

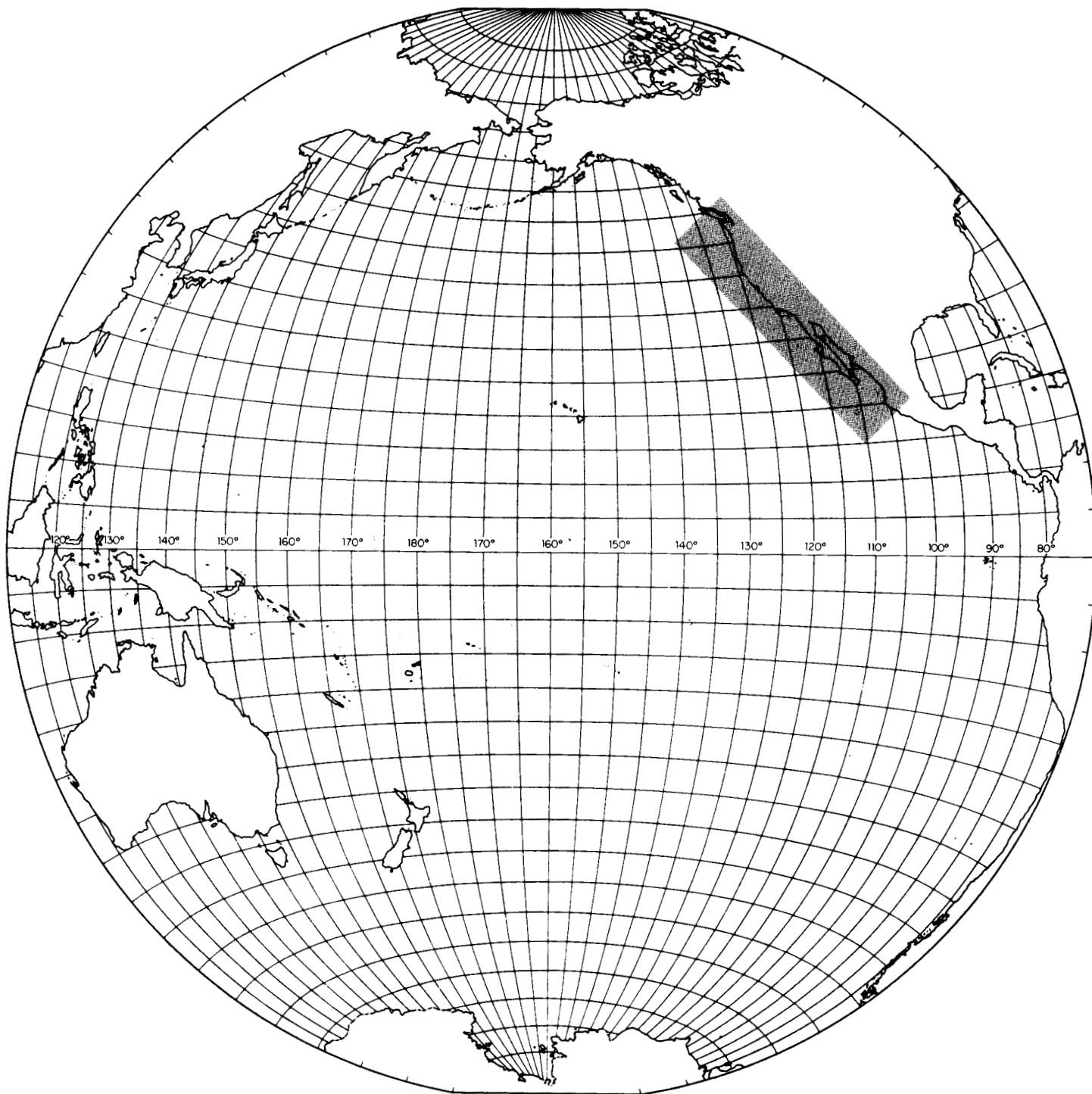
Atlas 12: Kramer, D. Distributional atlas of fish eggs and larvae in the California Current region: Pacific sardine, *Sardinops caerulea* (Girard), 1951-1966. Published June 1970.

23 May 2007

References to the data, published in annual ichthyoplankton data reports are given in the introduction to the Atlas. In addition, these data are available in PDF format on the SWFSC web site at <http://swfsc.noaa.gov/publications/swcpub/qryPublications.asp>, enter "ichthyoplankton" in the Subject line and "California Cooperative Oceanic Fisheries Investigations" in the Title line. Checking the ALL YEARS button will produce the entire list of available data.

The report for each year usually is published about 7-9 months after the fall cruise, and includes notes about nomenclature changes, etc. The ultimate goal is to update the old ichthyoplankton identifications to current standards; the database is updated as re-identifications for each cruise are completed.

STATE OF CALIFORNIA
MARINE RESEARCH COMMITTEE



CALIFORNIA COOPERATIVE OCEANIC FISHERIES INVESTIGATIONS

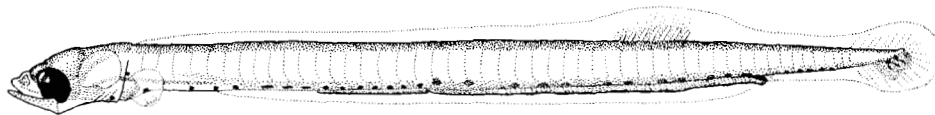
ATLAS No. 12



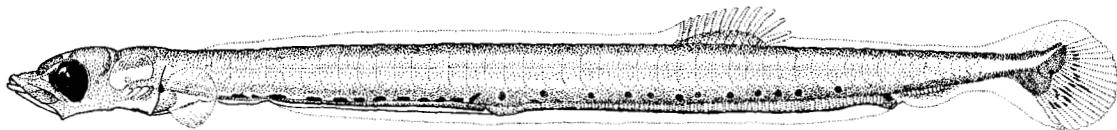
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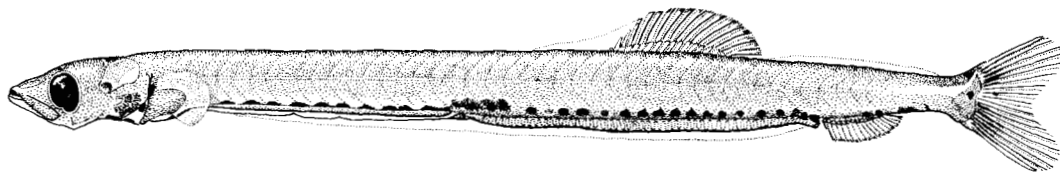
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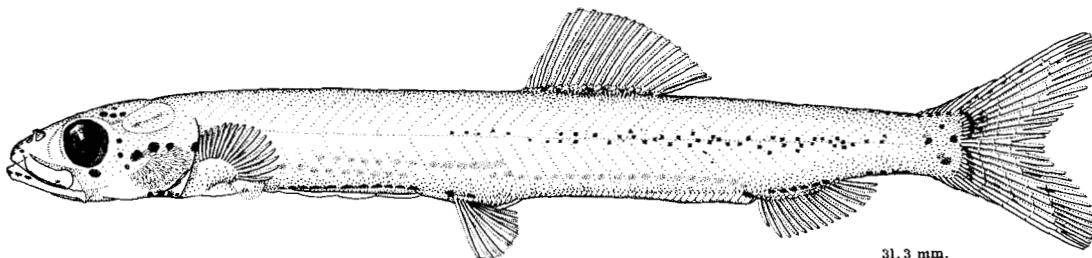
9.1 mm.



14.0 mm.



19.7 mm.



31.3 mm.

Pacific Sardine
Sardinops caerulea

CALIFORNIA
COOPERATIVE
OCEANIC
FISHERIES
INVESTIGATIONS

Atlas No. 12

STATE OF CALIFORNIA
MARINE RESEARCH COMMITTEE

Cooperating Agencies:

CALIFORNIA ACADEMY OF SCIENCES
CALIFORNIA DEPARTMENT OF FISH AND GAME
STANFORD UNIVERSITY, HOPKINS MARINE STATION
U. S. FISH AND WILDLIFE SERVICE, BUREAU OF COMMERCIAL FISHERIES
UNIVERSITY OF CALIFORNIA, SCRIPPS INSTITUTION OF OCEANOGRAPHY

June, 1970

THE CALCOFI ATLAS SERIES

This is the twelfth 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
U. S. Fish and Wildlife Service, Bureau of Commercial Fisheries
University of California, Scripps Institution of Oceanography

CalCOFI atlases² 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 and Hans T. Klein, Editors
John G. Wyllie, Cartographer

Atlases in this series, through June 1969, are:

- CalCOFI Atlas No. 1
Anonymous CalCOFI atlas of 10-meter temperatures and salinities 1949 through 1959.
- CalCOFI Atlas No. 2
Fleminger, A. Distributional atlas of calanoid copepods in the California Current region, Part I.
- CalCOFI Atlas No. 3
Alvarino, A. Distributional atlas of Chaetognatha in the California Current region.
- CalCOFI Atlas No. 4
Wyllie, J. G. Geostrophic flow of the California Current at the surface and at 200 meters.
- CalCOFI Atlas No. 5
Brinton, E. Distributional atlas of Euphausiacea (Crustacea) in the California Current region, Part I.
- CalCOFI Atlas No. 6
McGowan, J. A. Distributional atlas of pelagic molluscs in the California Current region.
- CalCOFI Atlas No. 7
Fleminger, A. Distributional atlas of calanoid copepods in the California Current region, Part II.
- CalCOFI Atlas No. 8
Bernier, L. Distributional atlas of Thaliacea in the California Current region.
- CalCOFI Atlas No. 9
Kramer, D., and E. H. Ahlstrom. Distributional atlas of fish larvae in the California Current region: Northern Anchovy, Engraulis mordax Girard, 1951 through 1965.
- CalCOFI Atlas No. 10
Isaacs, J. D., A. Fleminger and J. K. Miller. Distributional atlas of zooplankton biomass in the California Current region: Spring and Fall 1955 - 1959.
- CalCOFI Atlas No. 11
Ahlstrom, Elbert H. Distributional atlas of fish larvae in the California Current region: jack mackerel, Trachurus symmetricus, and Pacific hake, Merluccius productus, 1951 through 1966.
- CalCOFI Atlas No. 12
Kramer, David Distributional atlas of fish eggs and larvae in the California Current region: Pacific sardine, Sardinops caerulea (Girard), 1951 through 1966.

¹ Usually abbreviated CalCOFI, sometimes CALCOFI or CCOFI.

² For citation this issue in the series should be referred to as CalCOFI Atlas No. 12.

DISTRIBUTIONAL ATLAS OF FISH EGGS AND LARVAE IN THE CALIFORNIA
CURRENT REGION: PACIFIC SARDINE, SARDINOPS CAERULEA (GIRARD),
1951 THROUGH 1966

David Kramer

CALCOFI ATLAS NO. 12

Data Collection and Processing Group
Marine Life Research Program
Scripps Institution of Oceanography
La Jolla, California

June 1970

DISTRIBUTIONAL ATLAS OF FISH EGGS AND LARVAE IN THE CALIFORNIA

CURRENT REGION: PACIFIC SARDINE, SARDINOPS CAERULEA (GIRARD),

1951 THROUGH 1966

David Kramer¹

This atlas illustrates the distribution and relative abundance of the eggs and larvae of the Pacific sardine, Sardinops caerulea (Girard), off the coasts of California and Baja California in the region of the California Current during the years 1951 through 1966. The data were collected by the California Cooperative Oceanic Fisheries Investigations on surveys covering selected portions of the pattern shown in Chart 1. The surveys were conducted monthly in 1951 through 1960 and again in 1966, and quarterly in 1961 through 1965. Sampling methods and collecting apparatus have been described in detail by Fleminger (1964) and Ahlstrom (1966). In brief, each sample was collected by lowering a plankton net of 0.55 mm silk mesh, and a mouth opening one meter in diameter, to a depth of about 140 meters (200 meters of wire out, depth permitting) and retrieving it at 20 meters per minute, while maintaining a wire angle of 45 degrees and a ship speed of about two knots. In shallow water, samples were taken to within 15 meters of the bottom. Data on vertical distribution (Ahlstrom, 1959a) indicate that this standard net tow samples the entire stratum occupied by sardine eggs and larvae.

Samples were sorted in the laboratory for all fish eggs and larvae. Very large samples were fractionated with the Folsom Plankton Sample Splitter (McEwen, Johnson and Folsom, 1954).

Estimates of abundance of fish eggs and larvae were made comparable between samples by standardizing the values to a unit of 10 square meters of sea surface. Details of this standardizing procedure were described by Kramer and Ahlstrom (1968). The abundance of other planktonic organisms dealt with in previous CalCOFI atlases has been standardized by estimating the number in 1000 cubic meters of water strained.

Standardized data for sardine eggs and larvae from CalCOFI cruises of 1951 through 1957 and for larvae in the years 1958 through 1962 have been issued previously elsewhere (Ahlstrom, 1953, 1954, 1958, 1959b, 1966; Ahlstrom and Kramer, 1955, 1956, 1957). Standardized data for eggs from 1958 through 1966 and for larvae from 1963 through 1966 have not yet been published.

¹Fishery-Oceanography Center, Bureau of Commercial Fisheries, La Jolla, California.

No charts are presented for those cruises in which both eggs and larvae were absent. These cruises are indicated in the pagination tables by the term "no occurrences." Tables 1 and 2 give the pagination of egg and larvae charts, respectively.

REFERENCES CITED

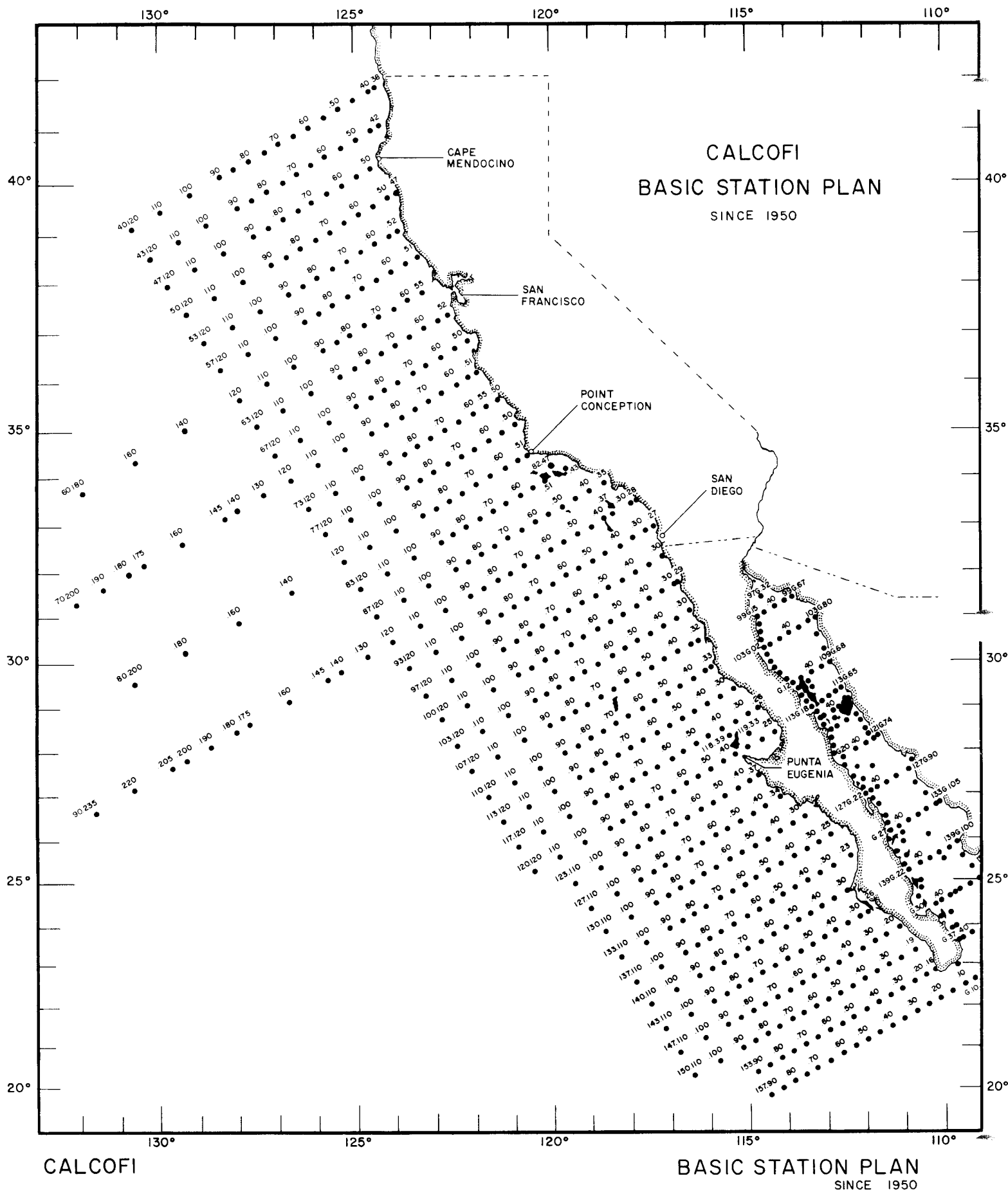
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Table 1. Pagination of charts showing the distributions of sardine eggs.
(O) No occurrences. (-) No cruise. (*) Distribution for early
and late March cruises are shown on the same chart.

	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66
Jan. 01	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32 ~
Feb. 02	34	36	38	40	42	44	46	48	50	52	-	-	-	-	-	54
Mar. 03	56	58*	60*	62	64	66	68	70	72	74	-	-	-	-	-	-
Apr. 04	76	78	80	82	84	86	88	90	92	94	96	98	100	102	104	106 ~
May 05	108	110	112	114	116	118	120	122	124	126	-	-	-	-	-	128
June 06	130	132	134	136	138	140	142	144	146	148	-	-	-	-	-	150
July 07	152	154	156	158	160	162	164	166	168	170	172	174	176	178	180	182 ~
Aug. 08	184	186	188	190	O	192	194	196	198	200	-	-	-	-	-	202
Sept. 09	204	206	208	O	O	210	212	214	216	218	-	-	-	-	220	222
Oct. 10	224	226	228	230	232	234	236	238	240	242	244	246	248	250	-	252 ~
Nov. 11	254	256	O	O	O	O	258	O	260	-	-	-	-	-	-	262
Dec. 12	264	-	266	268	270	O	O	272	274	-	-	-	-	-	-	276

Table 2. Pagination of charts showing the distributions of sardine larvae.
(O) No occurrences. (-) No cruise. (*) Distribution for early
and late March cruises are shown on the same chart.

	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66
Jan. 01	3	5	7	9	11	13	15	17	19	21	23	25	27	29	31	33
Feb. 02	35	37	39	41	43	45	47	49	51	53	-	-	-	-	-	55
Mar. 03	57	59*	61*	63	65	67	69	71	73	75	-	-	-	-	-	-
Apr. 04	77	79	81	83	85	87	89	91	93	95	97	99	101	103	105	107
May 05	109	111	113	115	117	119	121	123	125	127	-	-	-	-	-	129
June 06	131	133	135	137	139	141	143	145	147	149	-	-	-	-	-	151
July 07	153	155	157	159	161	163	165	167	169	171	173	175	177	179	181	183
Aug. 08	185	187	189	191	O	193	195	197	199	201	-	-	-	-	-	203
Sept. 09	205	207	209	O	O	211	213	215	217	219	-	-	-	-	221	223
Oct. 10	225	227	229	231	233	235	237	239	241	243	245	247	249	251	-	253
Nov. 11	255	257	O	O	O	O	259	O	261	-	-	-	-	-	-	263
Dec. 12	265	-	267	269	271	O	O	273	275	-	-	-	-	-	-	277



JANUARY



FEBRUARY



MARCH



APRIL



MAY



JUNE



JULY



AUGUST



SEPTEMBER



OCTOBER

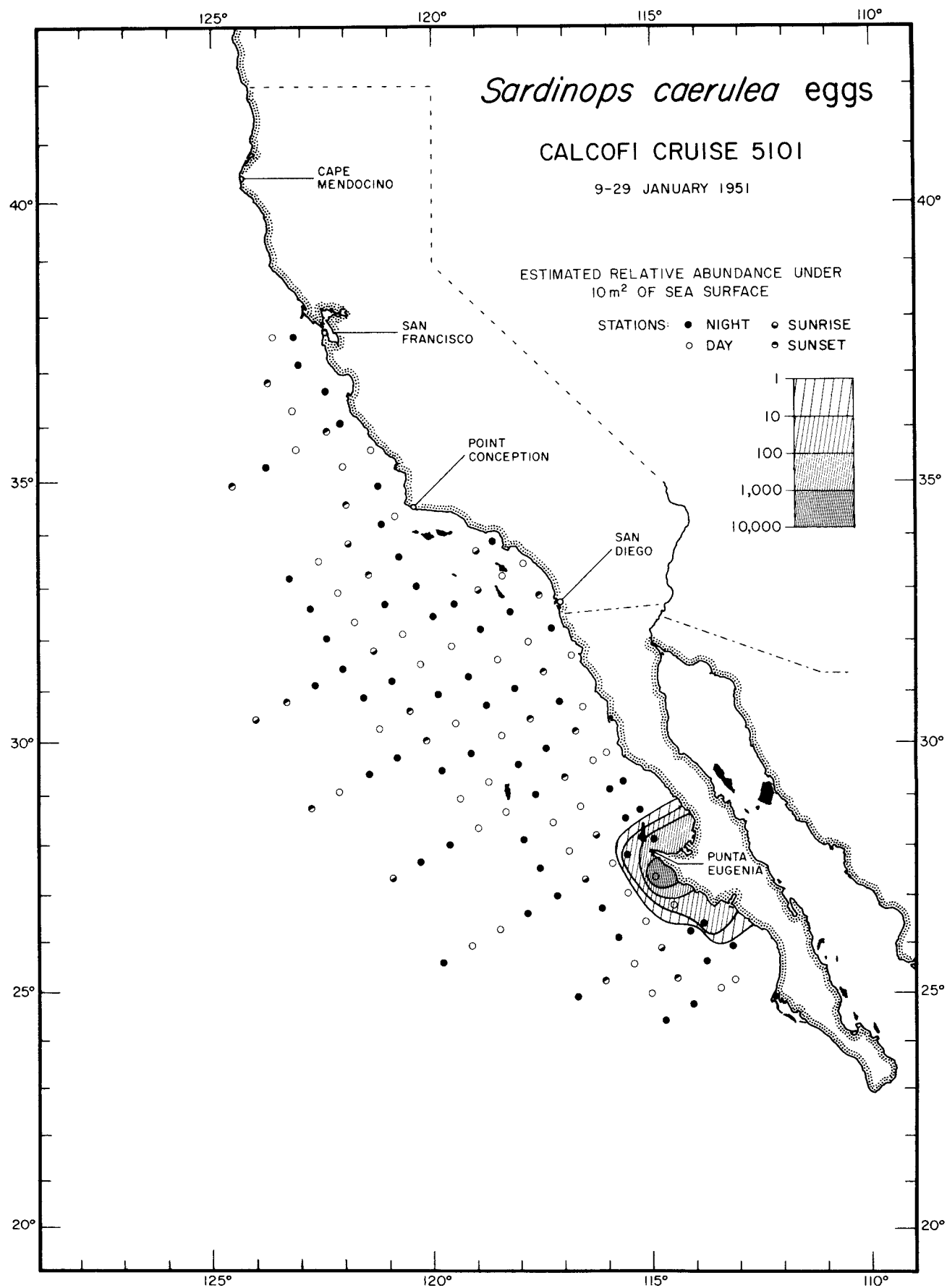


NOVEMBER



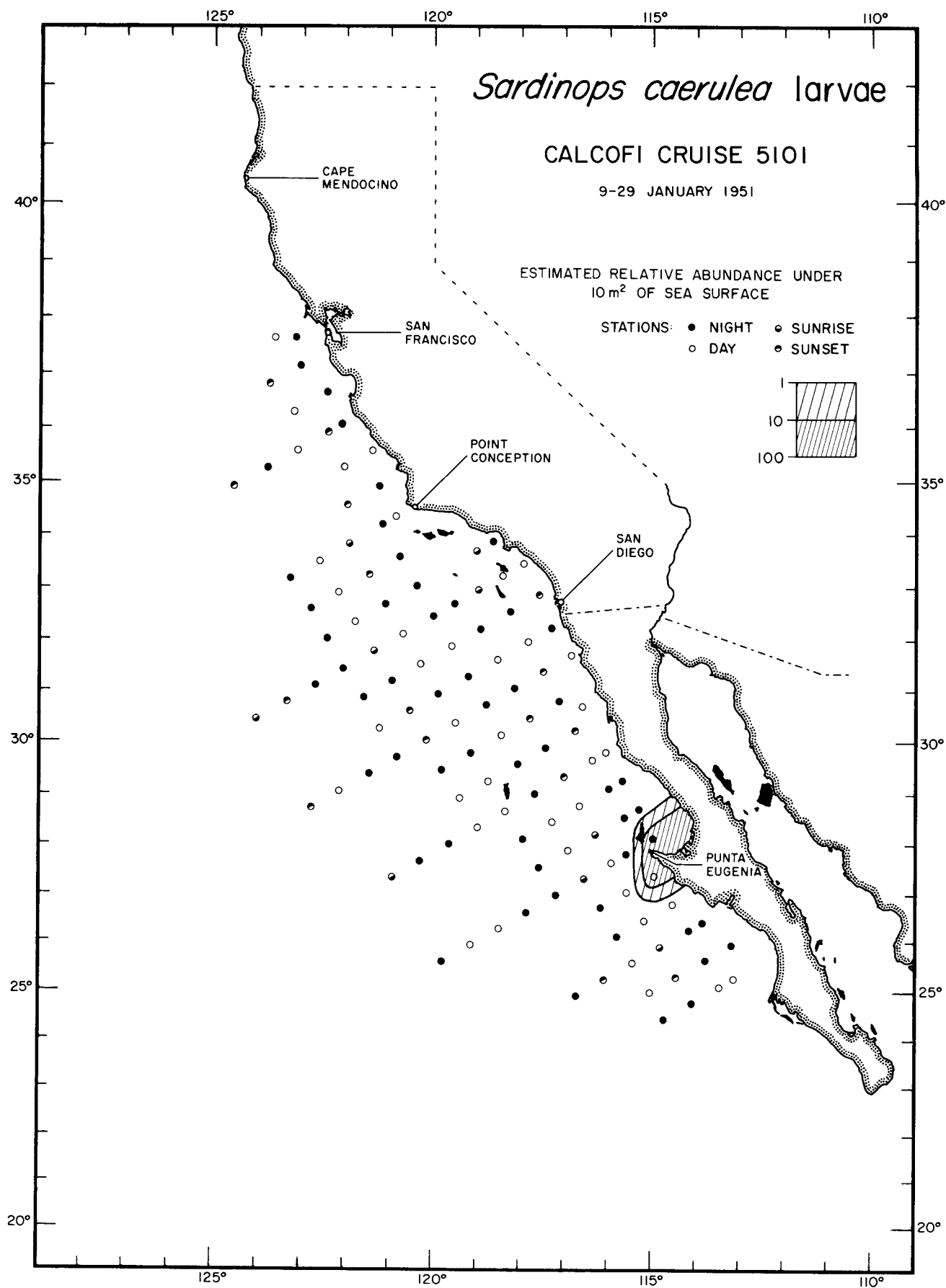
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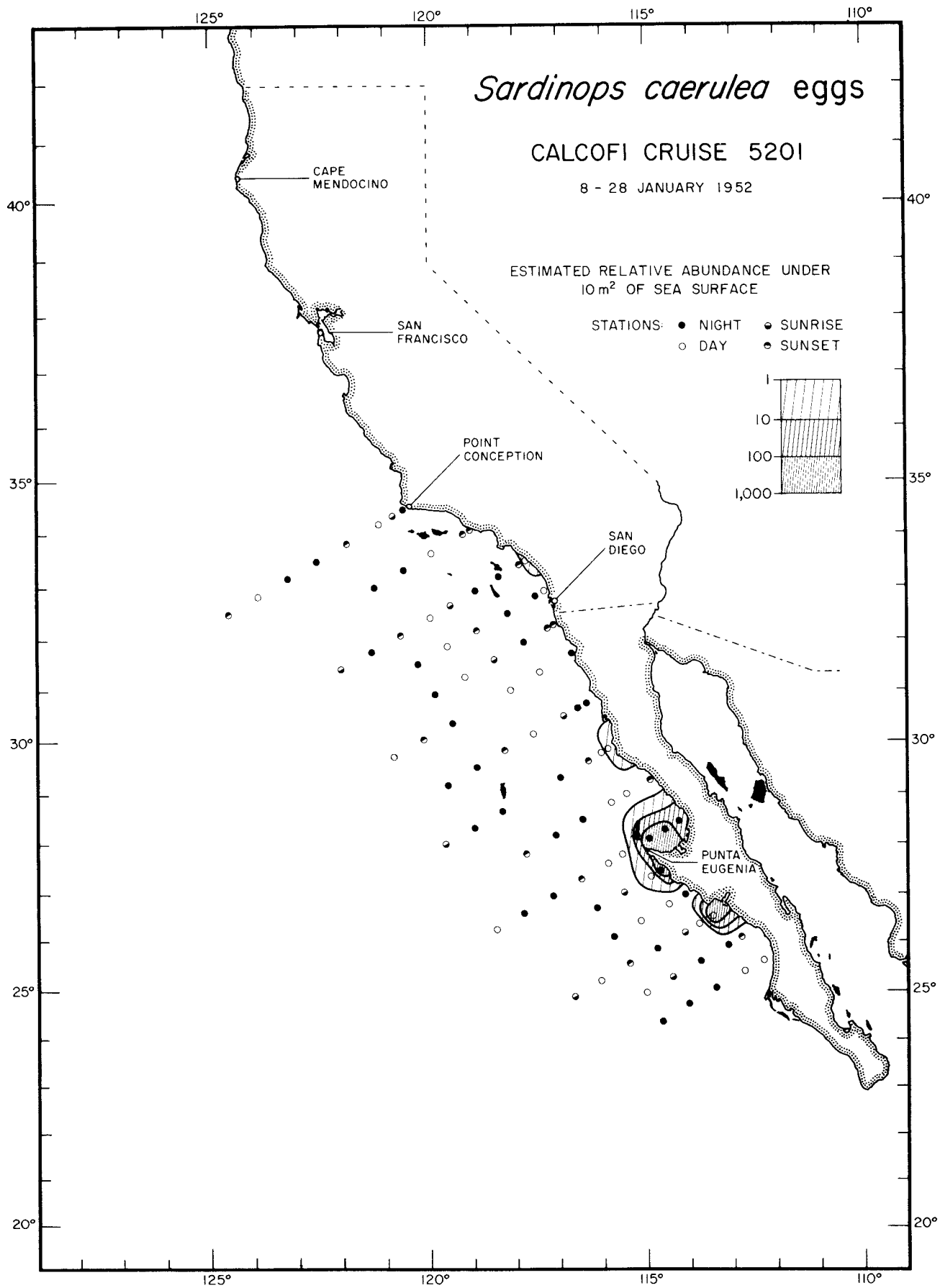
Sardinops caerulea eggs

5101



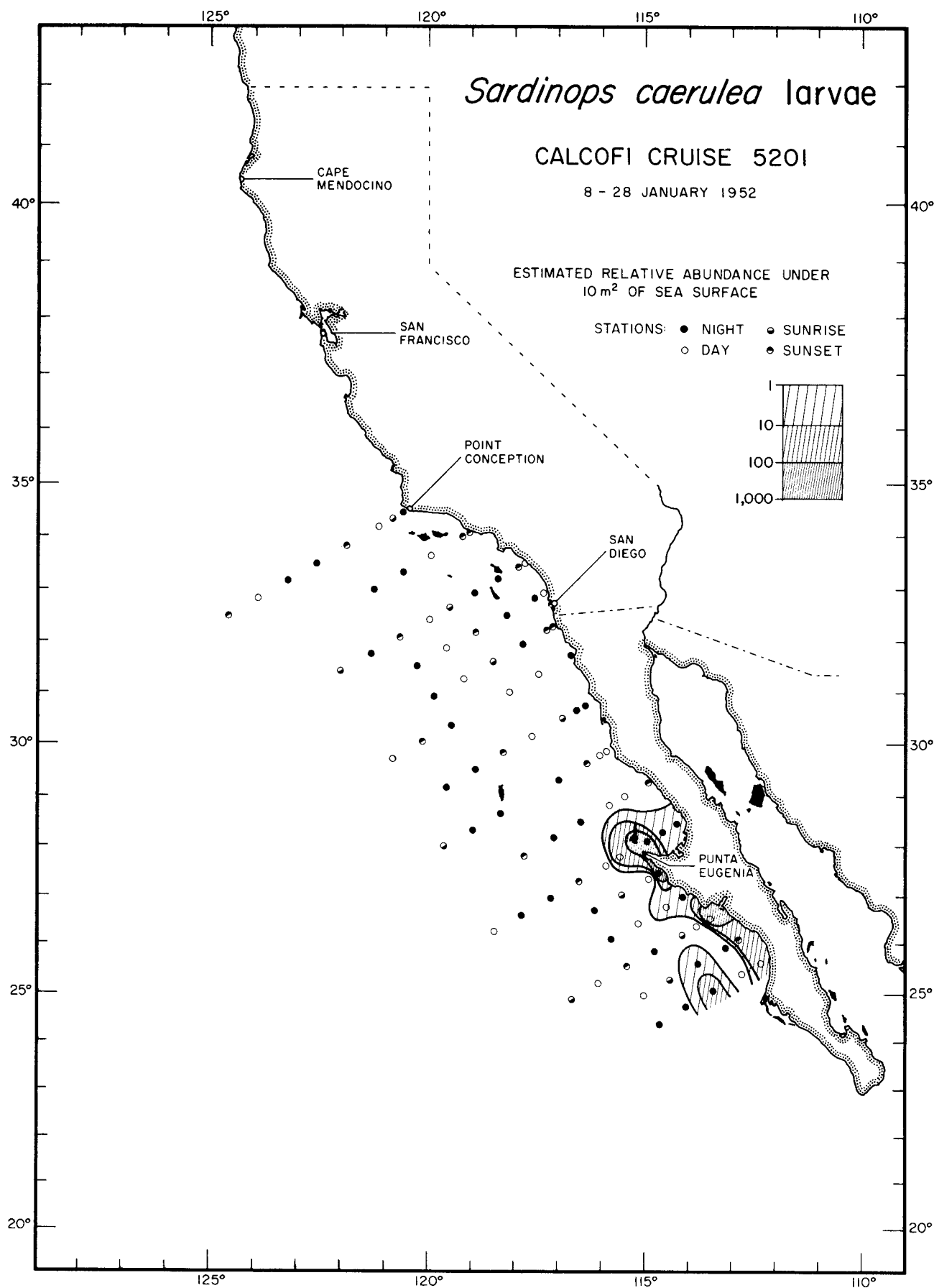
Sardinops caerulea larvae

5101



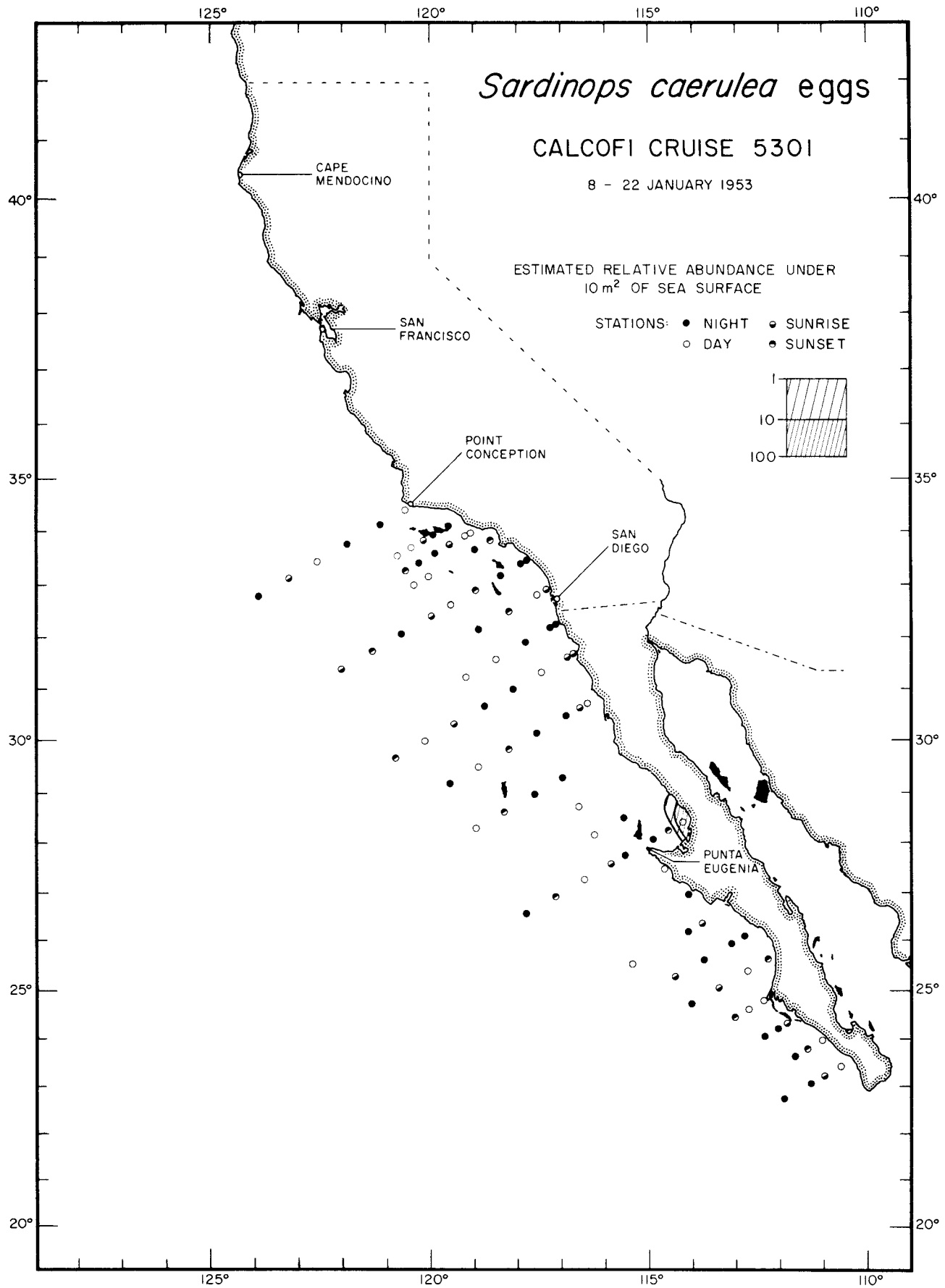
Sardinops caerulea eggs

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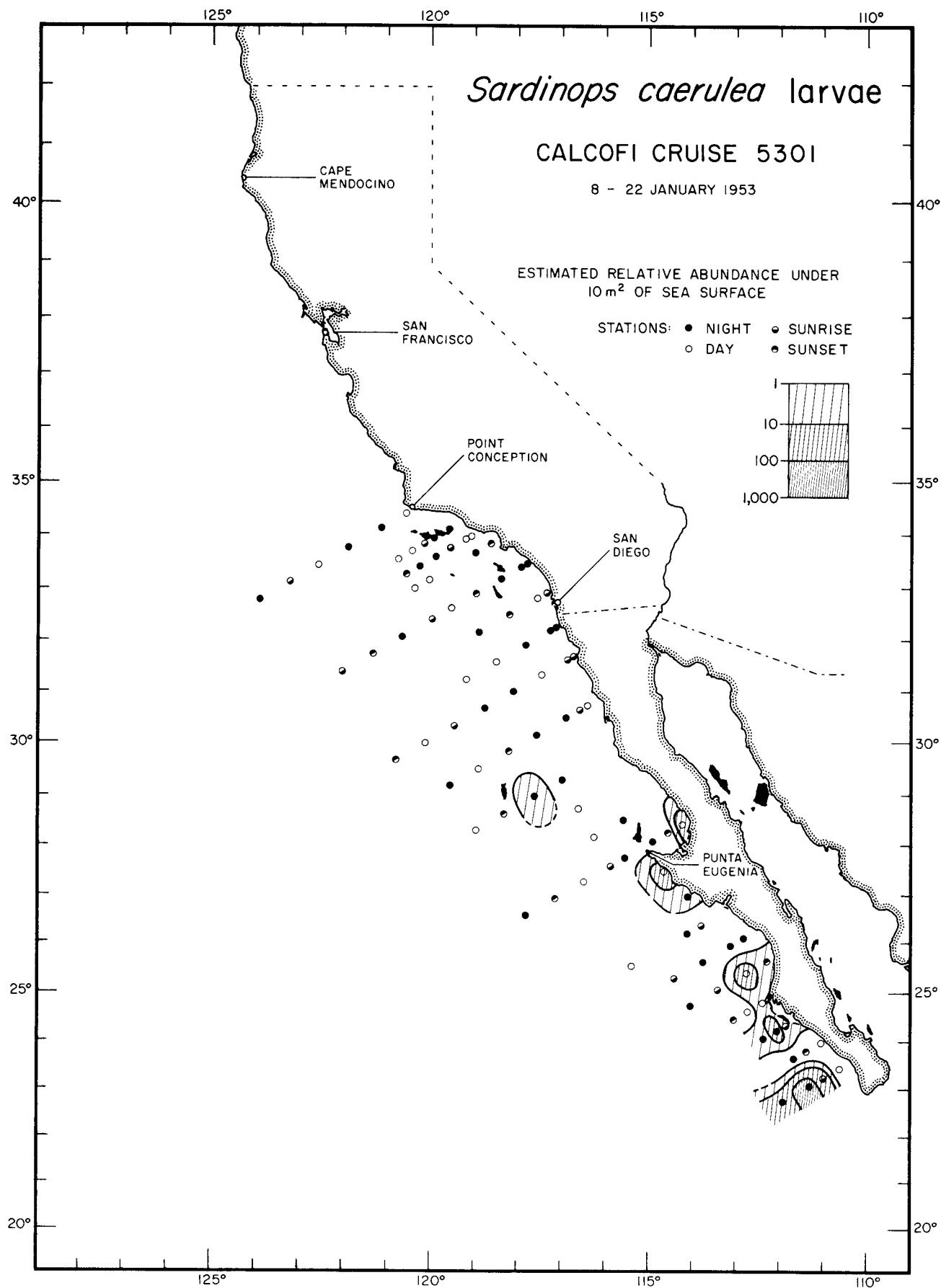
Sardinops caerulea larvae

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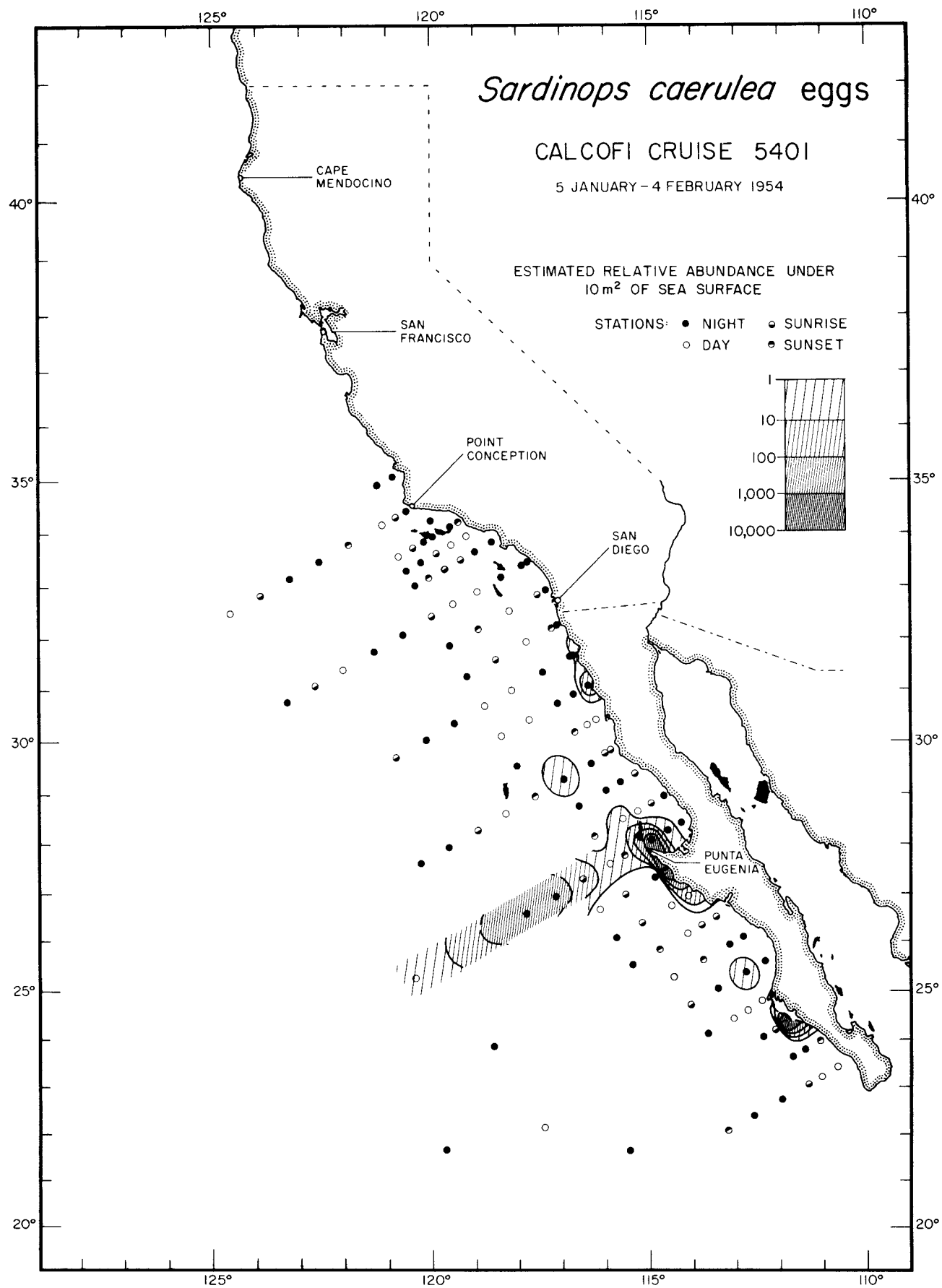
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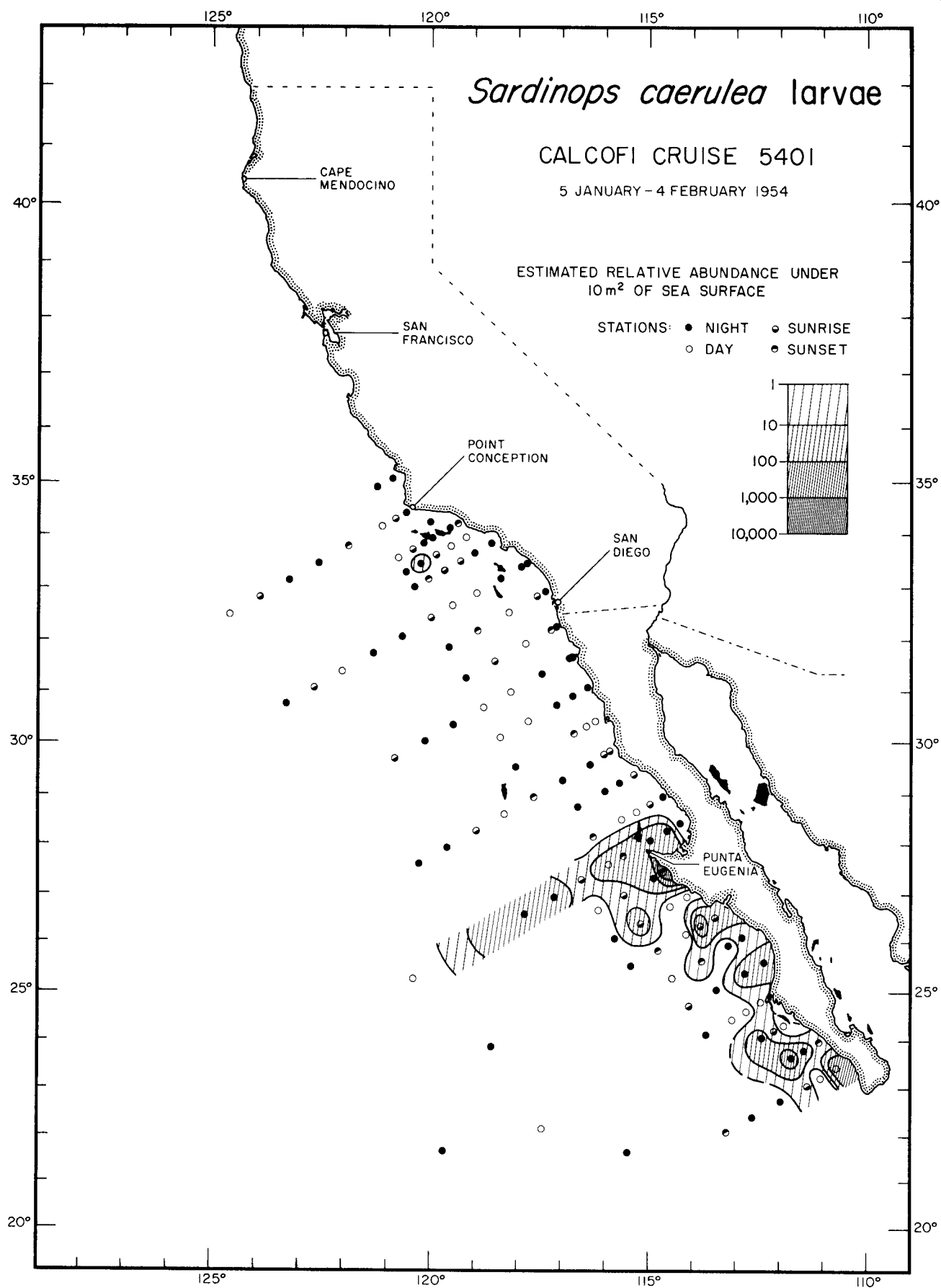
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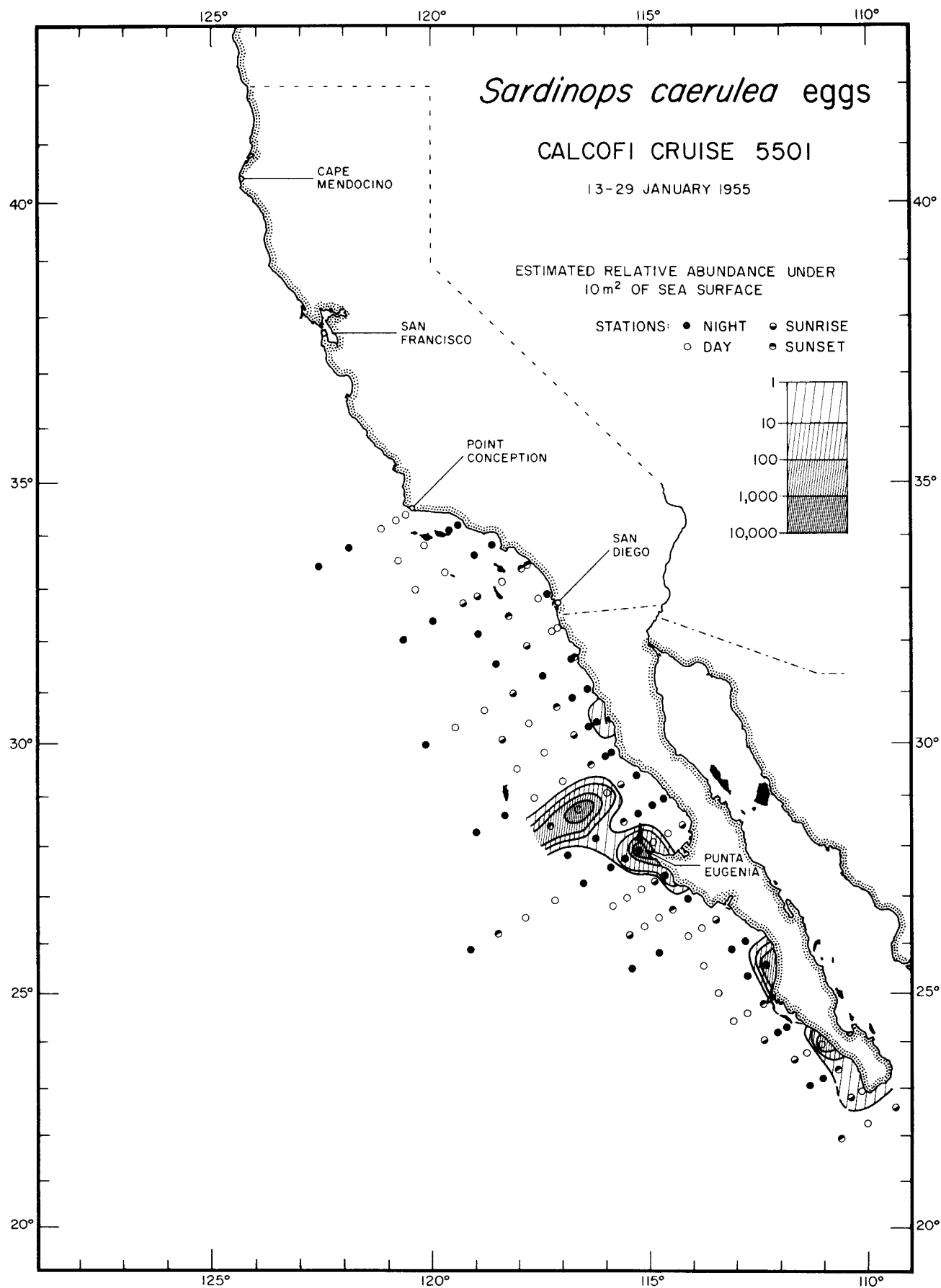
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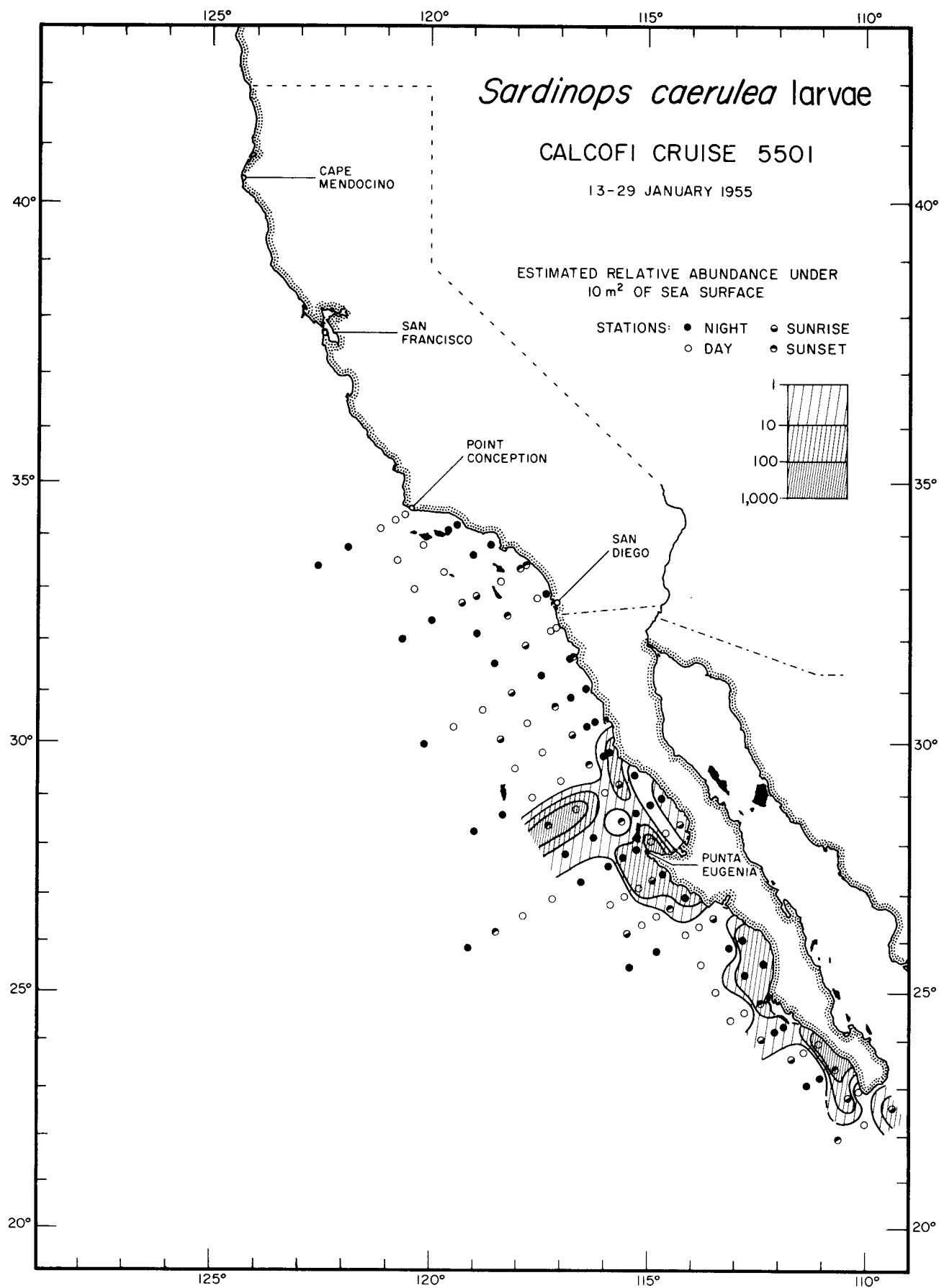
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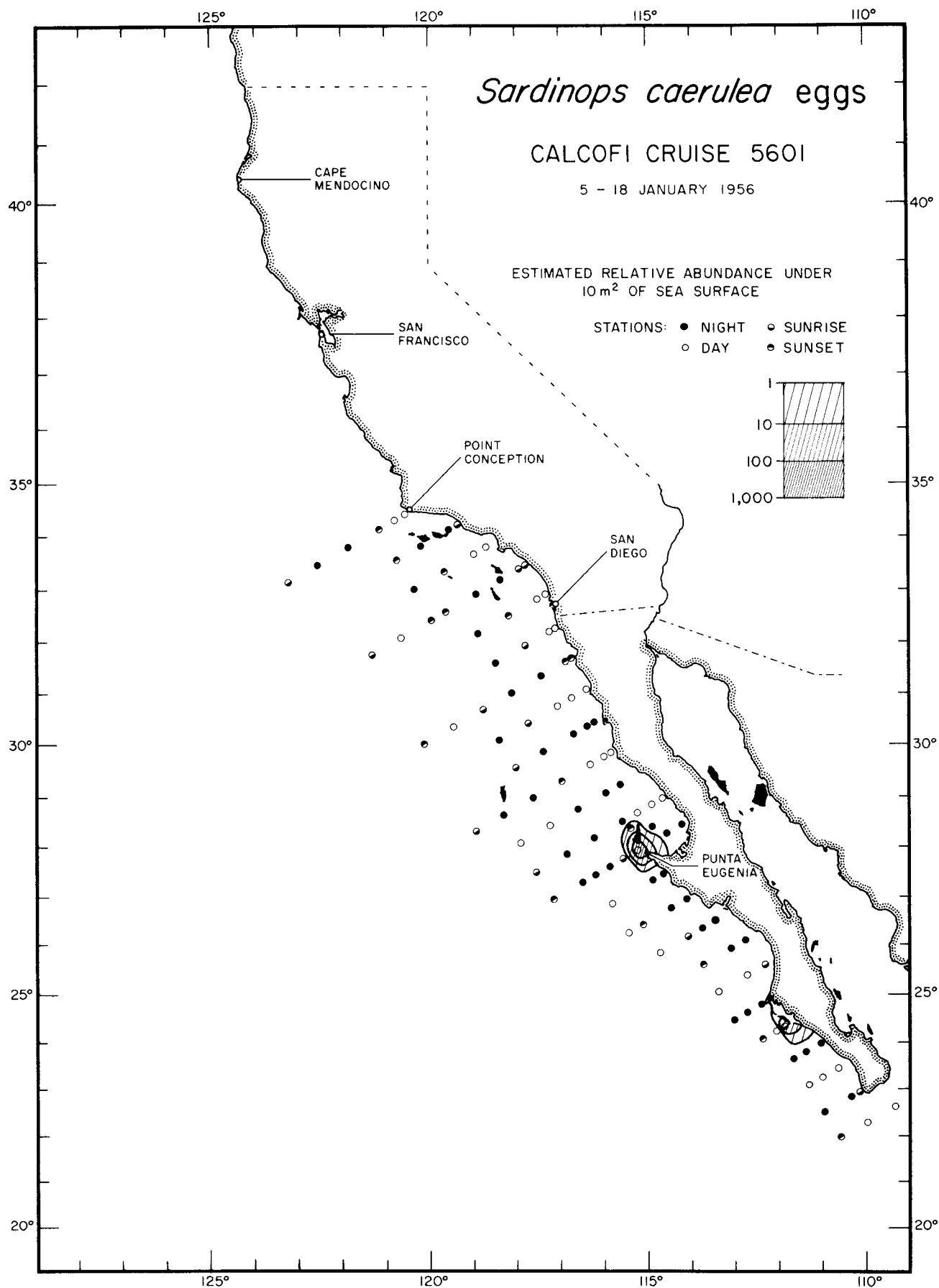
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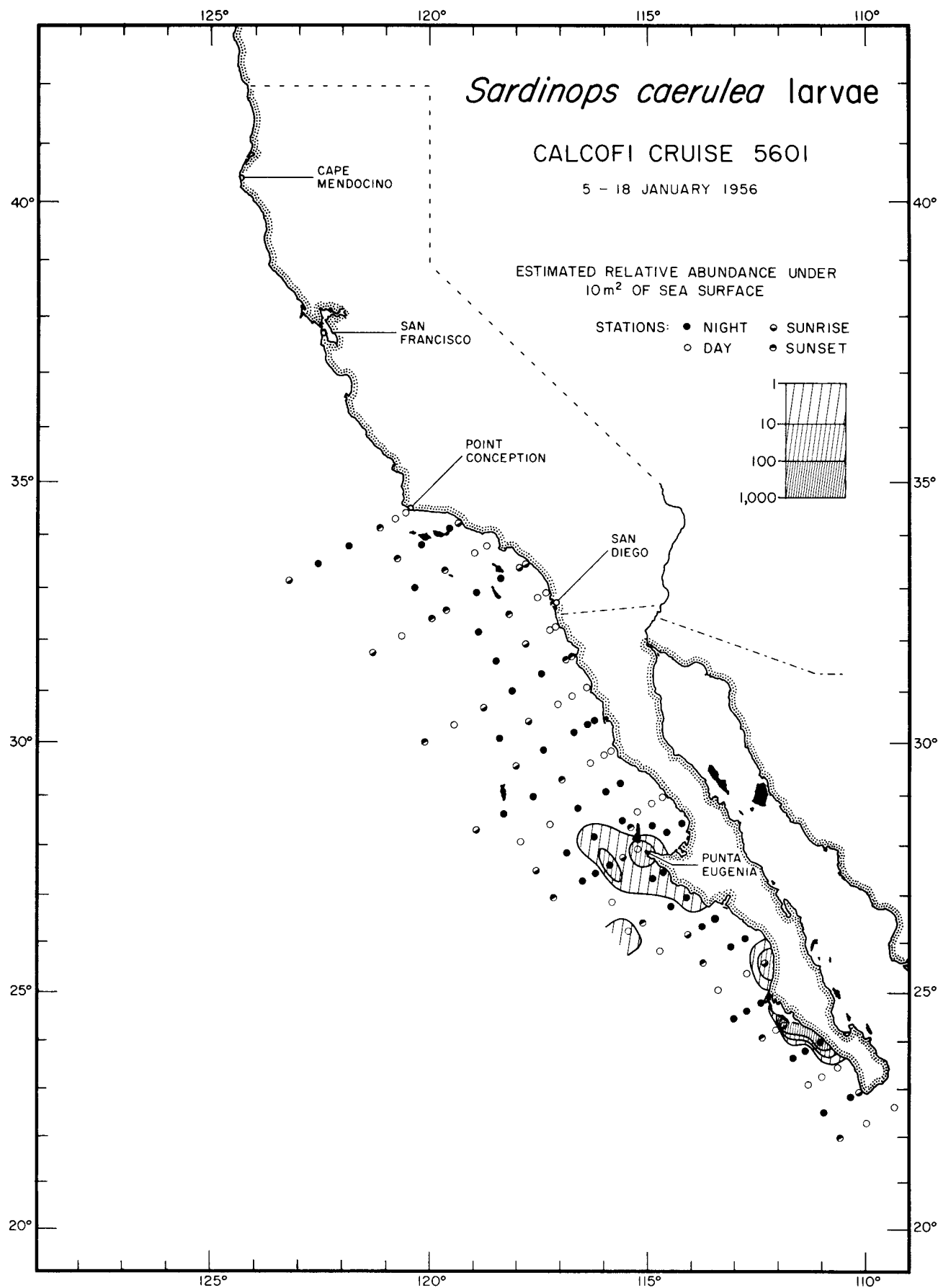
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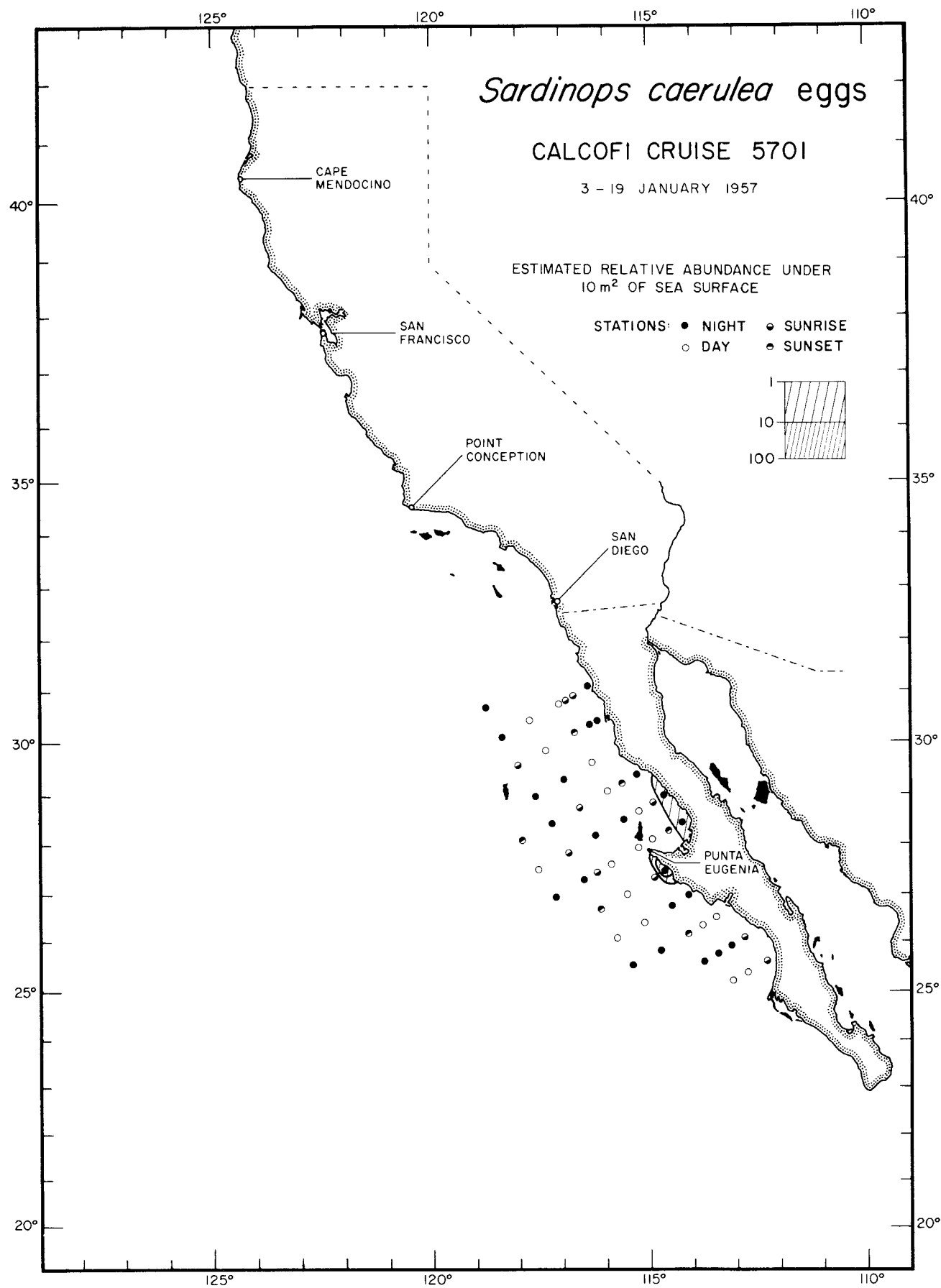


Sardinops caerulea eggs

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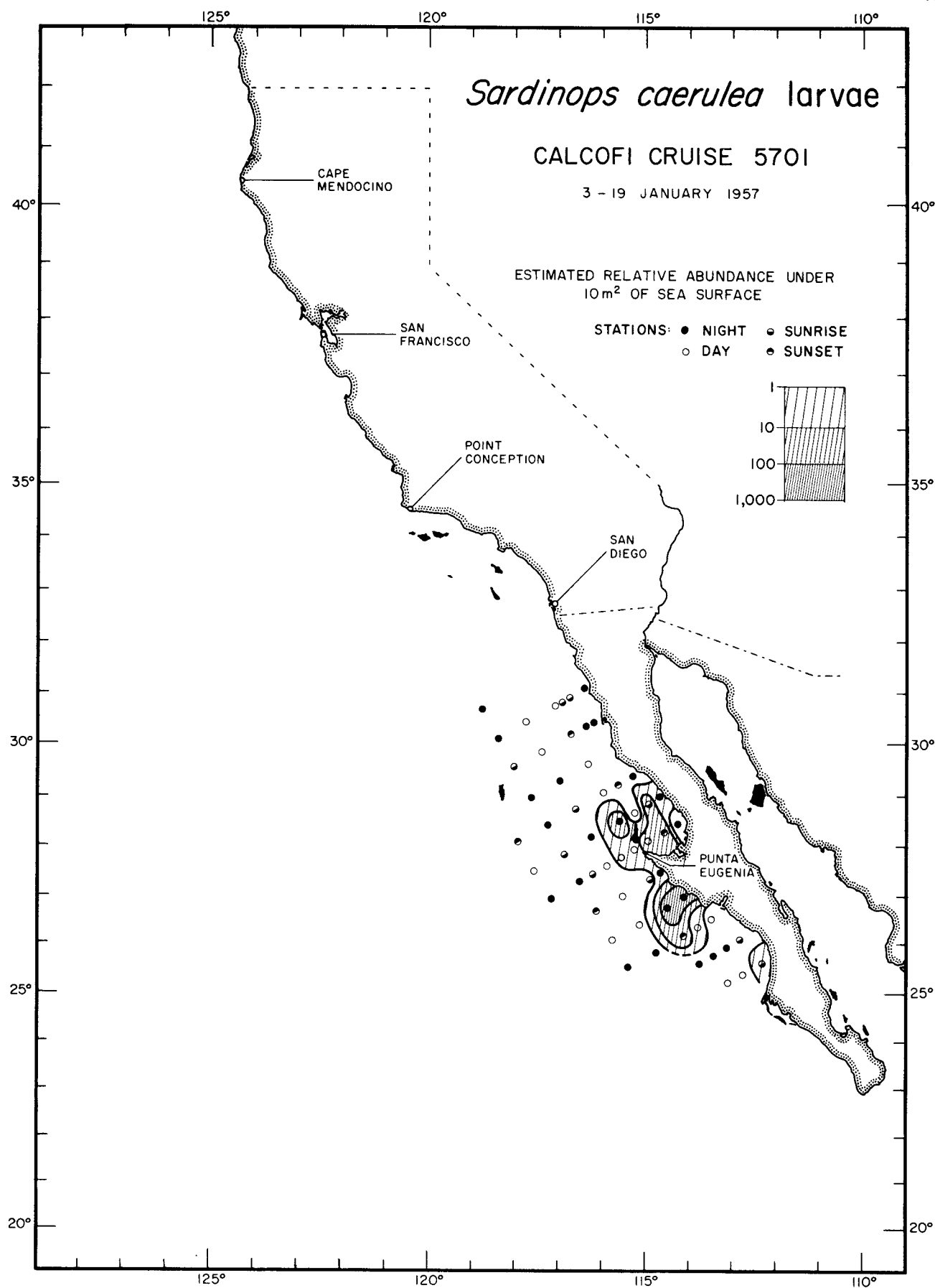
*Sardinops caerulea* larvae

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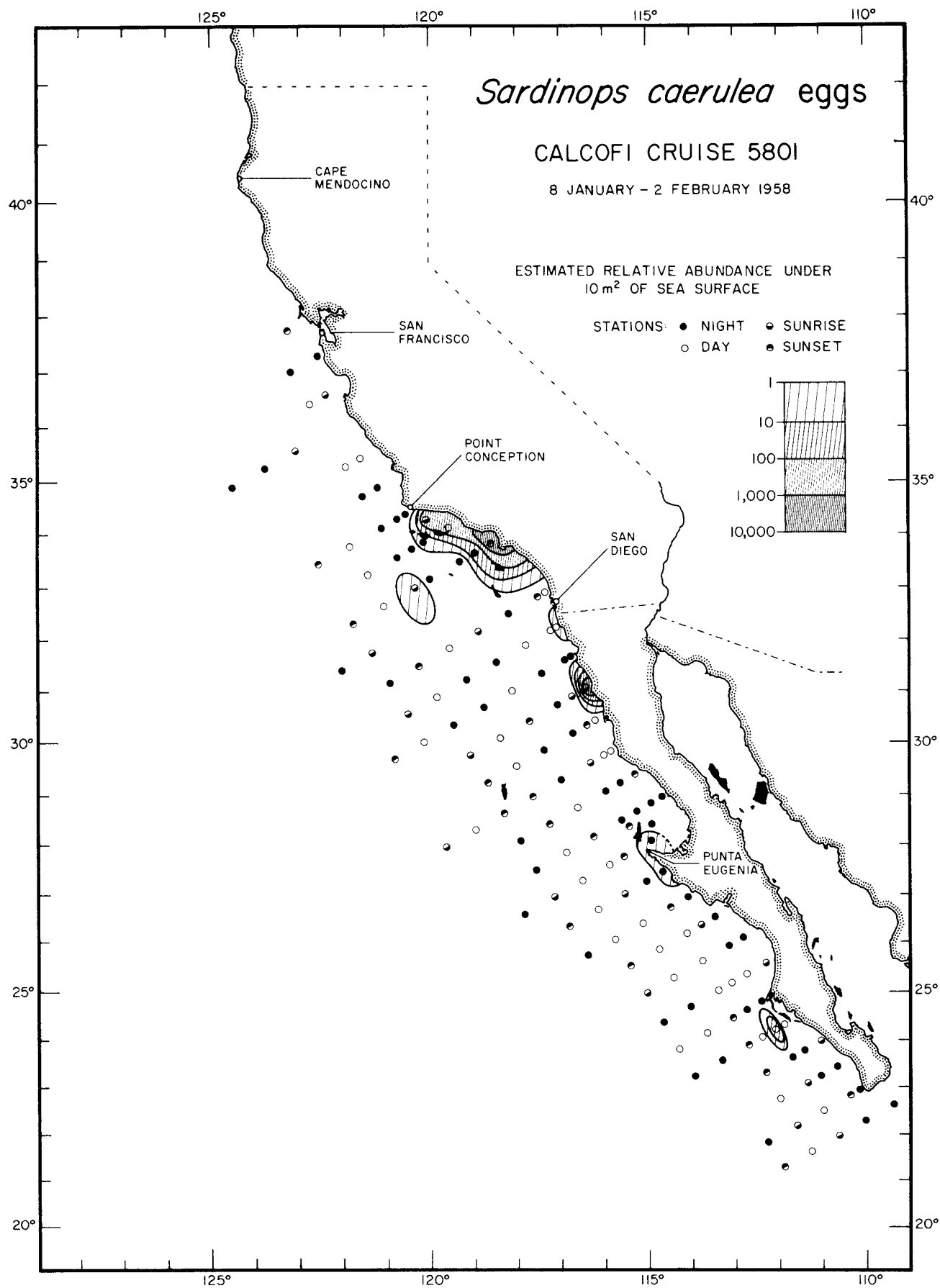
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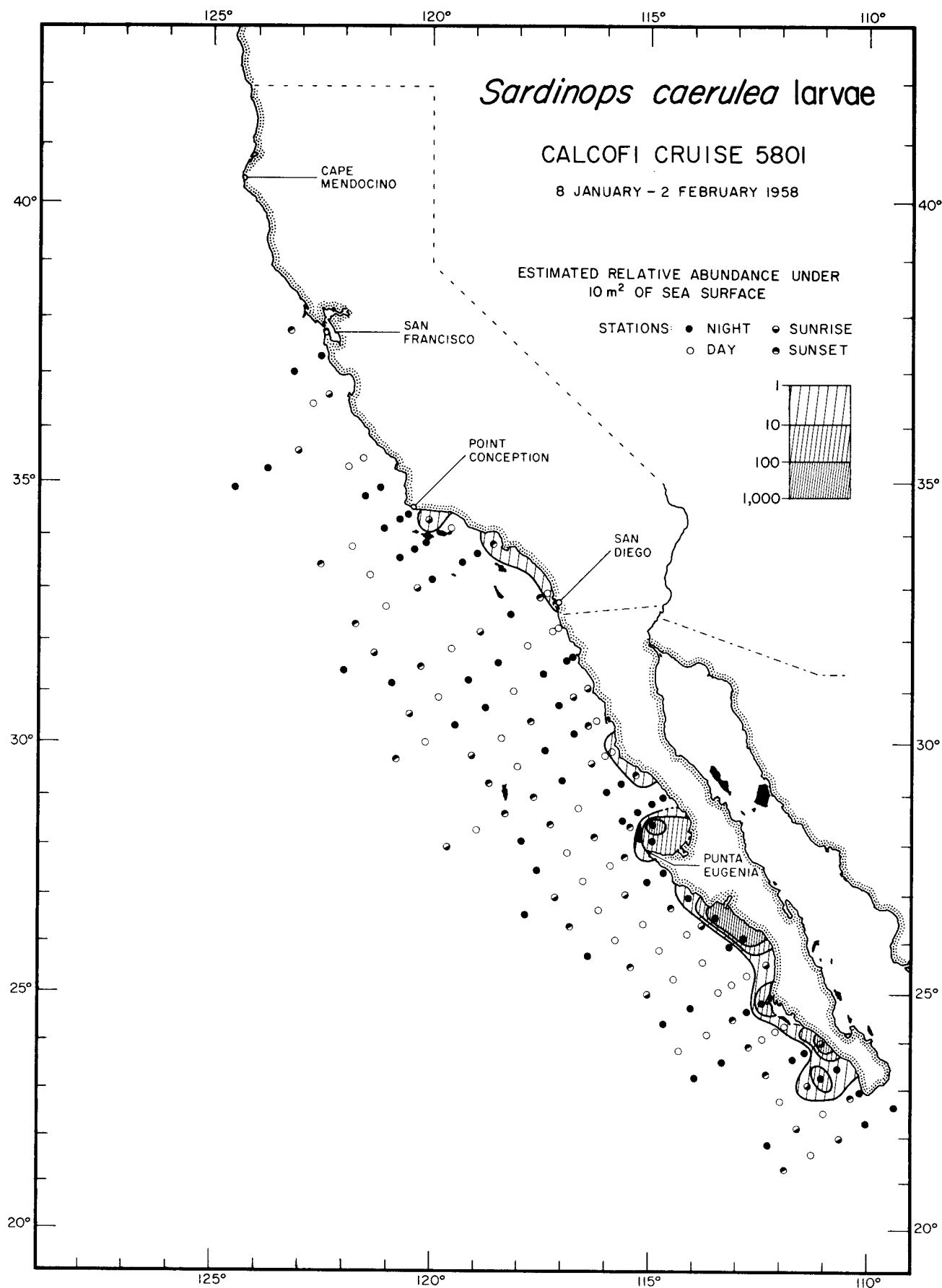
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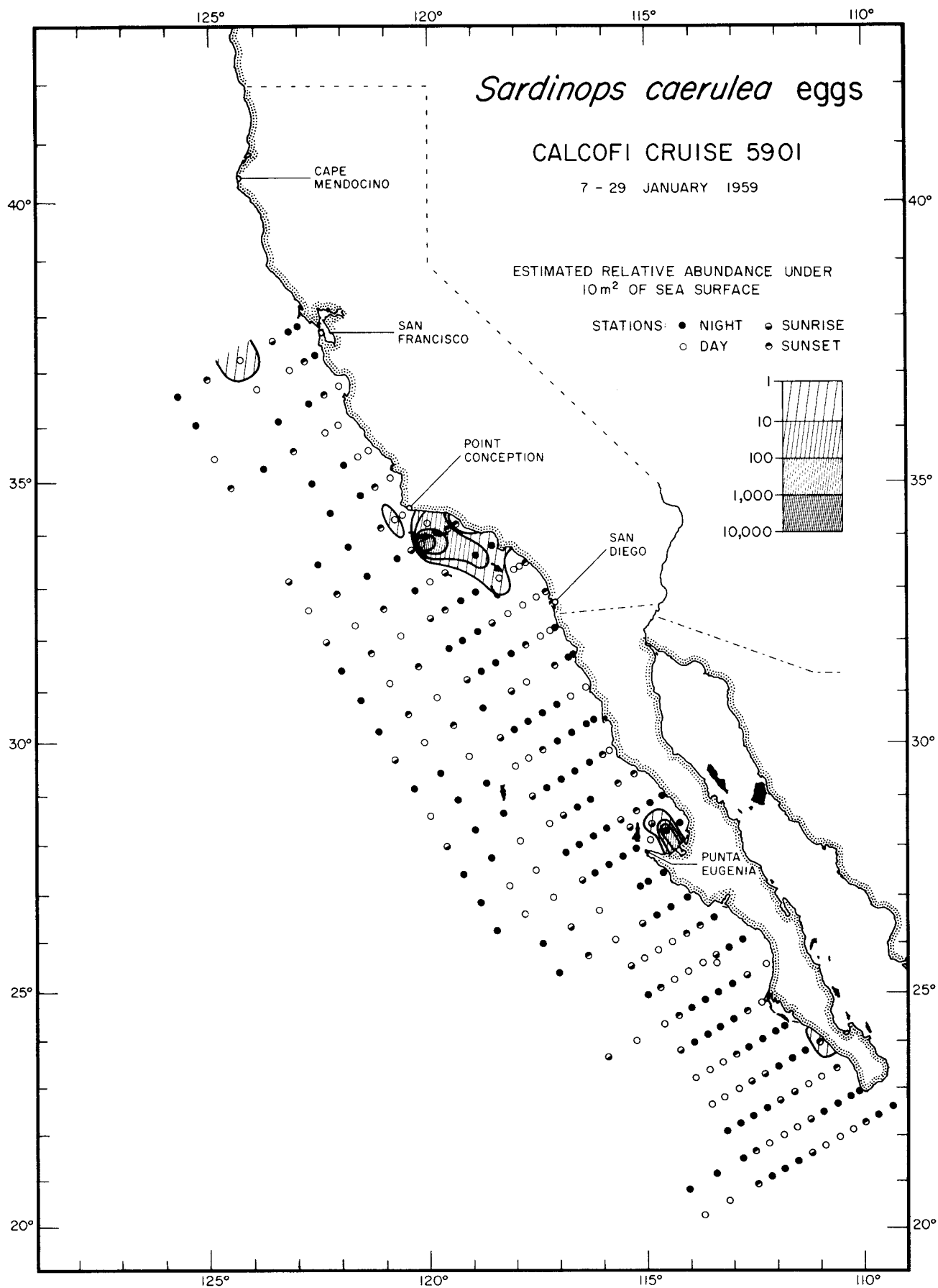
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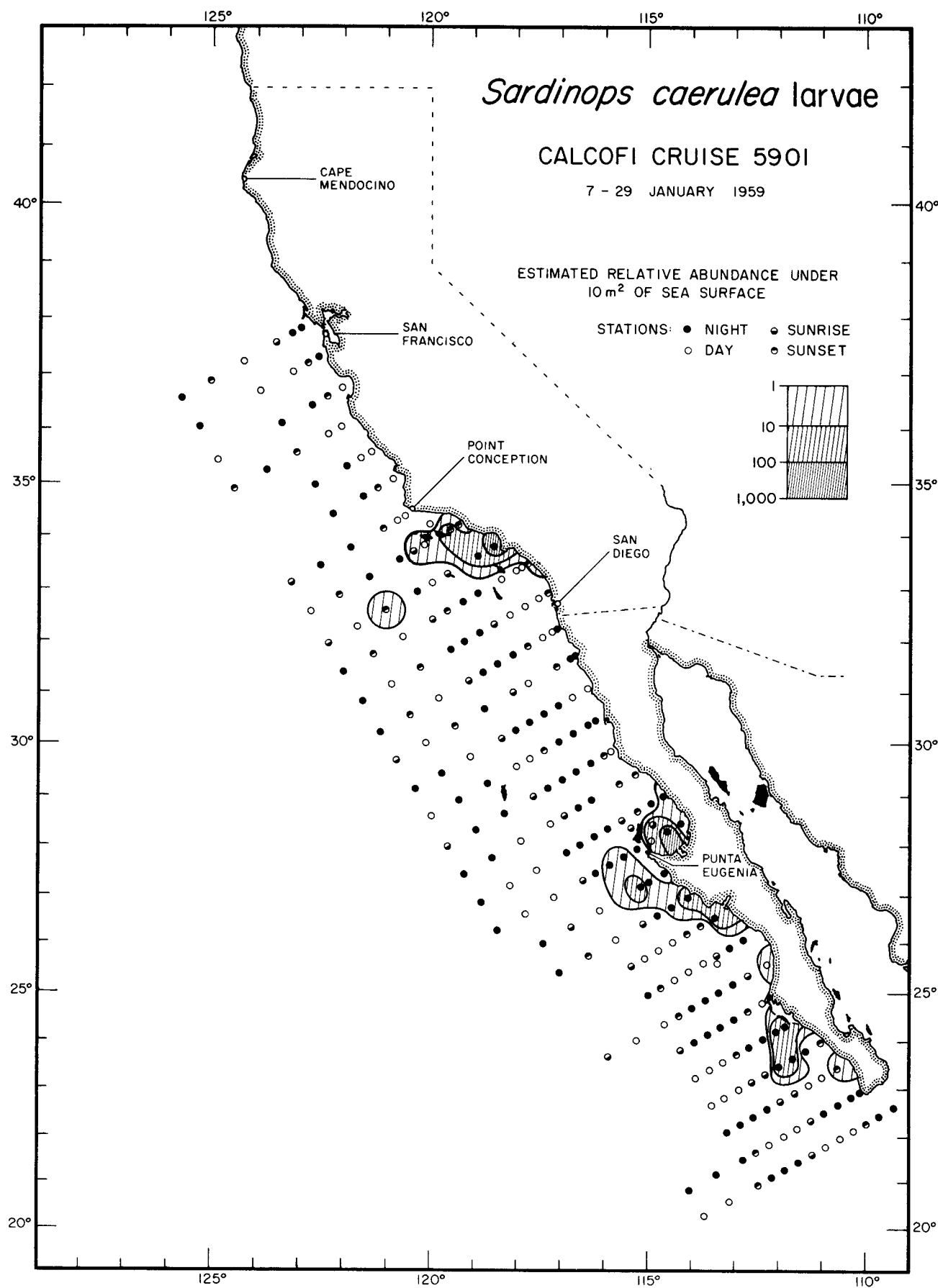
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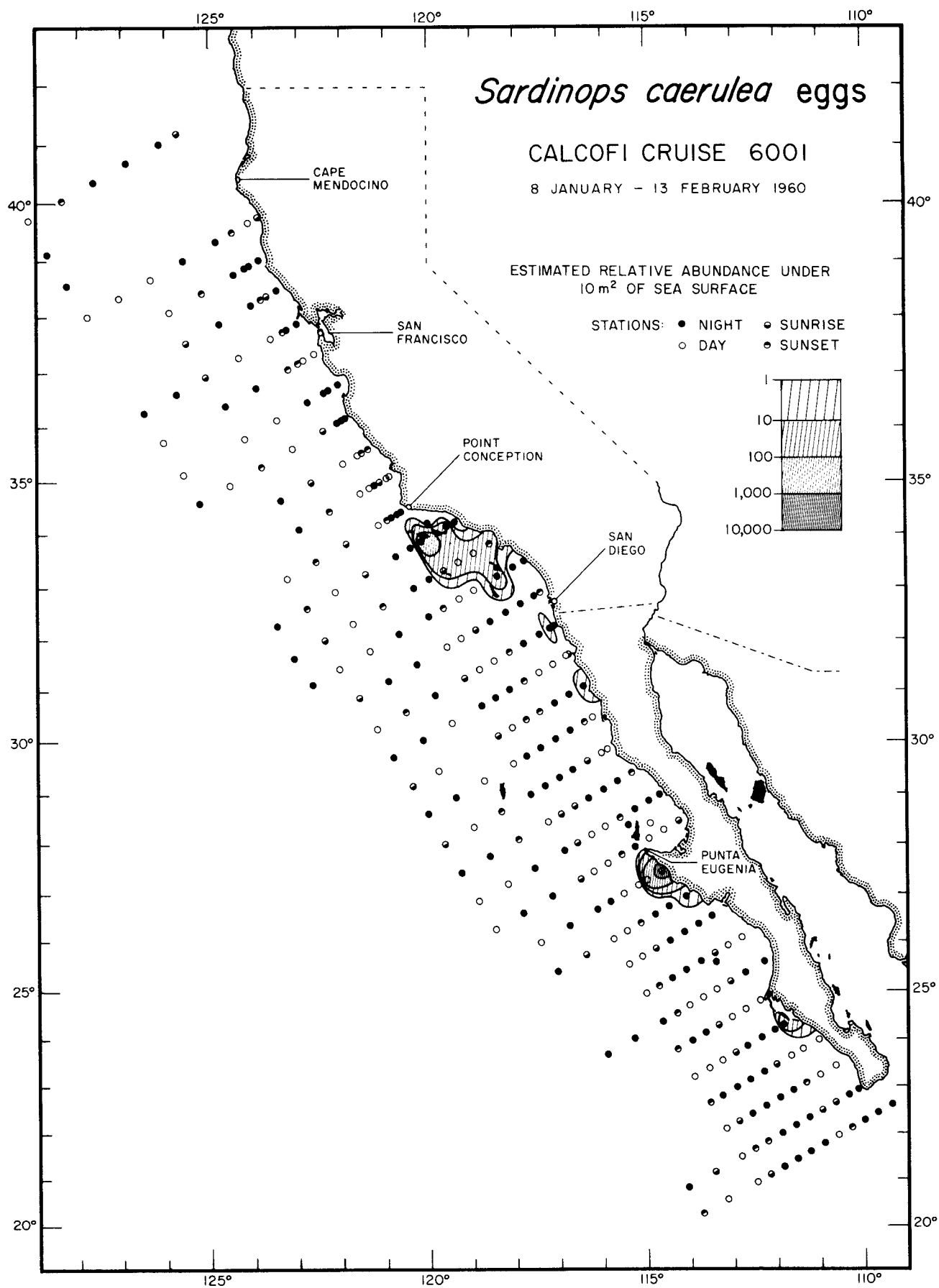
Sardinops caerulea eggs

