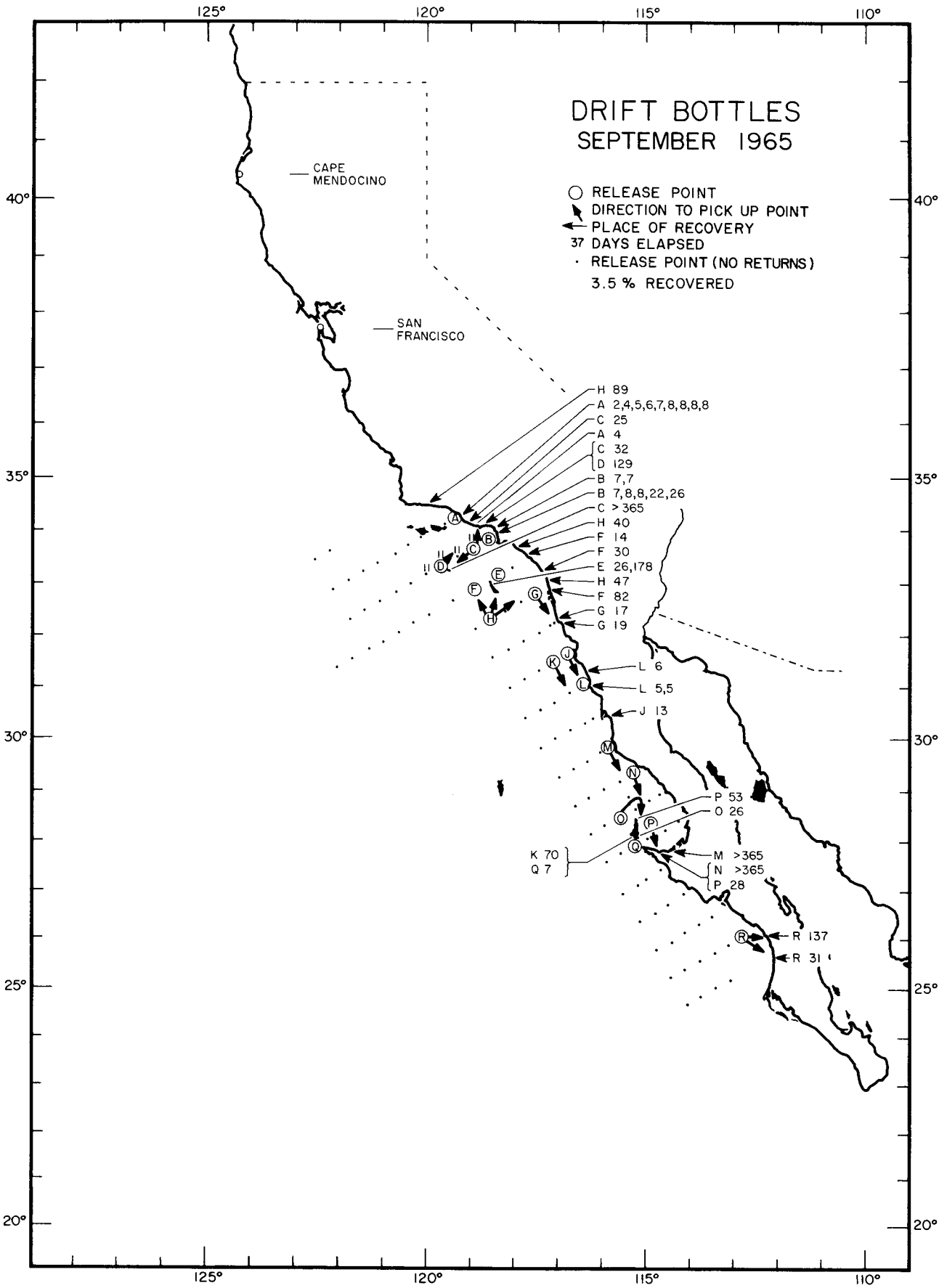
DRIFT BOTTLES
SEPTEMBER 1959



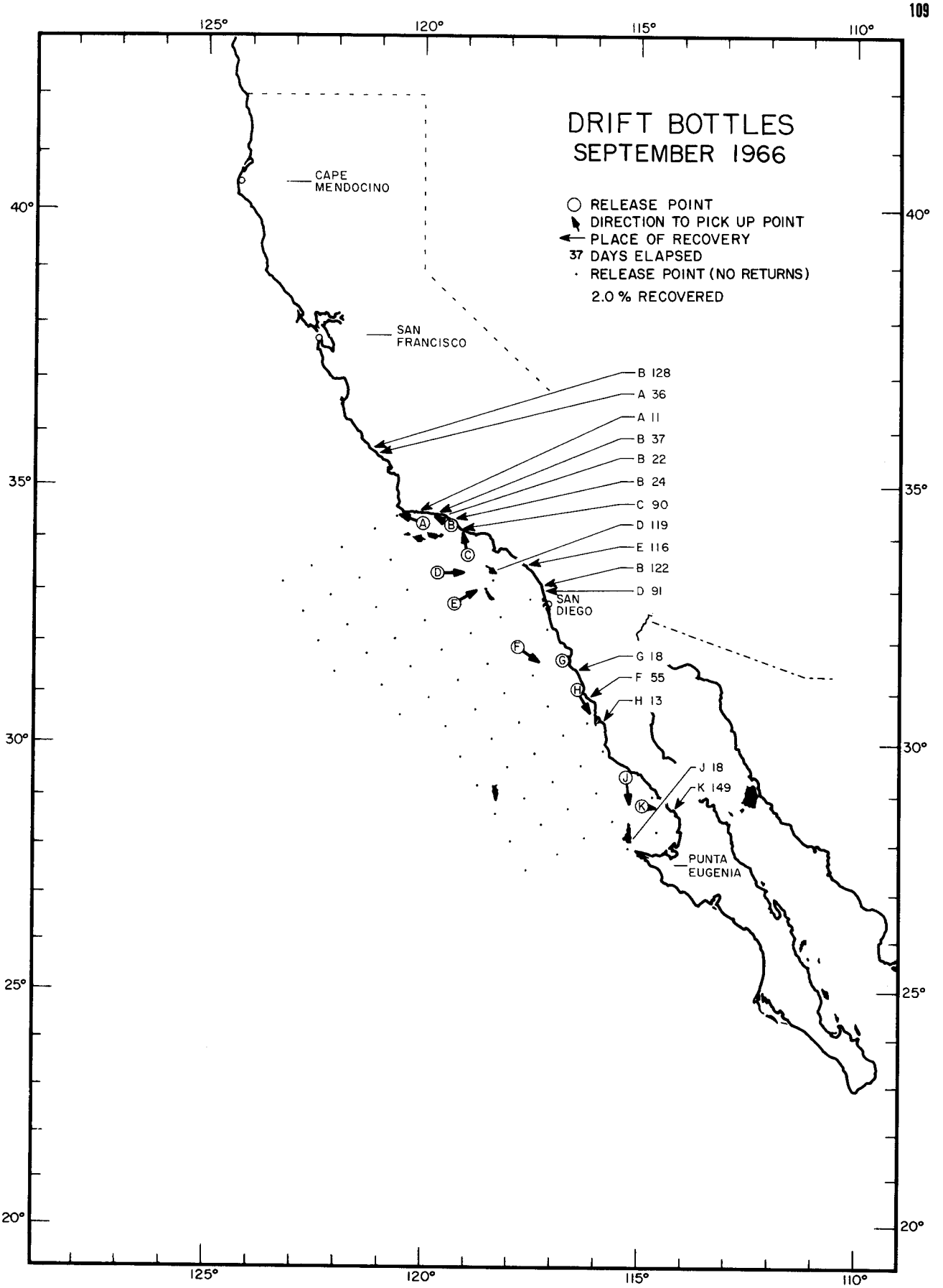
DRIFT BOTTLES
SEPTEMBER 1960



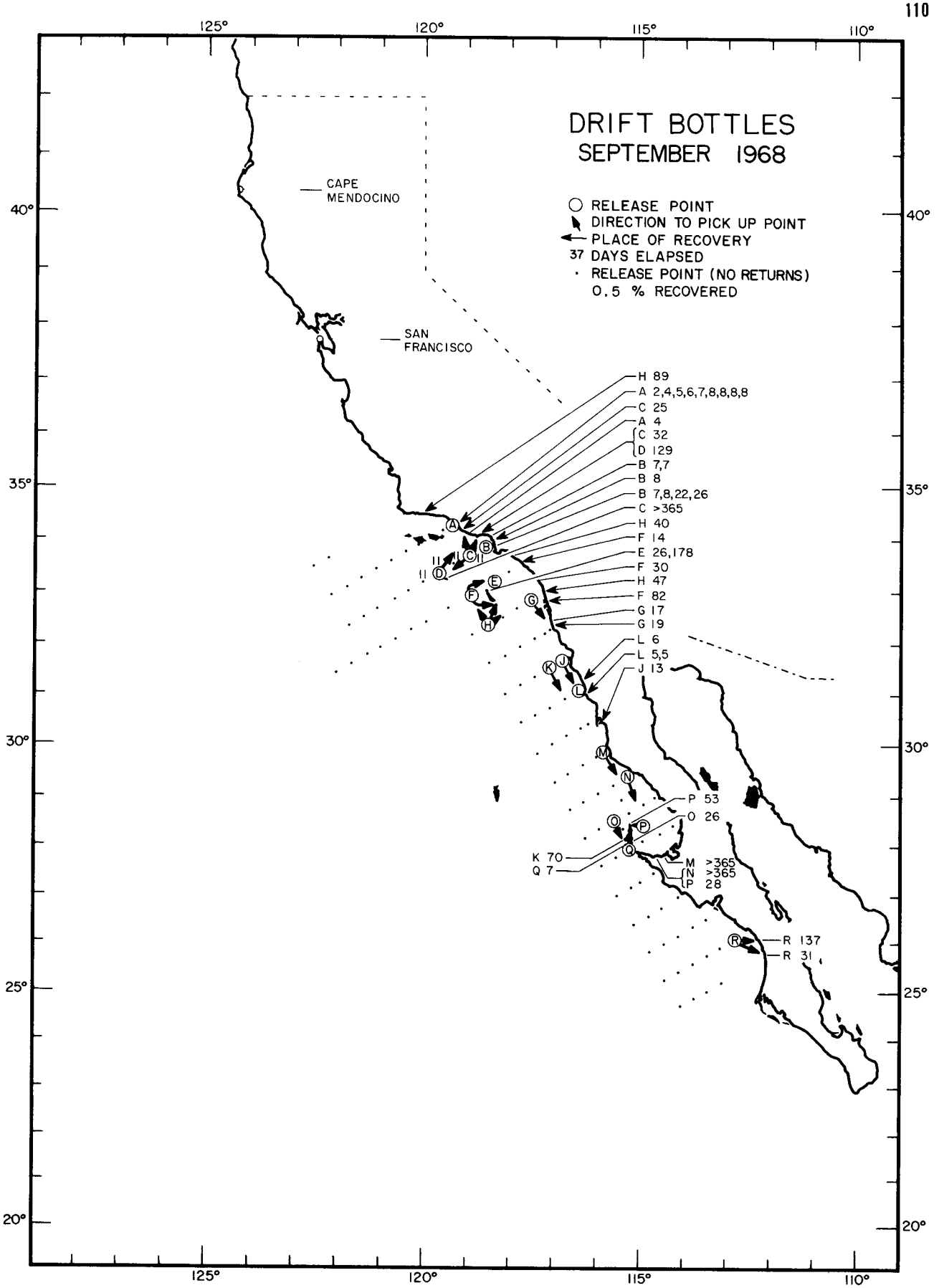
DRIFT BOTTLES
SEPTEMBER 1962



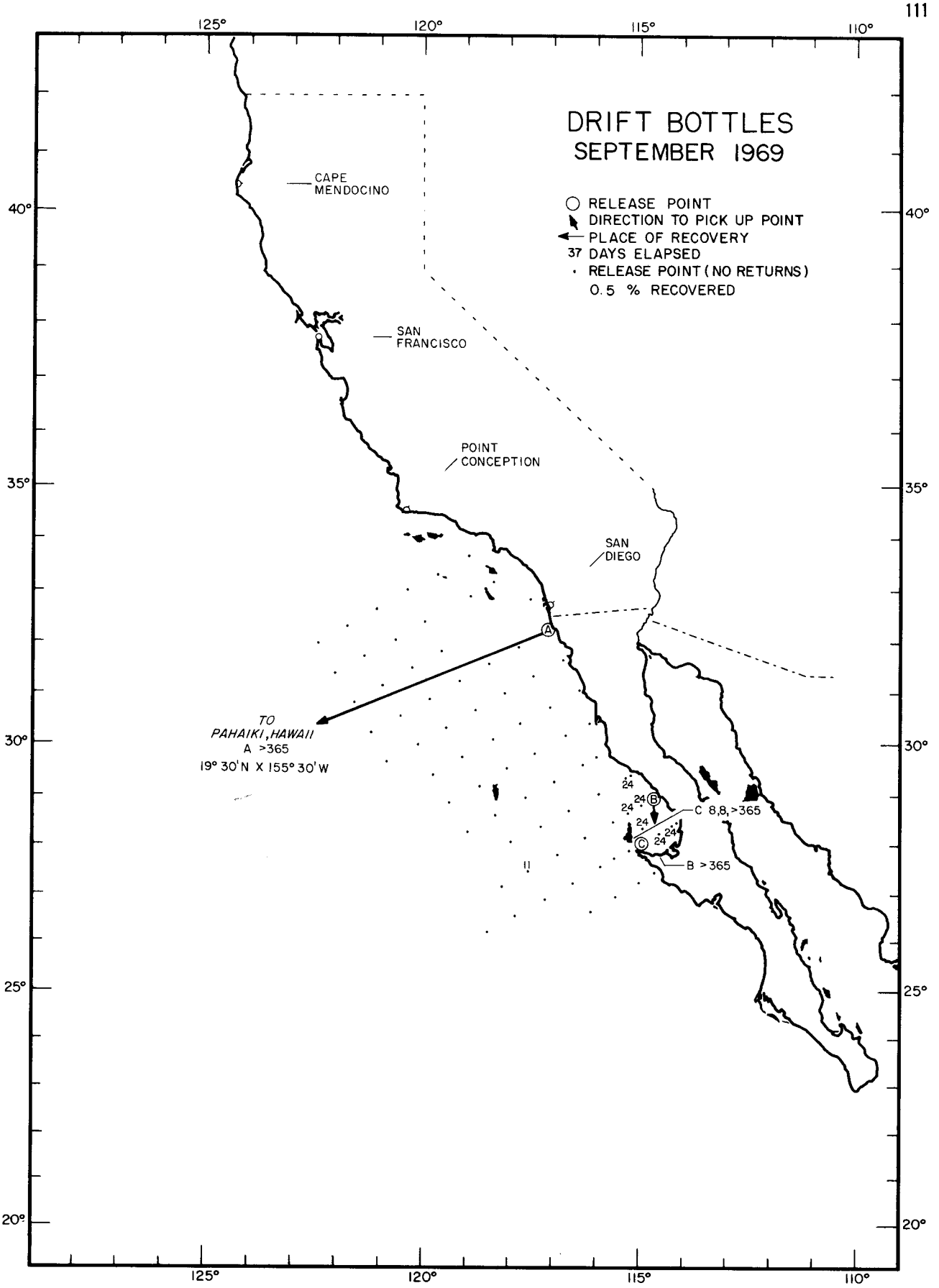
DRIFT BOTTLES
SEPTEMBER 1965



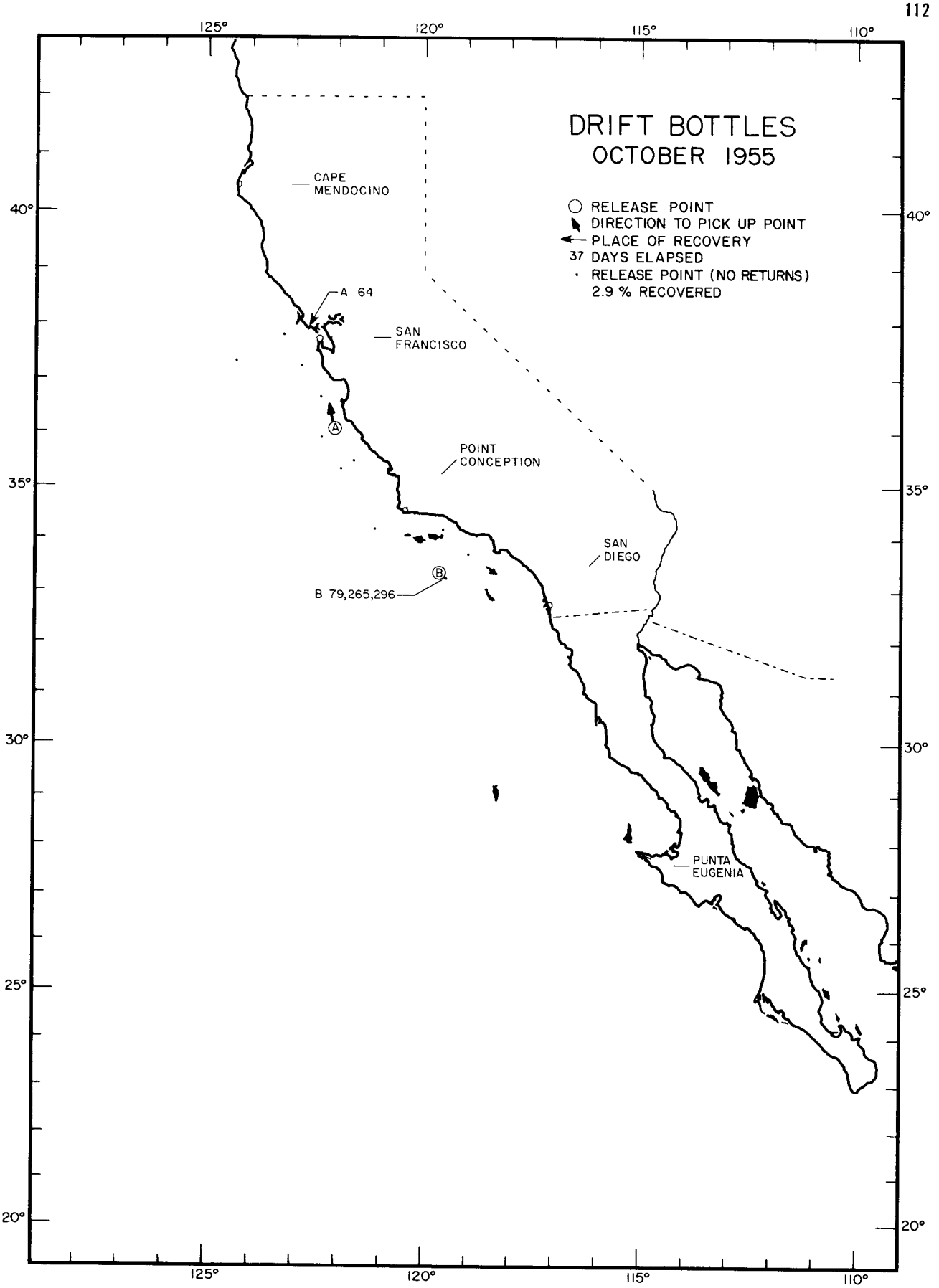
DRIFT BOTTLES
SEPTEMBER 1966



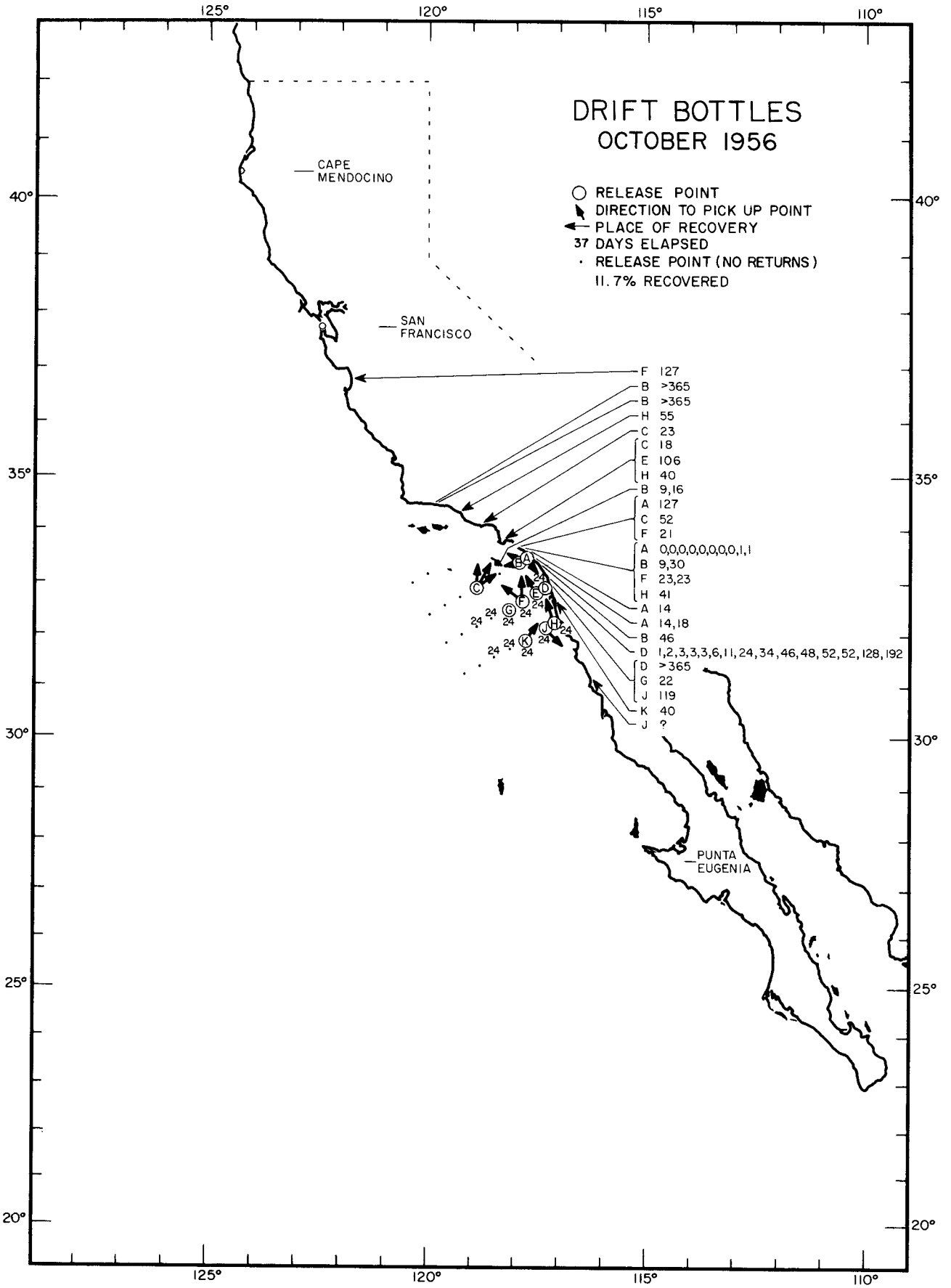
DRIFT BOTTLES
SEPTEMBER 1968



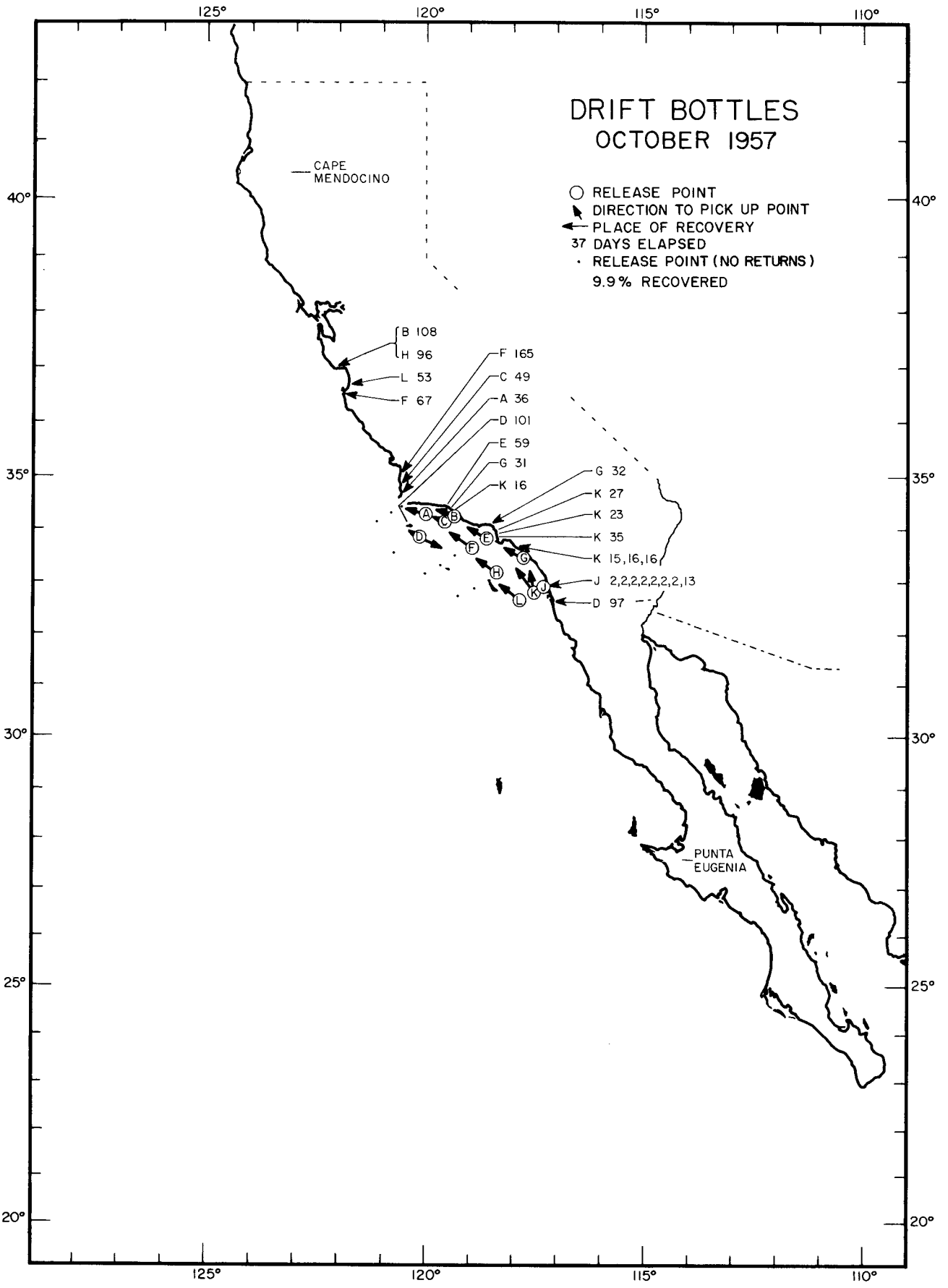
DRIFT BOTTLES
SEPTEMBER 1969



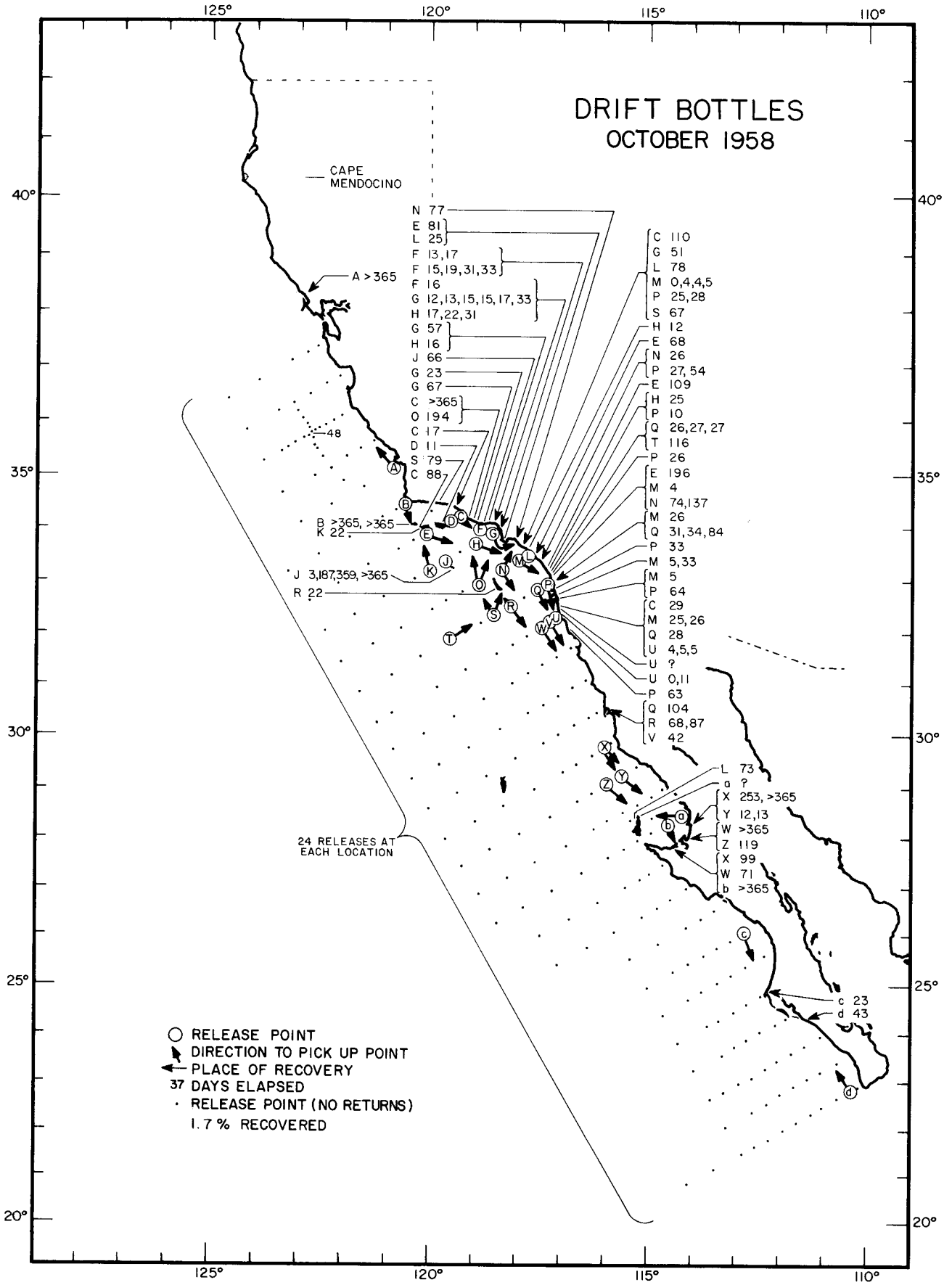
DRIFT BOTTLES
OCTOBER 1955



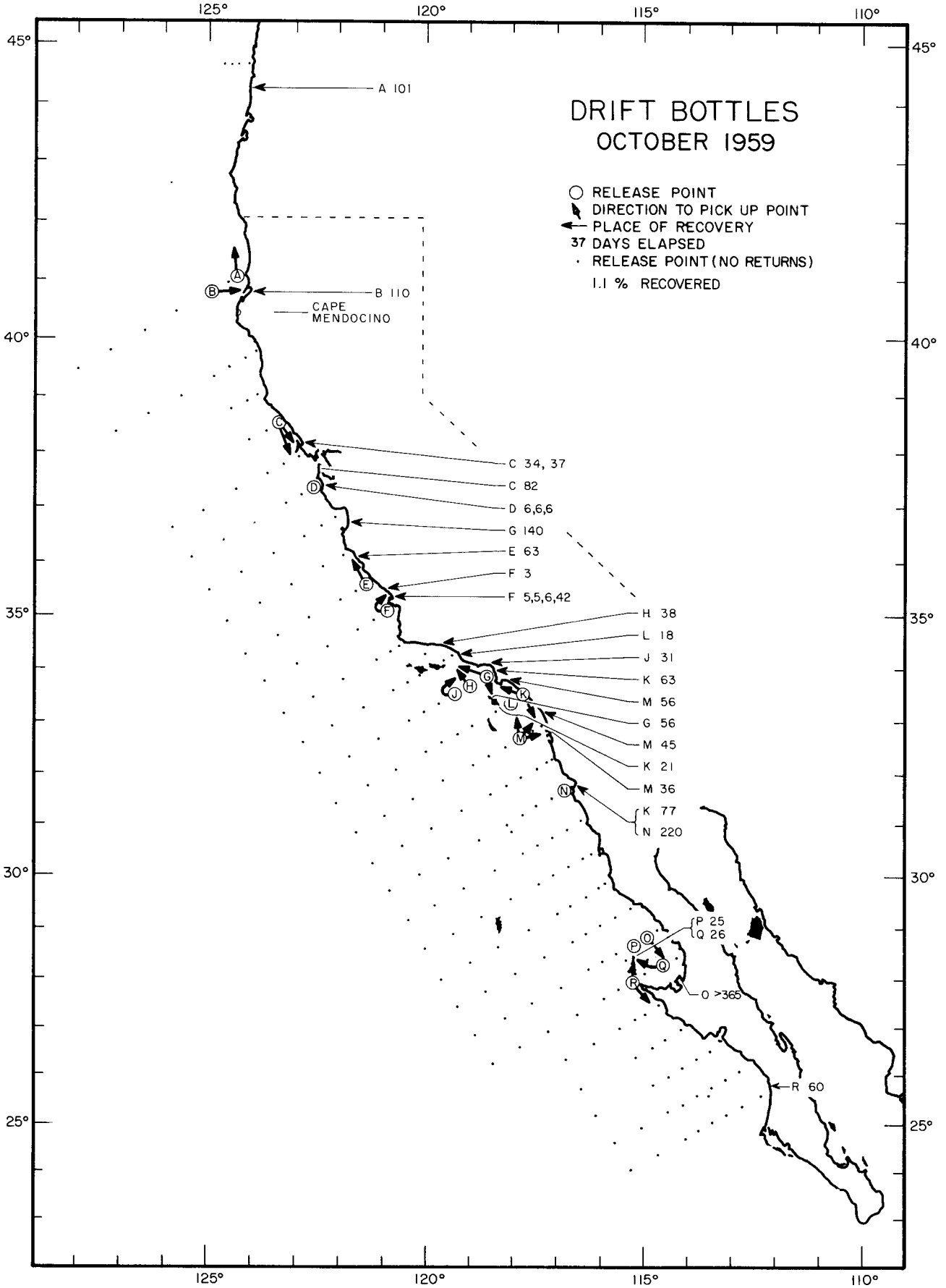
DRIFT BOTTLES
OCTOBER 1956



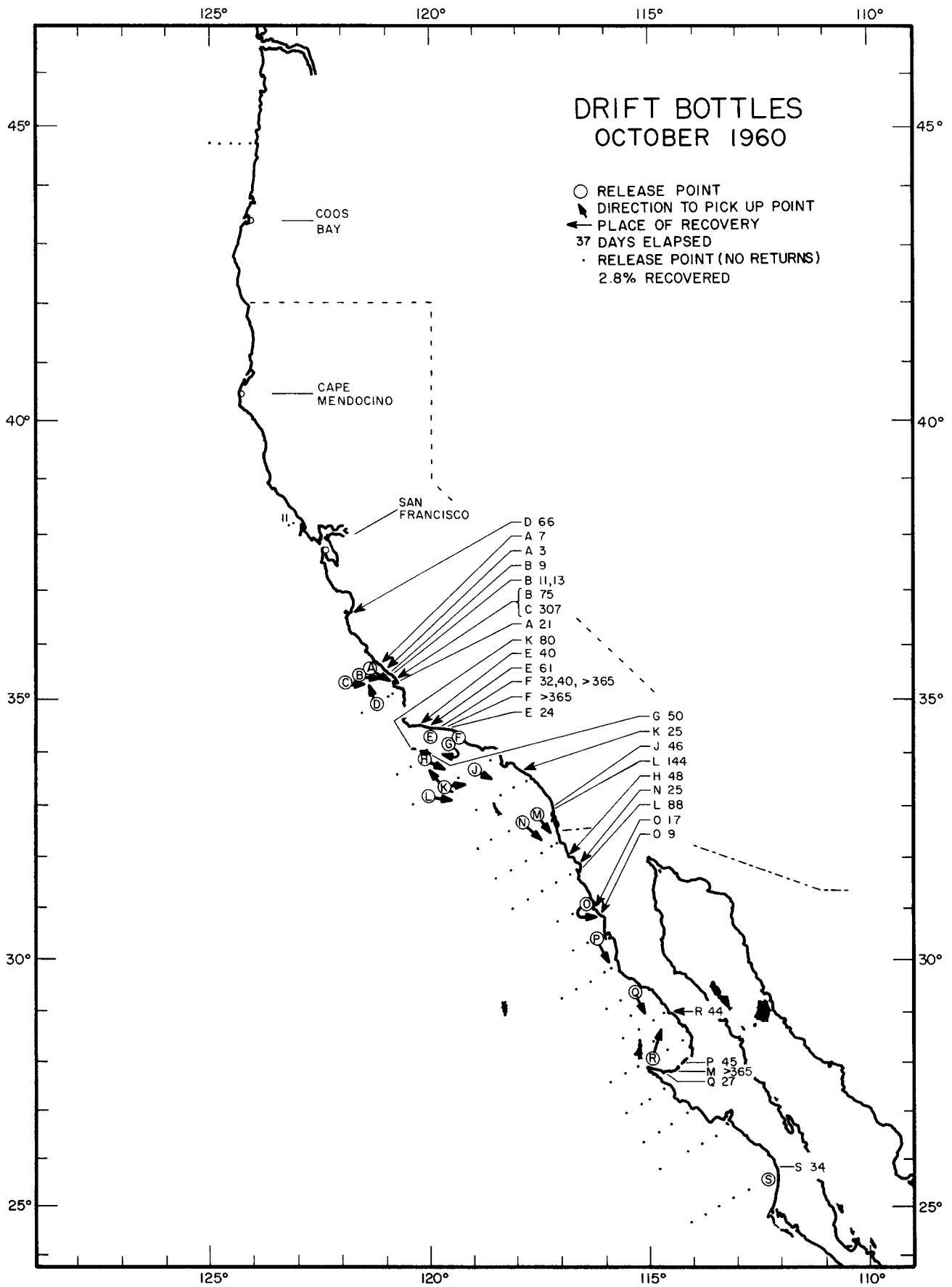