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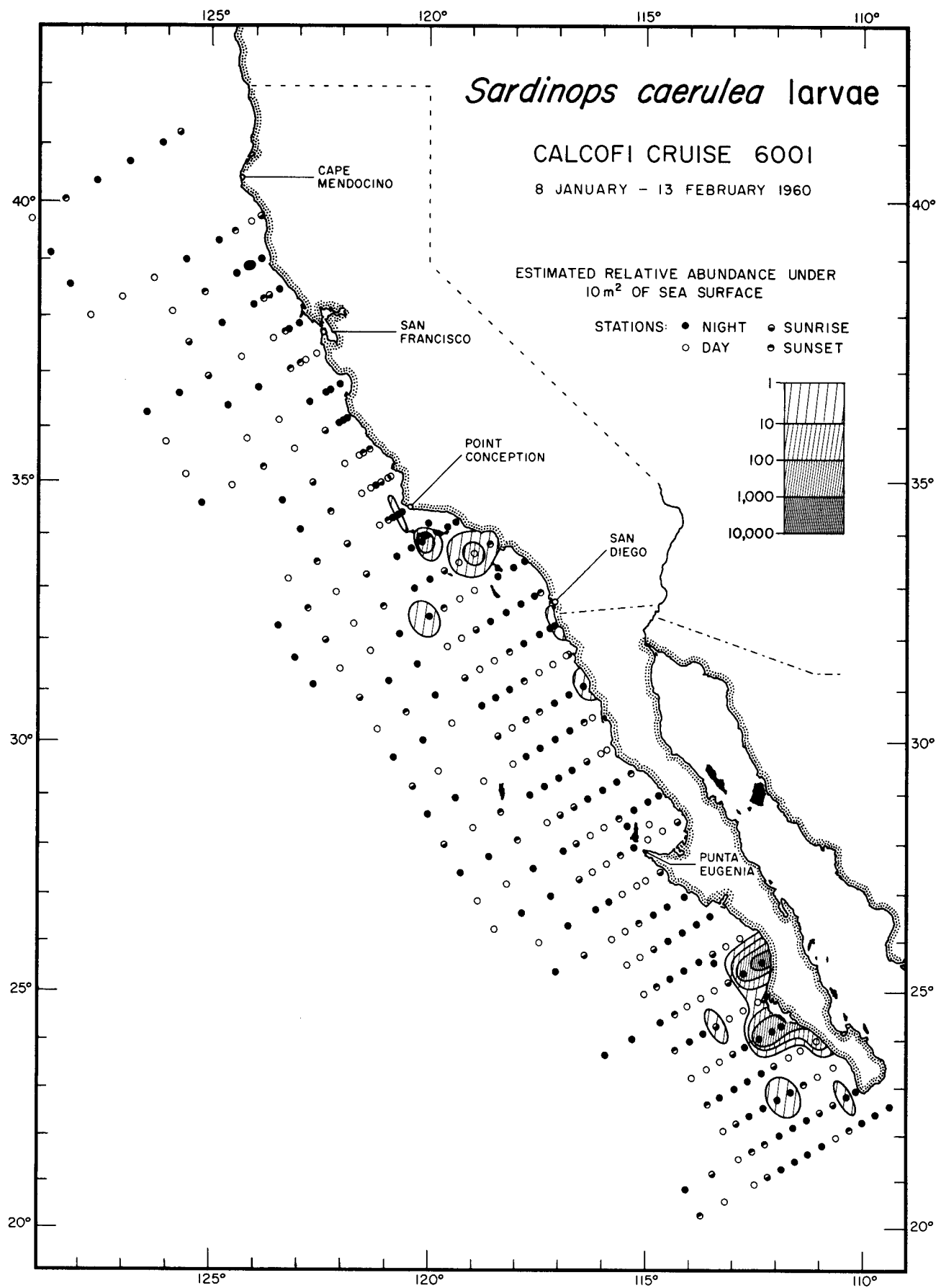
Sardinops caerulea larvae

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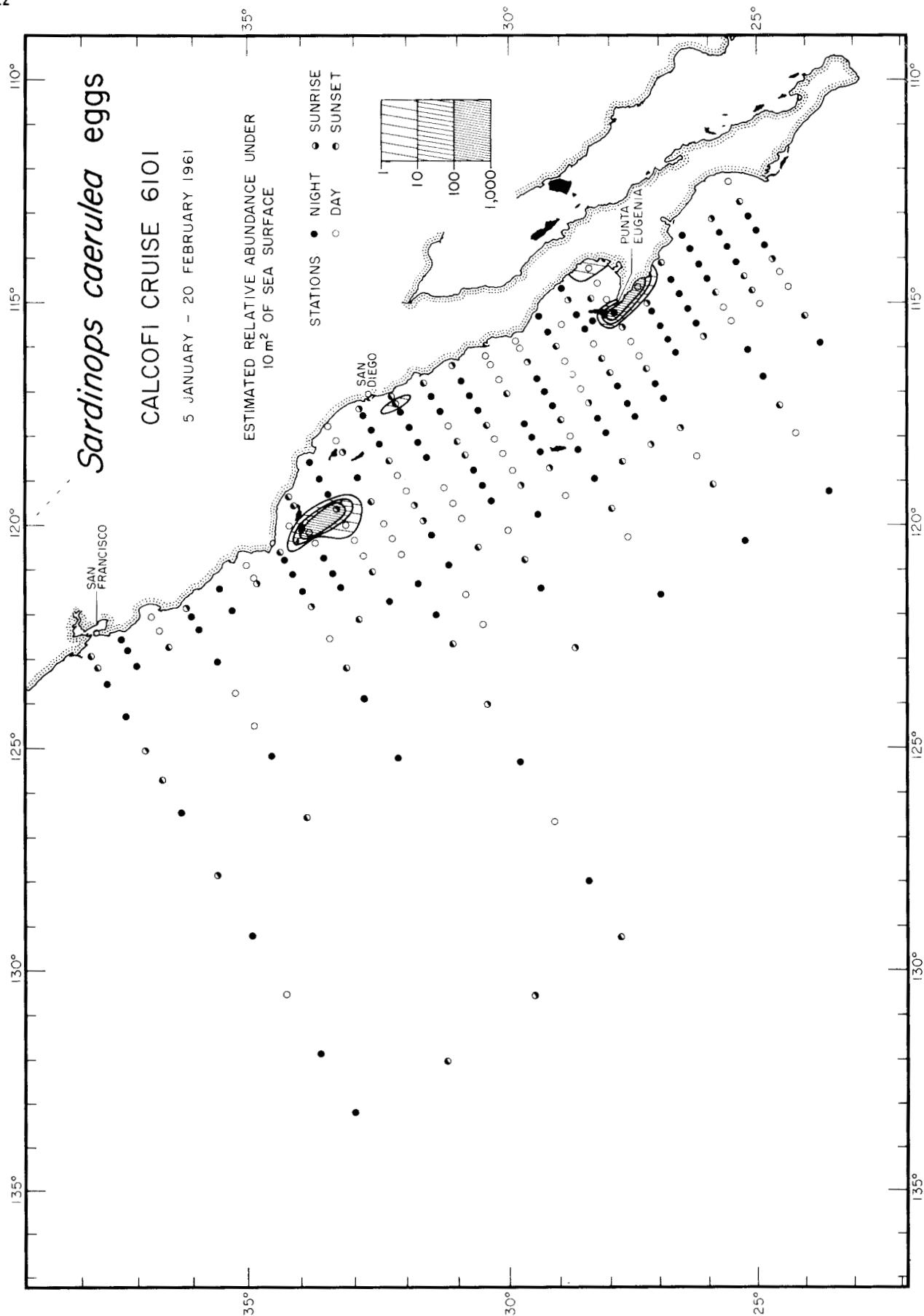
Sardinops caerulea eggs

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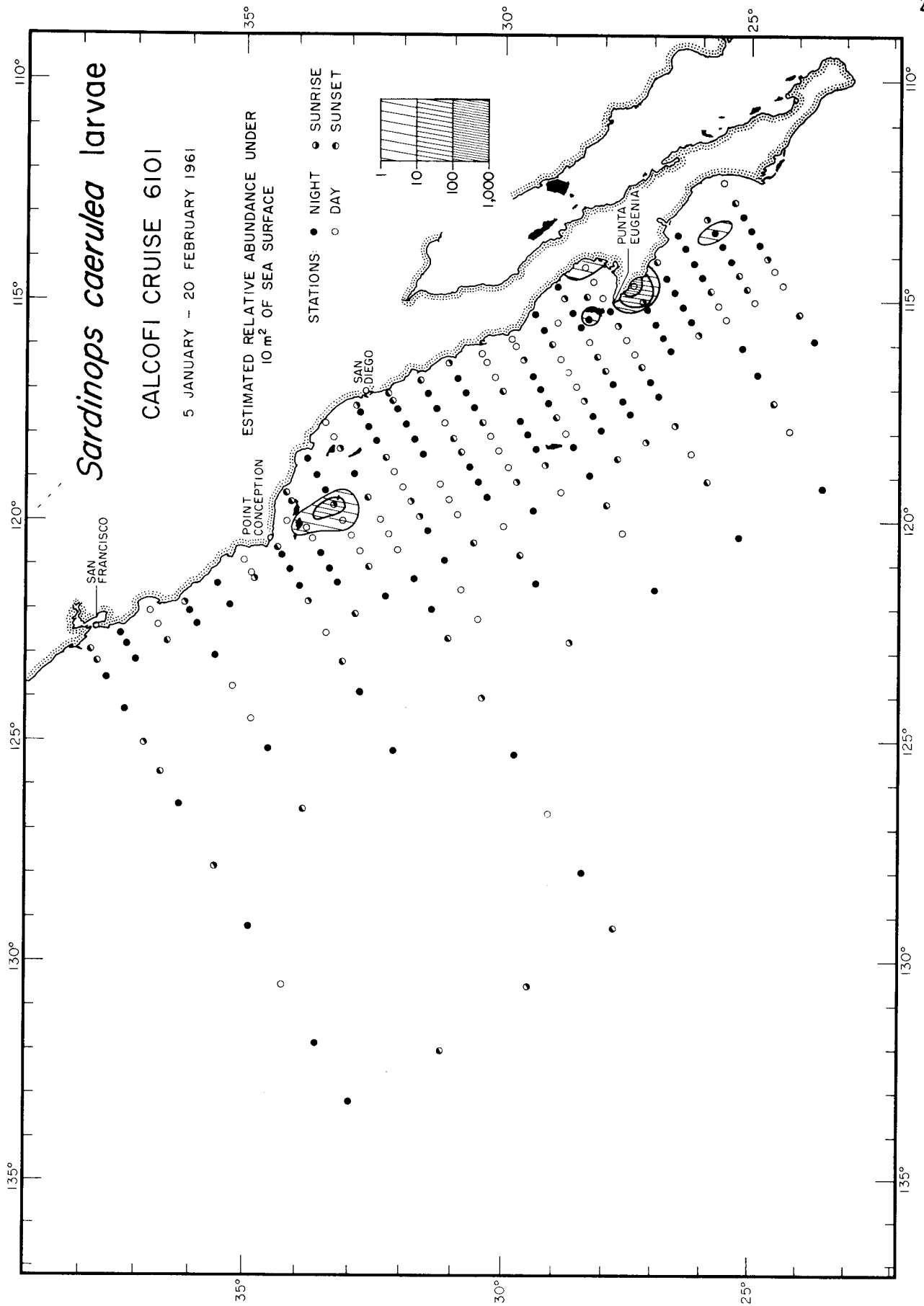
Sardinops caerulea larvae

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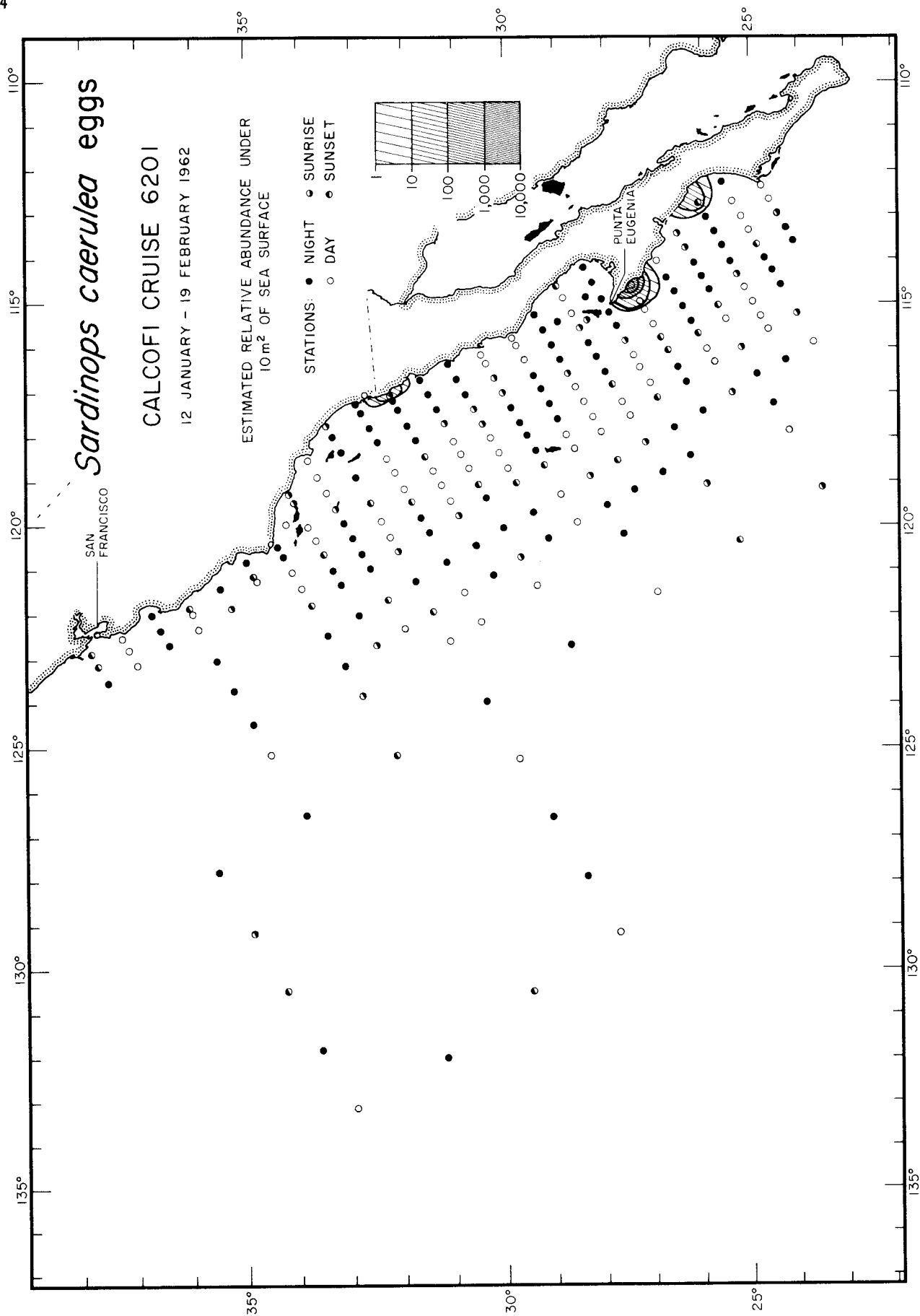


Sardinops caerulea eggs

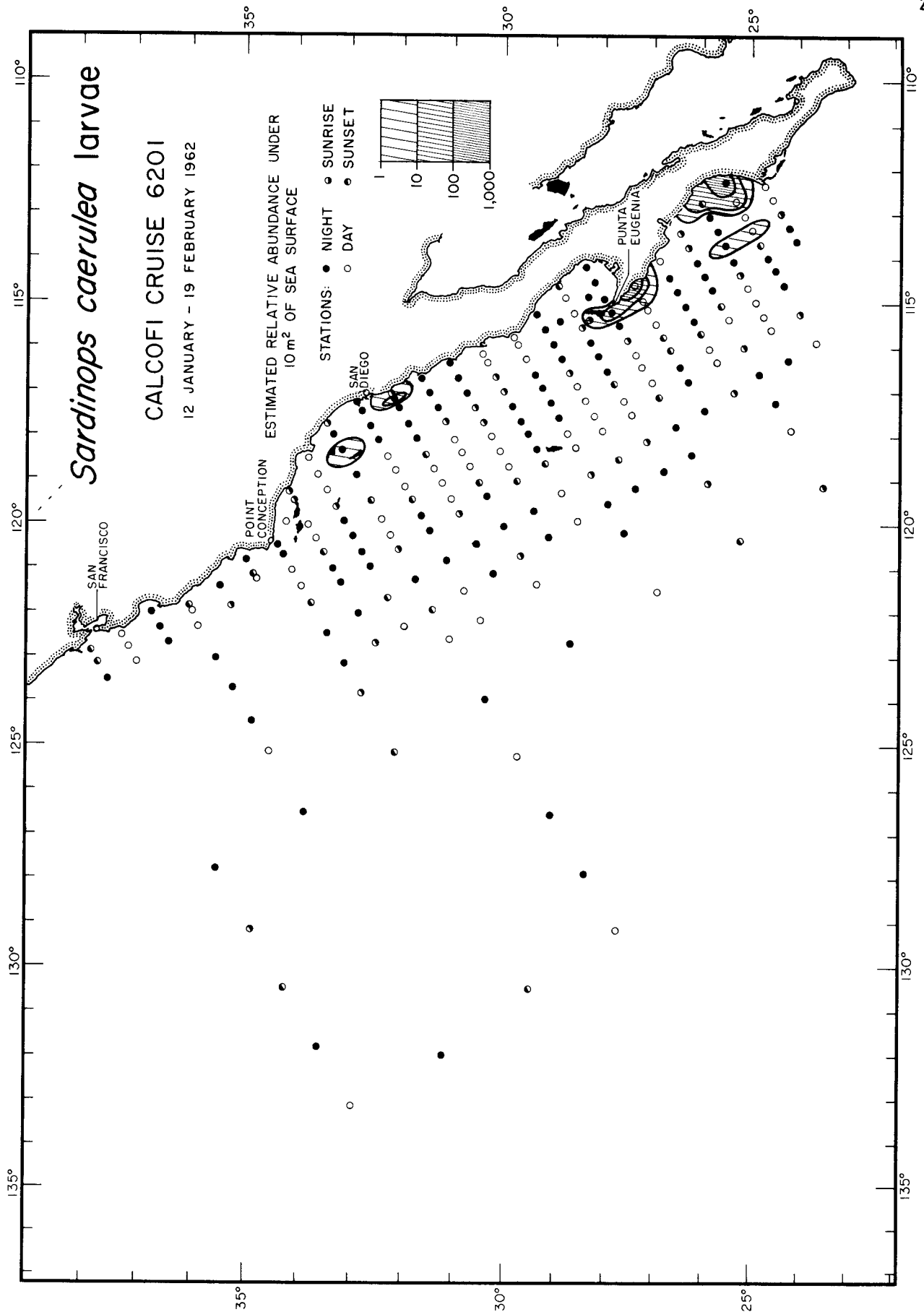
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*Sardinops caerulea* larvae

6101

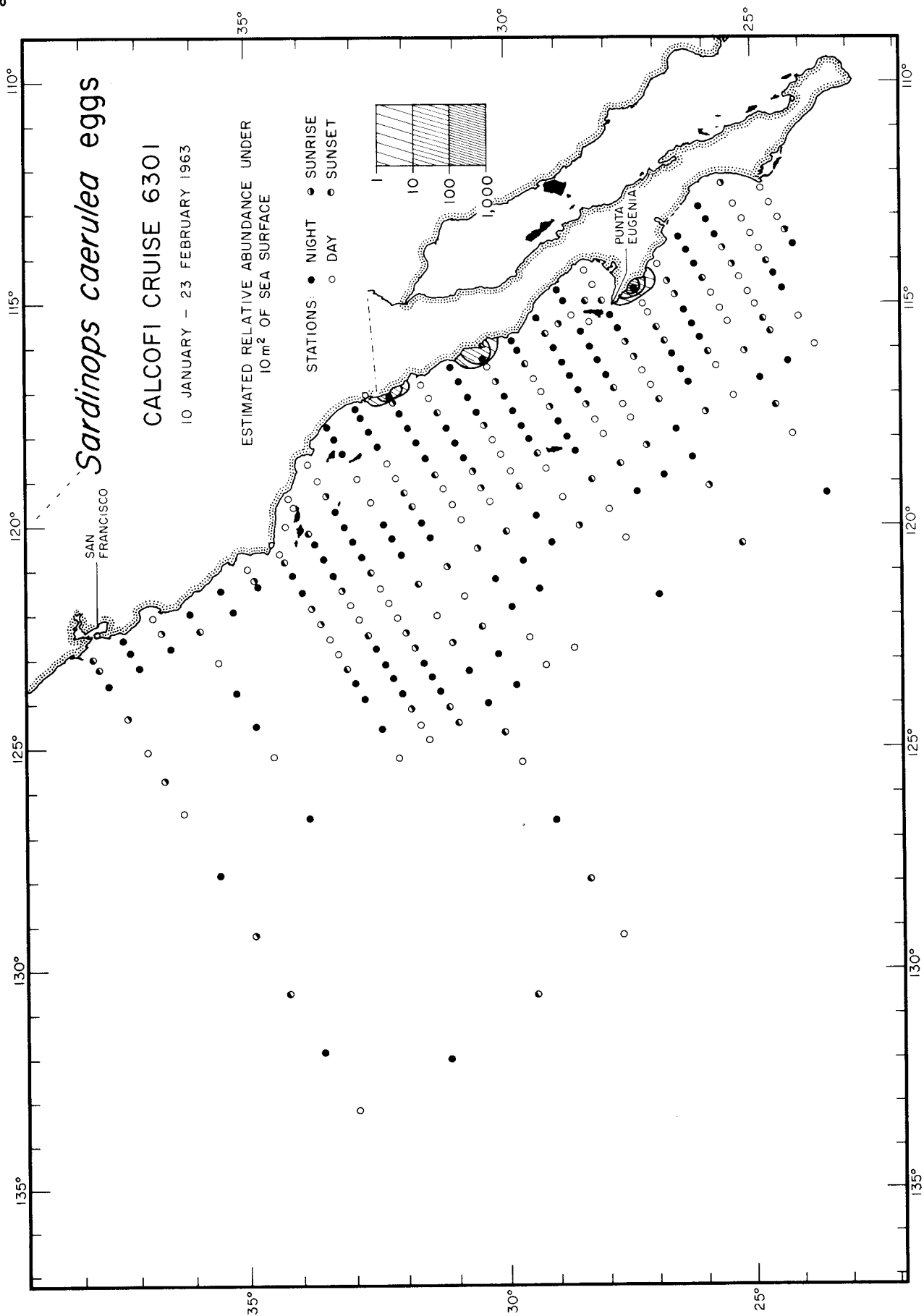
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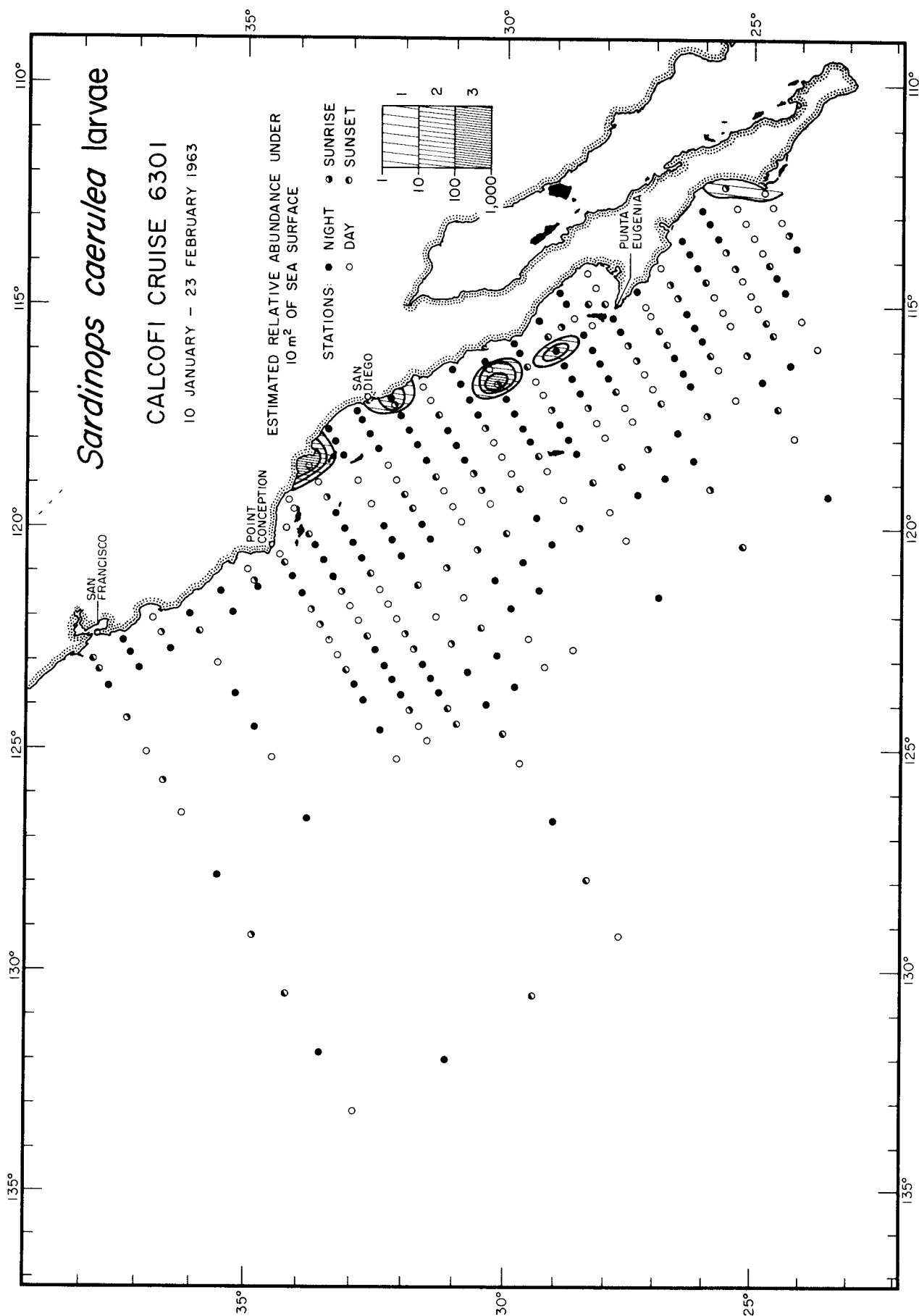


Sardinops caerulea larvae

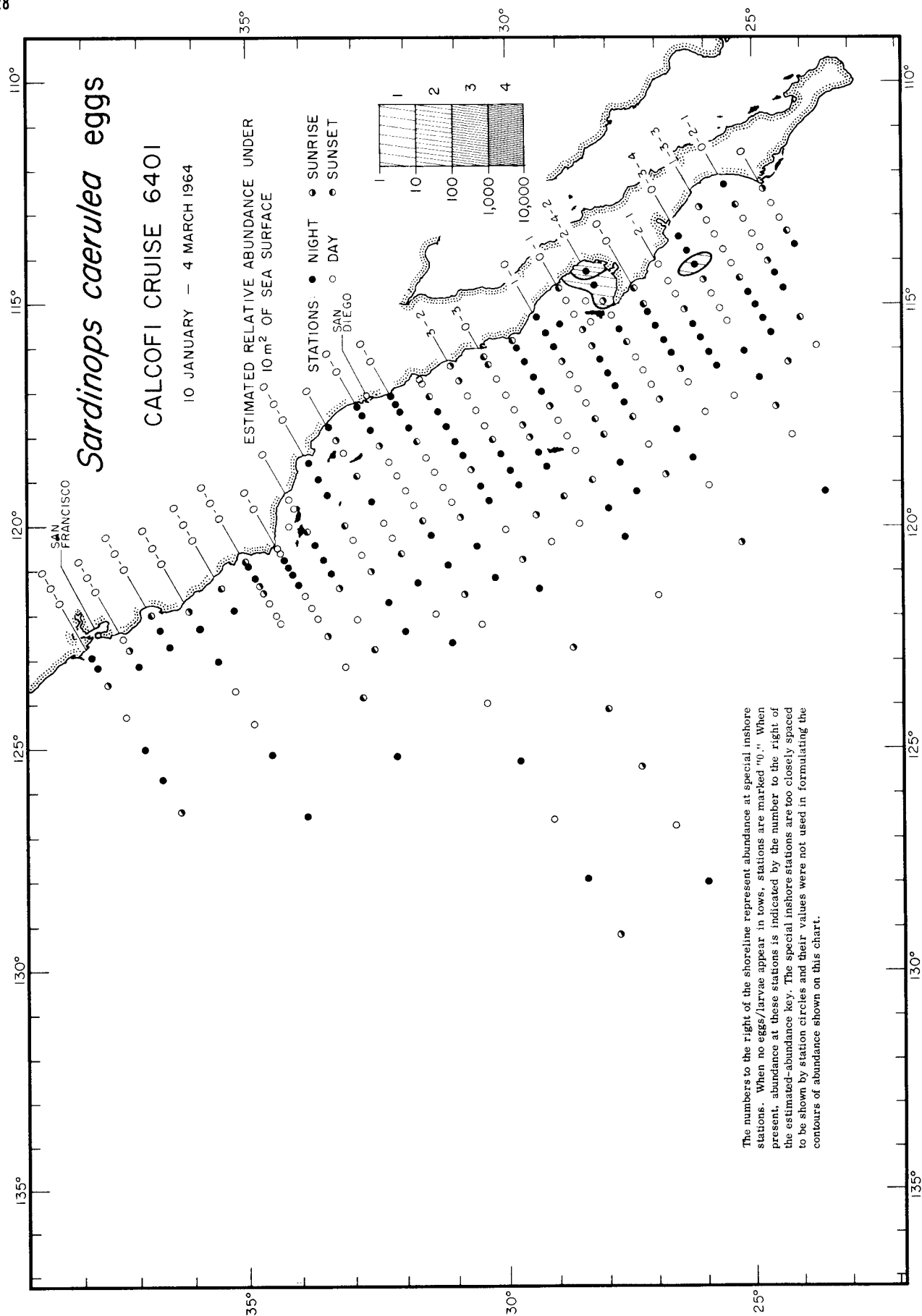
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*Sardinops caerulea* eggs

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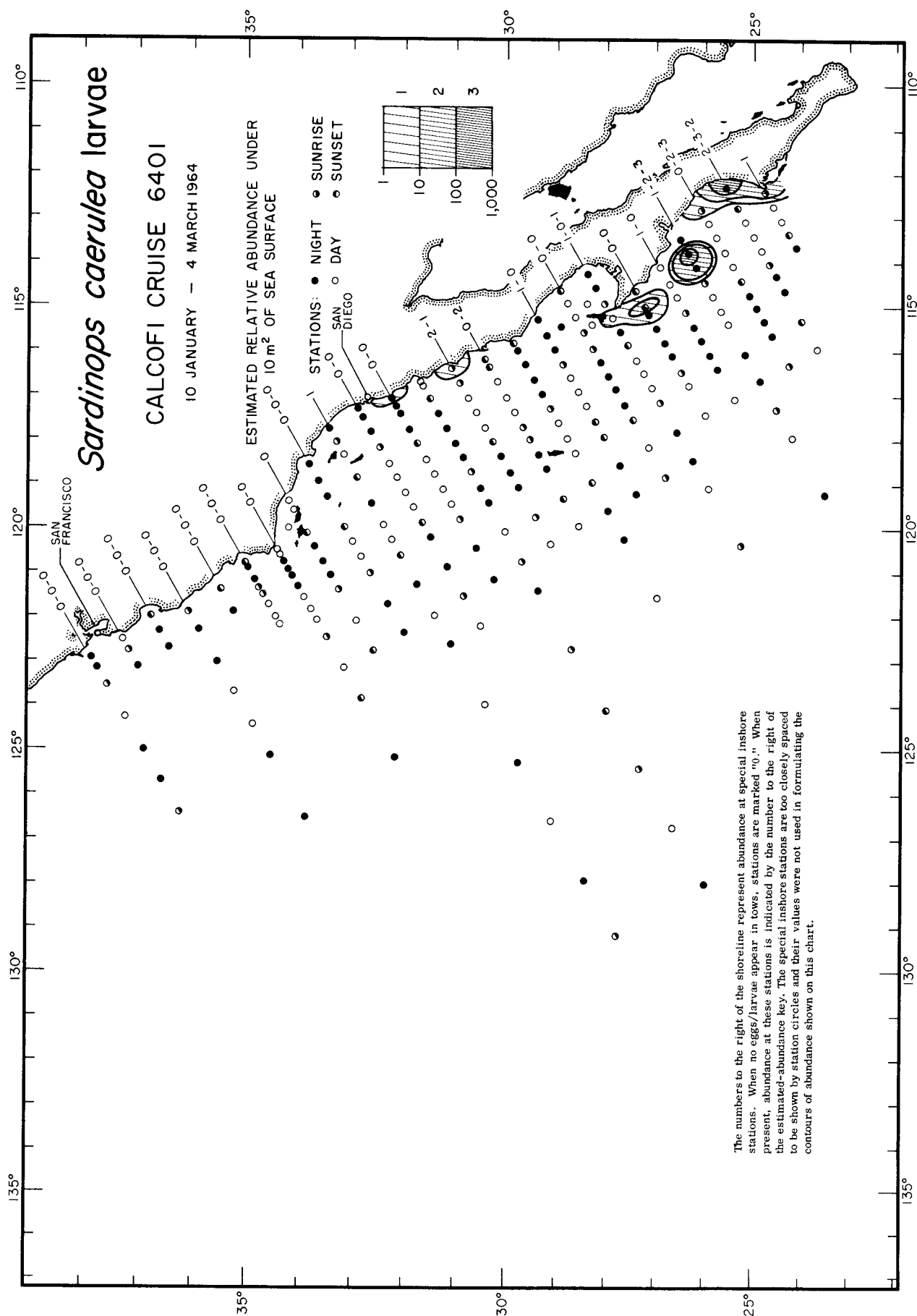
*Sardinops caerulea* larvae

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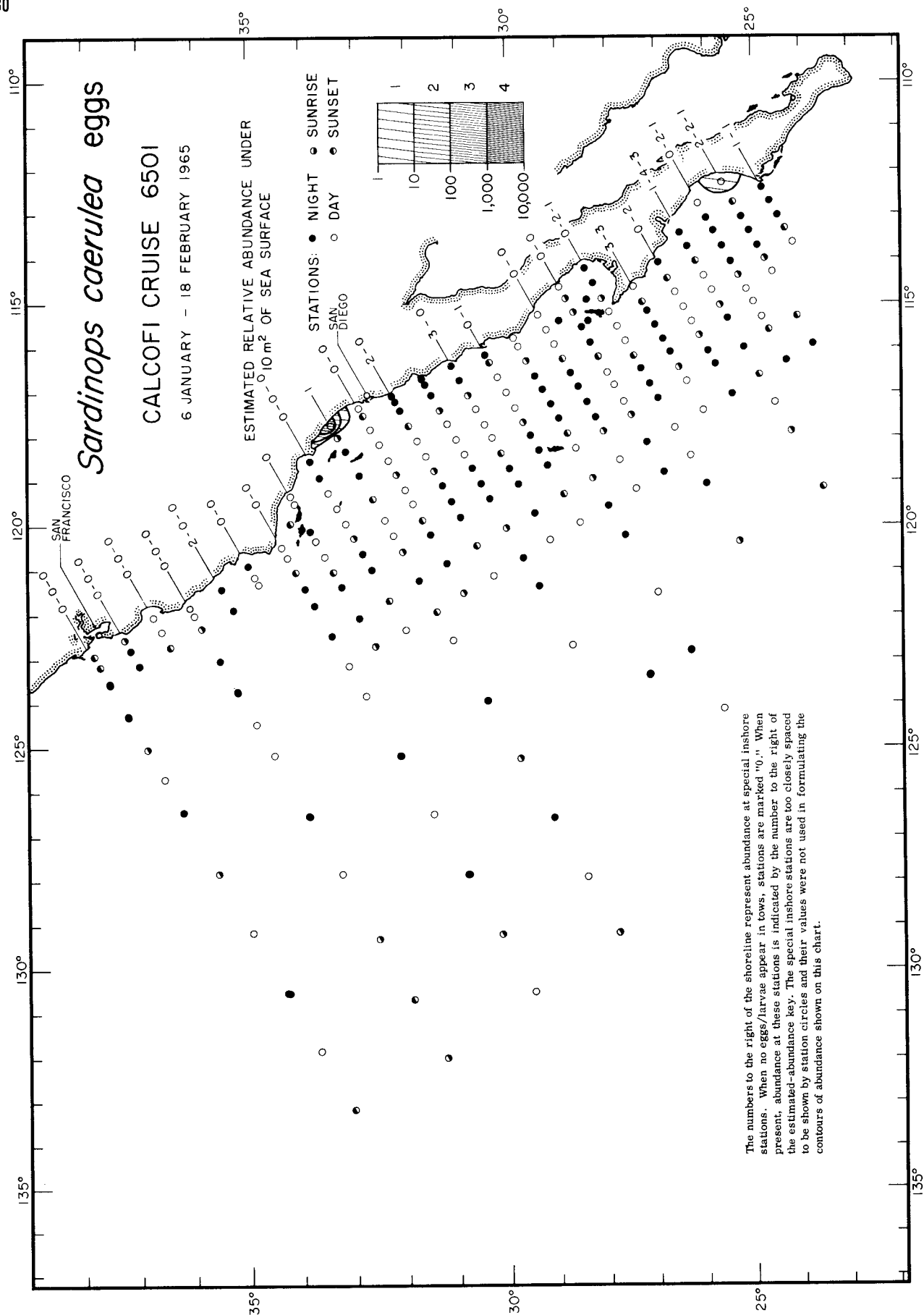


Sardinops caerulea eggs

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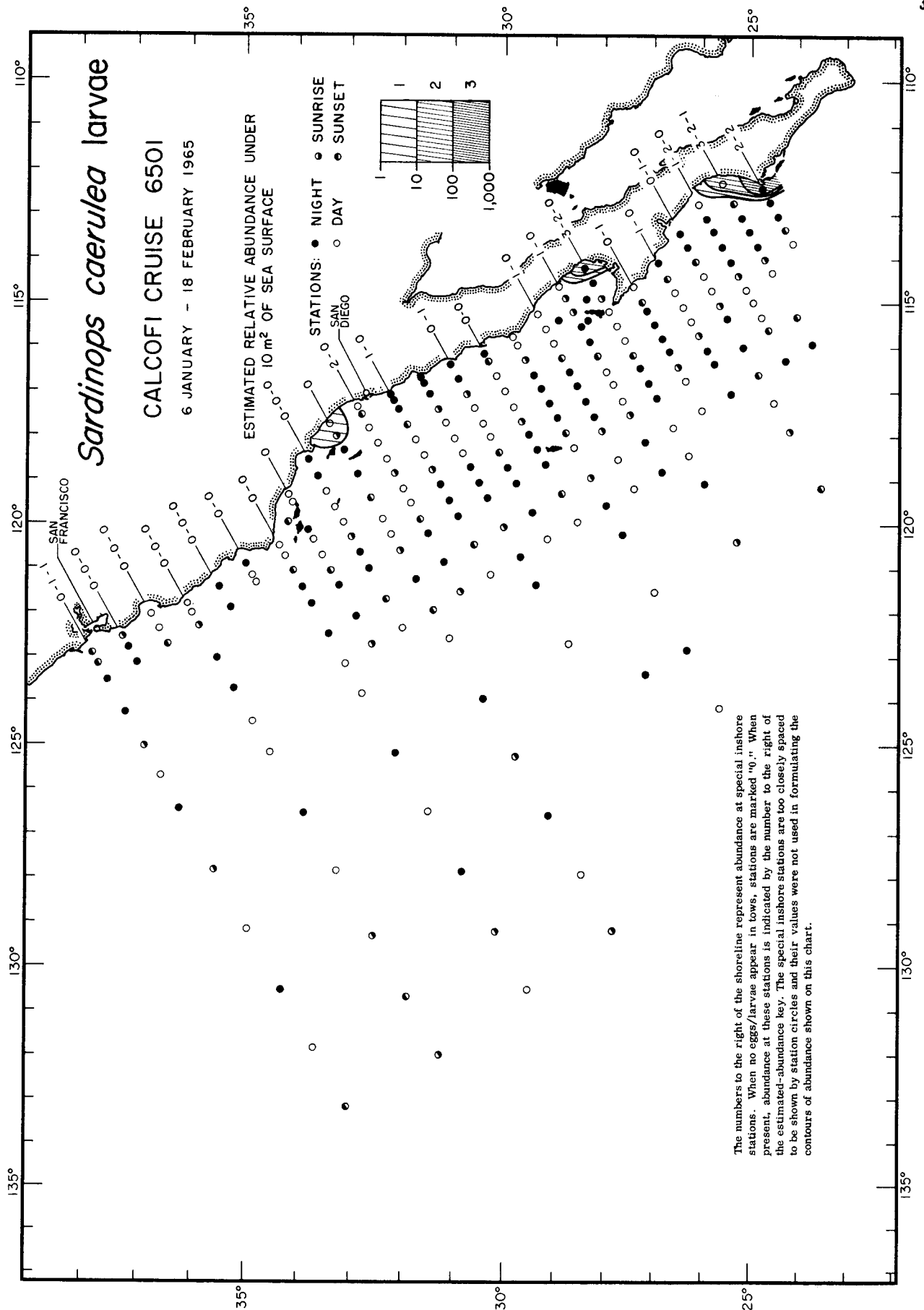
*Sardinops caerulea* larvae

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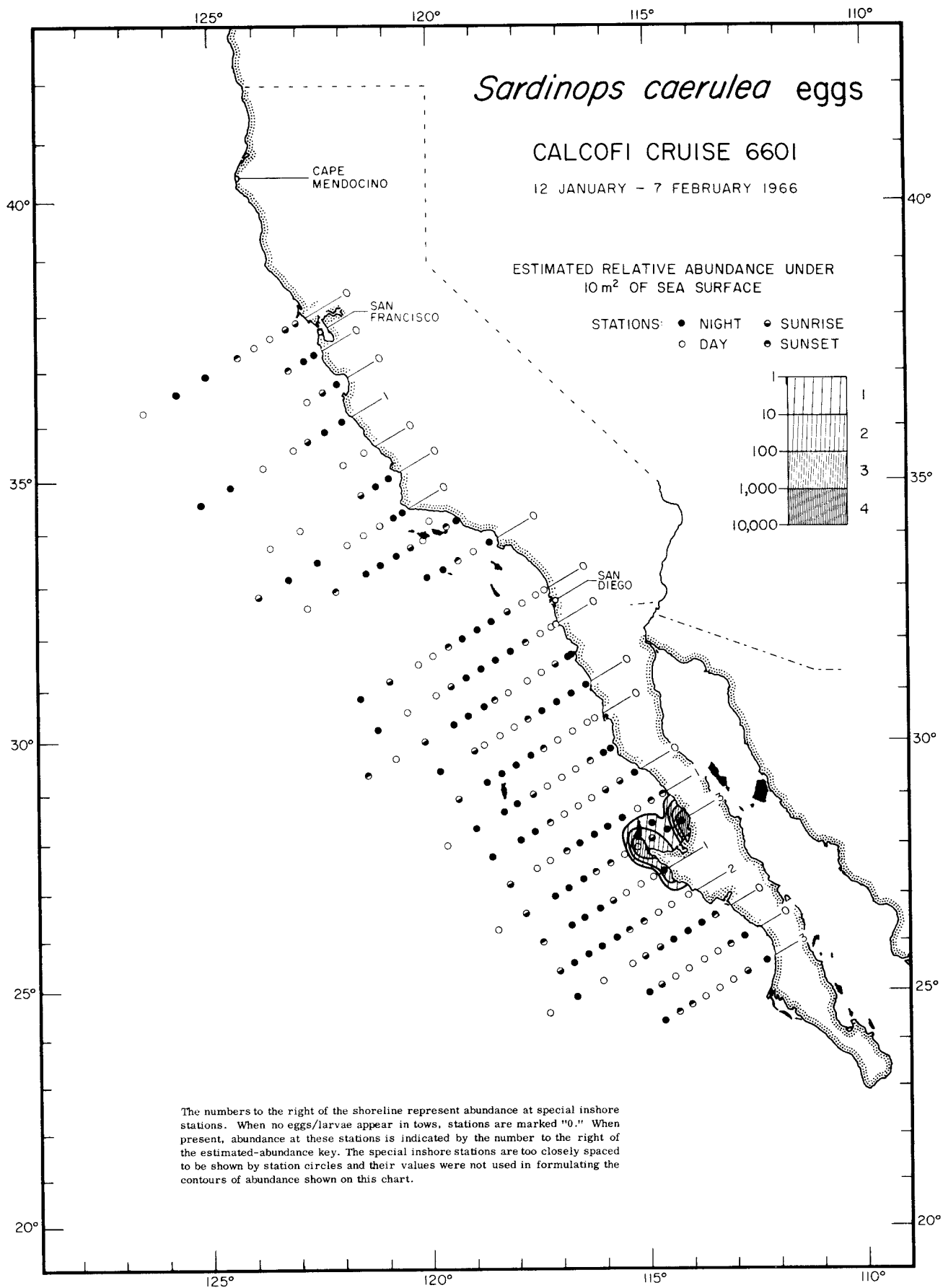
Sardinops caerulea eggs

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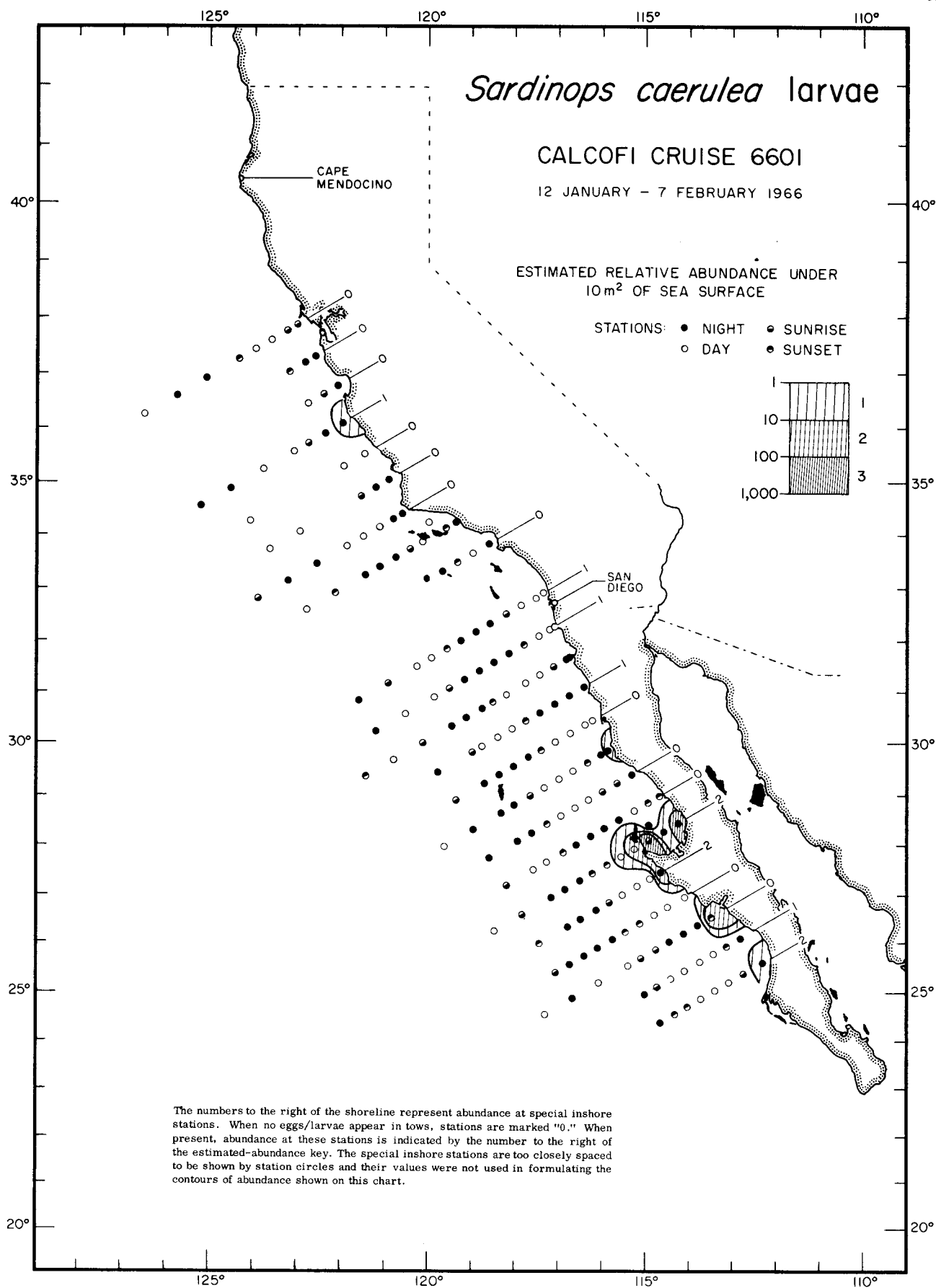
Sardinops caerulea larvae

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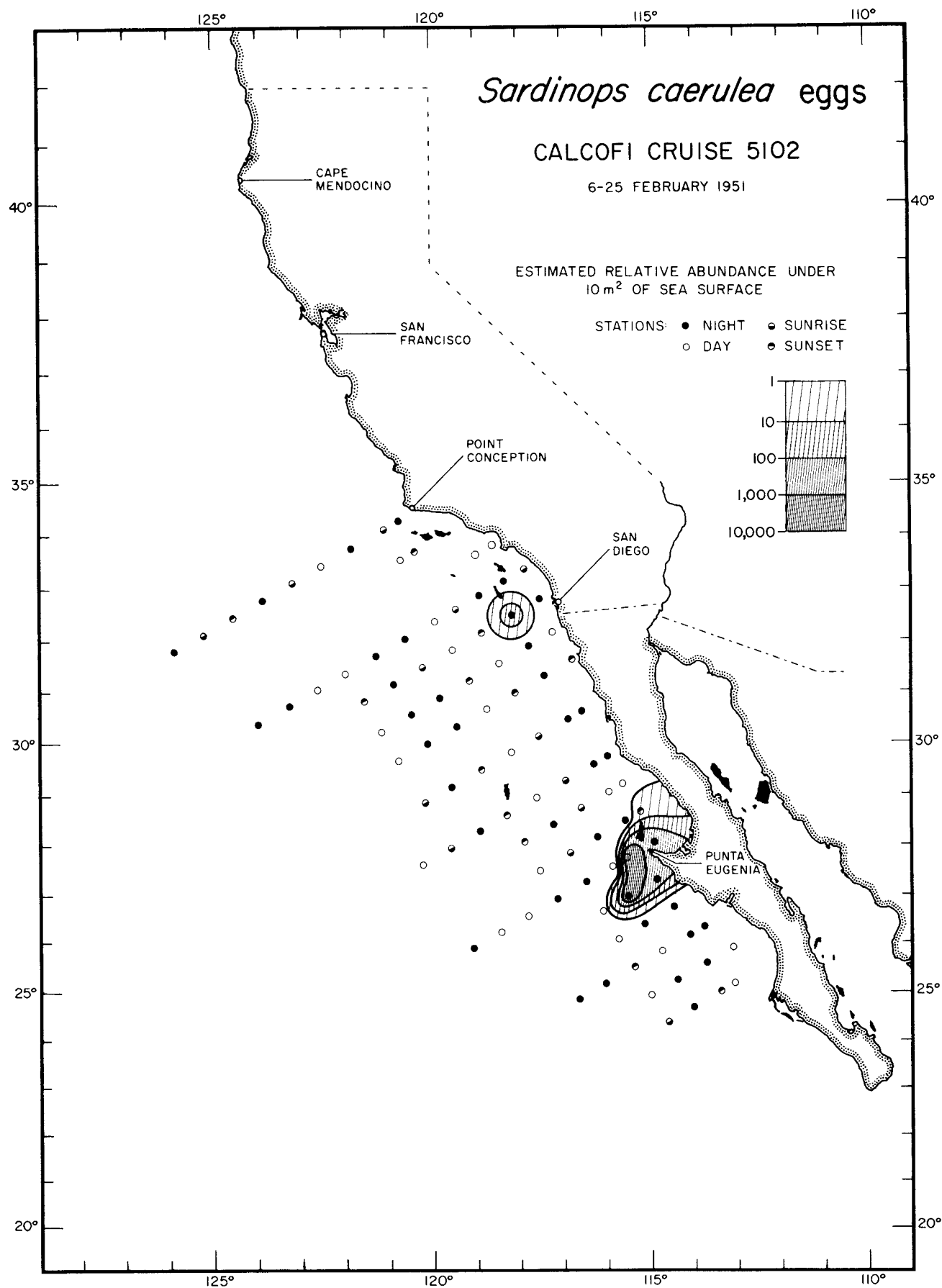
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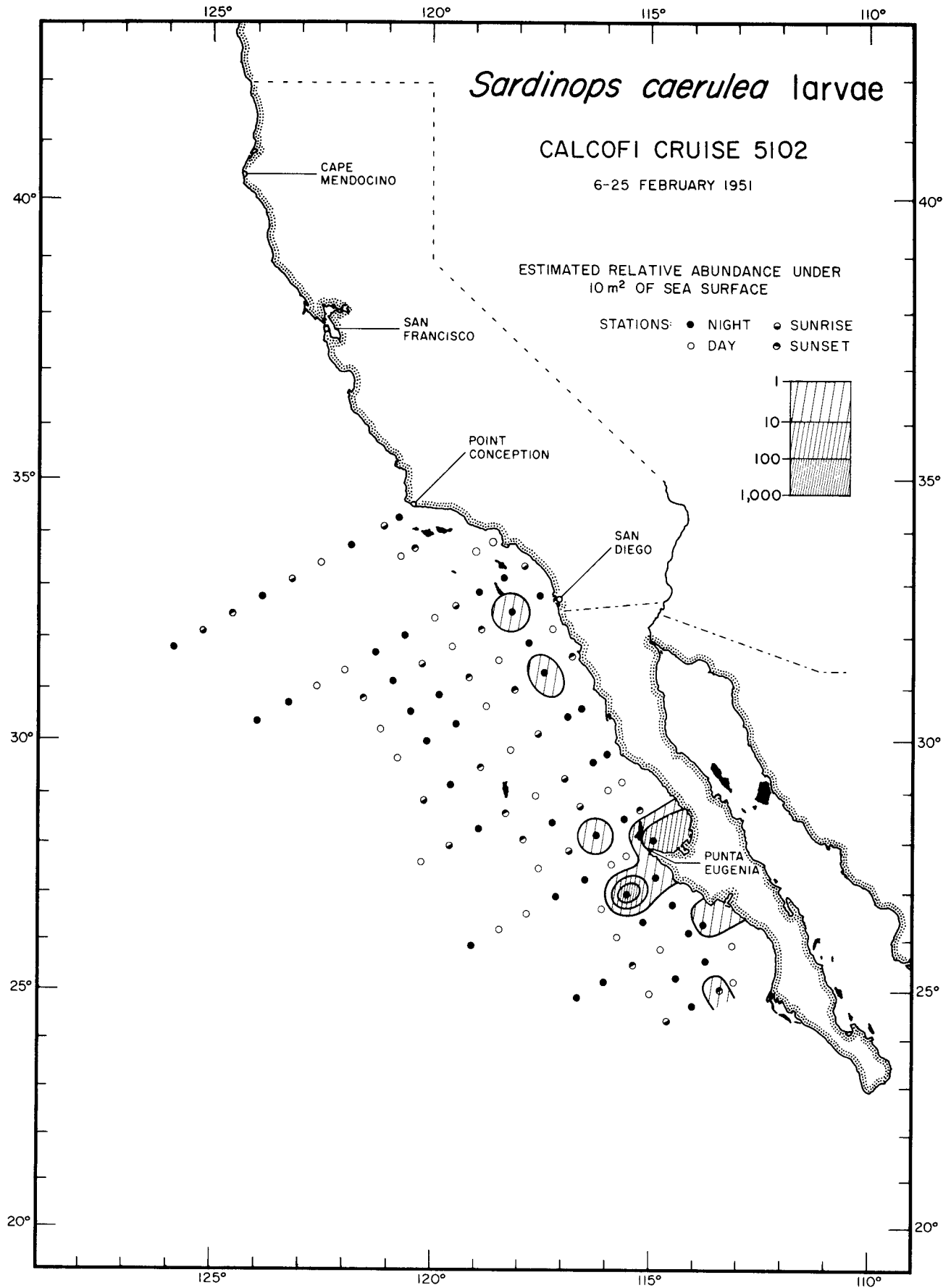
Sardinops caerulea larvae

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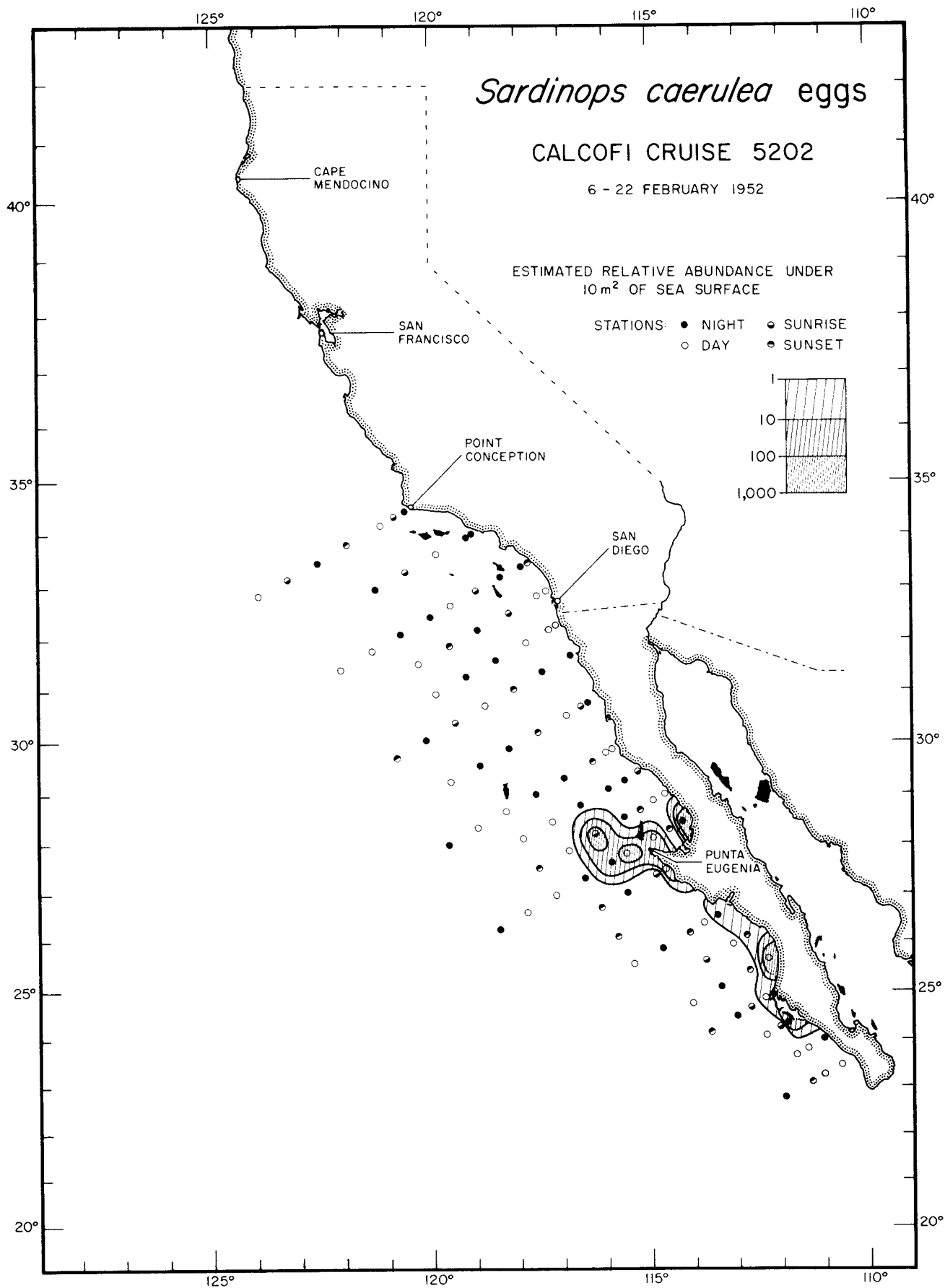
Sardinops caerulea eggs

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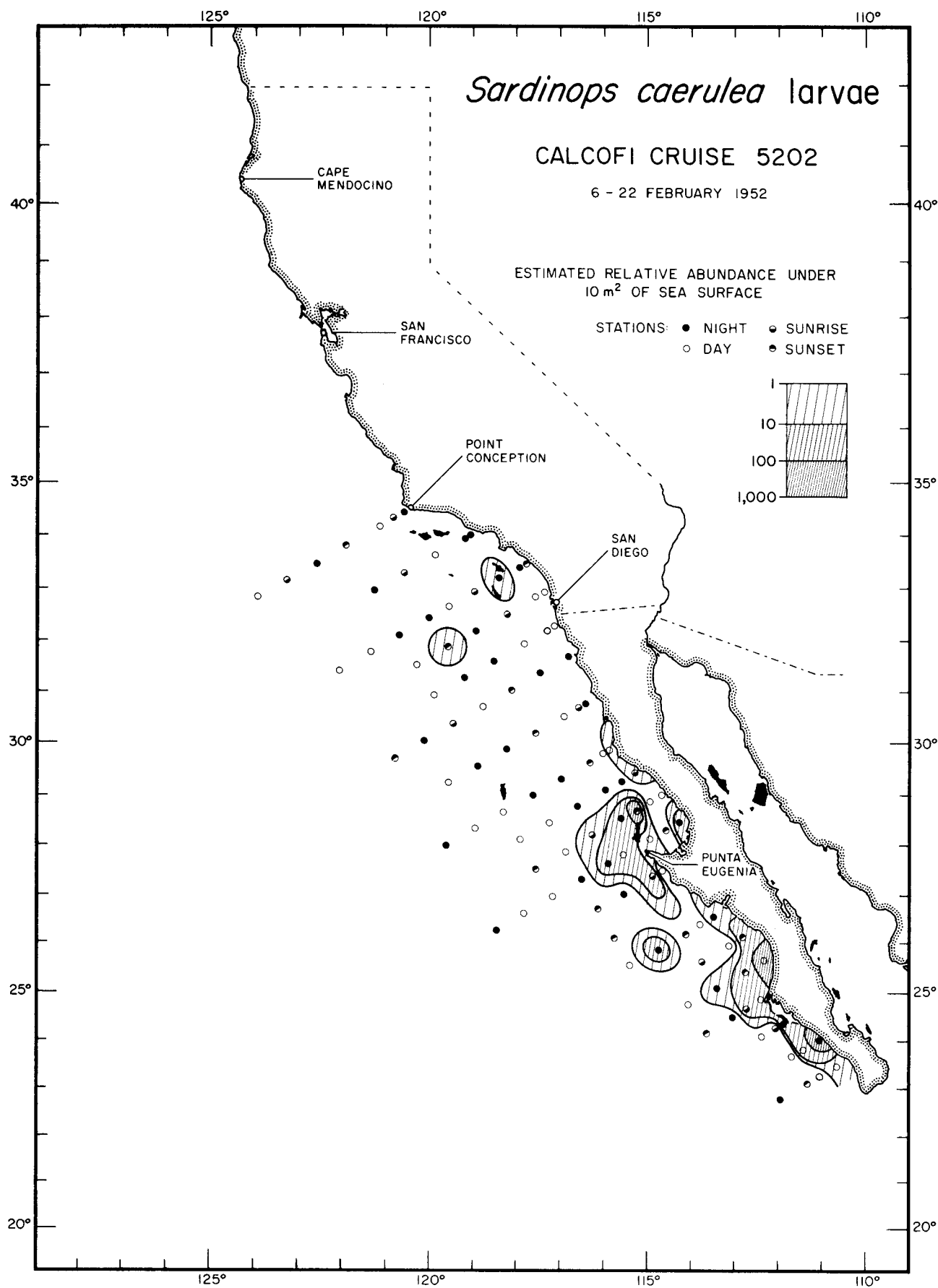
Sardinops caerulea larvae

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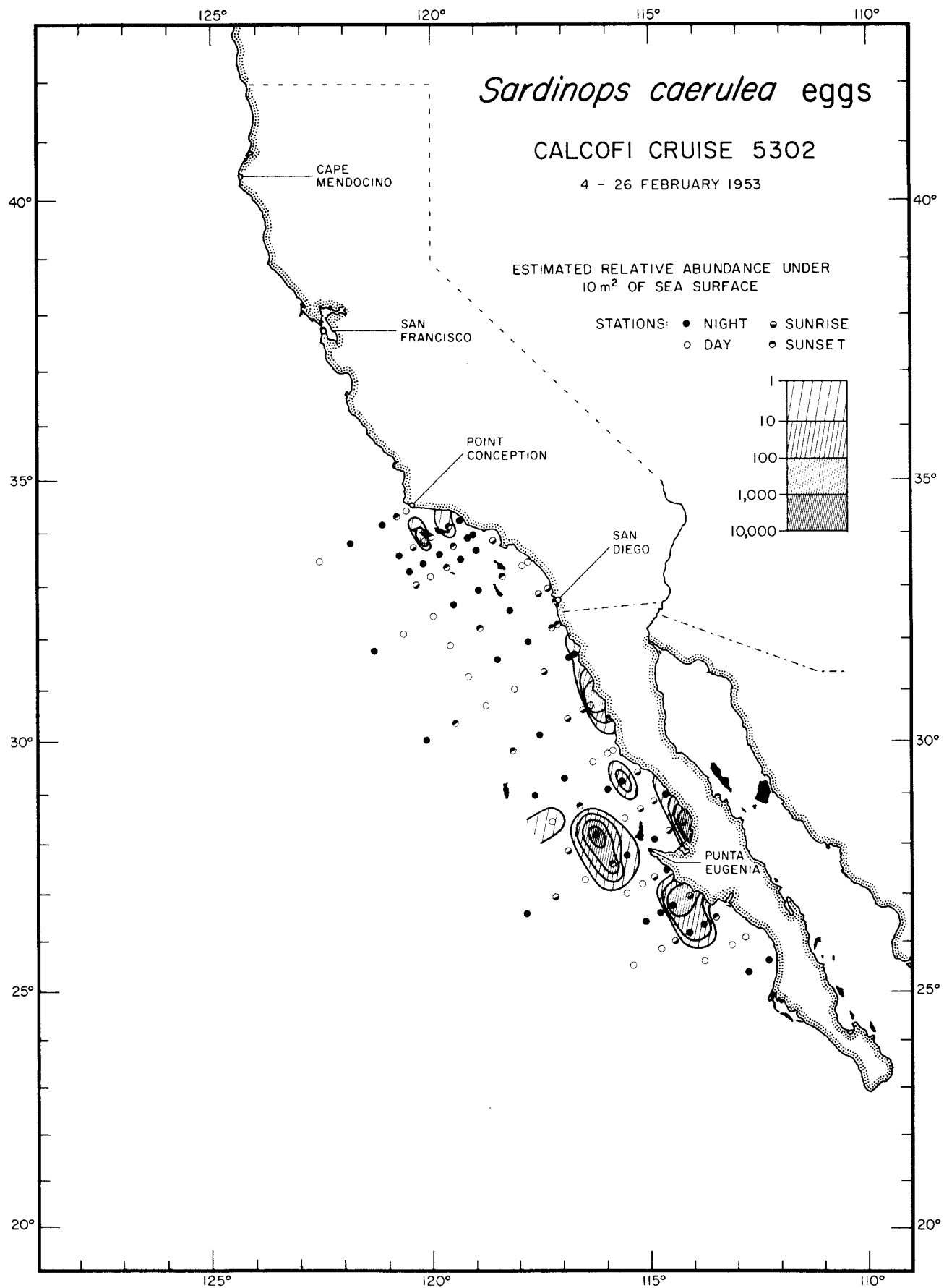
Sardinops caerulea eggs