DRIFT BOTTLES
OCTOBER 1957



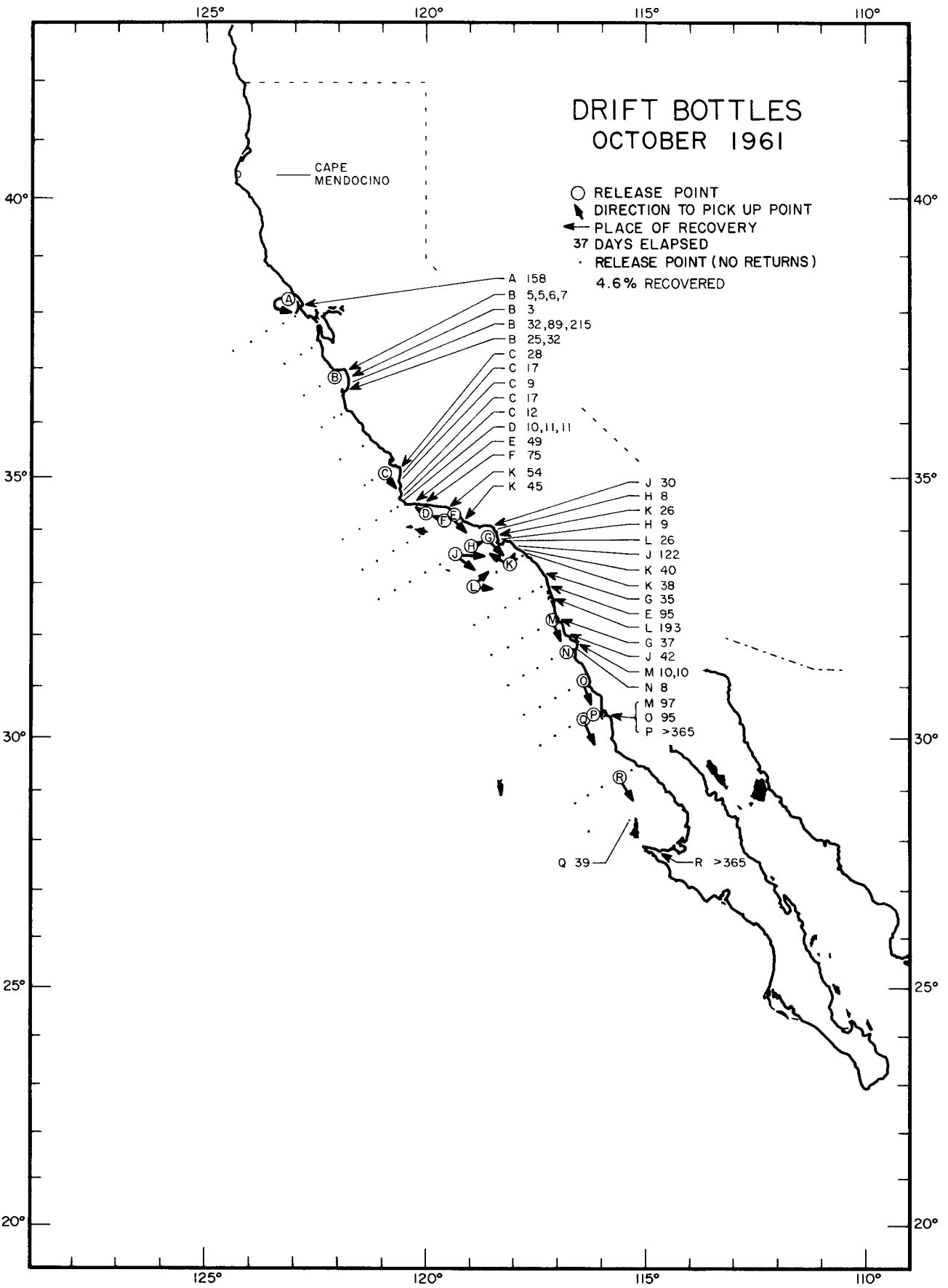
DRIFT BOTTLES
OCTOBER 1958



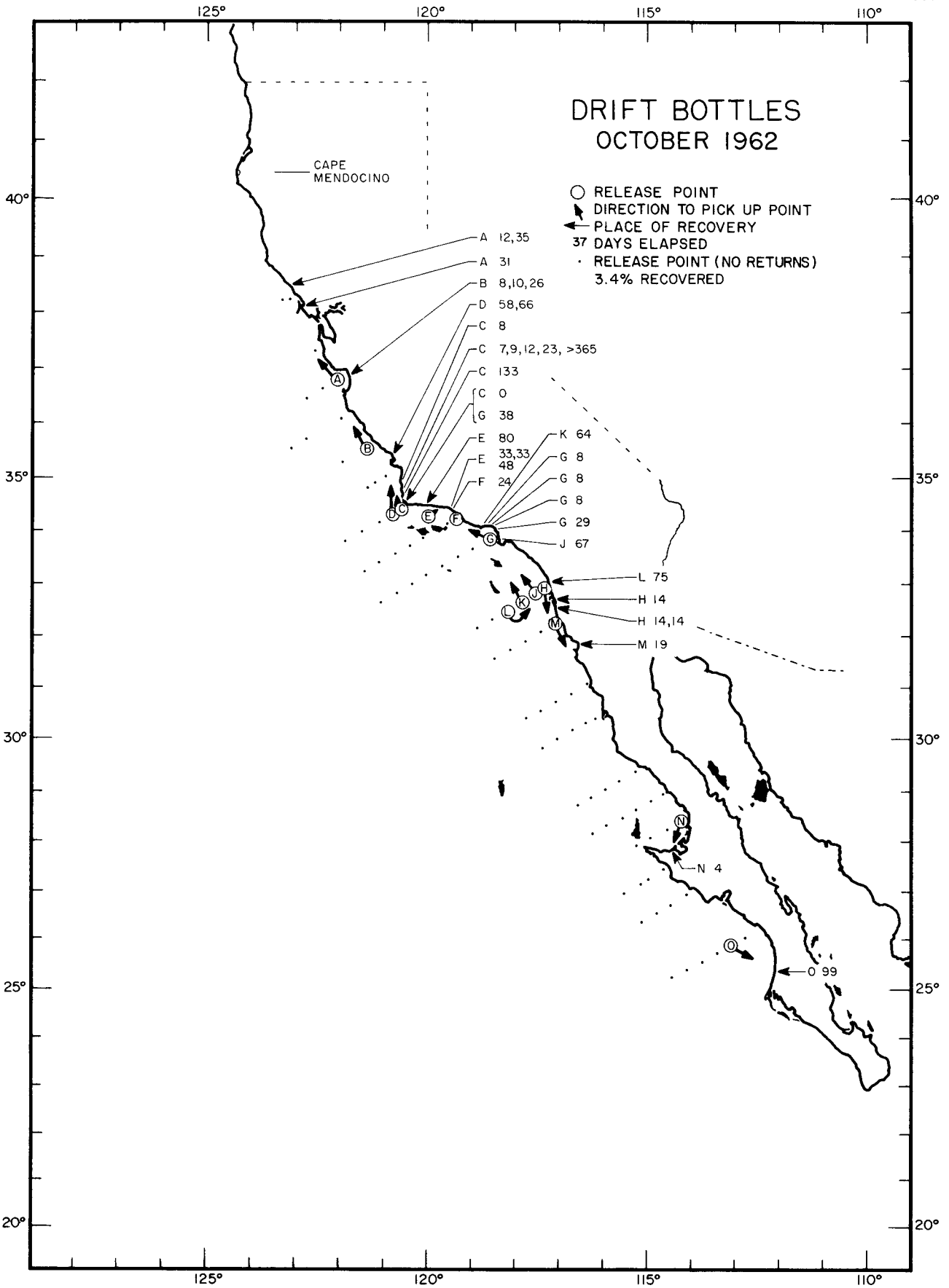
DRIFT BOTTLES
OCTOBER 1959



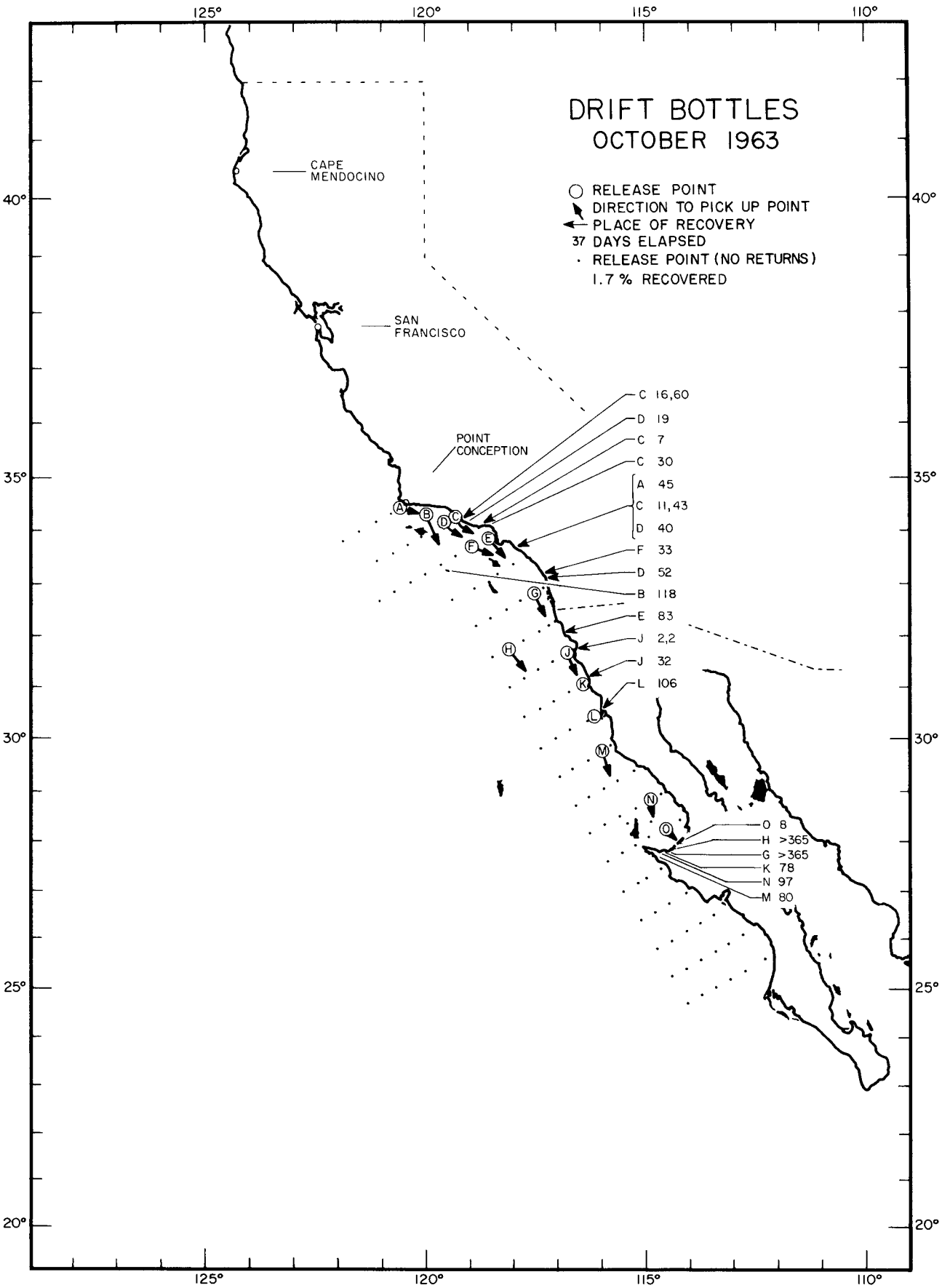
DRIFT BOTTLES
OCTOBER 1960



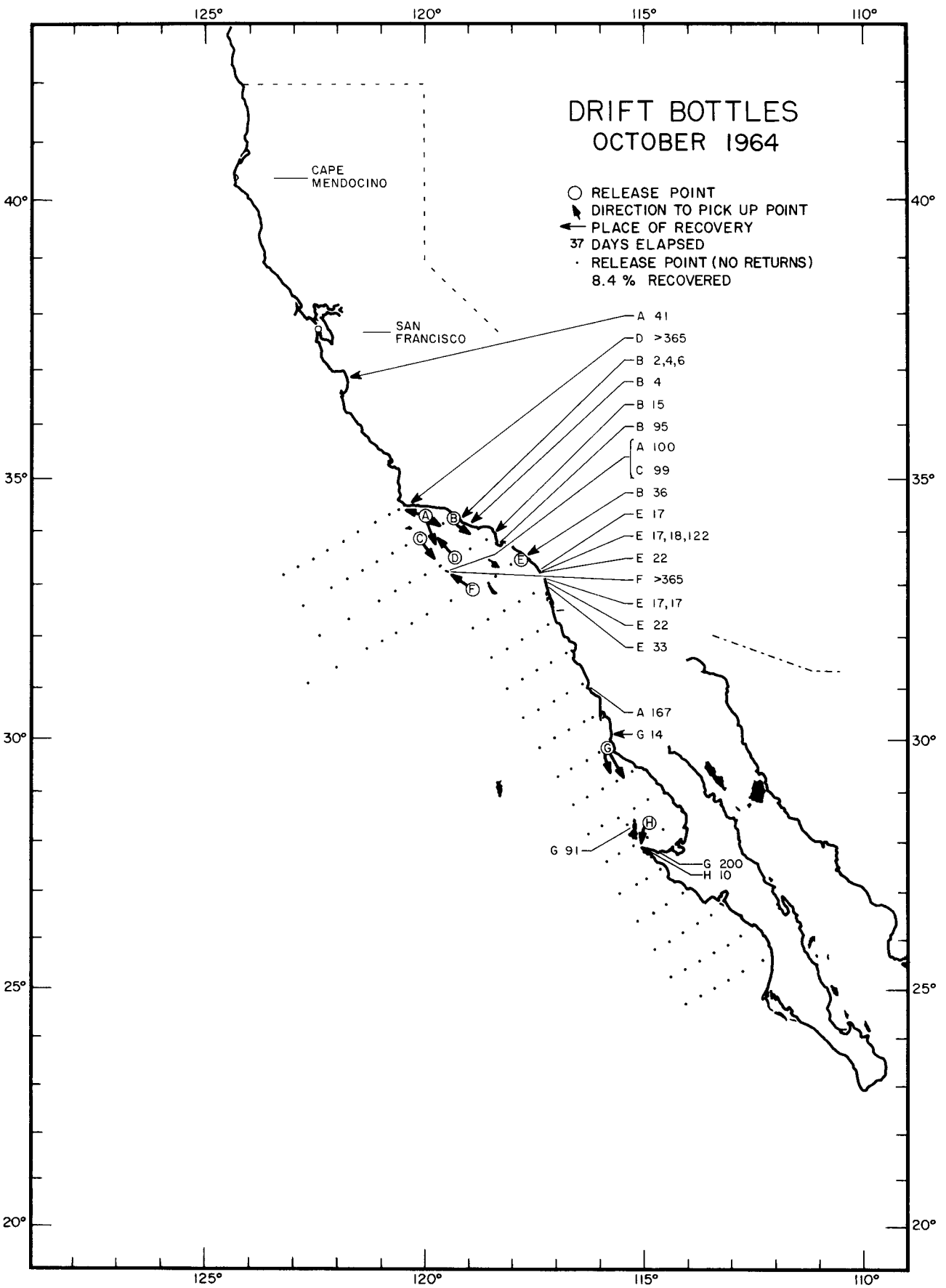
DRIFT BOTTLES
OCTOBER 1961



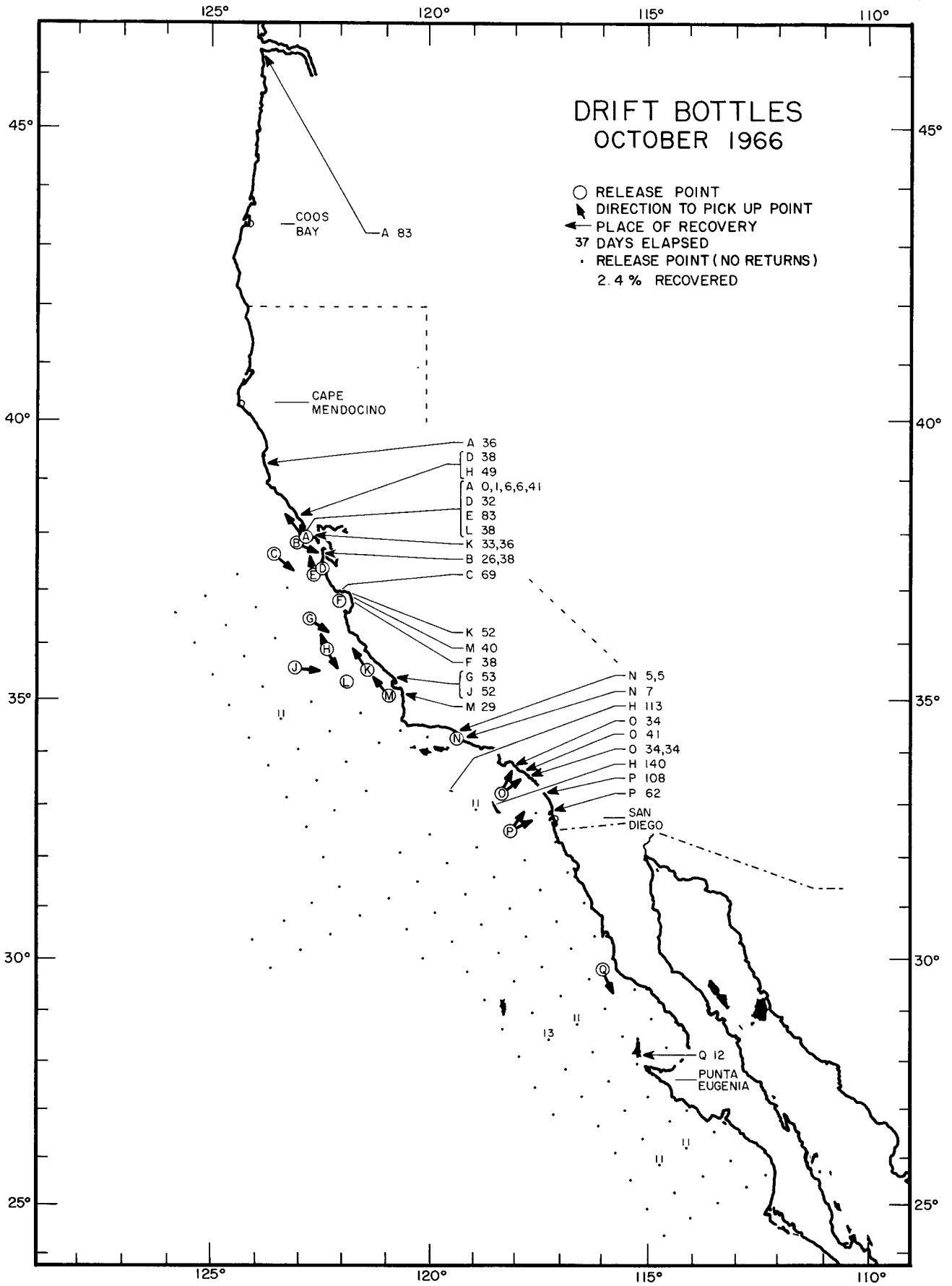
DRIFT BOTTLES
OCTOBER 1962



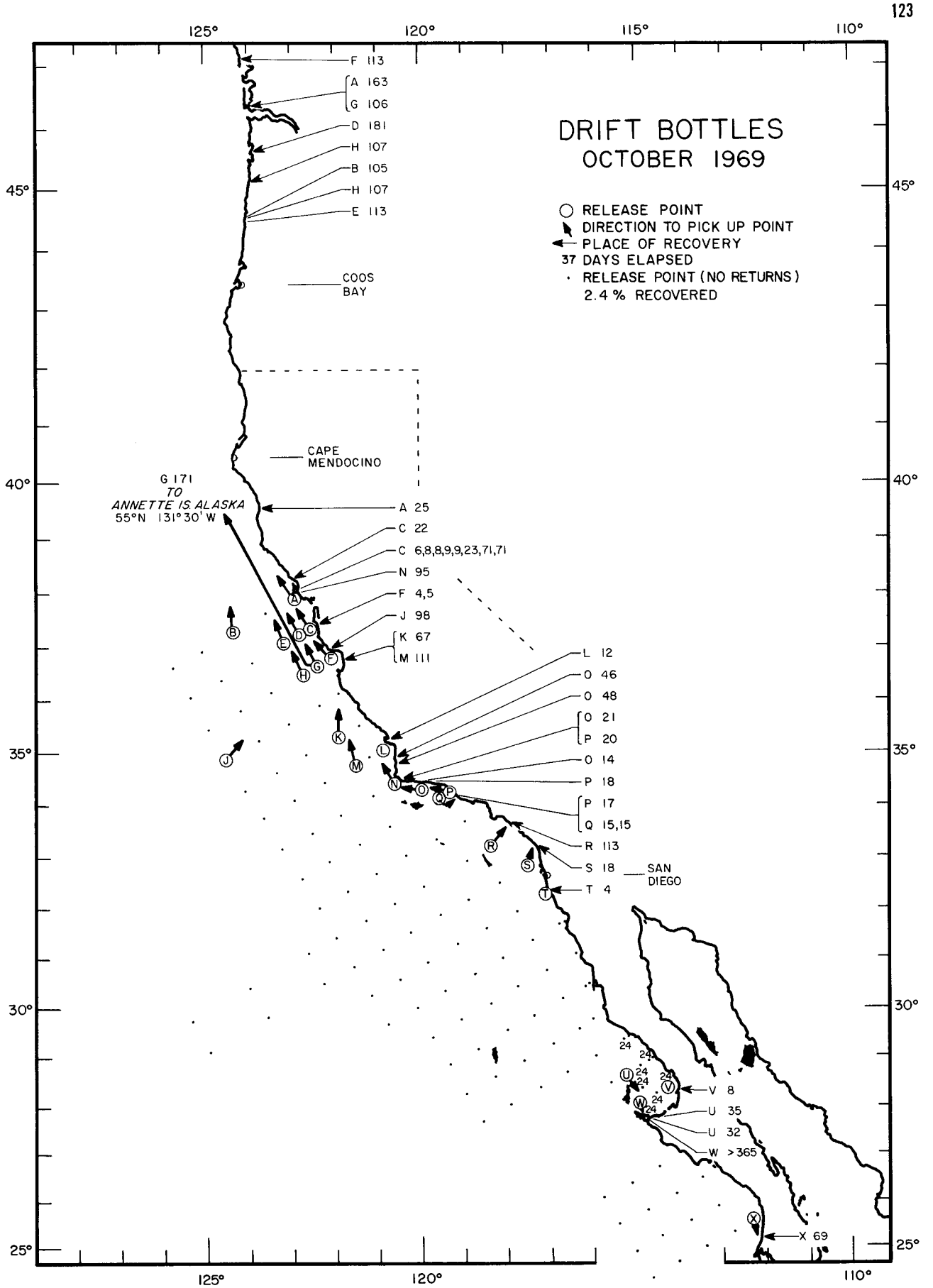
DRIFT BOTTLES
OCTOBER 1963



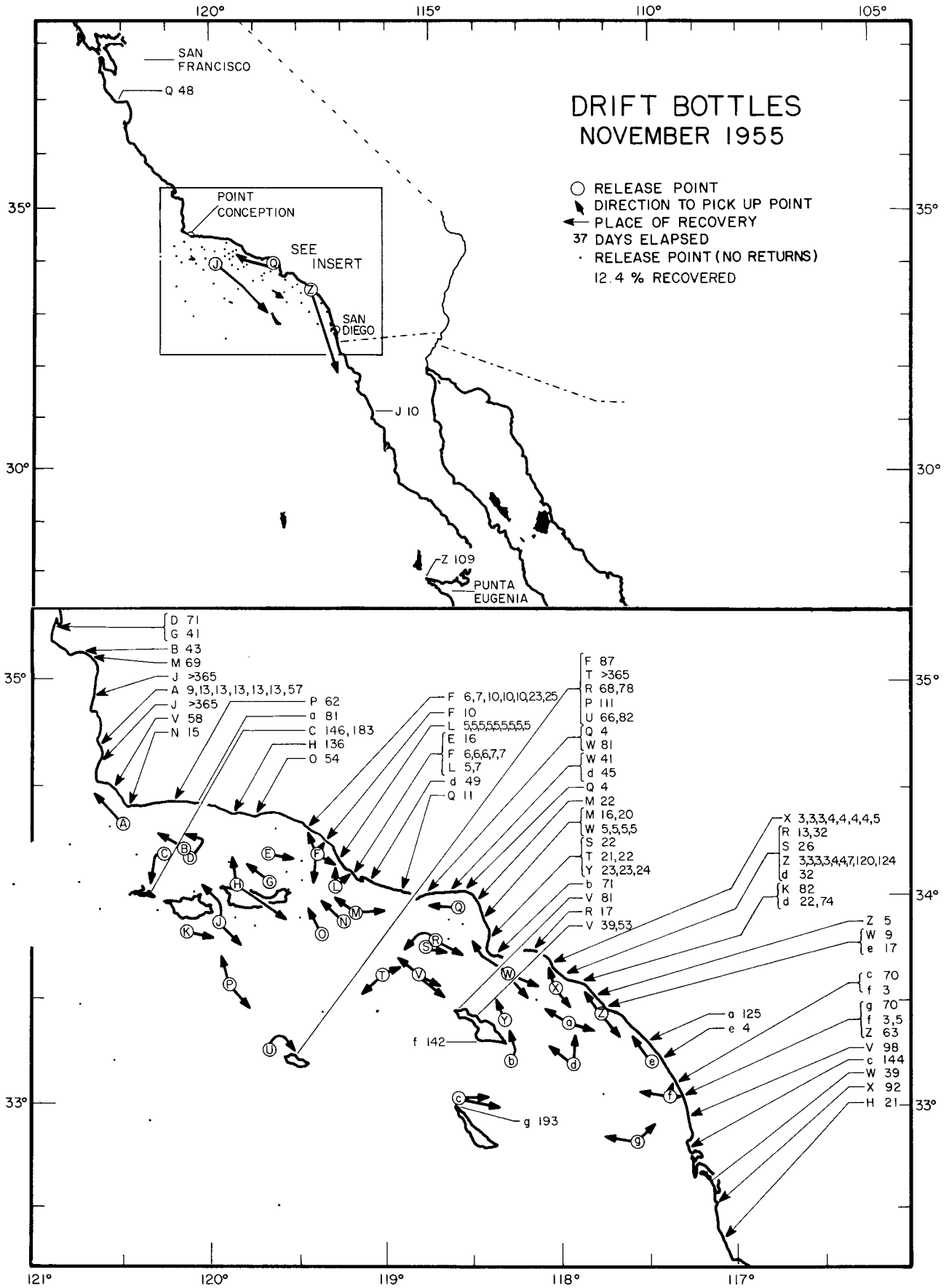
DRIFT BOTTLES
OCTOBER 1964



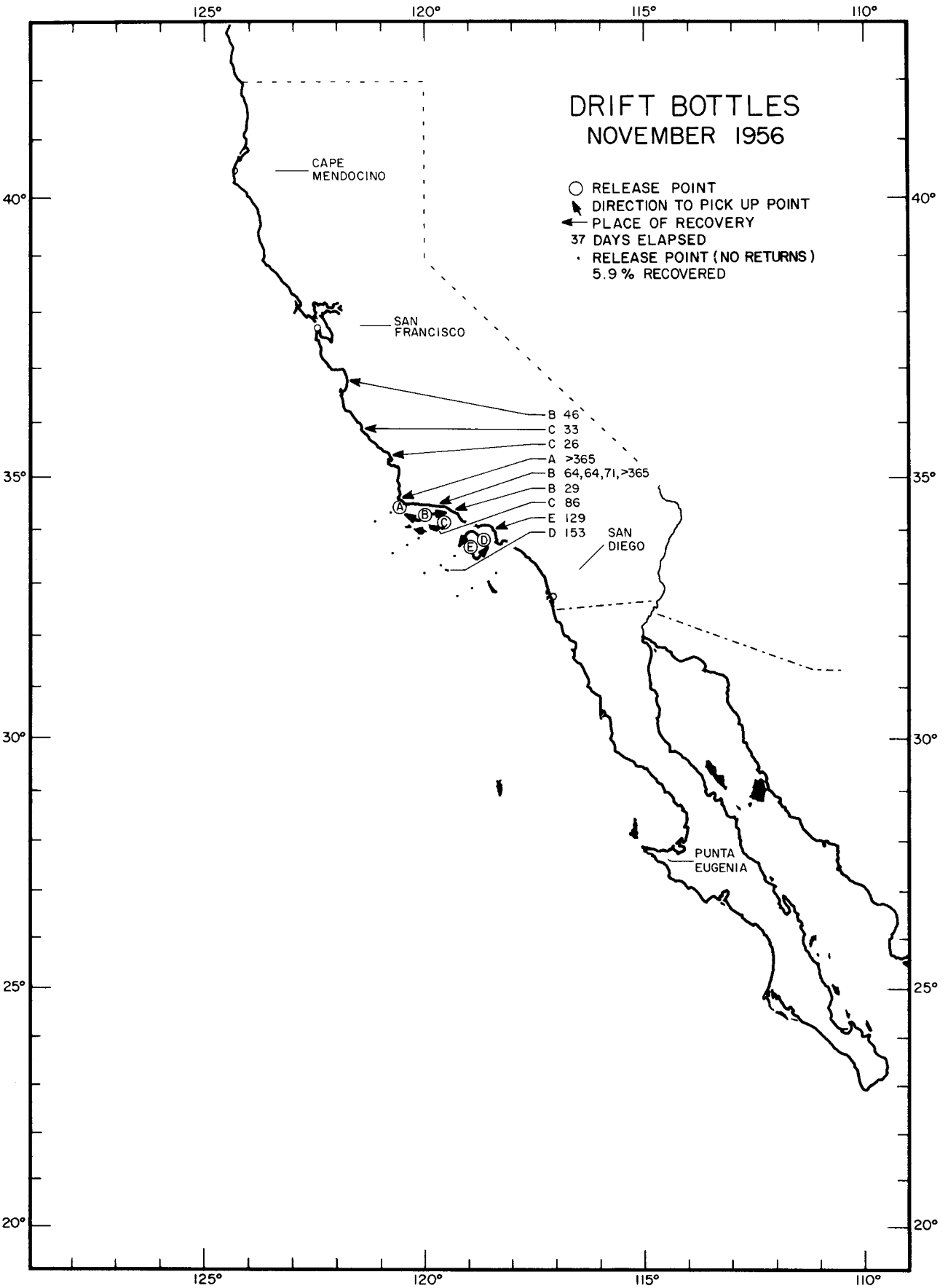
DRIFT BOTTLES
OCTOBER 1966



DRIFT BOTTLES
OCTOBER 1969



DRIFT BOTTLES
NOVEMBER 1955