5202

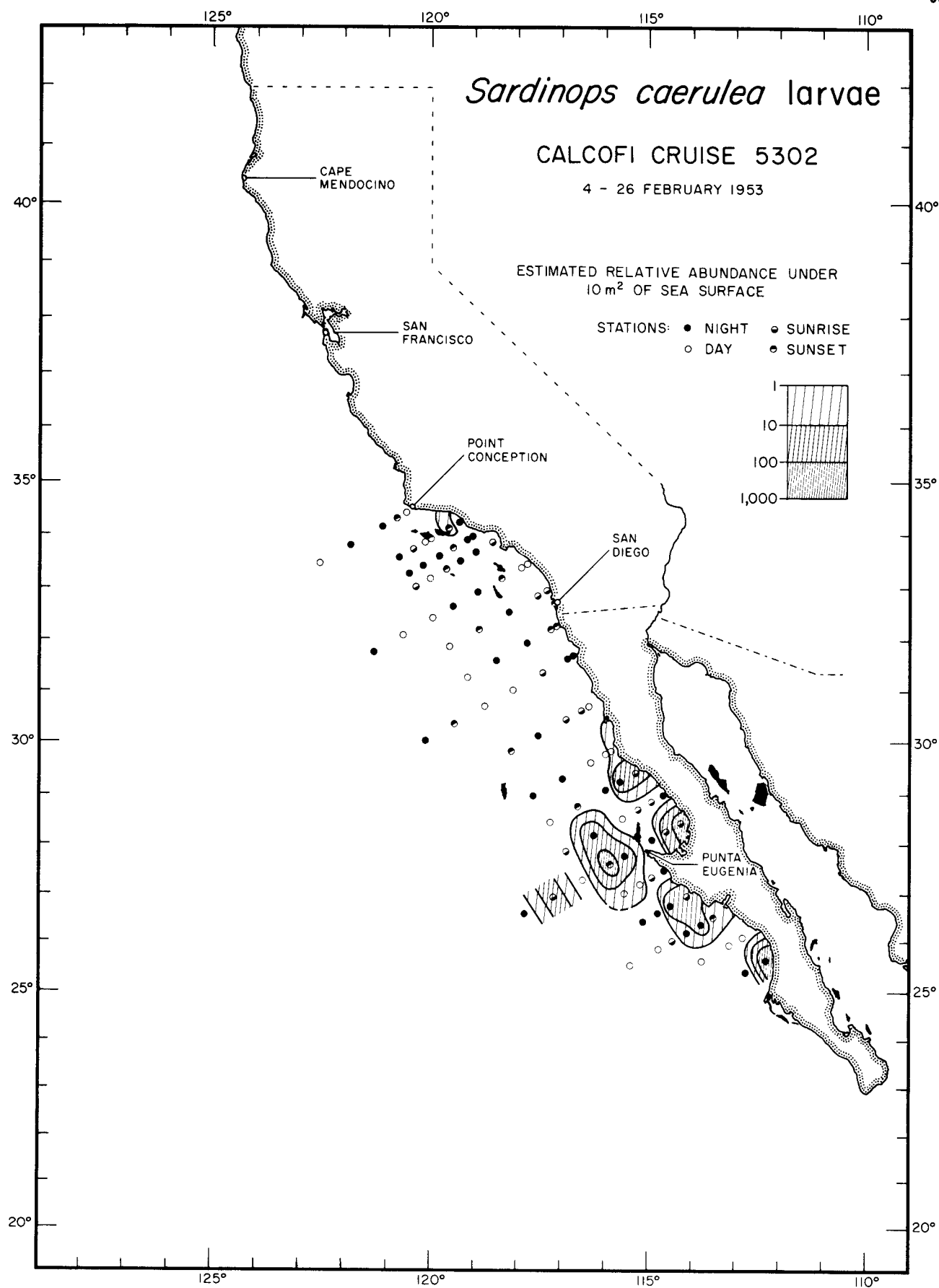


Sardinops caerulea larvae

5202

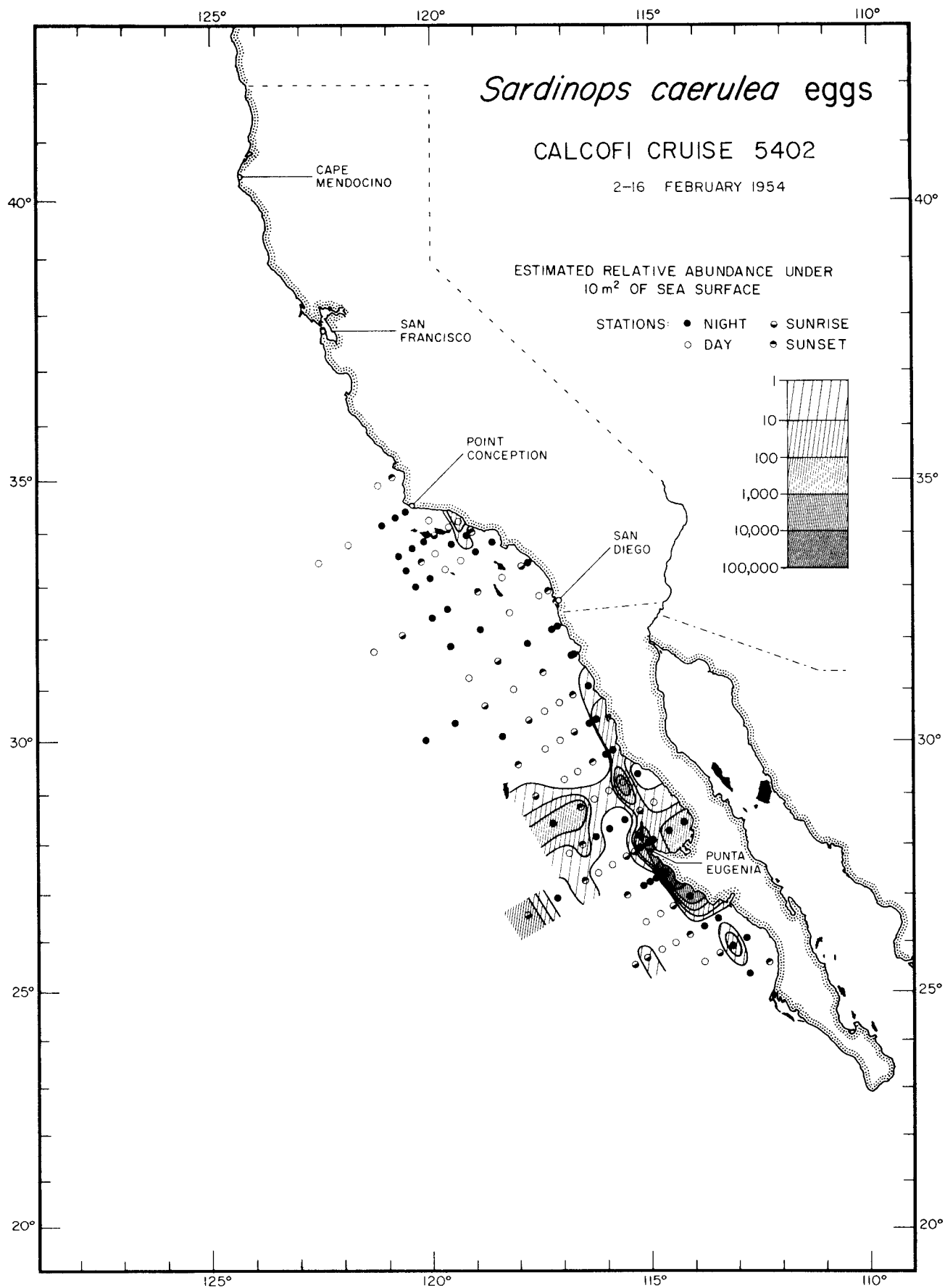
*Sardinops caerulea* eggs

5302



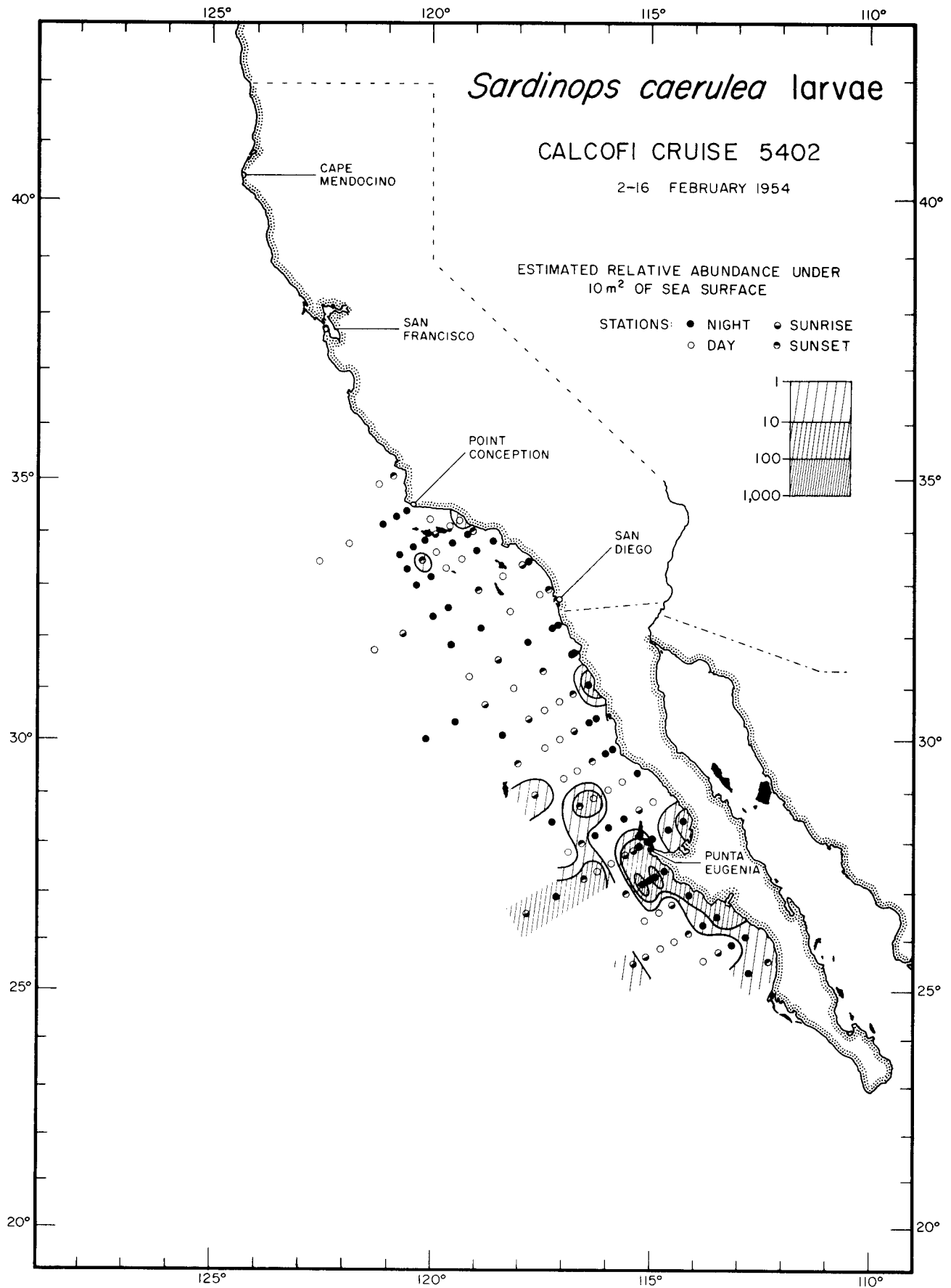
Sardinops caerulea larvae

5302



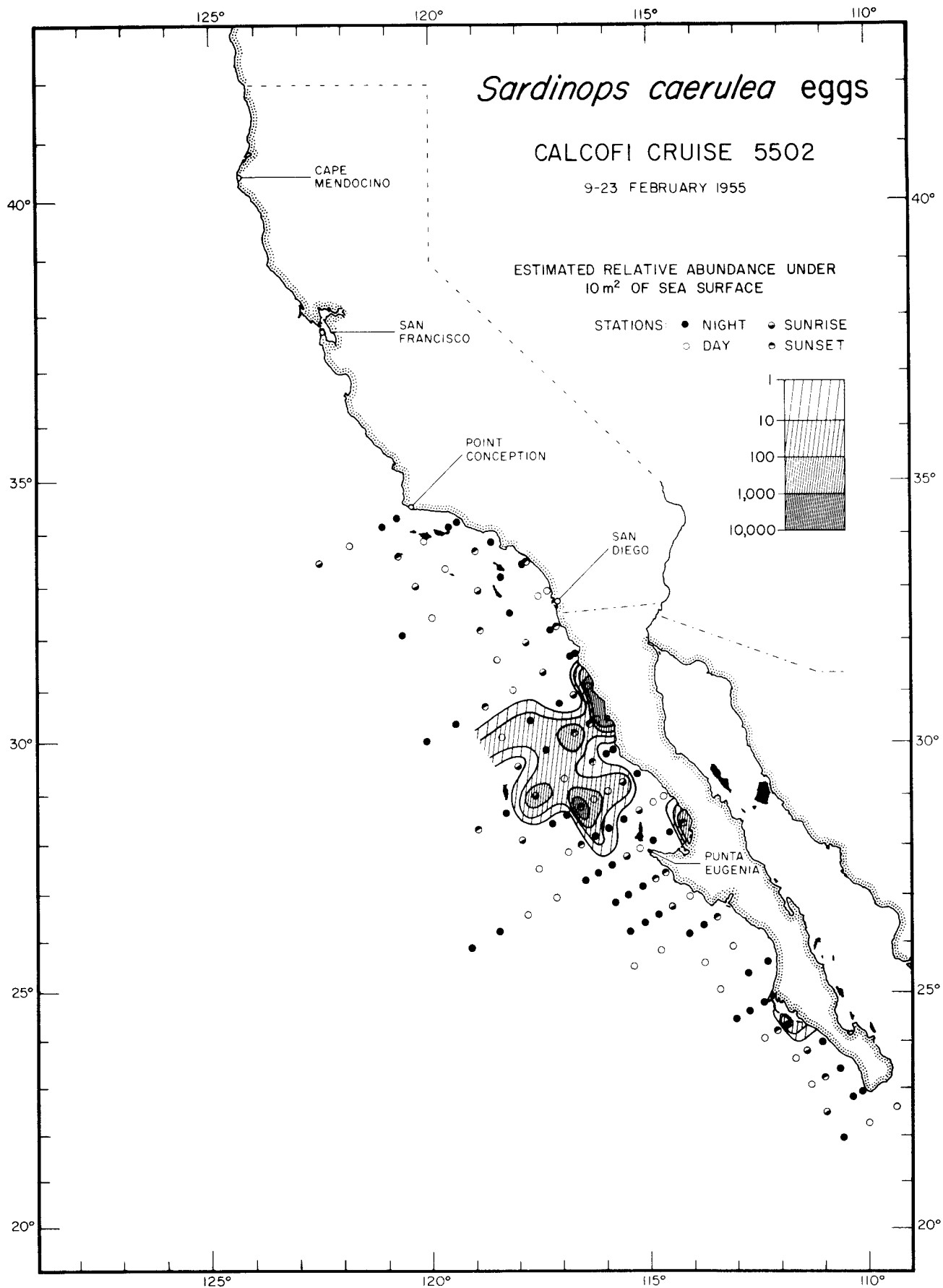
Sardinops caerulea eggs

5402



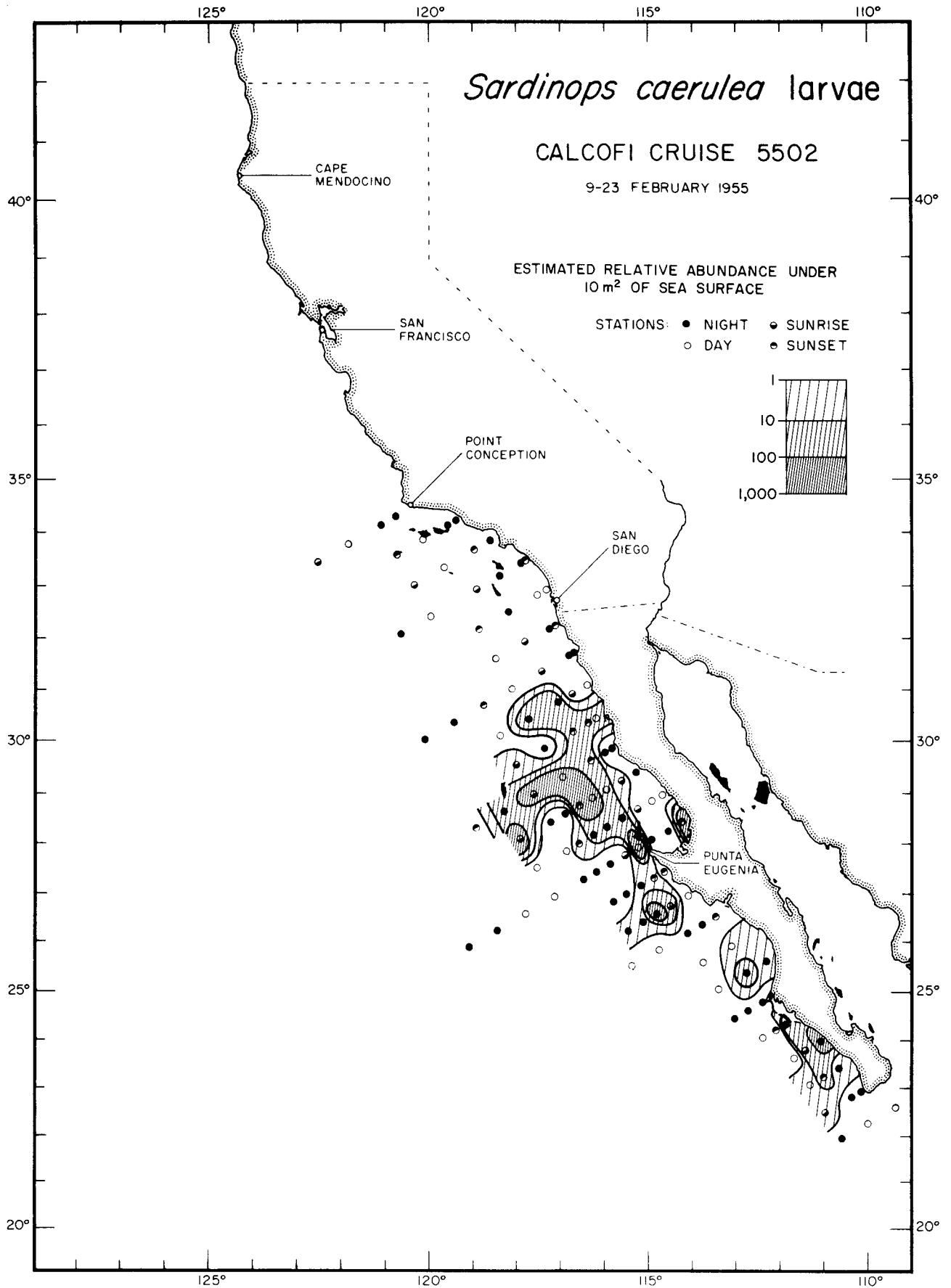
Sardinops caerulea larvae

5402



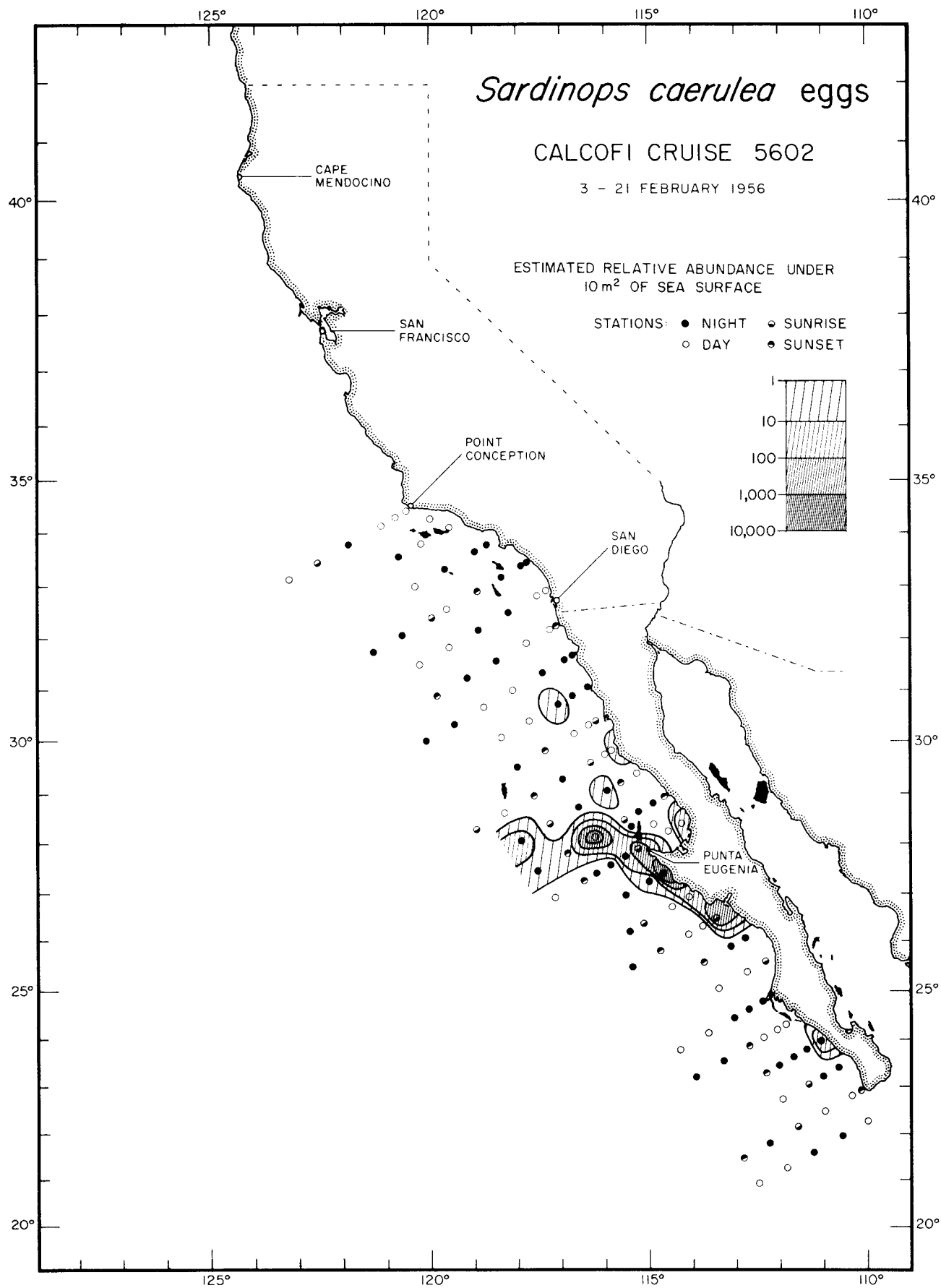
Sardinops caerulea eggs

5502



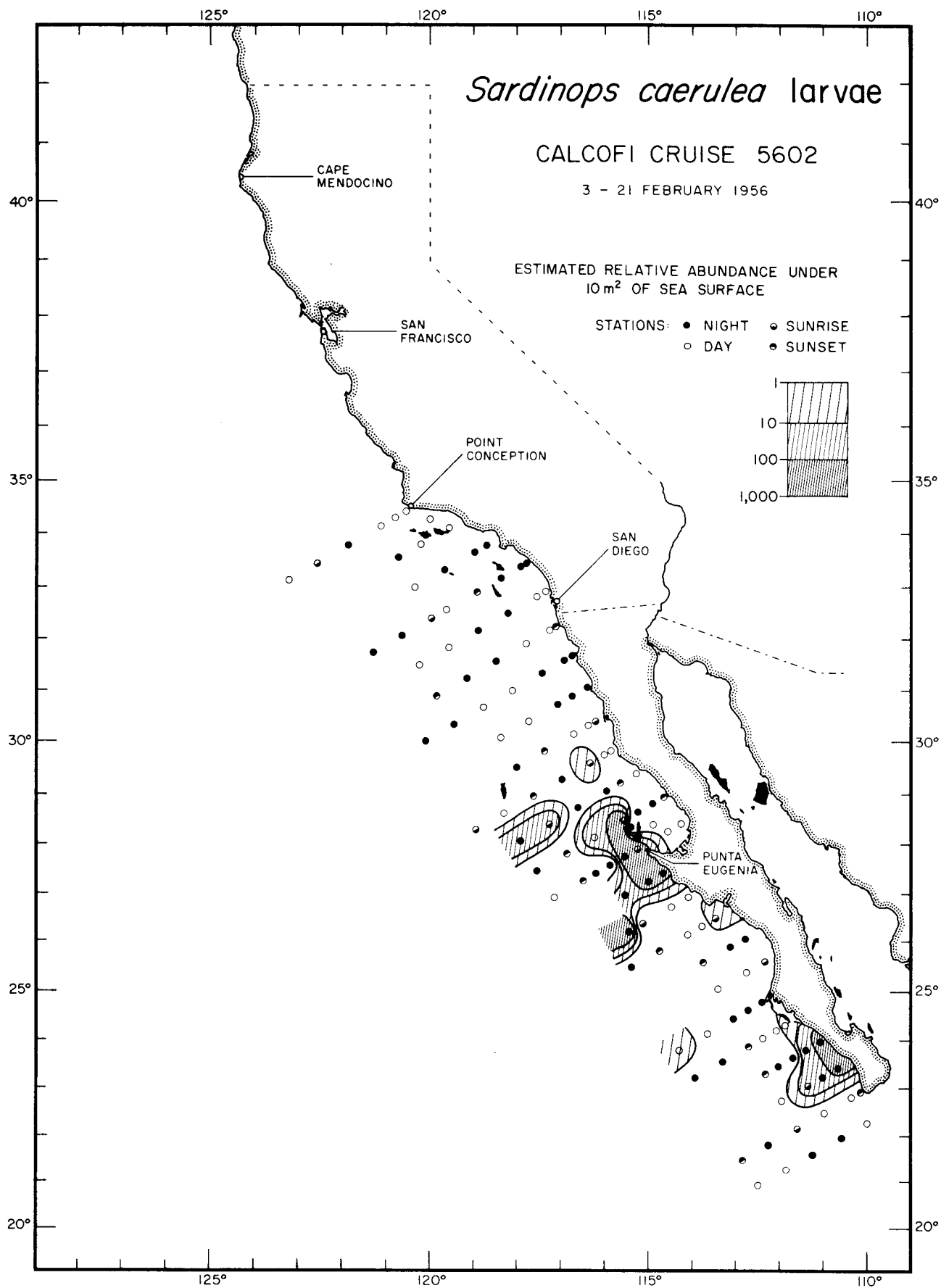
Sardinops caerulea larvae

5502



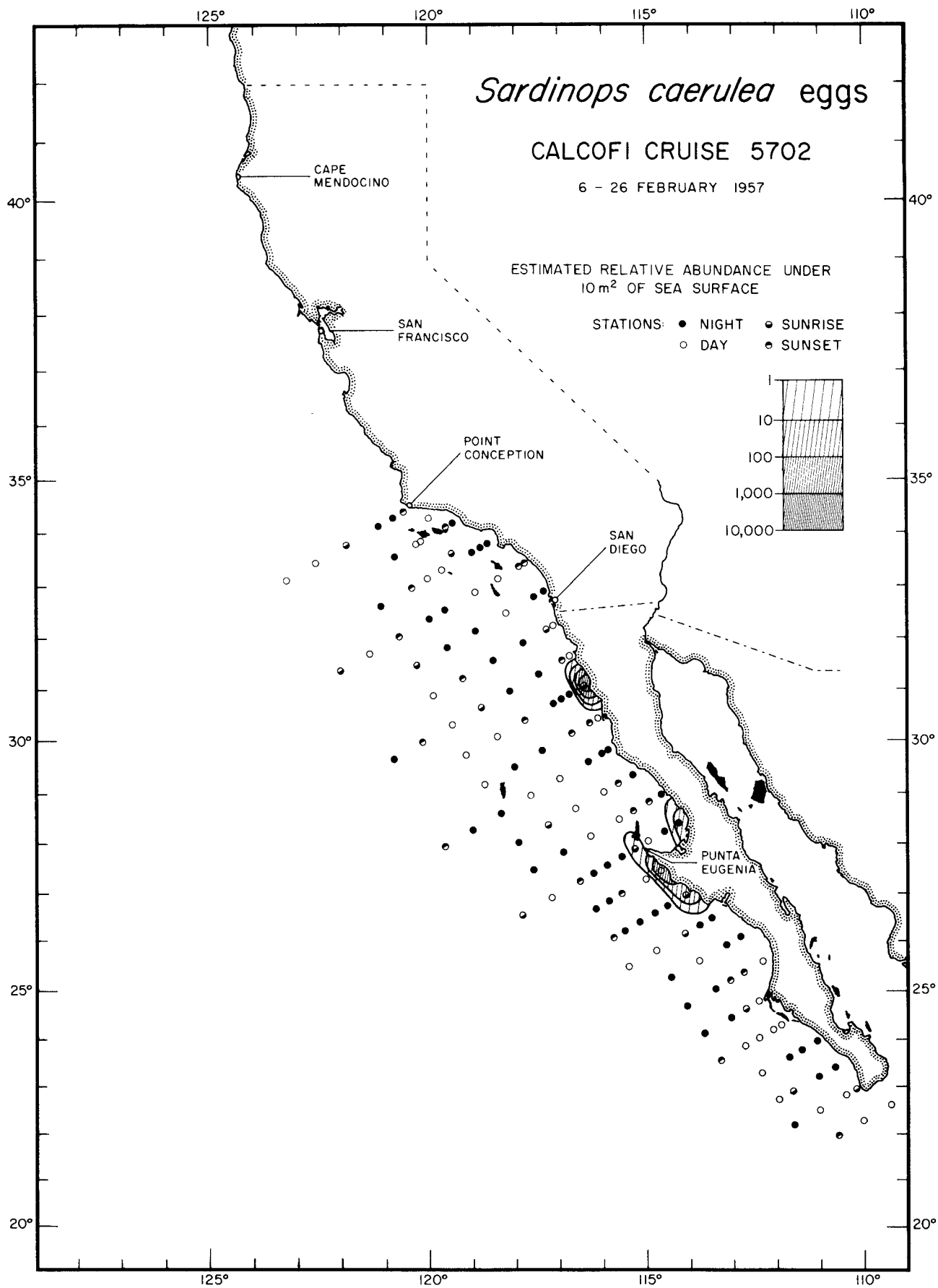
Sardinops caerulea eggs

5602



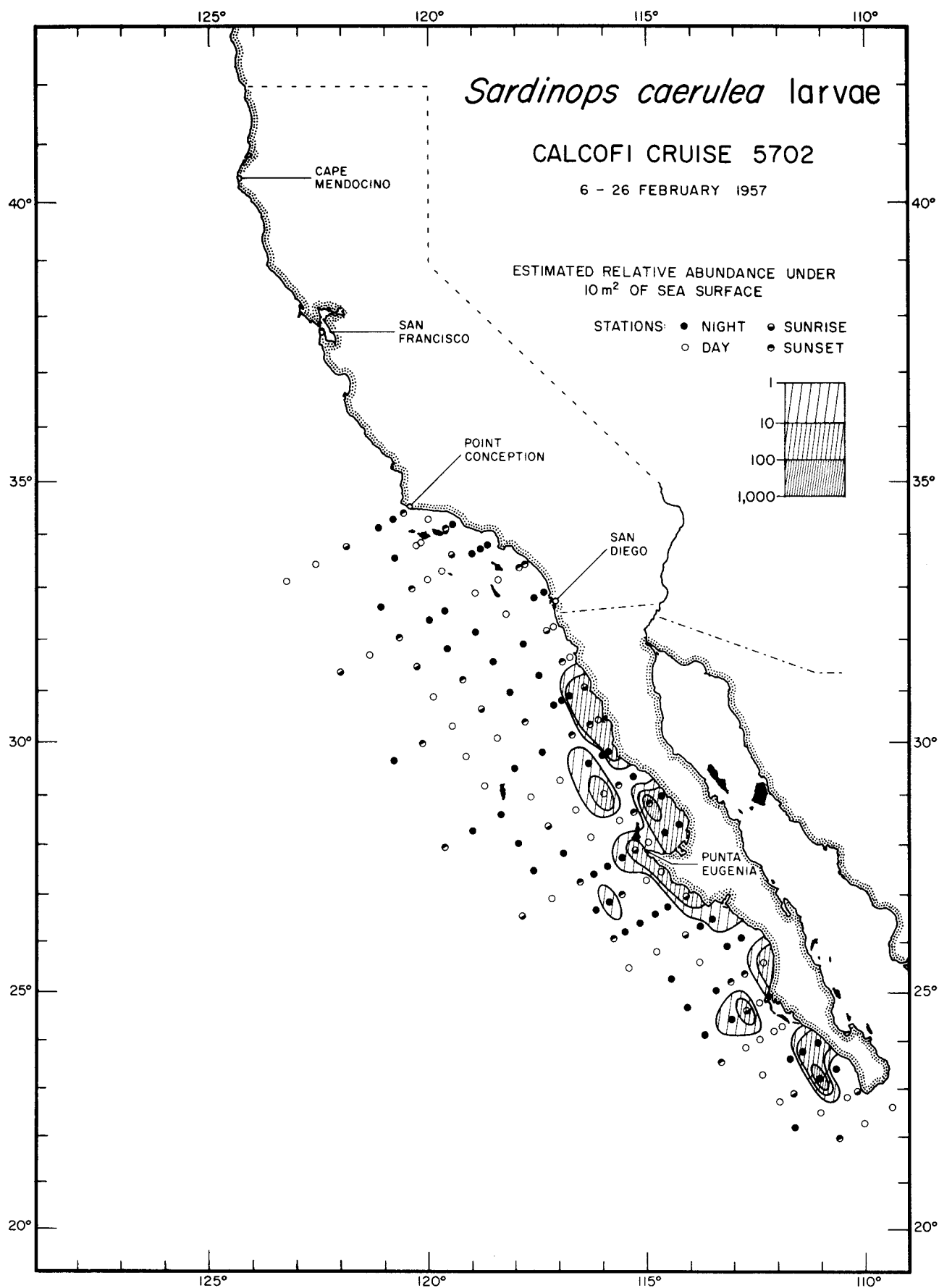
Sardinops caerulea larvae

5602



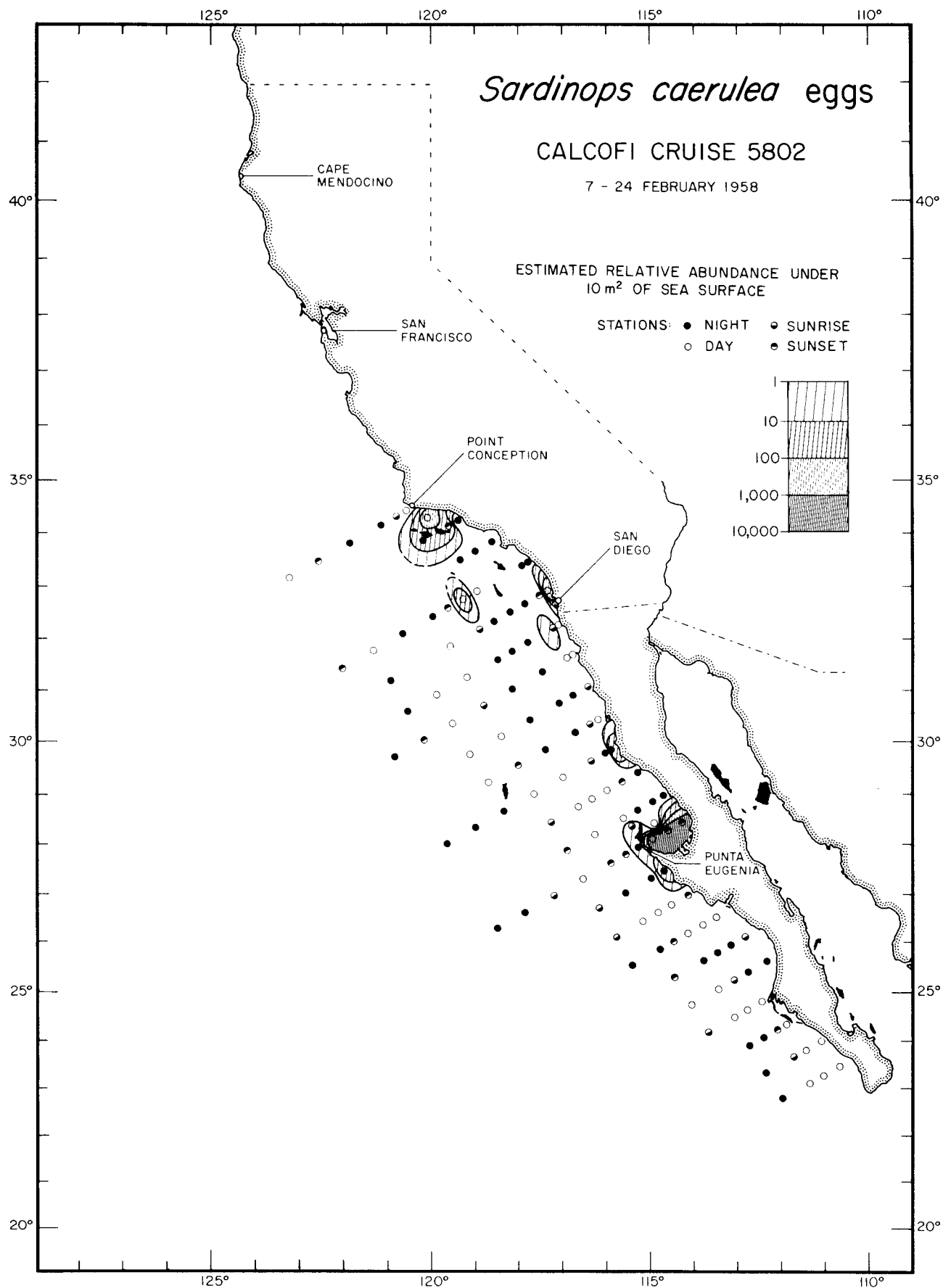
Sardinops caerulea eggs

5702



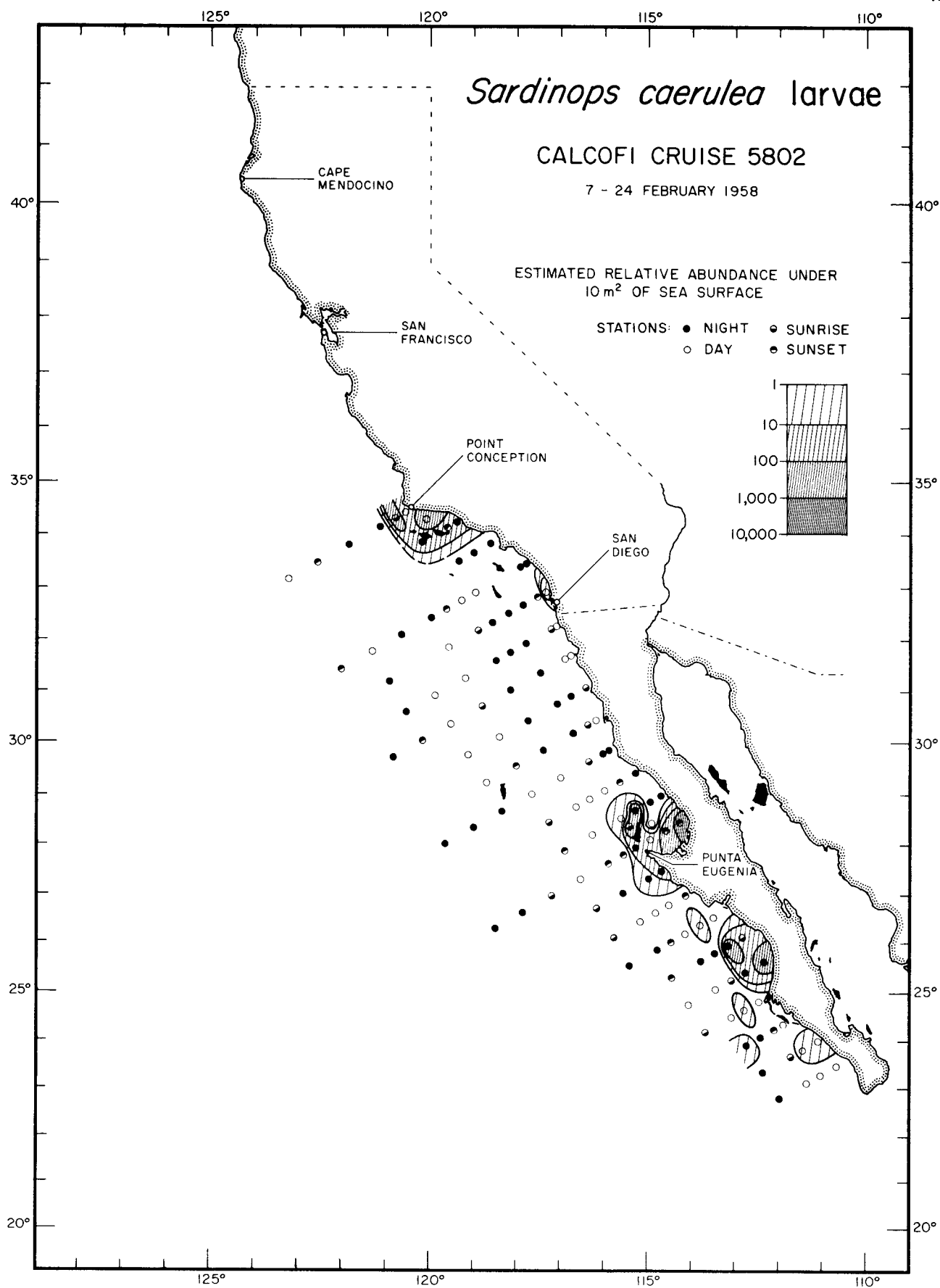
Sardinops caerulea larvae

5702



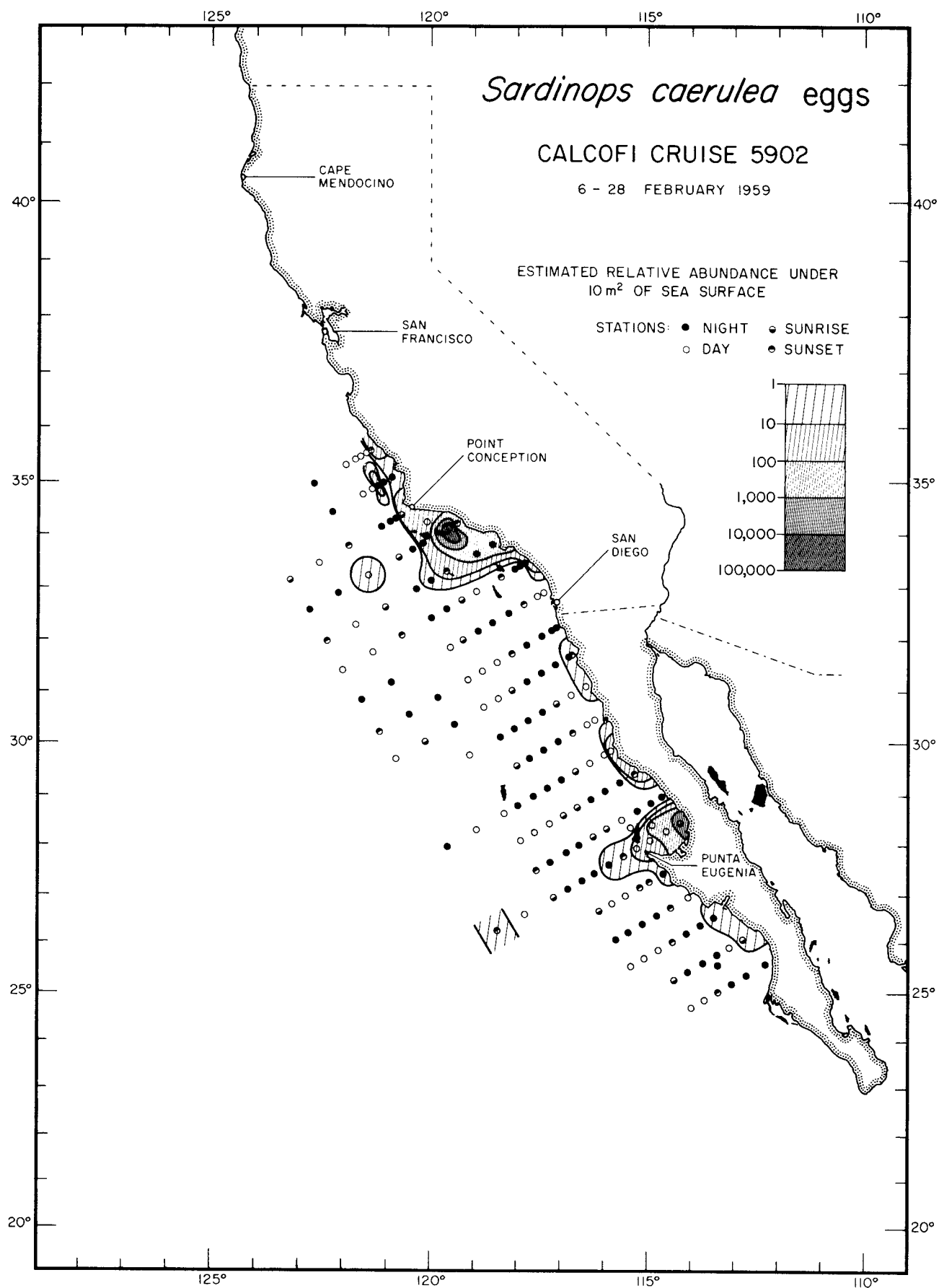
Sardinops caerulea eggs

5802



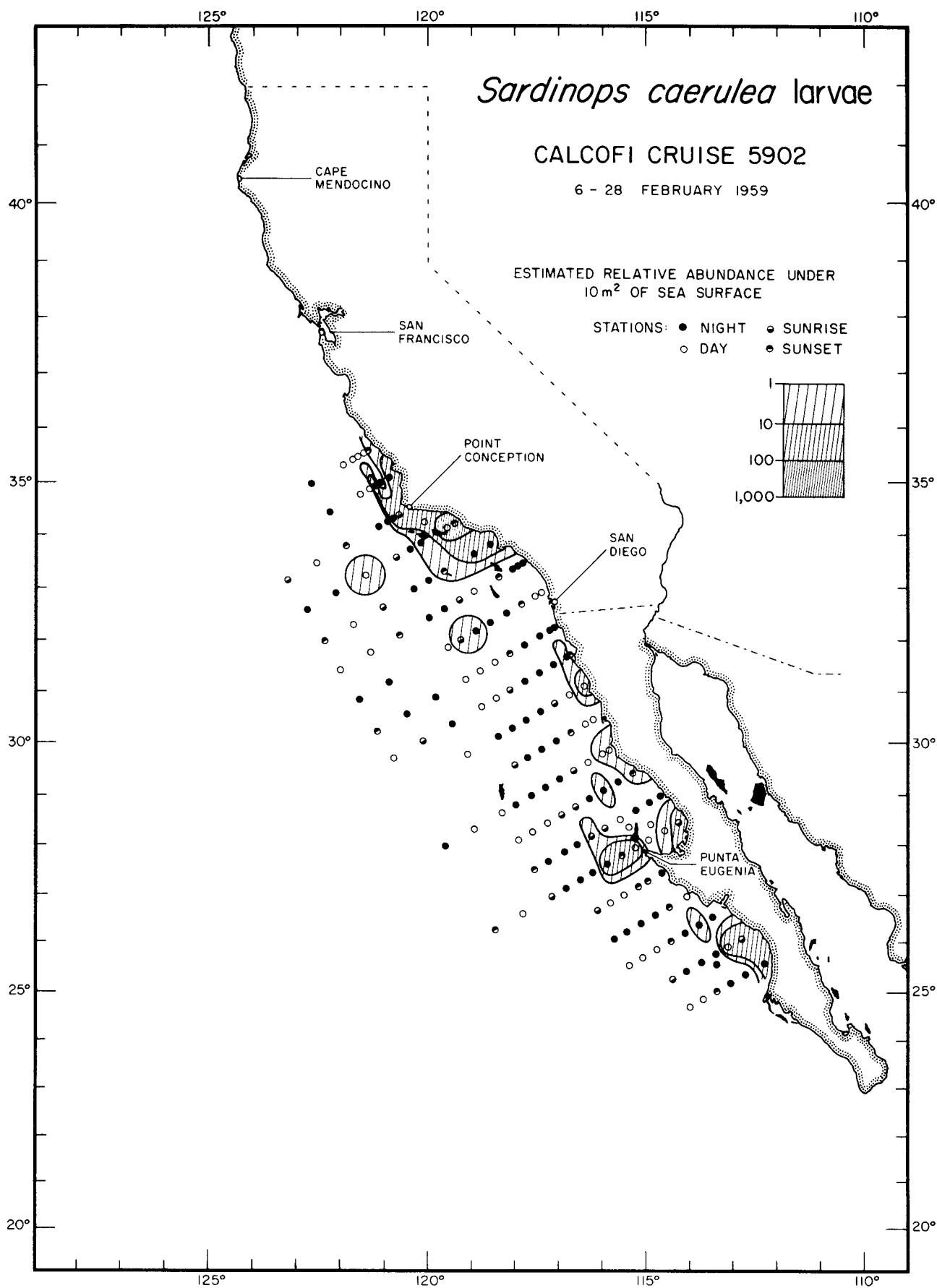
Sardinops caerulea larvae

5802



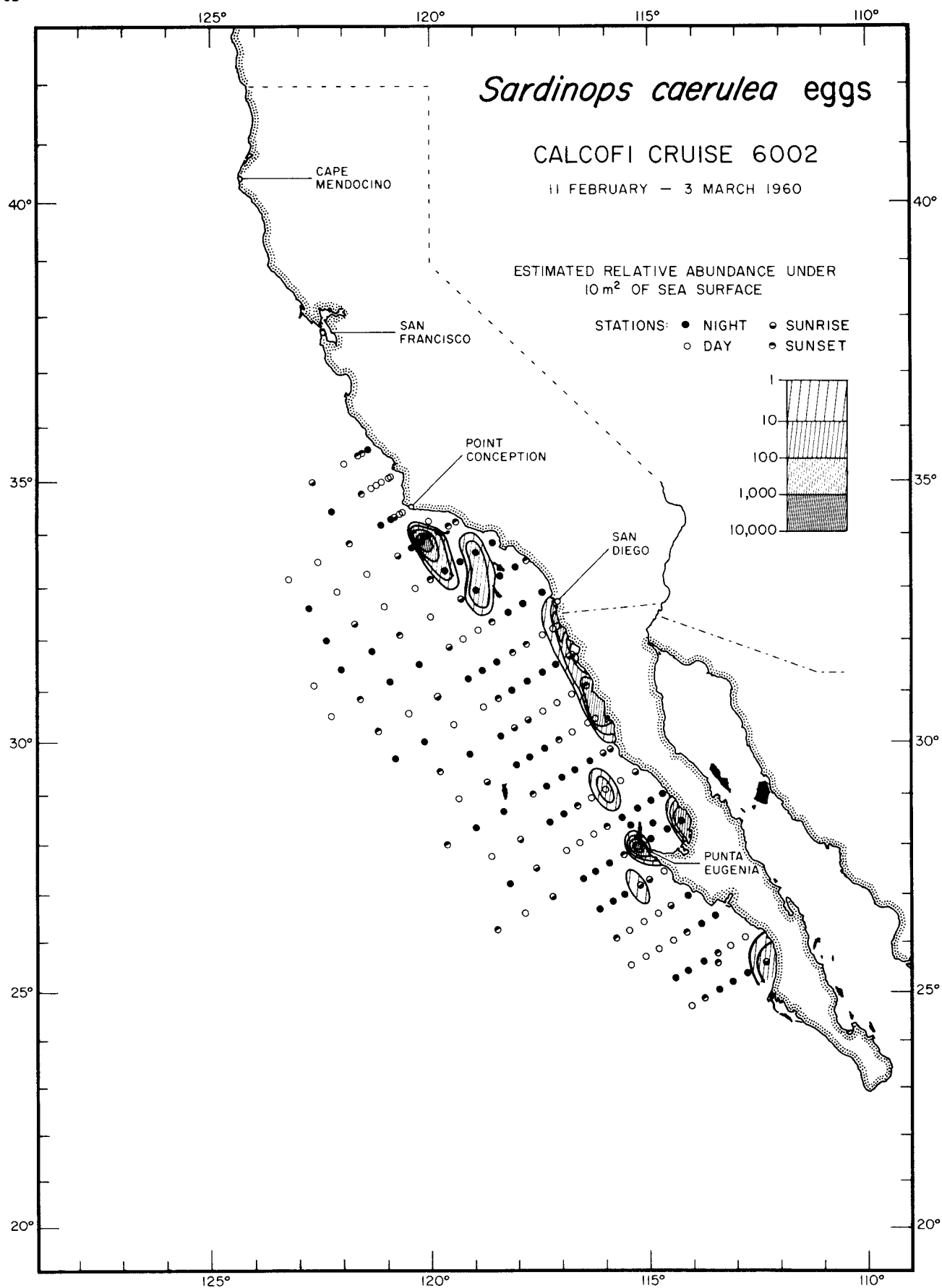
Sardinops caerulea eggs

5902



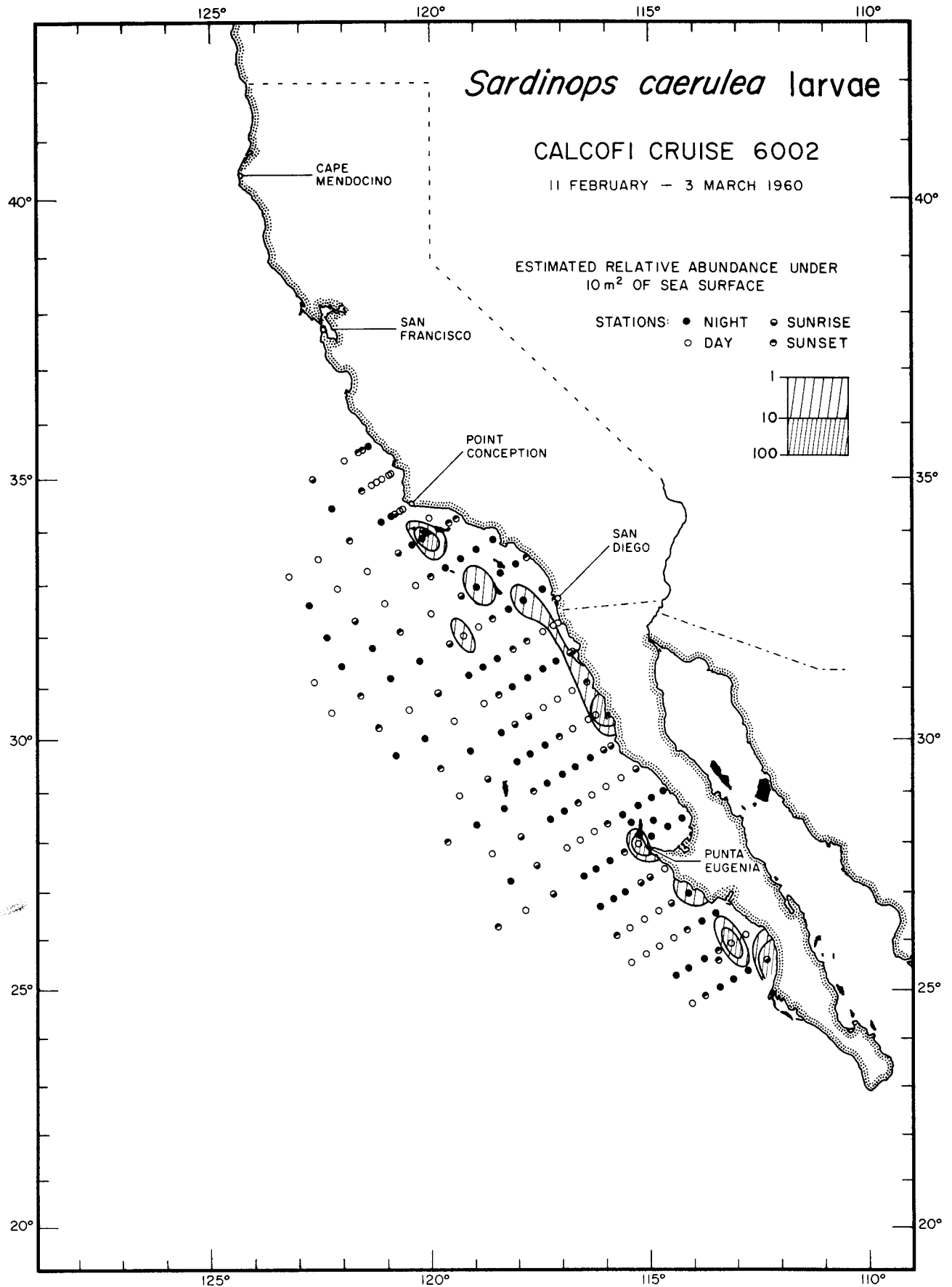
Sardinops caerulea larvae

5902



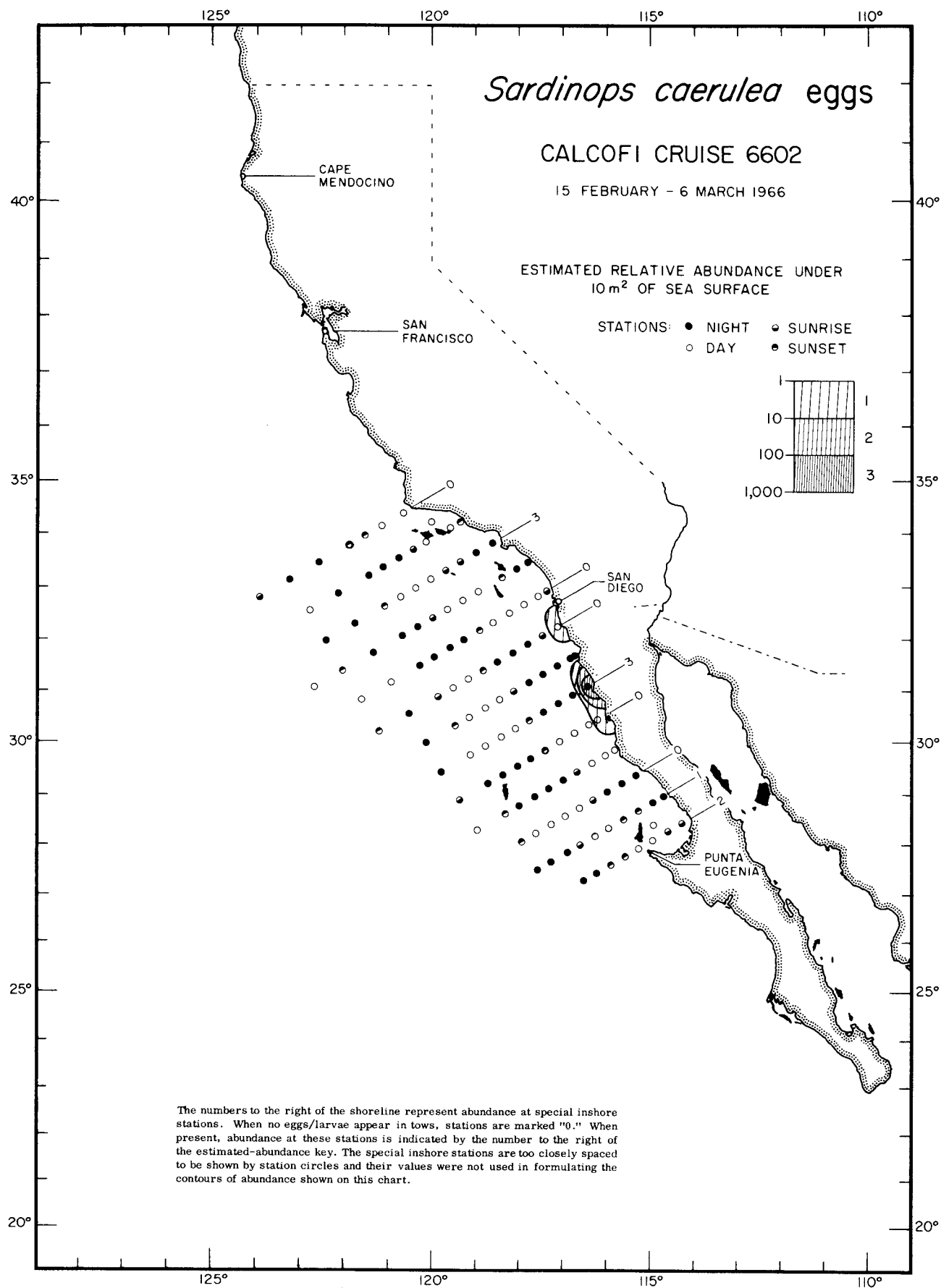
Sardinops caerulea eggs

6002

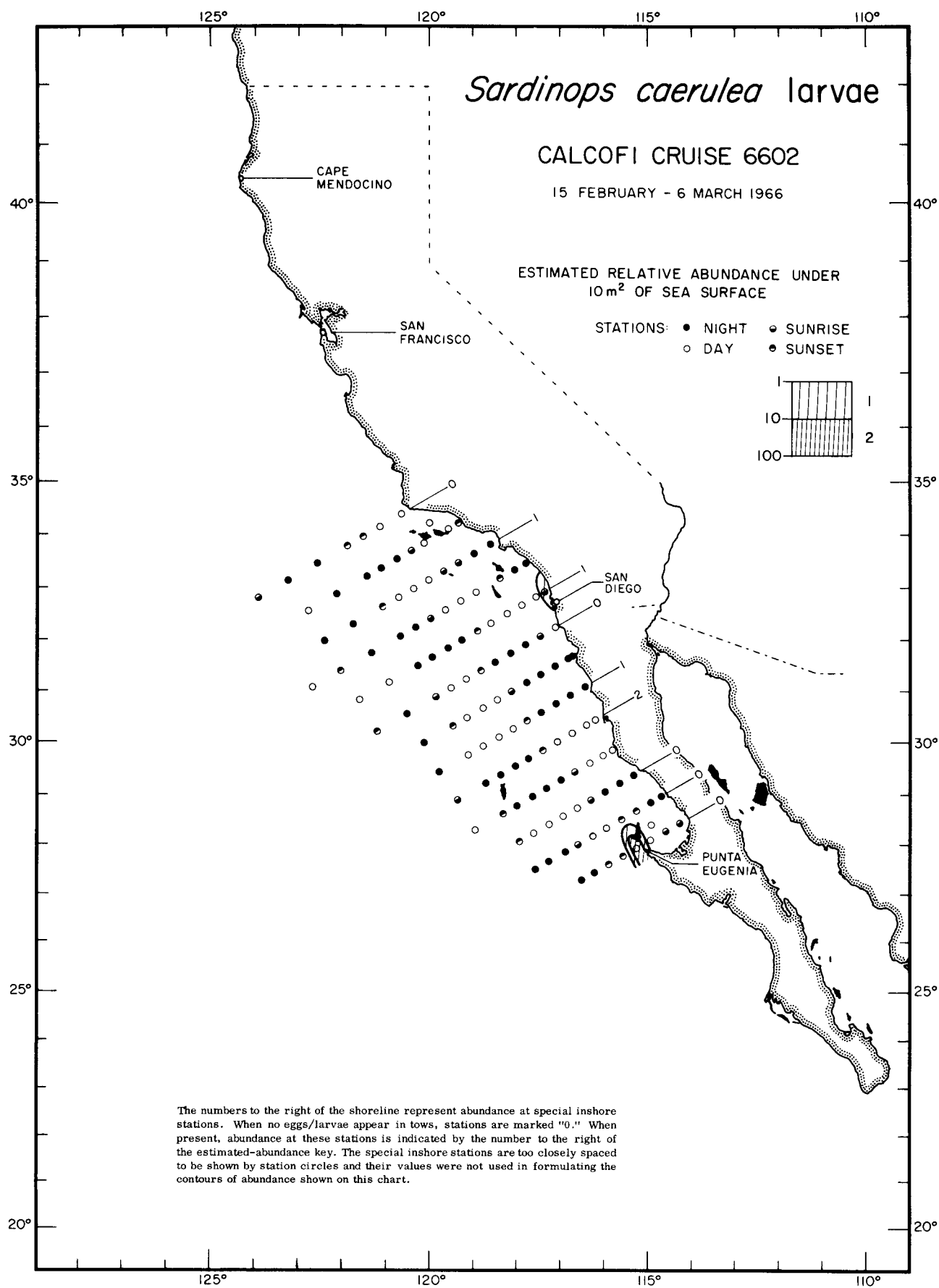


Sardinops caerulea larvae

6002

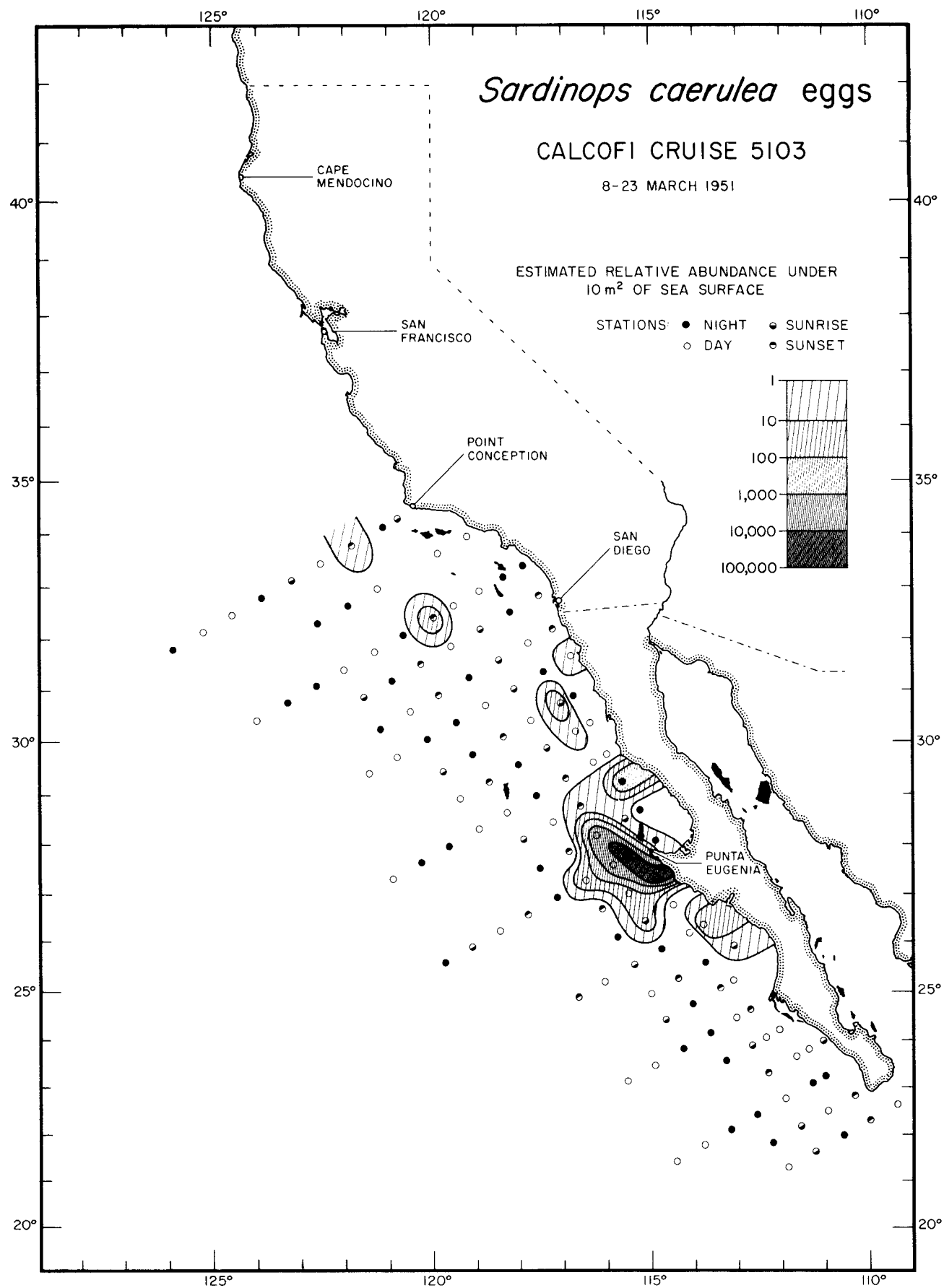
*Sardinops caerulea* eggs

6602



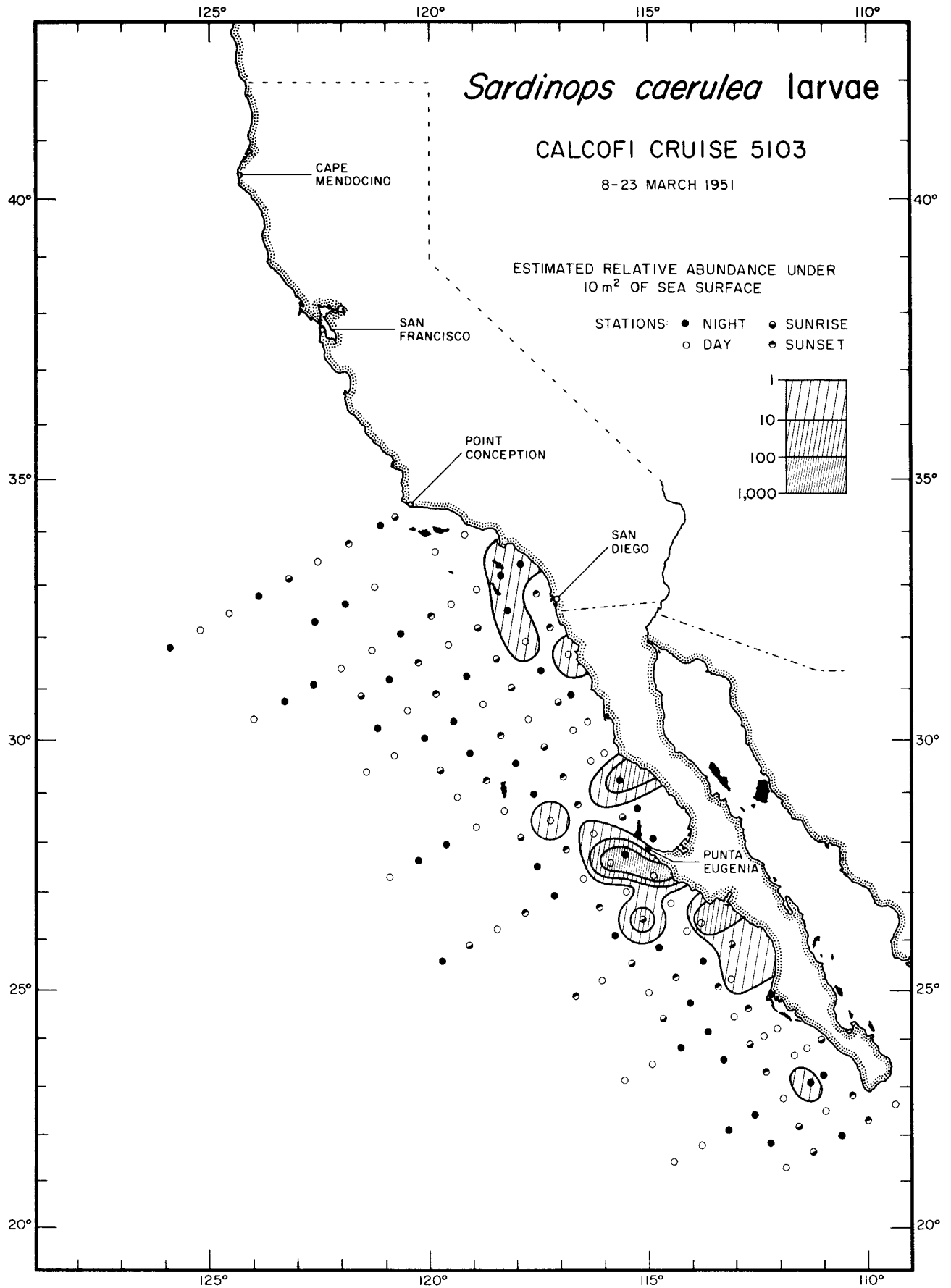
Sardinops caerulea larvae

6602



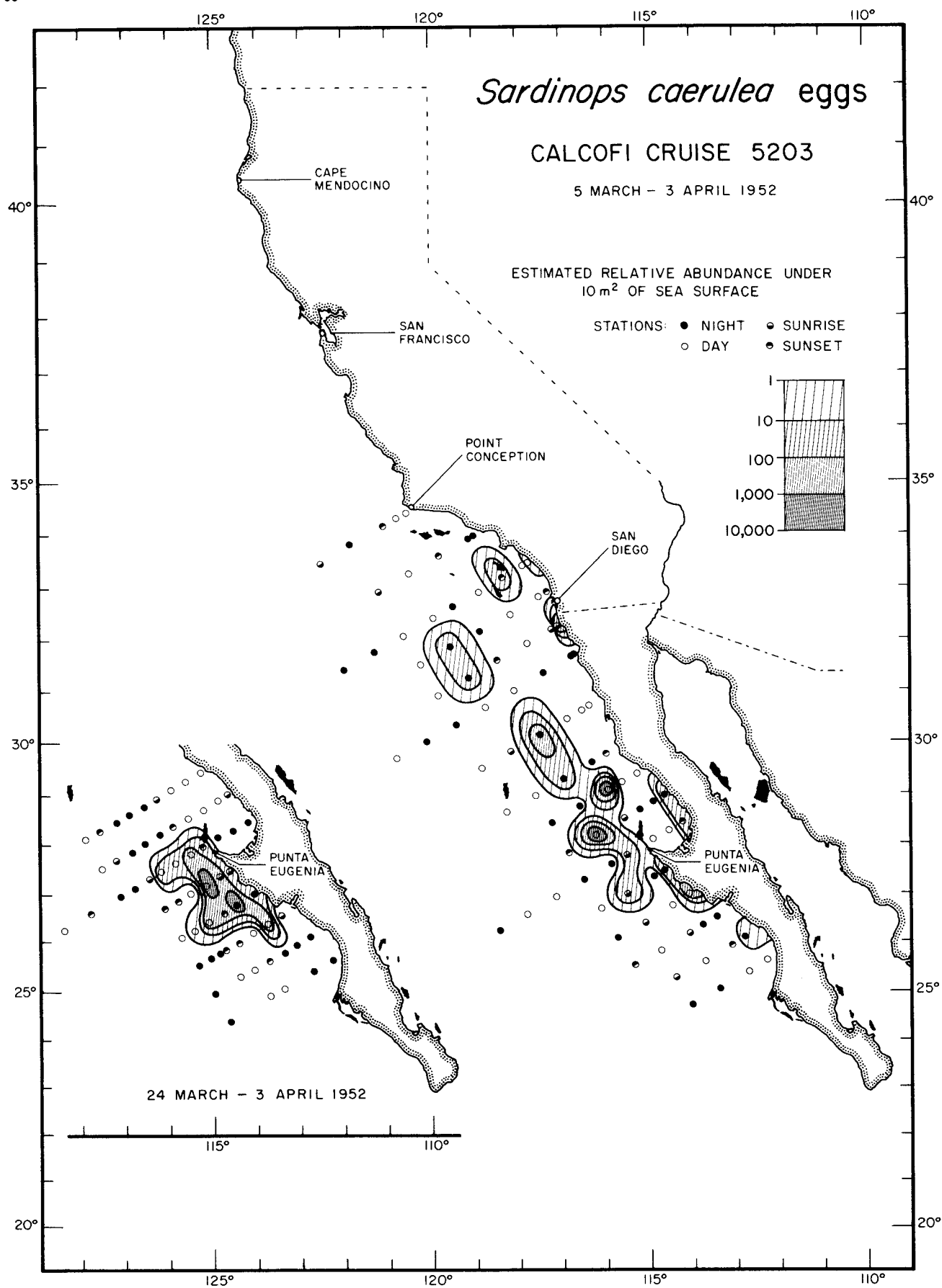
Sardinops caerulea eggs

5103



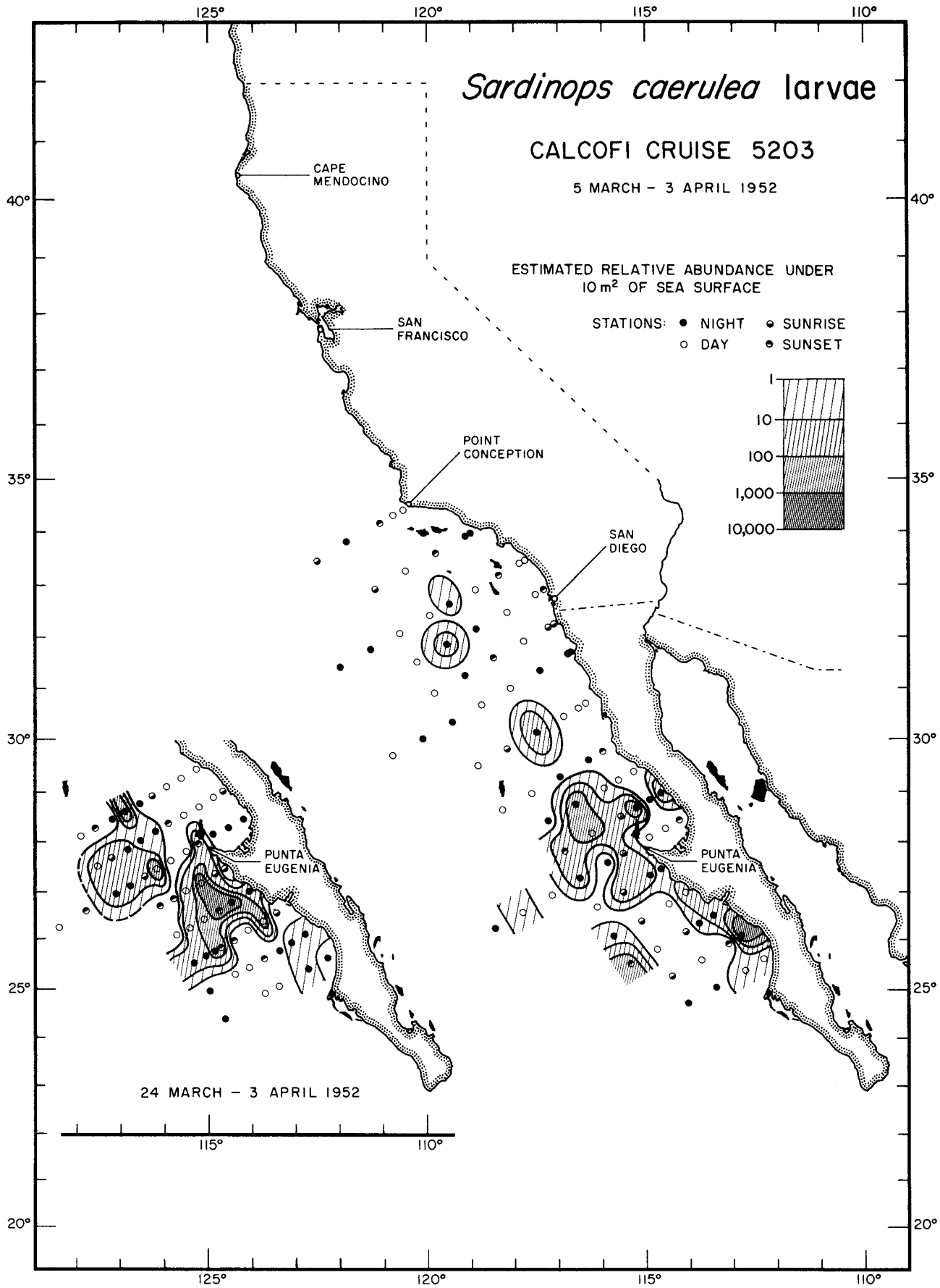
Sardinops caerulea larvae

5103



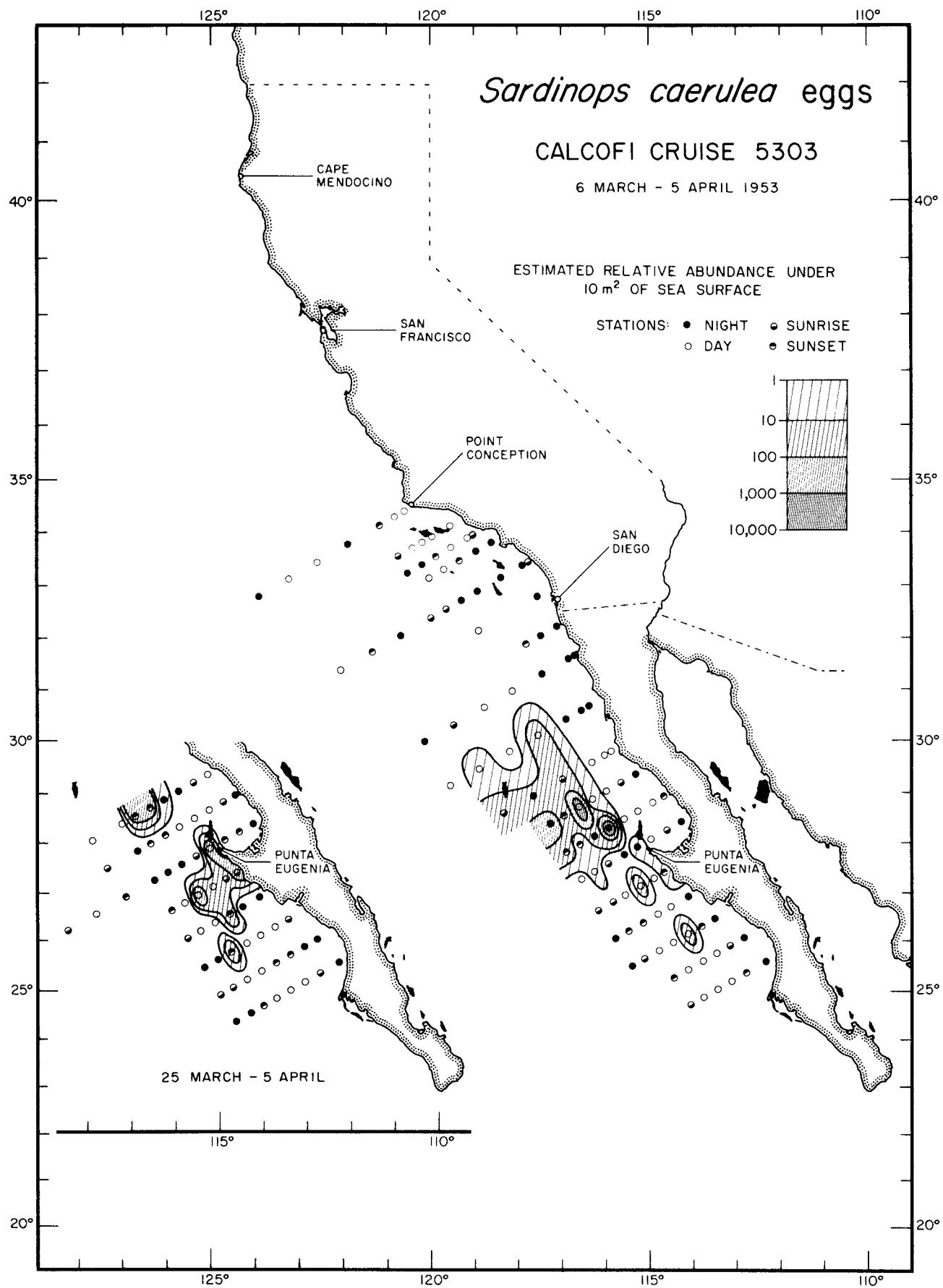
Sardinops caerulea eggs

5203



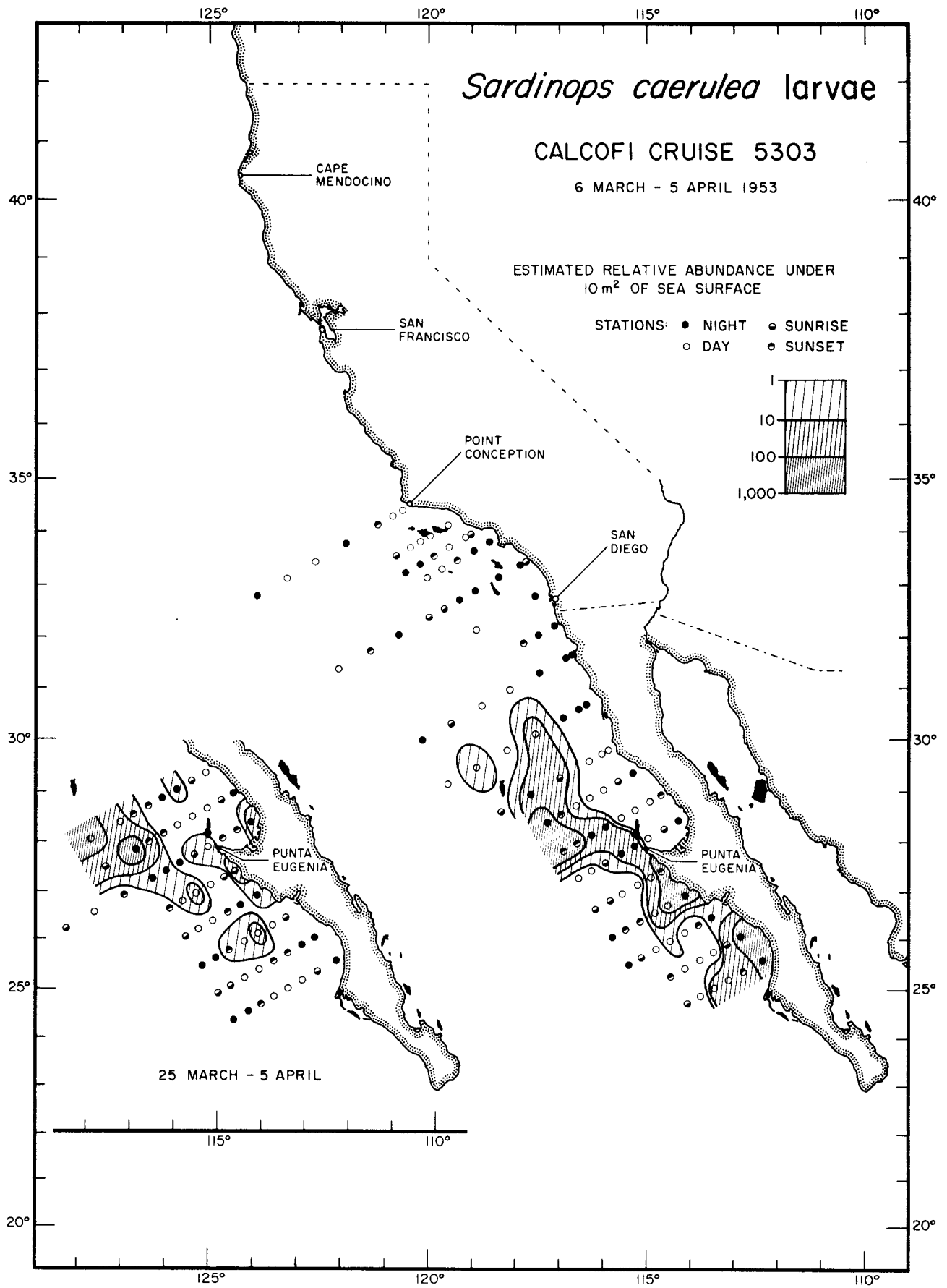
Sardinops caerulea larvae

5203



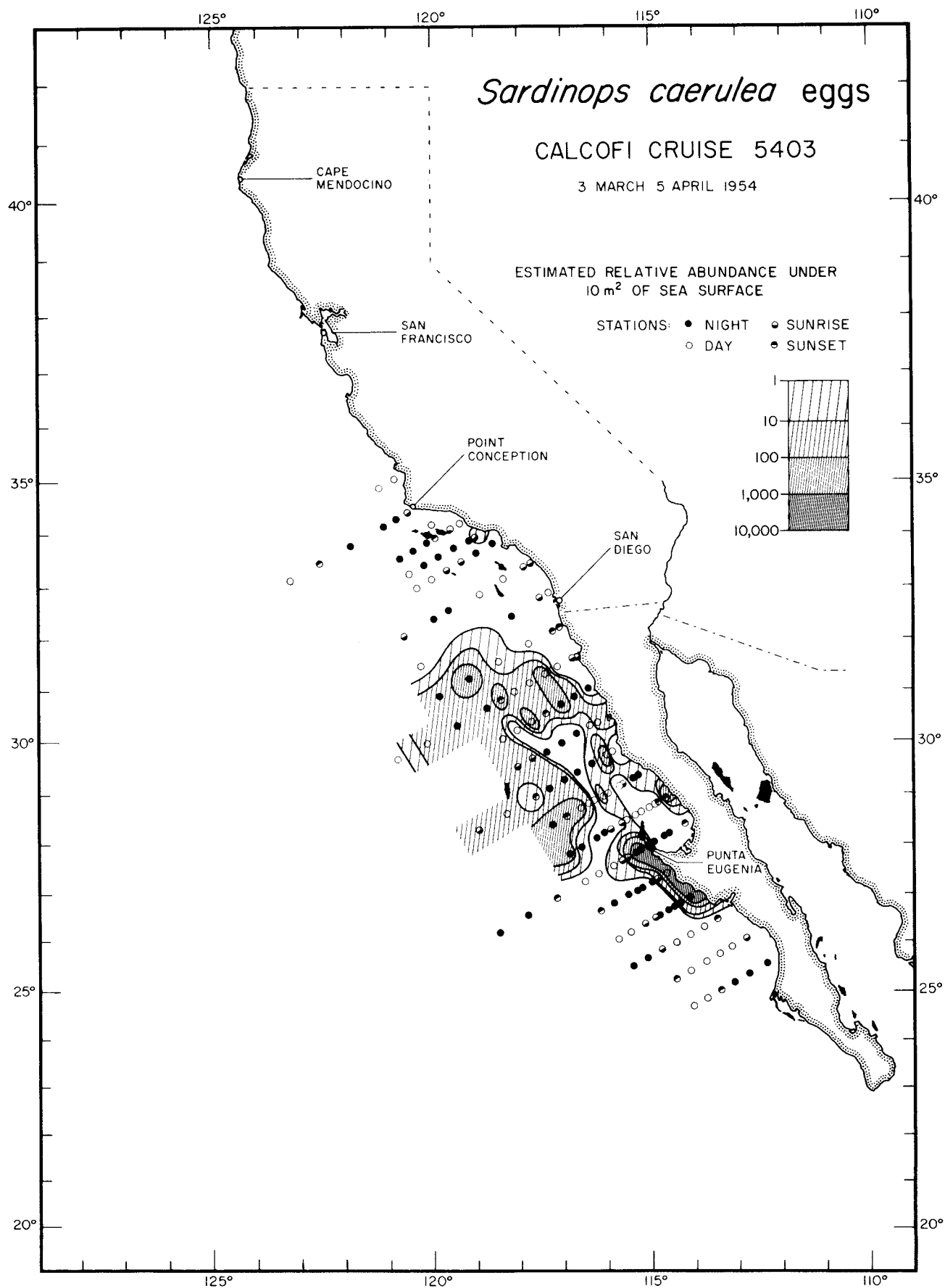
Sardinops caerulea eggs

5303