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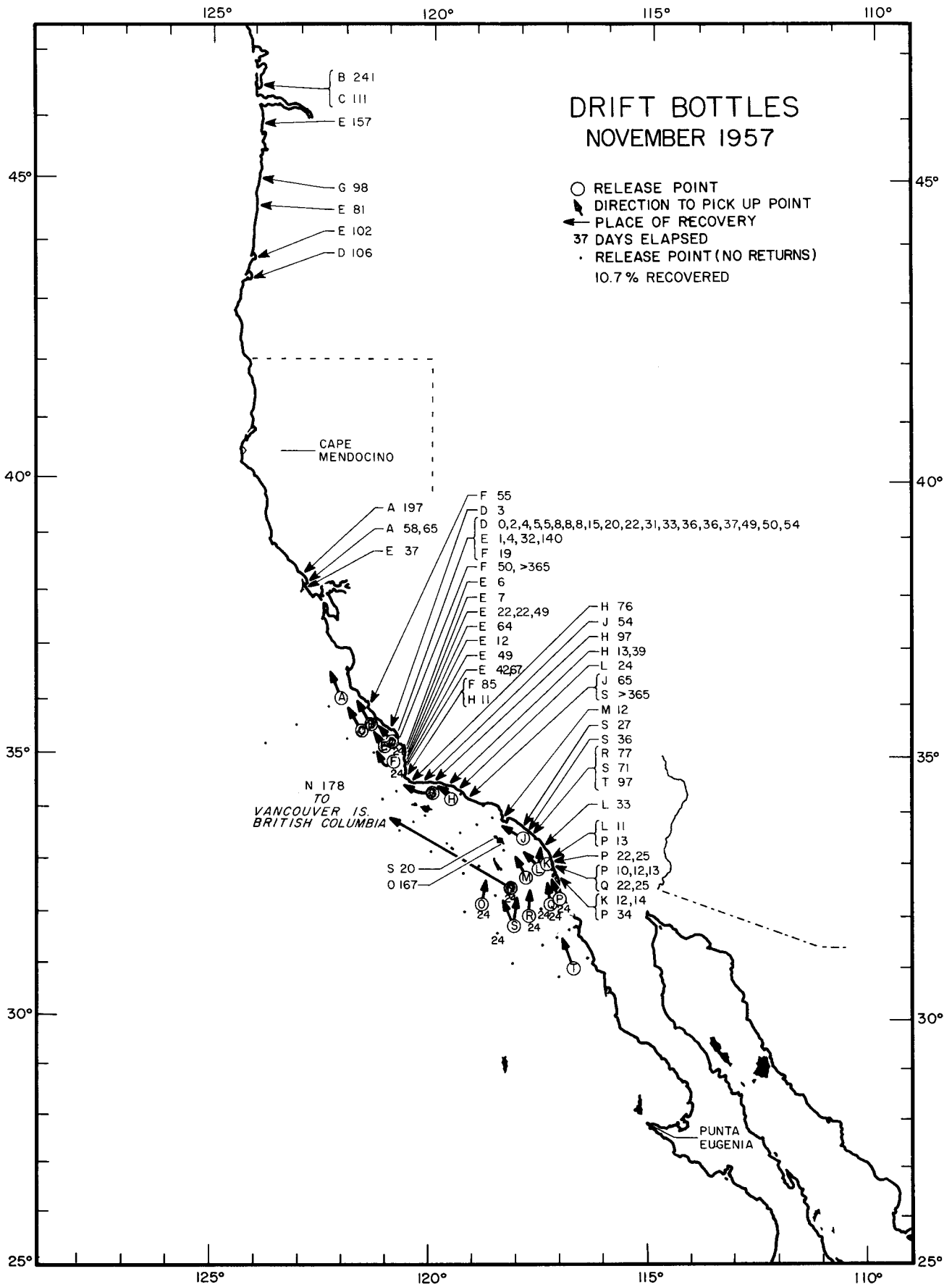
NOVEMBER 1956



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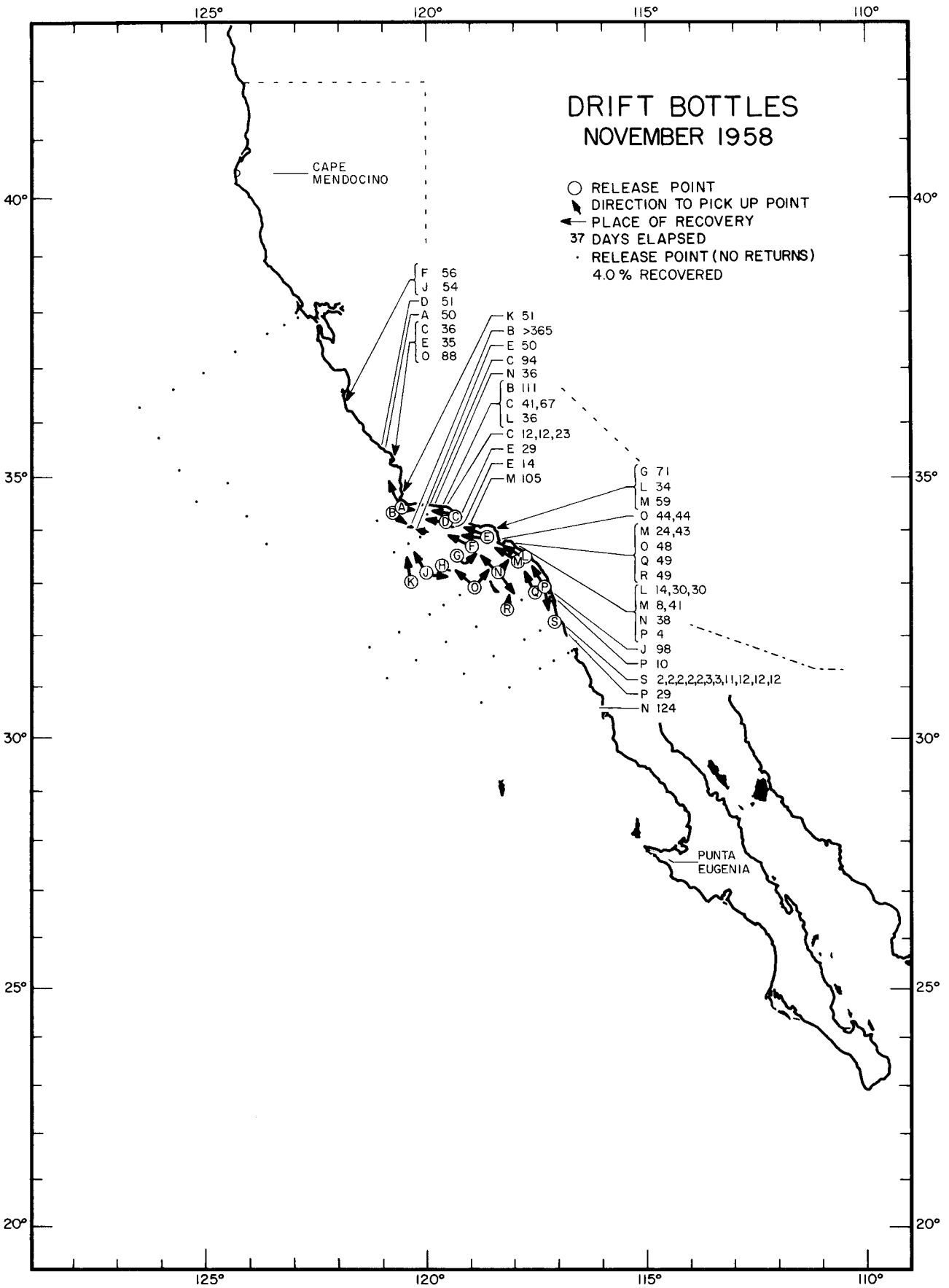

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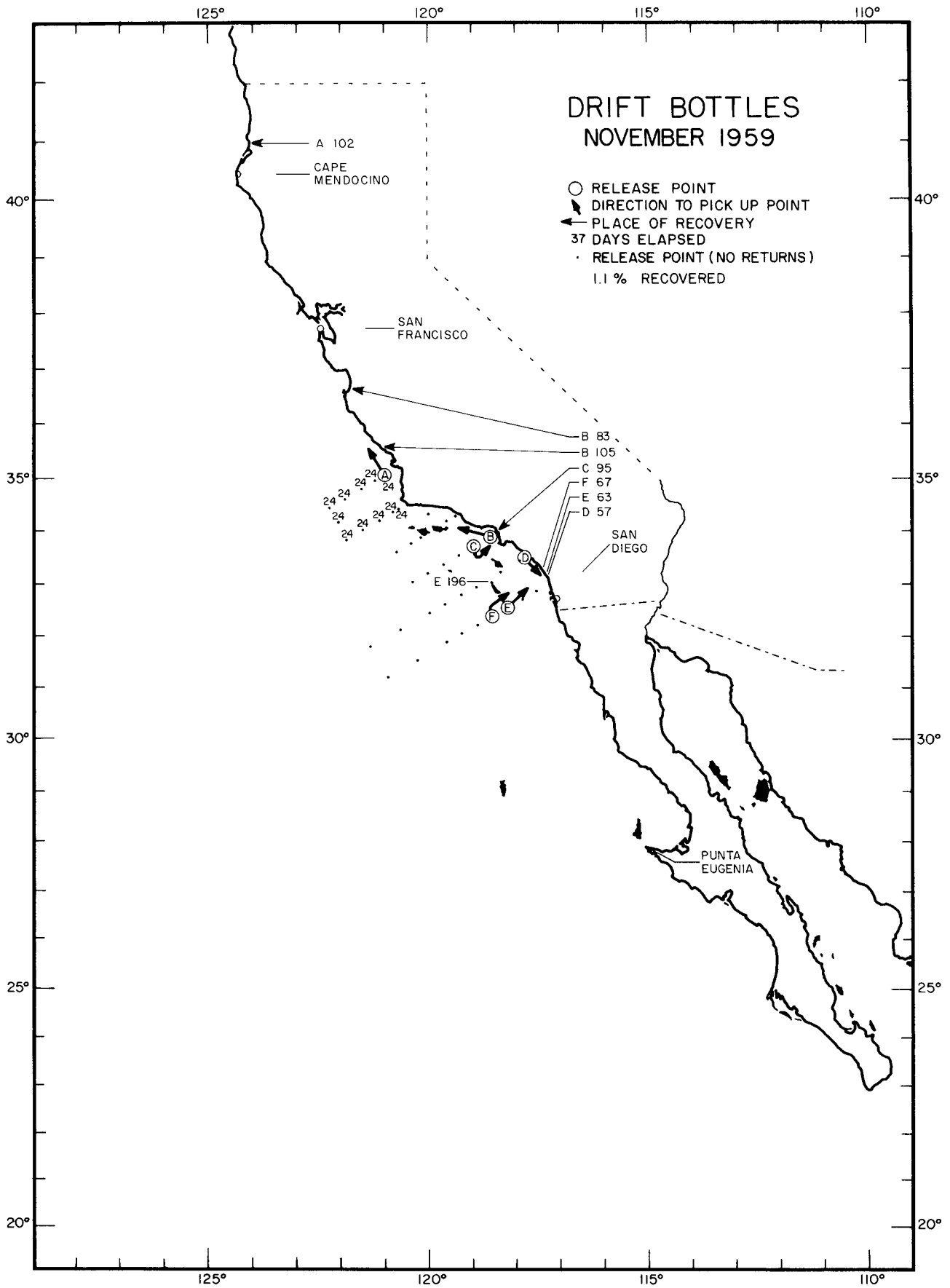

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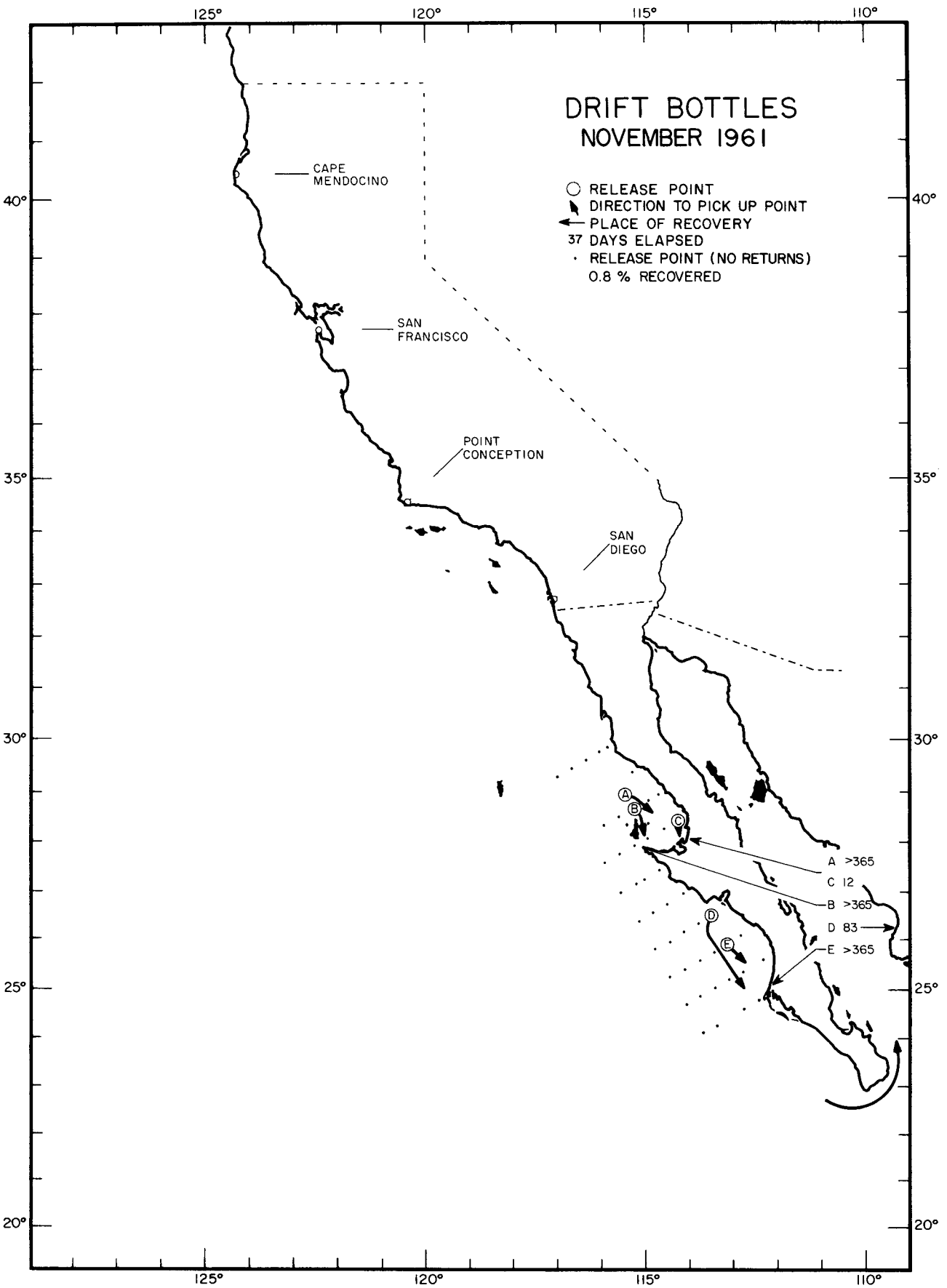

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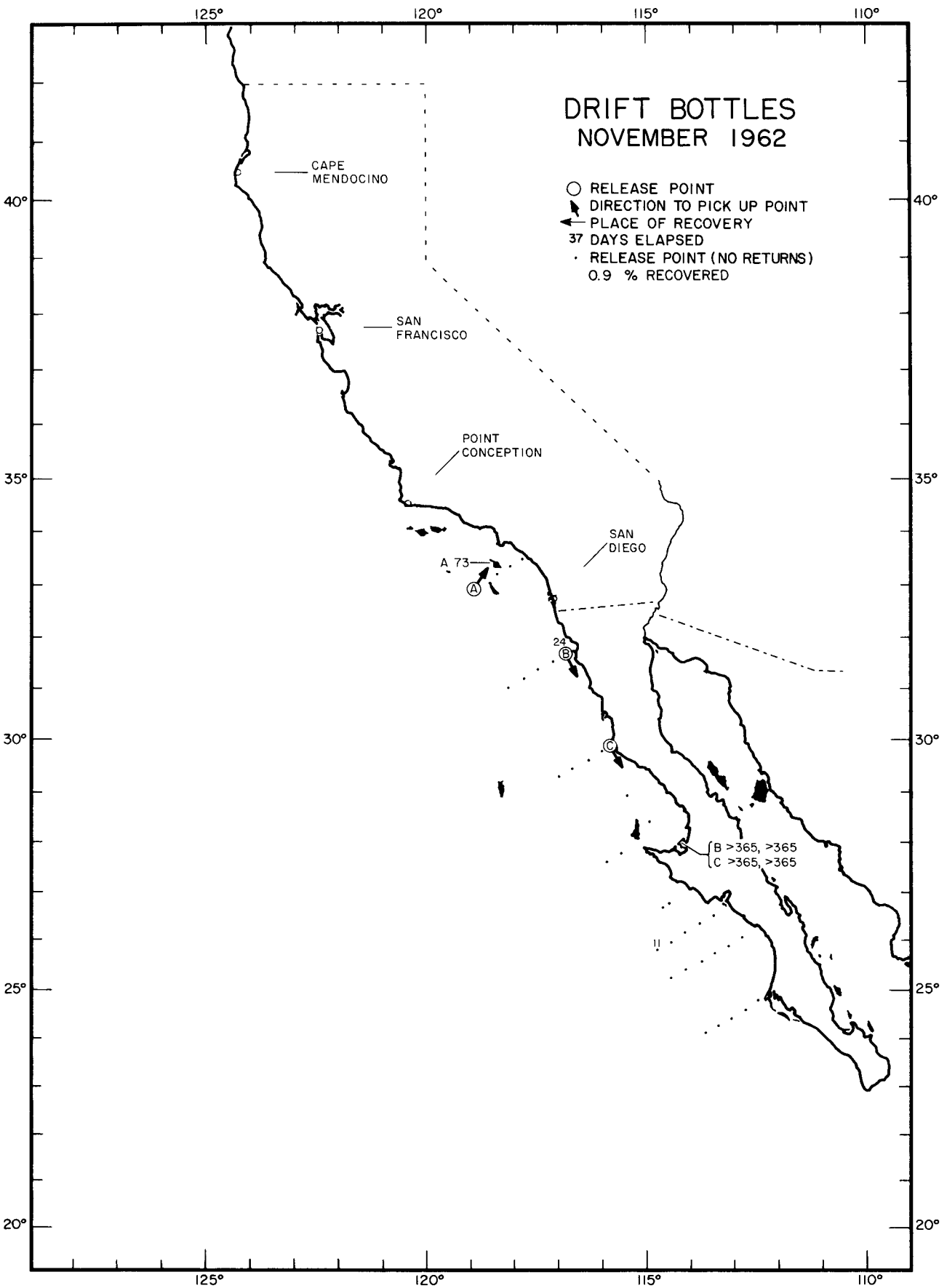

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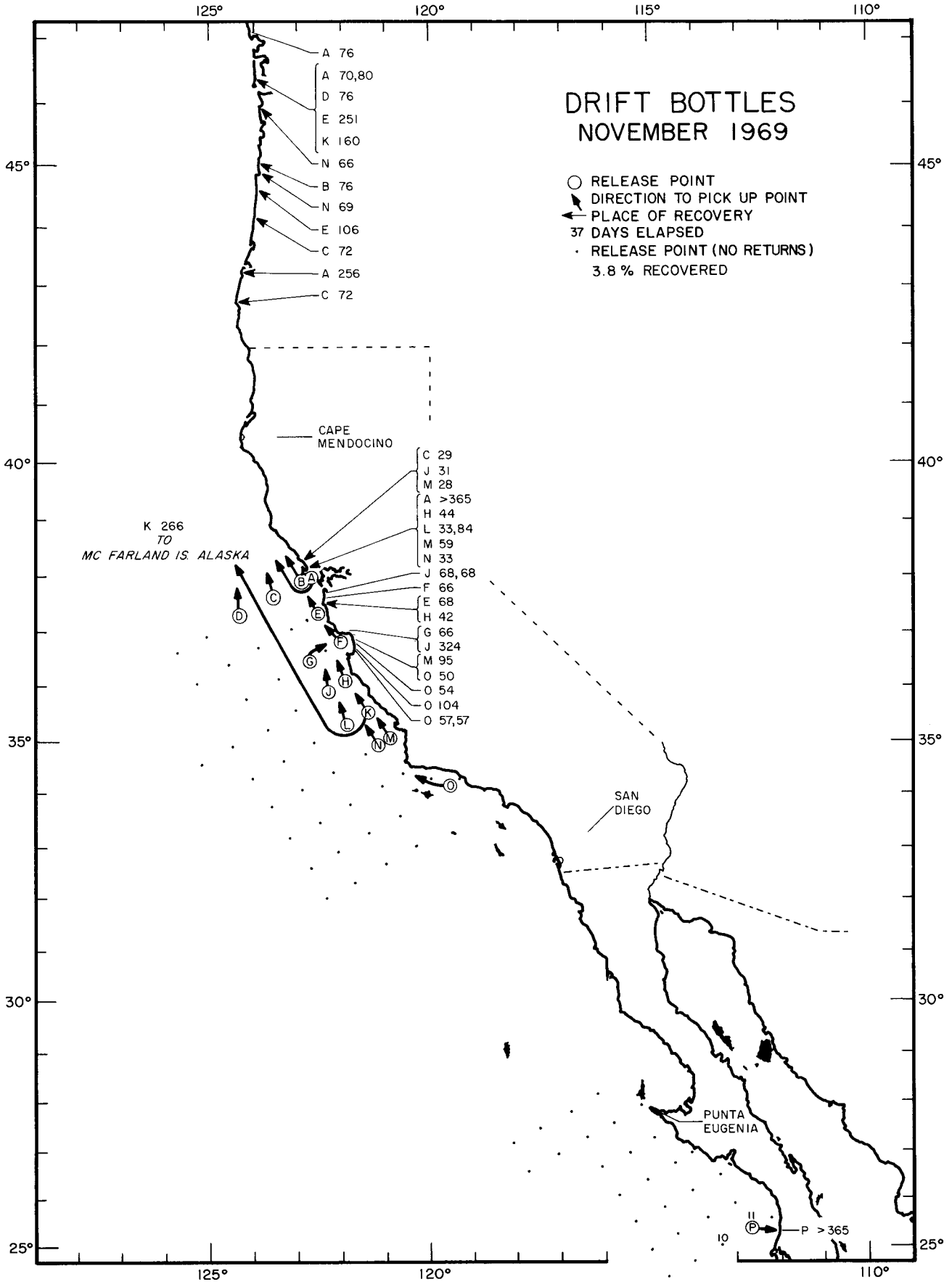

DRIFT BOTTLES
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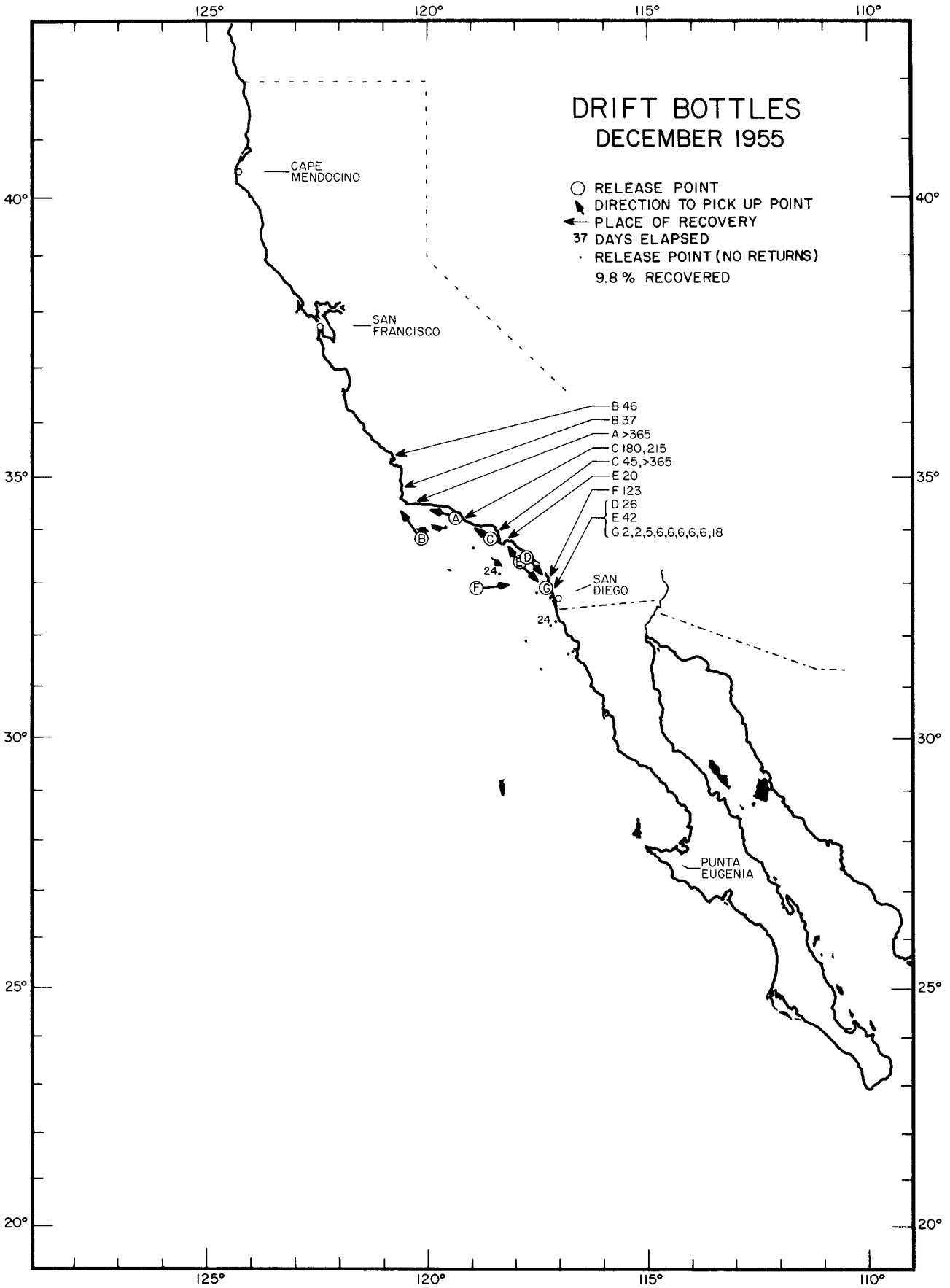

DRIFT BOTTLES
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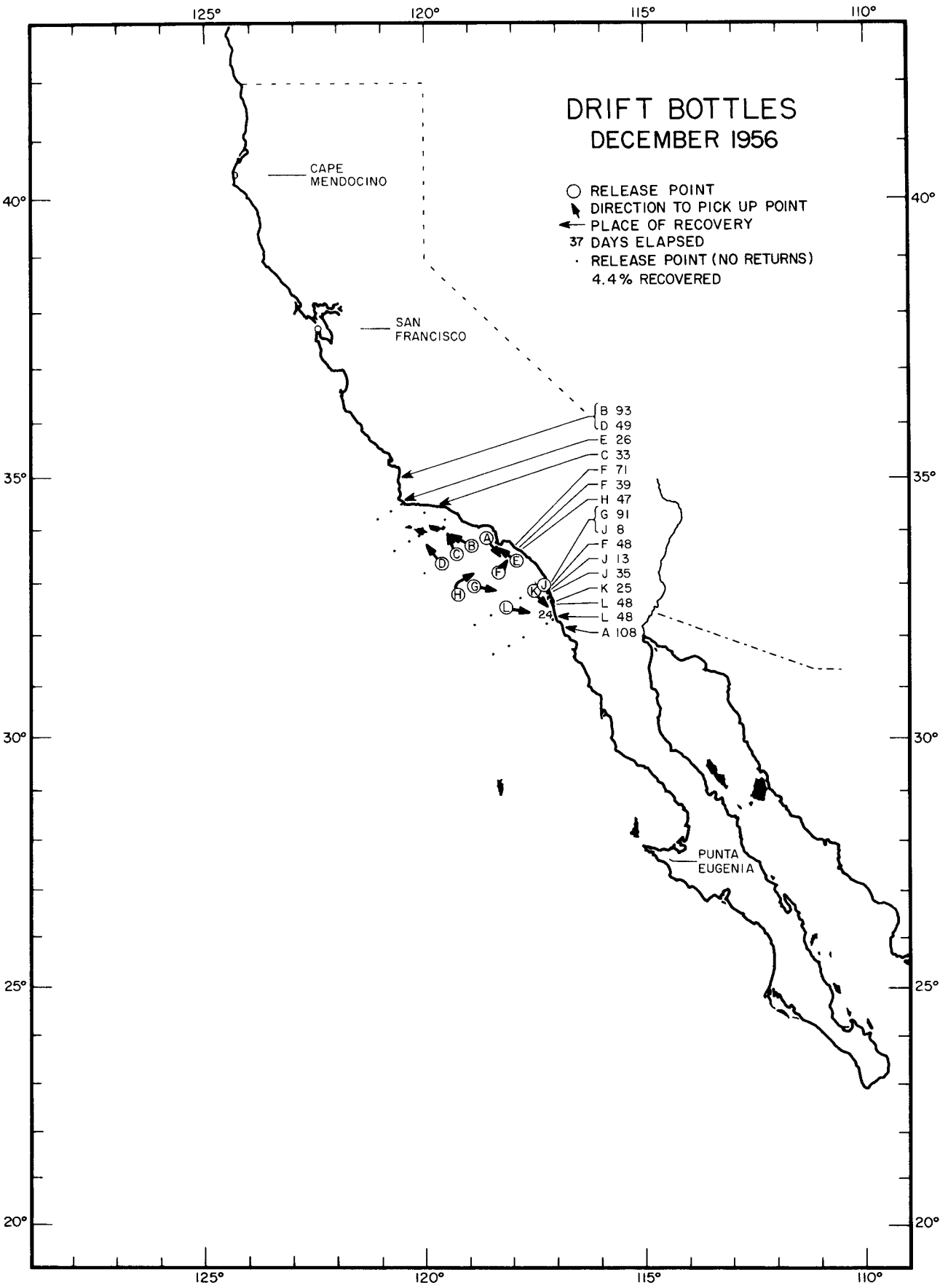