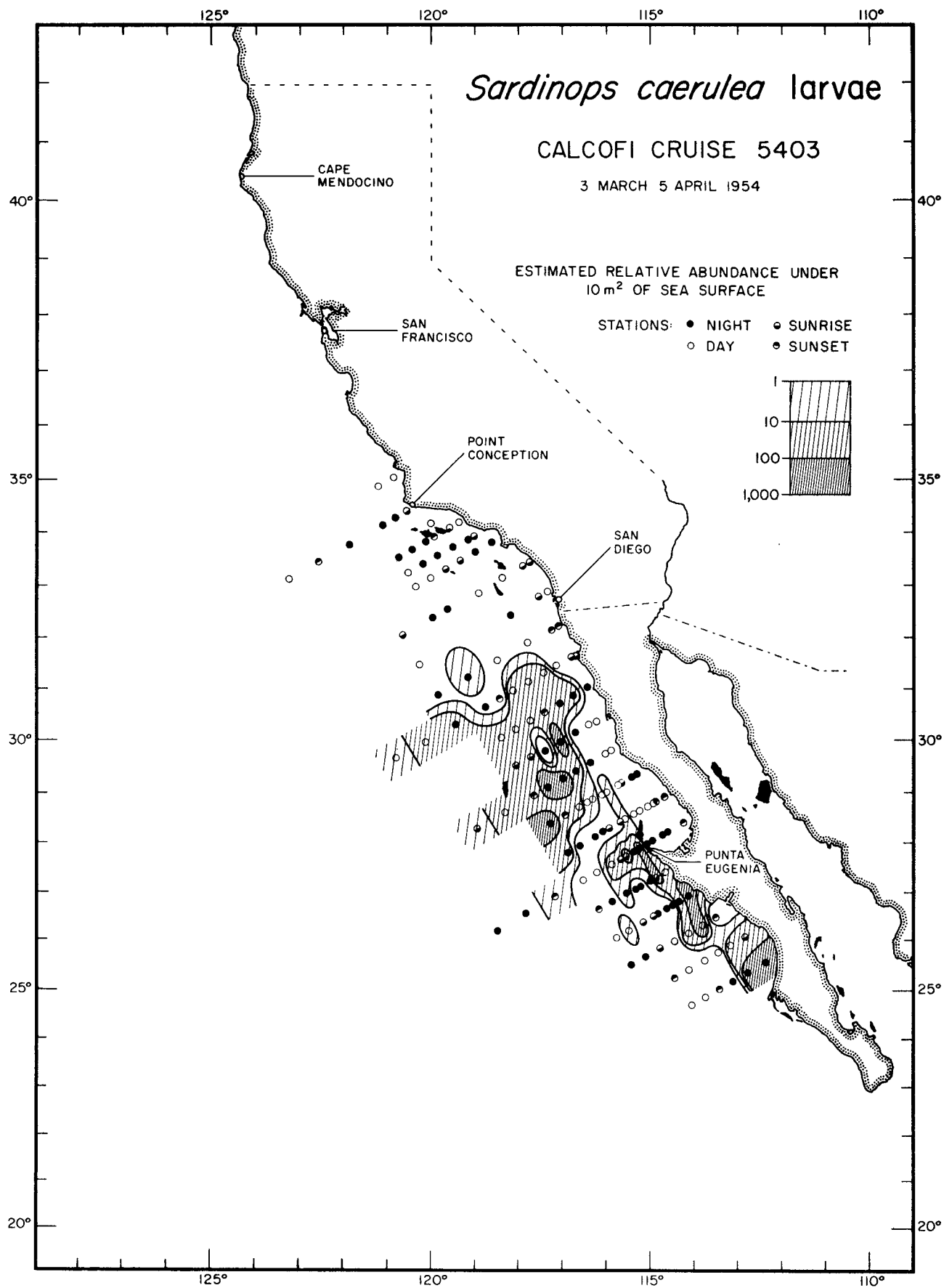
Sardinops caerulea larvae

5303



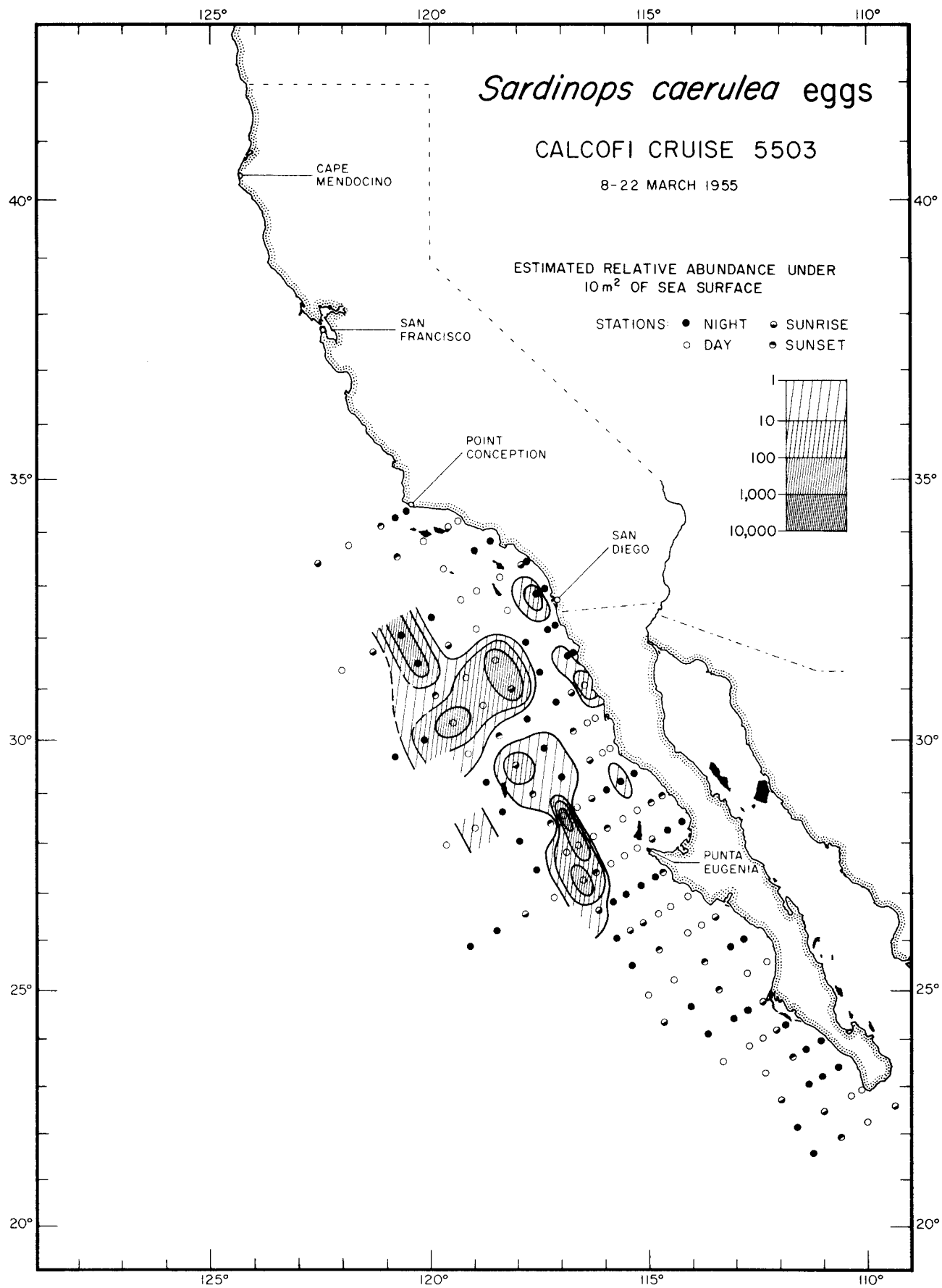
Sardinops caerulea eggs

5403



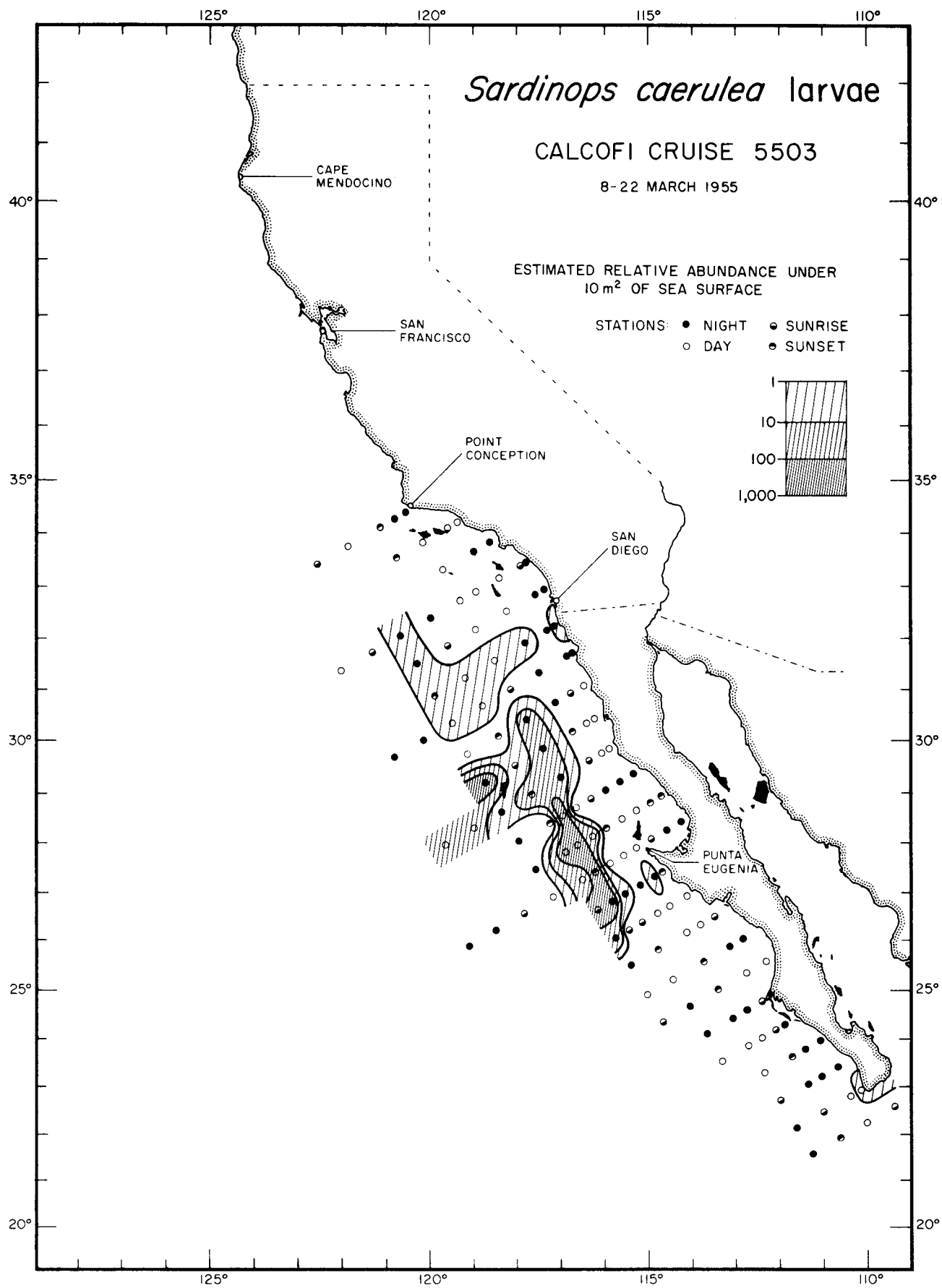
Sardinops caerulea larvae

5403



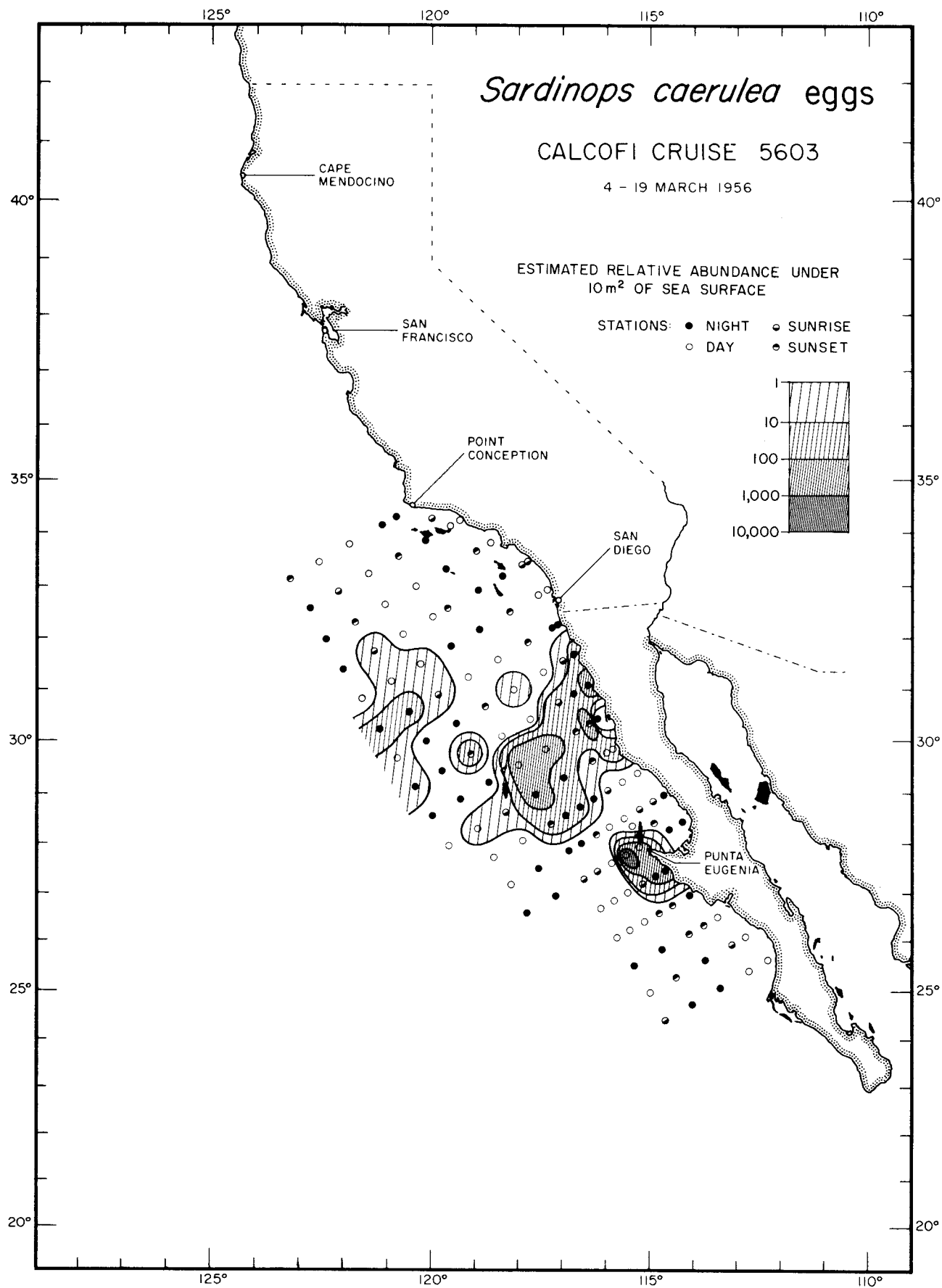
Sardinops caerulea eggs

5503



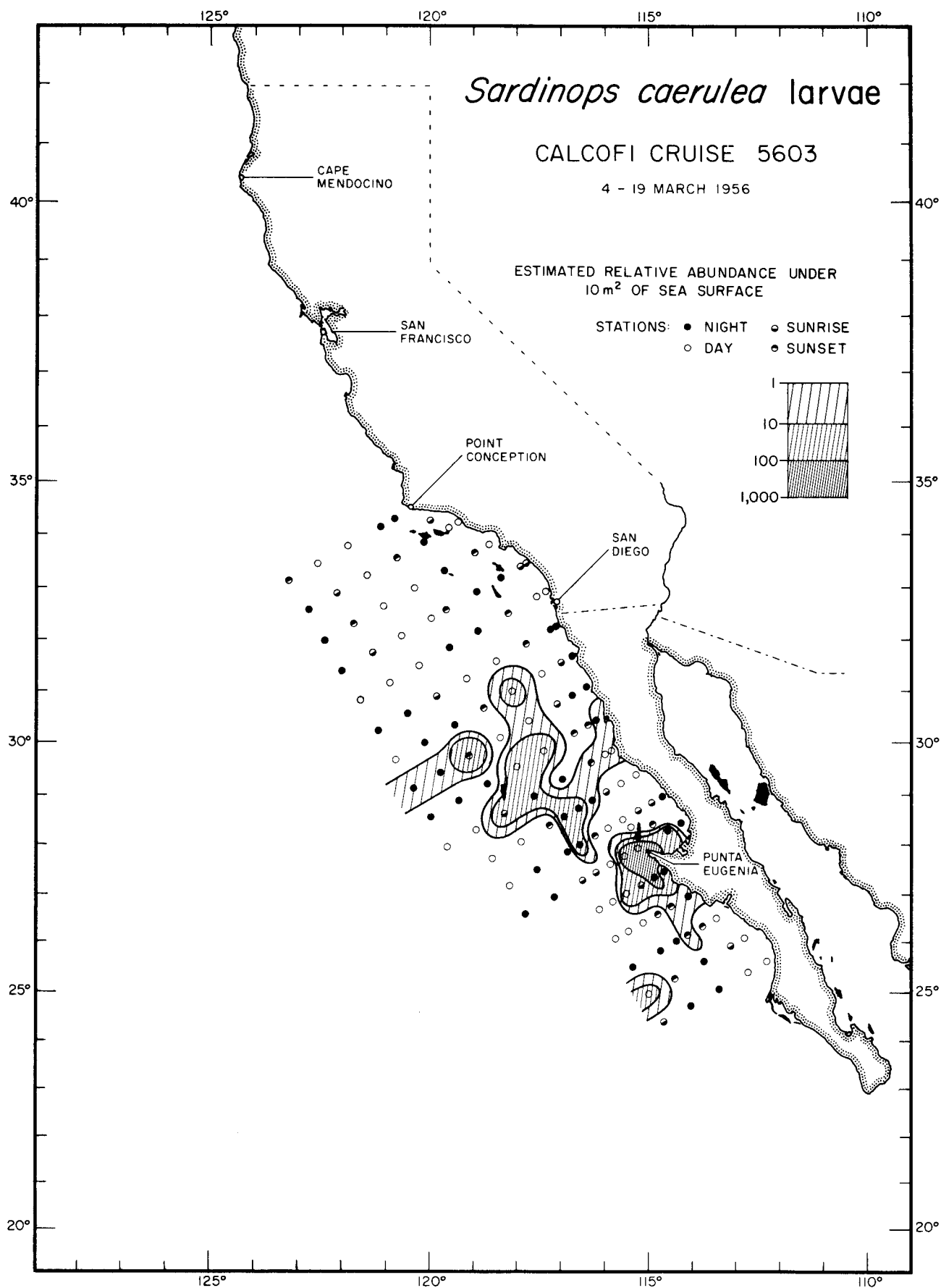
Sardinops caerulea larvae

5503



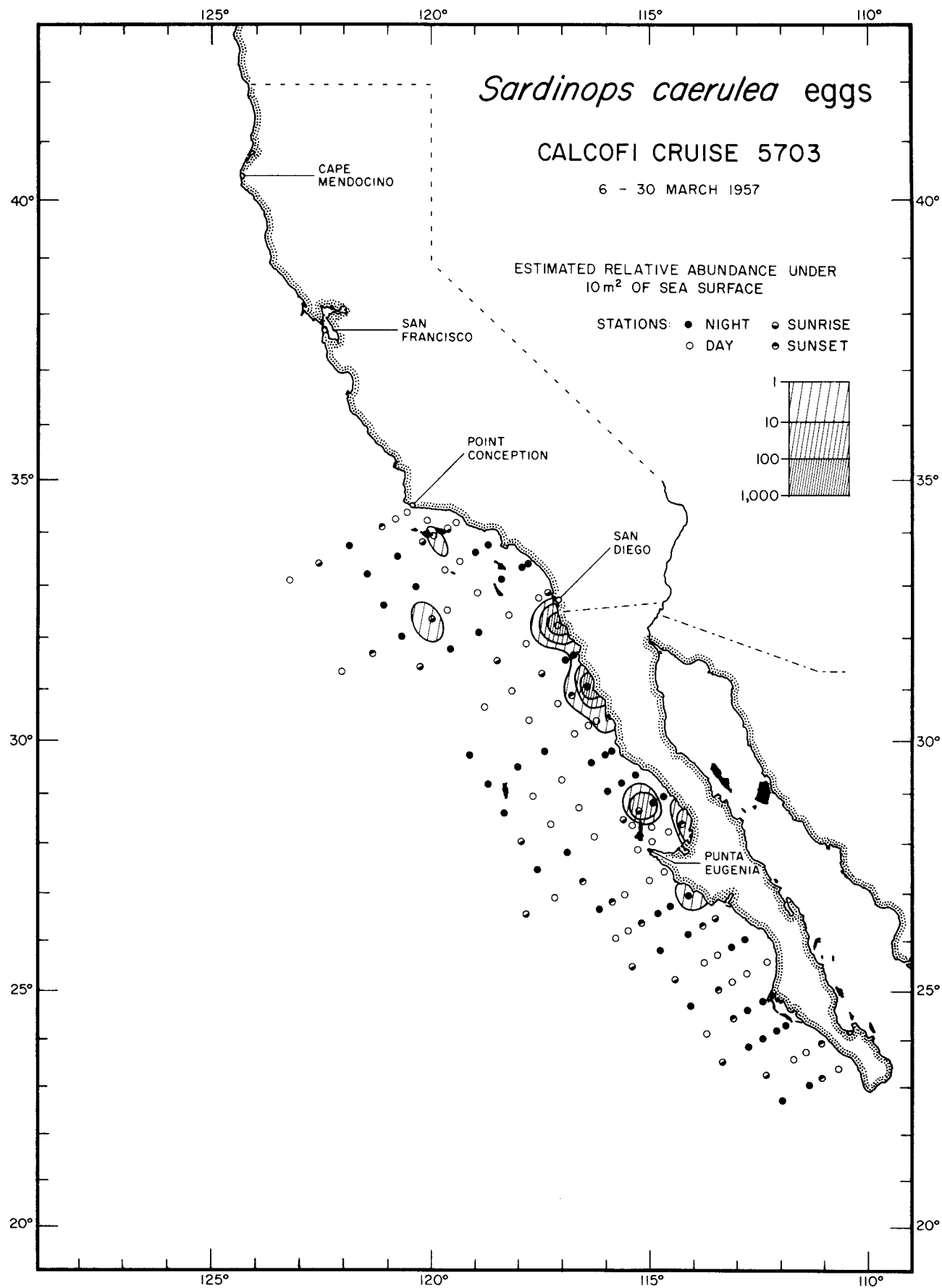
Sardinops caerulea eggs

5603



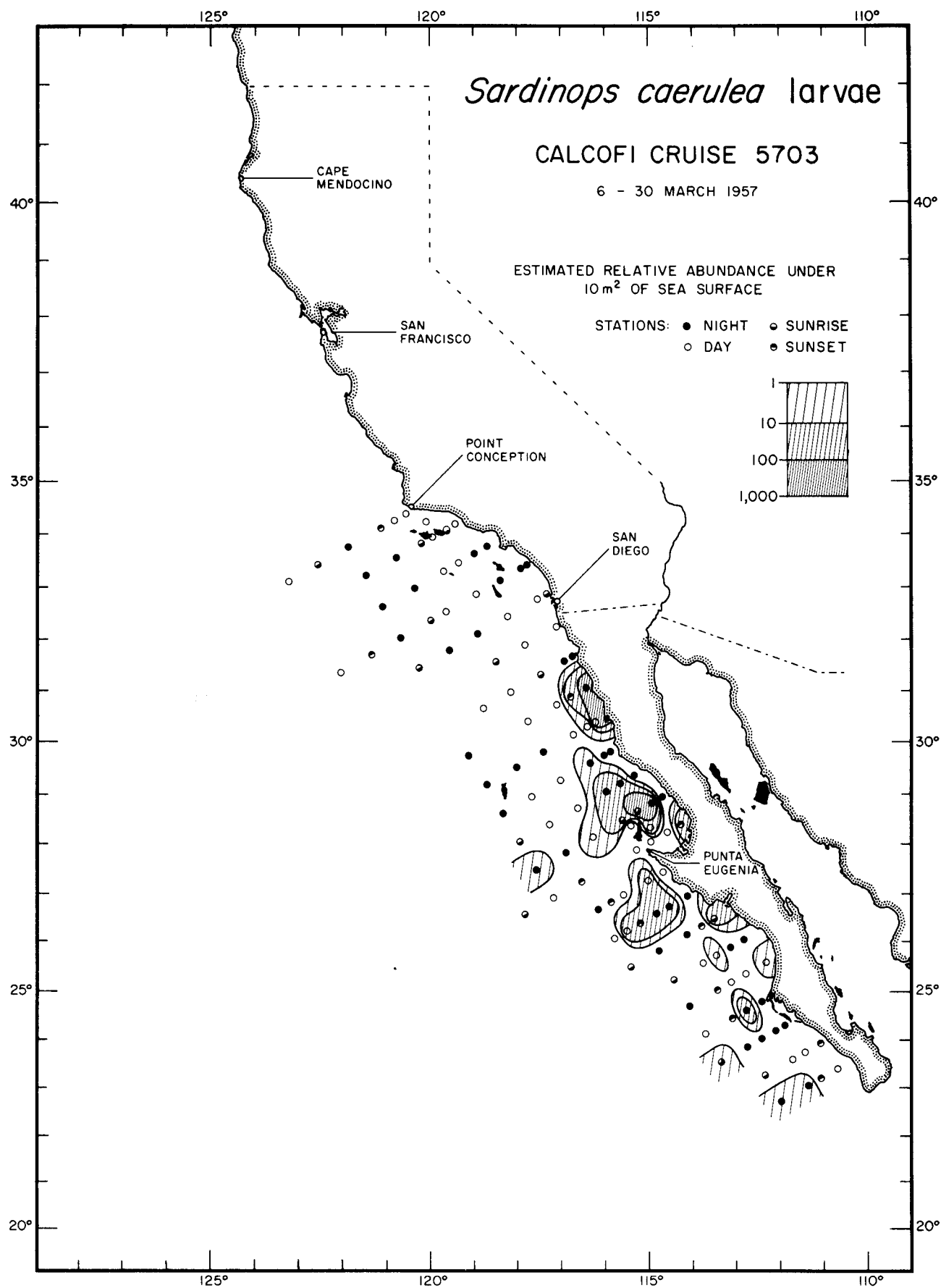
Sardinops caerulea larvae

5603



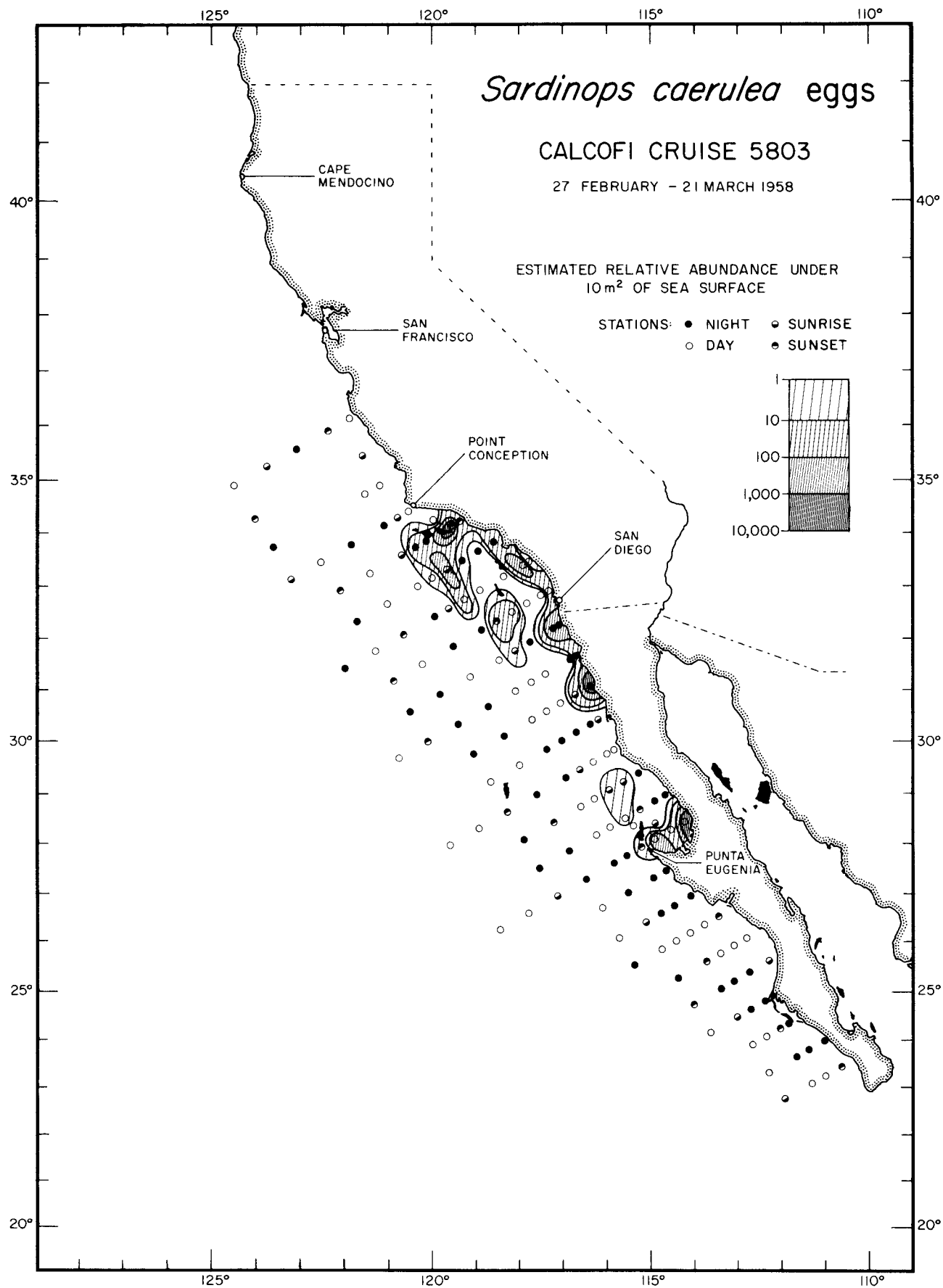
Sardinops caerulea eggs

5703

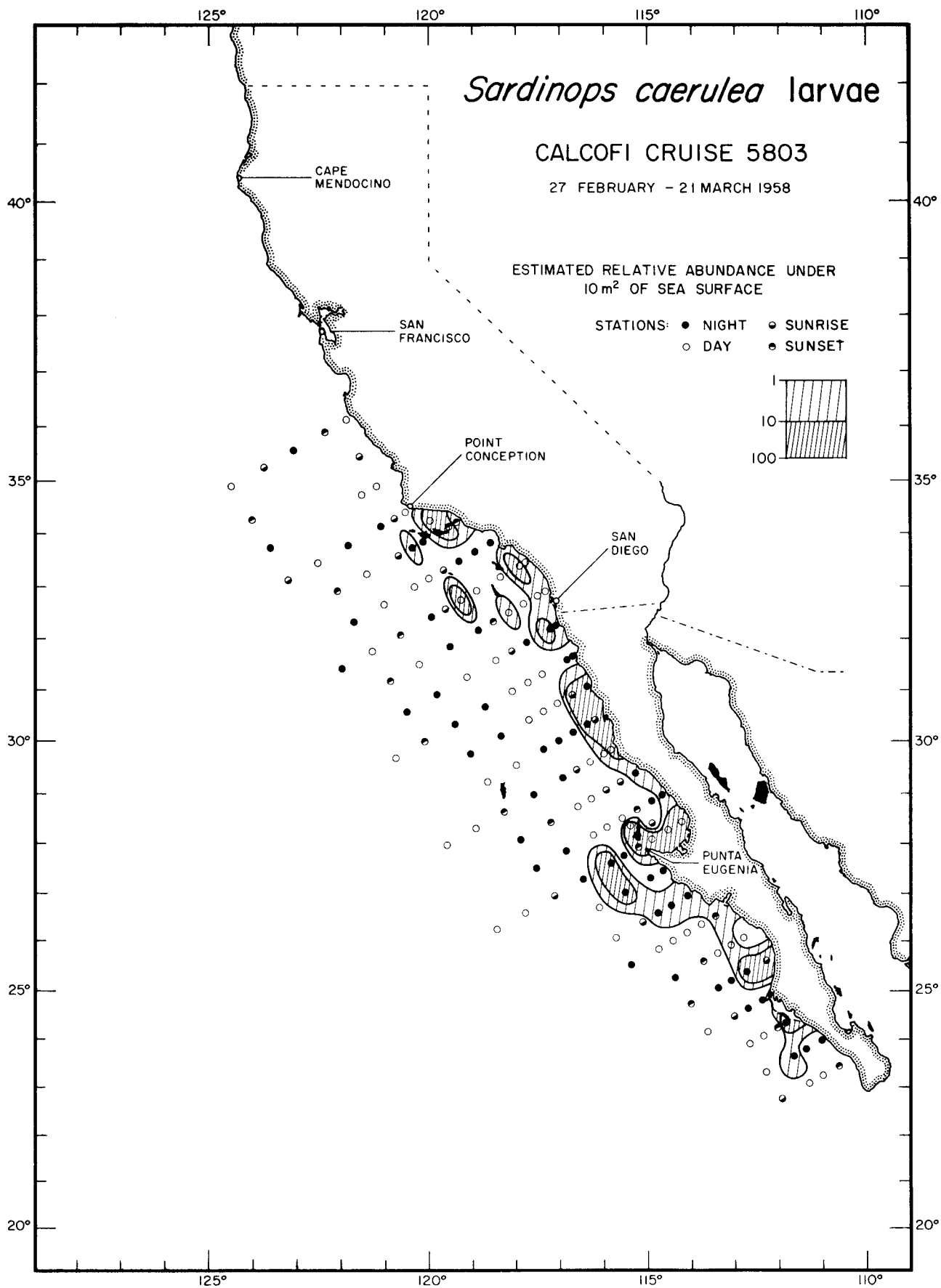


Sardinops caerulea larvae

5703

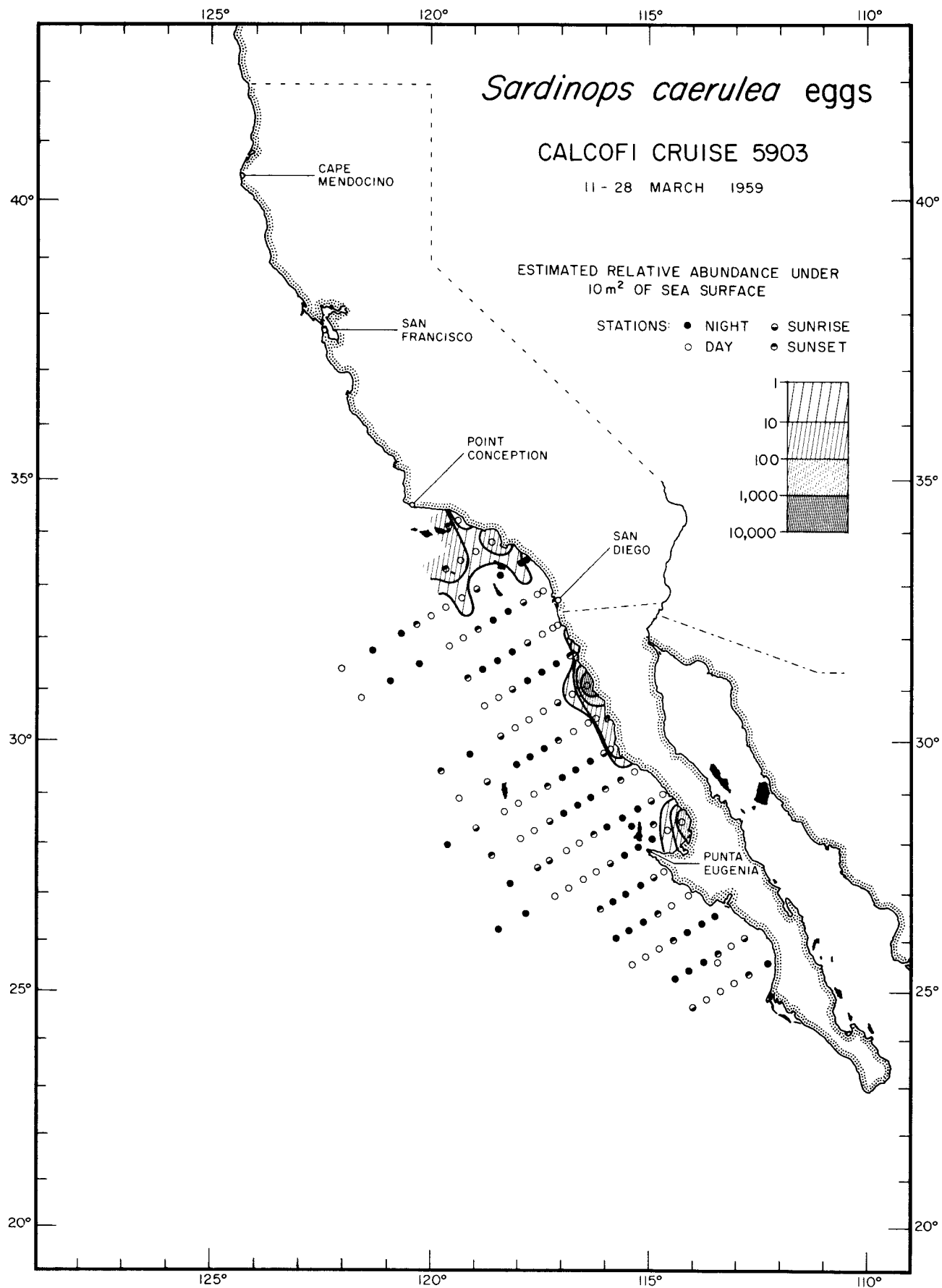
*Sardinops caerulea* eggs

5803



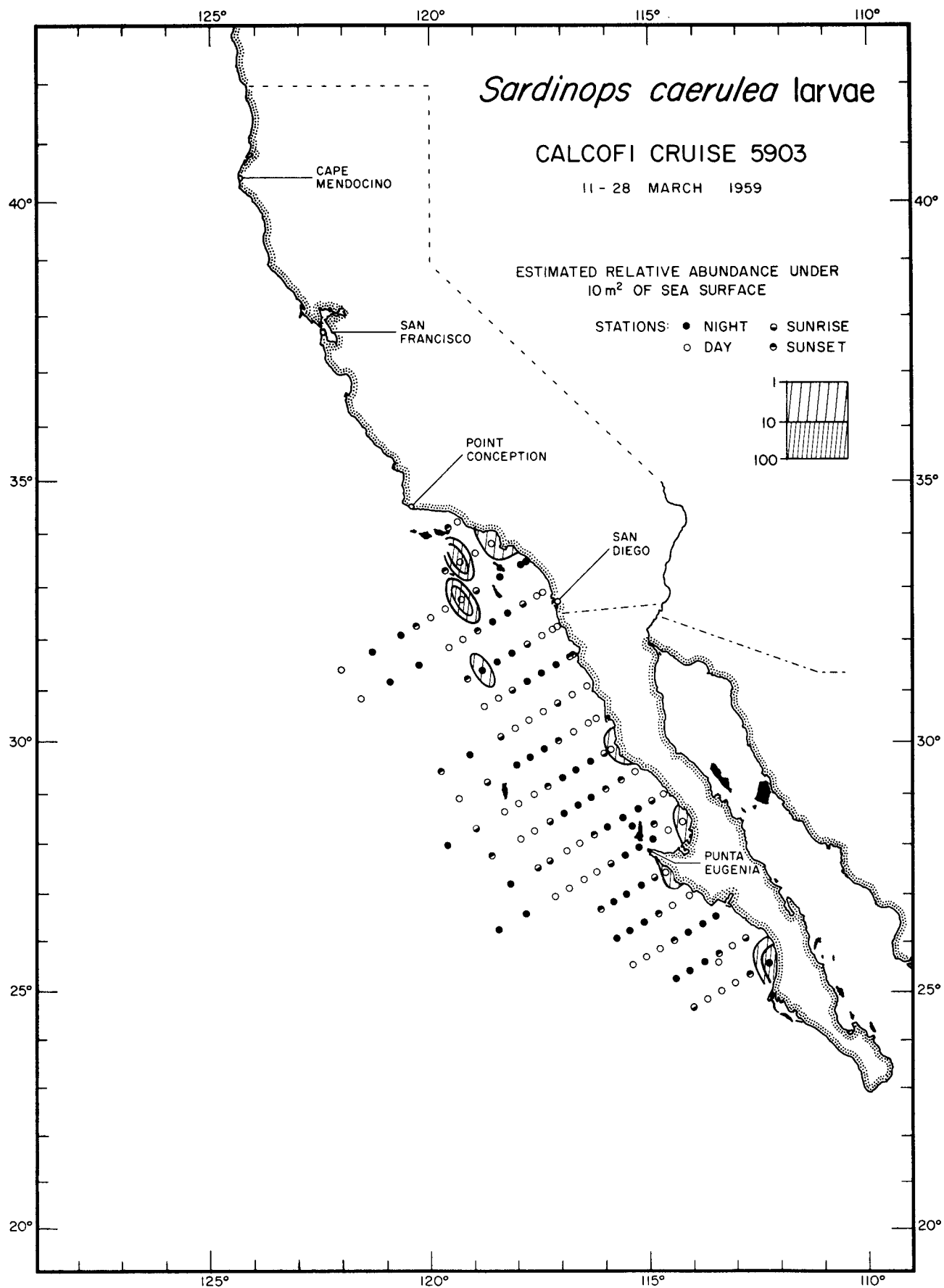
Sardinops caerulea larvae

5803



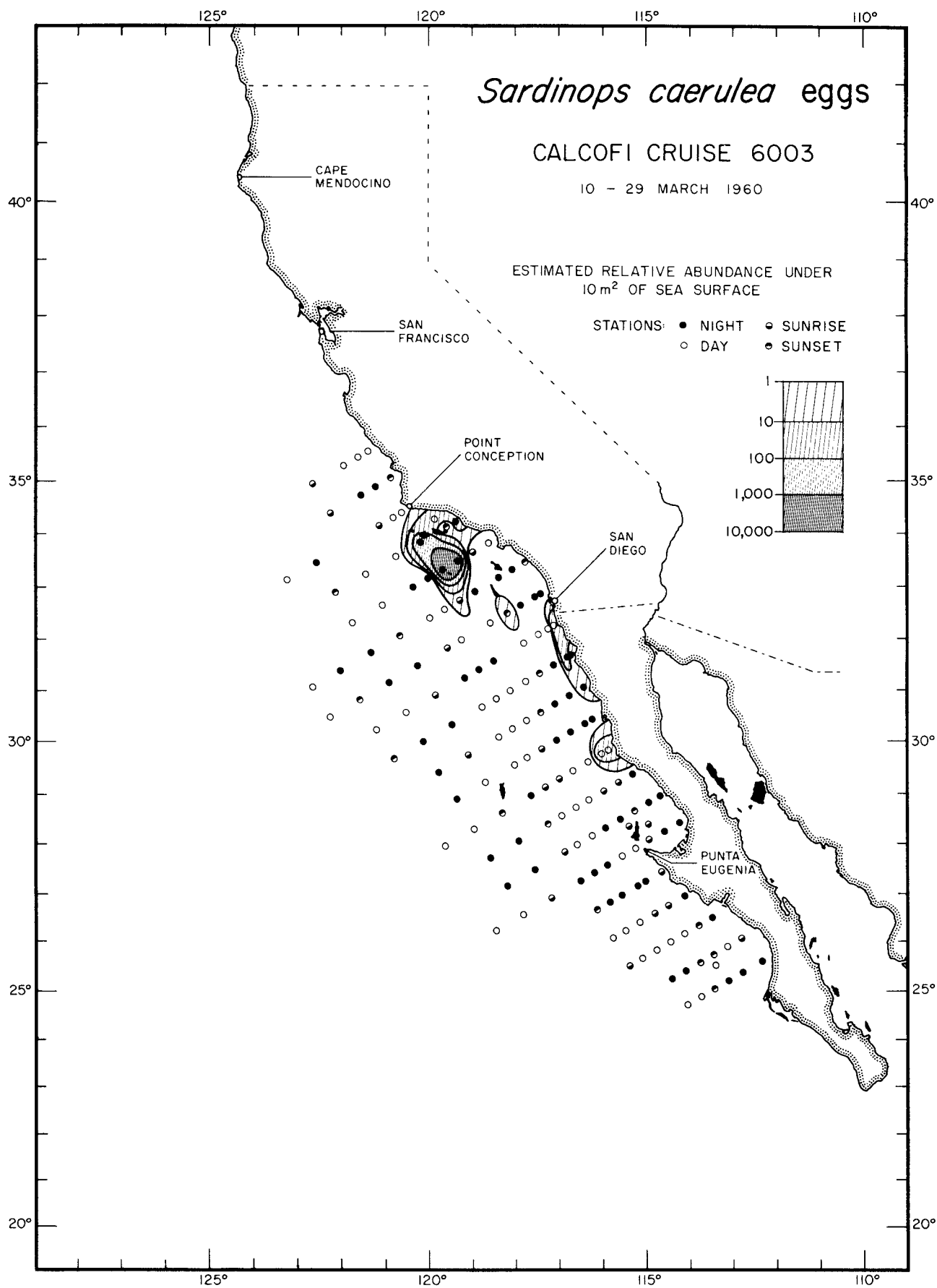
Sardinops caerulea eggs

5903



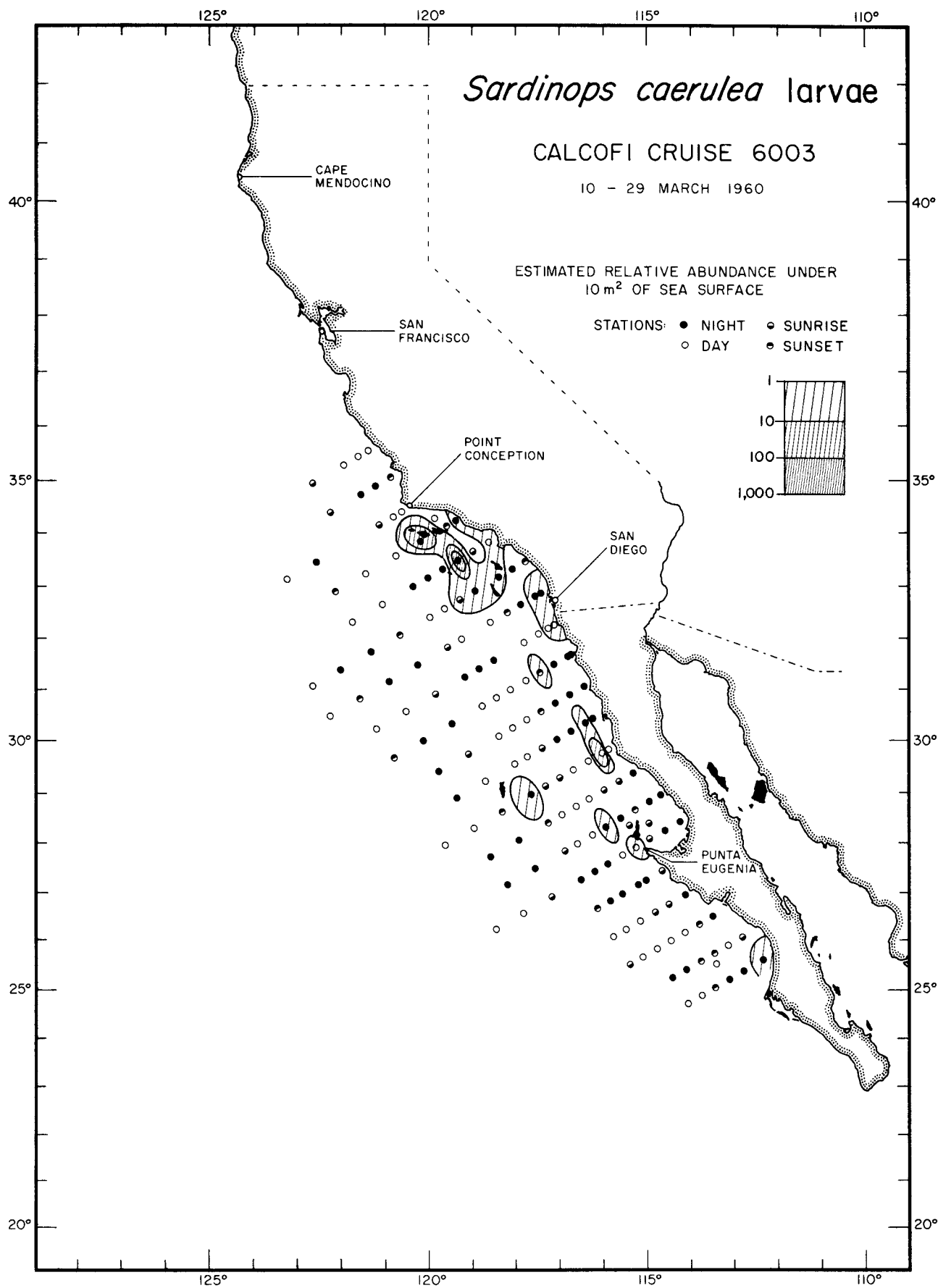
Sardinops caerulea larvae

5903



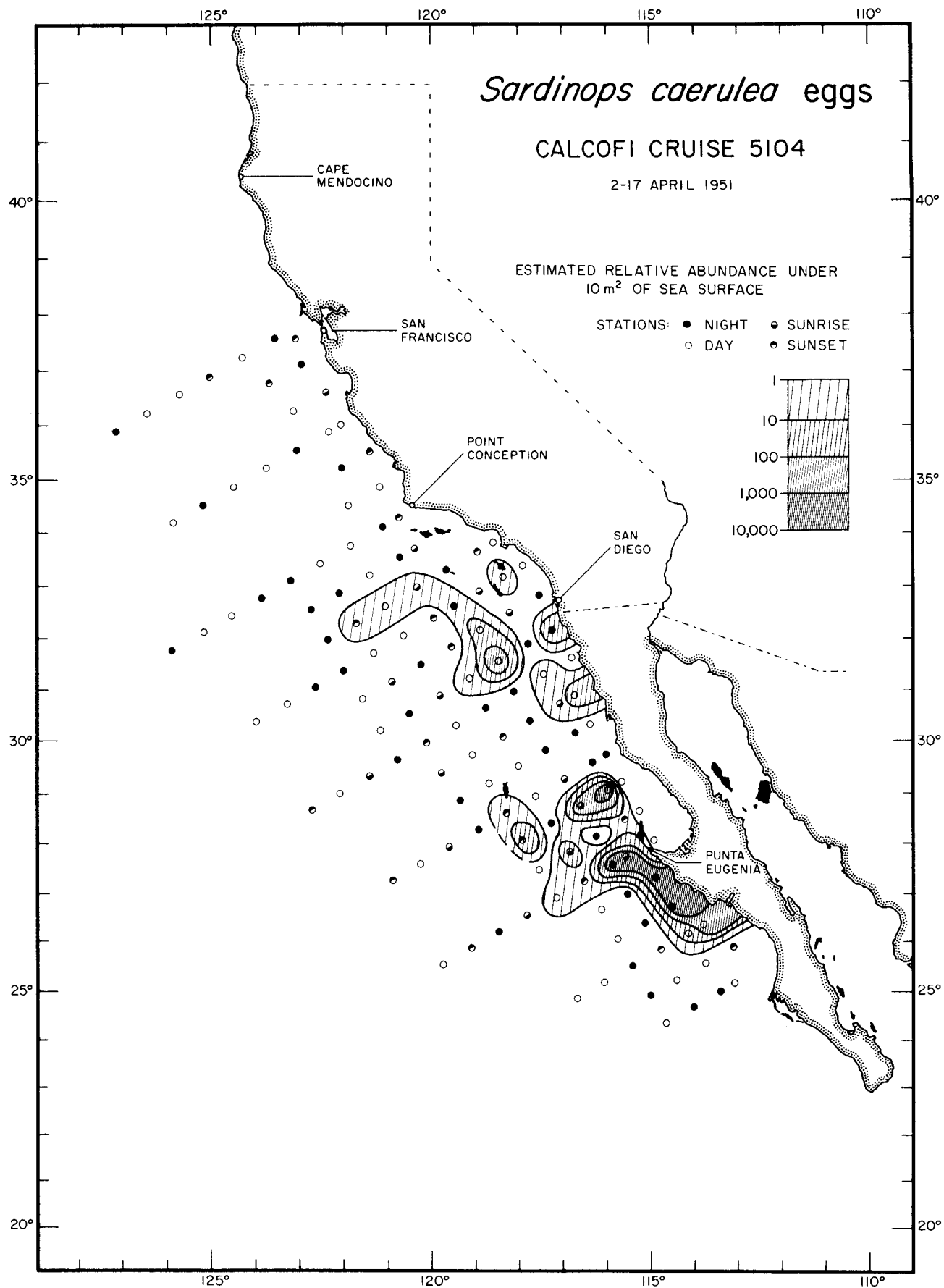
Sardinops caerulea eggs

6003



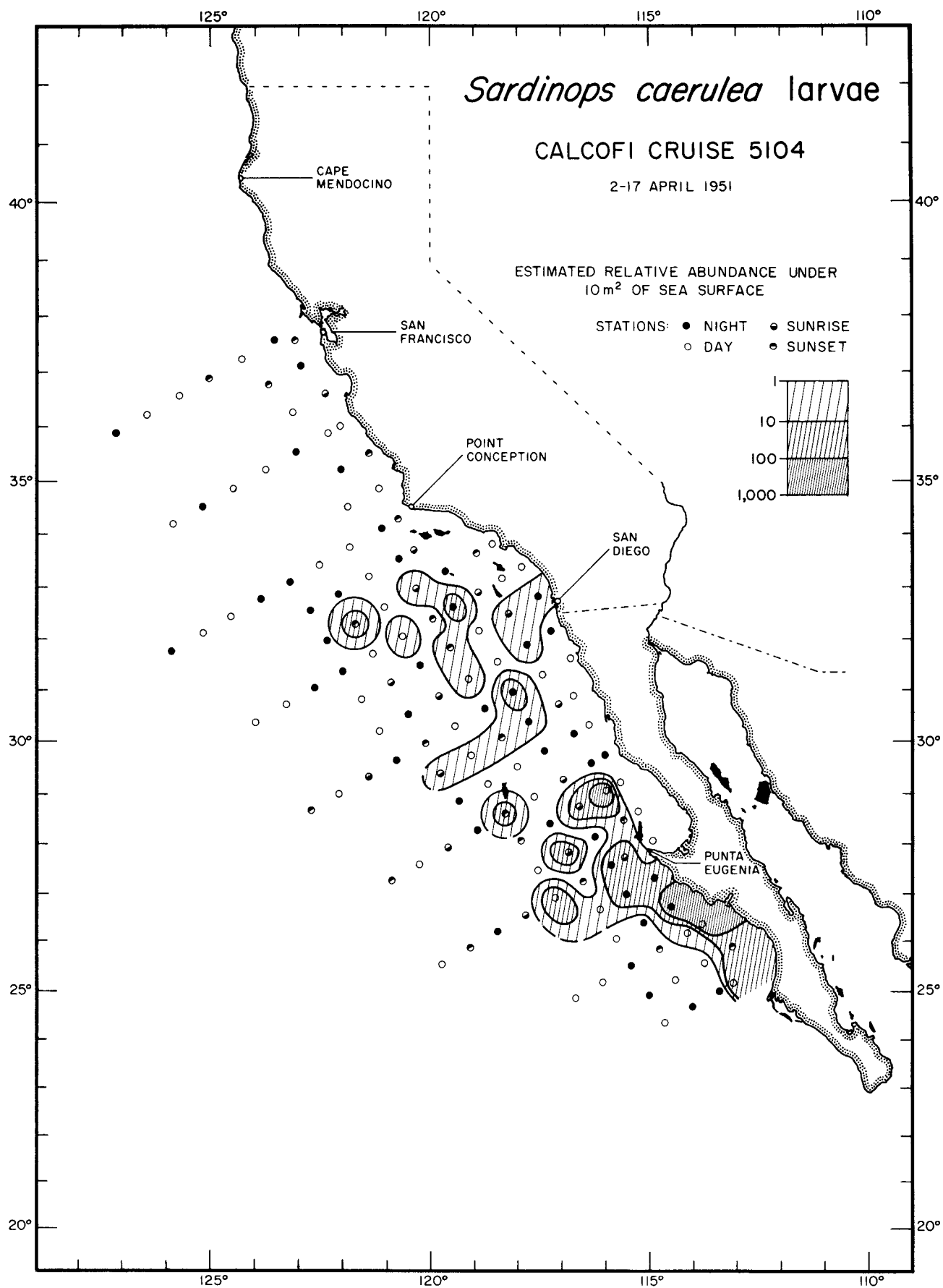
Sardinops caerulea larvae

6003



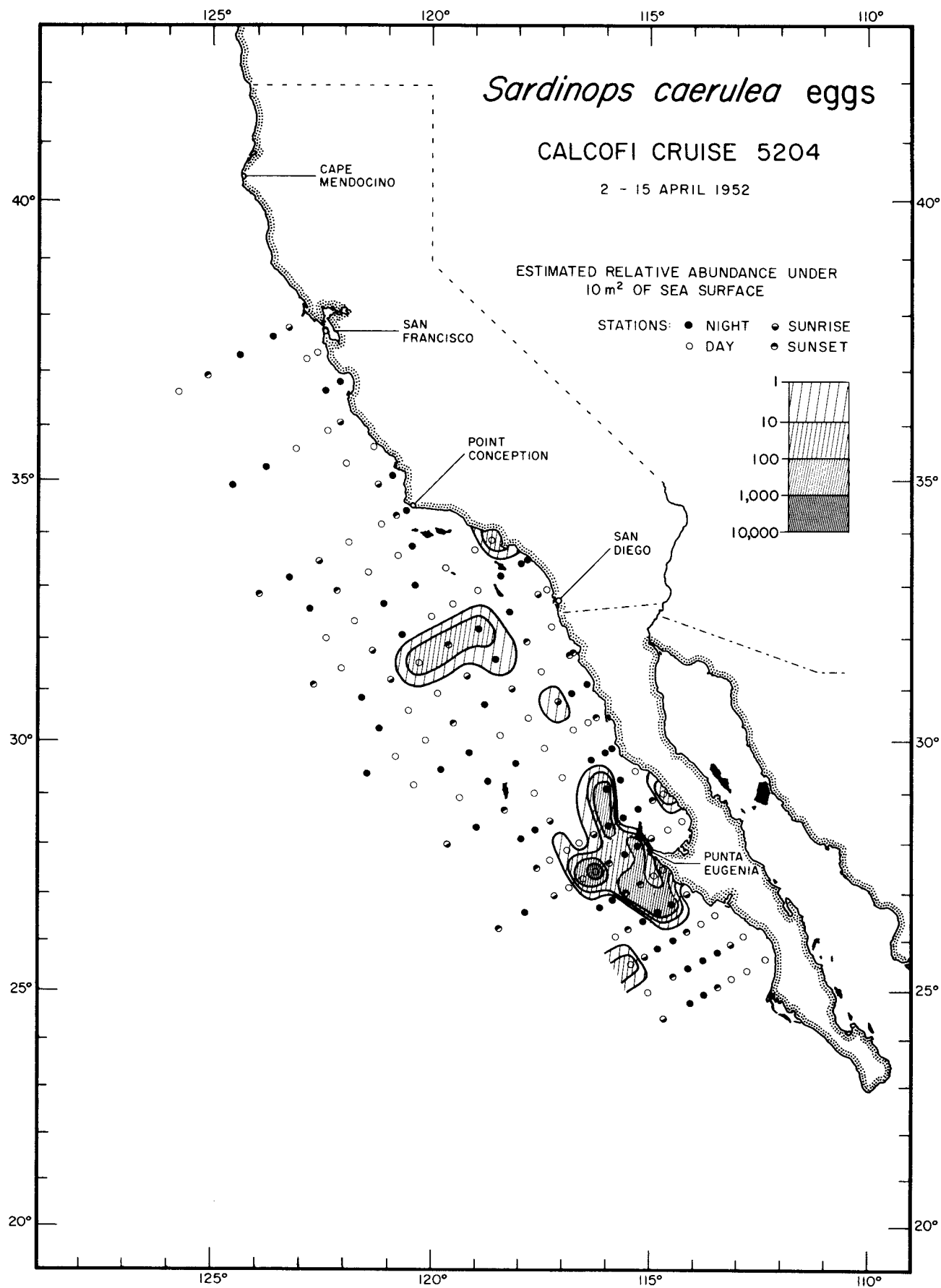
Sardinops caerulea eggs

5104



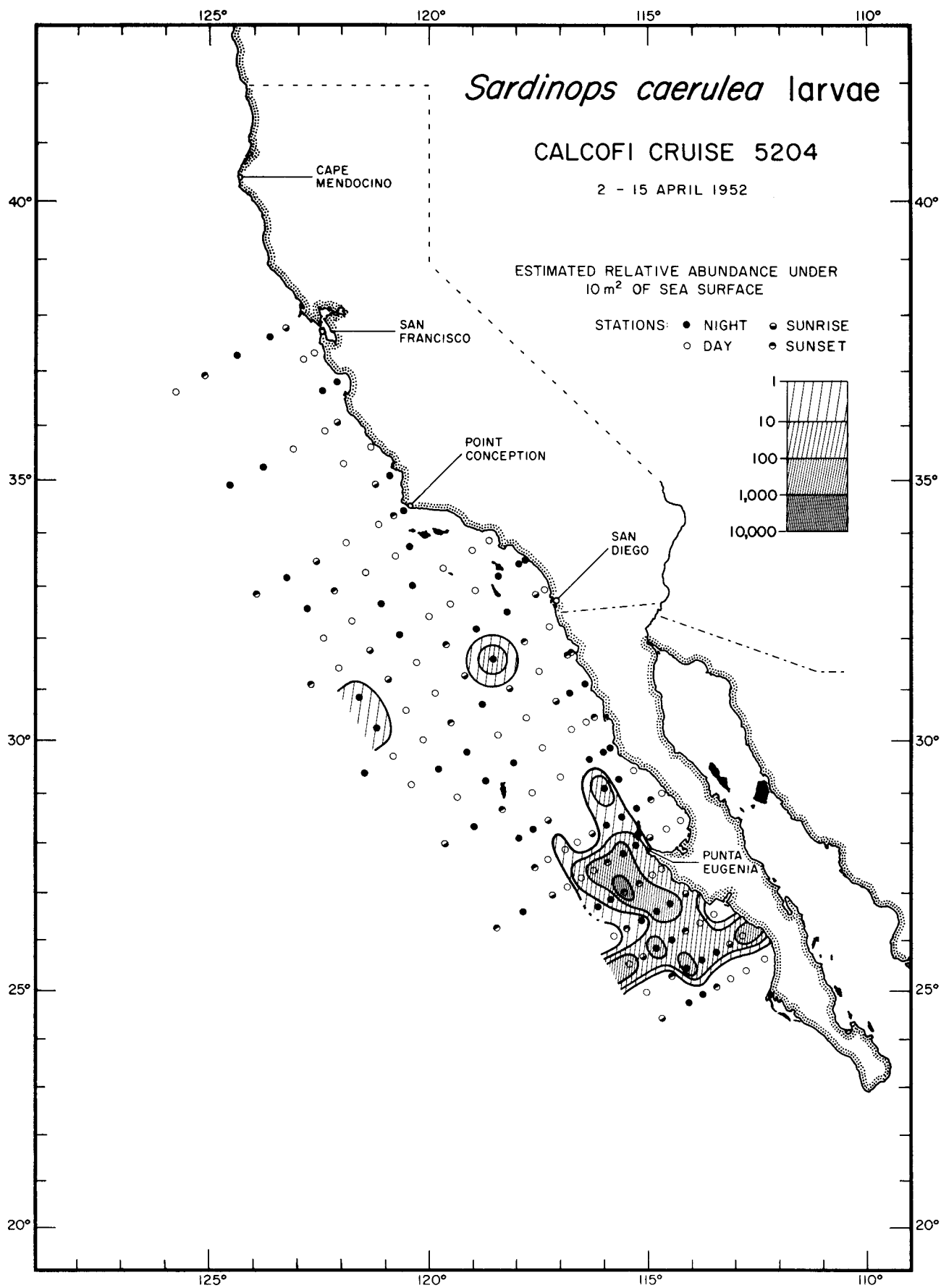
Sardinops caerulea larvae

5104



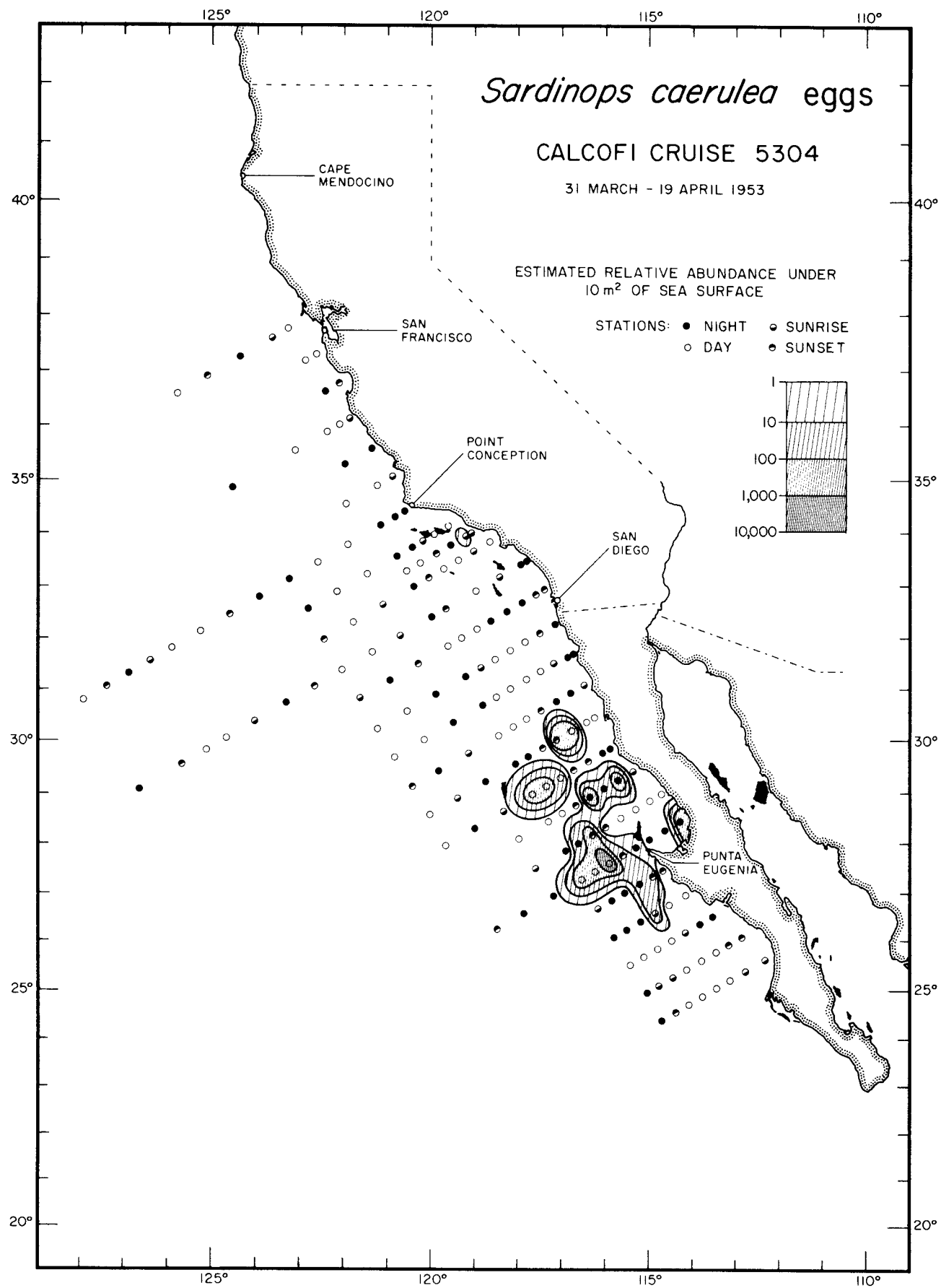
Sardinops caerulea eggs

5204



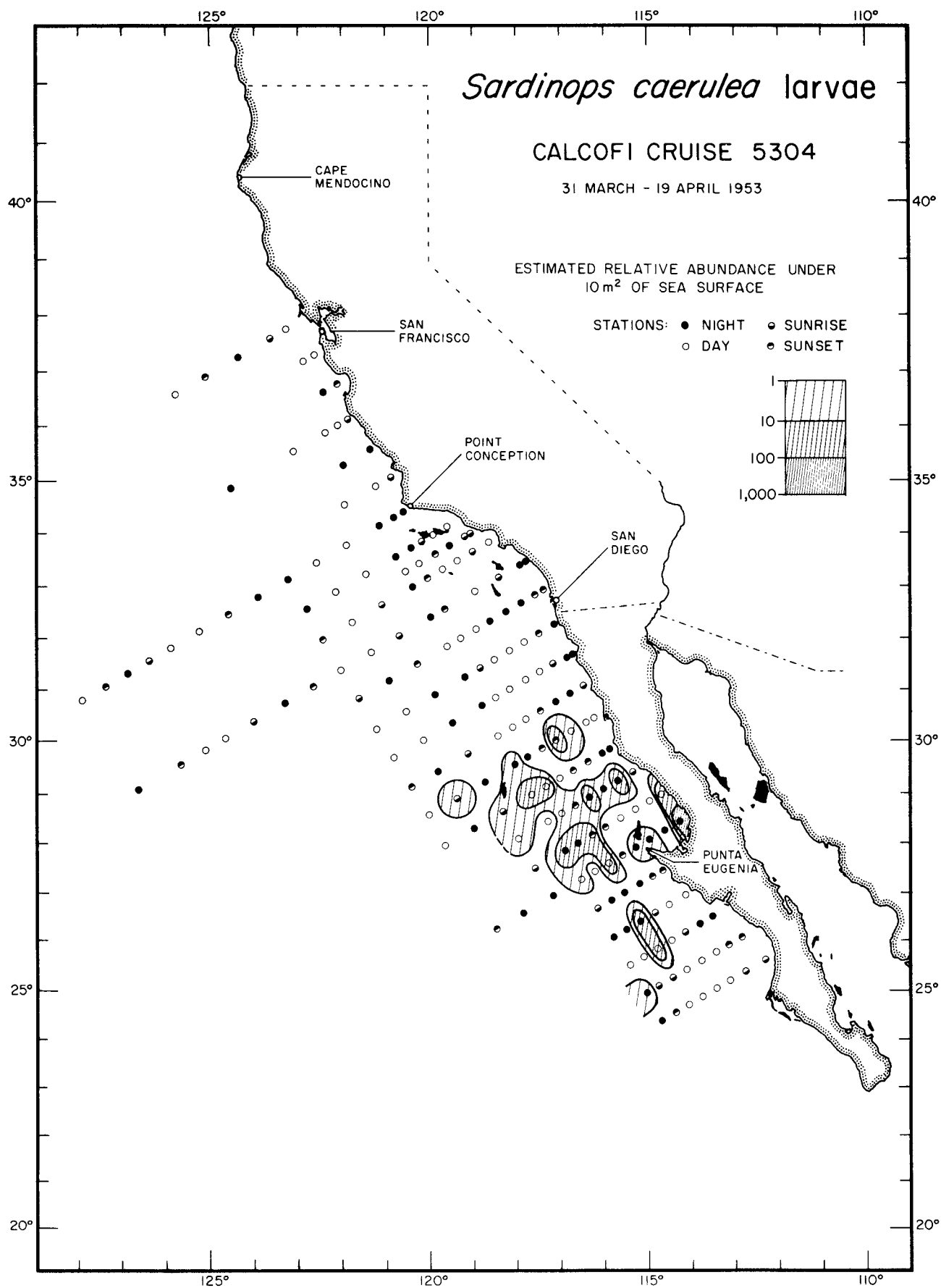
Sardinops caerulea larvae

5204



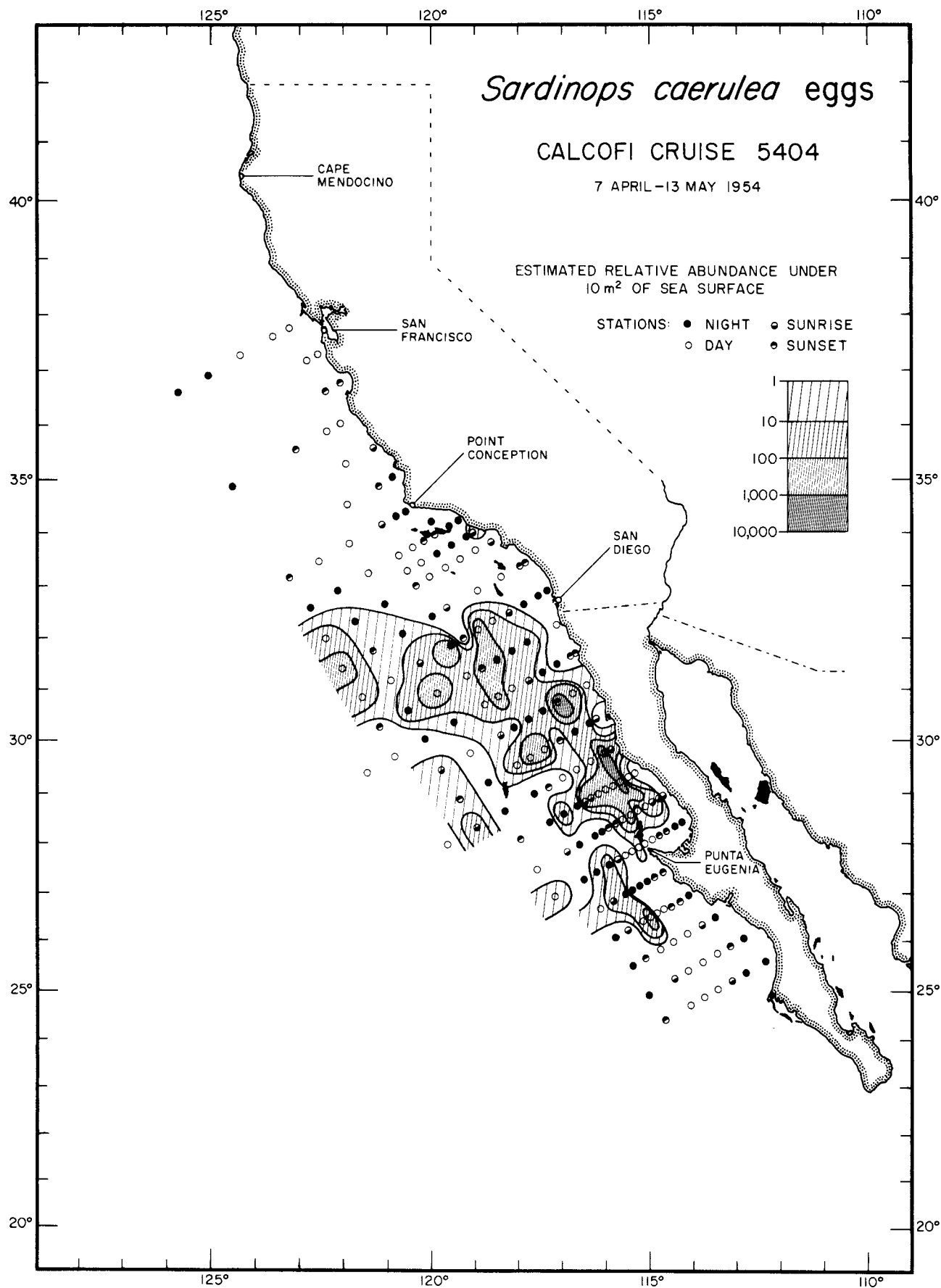
Sardinops caerulea eggs

5304



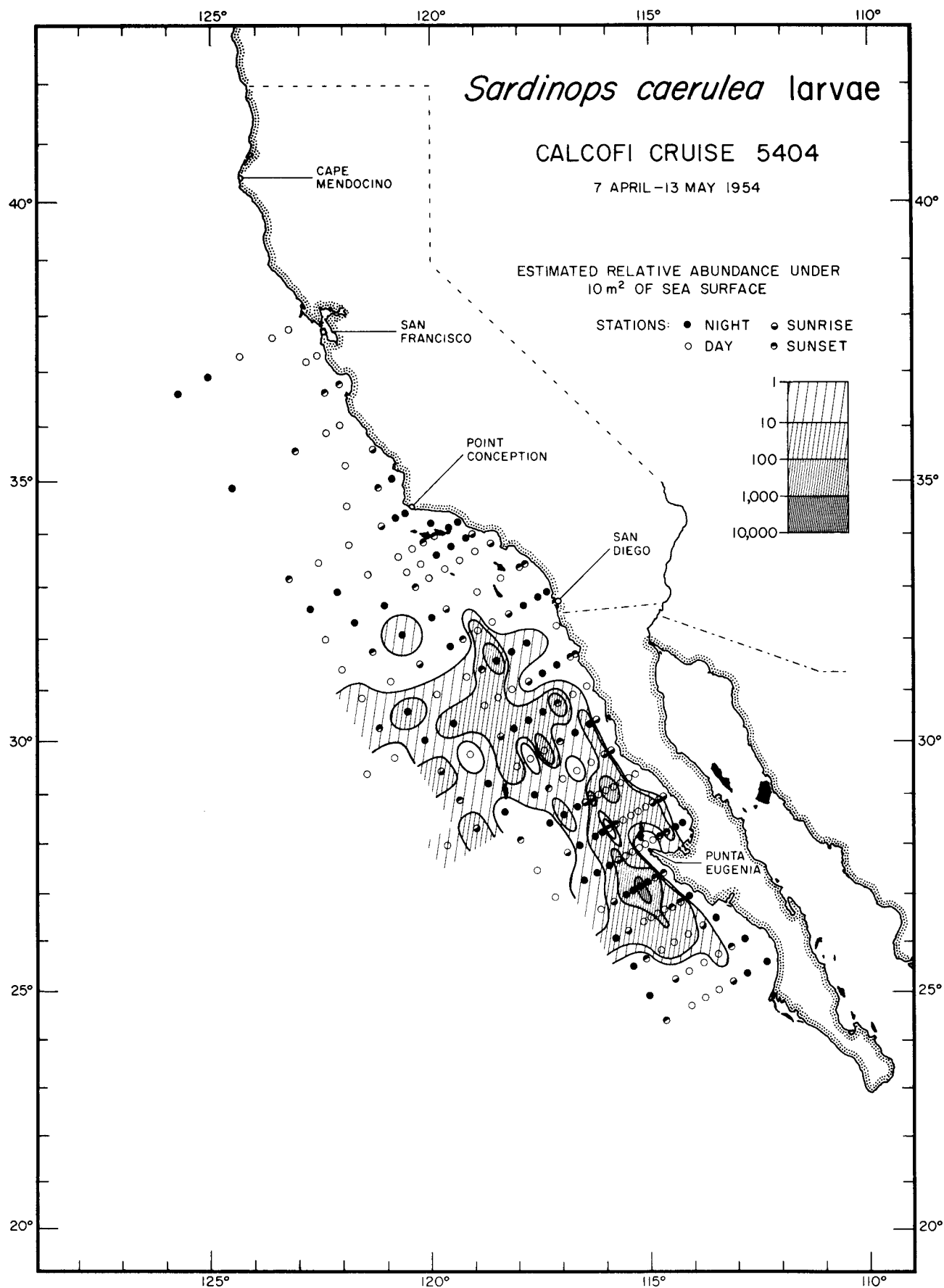
Sardinops caerulea larvae

5304



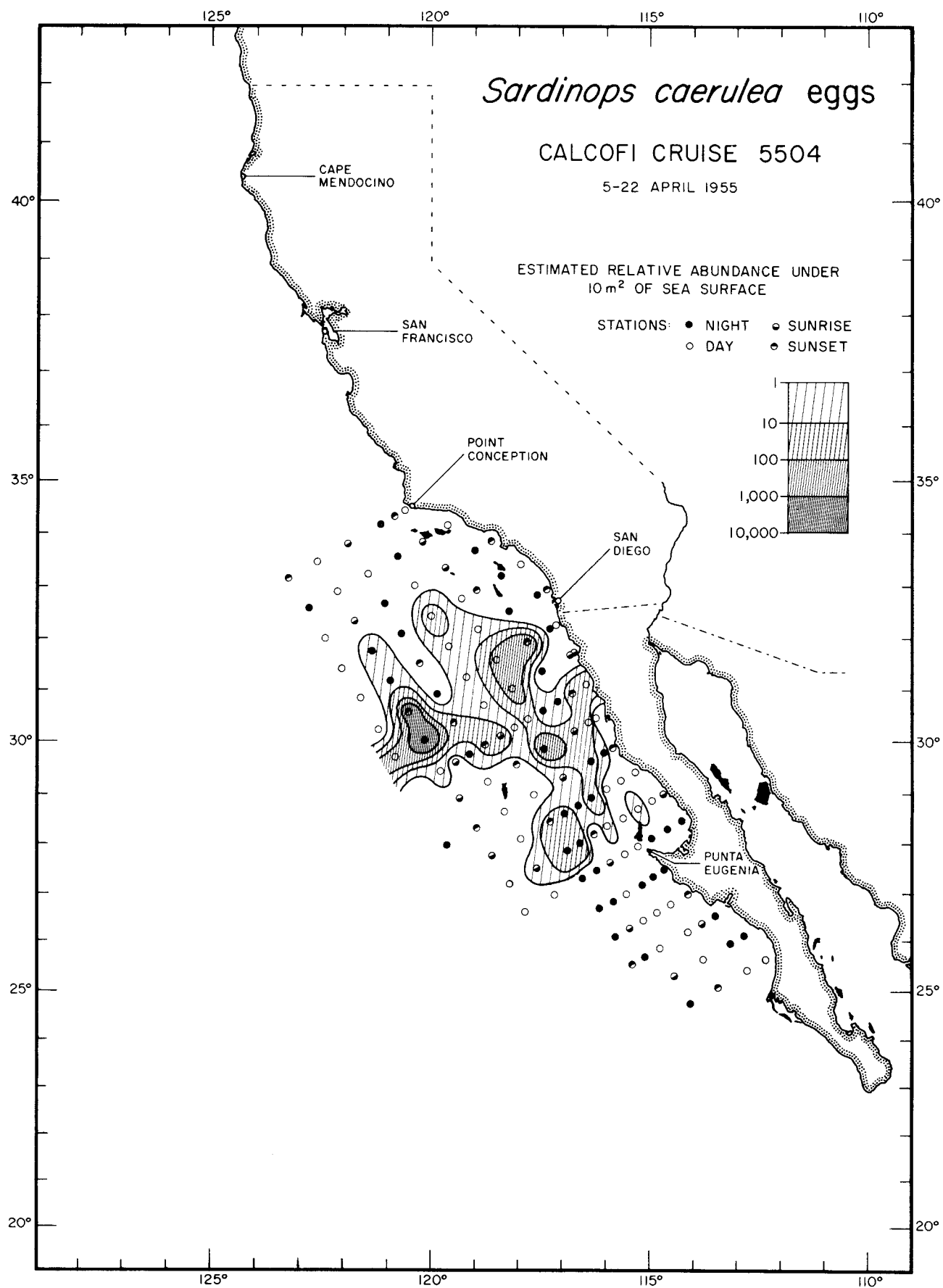
Sardinops caerulea eggs

5404



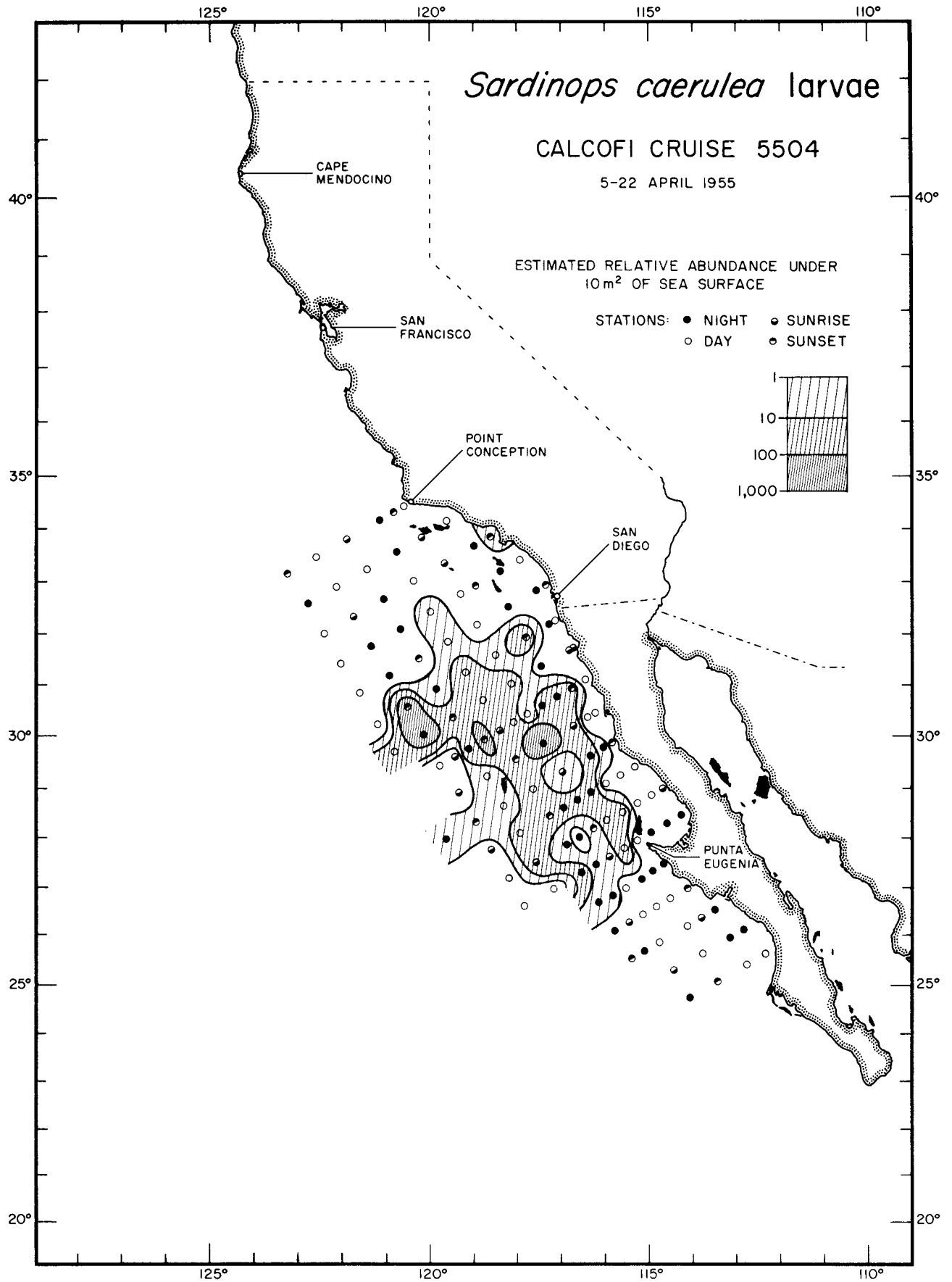
Sardinops caerulea larvae

5404



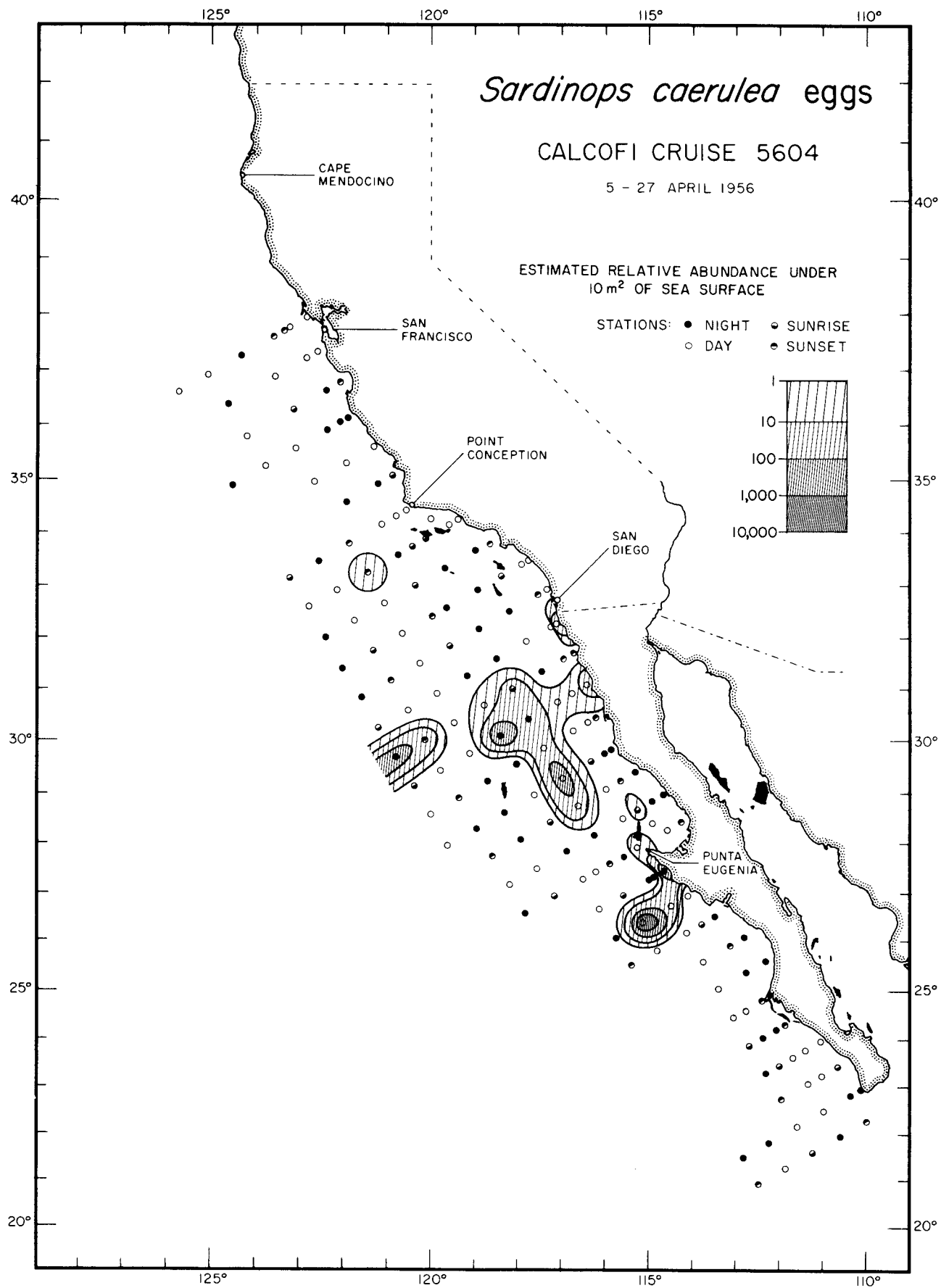
Sardinops caerulea eggs

5504



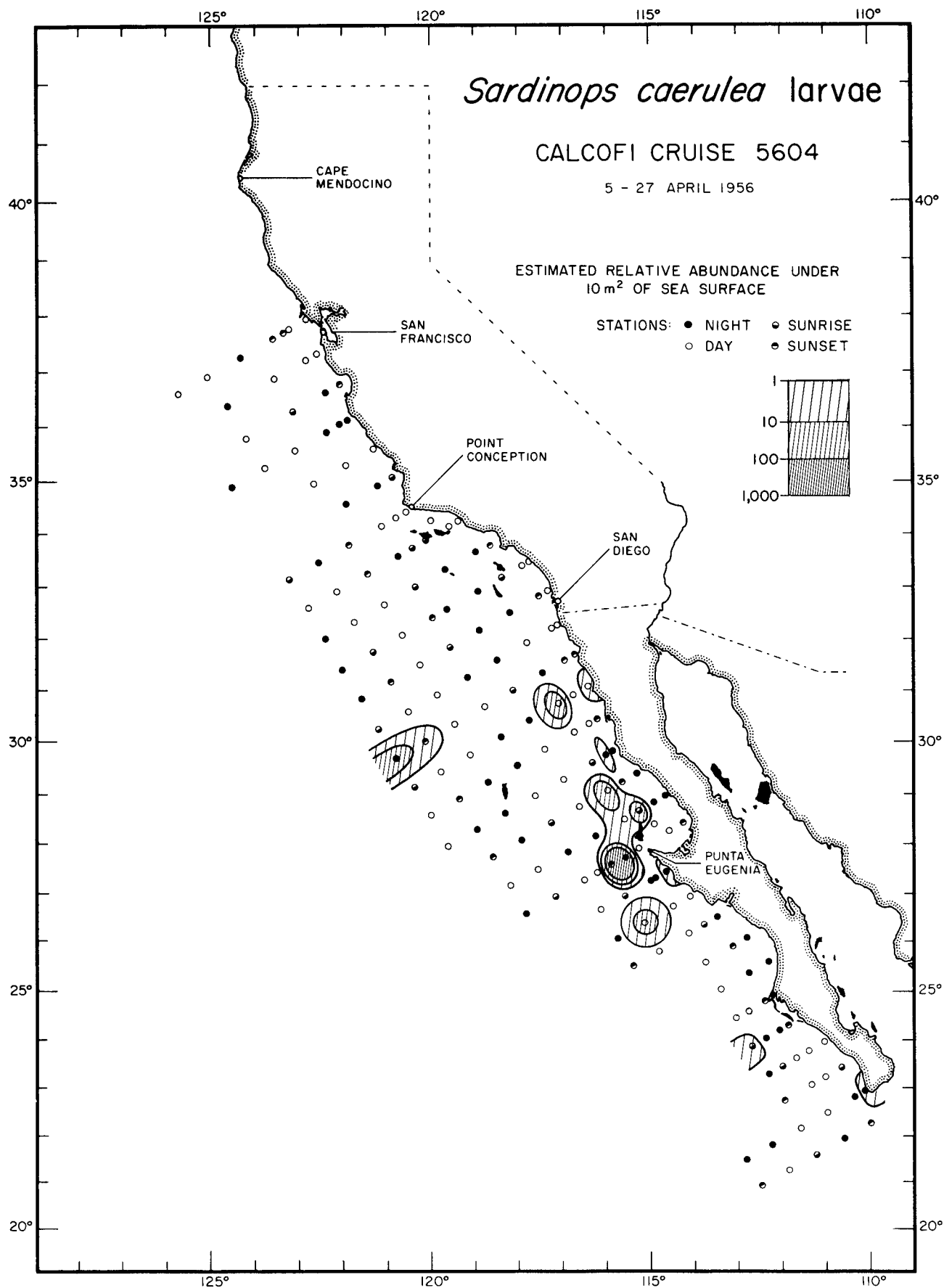