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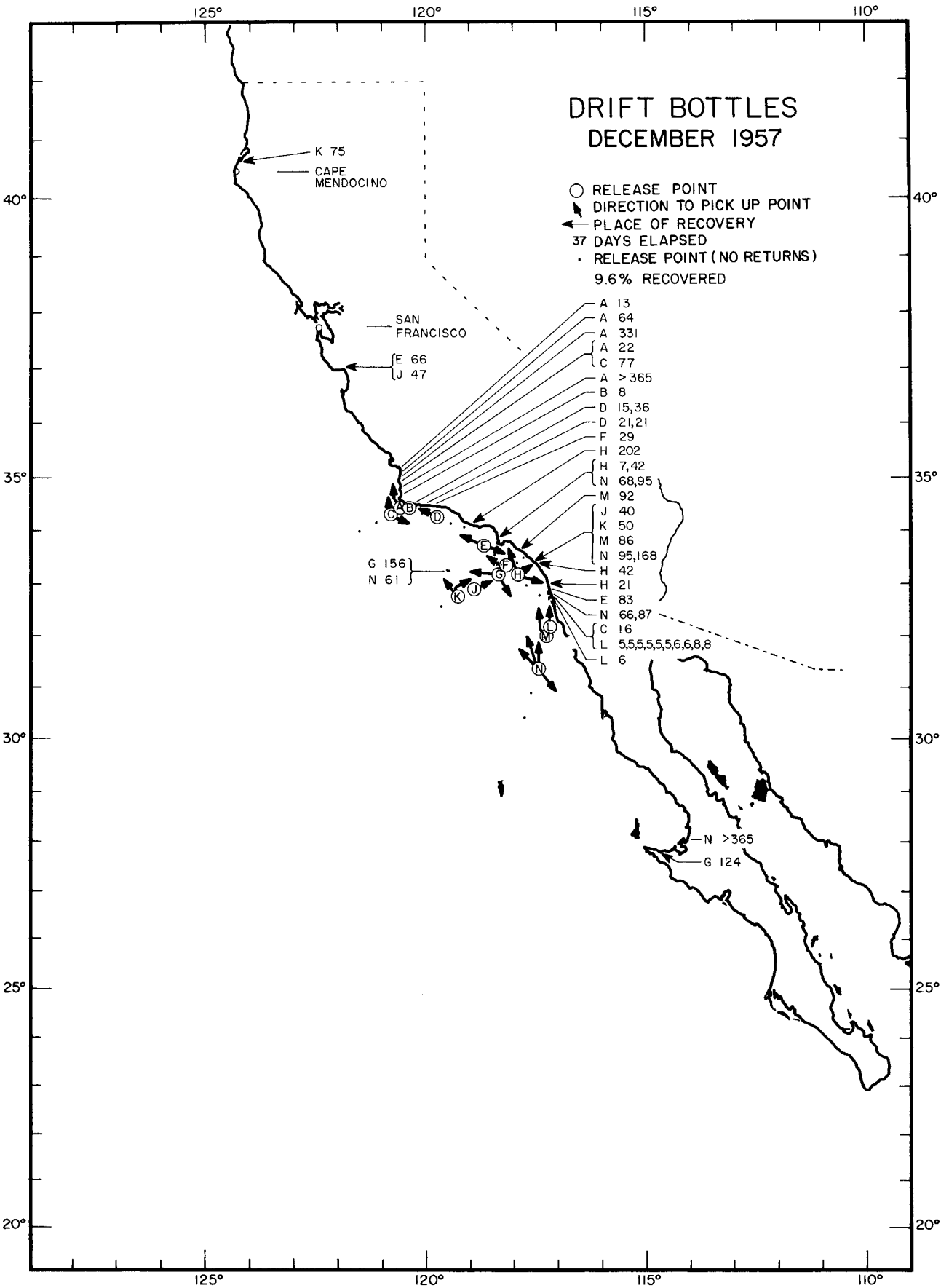

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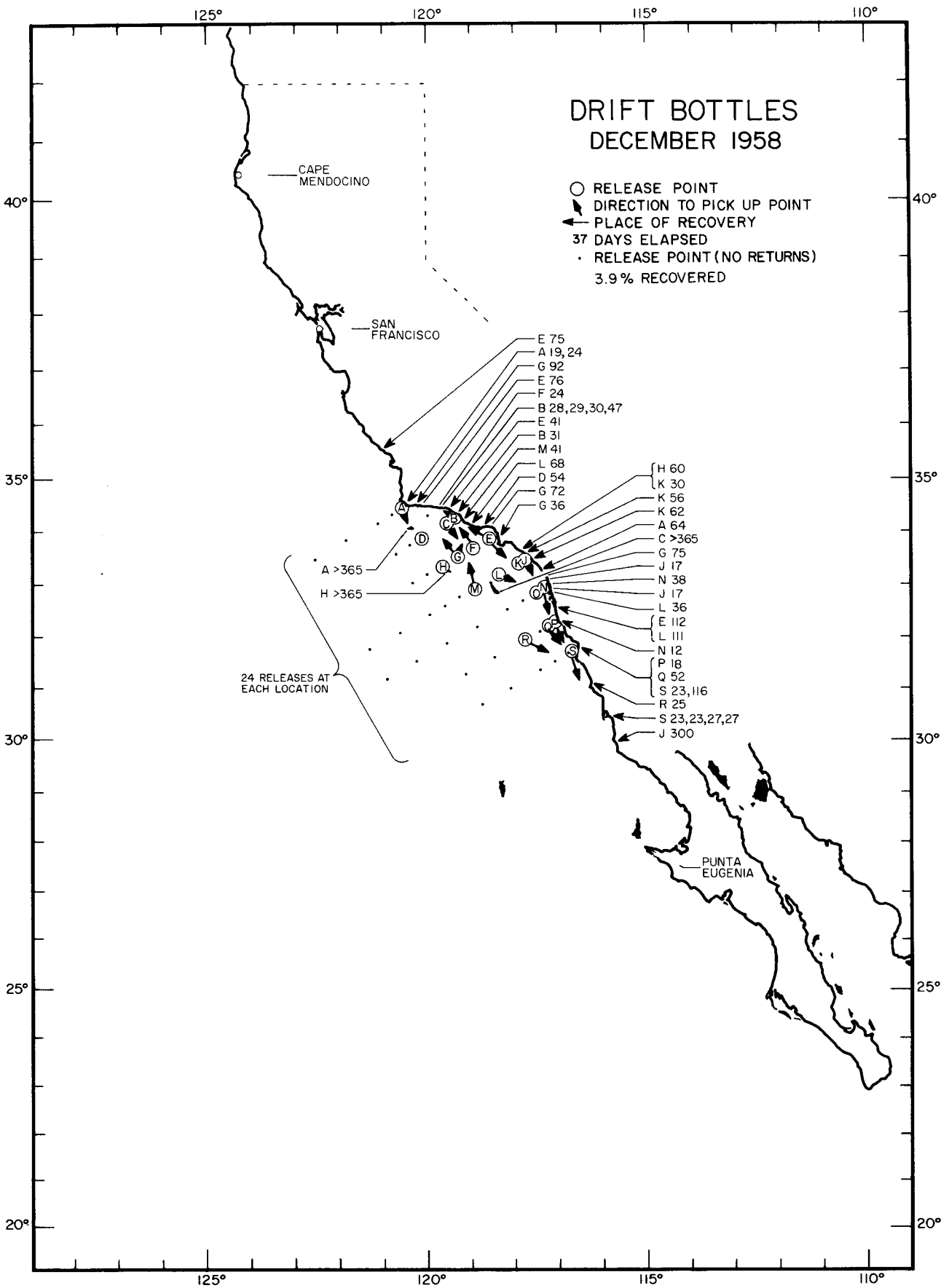

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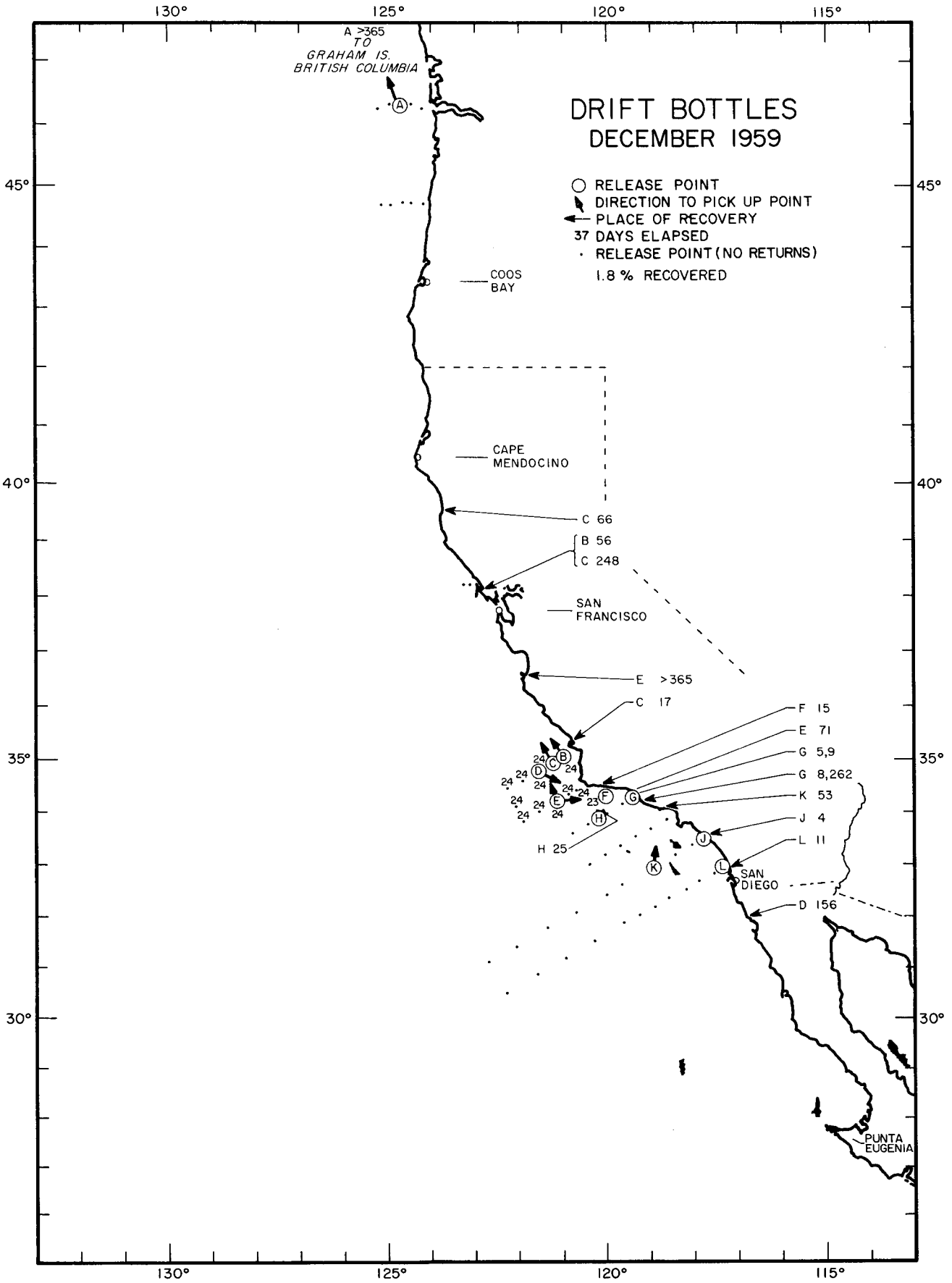

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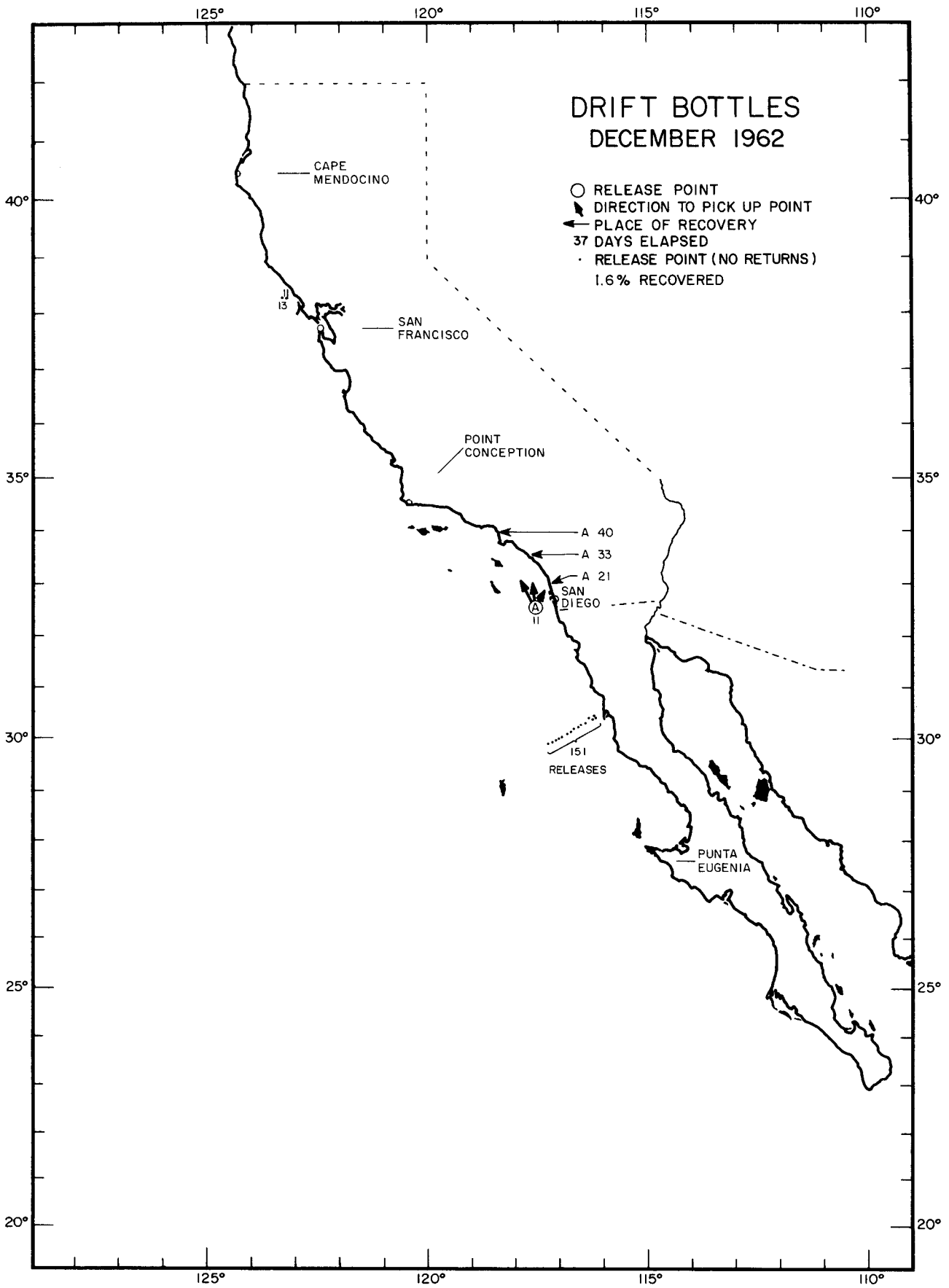