Sardinops caerulea larvae

5504



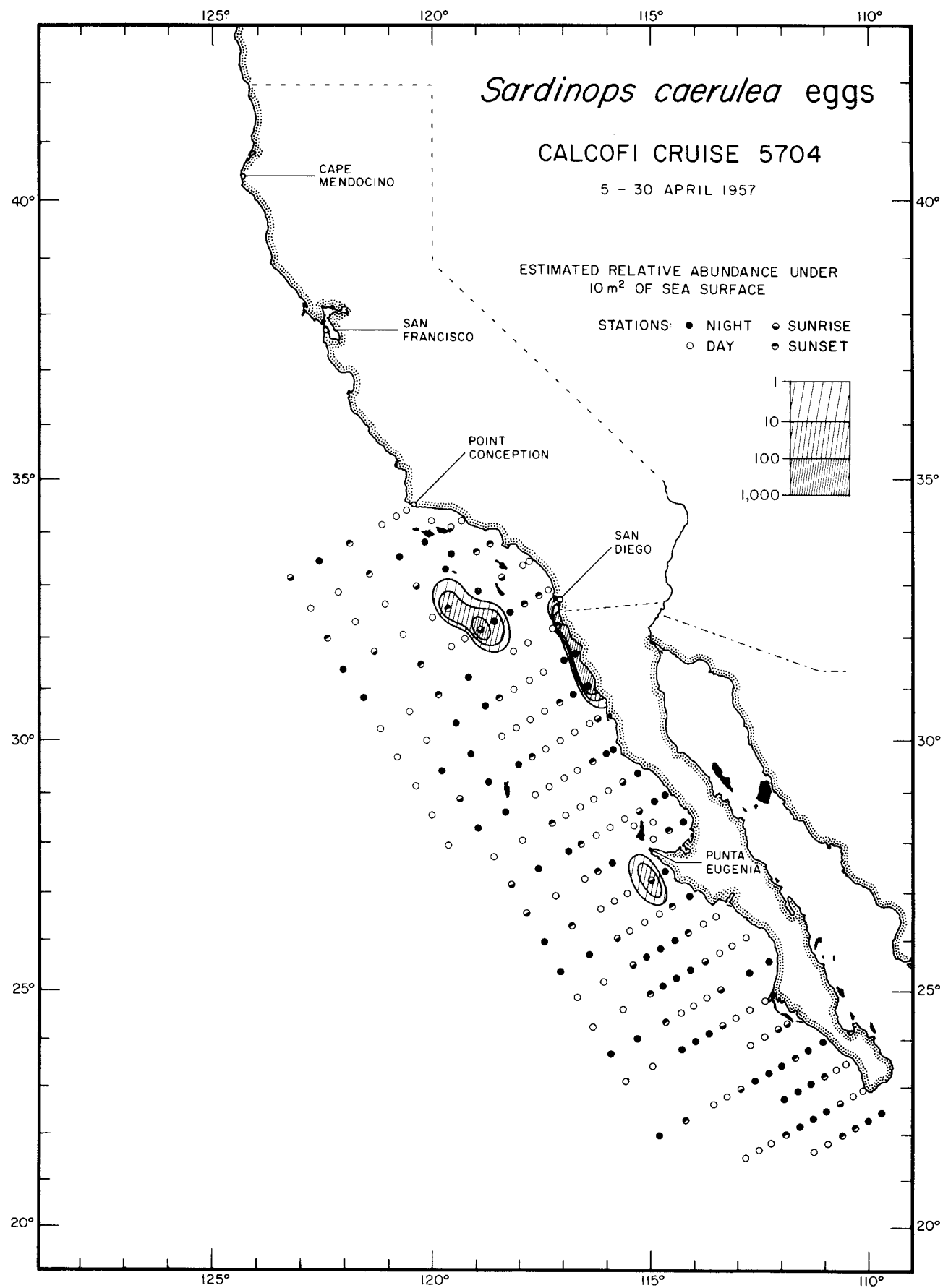
Sardinops caerulea eggs

5604



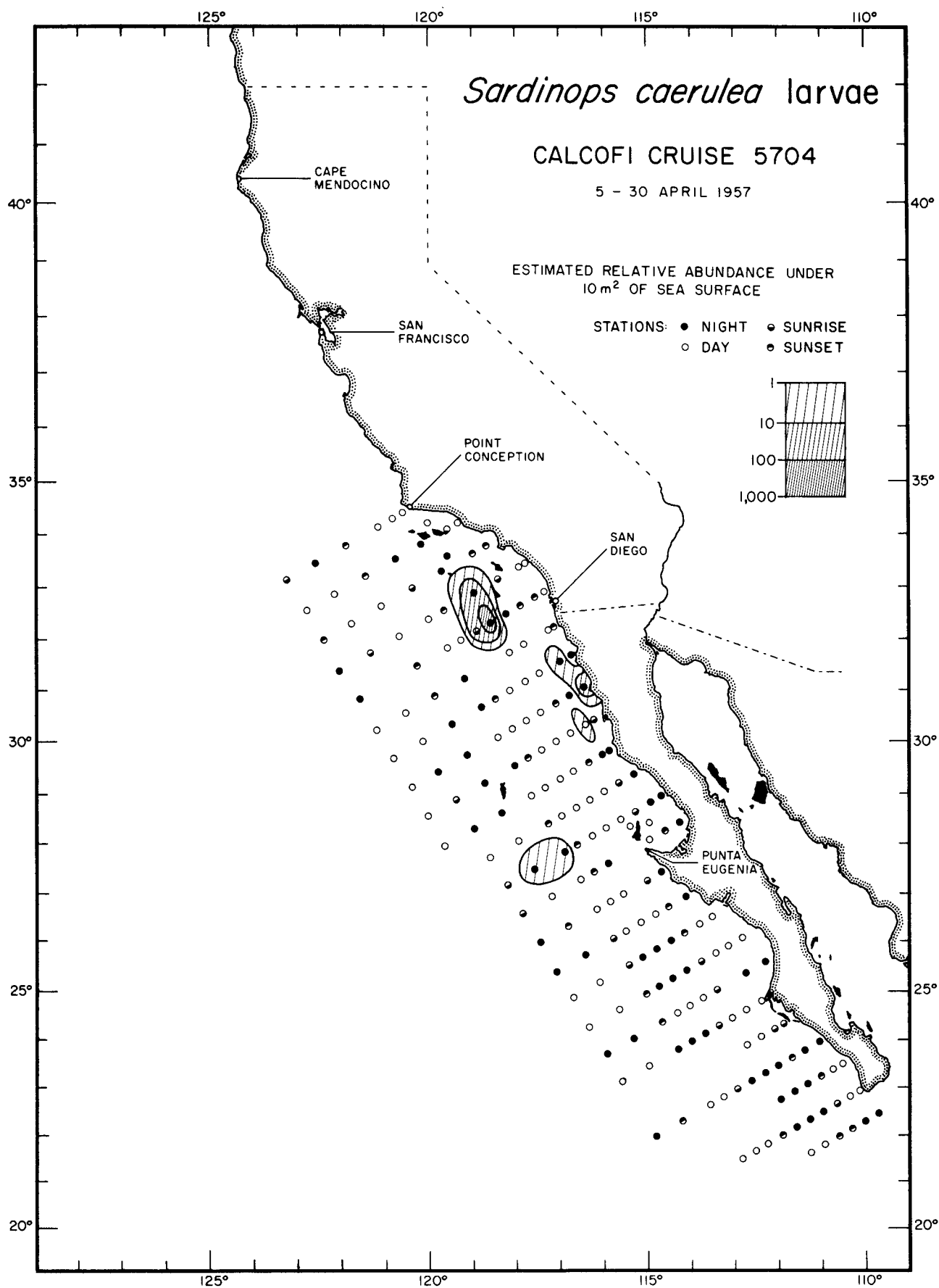
Sardinops caerulea larvae

5604



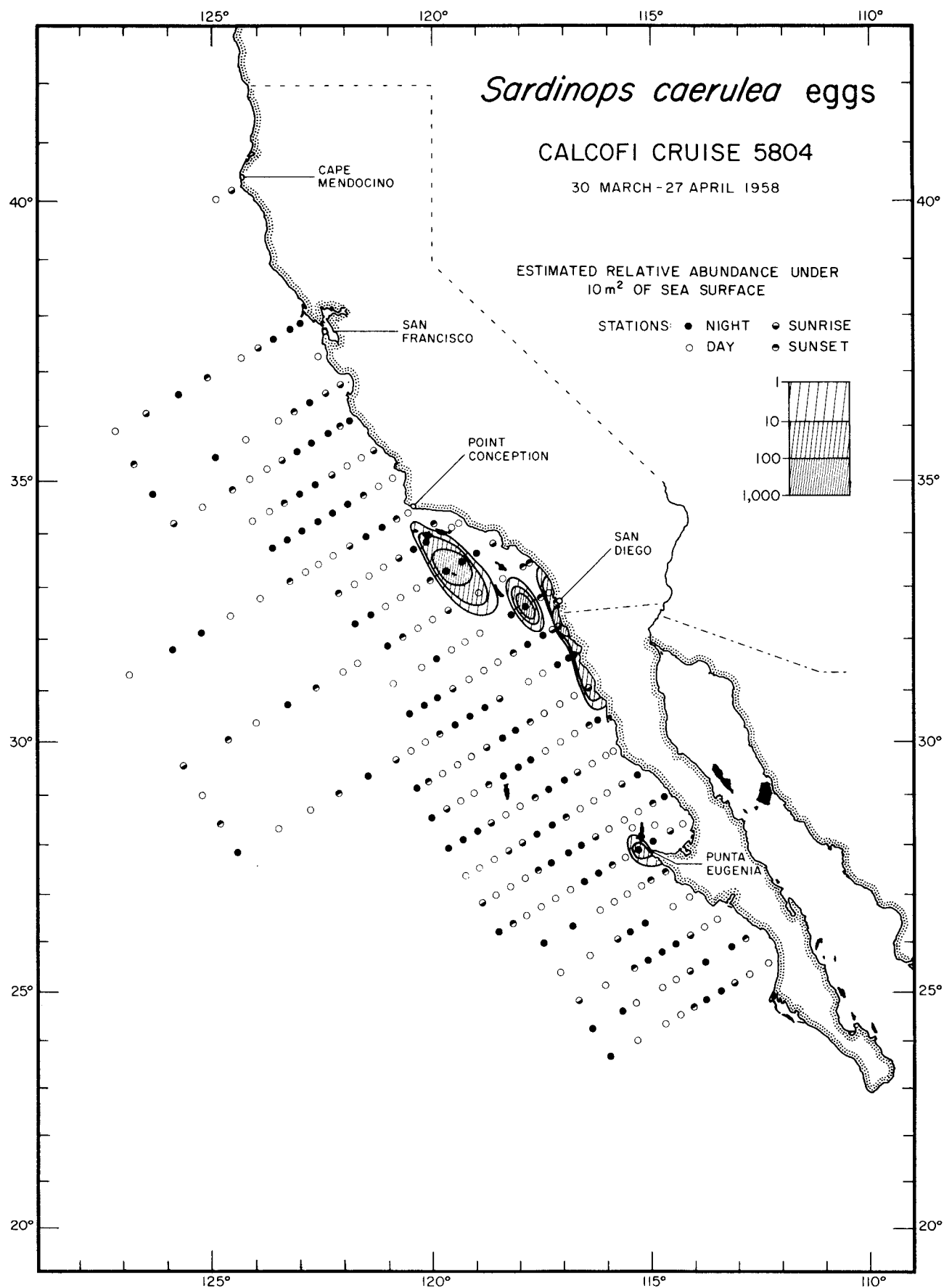
Sardinops caerulea eggs

5704



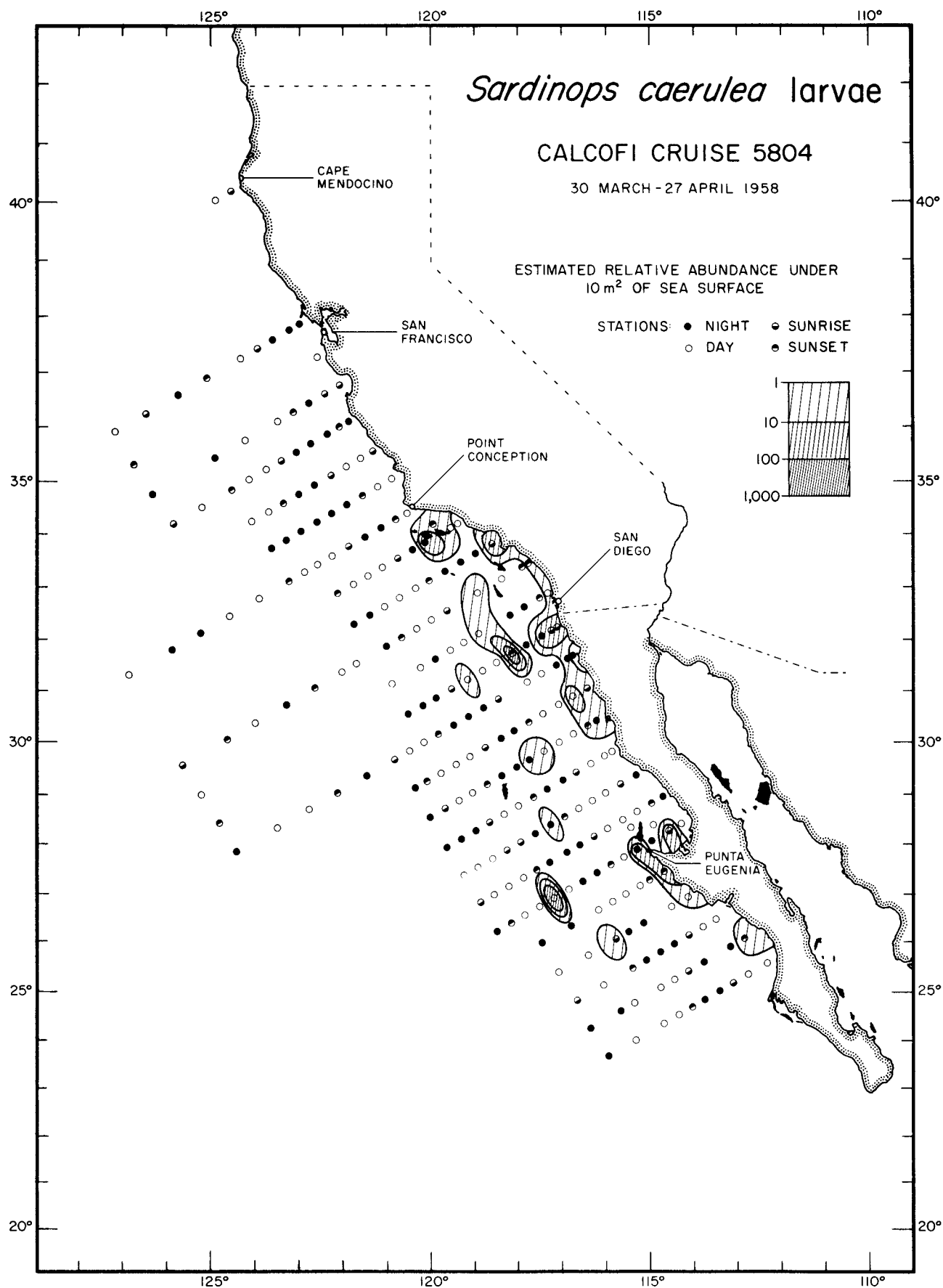
Sardinops caerulea larvae

5704



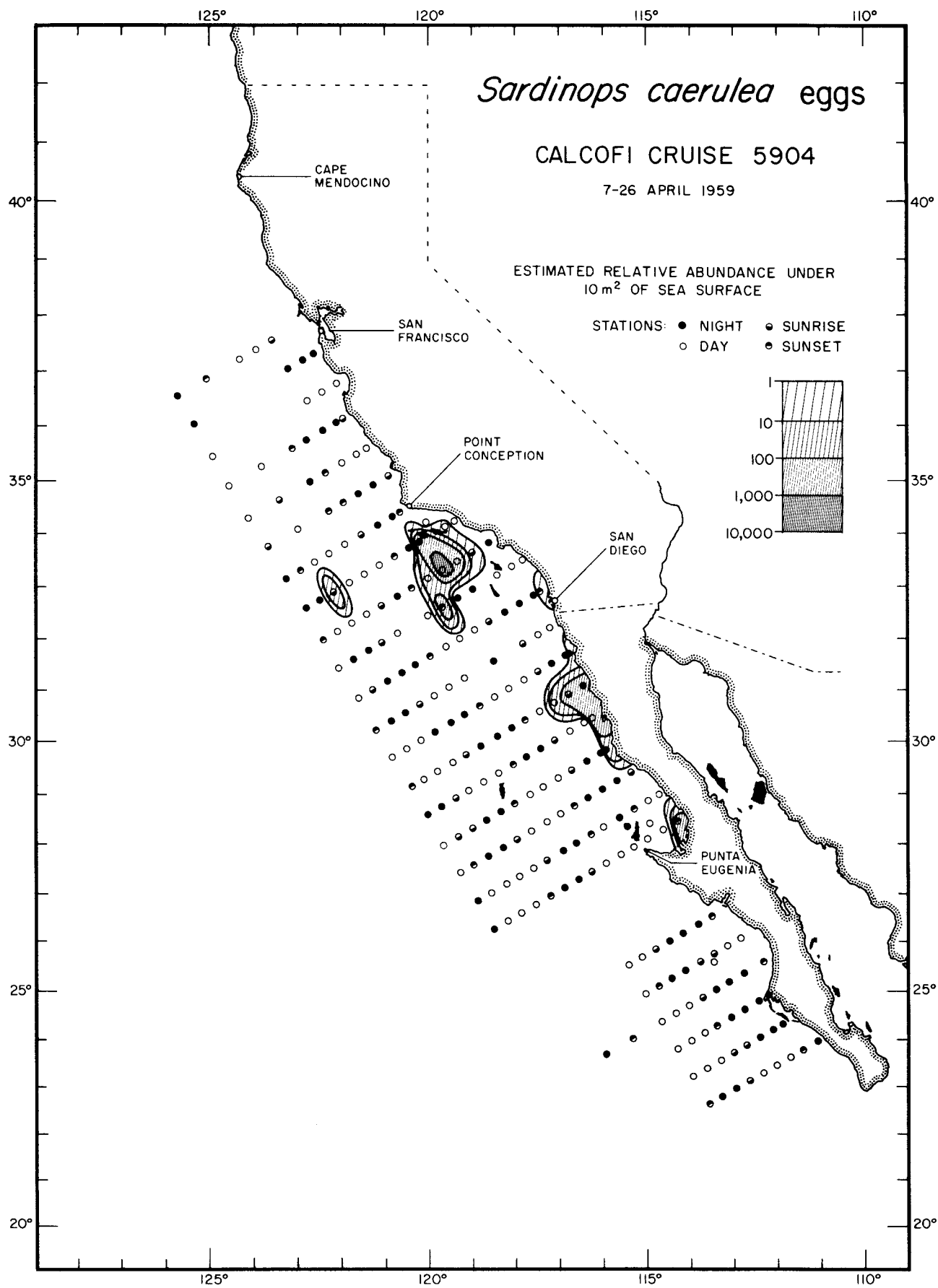
Sardinops caerulea eggs

5804



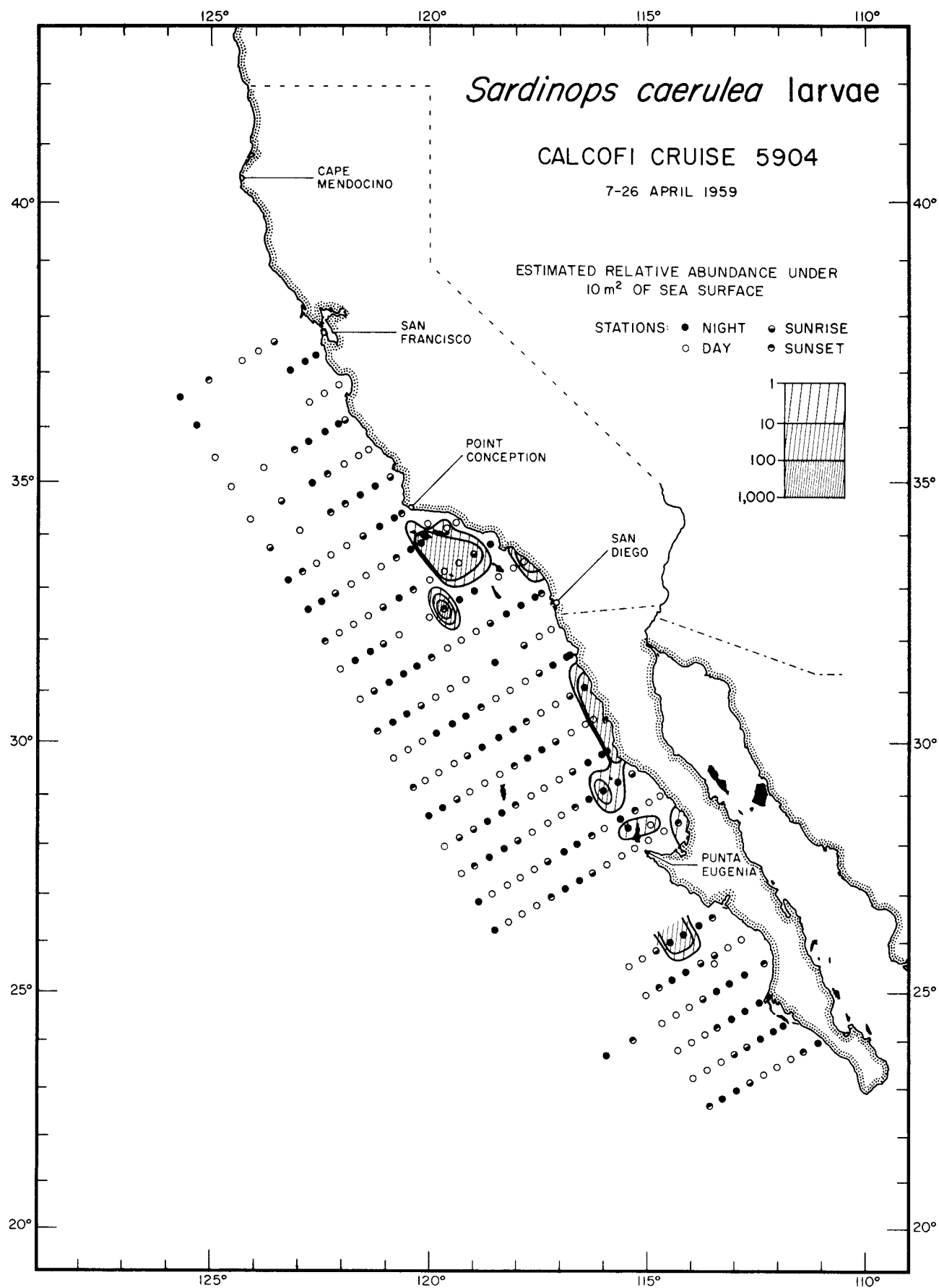
Sardinops caerulea larvae

5804



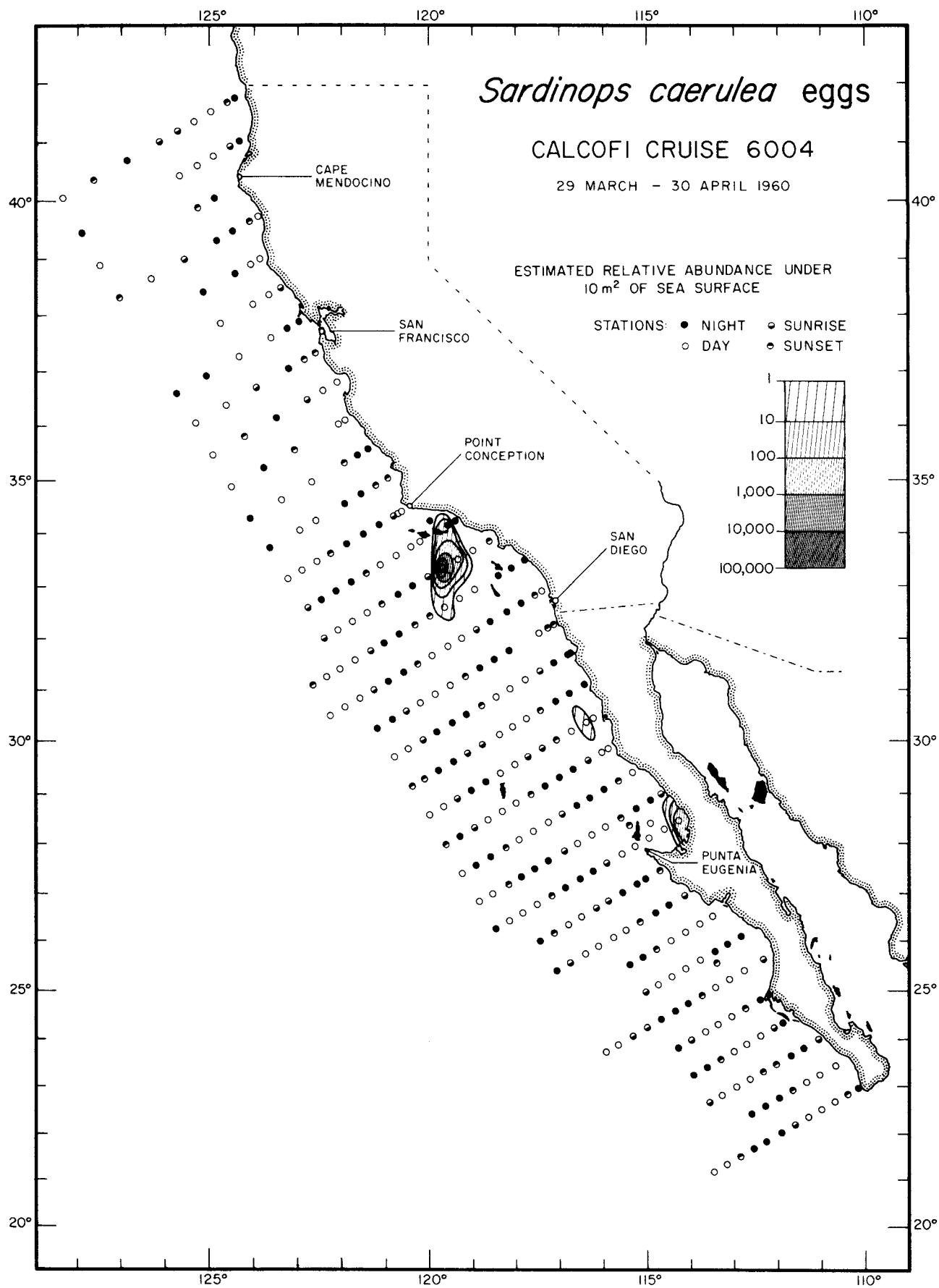
Sardinops caerulea eggs

5904



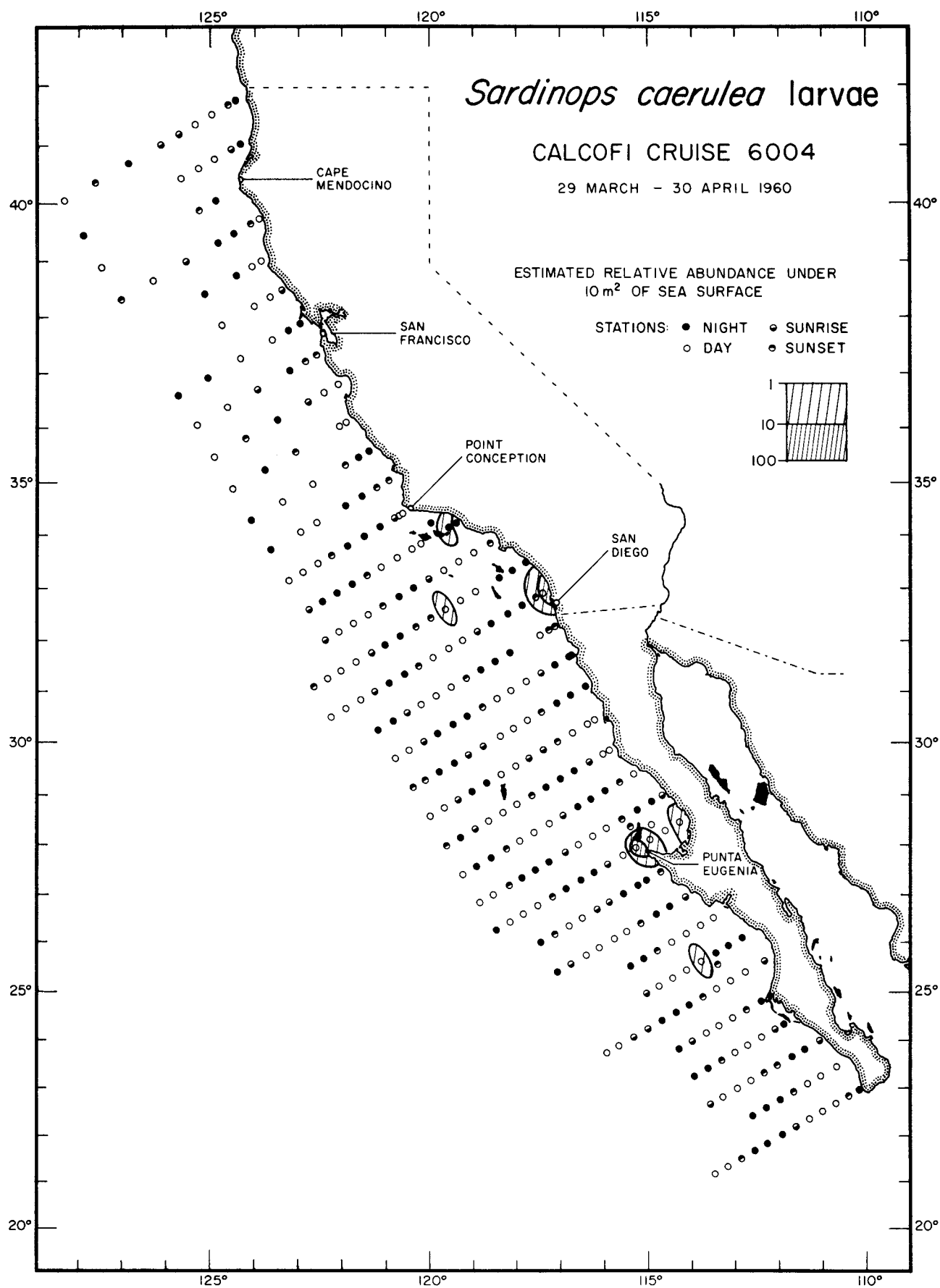
Sardinops caerulea larvae

5904



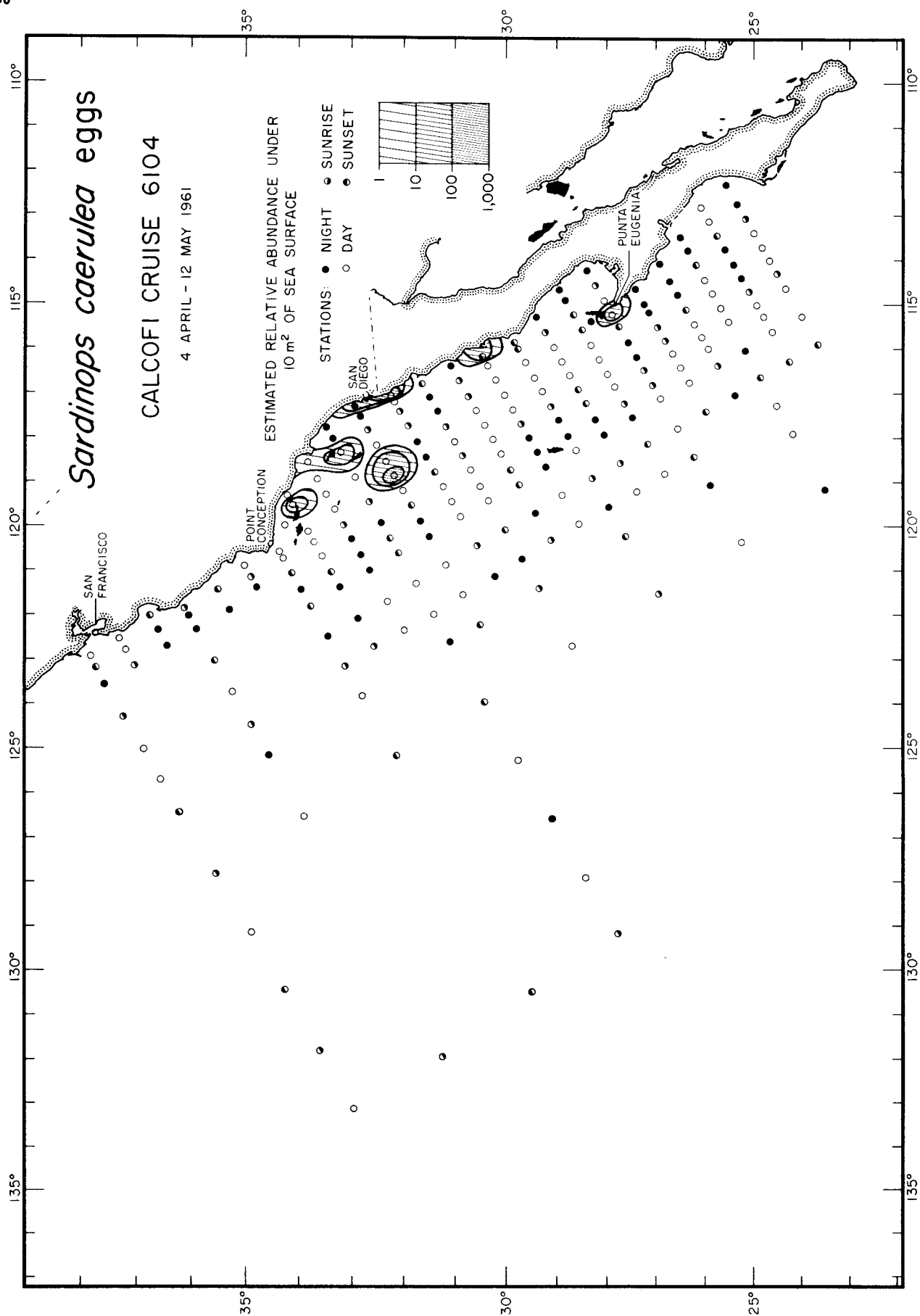
Sardinops caerulea eggs

6004



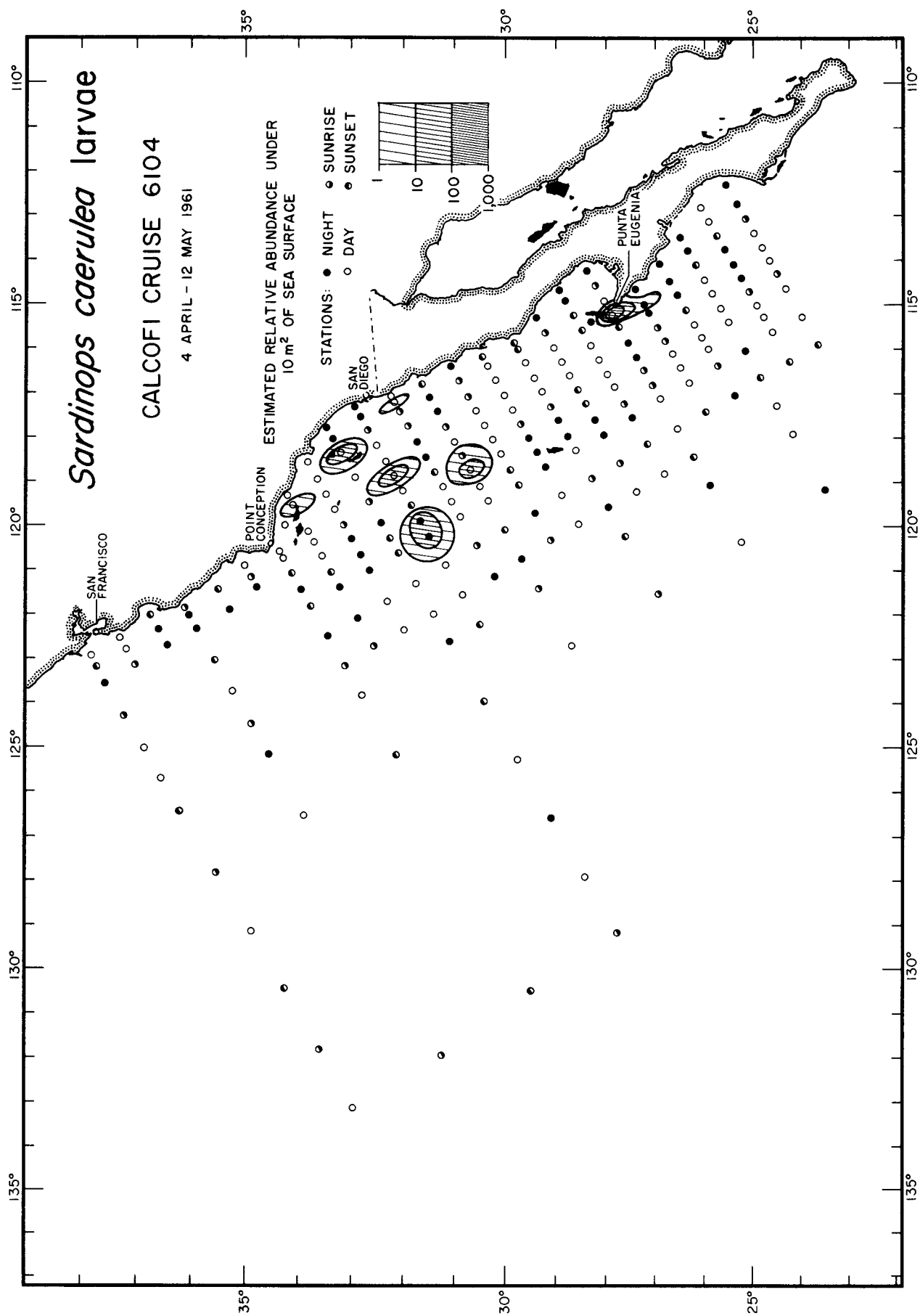
Sardinops caerulea larvae

6004



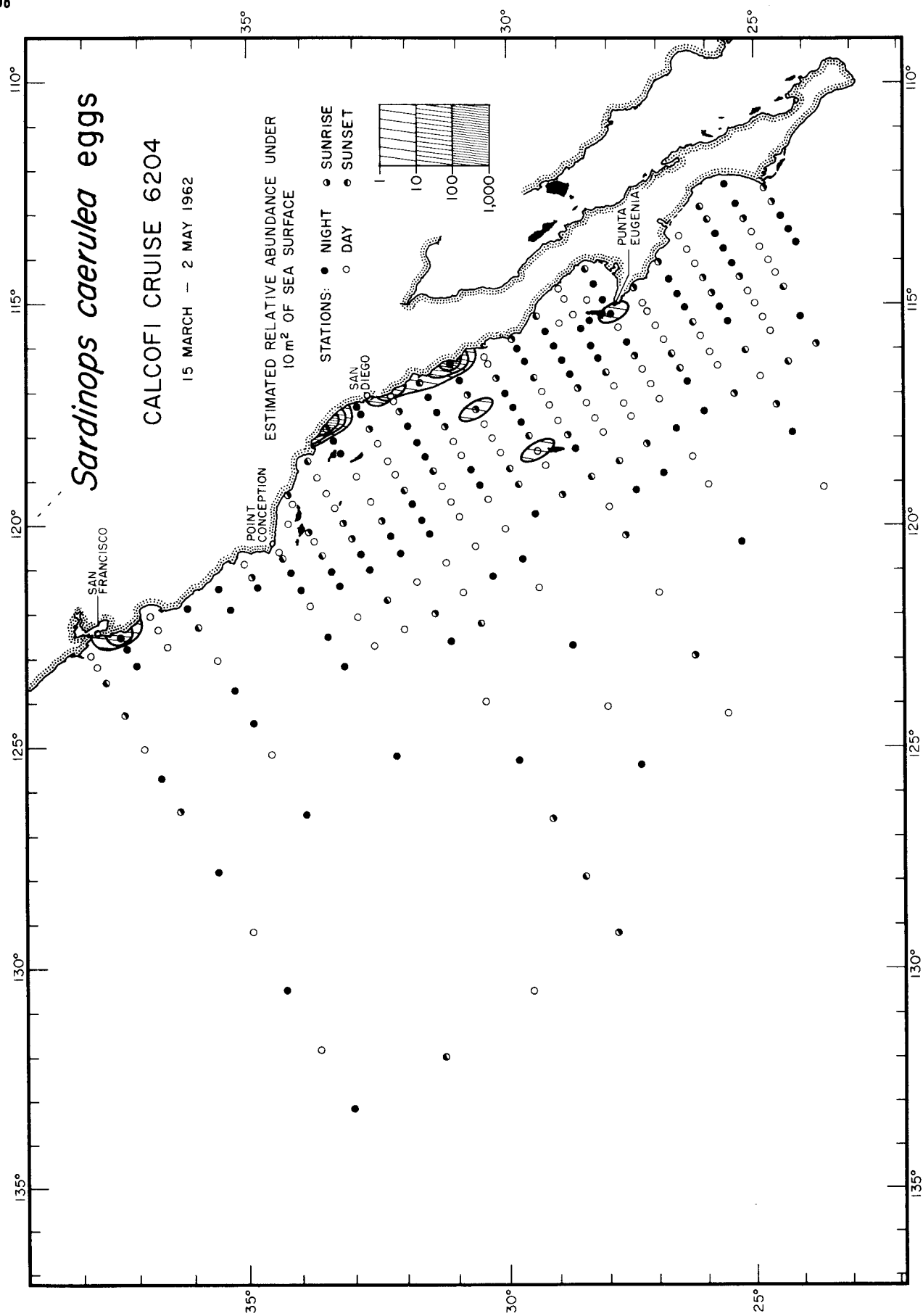
Sardinops caerulea eggs

6104



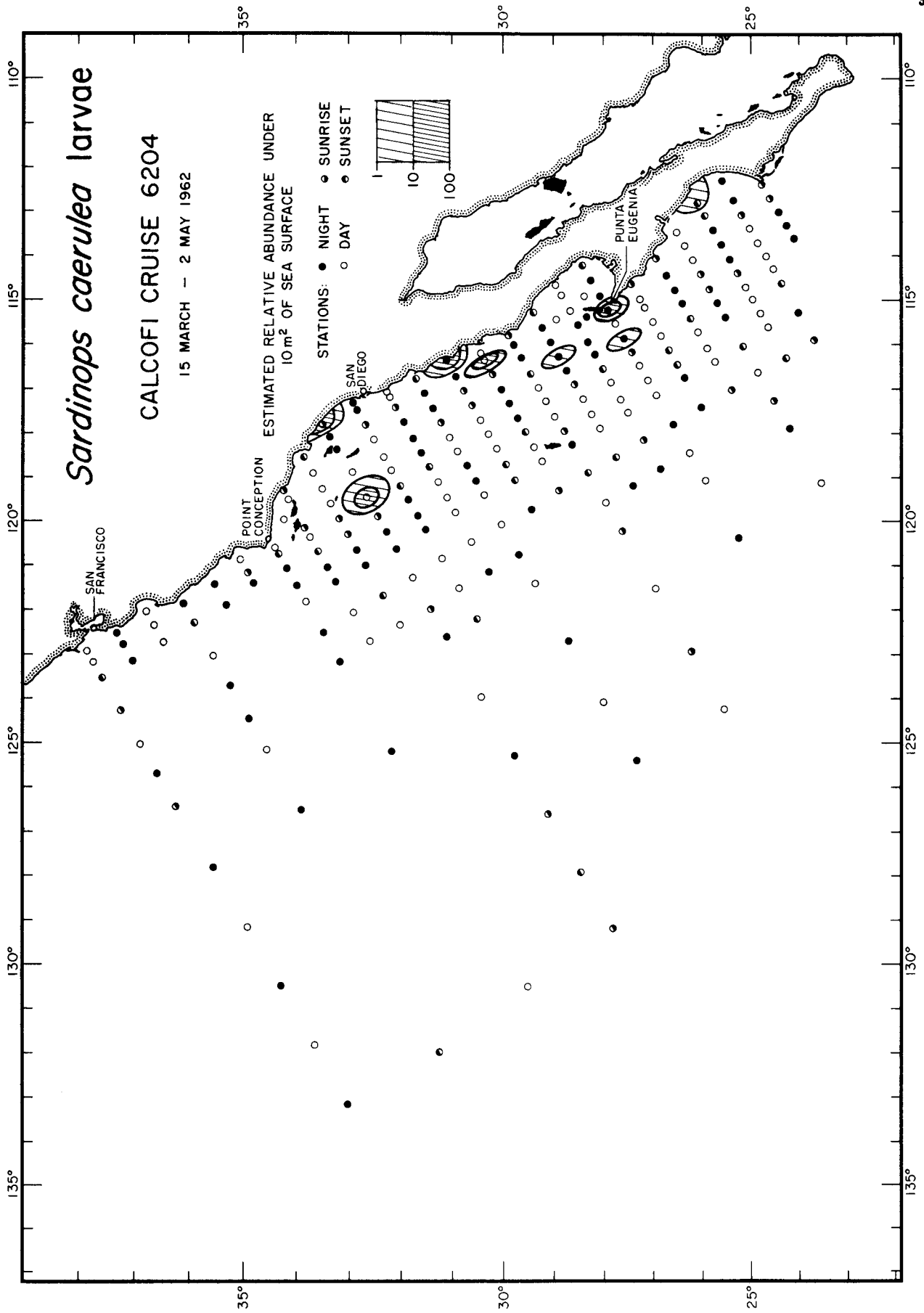
Sardinops caerulea larvae

6104



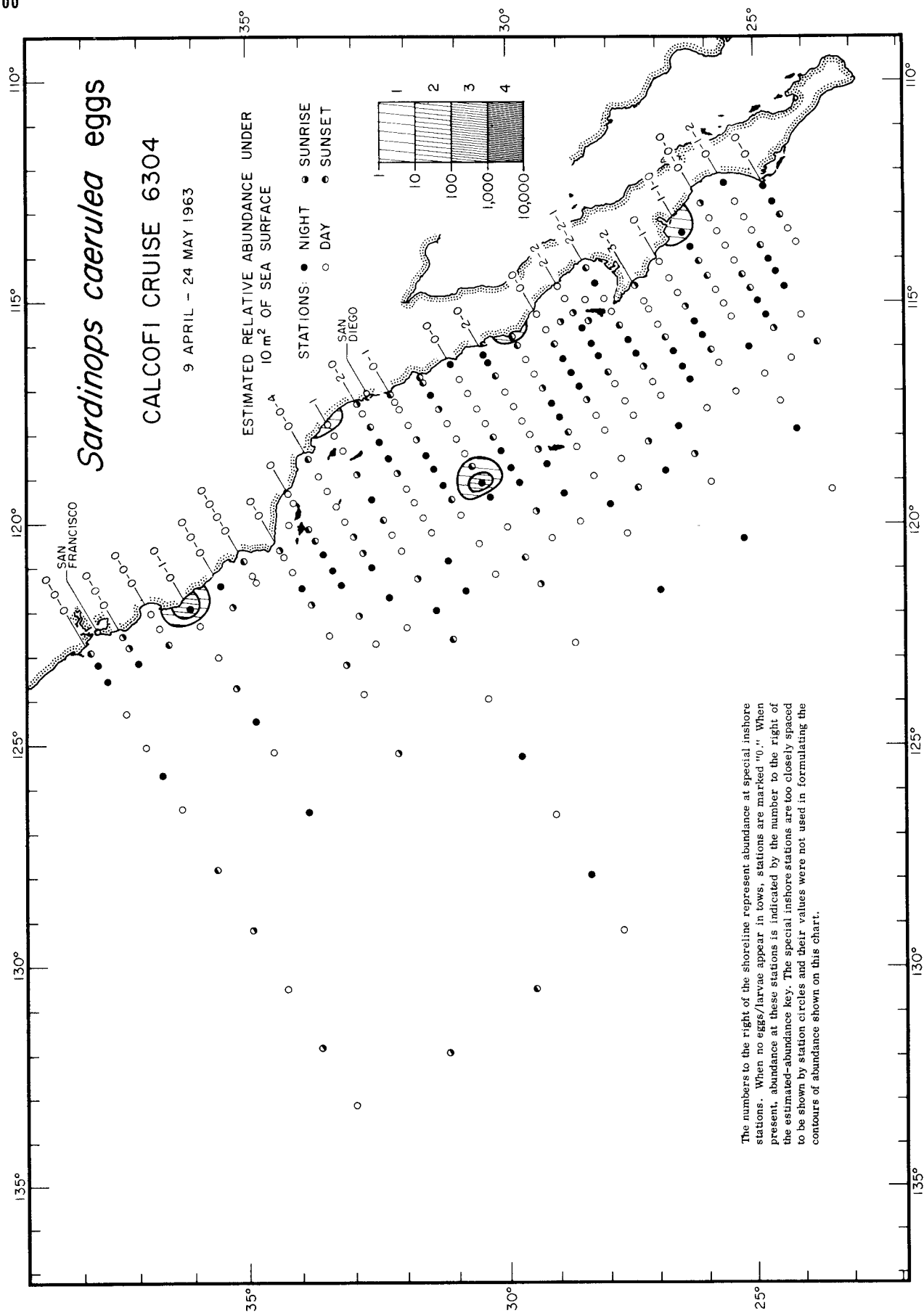
Sardinops caerulea eggs

6204



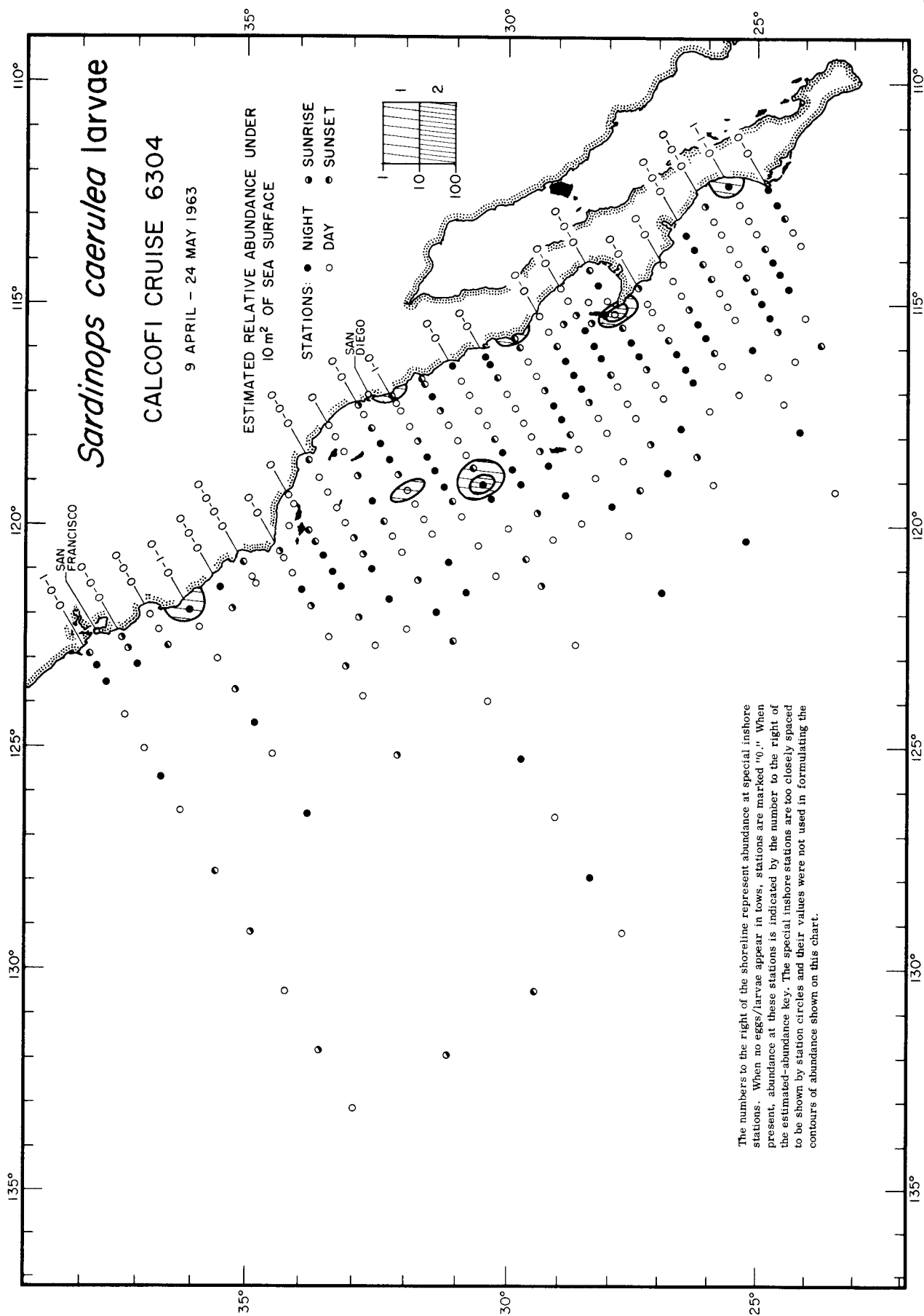
Sardinops caerulea larvae

6204

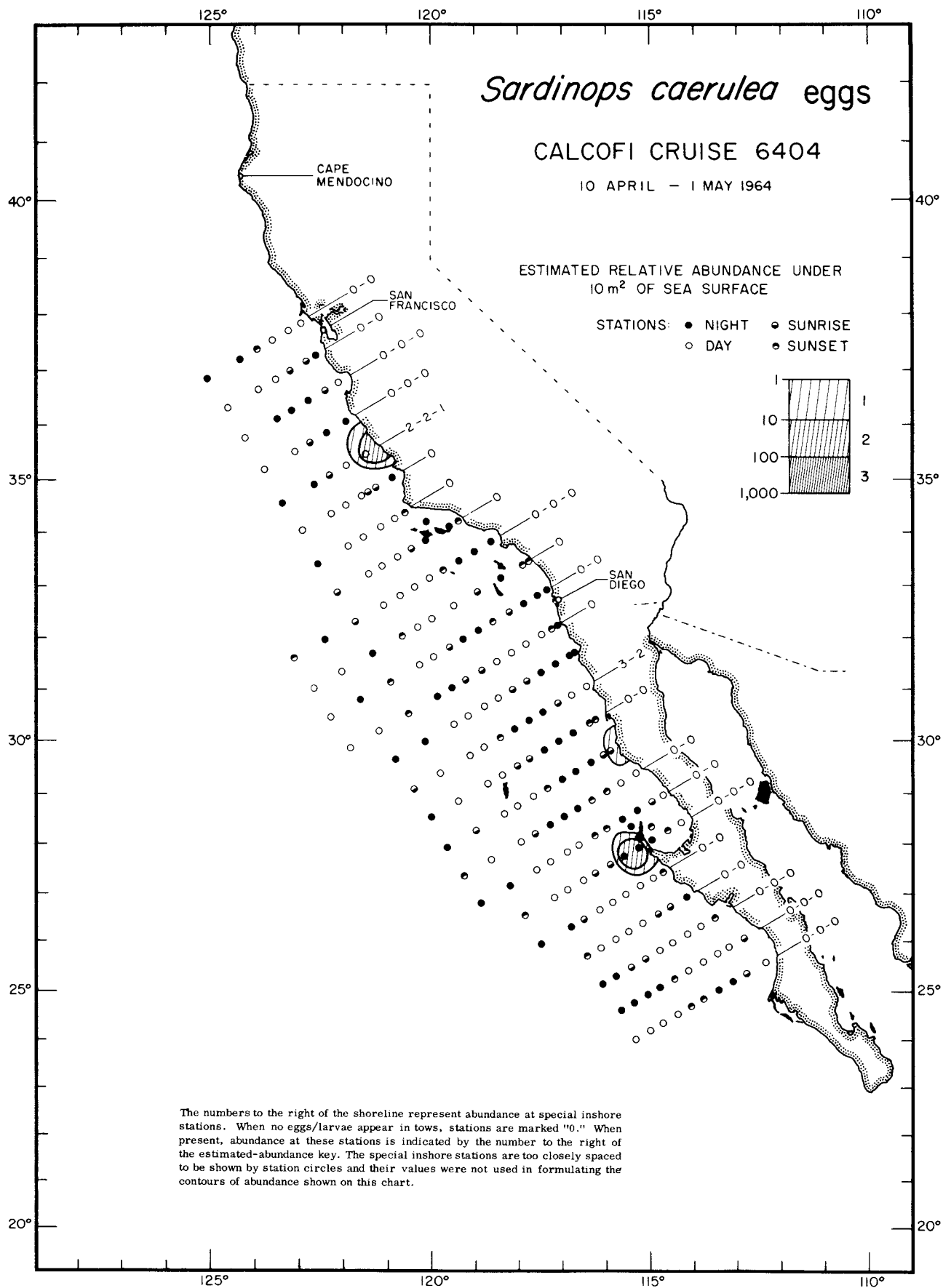


Sardinops caerulea eggs

6304

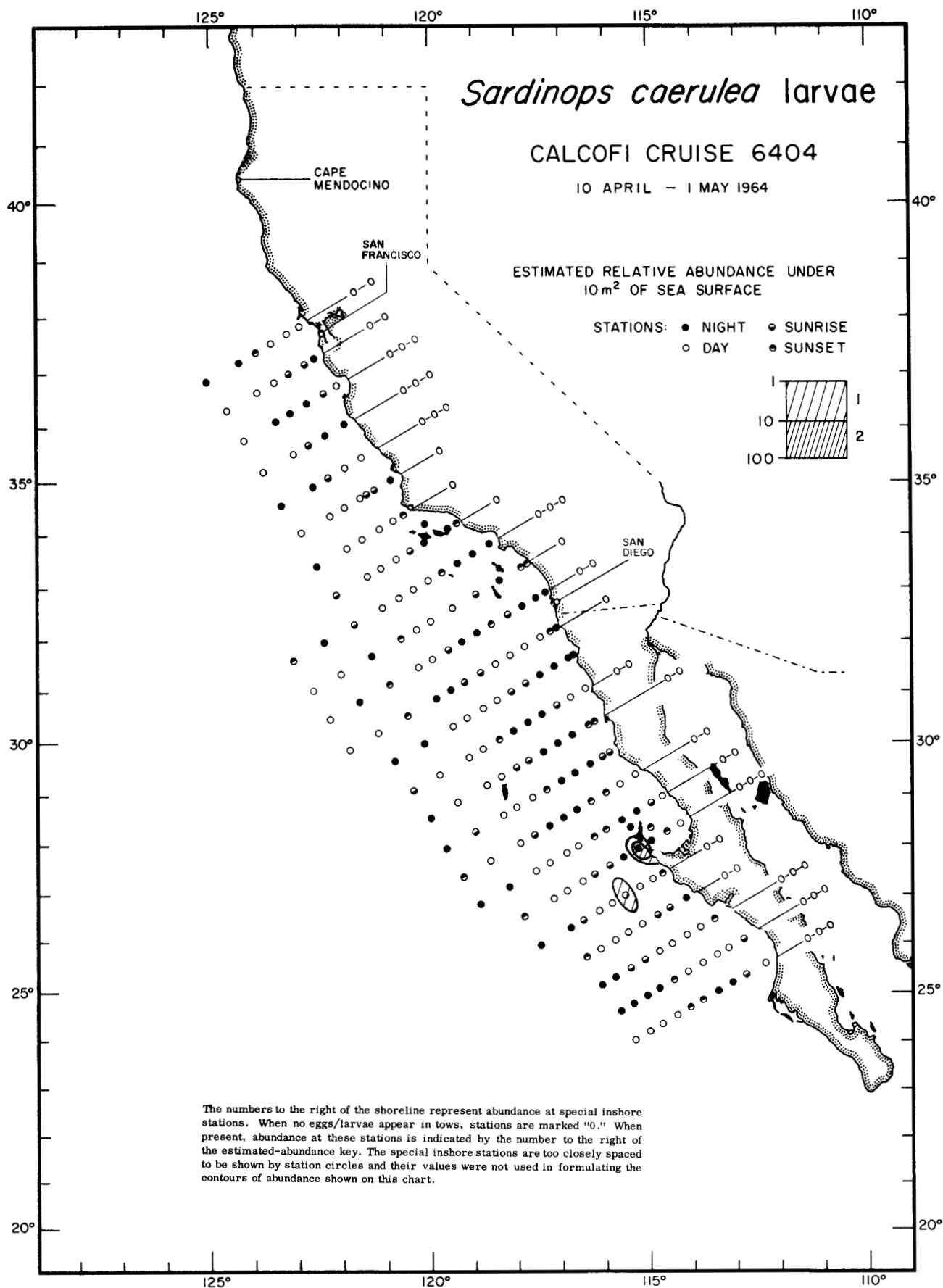
*Sardinops caerulea* larvae

6304



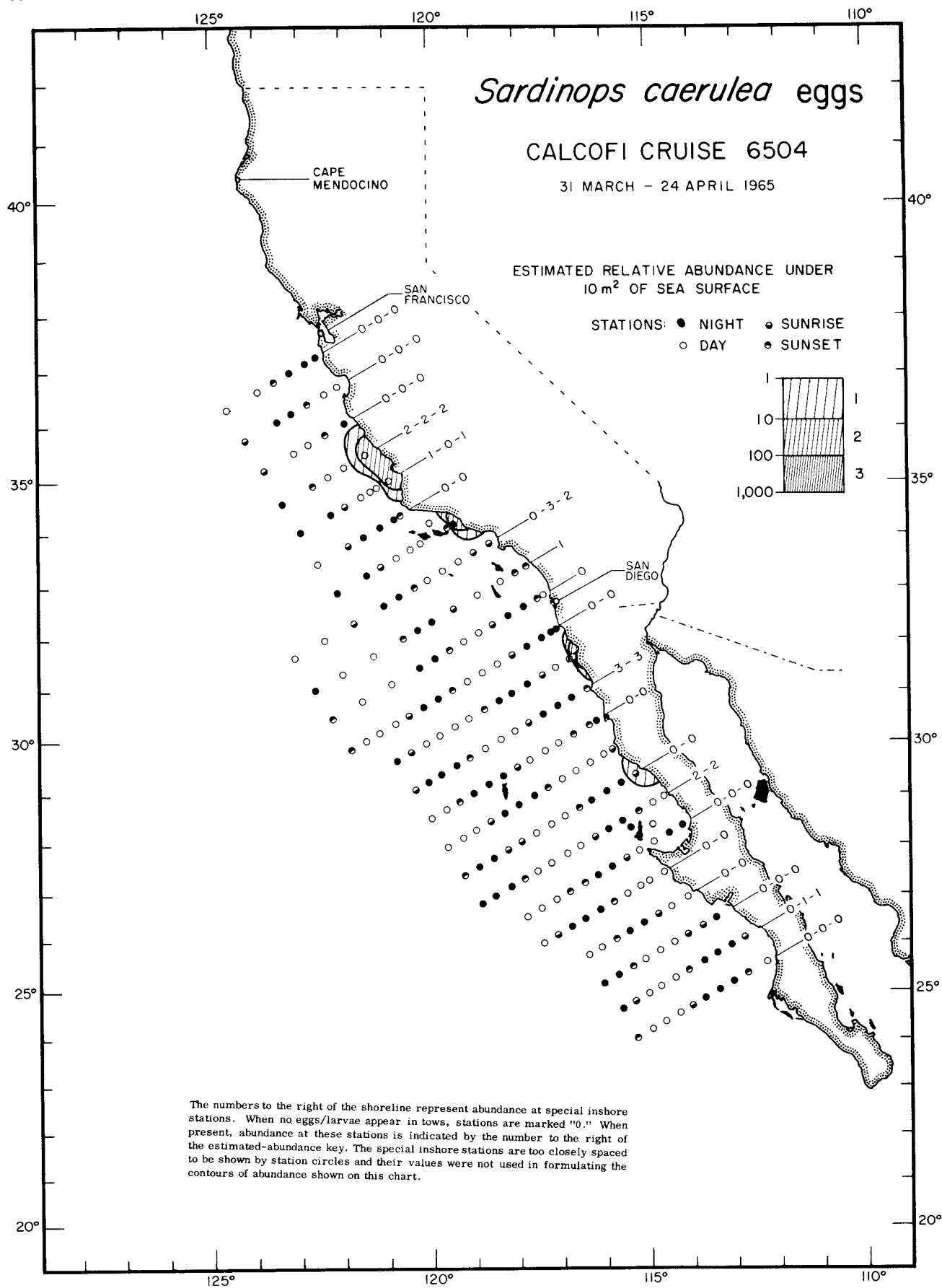
Sardinops caerulea eggs

6404

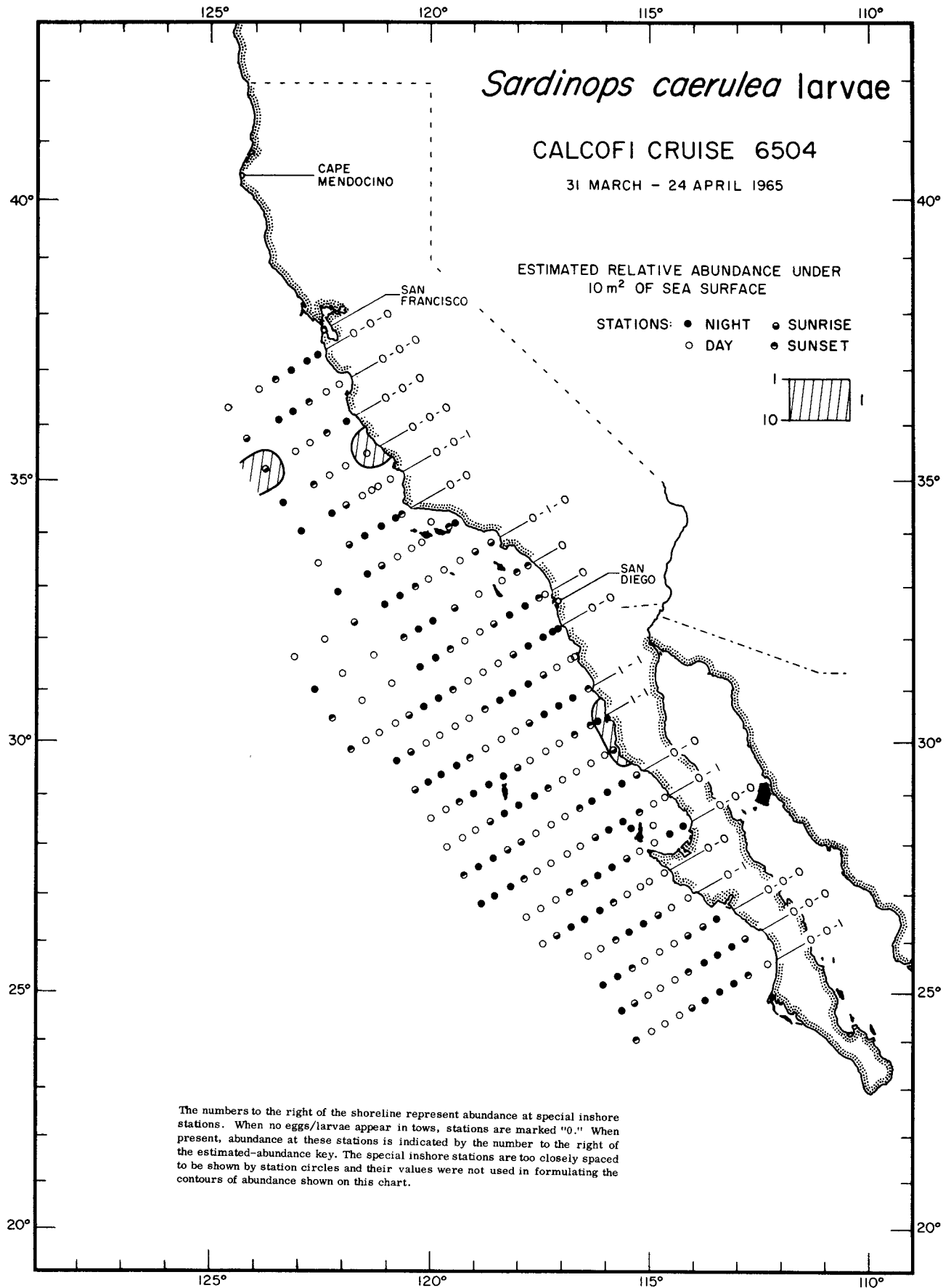


Sardinops caerulea larvae

6404

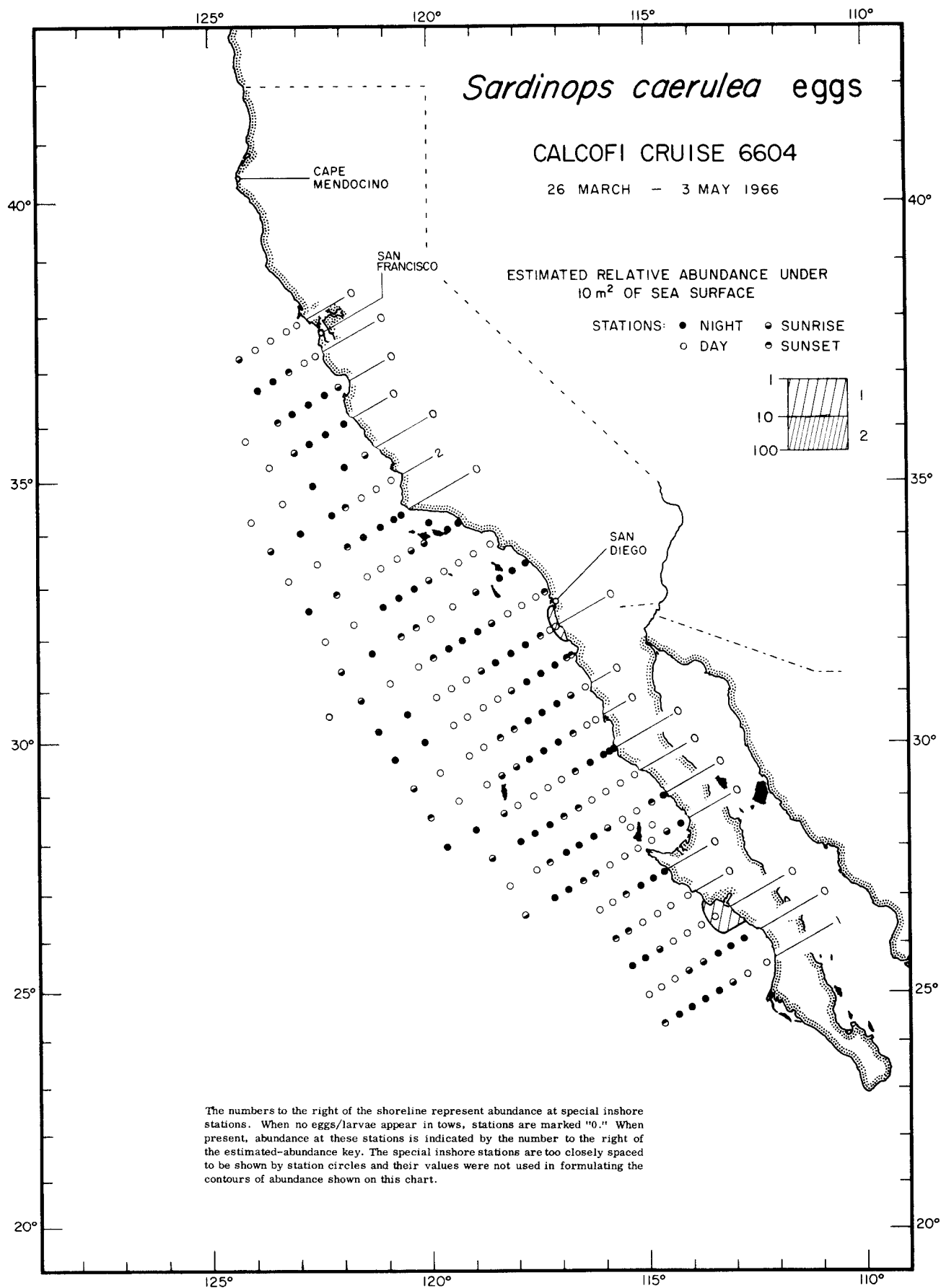
*Sardinops caerulea* eggs

6504



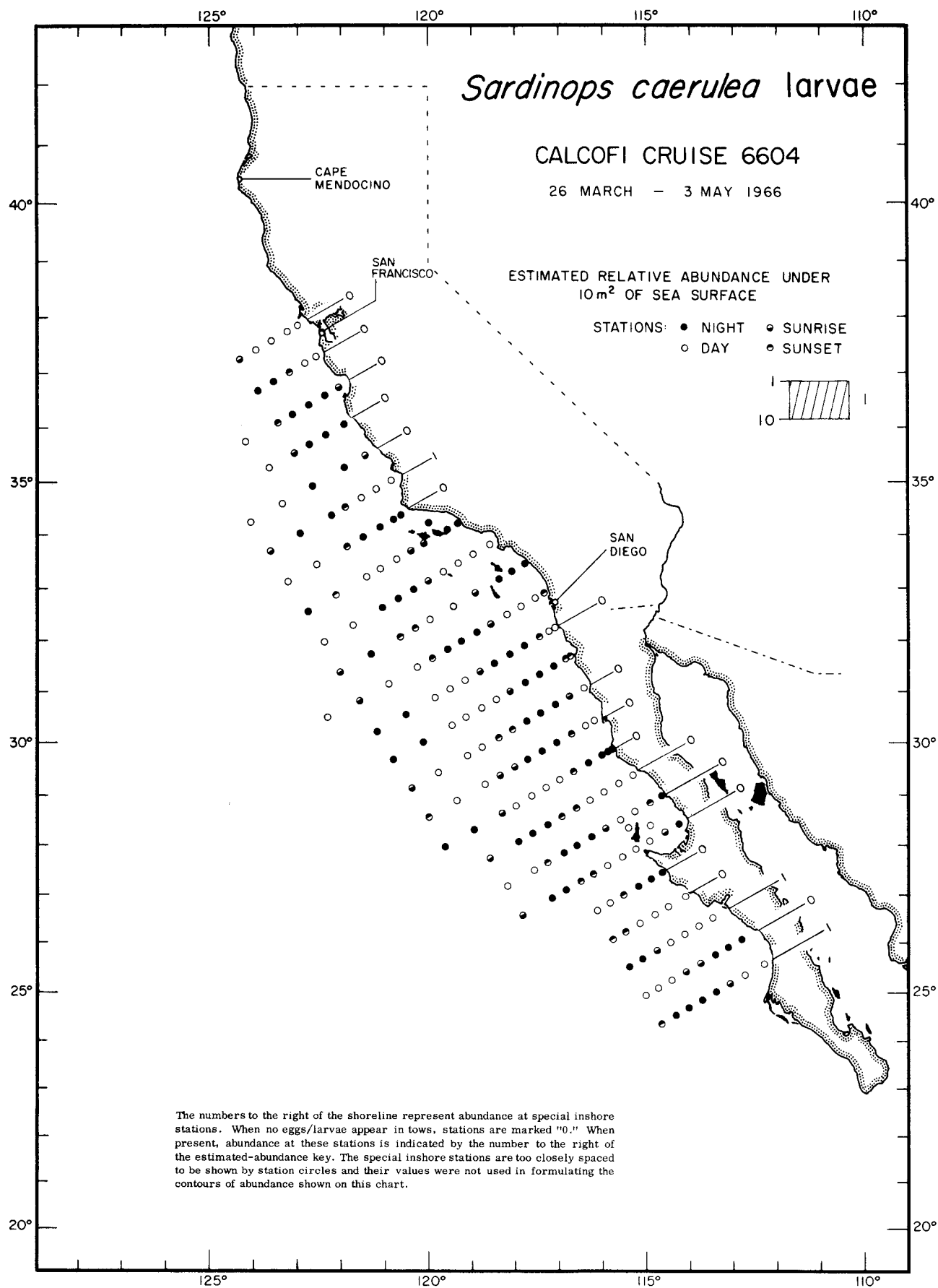
Sardinops caerulea larvae

6504



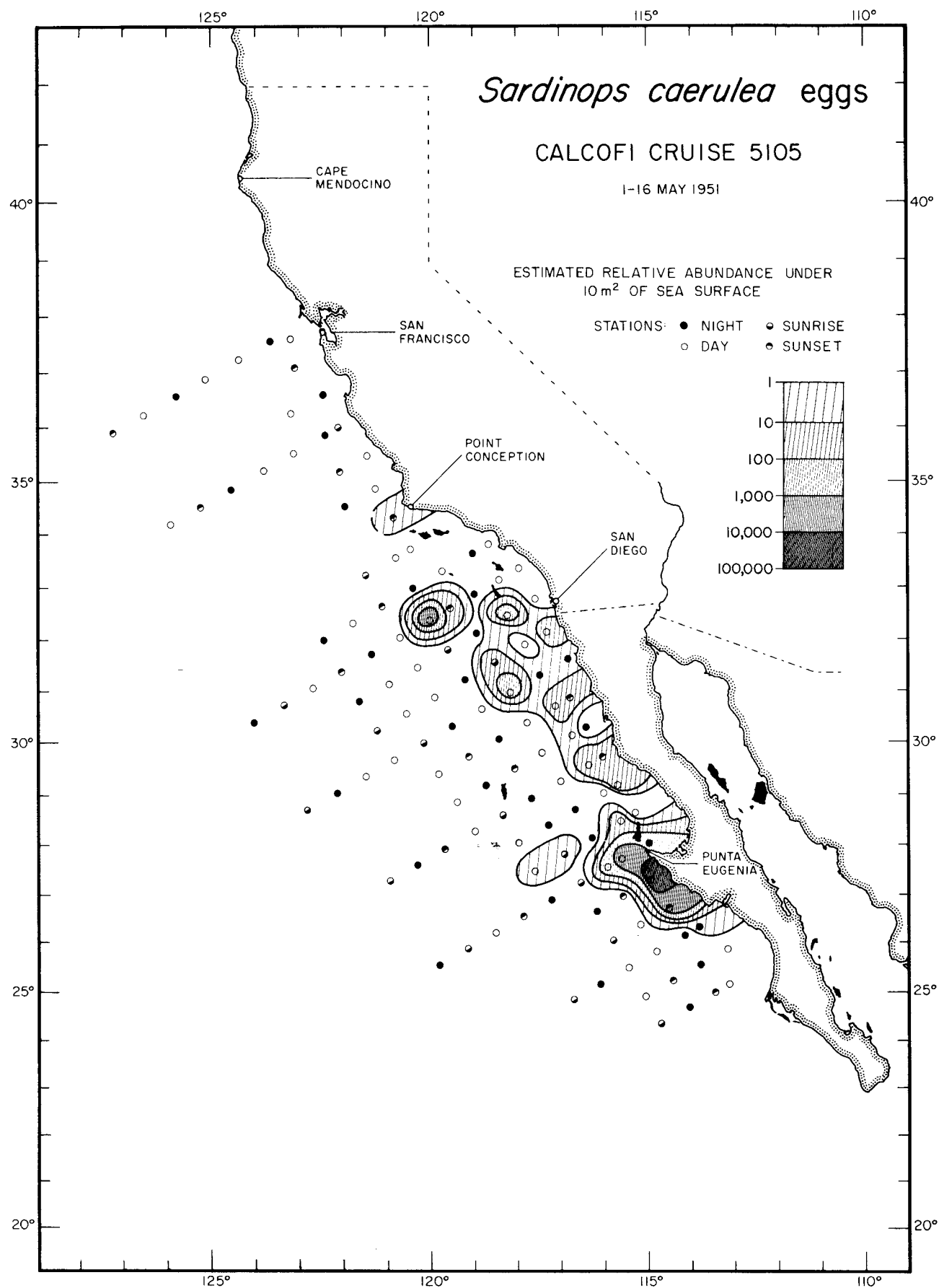
Sardinops caerulea eggs

6604



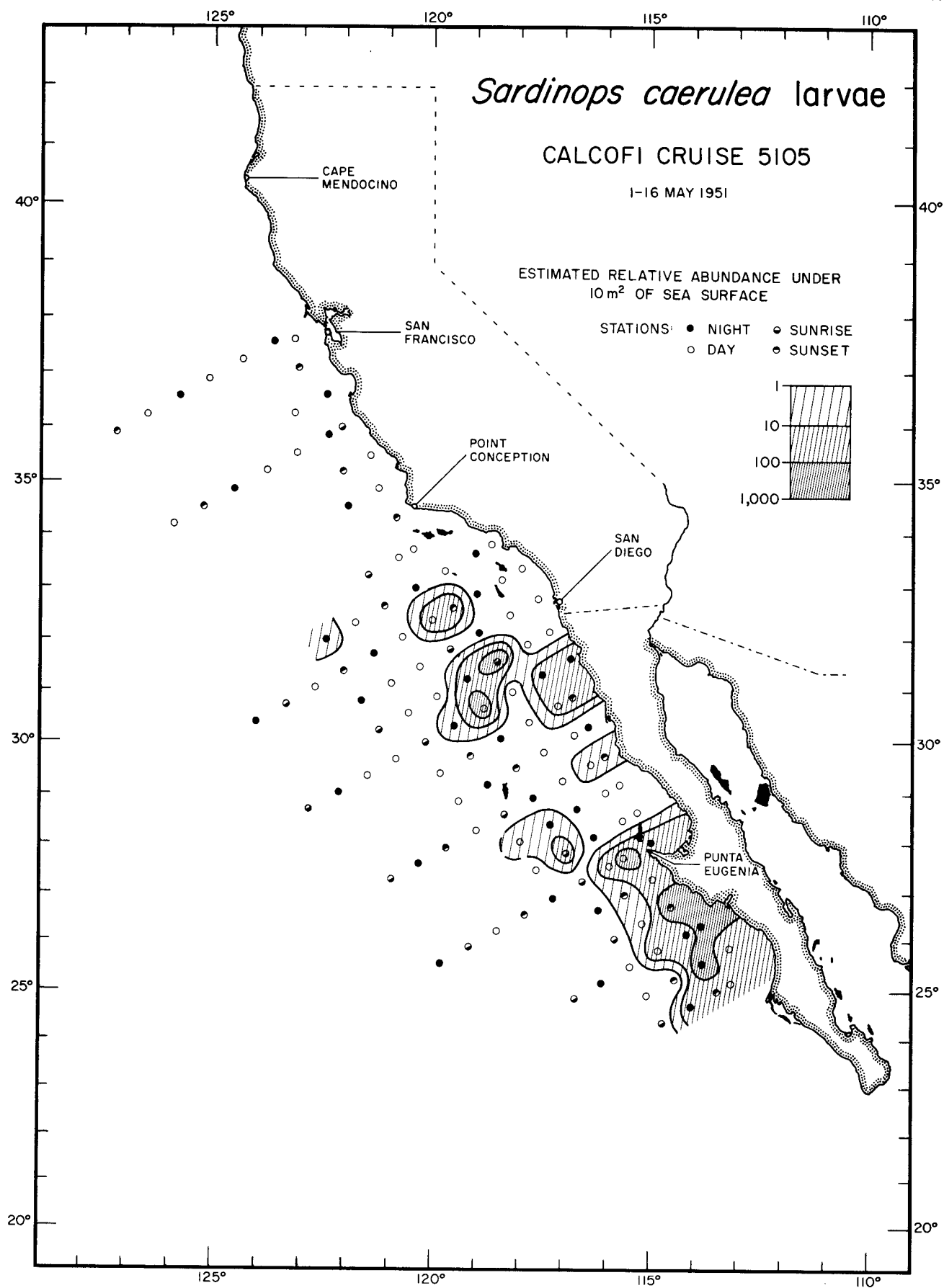
Sardinops caerulea larvae

6604



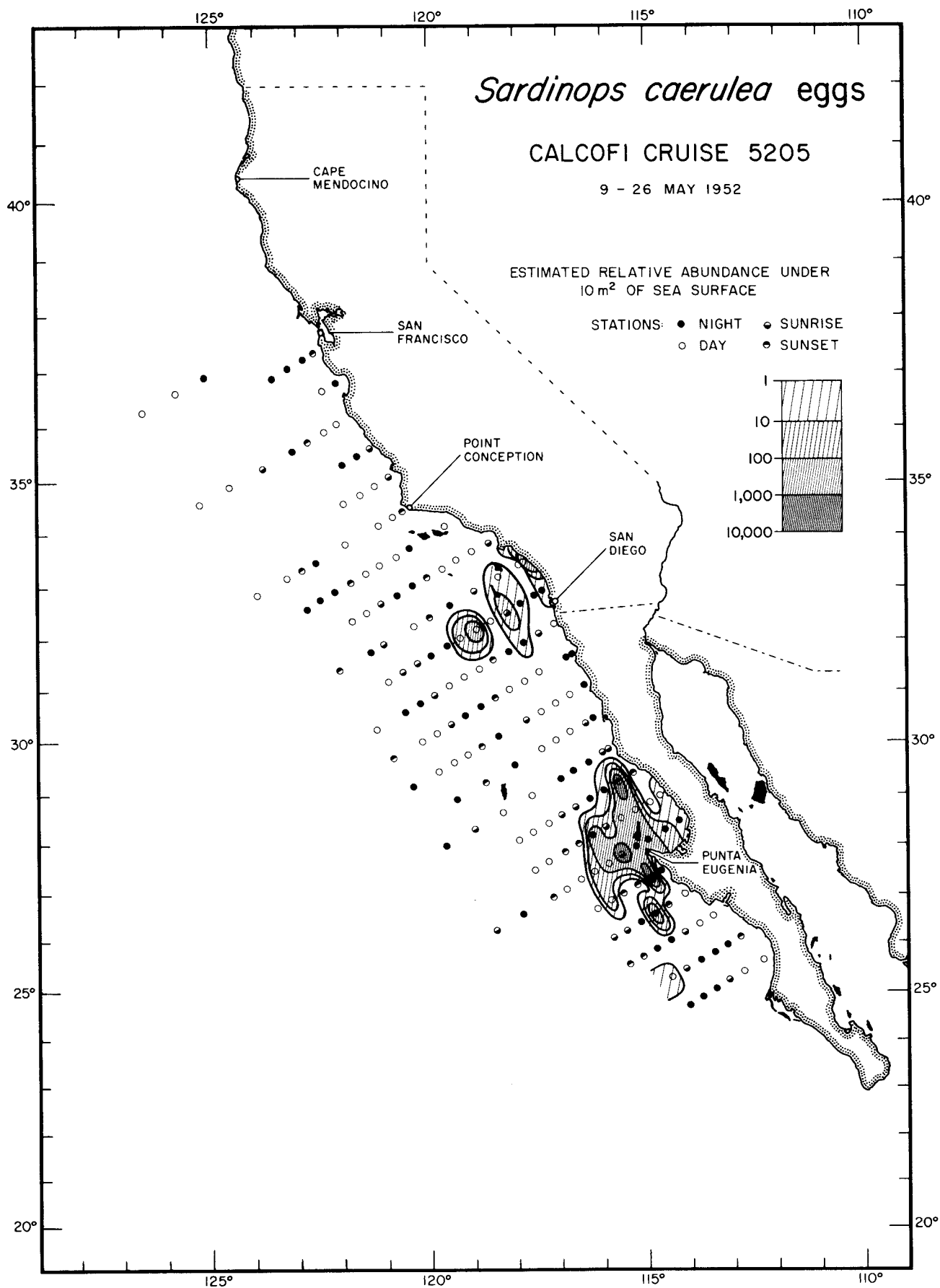
Sardinops caerulea eggs

5105

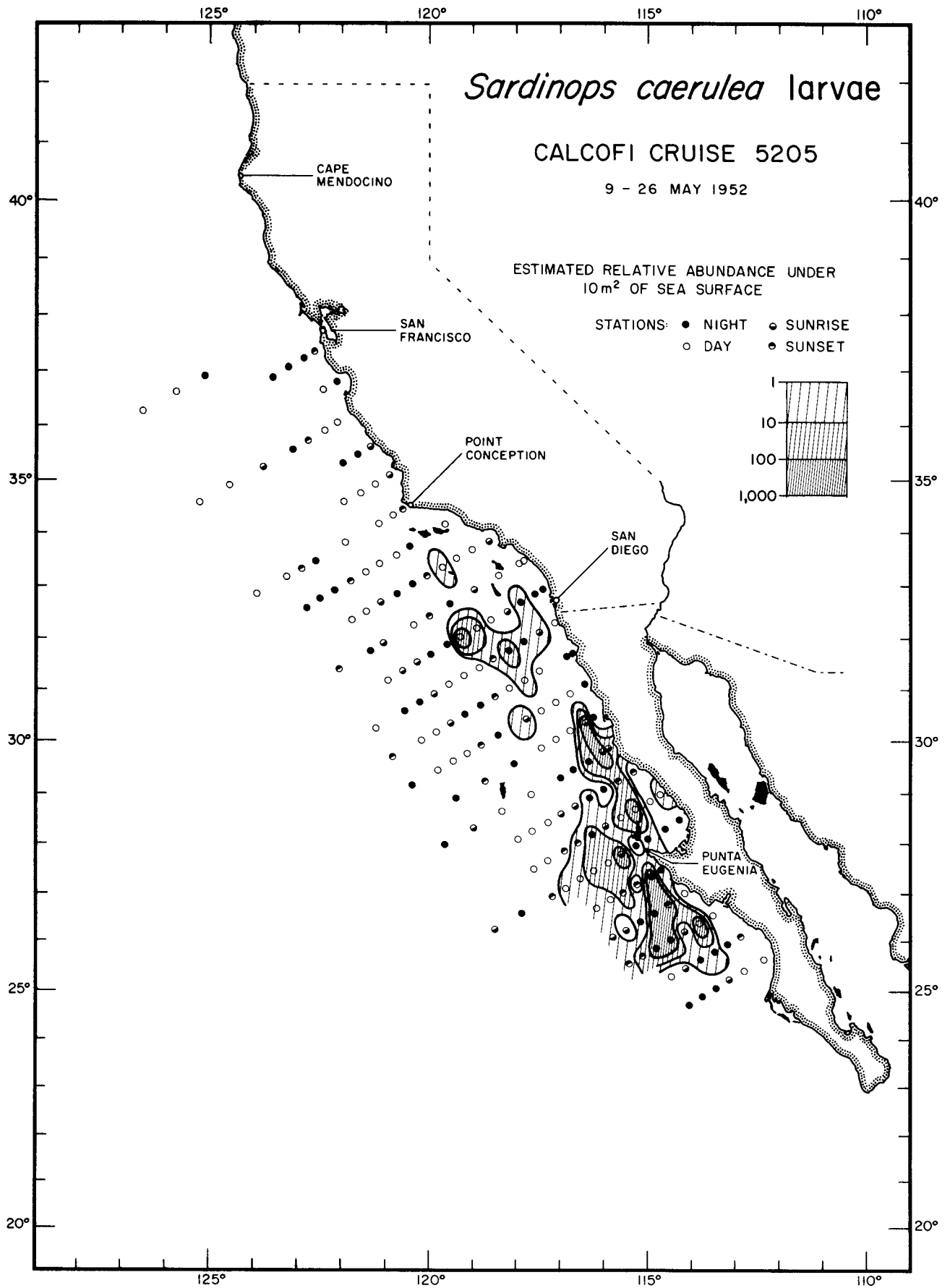


Sardinops caerulea larvae

5105

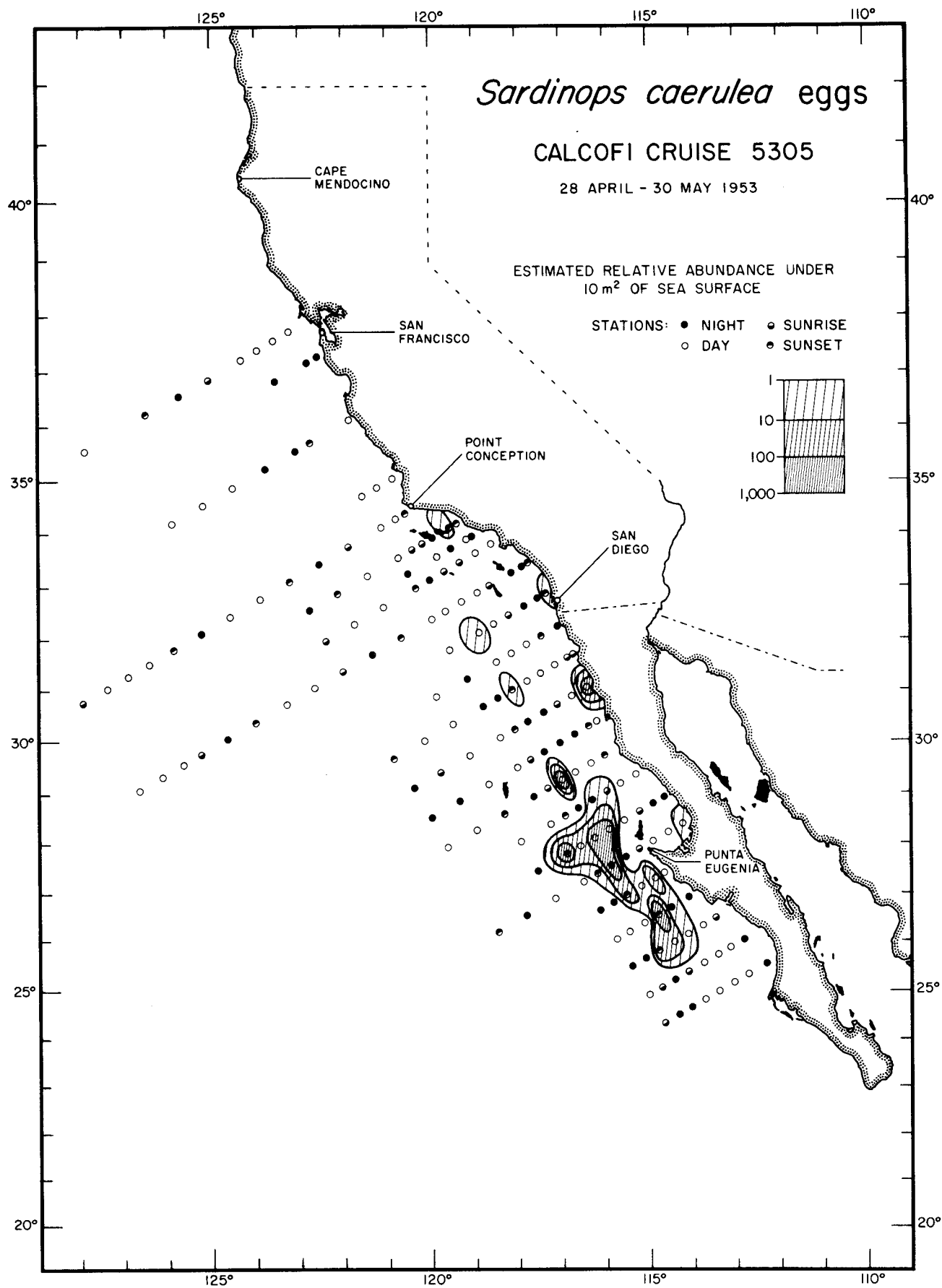
*Sardinops caerulea* eggs

5205

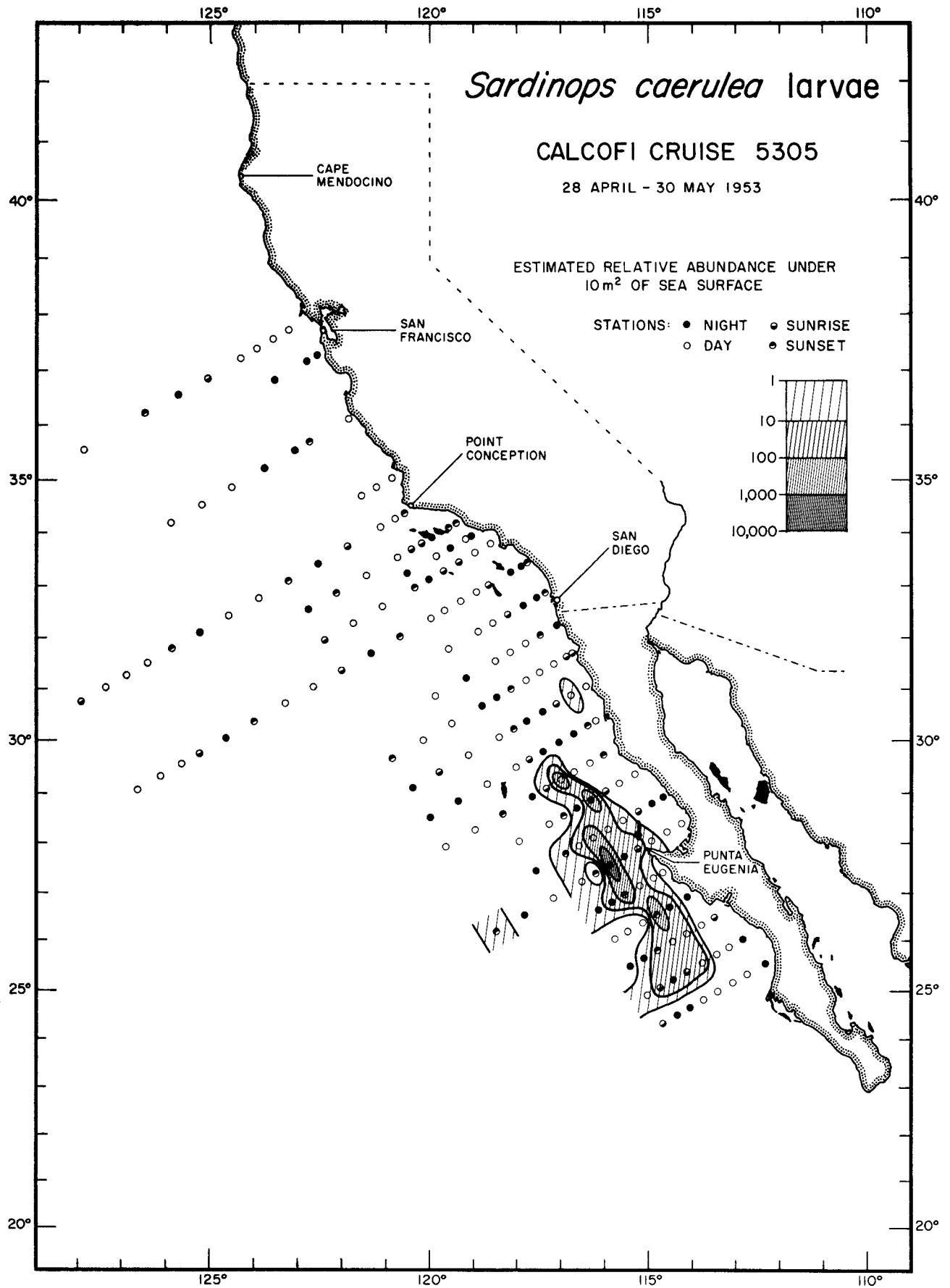


Sardinops caerulea larvae

5205

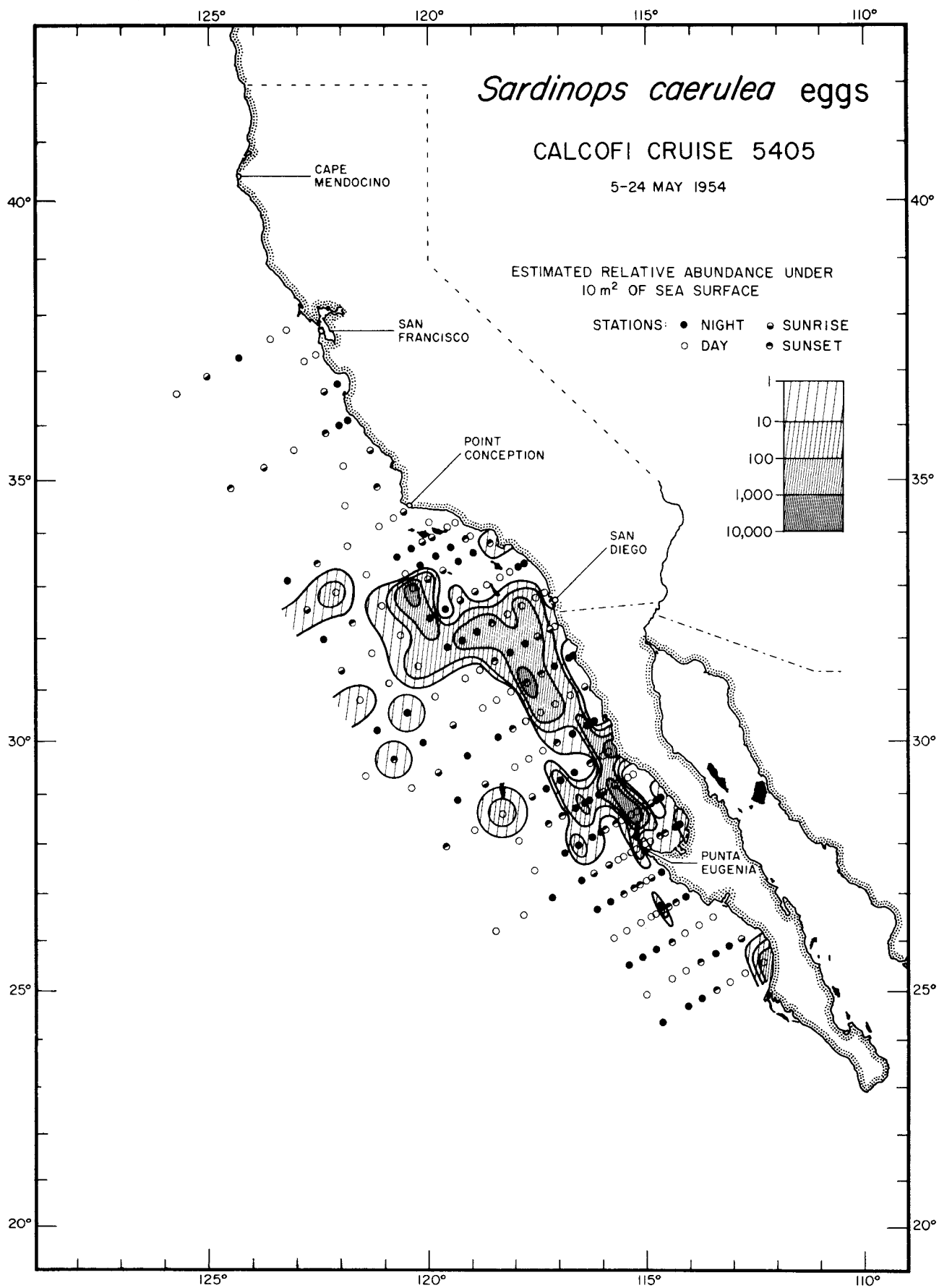
*Sardinops caerulea* eggs

5305



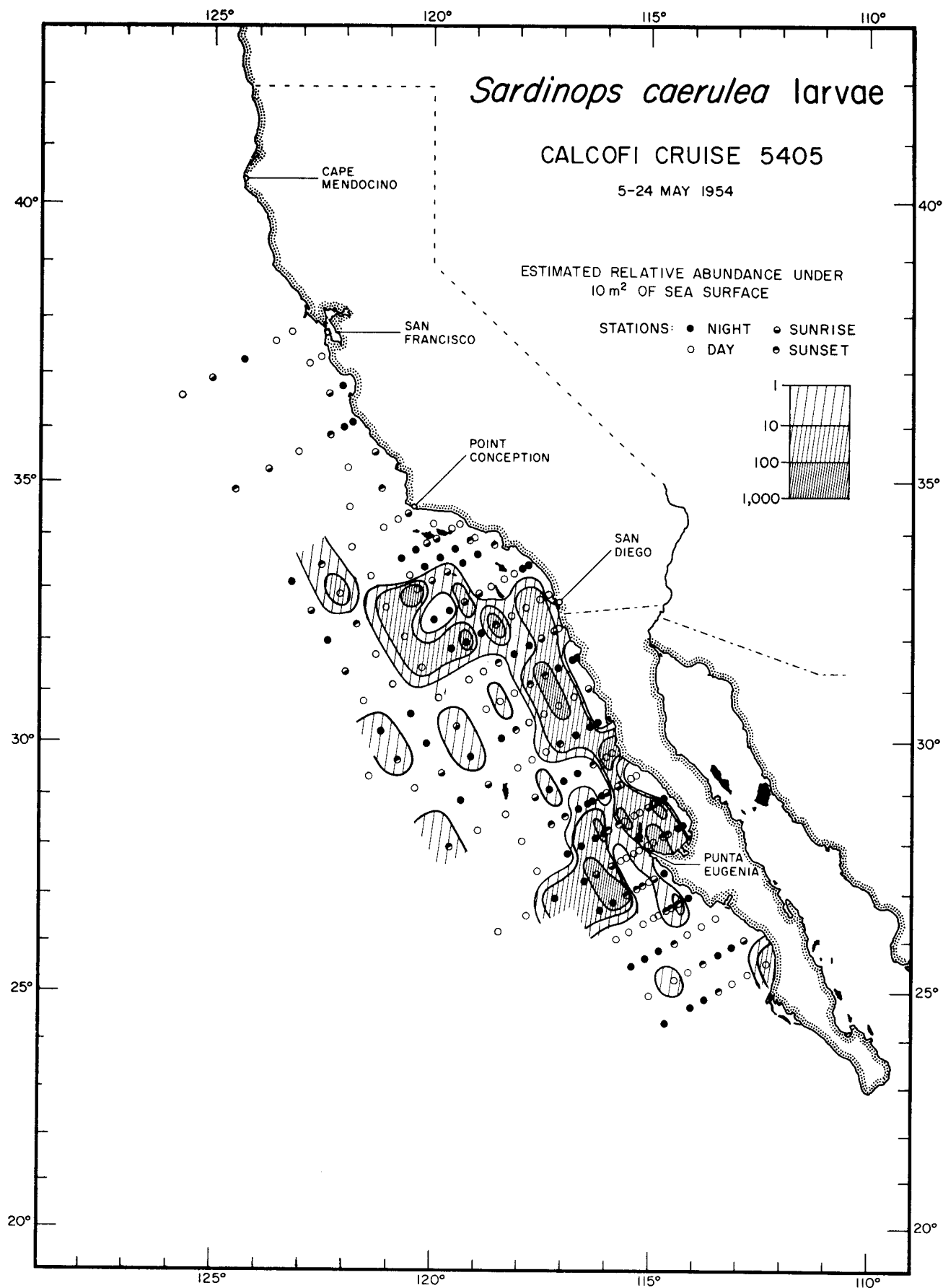
Sardinops caerulea larvae

5305



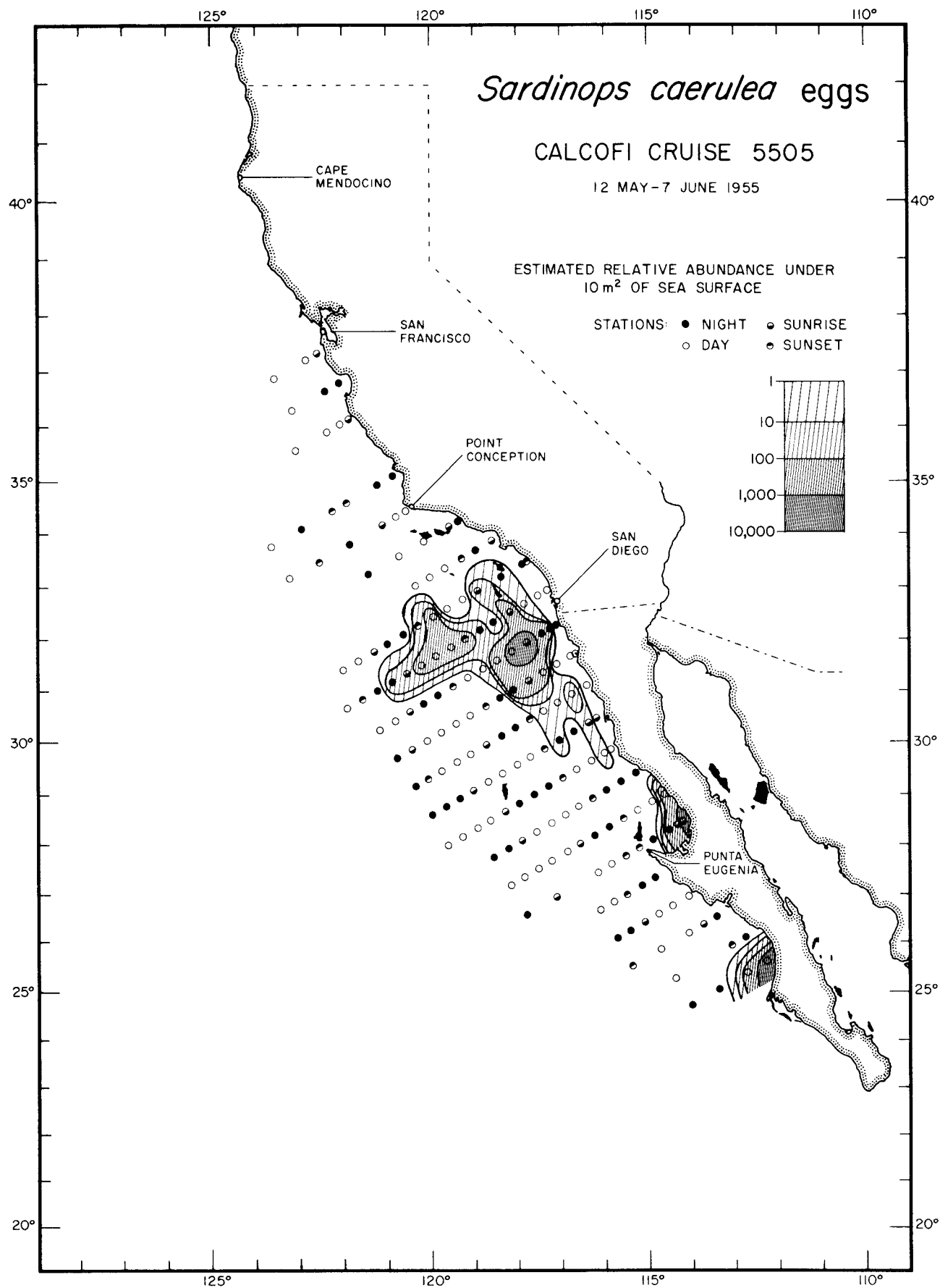
Sardinops caerulea eggs

5405



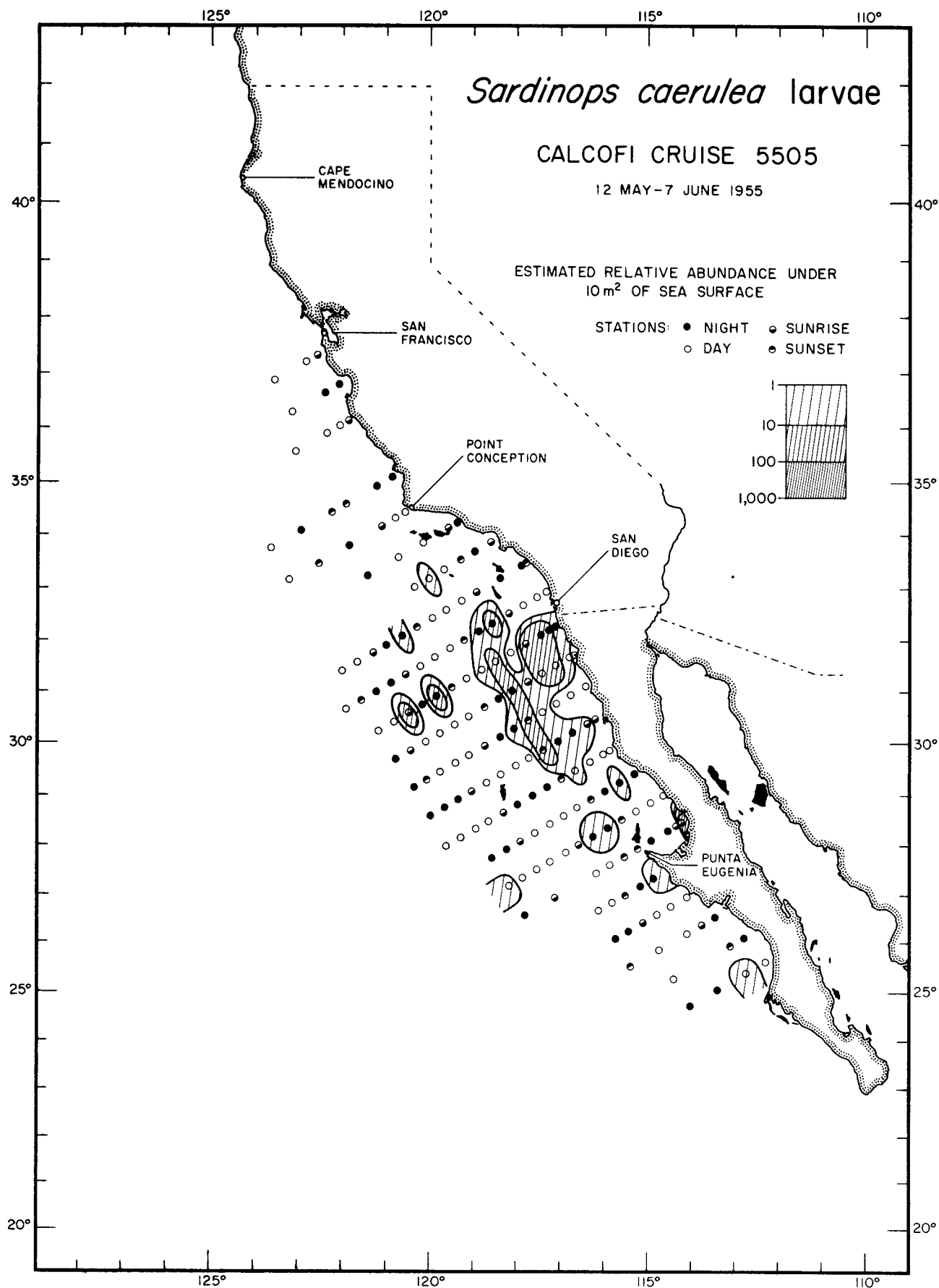
Sardinops caerulea larvae

5405



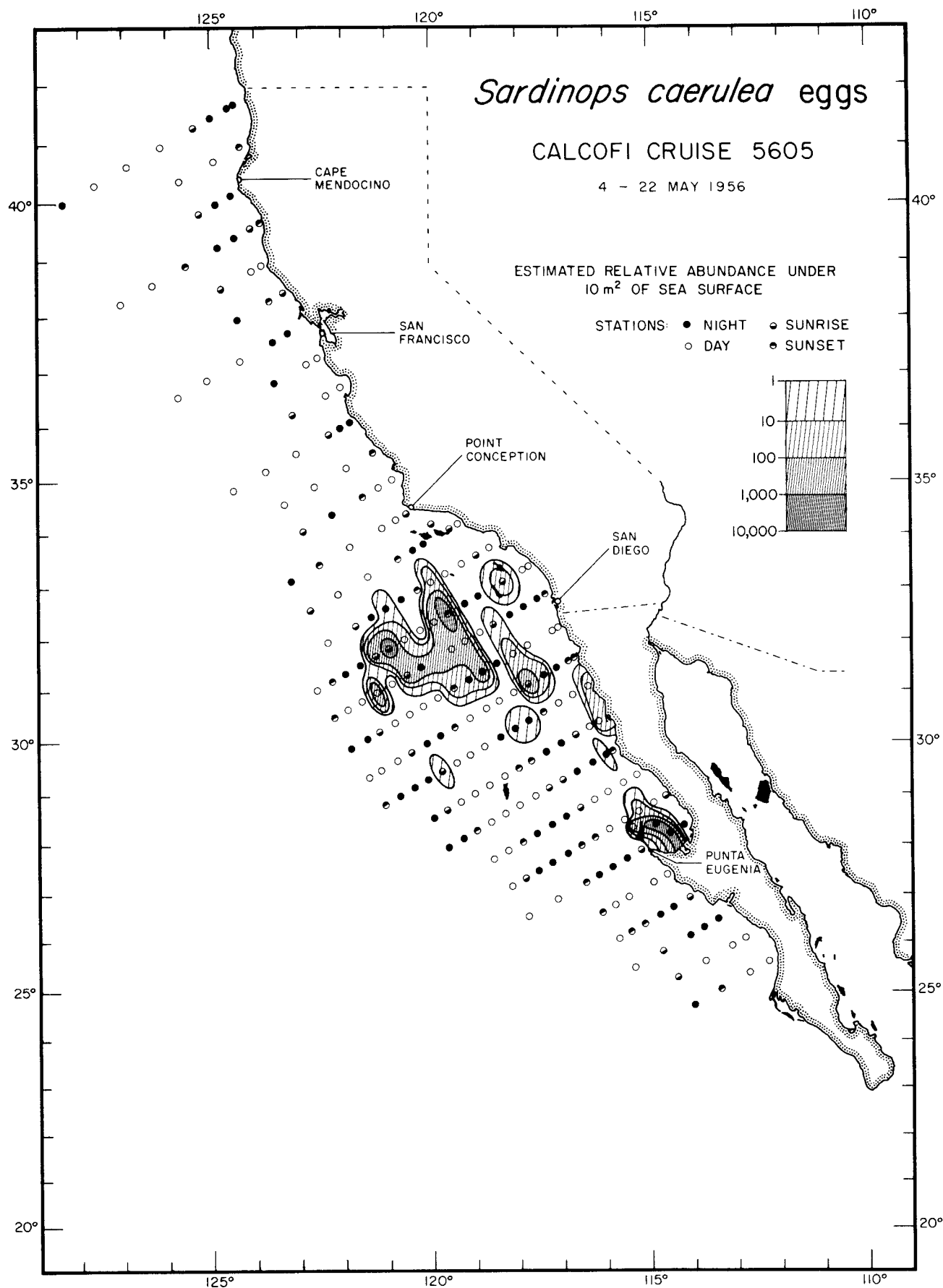
Sardinops caerulea eggs

5505

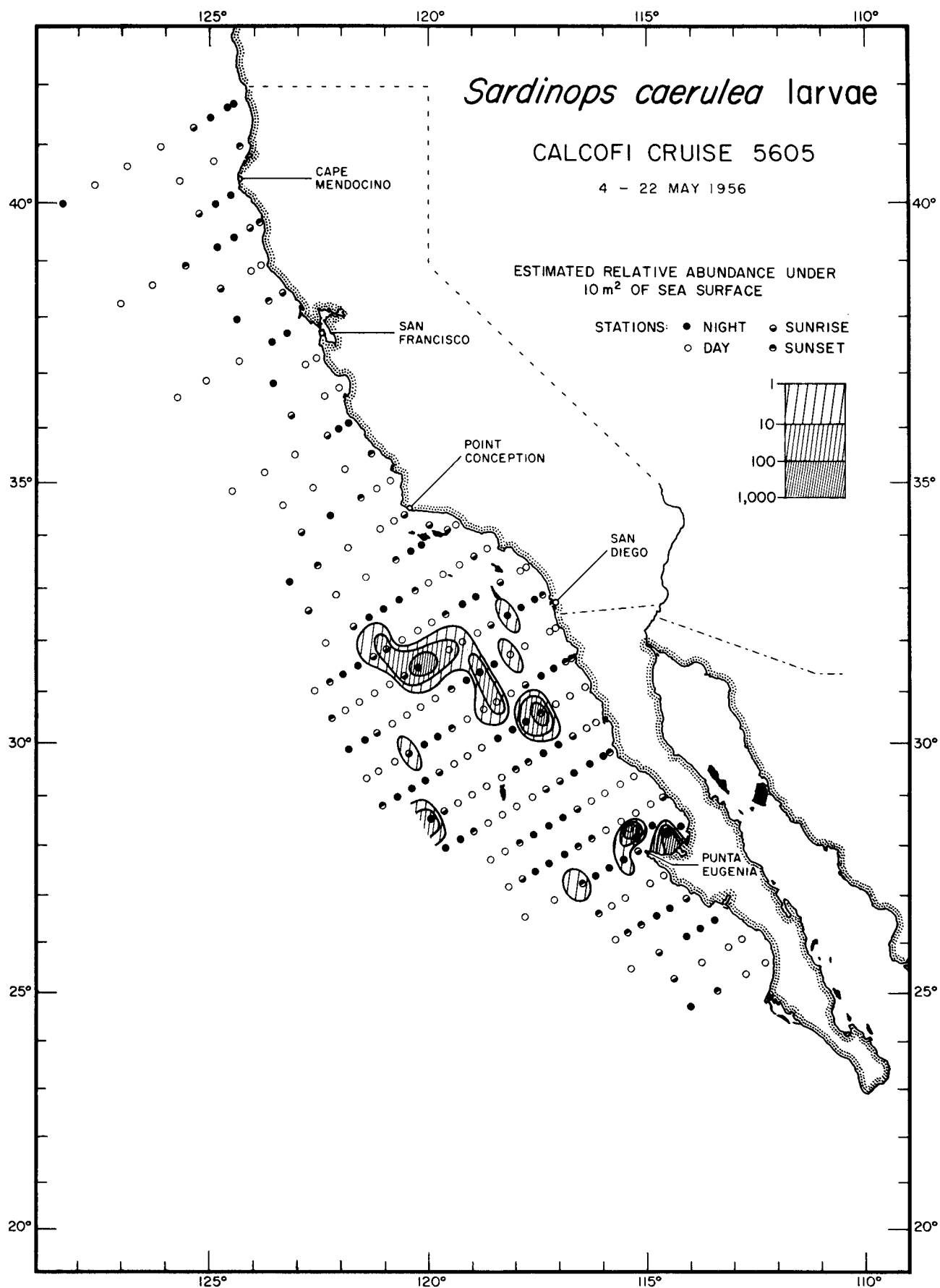


Sardinops caerulea larvae

5505

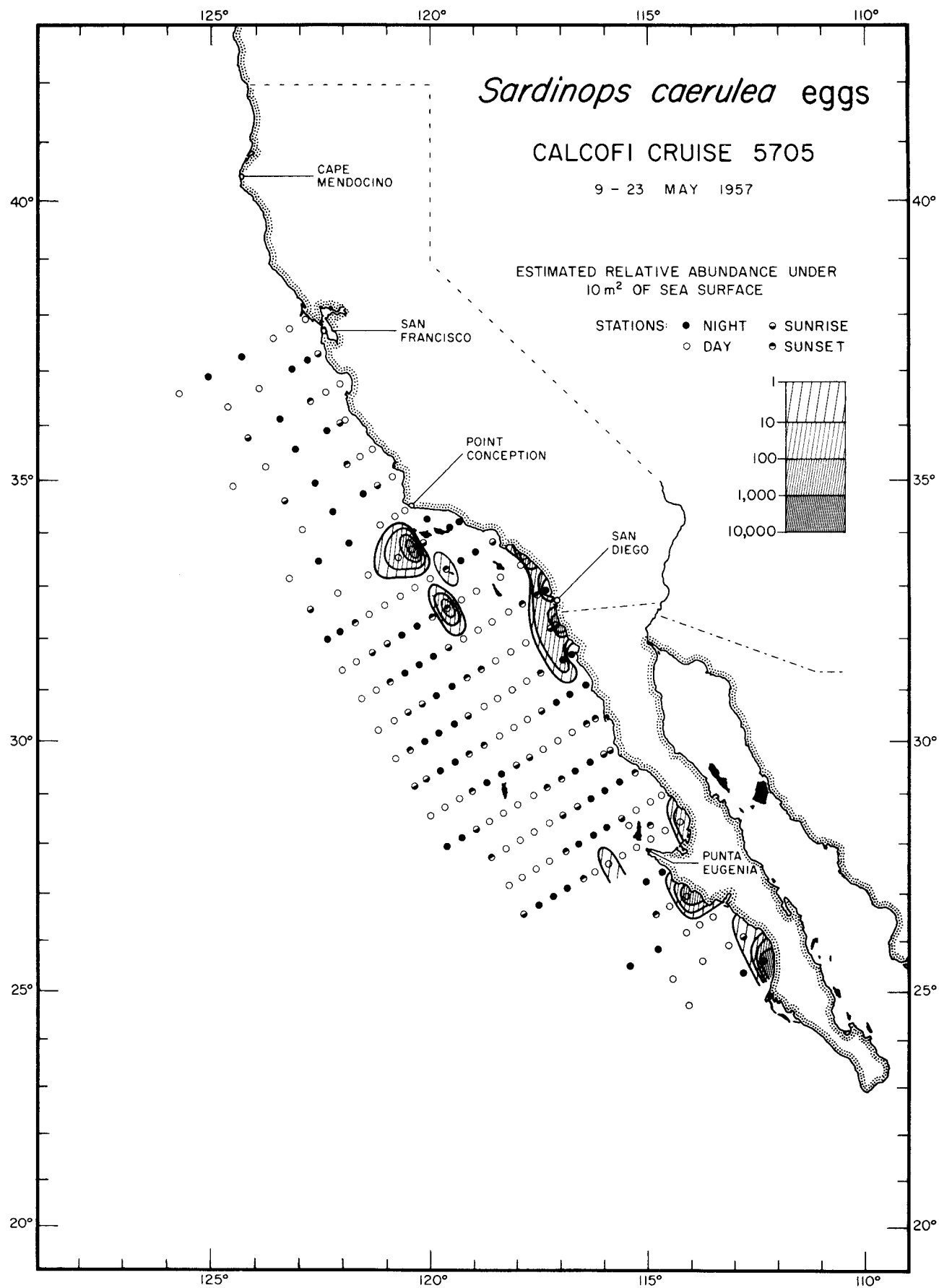
*Sardinops caerulea* eggs

5605

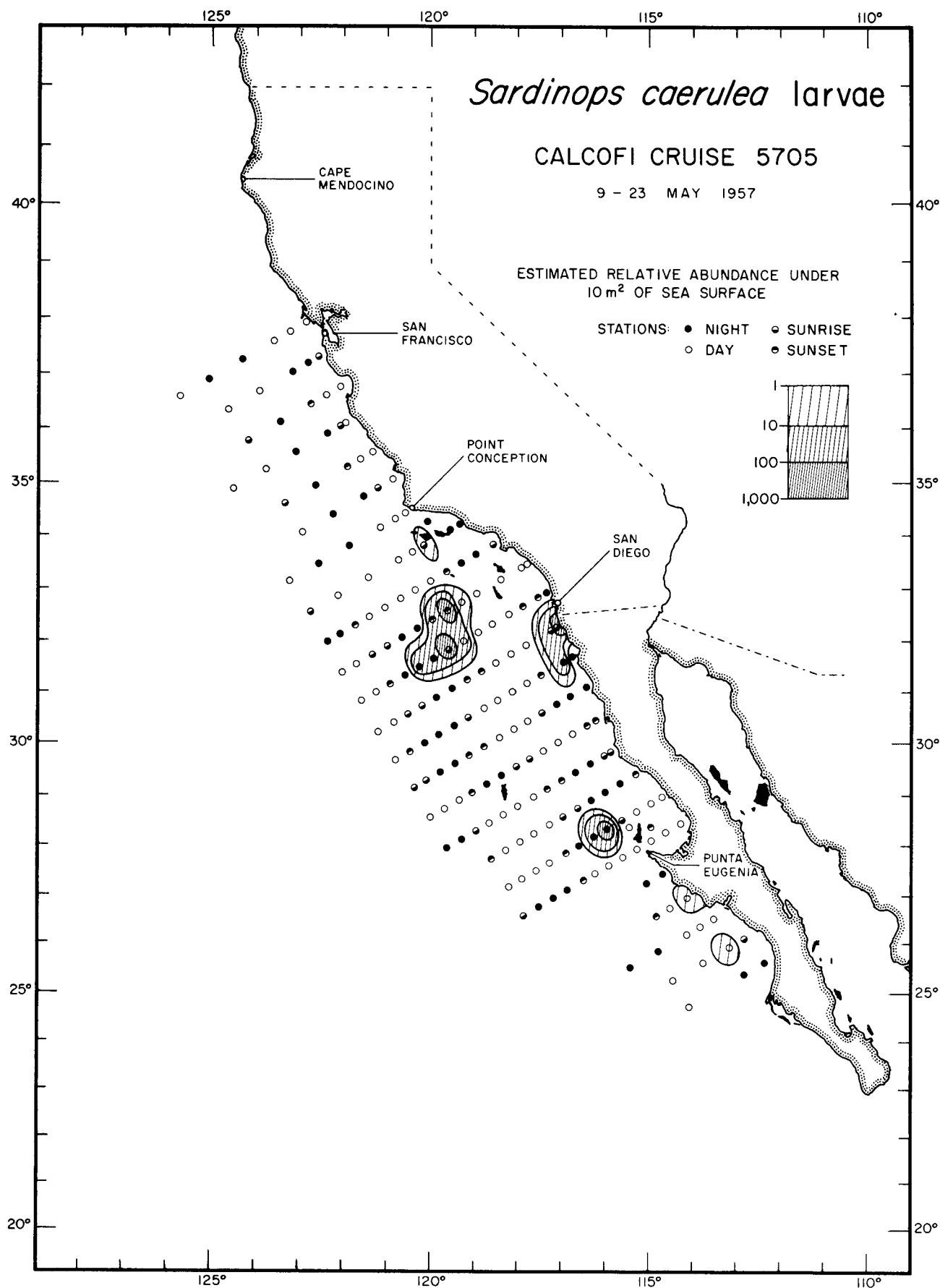


Sardinops caerulea larvae

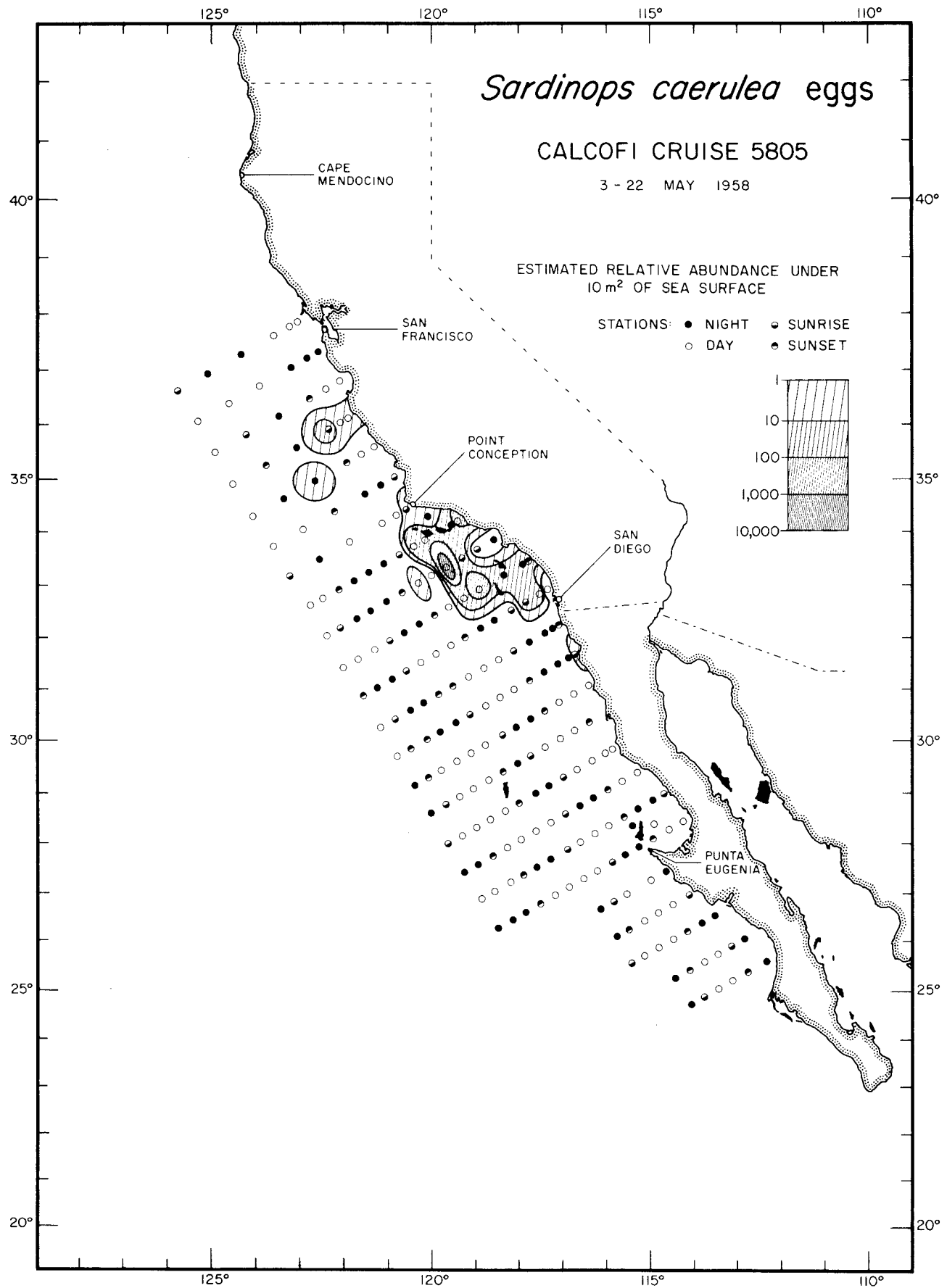
5605

*Sardinops caerulea* eggs

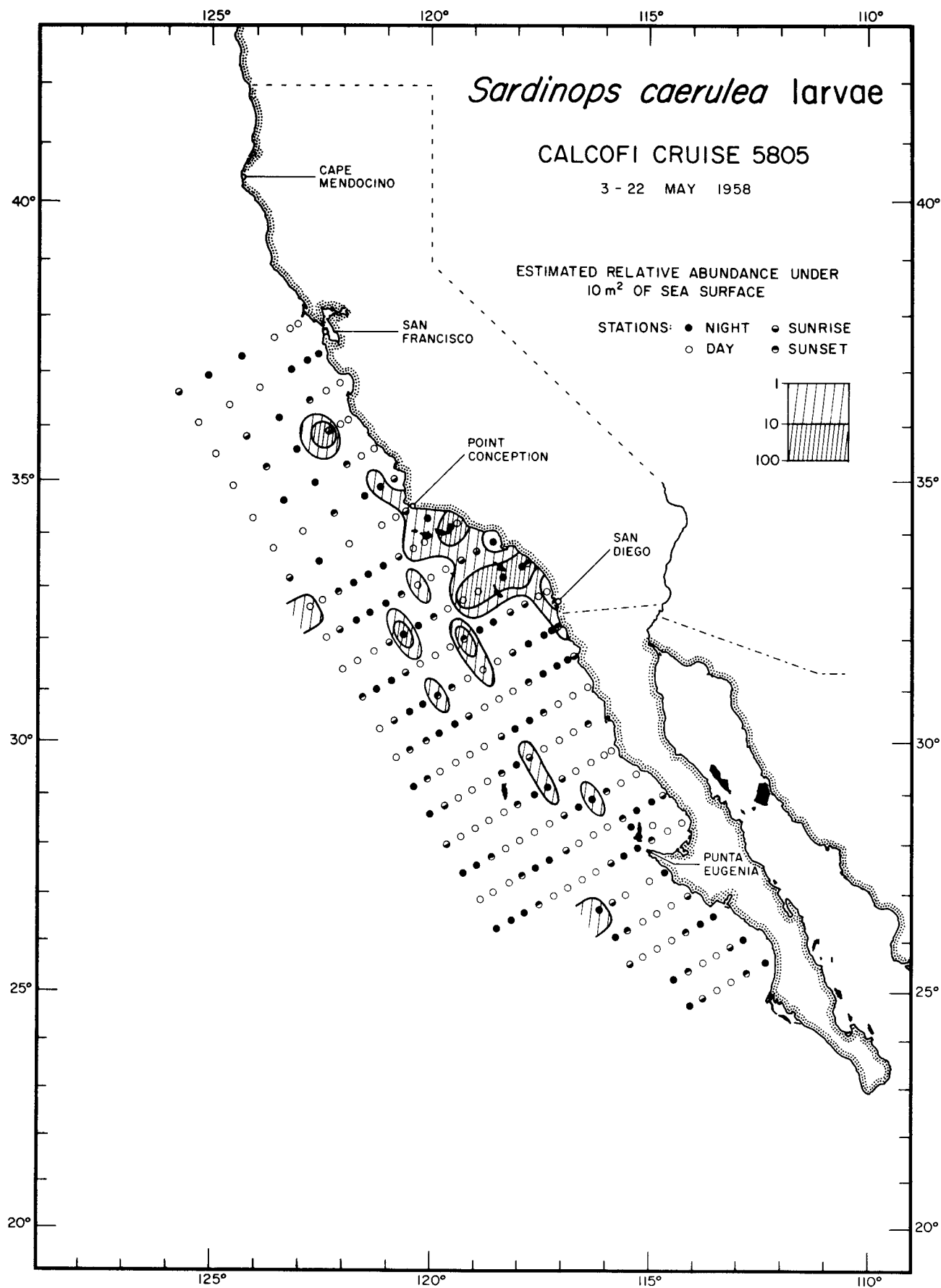
5705



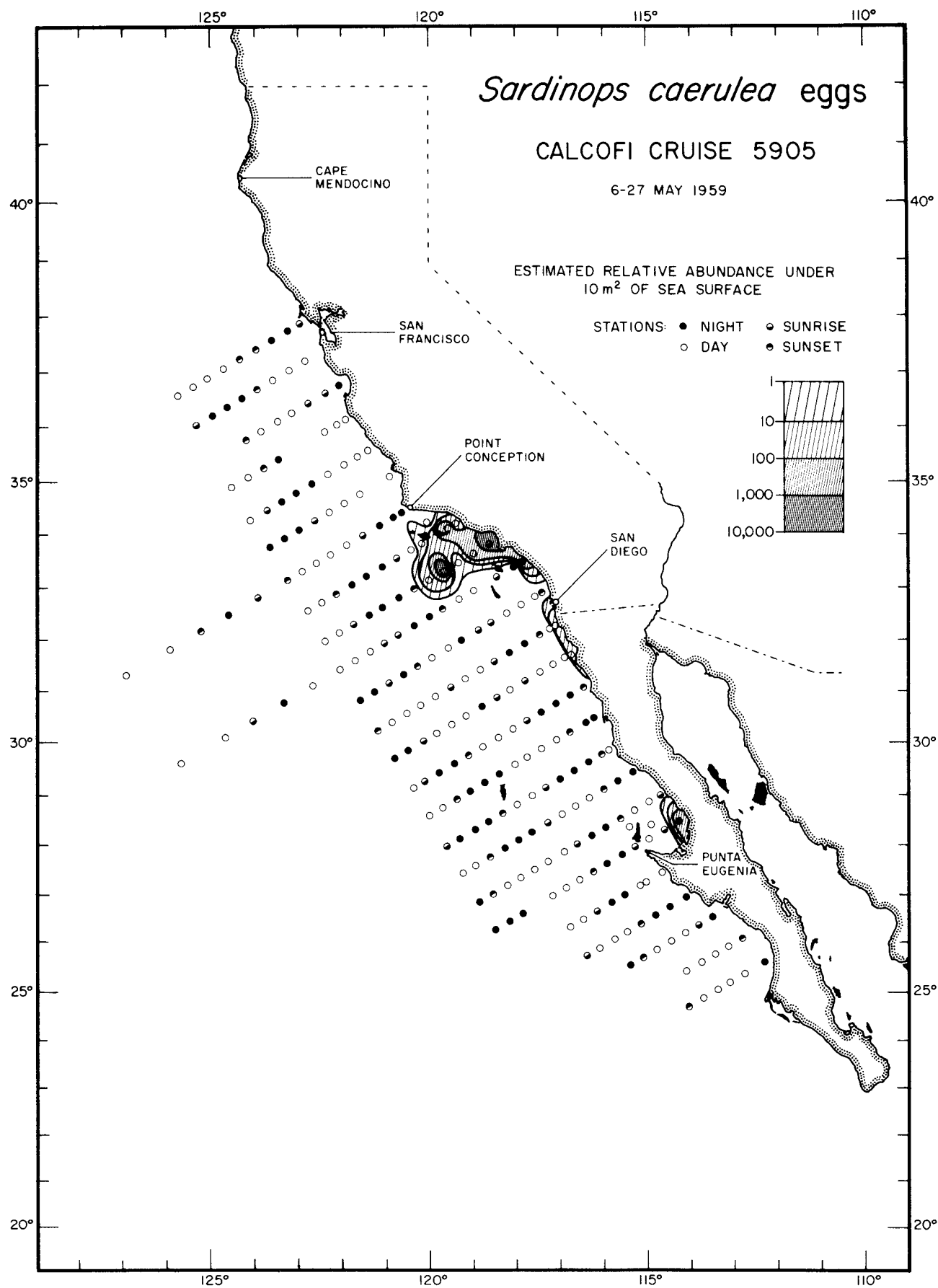
Sardinops caerulea larvae
5705

*Sardinops caerulea* eggs

5805

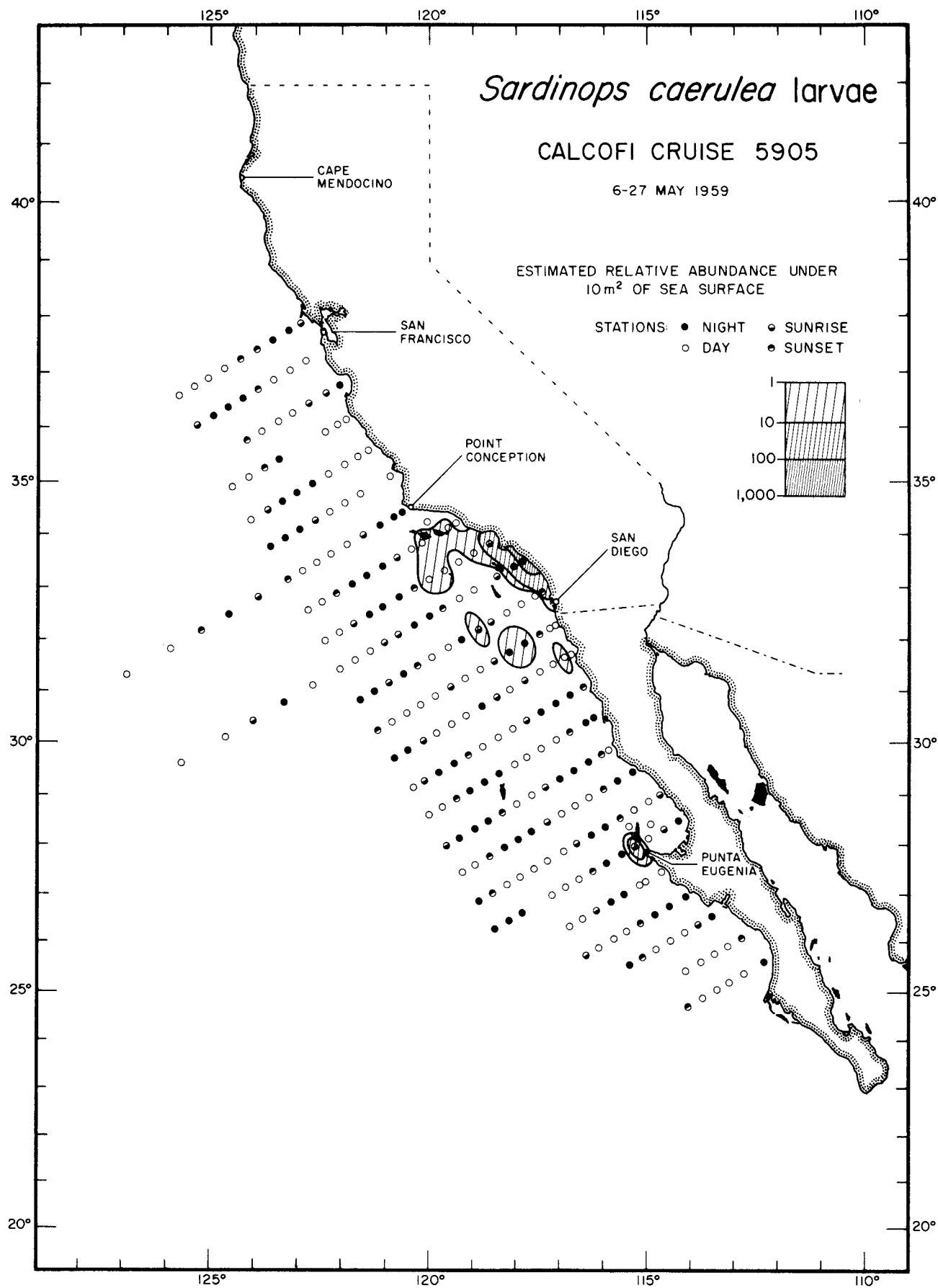
*Sardinops caerulea* larvae

5805



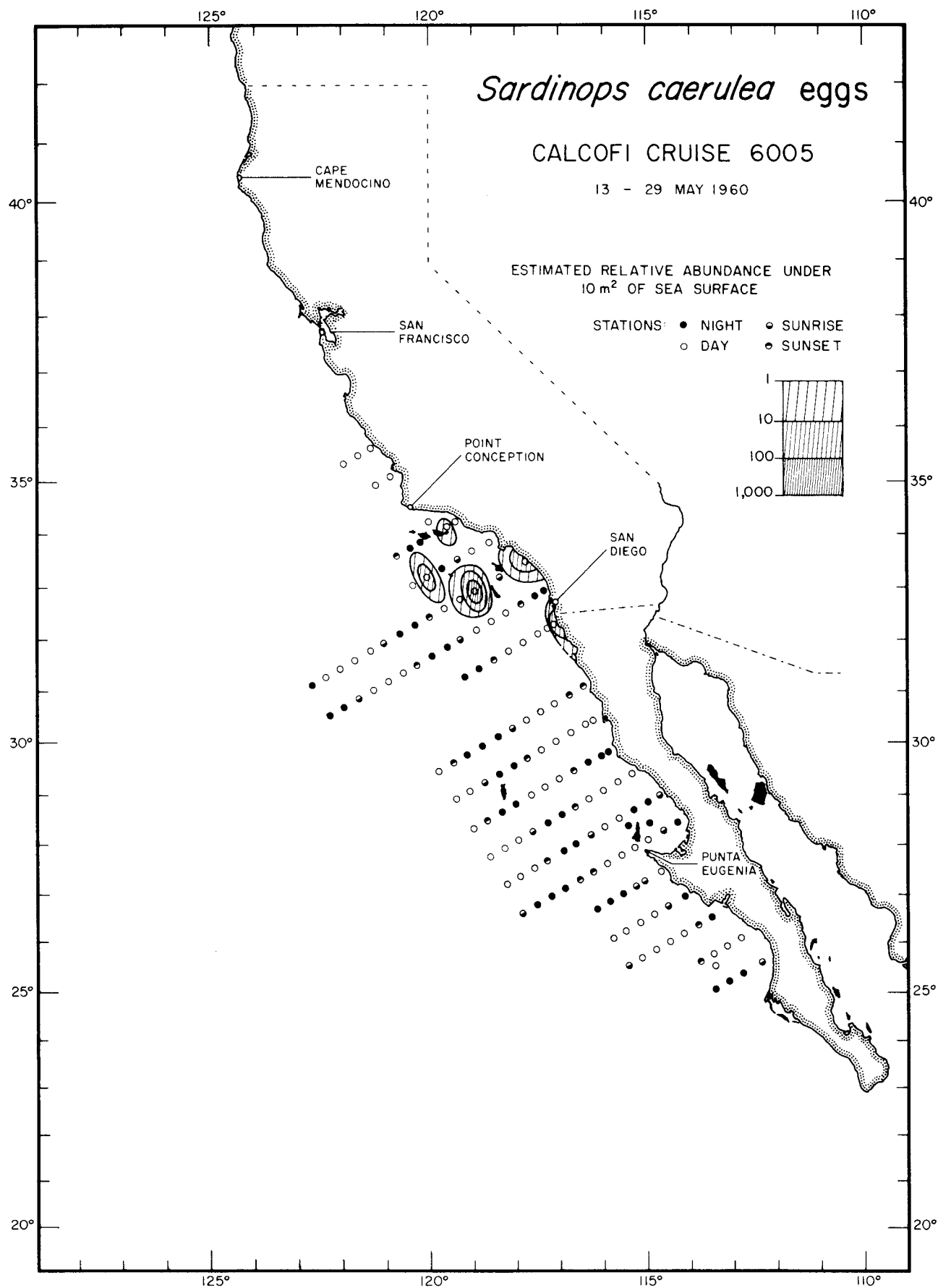
Sardinops caerulea eggs

5905

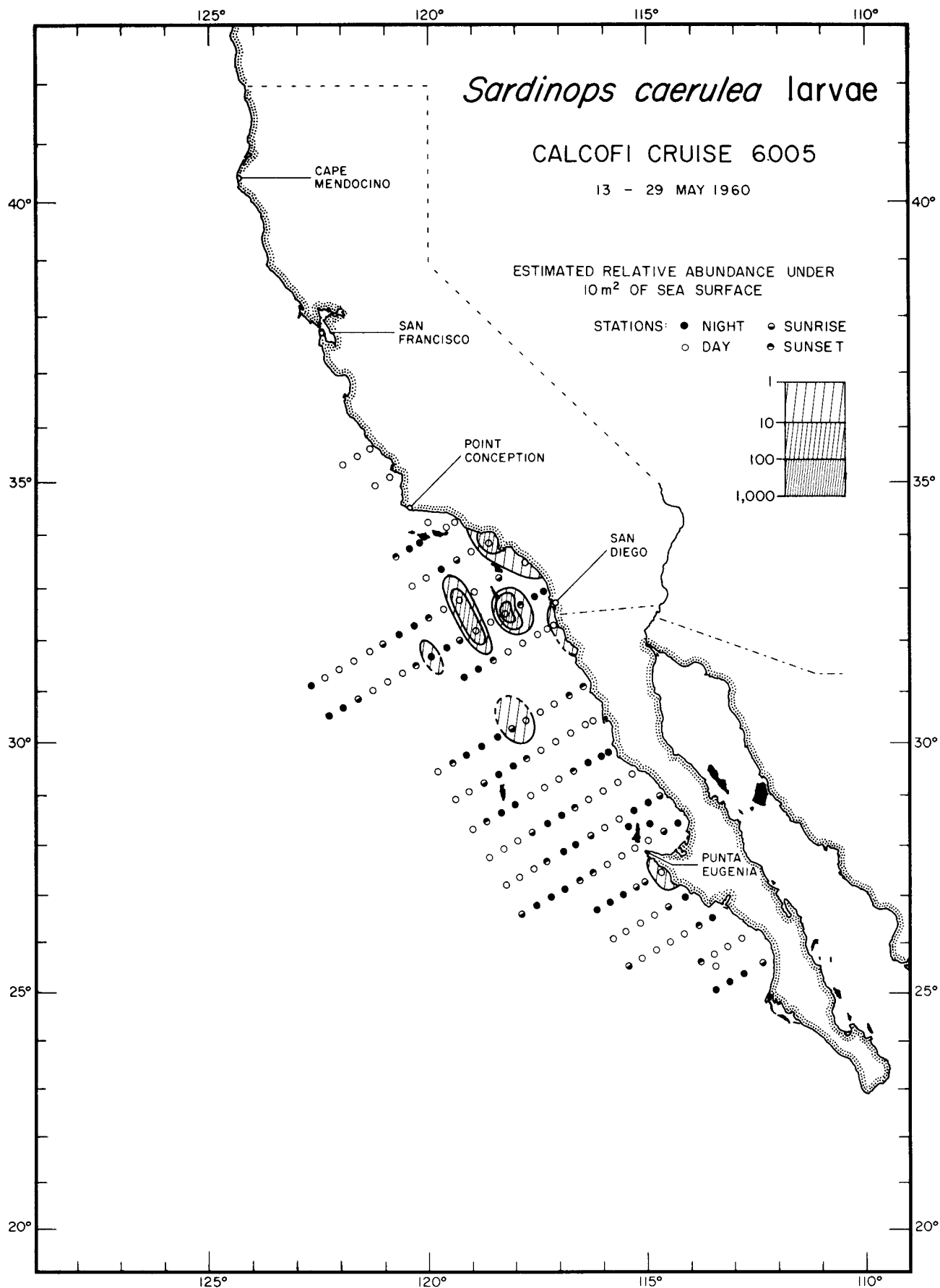


Sardinops caerulea larvae

5905

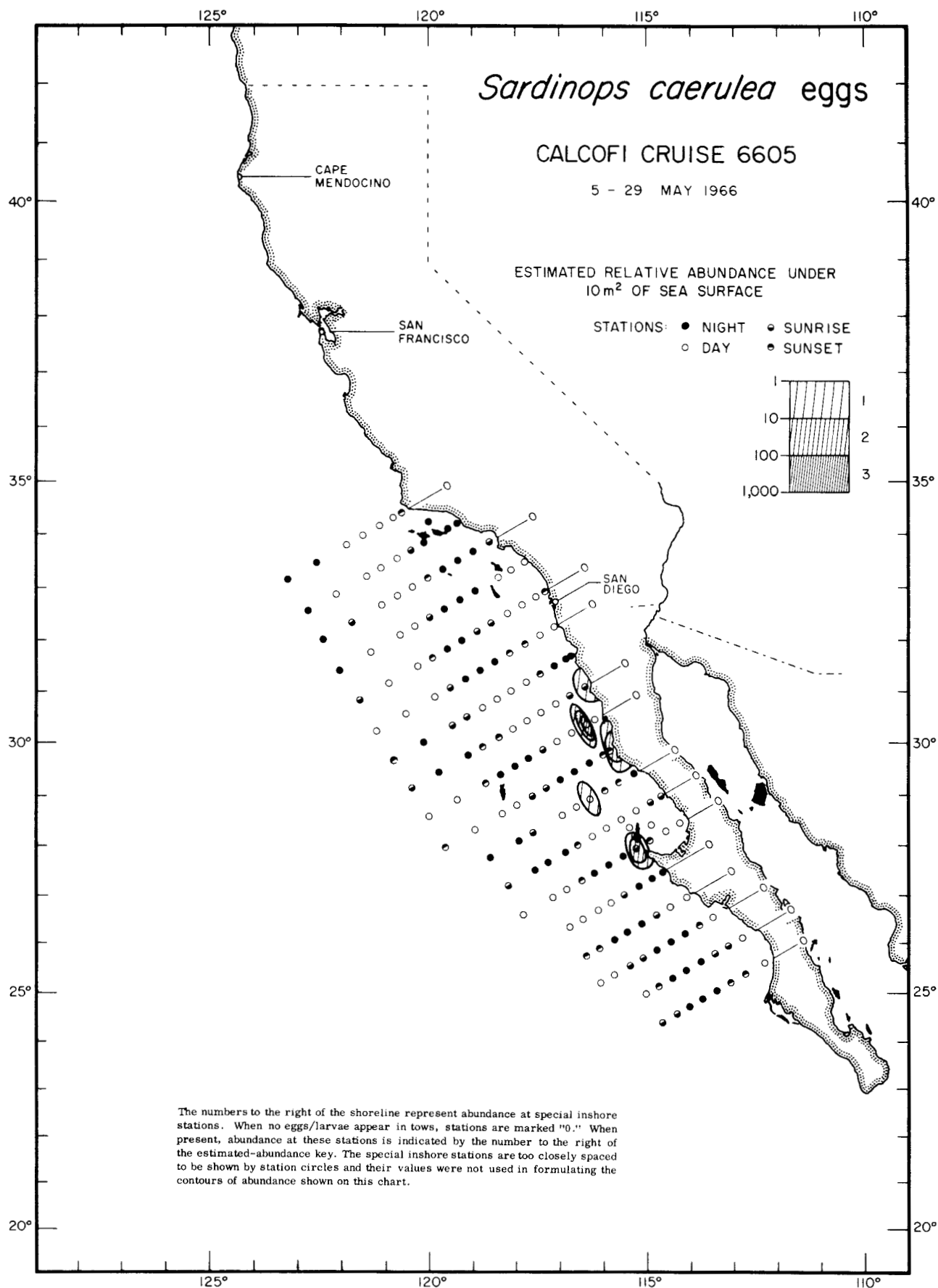
*Sardinops caerulea* eggs

6005

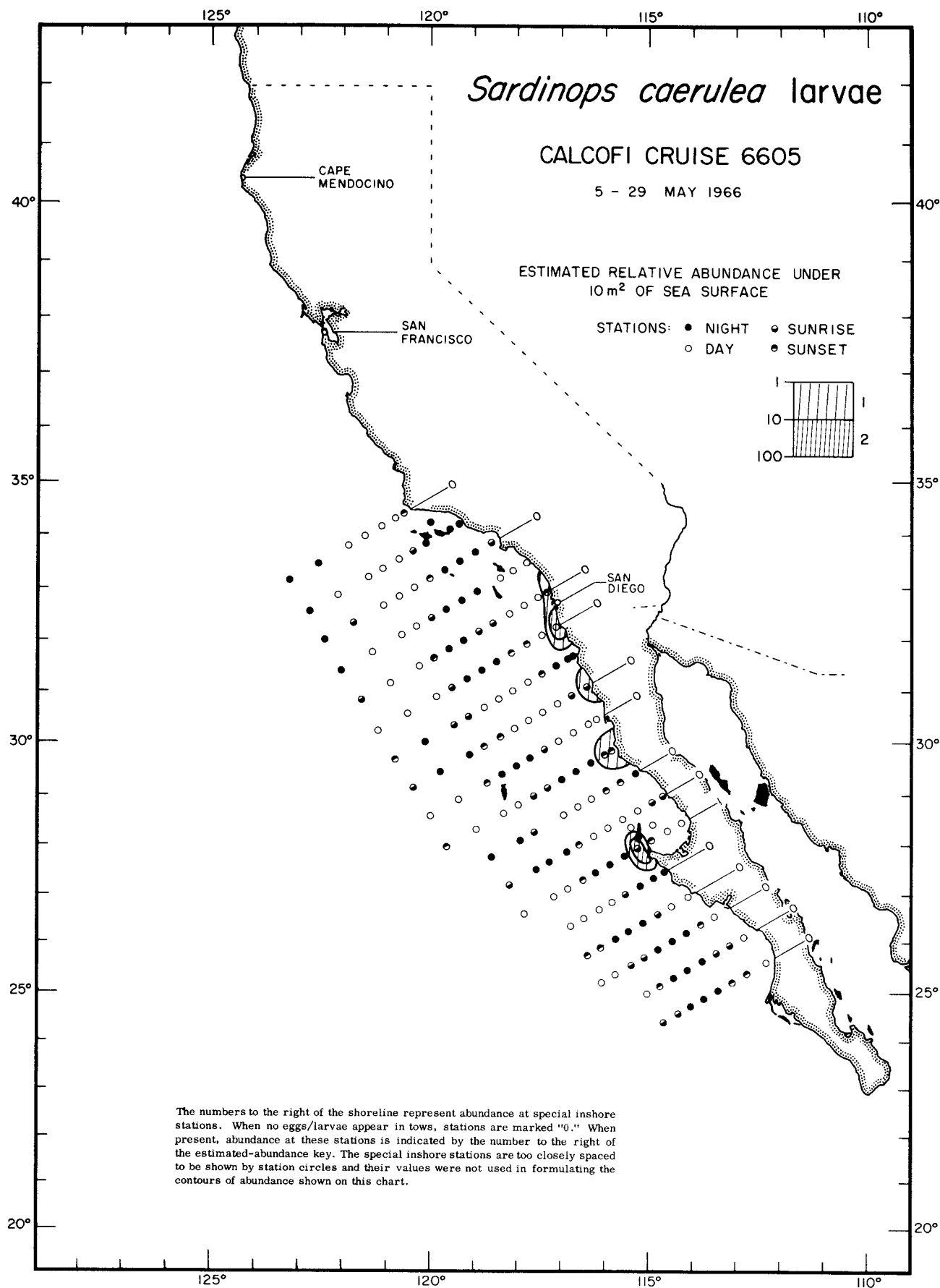


Sardinops caerulea larvae

6005

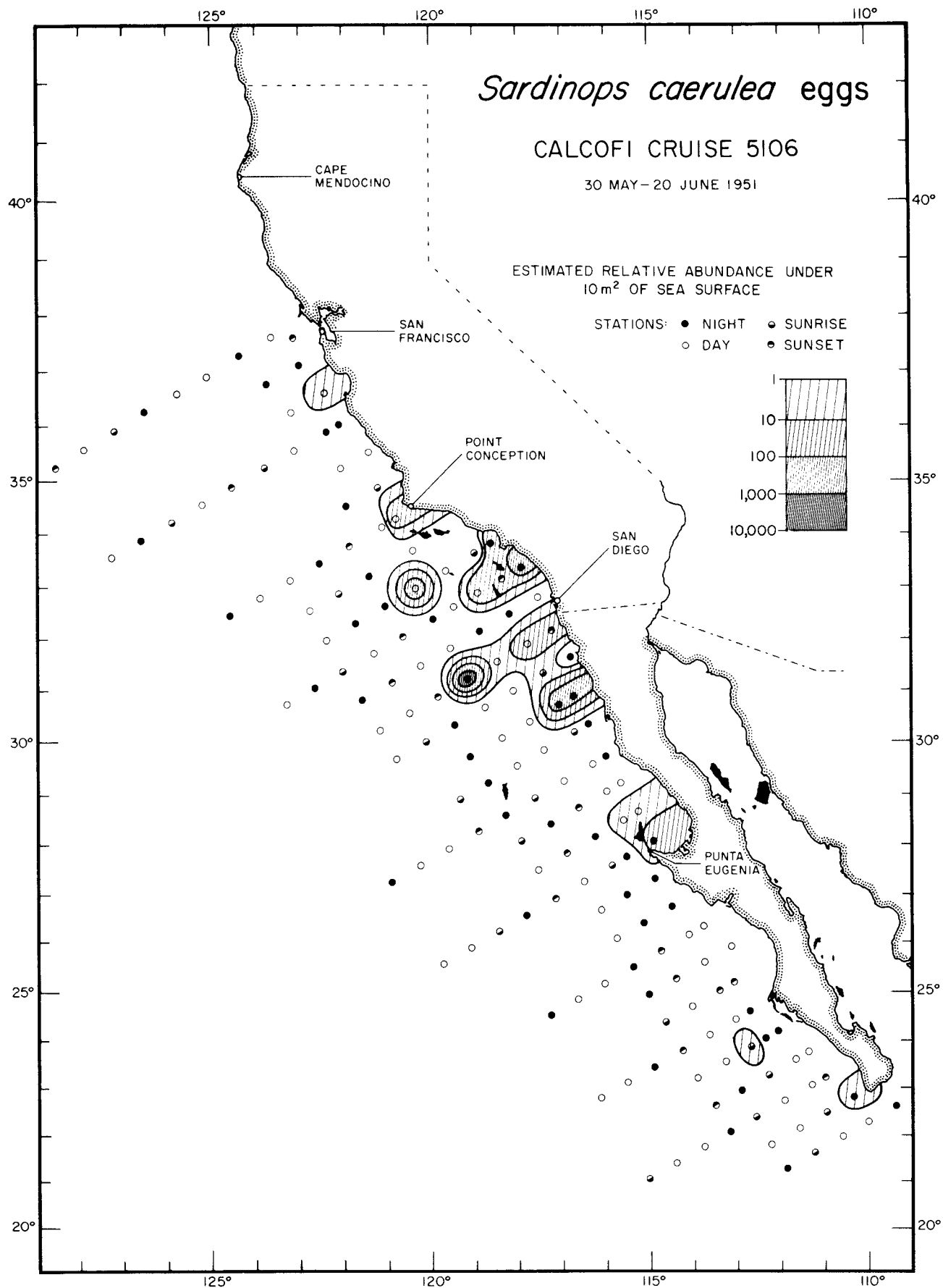
*Sardinops caerulea* eggs

6605

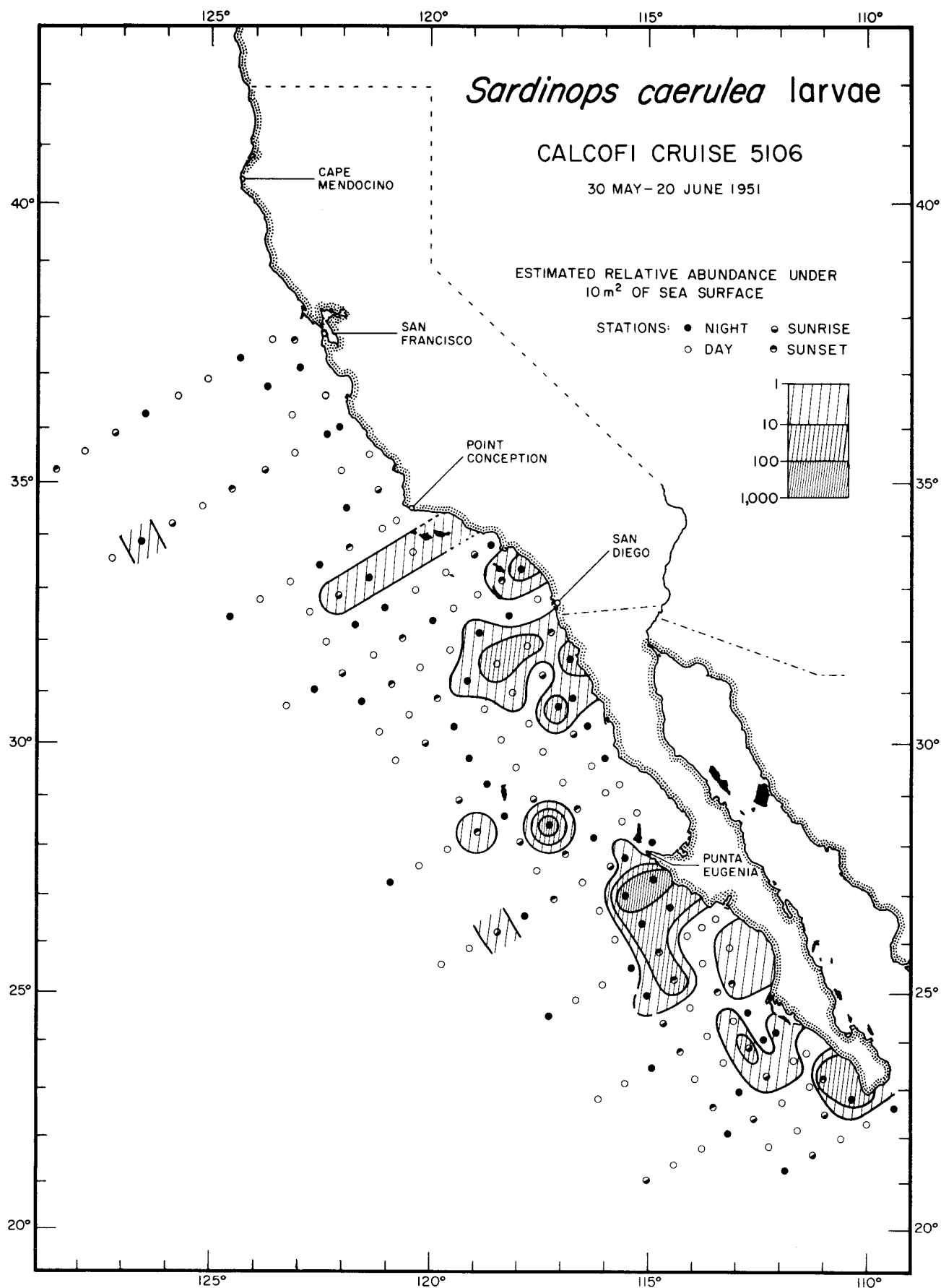


Sardinops caerulea larvae

6605

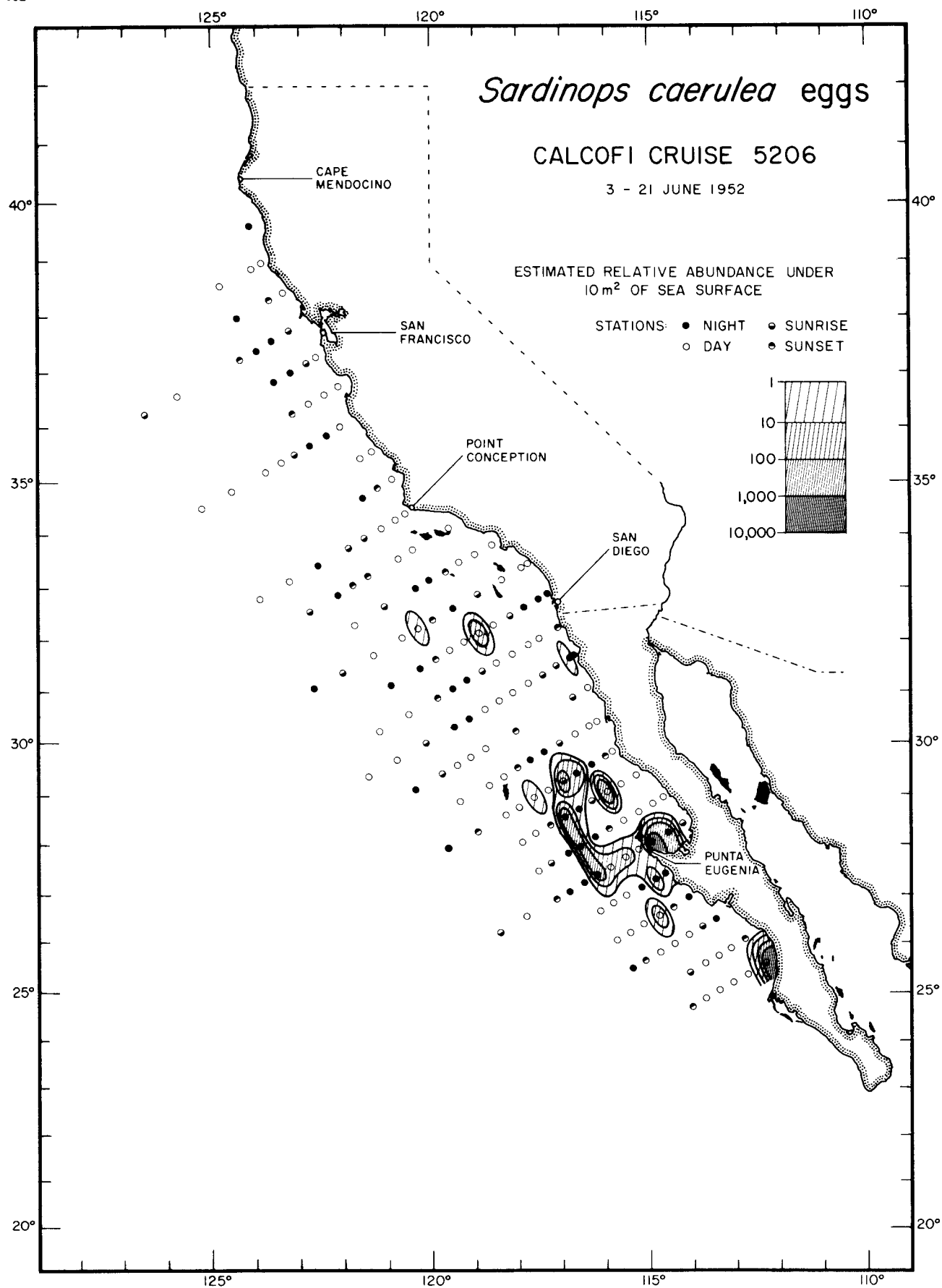
*Sardinops caerulea* eggs

5106



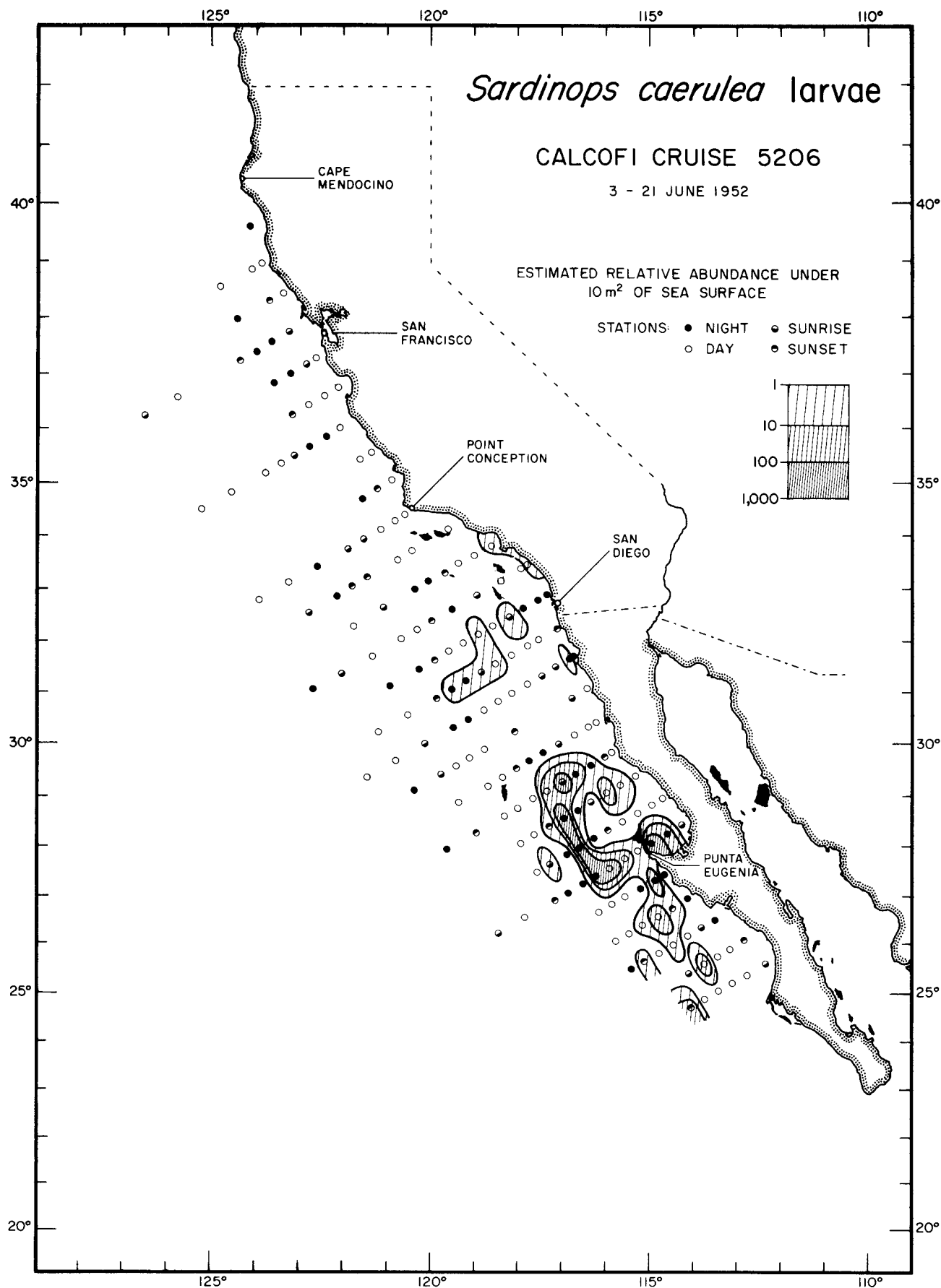
Sardinops caerulea larvae

5106



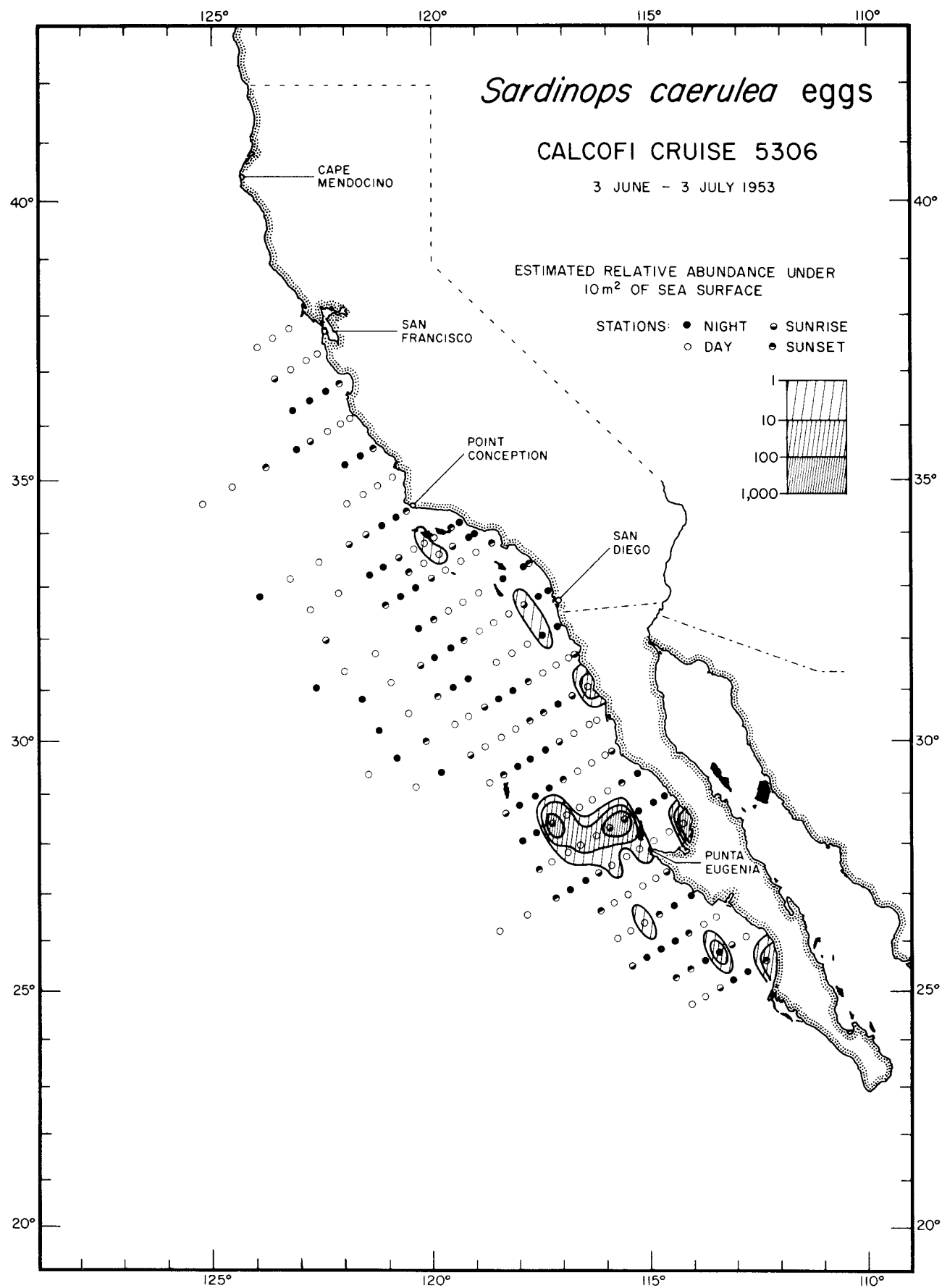
Sardinops caerulea eggs

5206

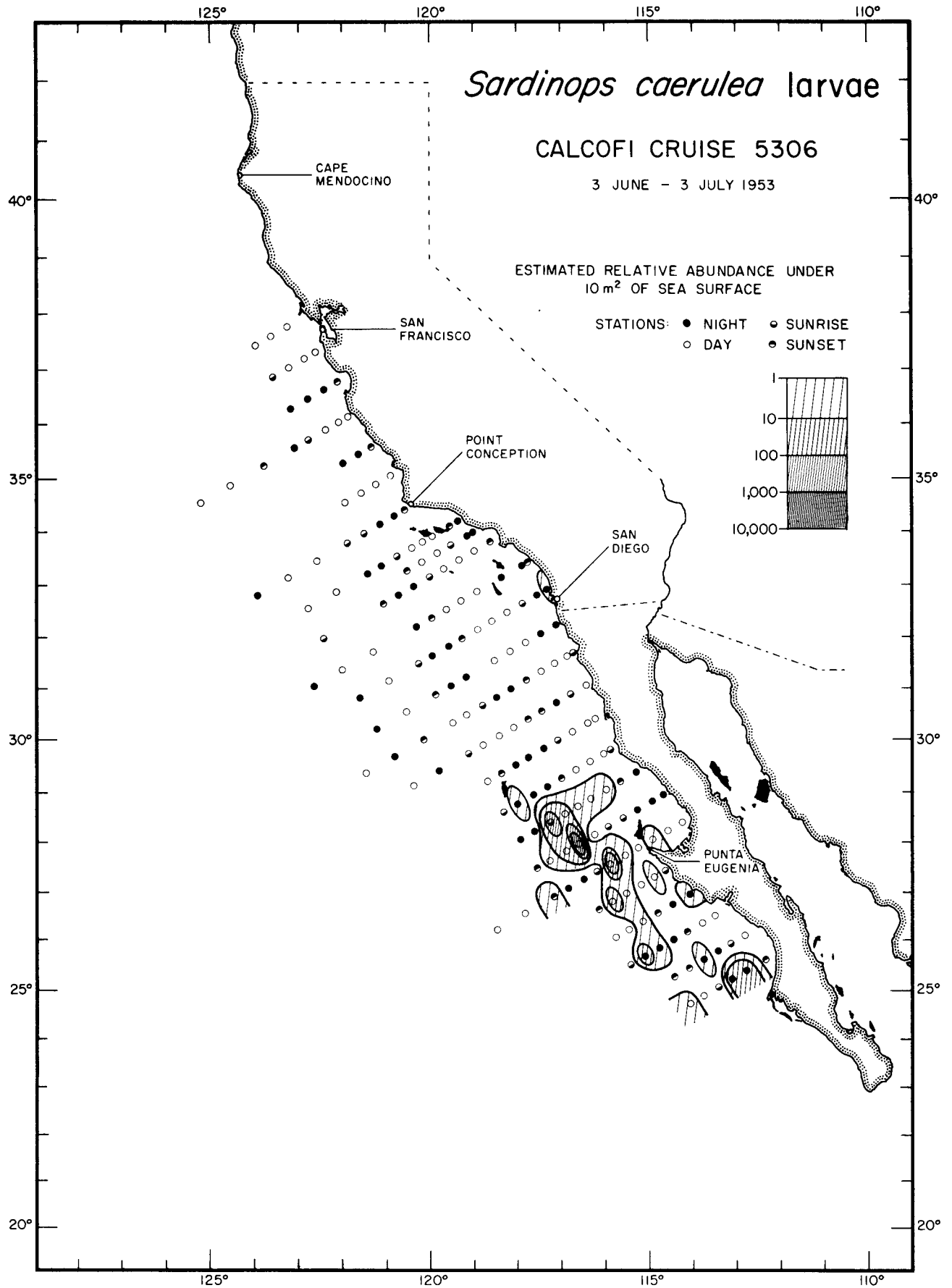


Sardinops caerulea larvae

5206

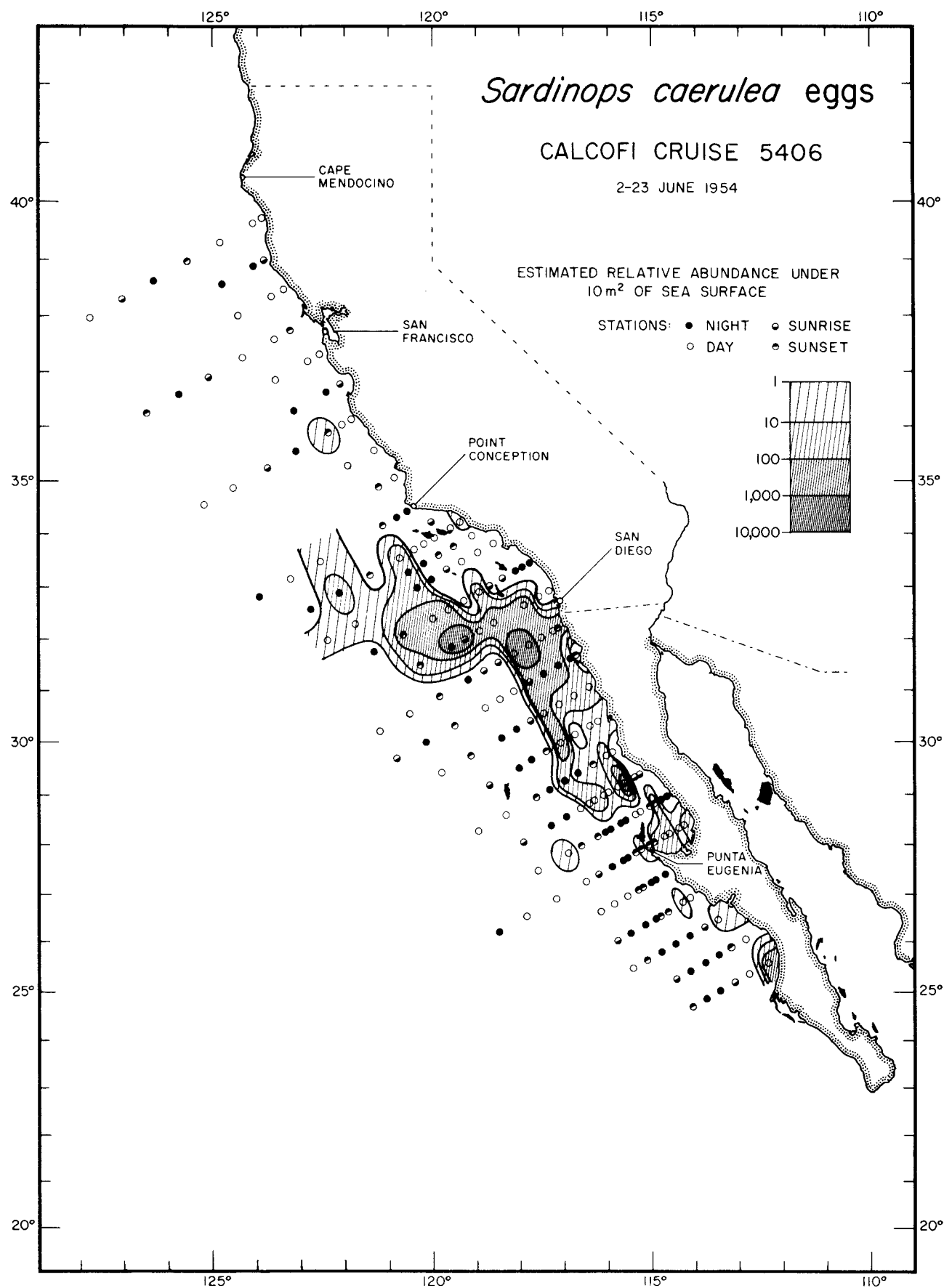