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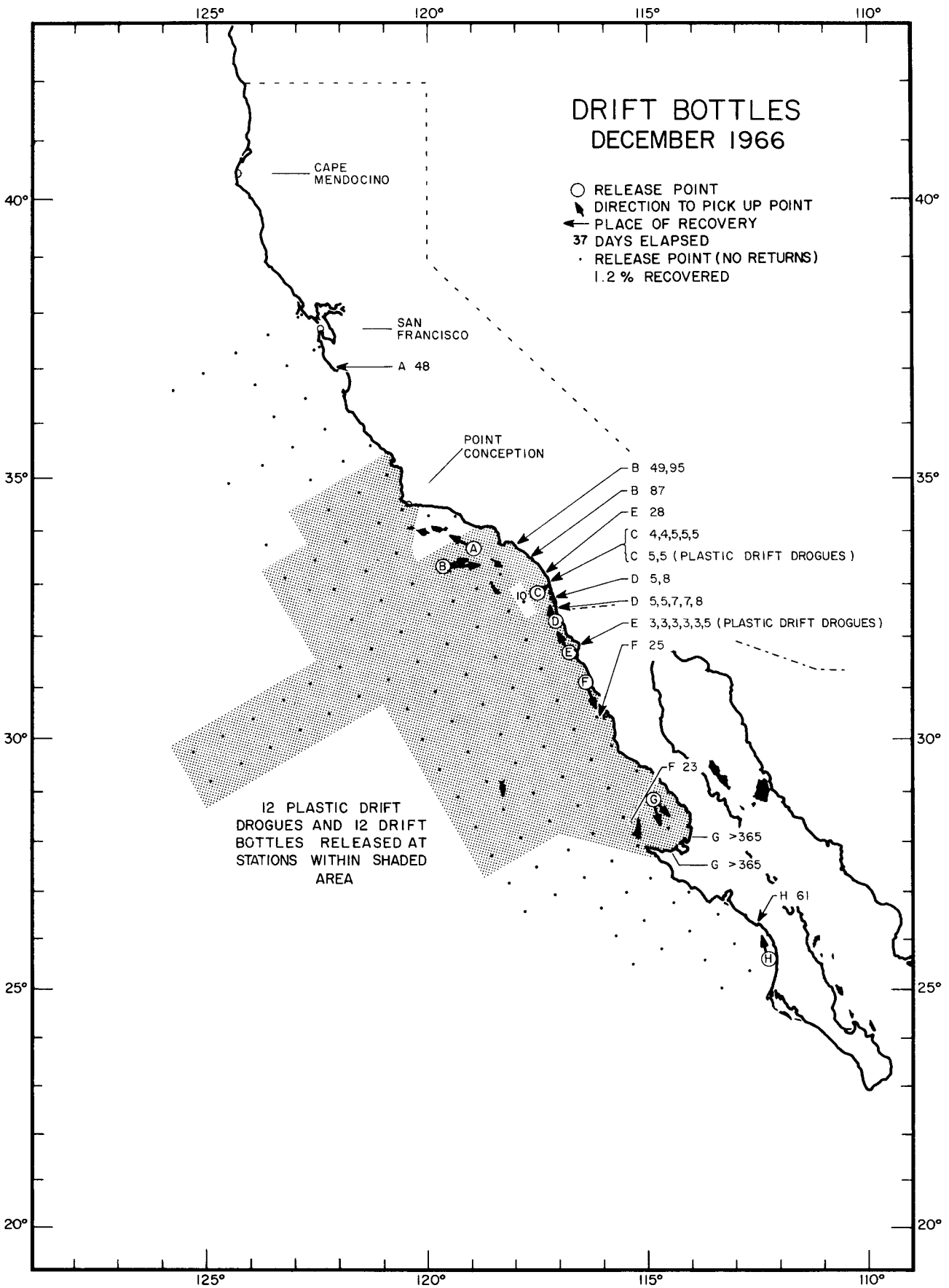

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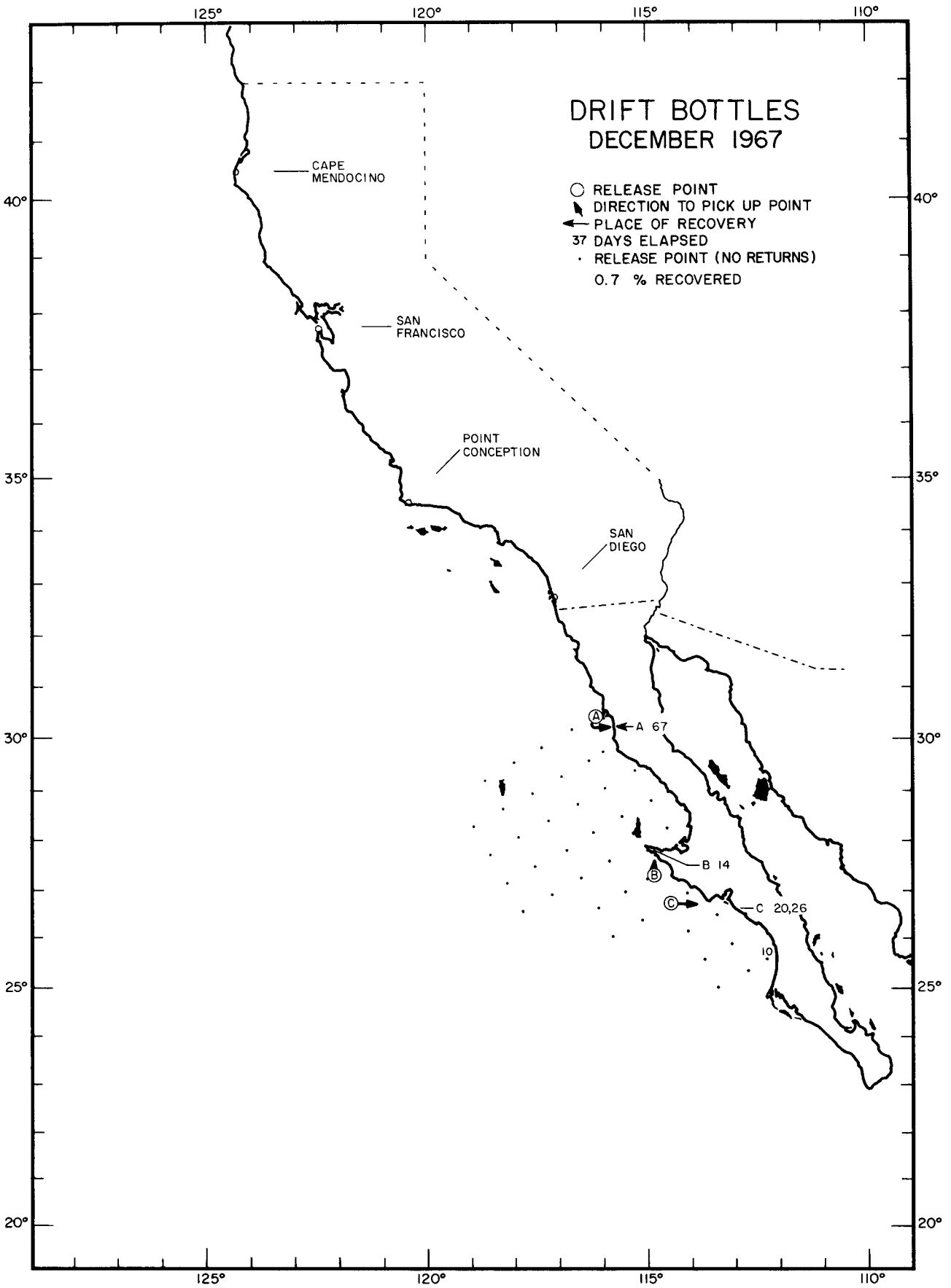

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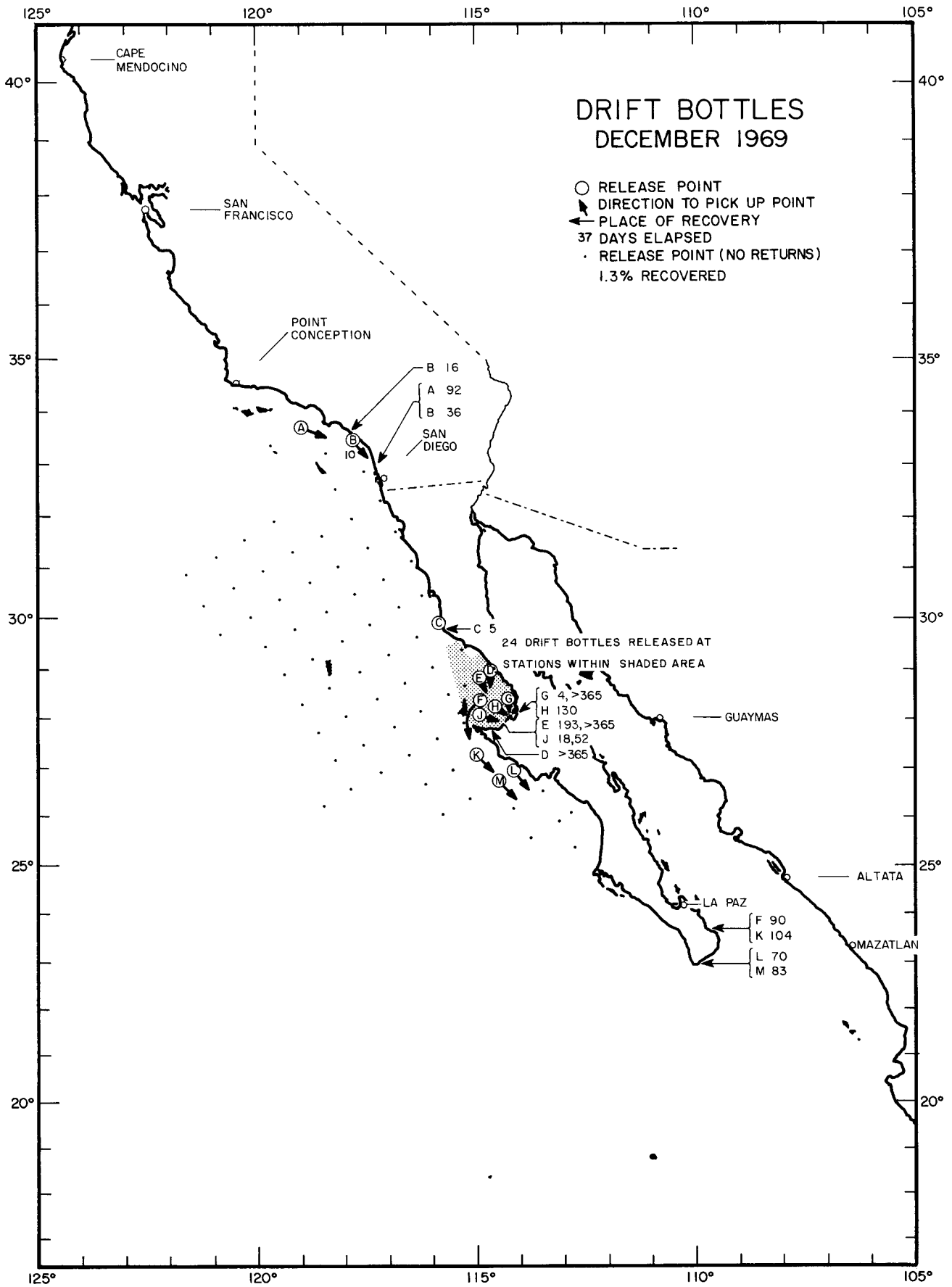

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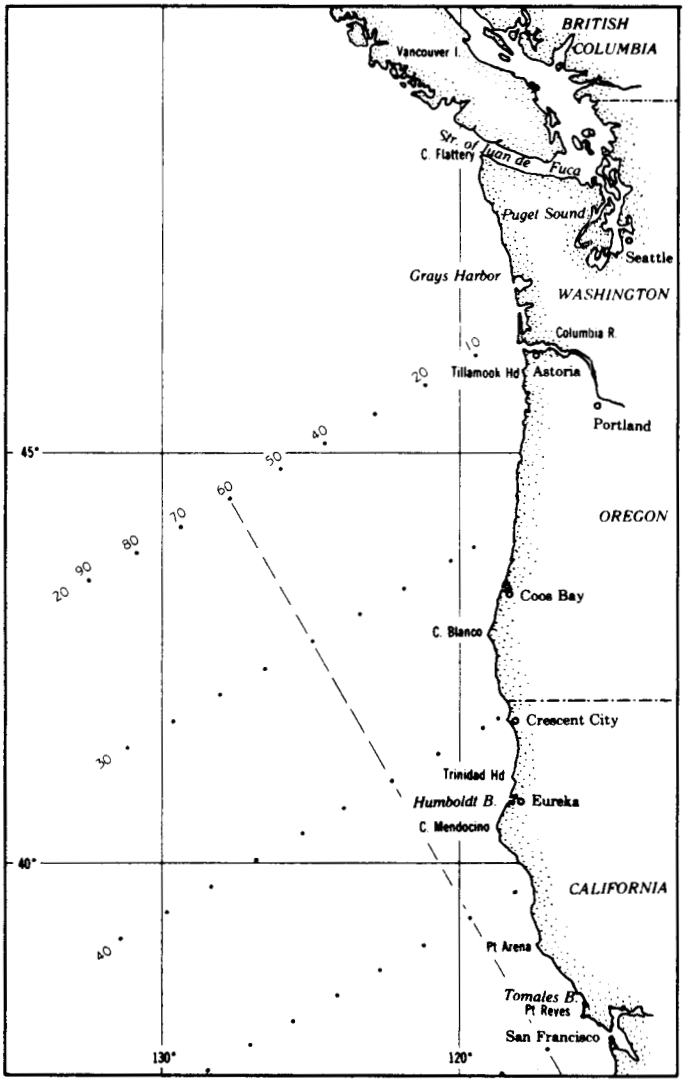

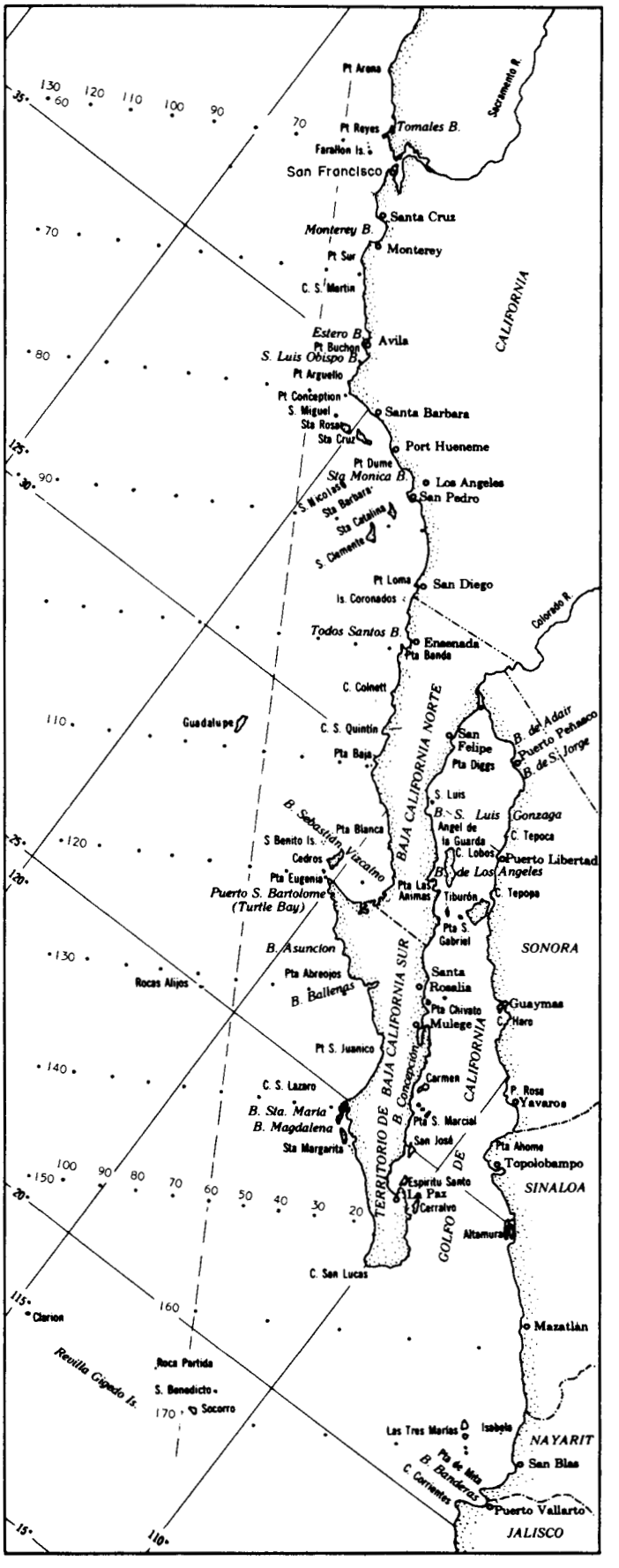

These maps are designed to show essential details of the area most intensively studied by the California Cooperative Oceanic Fisheries Investigations. This is approximately the same area as is shown in color on the front cover. Geographical place names are those most commonly used in the various publications emerging from the research. The cardinal station lines extending southwestward from the coast are shown. They are 120 miles apart. Additional lines are utilized as needed and can be as closely spaced as 12 miles apart and still have individual numbers. The stations along the lines are numbered with respect to the station 60 line, the numbers increasing to the west and decreasing to the east. Most of them are 40 miles apart, and are numbered in groups of 10. This permits adding stations as close as 4 miles apart as needed. An example of the usual identification is 120.65. This station is on line 120, 20 nautical miles southwest of station 60.

The projection of the front cover is Lambert's Azimuthal Equal Area Projection. The detail maps are a Mercator projection.

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