*Sardinops caerulea* eggs

5306

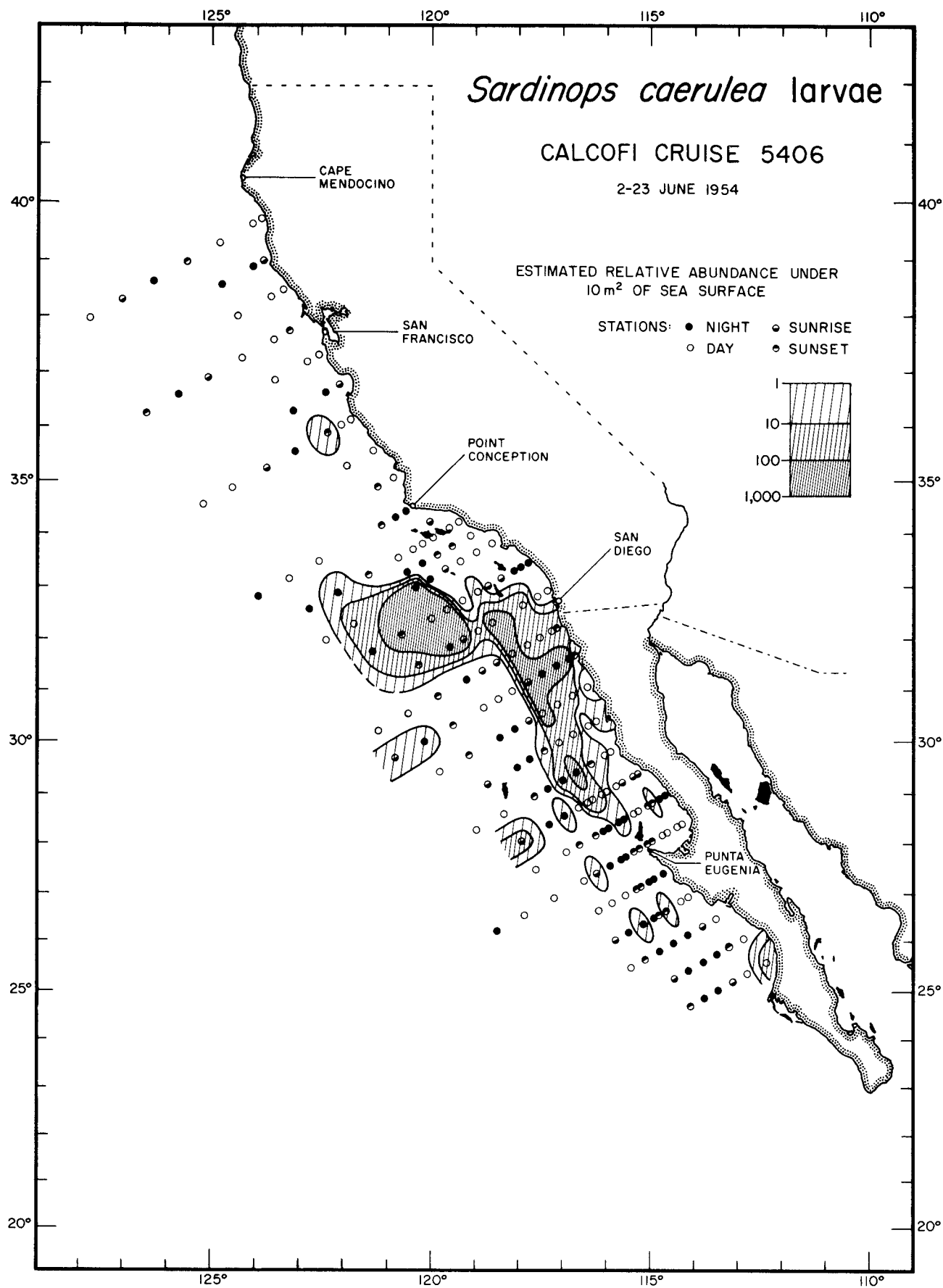


Sardinops caerulea larvae

5306

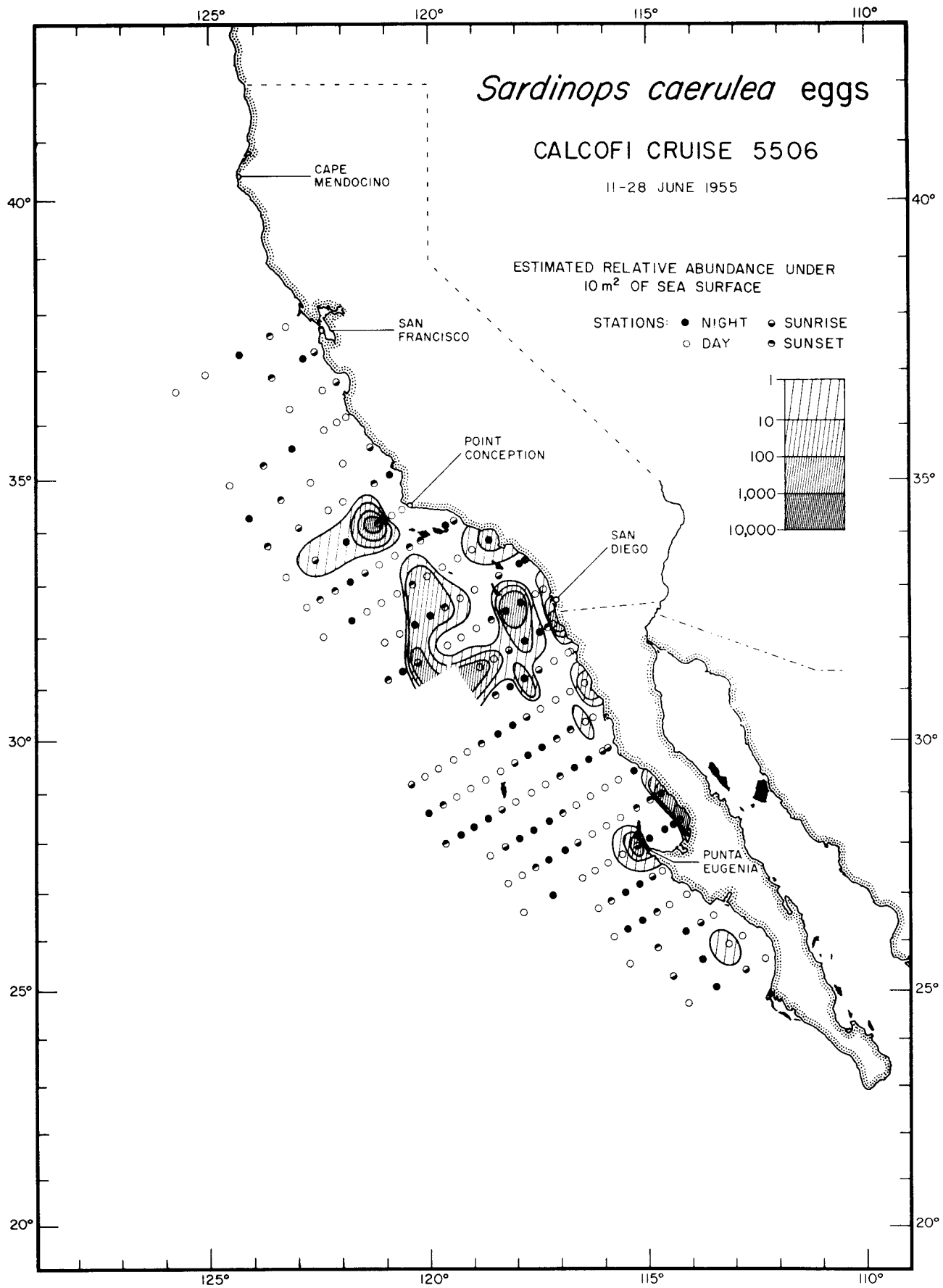
*Sardinops caerulea* eggs

5406



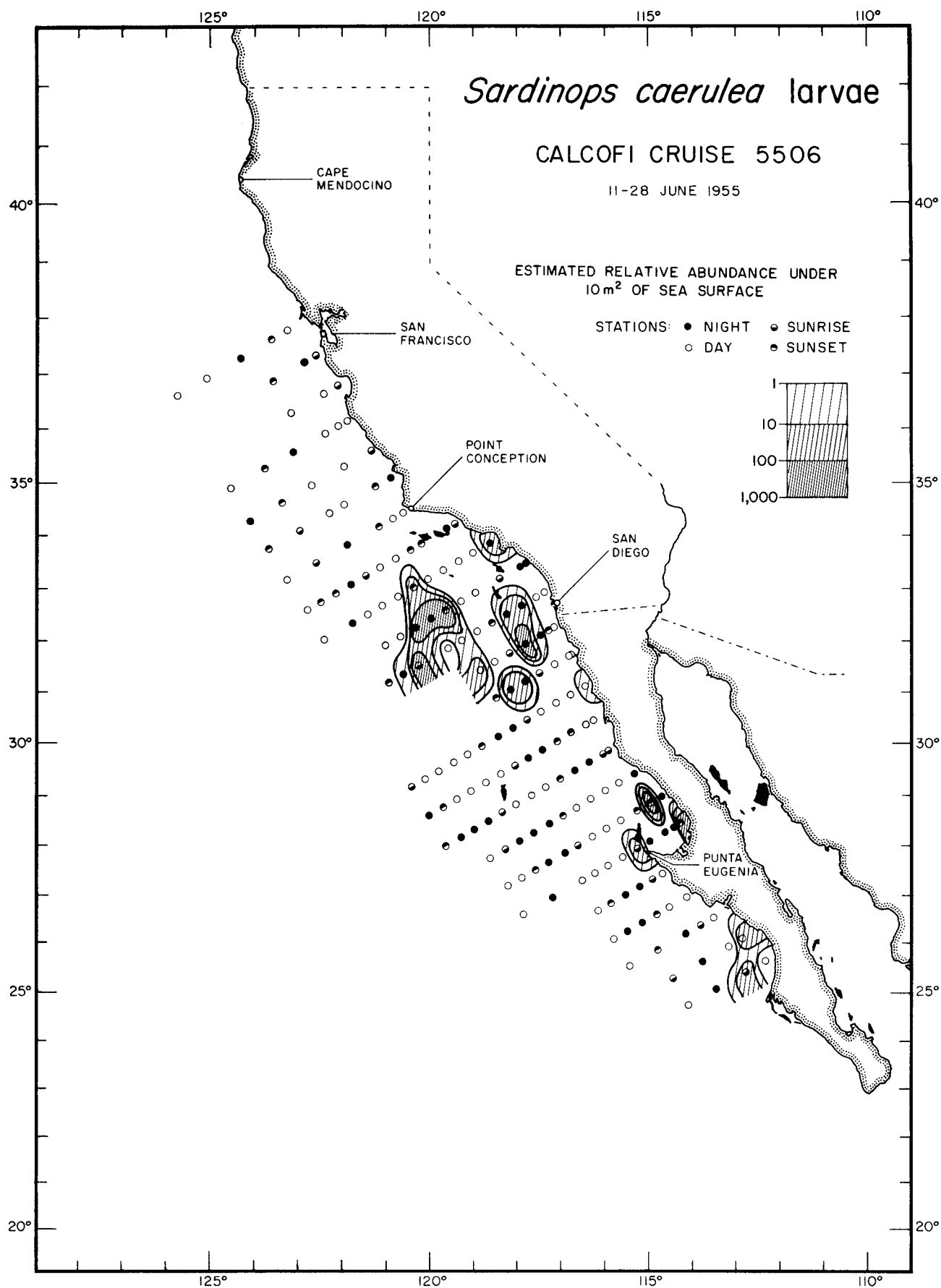
Sardinops caerulea larvae

5406



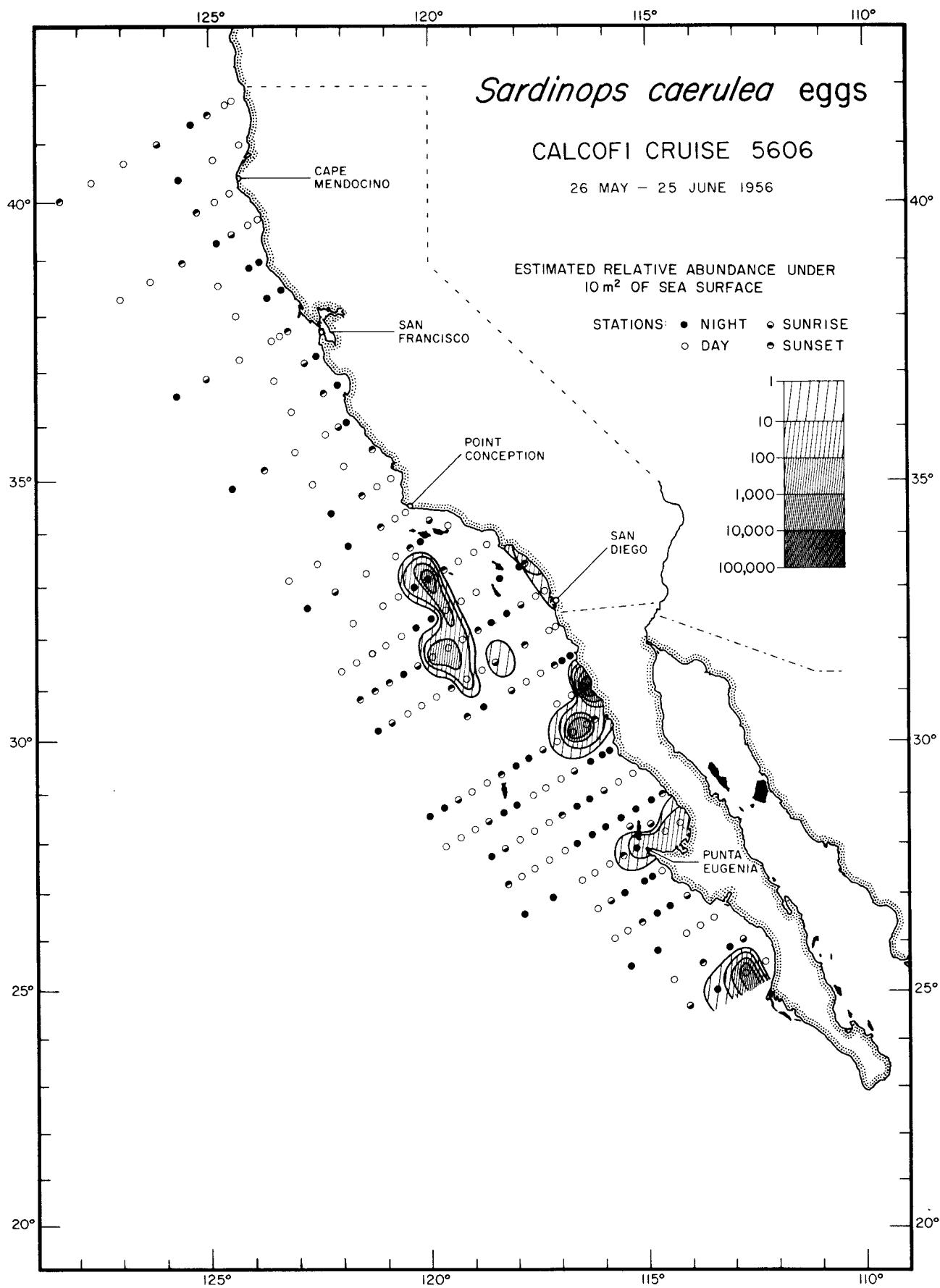
Sardinops caerulea eggs

5506

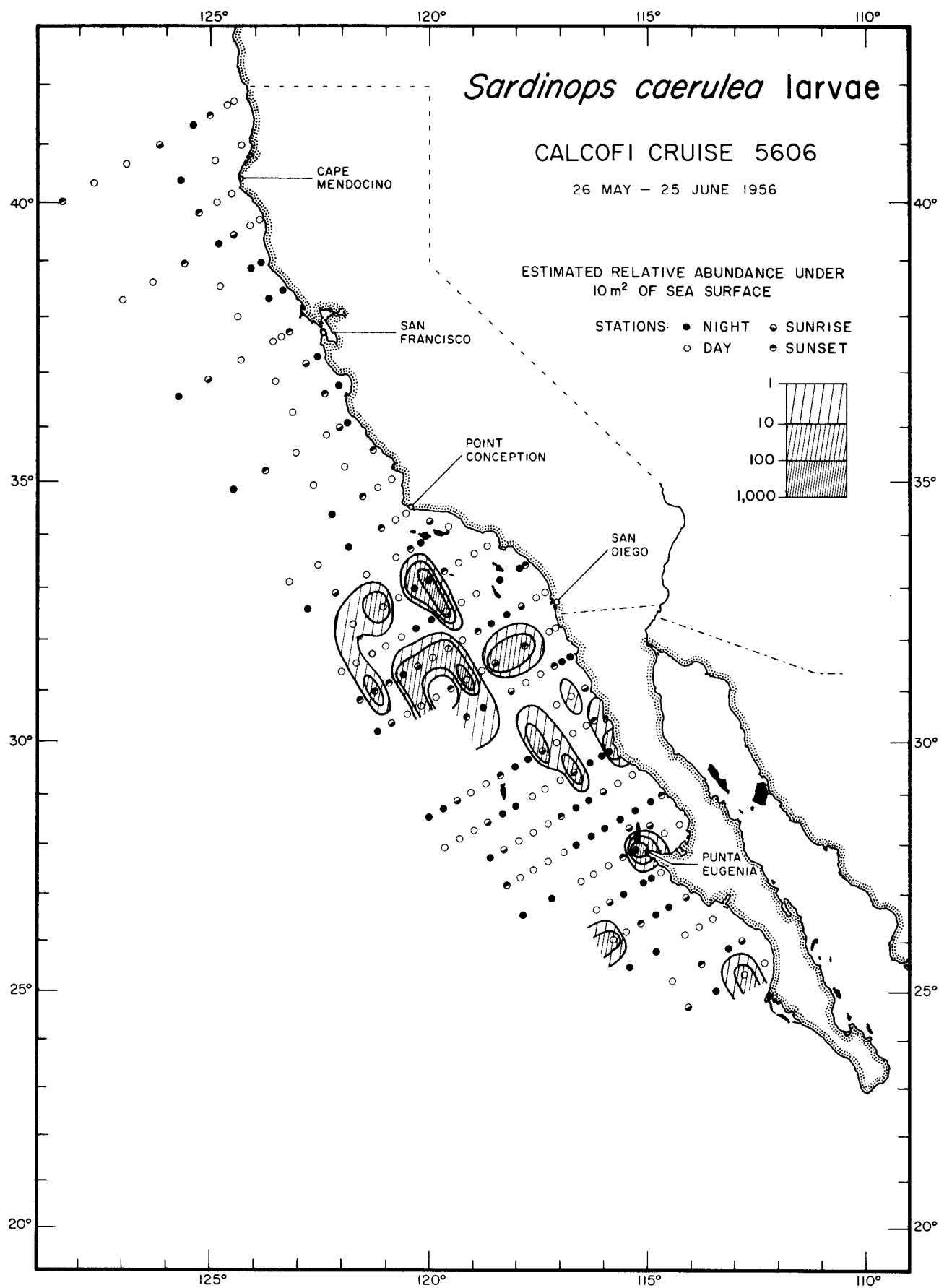


Sardinops caerulea larvae

5506

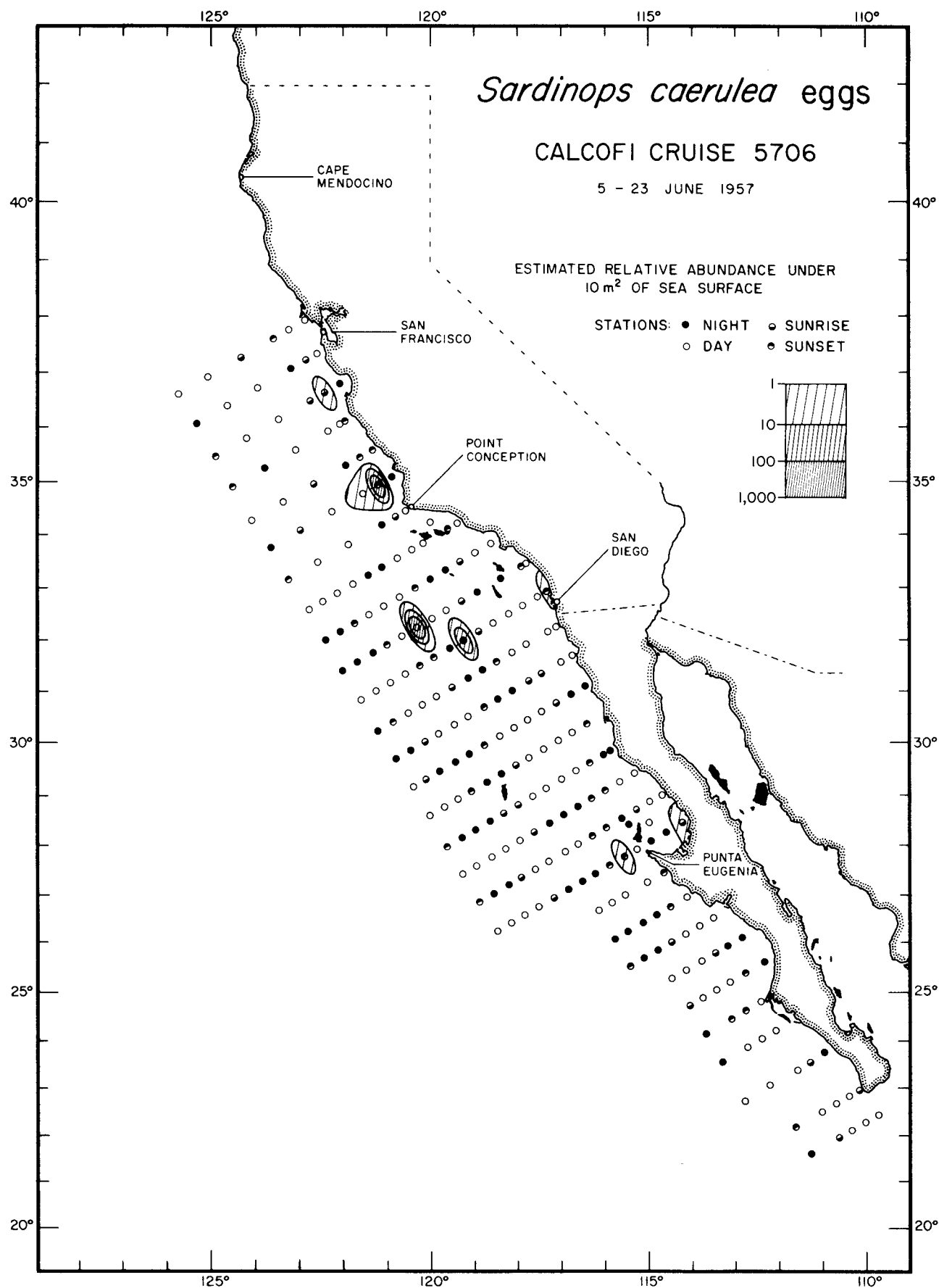
*Sardinops caerulea* eggs

5606



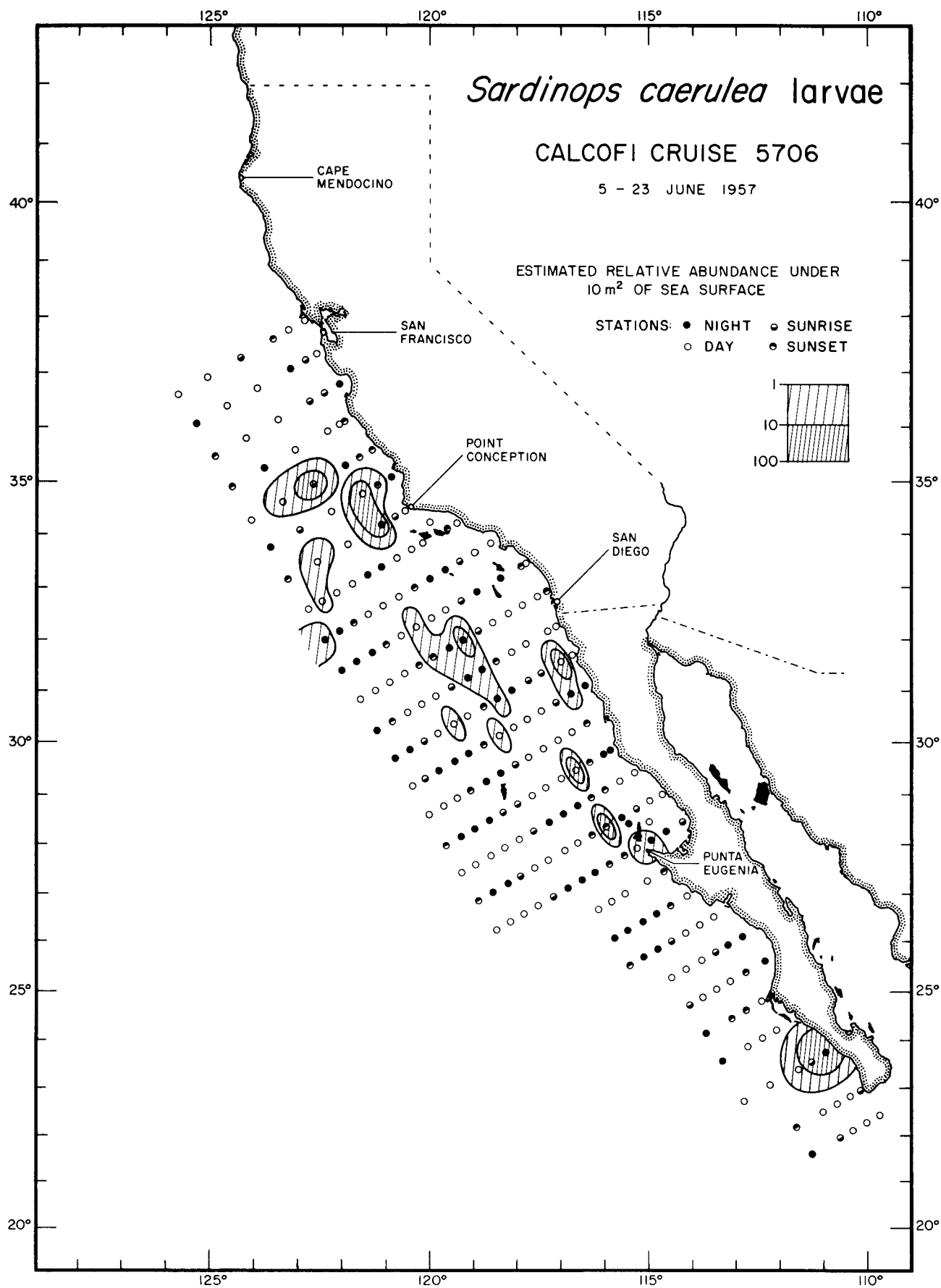
Sardinops caerulea larvae

5606



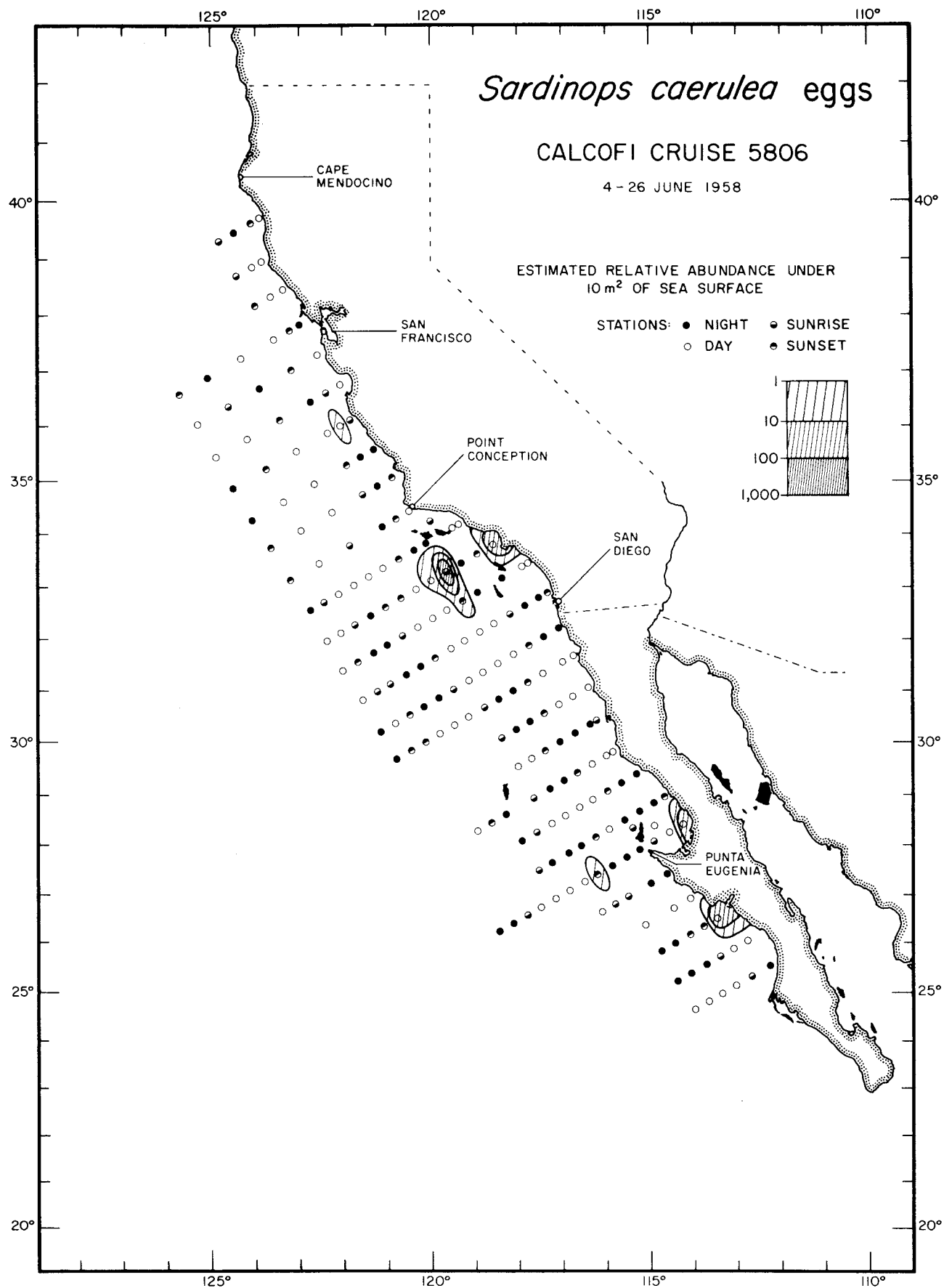
Sardinops caerulea eggs

5706



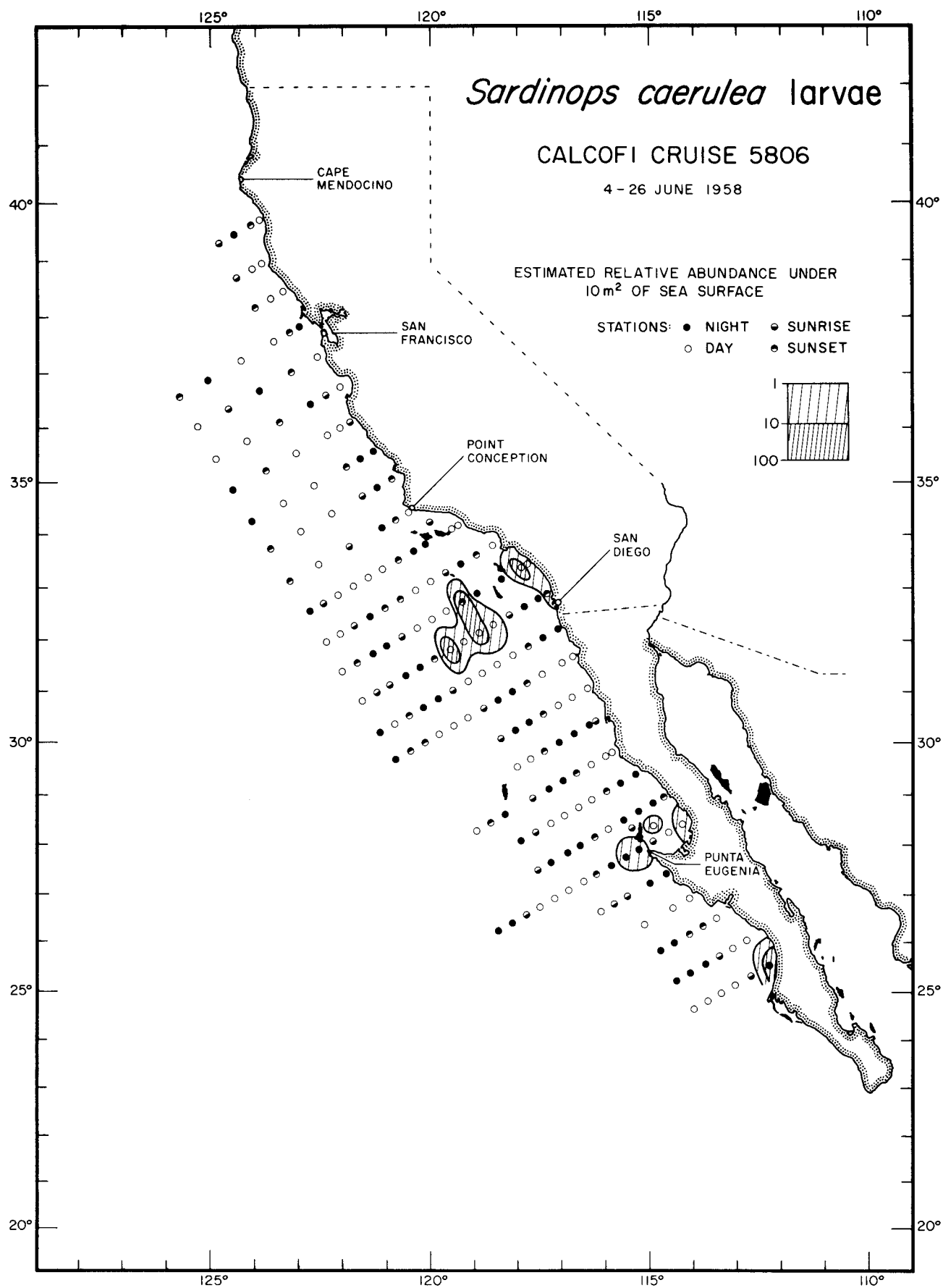
Sardinops caerulea larvae

5706



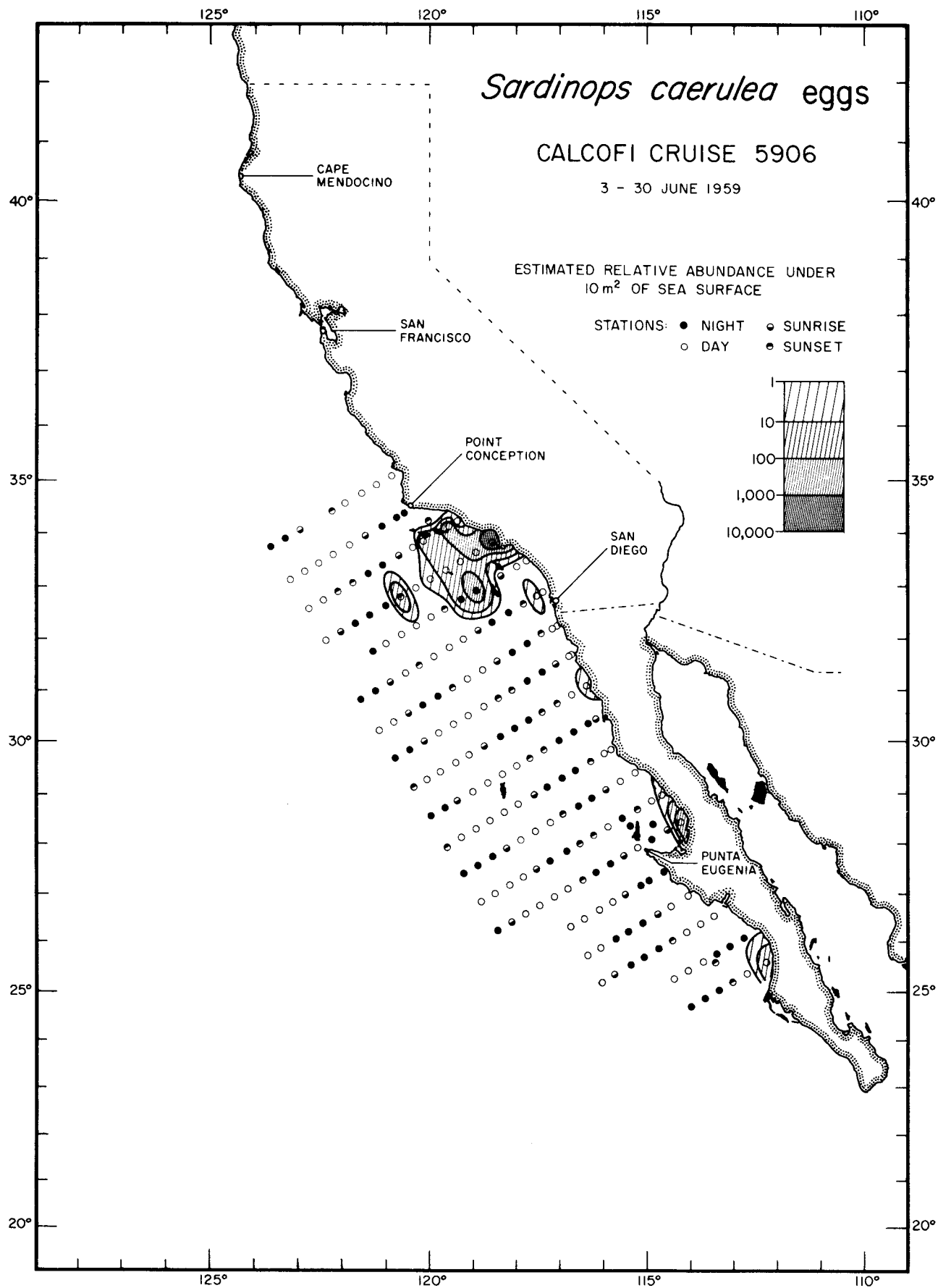
Sardinops caerulea eggs

5806



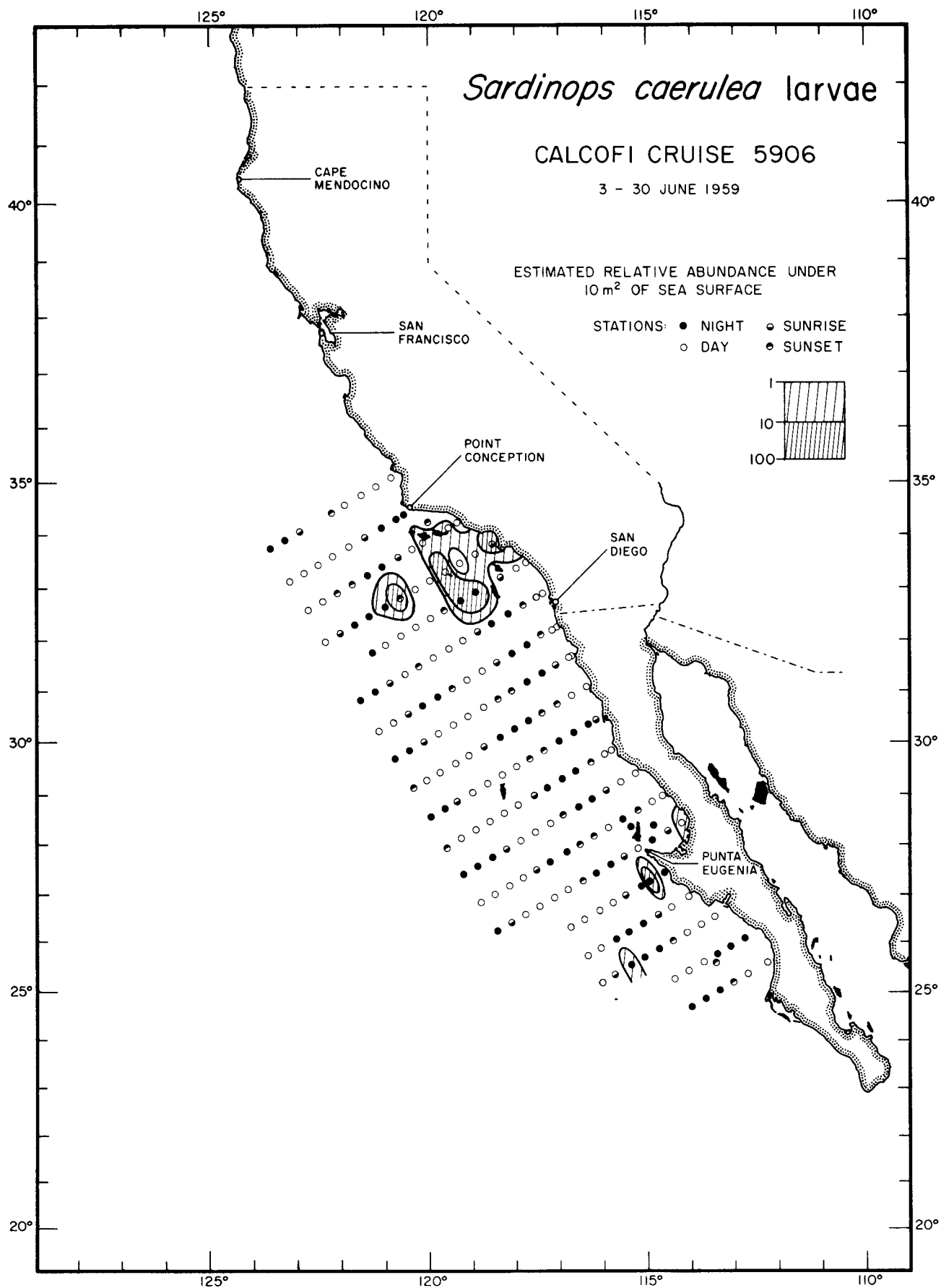
Sardinops caerulea larvae

5806



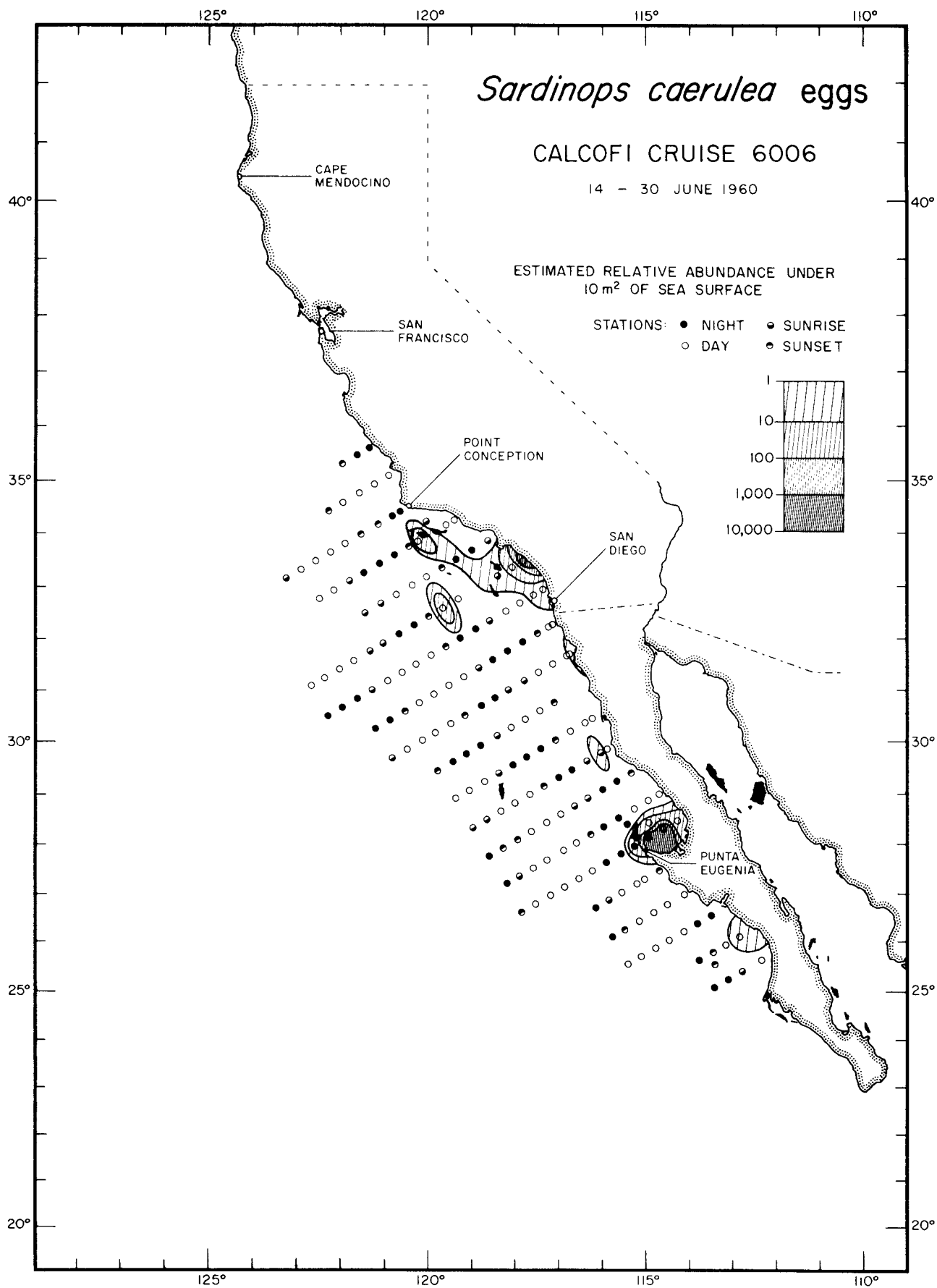
Sardinops caerulea eggs

5906

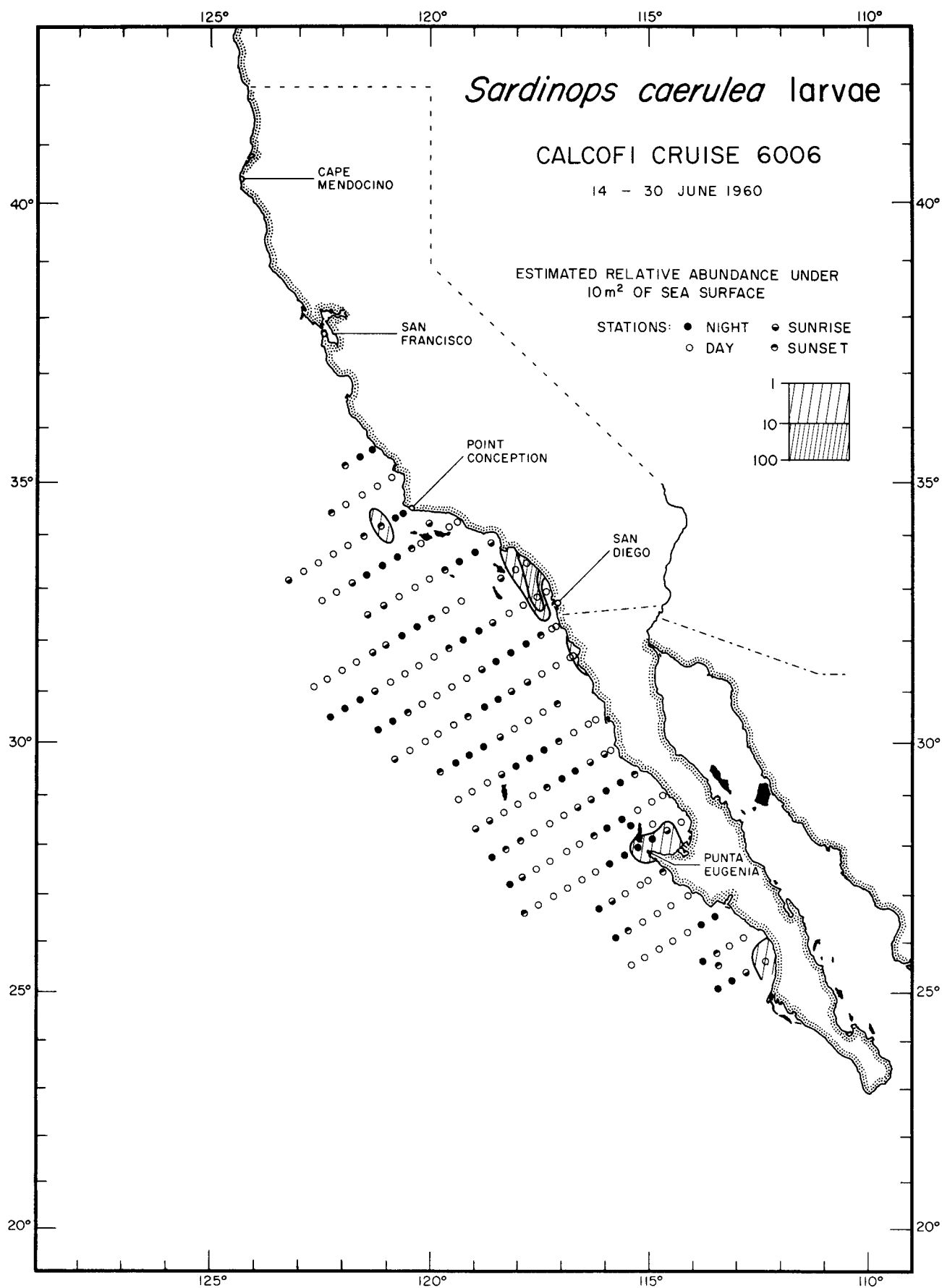


Sardinops caerulea larvae

5906

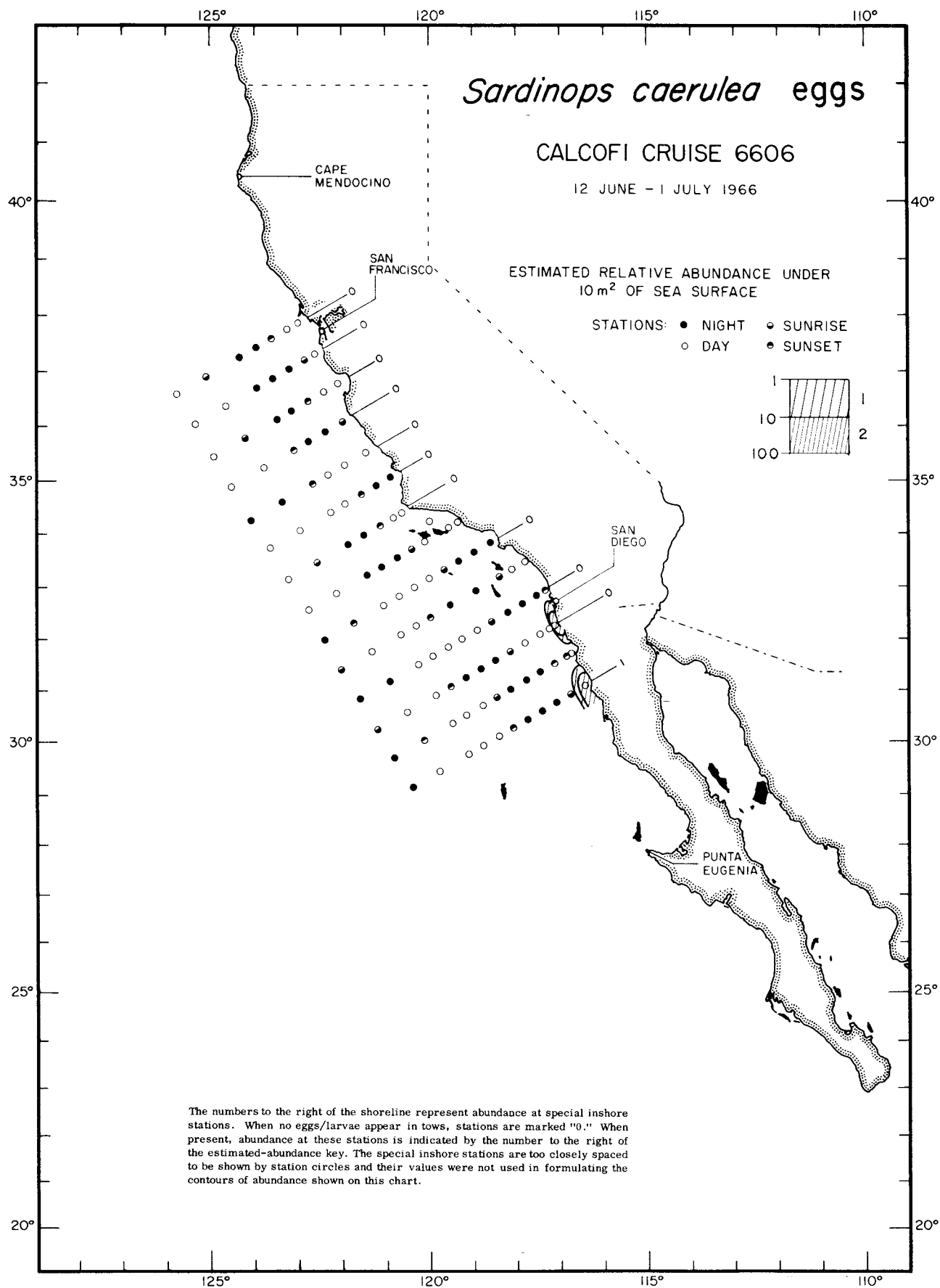
*Sardinops caerulea* eggs

6006

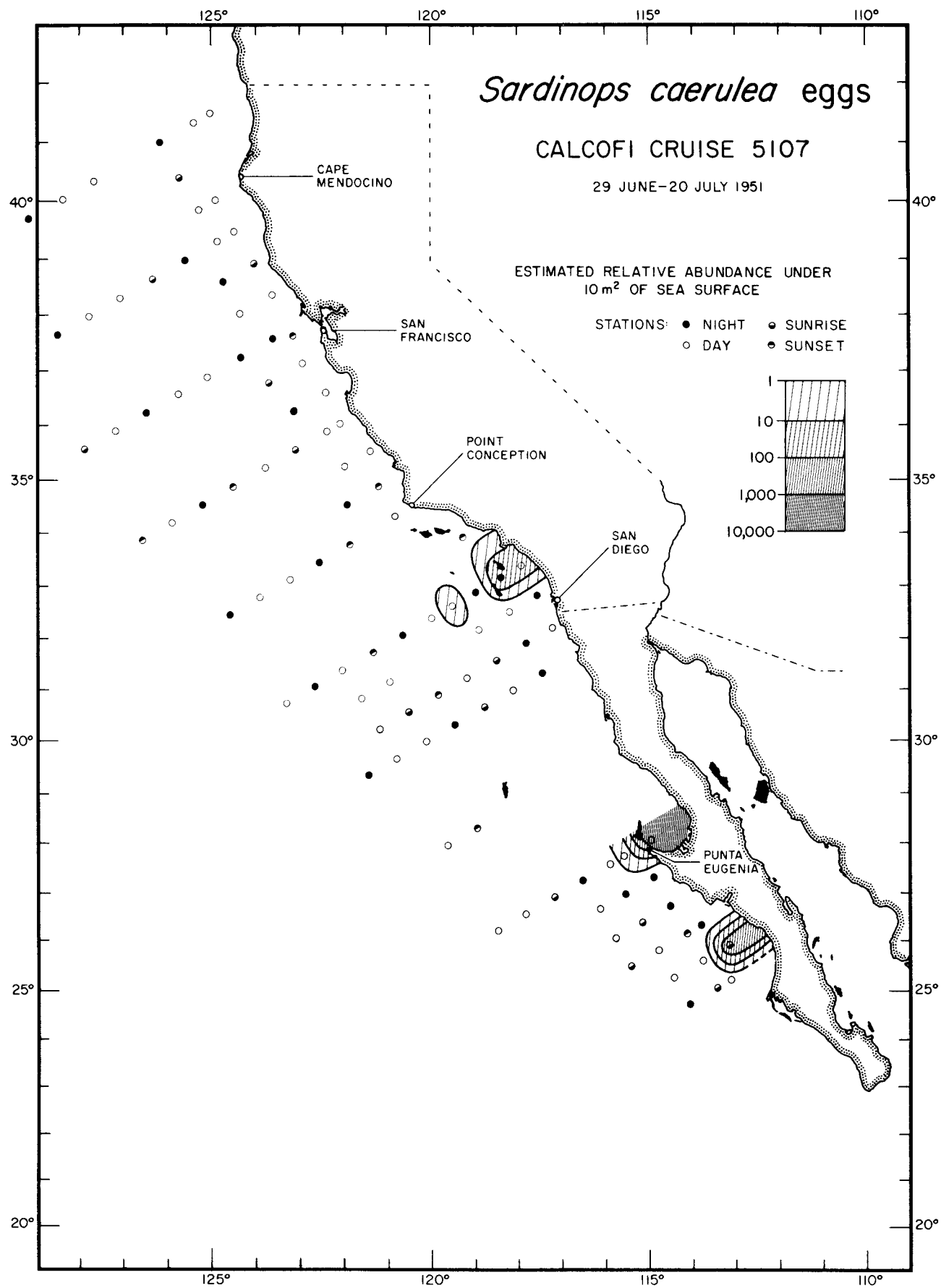


Sardinops caerulea larvae

6006

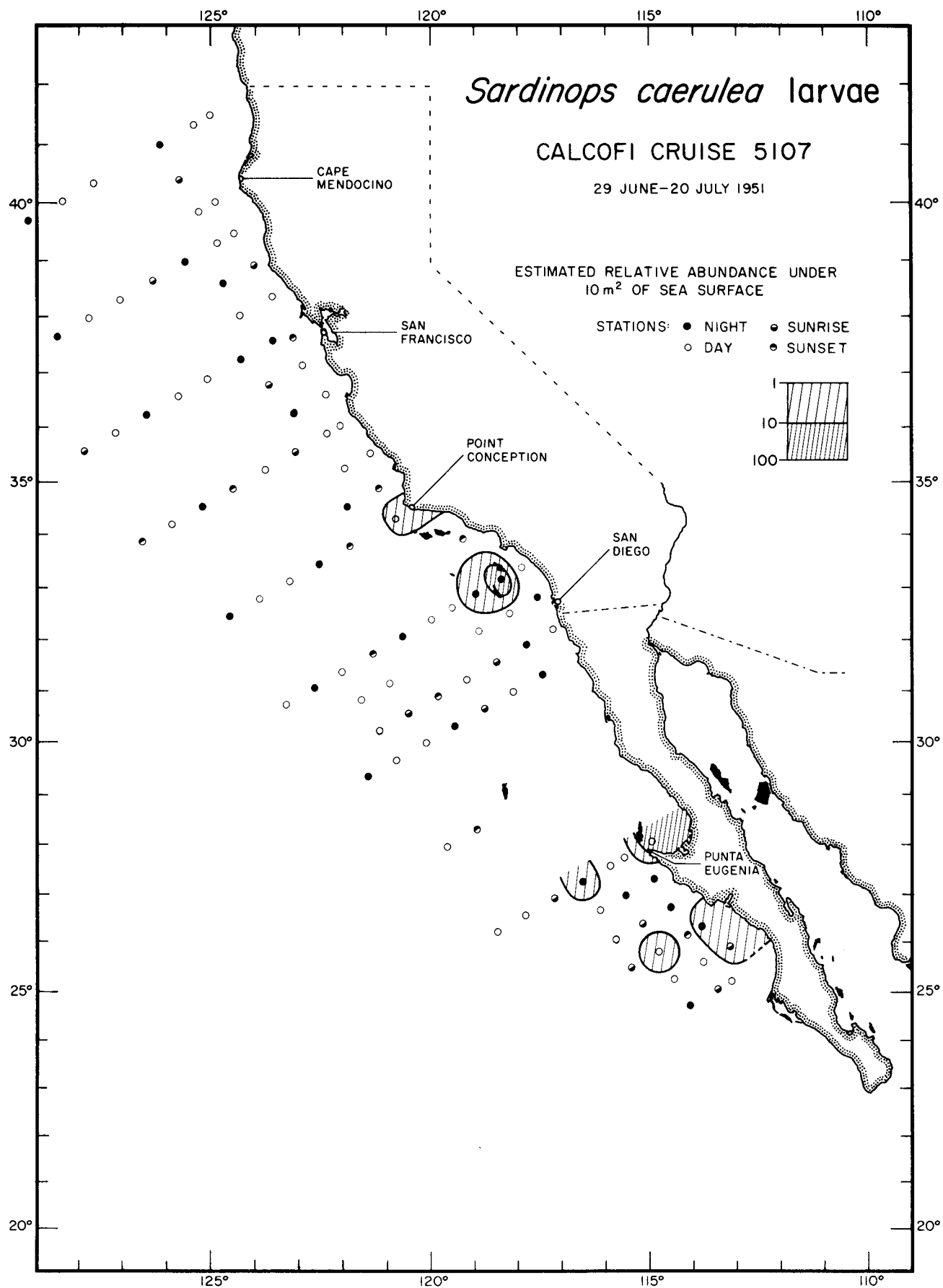
*Sardinops caerulea* eggs

6606



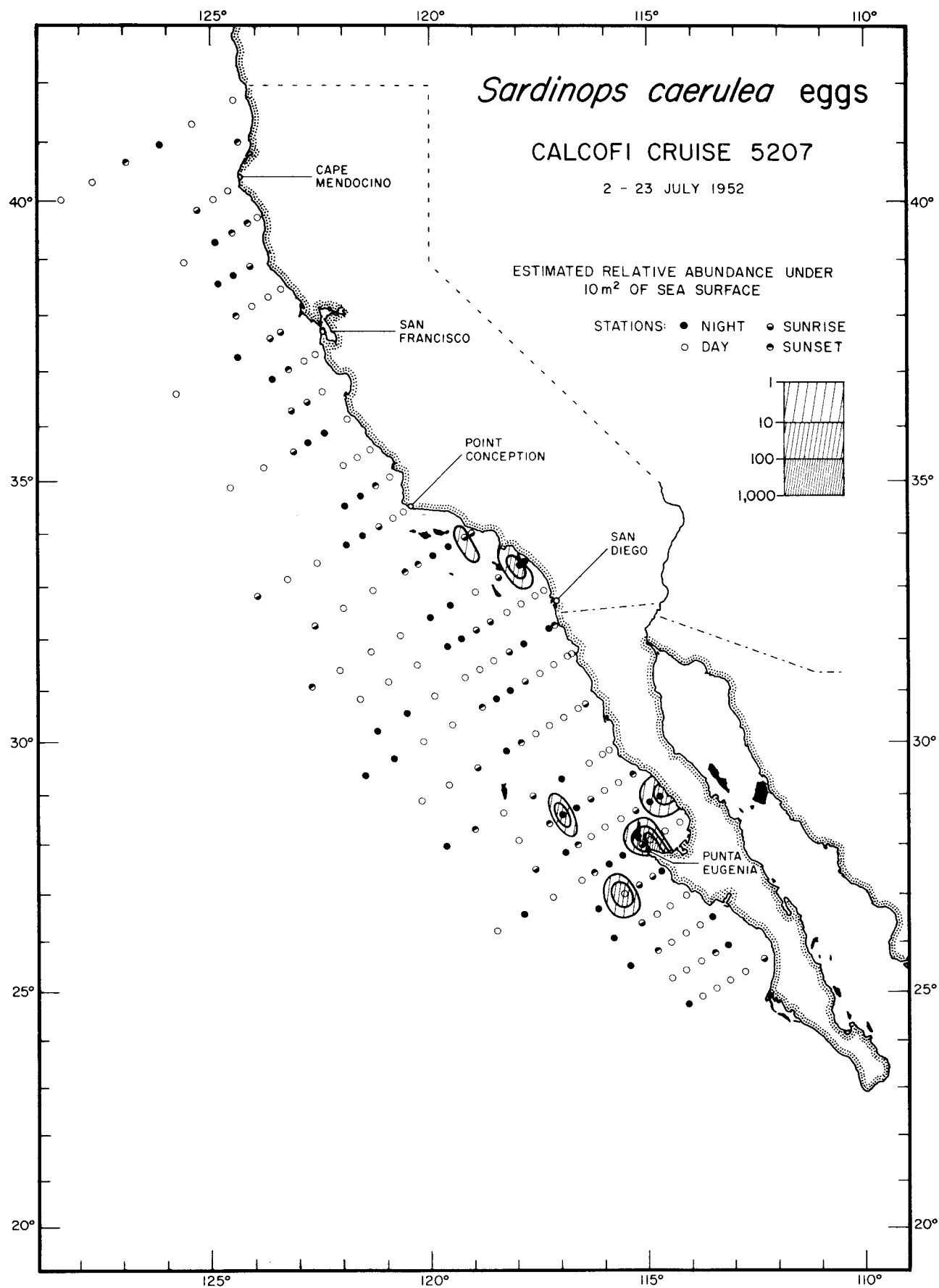
Sardinops caerulea eggs

5107

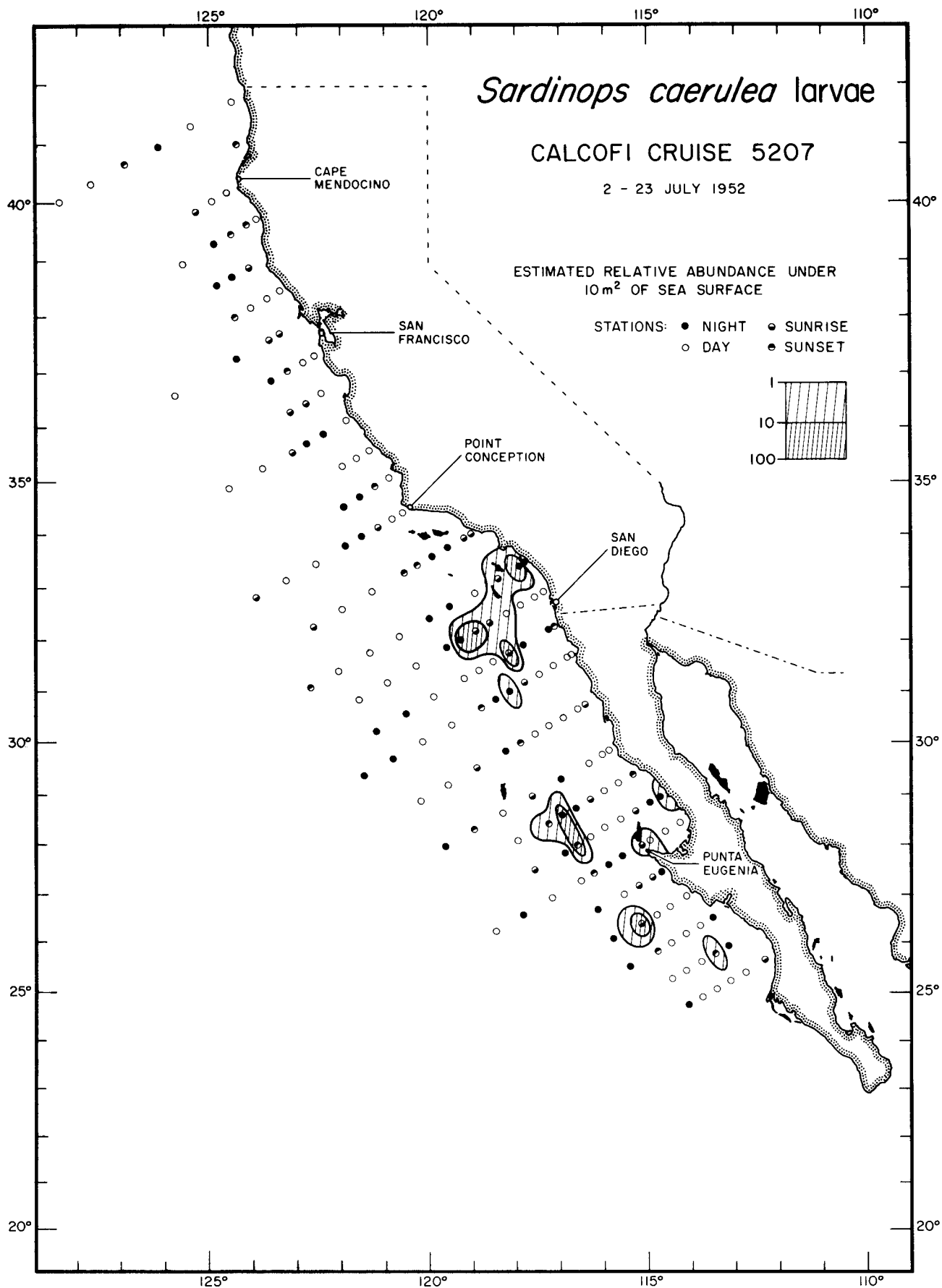


Sardinops caerulea larvae

5107

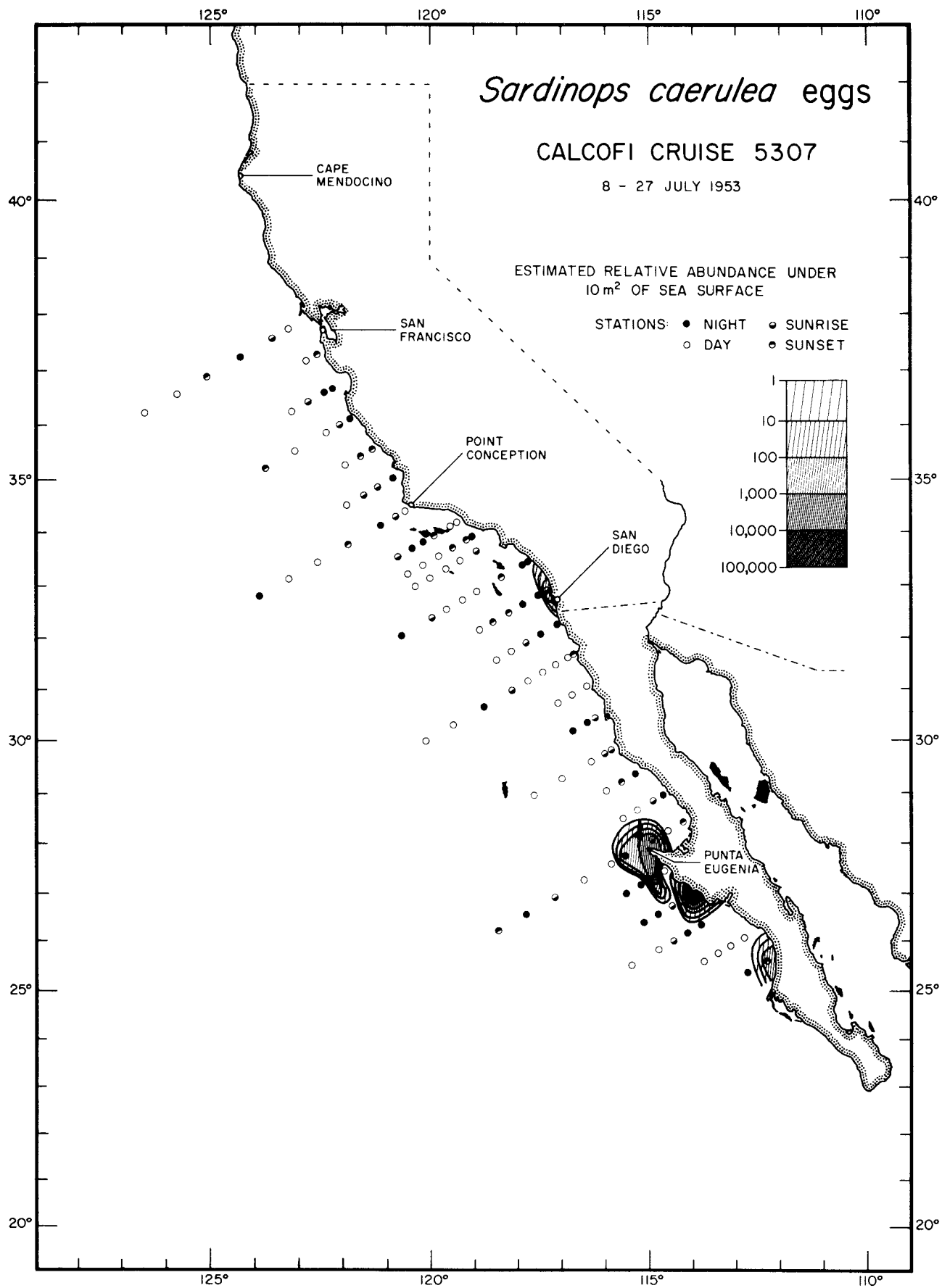
*Sardinops caerulea* eggs

5207



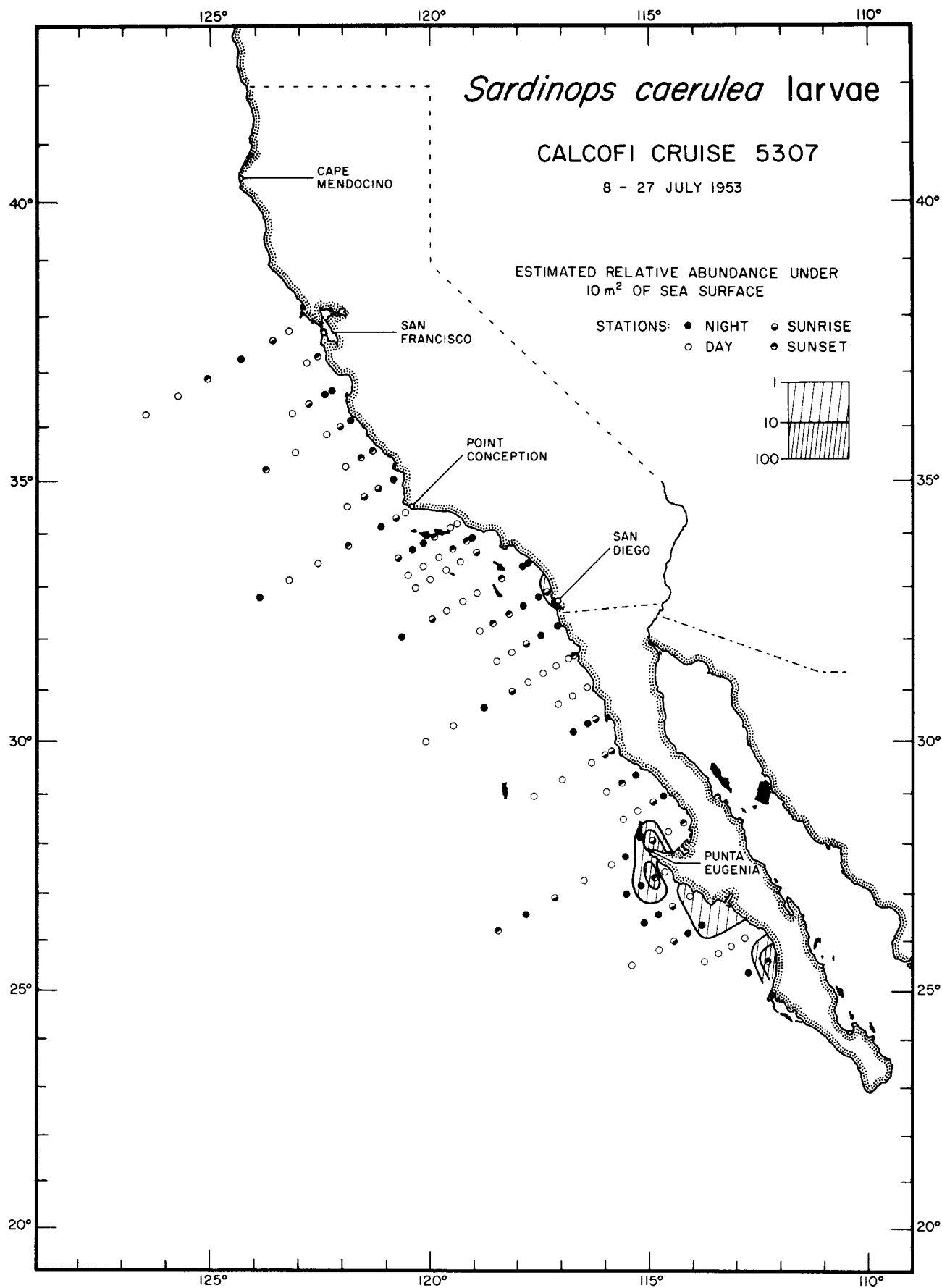
Sardinops caerulea larvae

5207



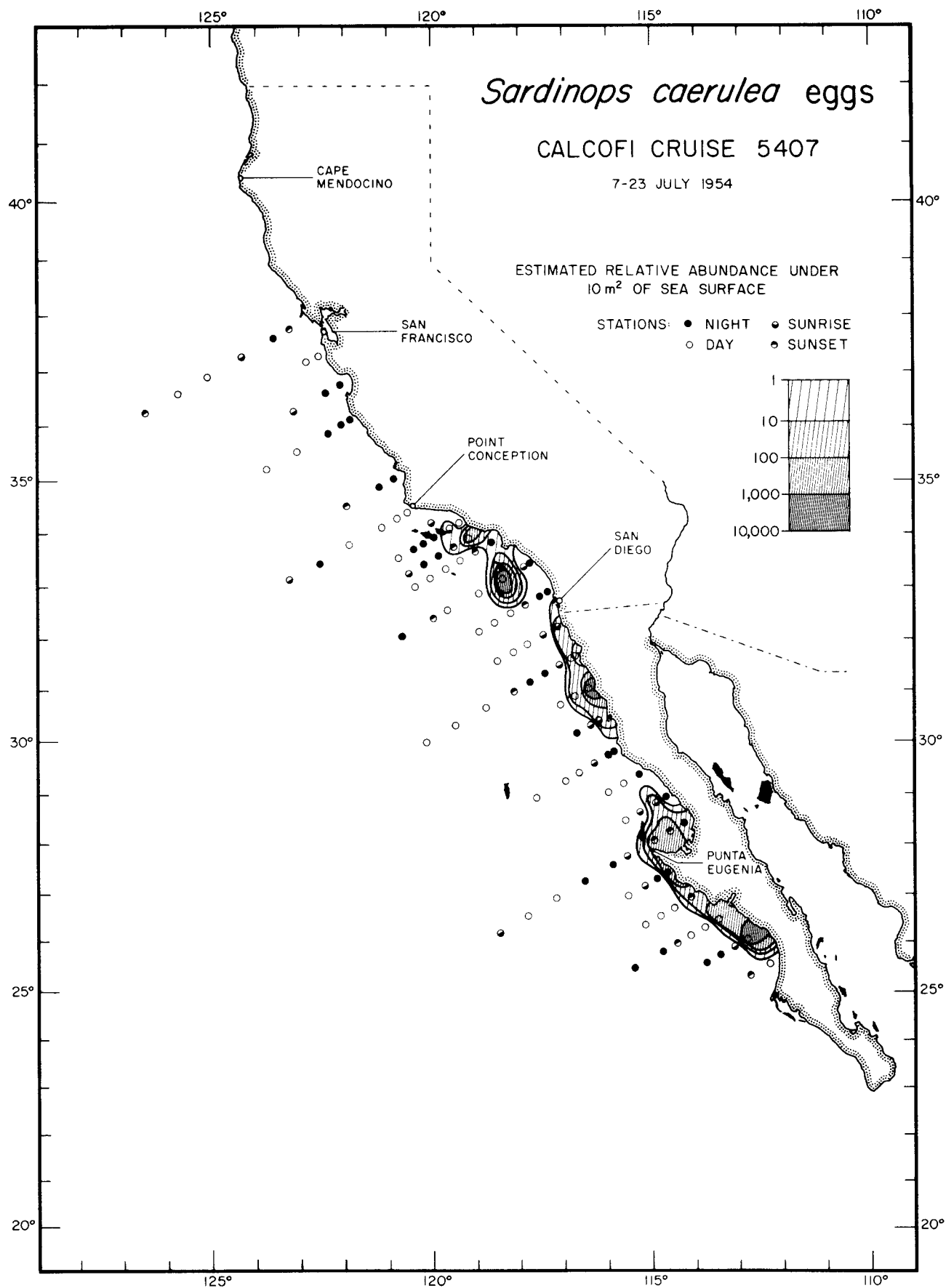
Sardinops caerulea eggs

5307

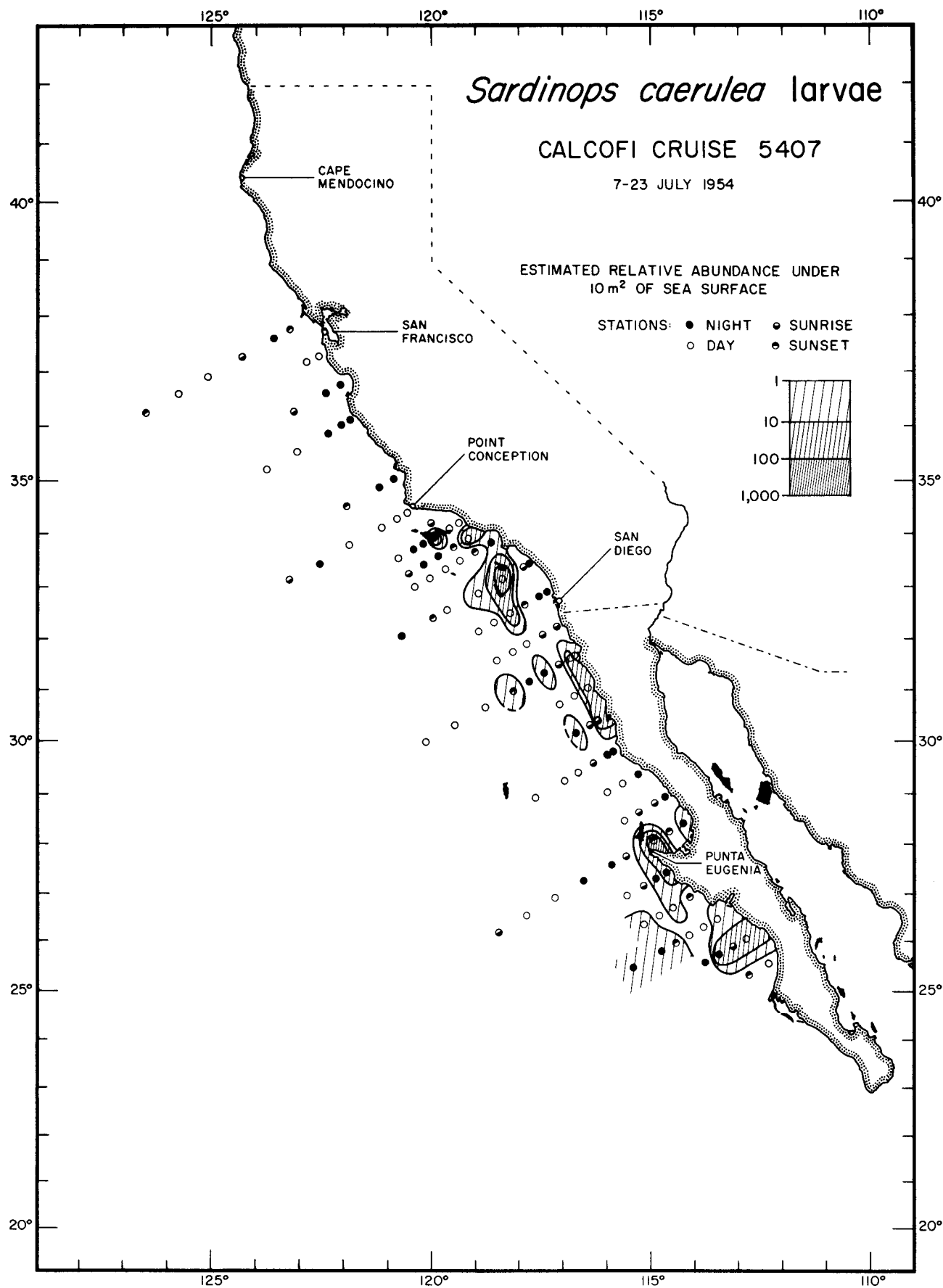


Sardinops caerulea larvae

5307

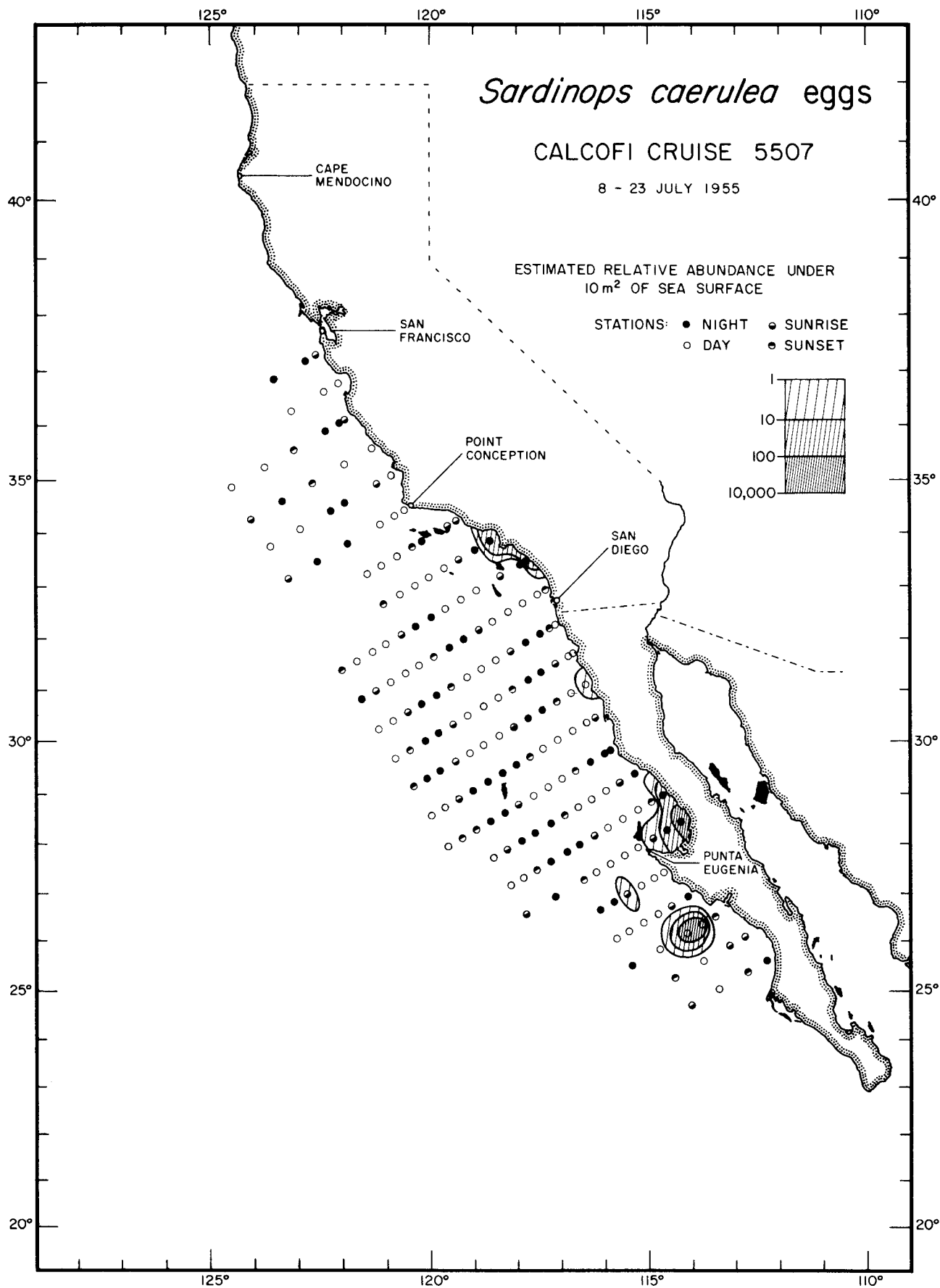


Sardinops caerulea eggs
5407



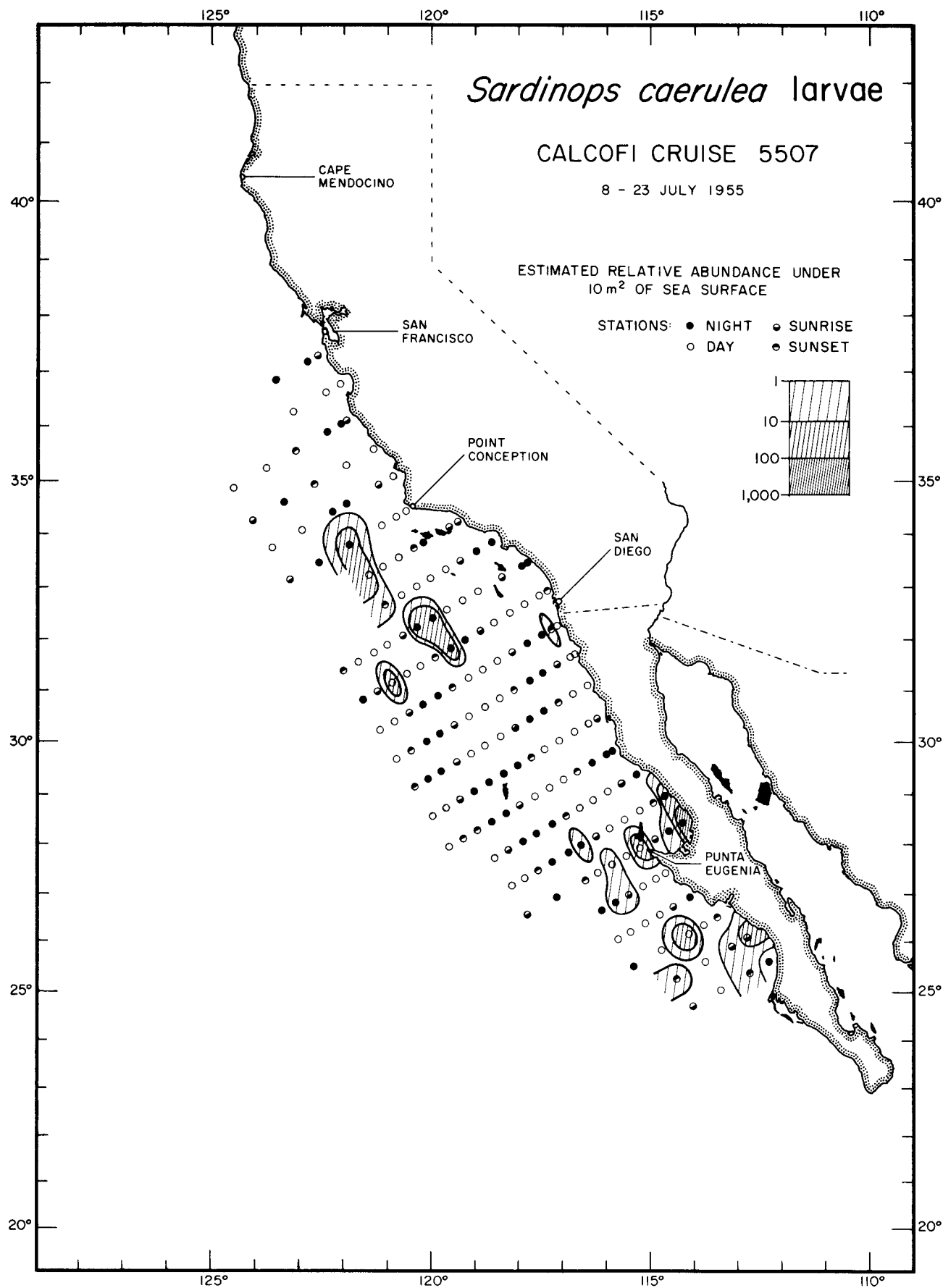
Sardinops caerulea larvae

5407



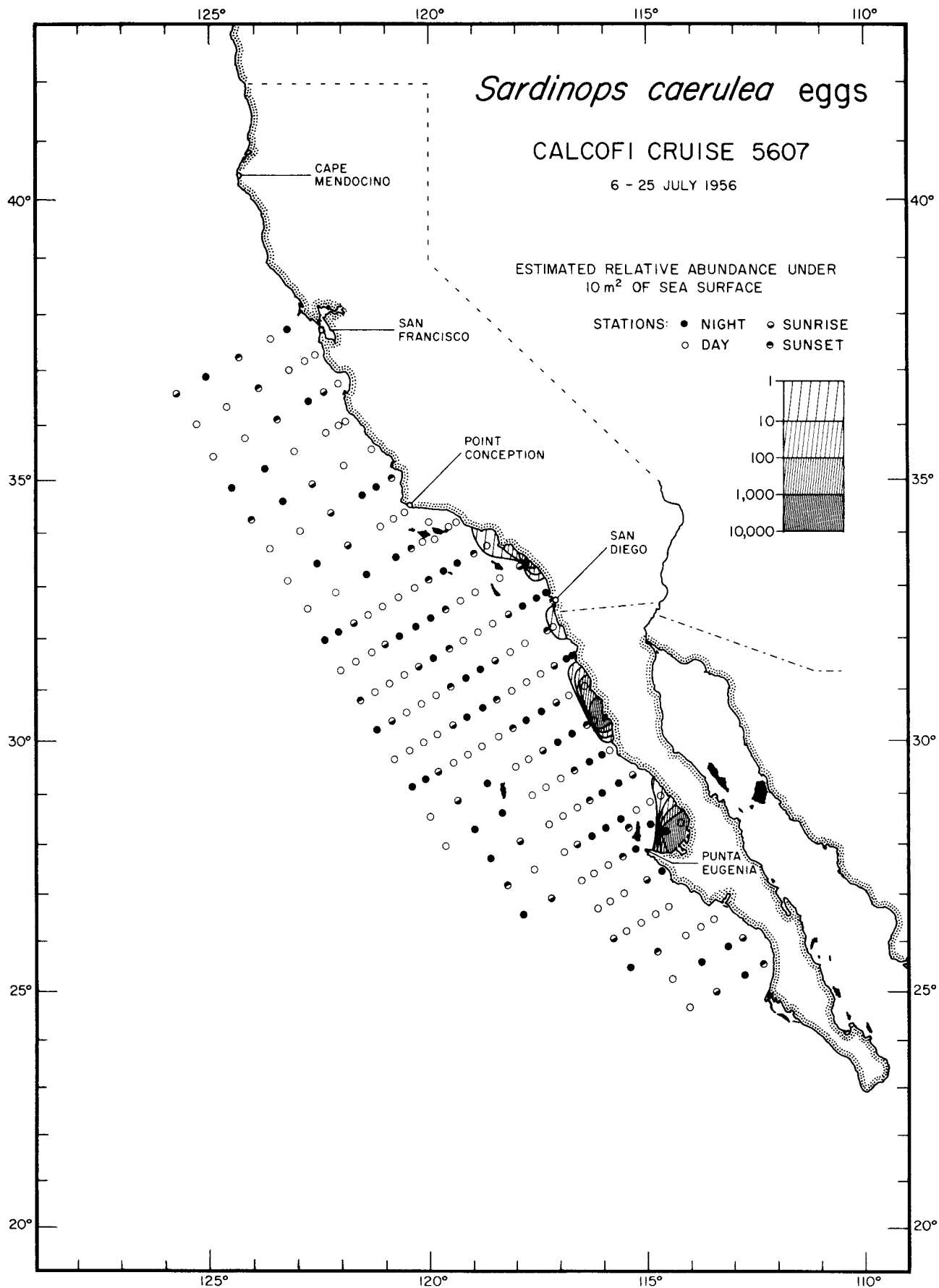
Sardinops caerulea eggs

5507



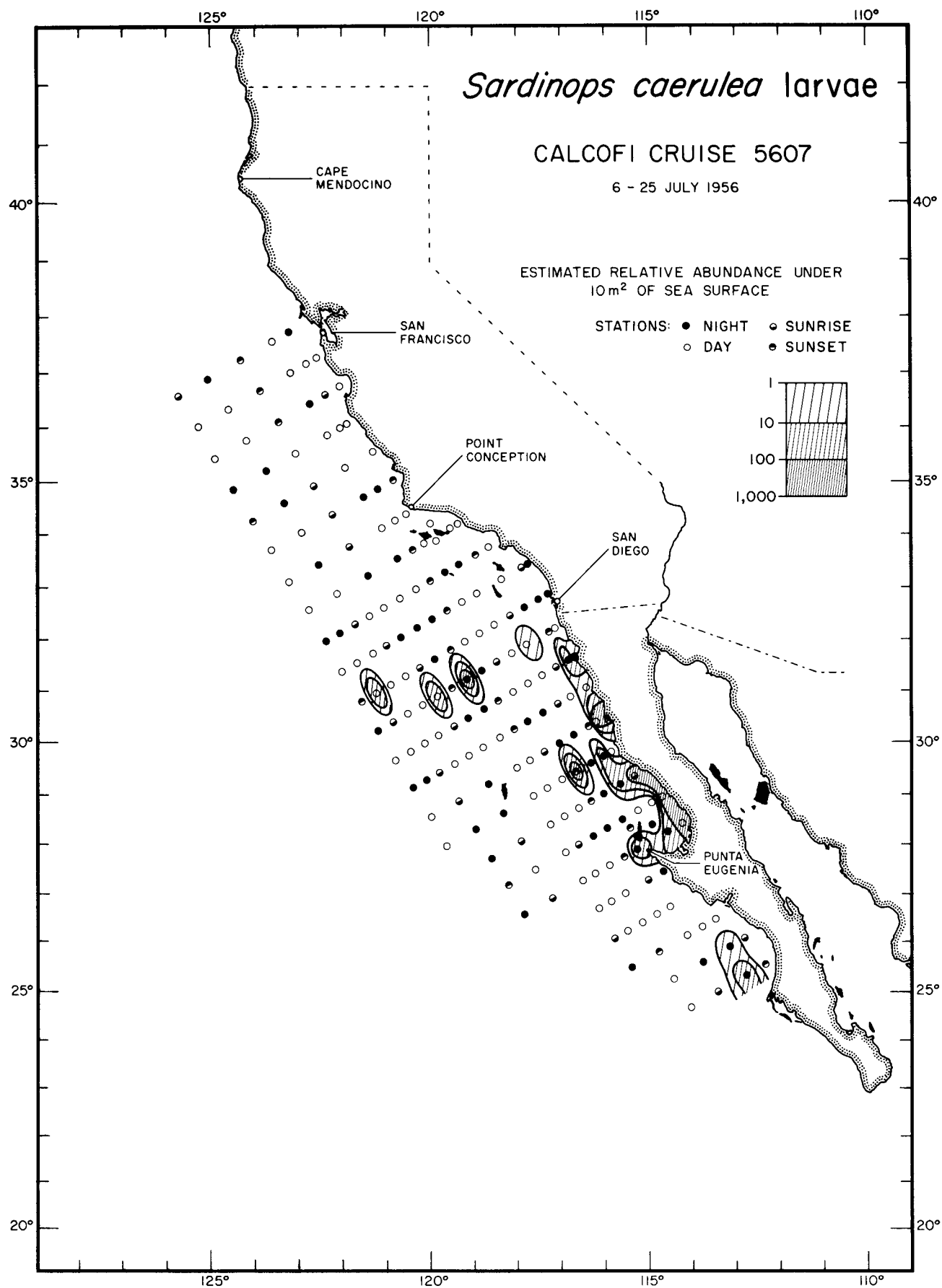
Sardinops caerulea larvae

5507



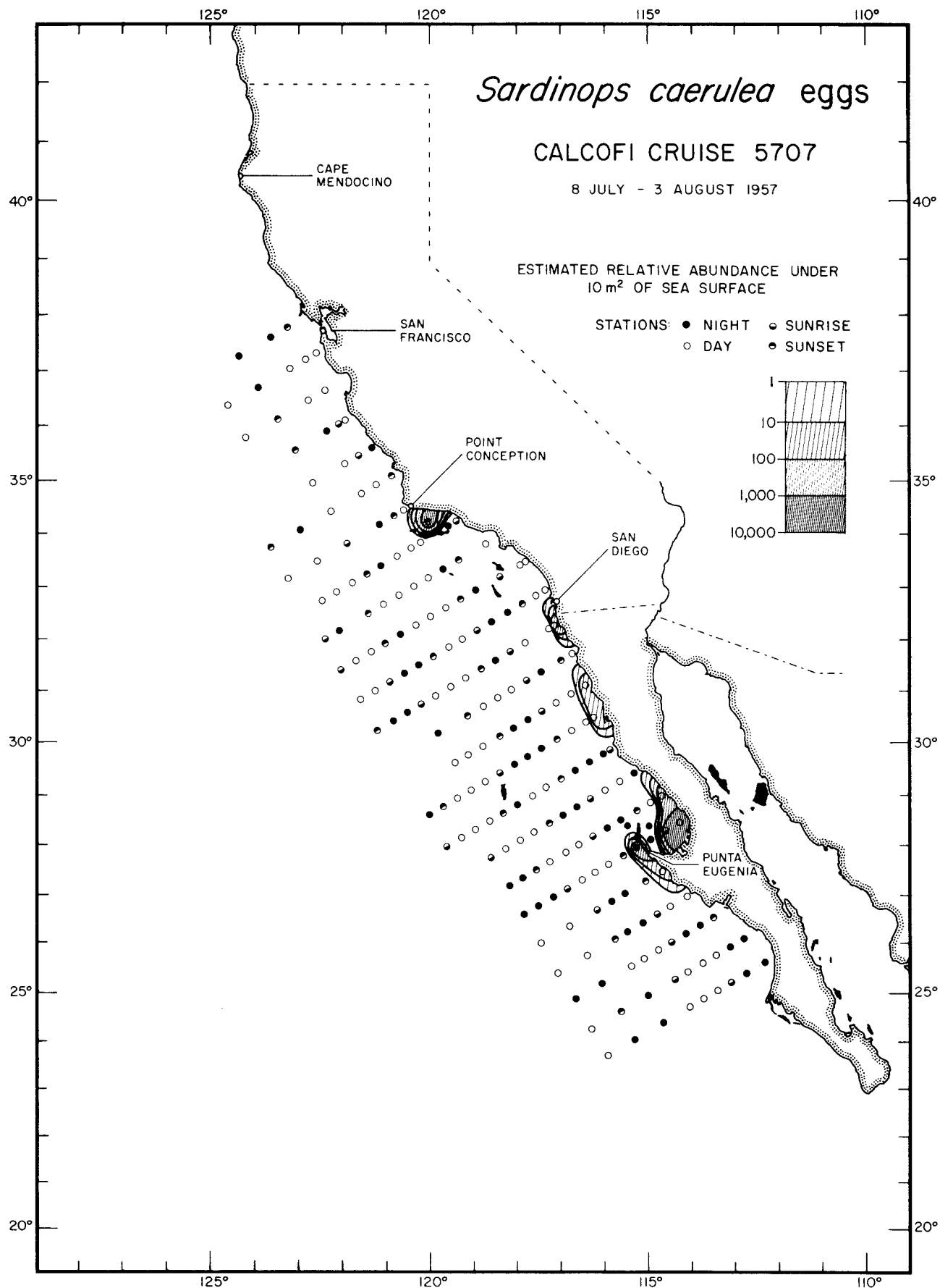
Sardinops caerulea eggs

5607

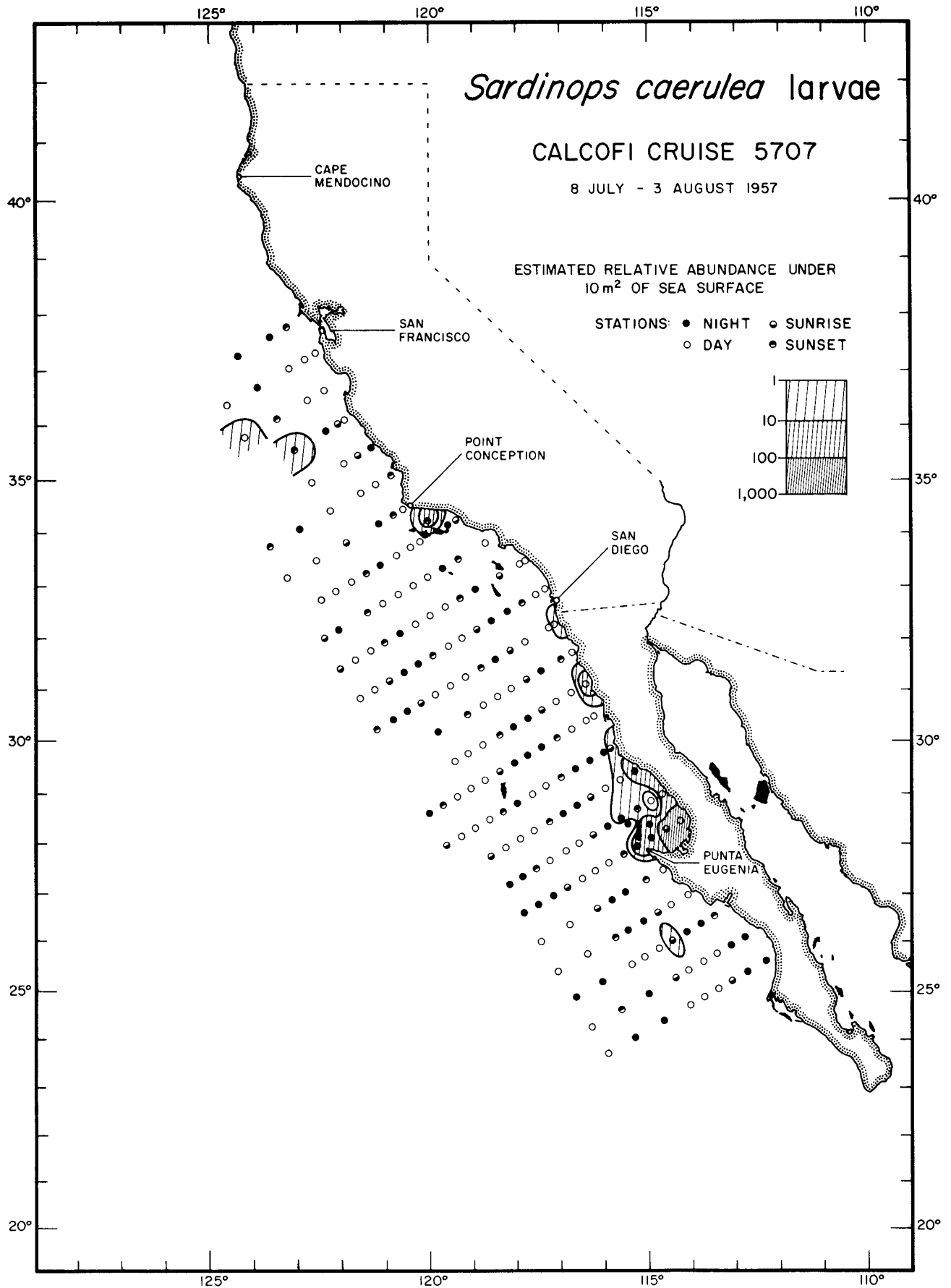


Sardinops caerulea larvae

5607

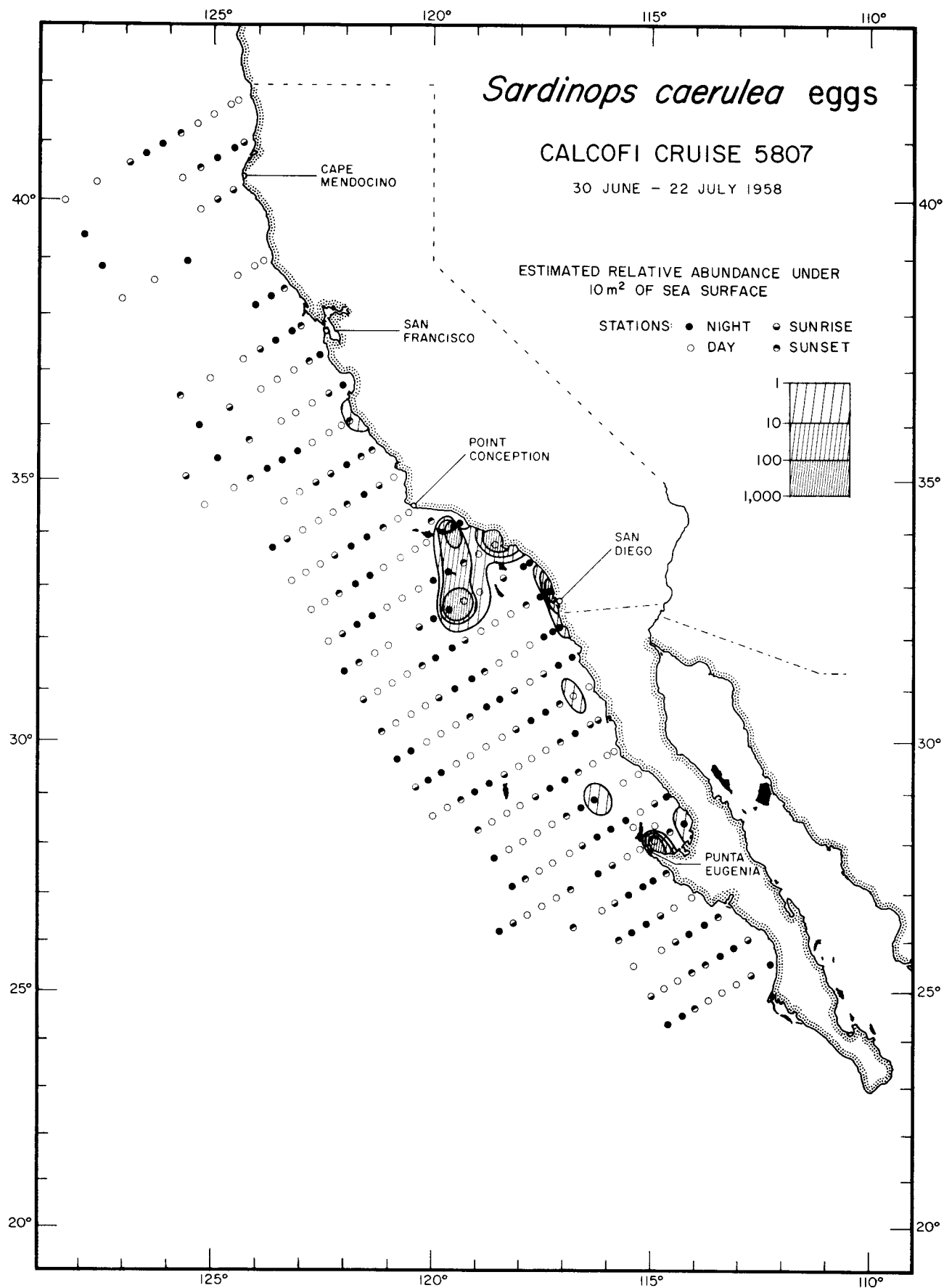
*Sardinops caerulea* eggs

5707



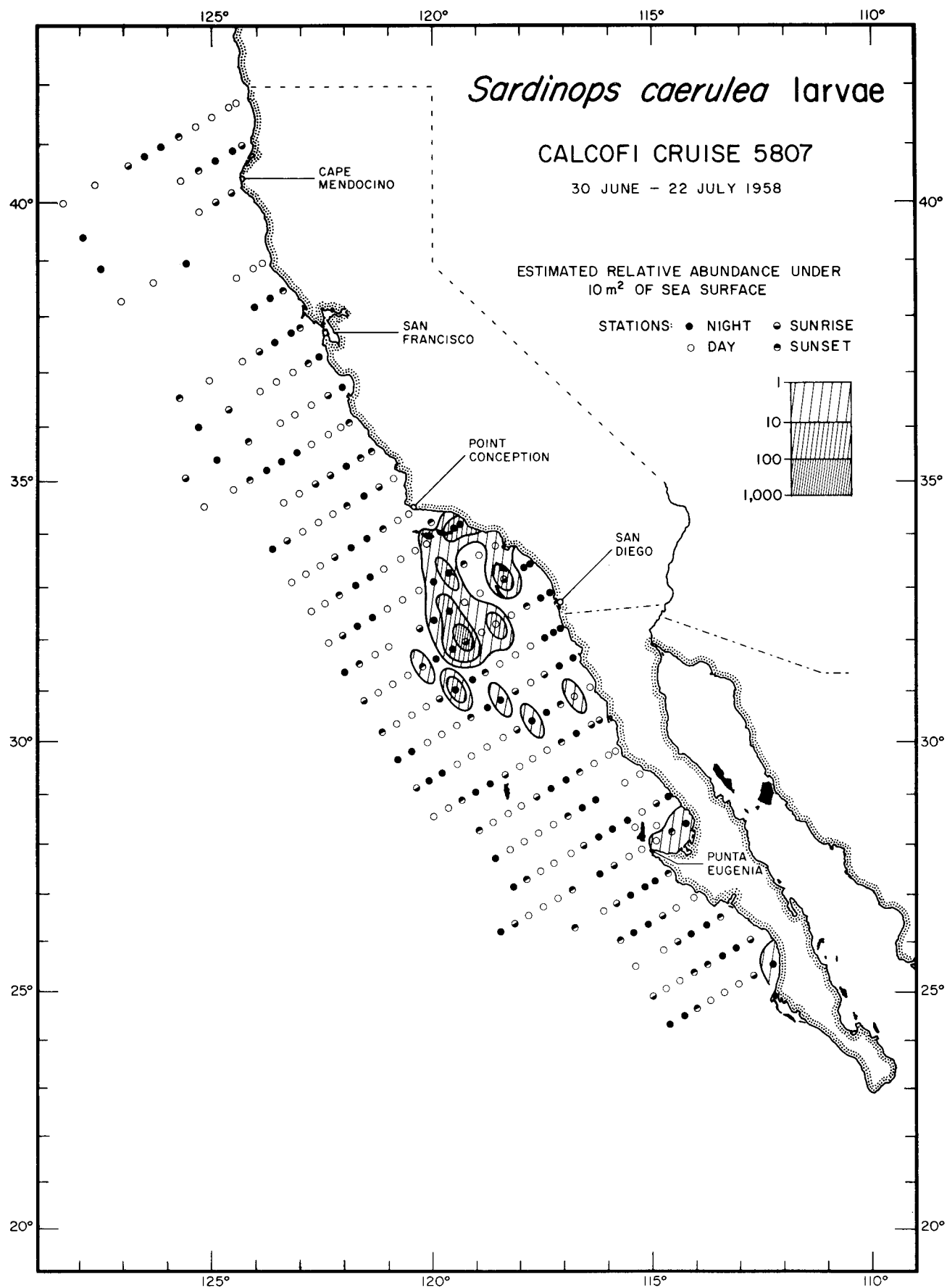
Sardinops caerulea larvae

5707



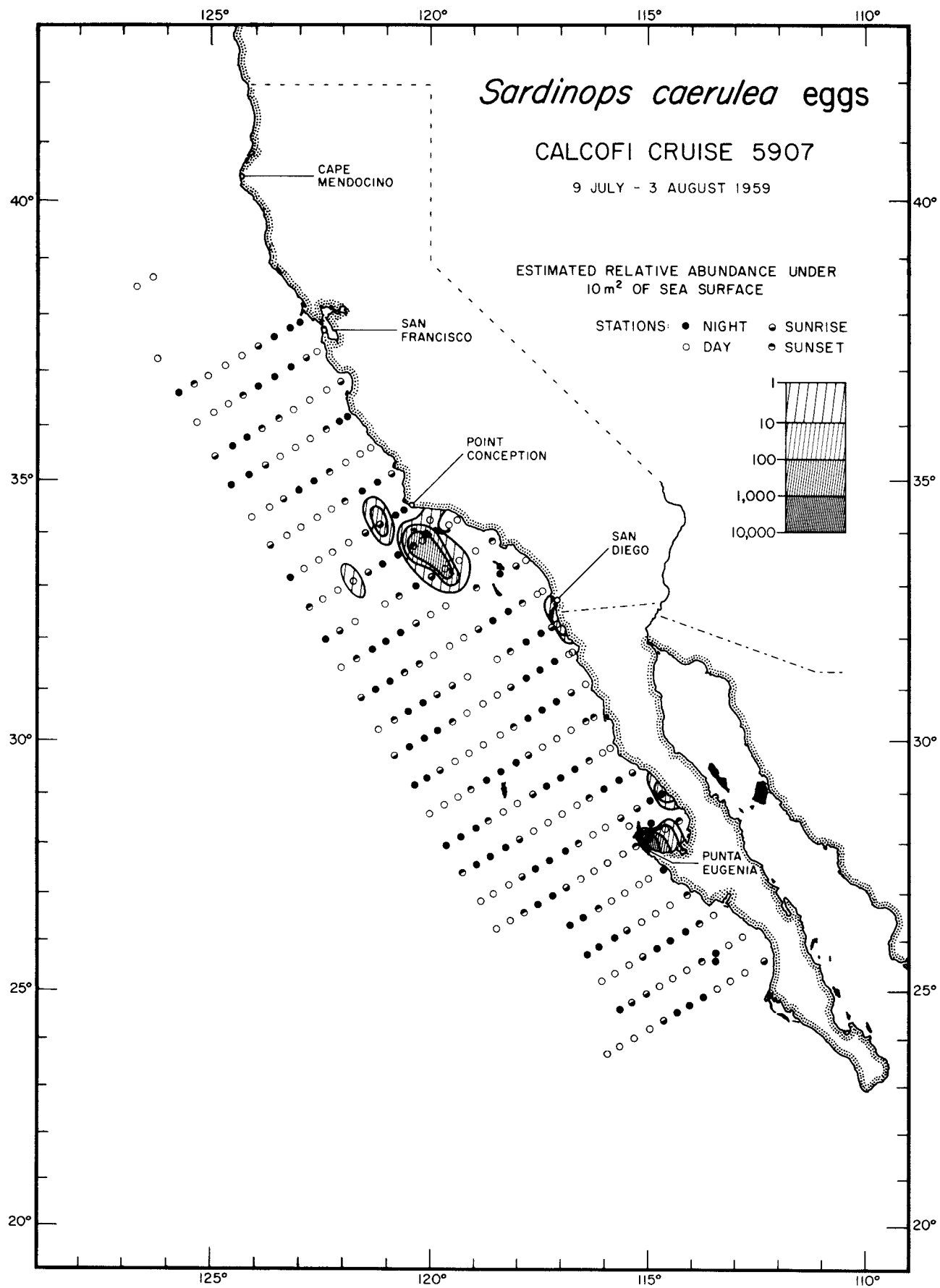
Sardinops caerulea eggs

5807



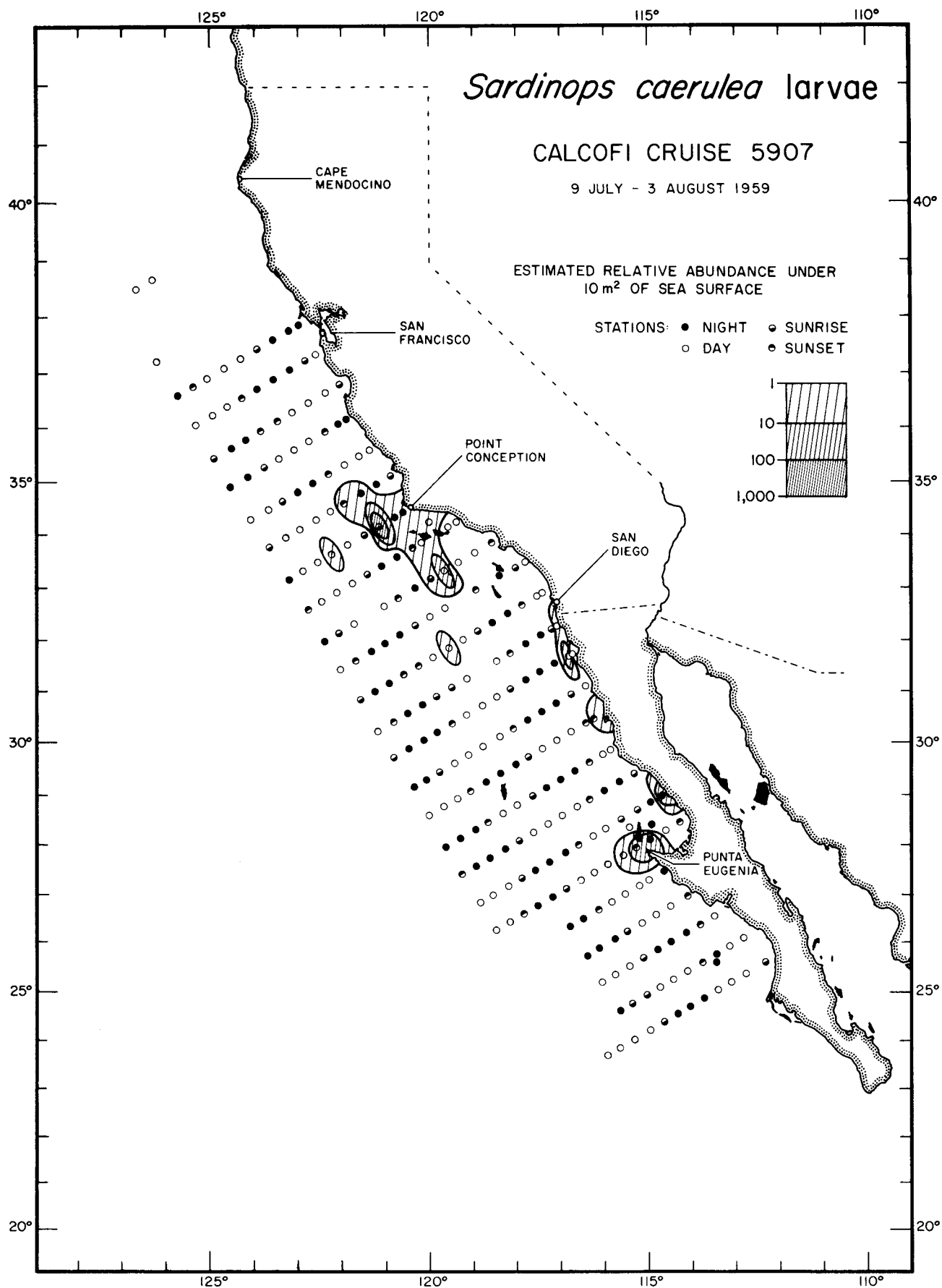
Sardinops caerulea larvae

5807



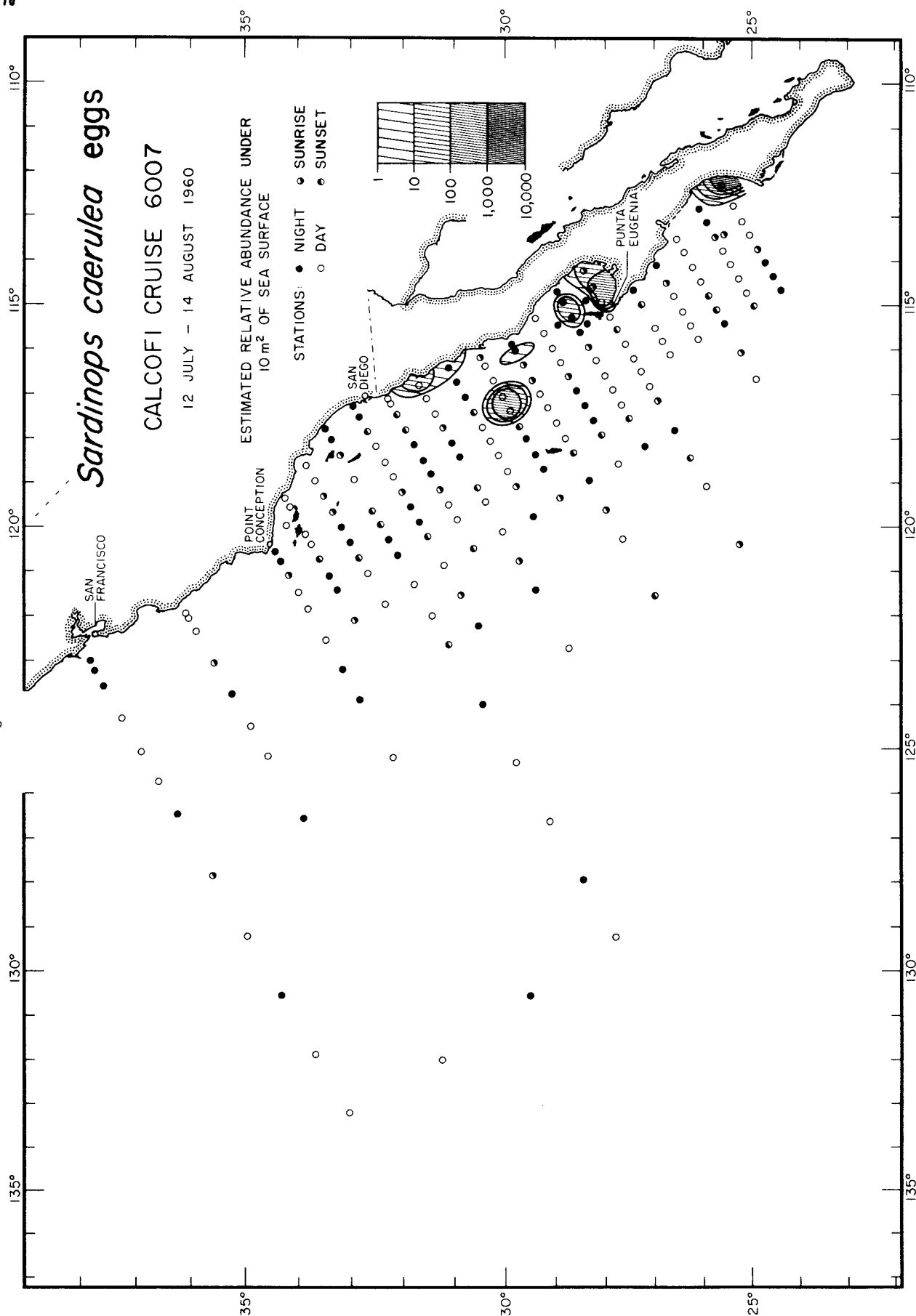
Sardinops caerulea eggs

5907

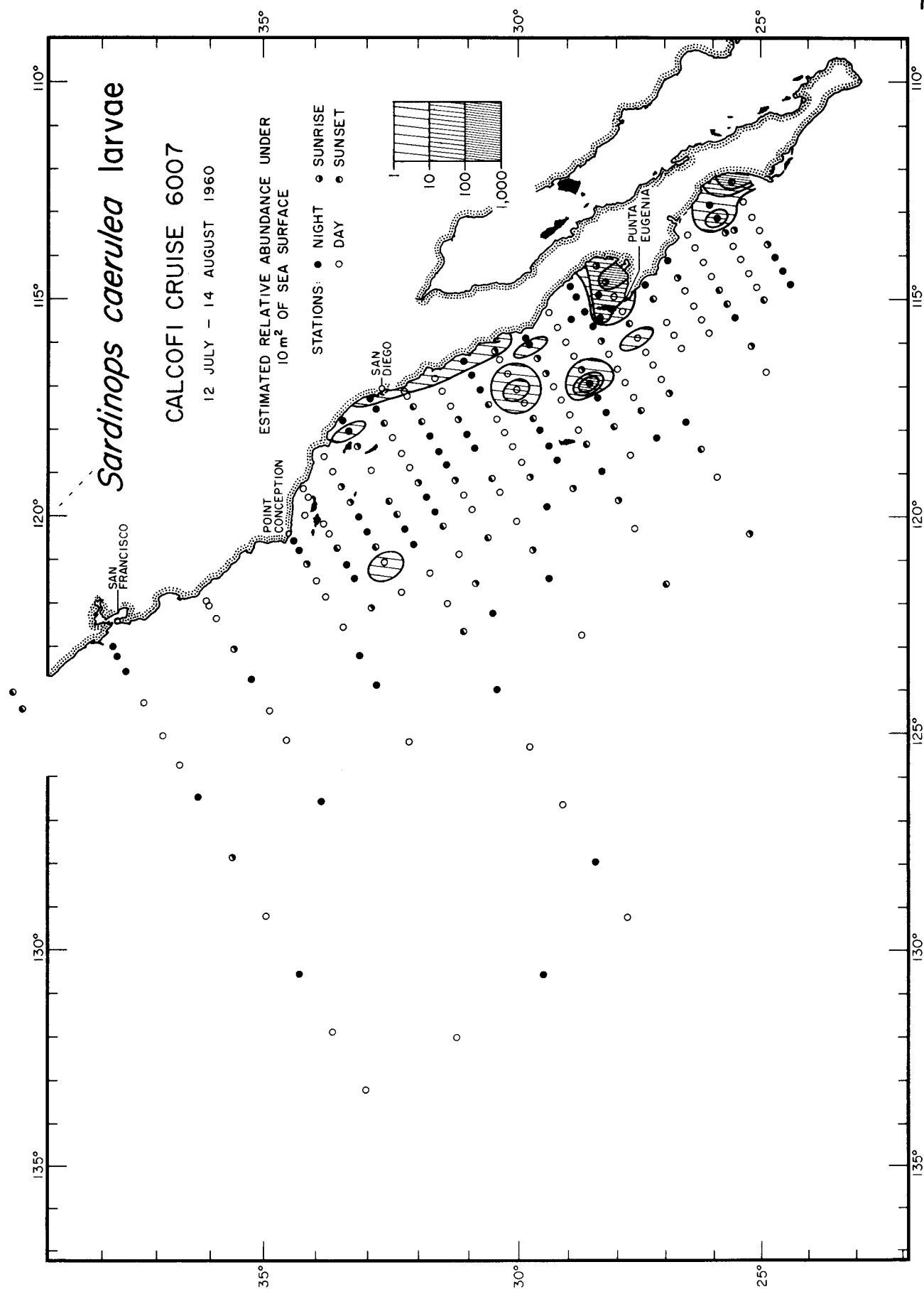


Sardinops caerulea larvae

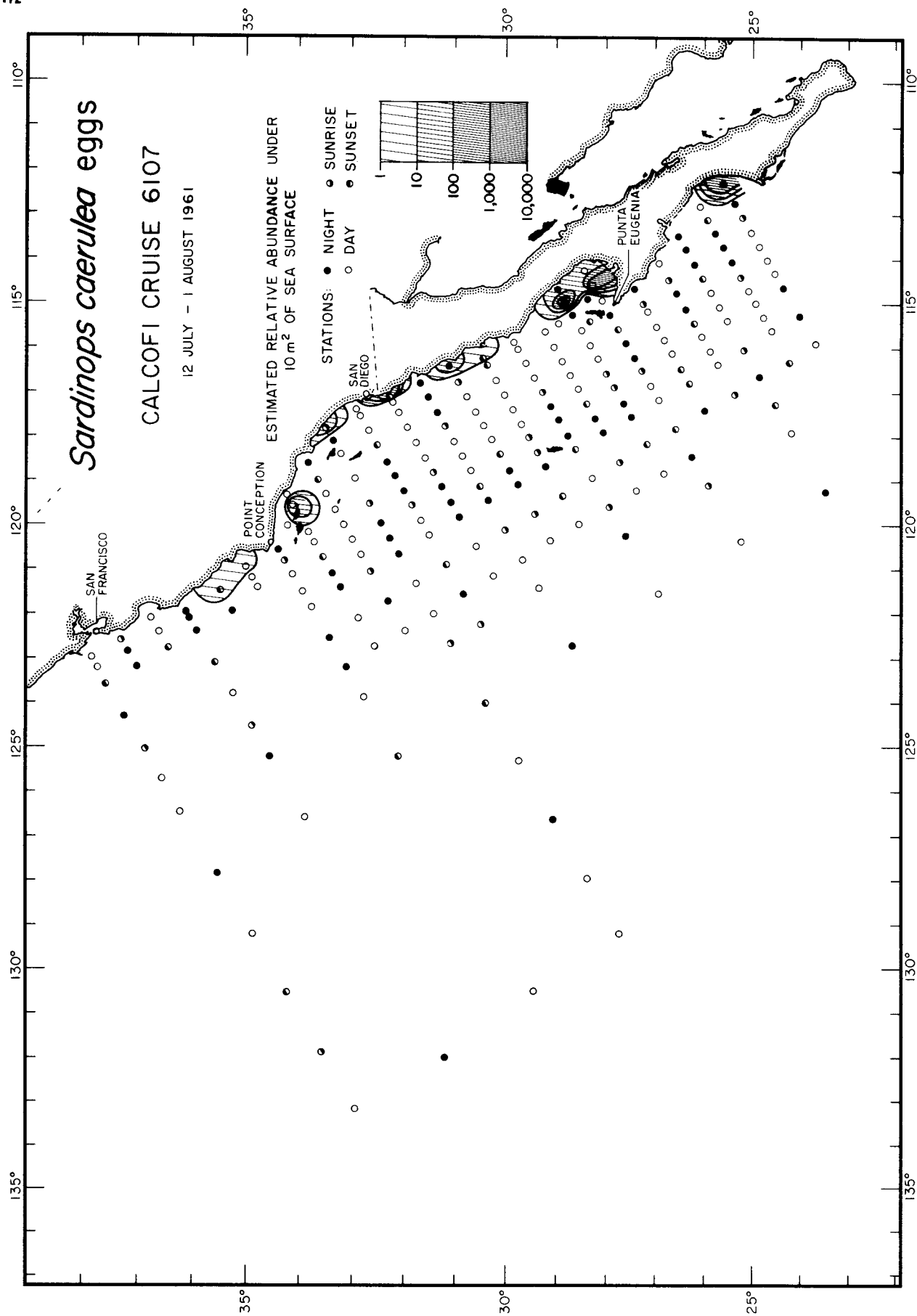
5907

*Sardinops caerulea* eggs

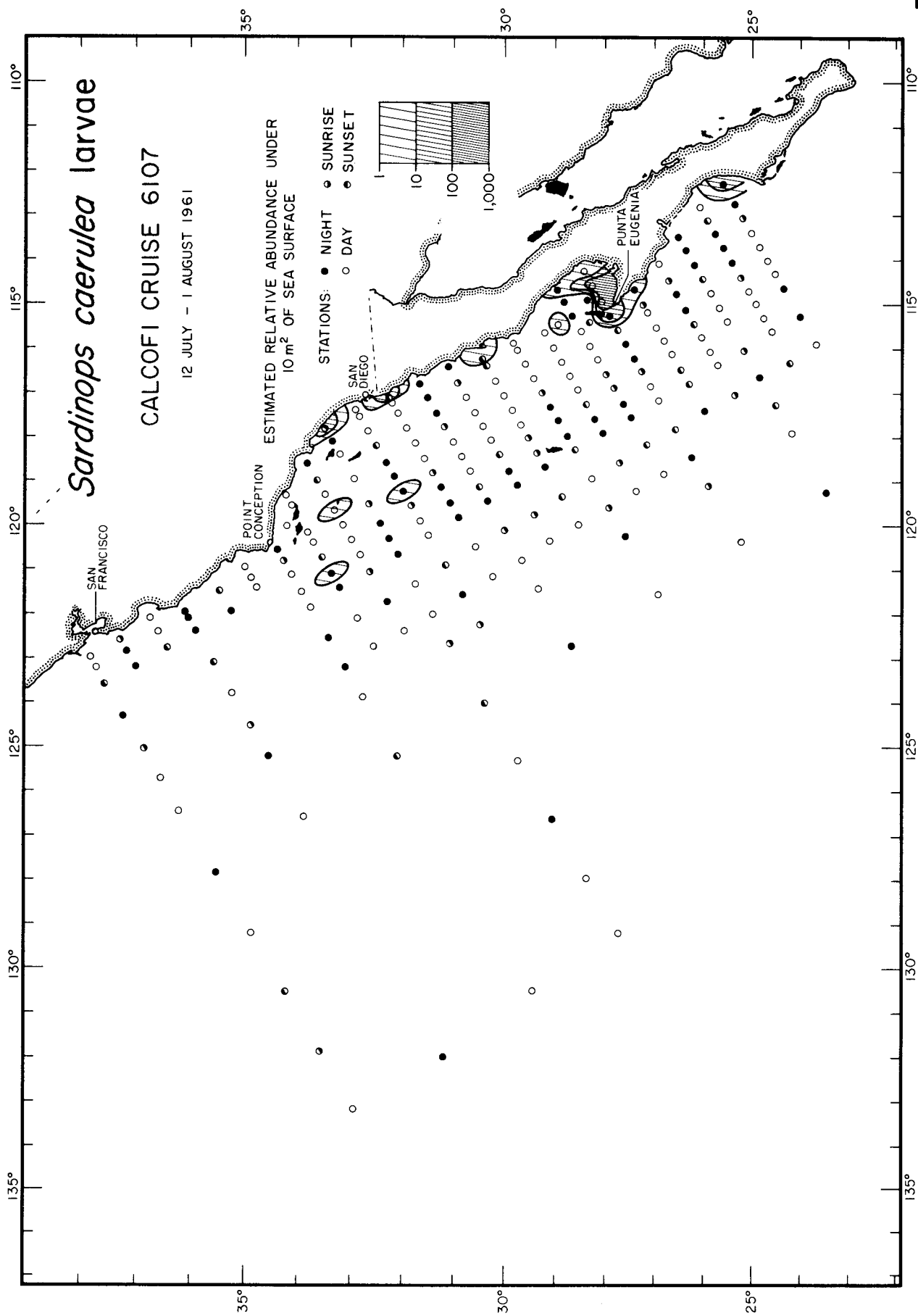
6007

*Sardinops caerulea* larvae

6007

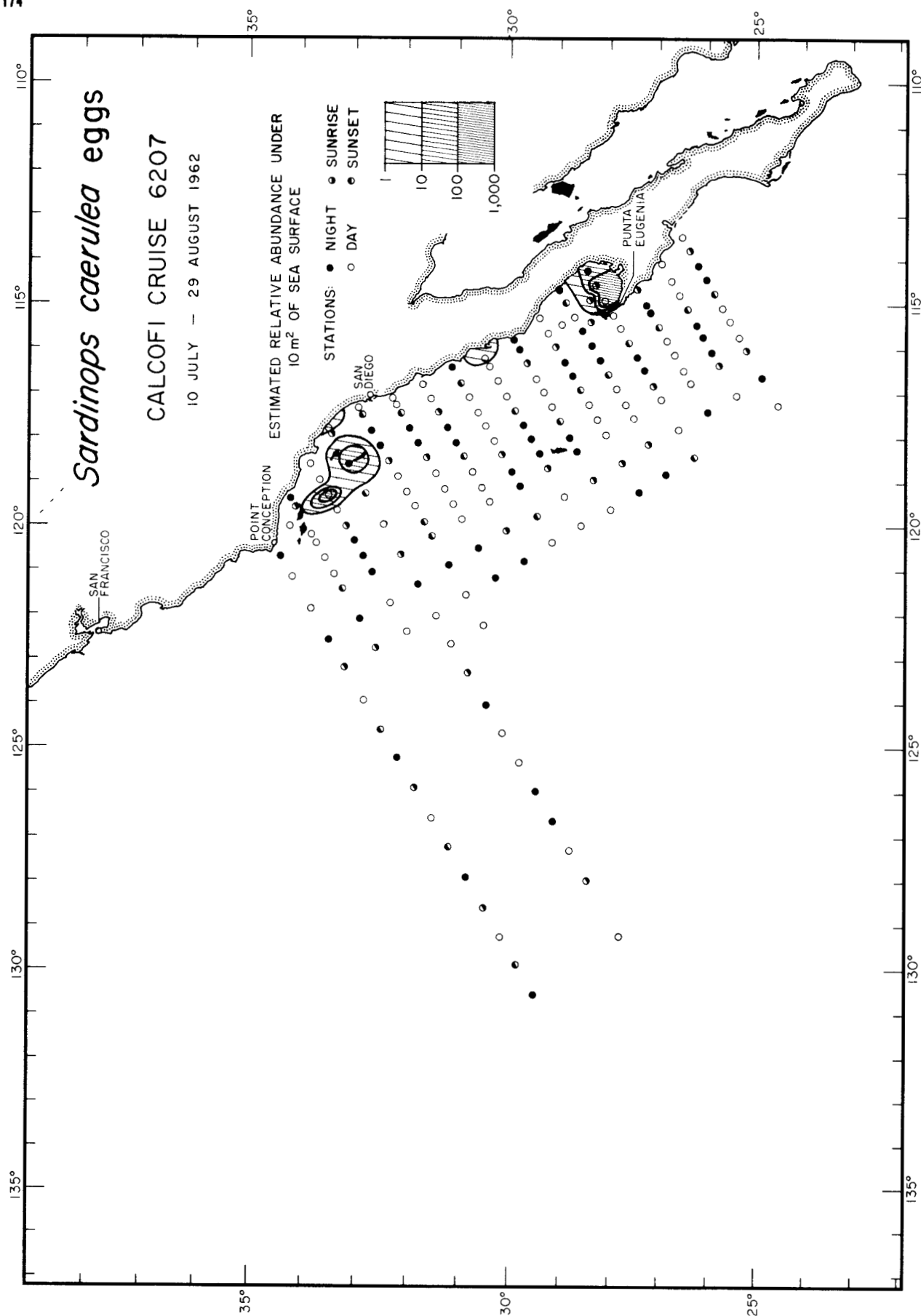
*Sardinops caerulea* eggs

6107

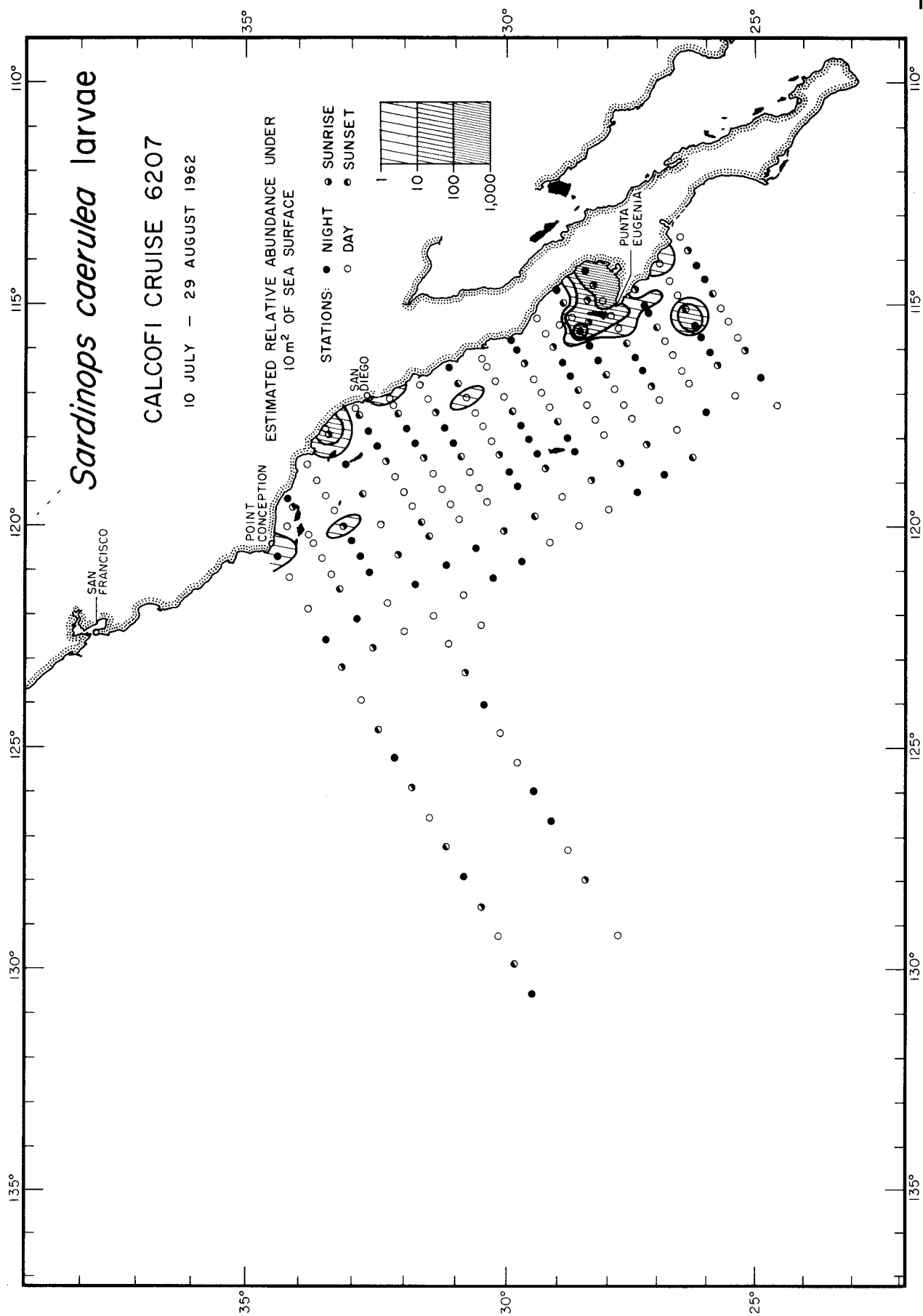


Sardinops caerulea larvae

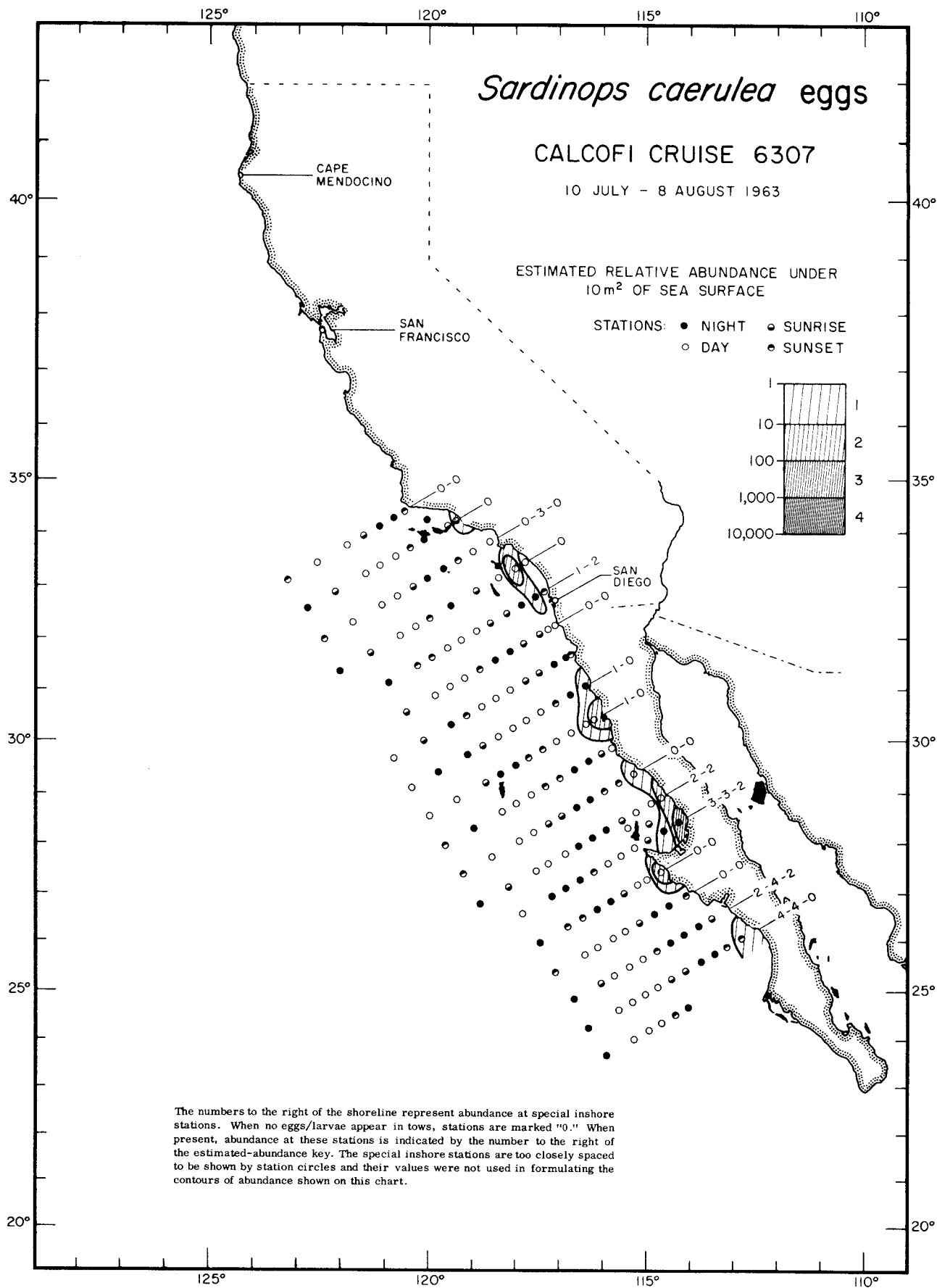
6107

*Sardinops caerulea* eggs

6207

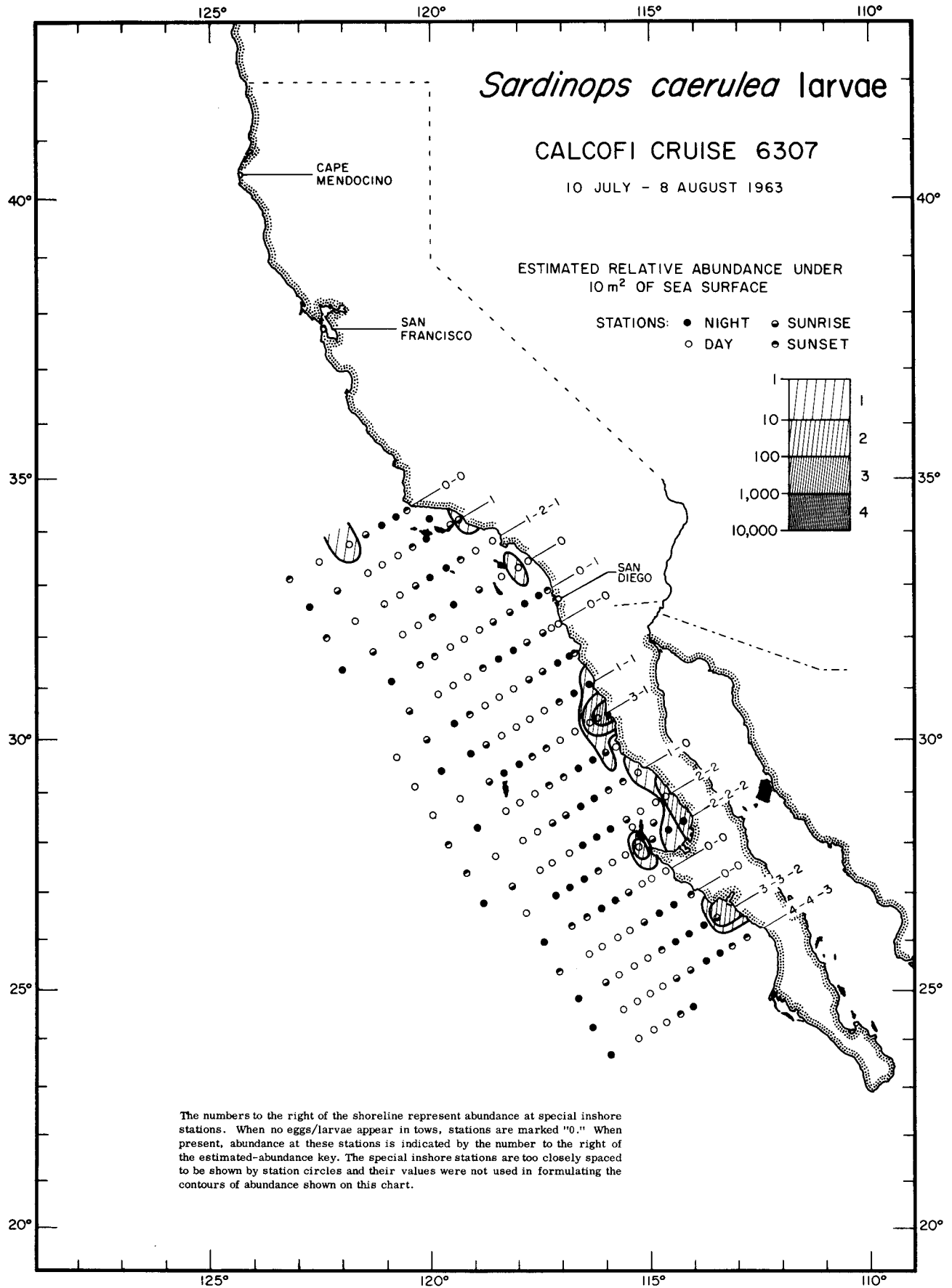
*Sardinops caerulea* larvae

6207



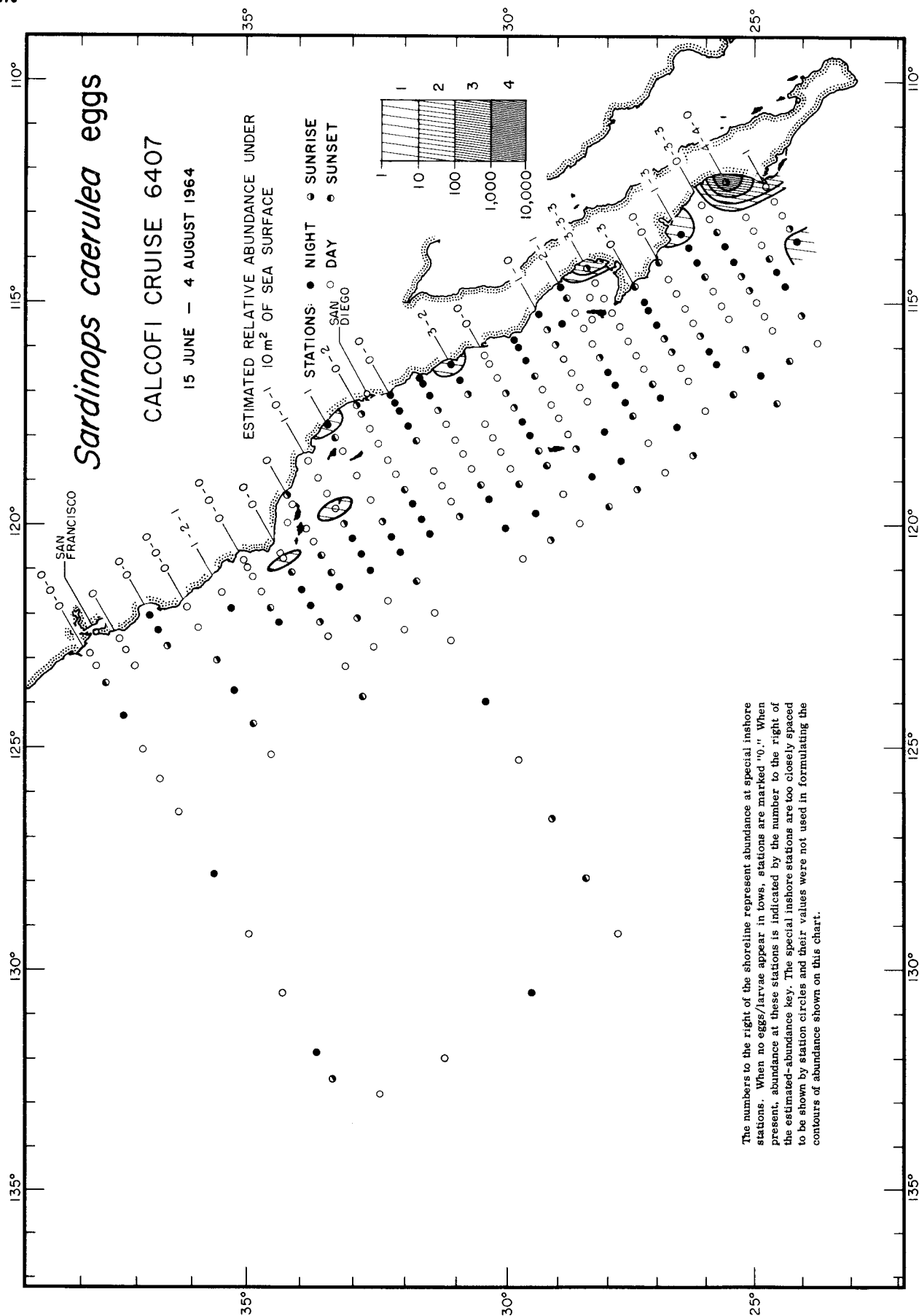
Sardinops caerulea eggs

6307



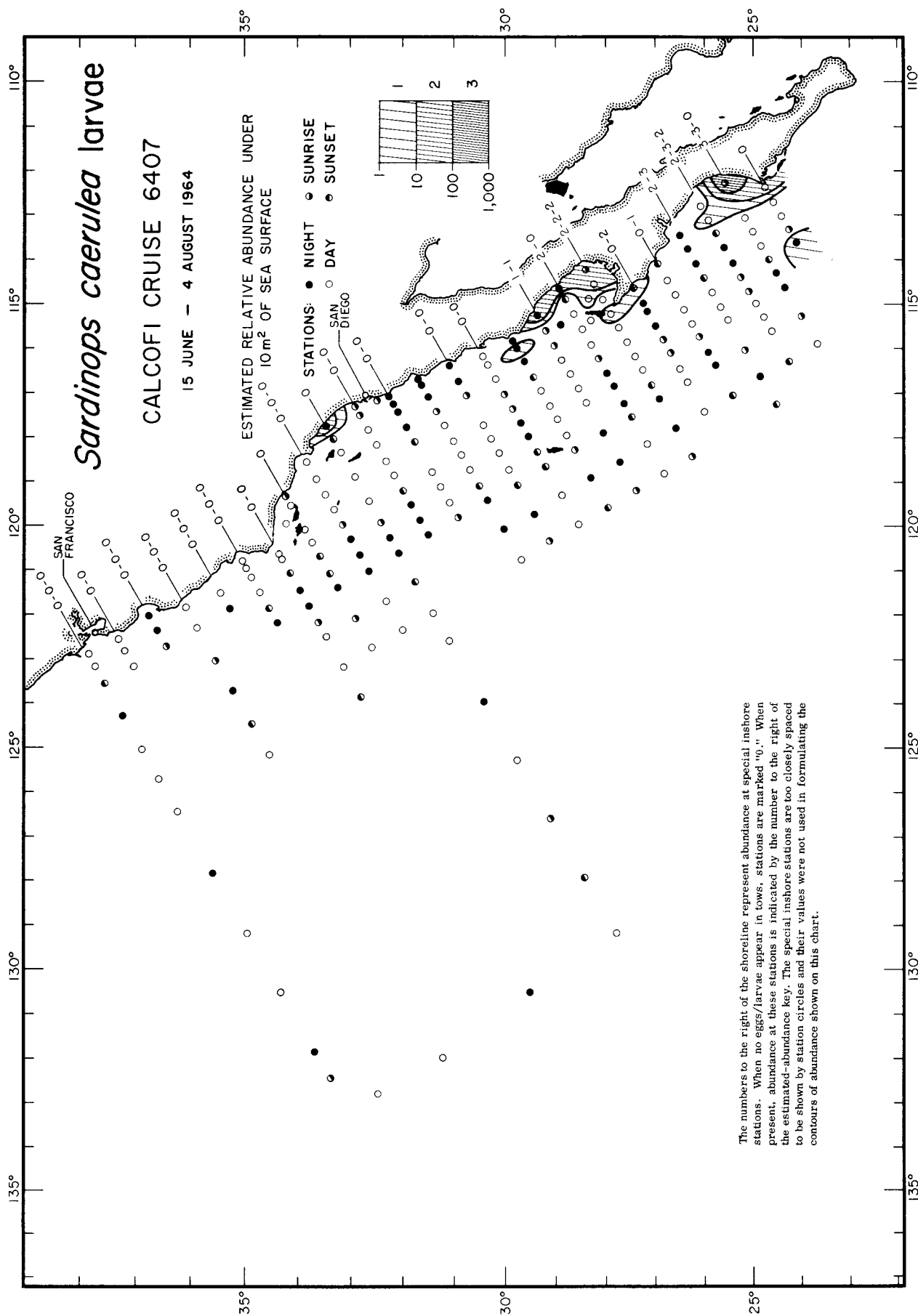
Sardinops caerulea larvae

6307

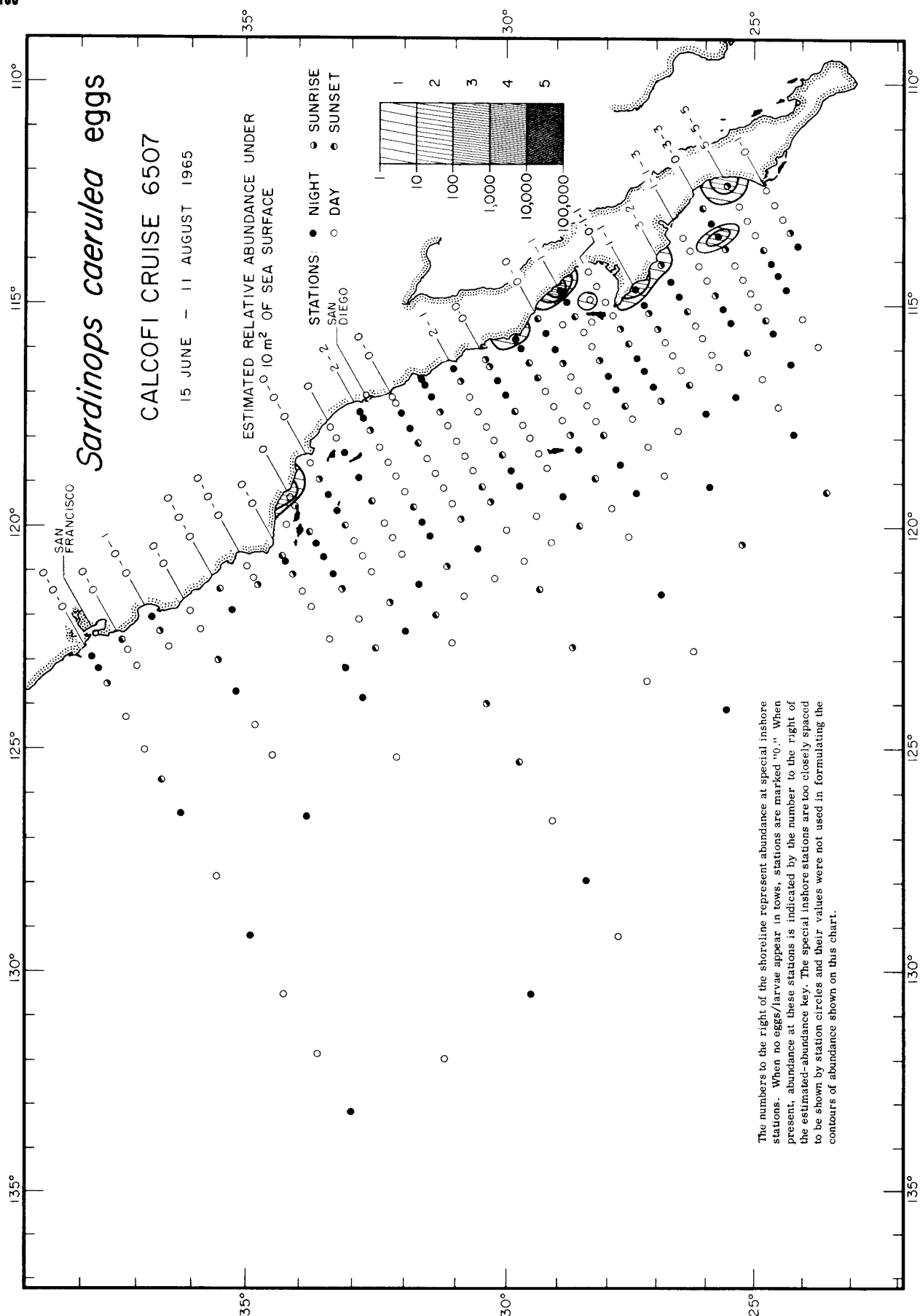


Sardinops caerulea eggs

6407

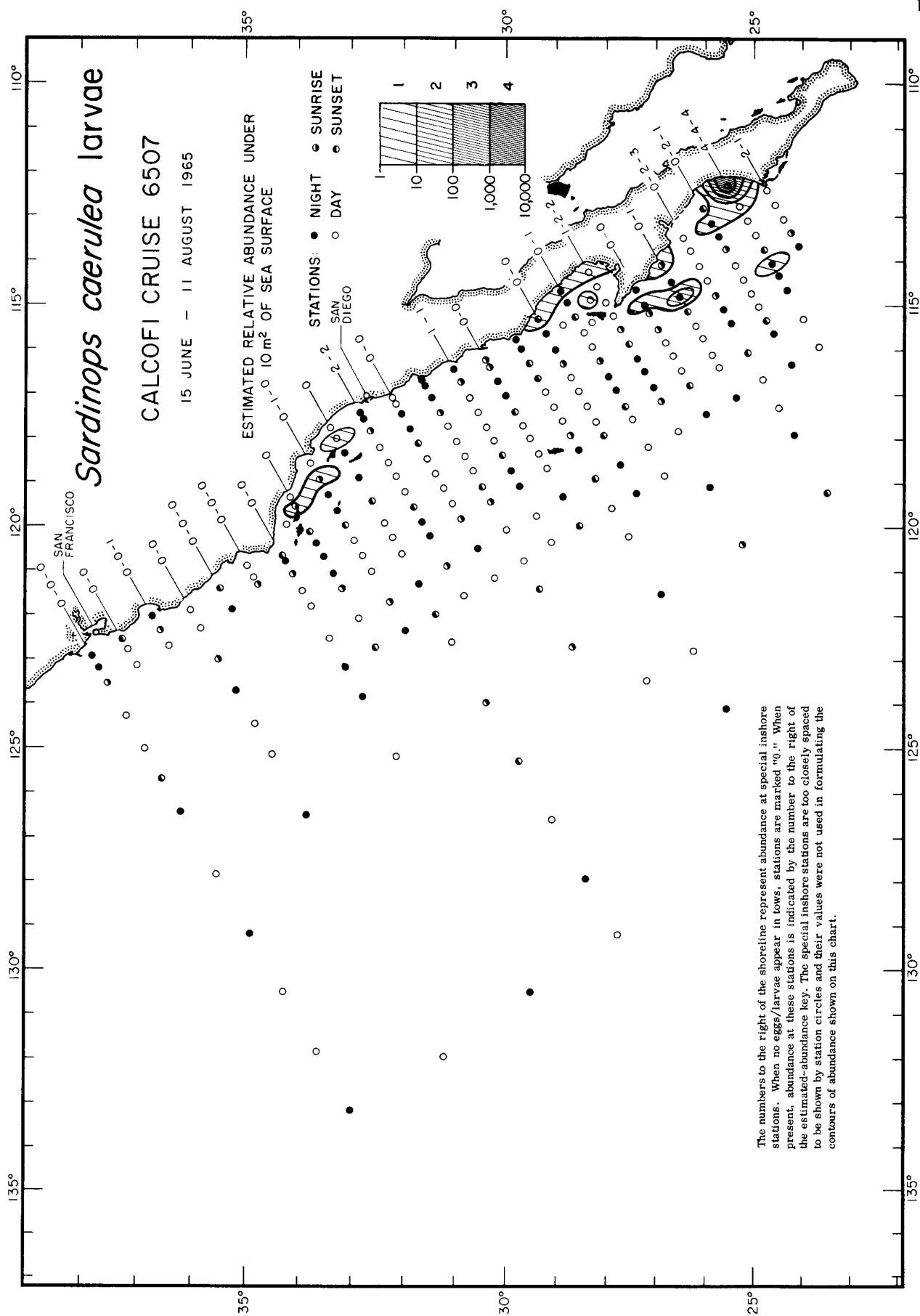
*Sardinops caerulea* larvae

6407

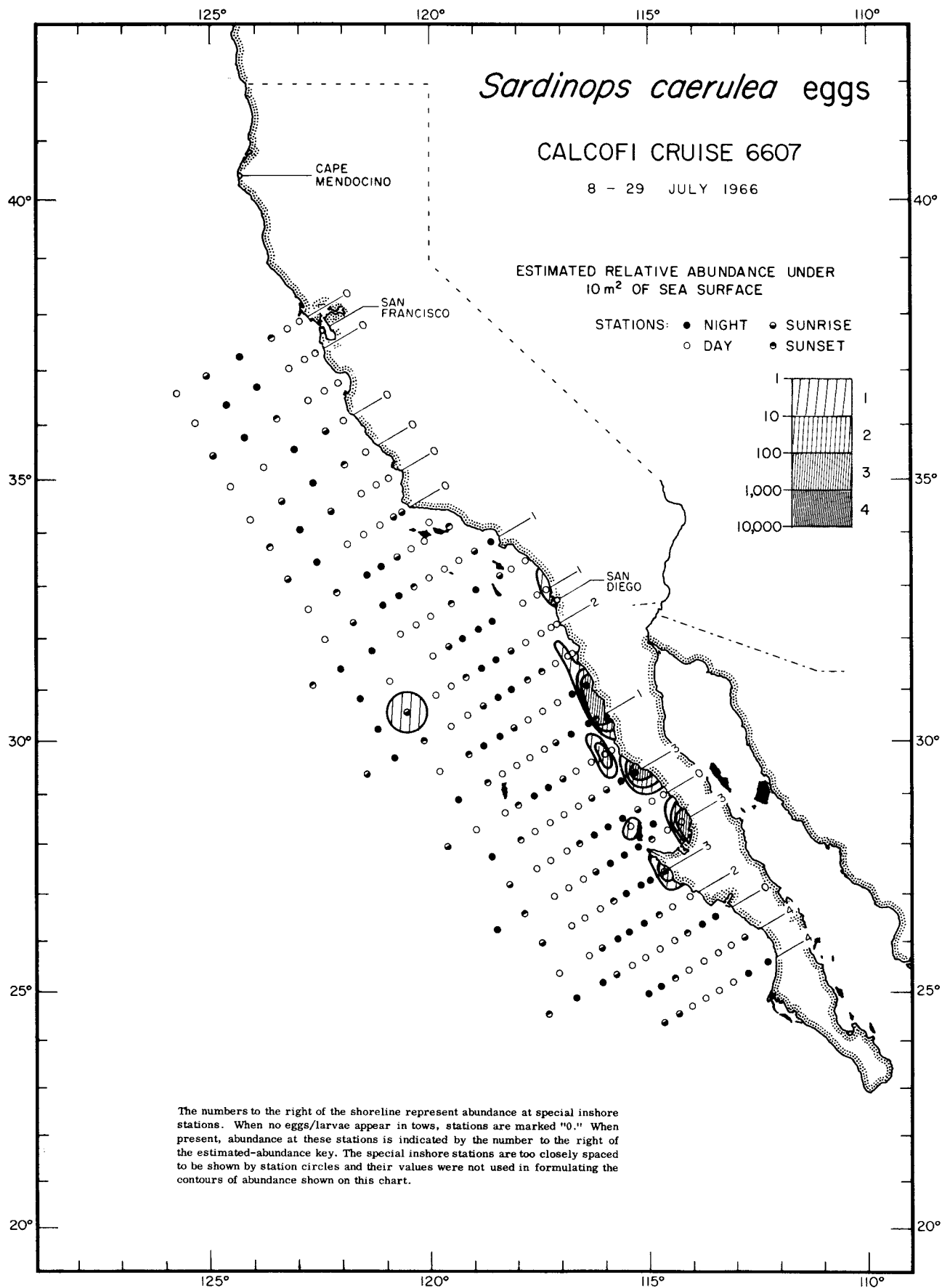


Sardinops caerulea eggs

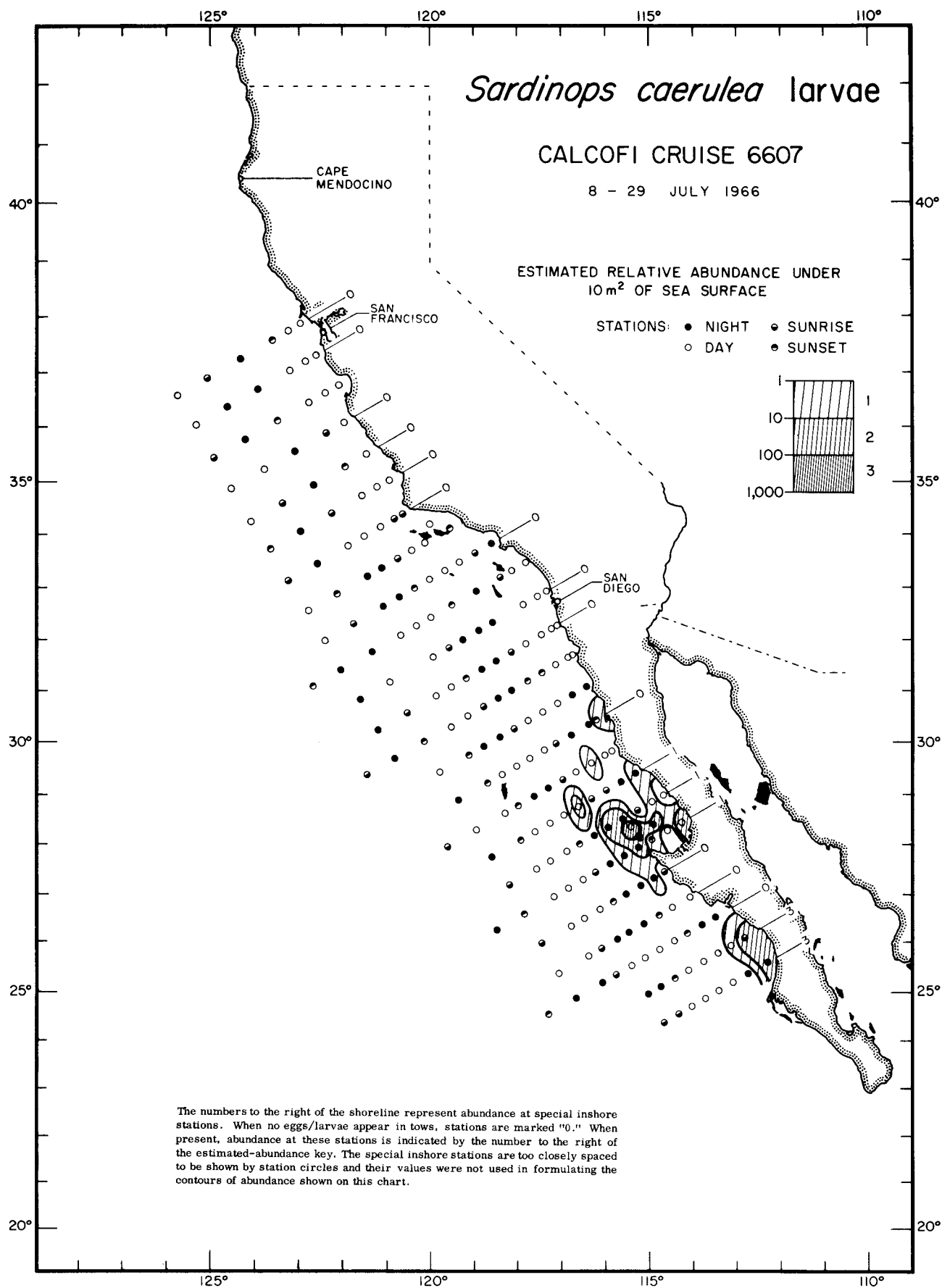
6507

*Sardinops caerulea* larvae

6507

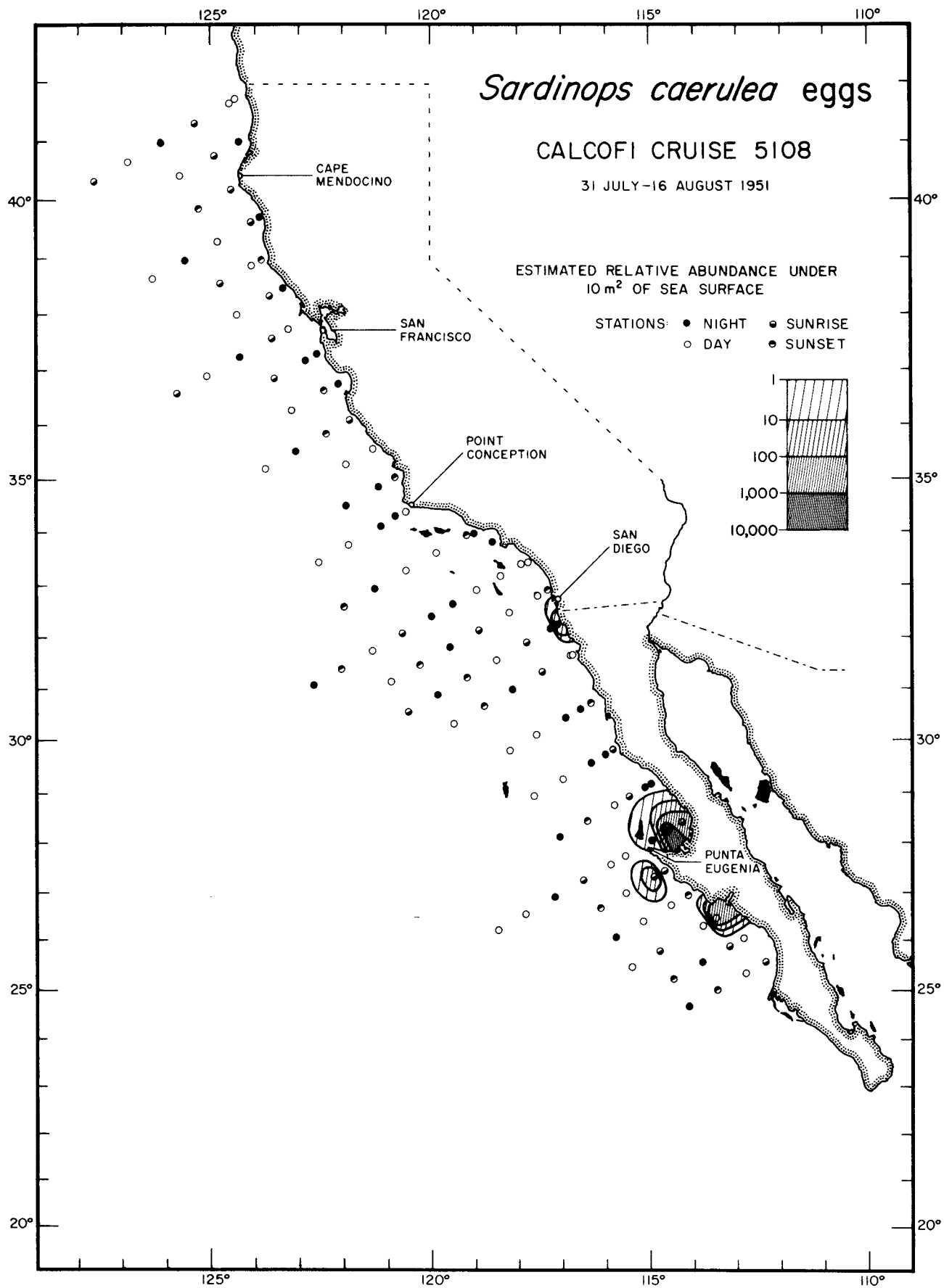
*Sardinops caerulea* eggs

6607



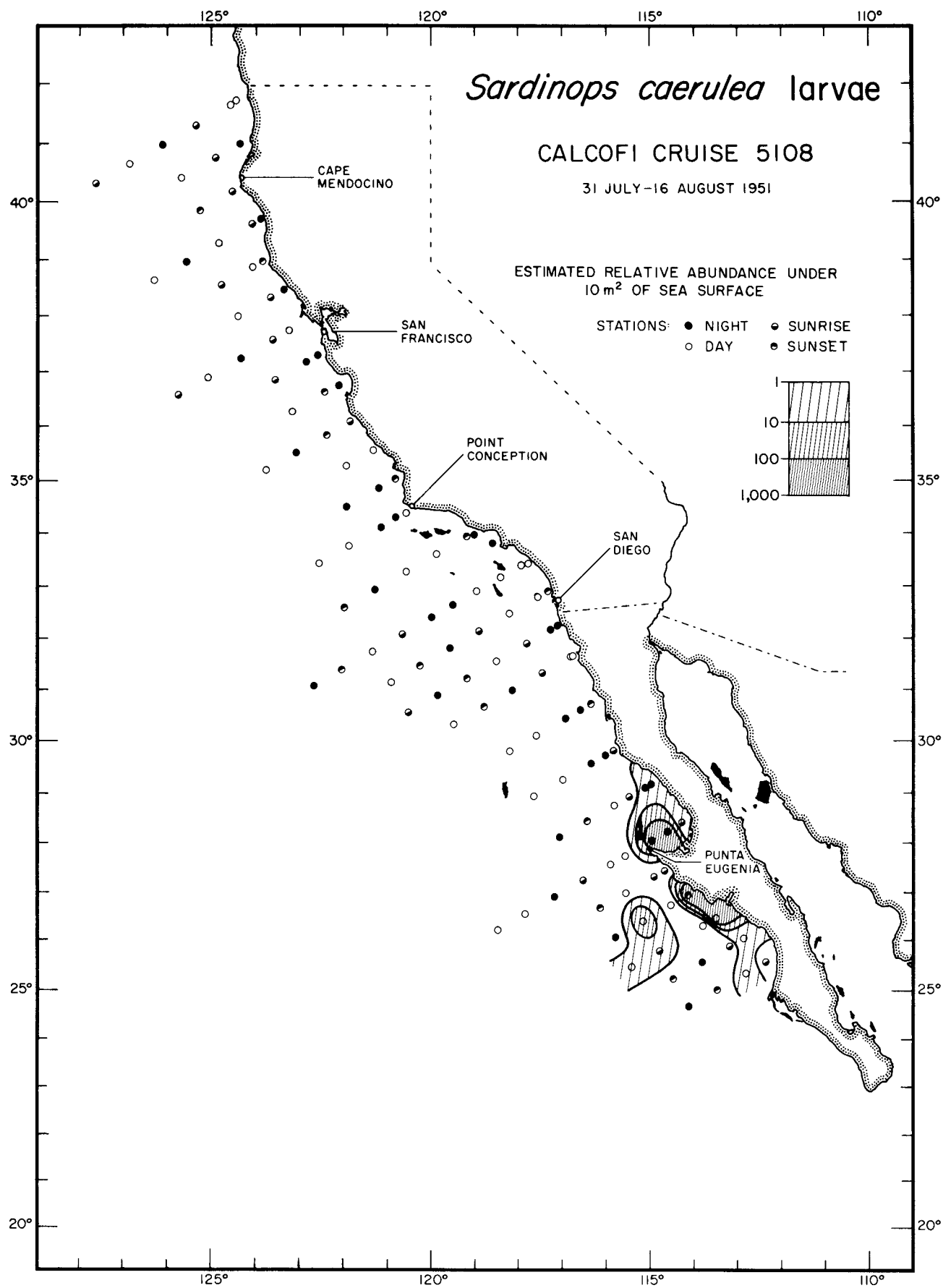
Sardinops caerulea larvae

6607



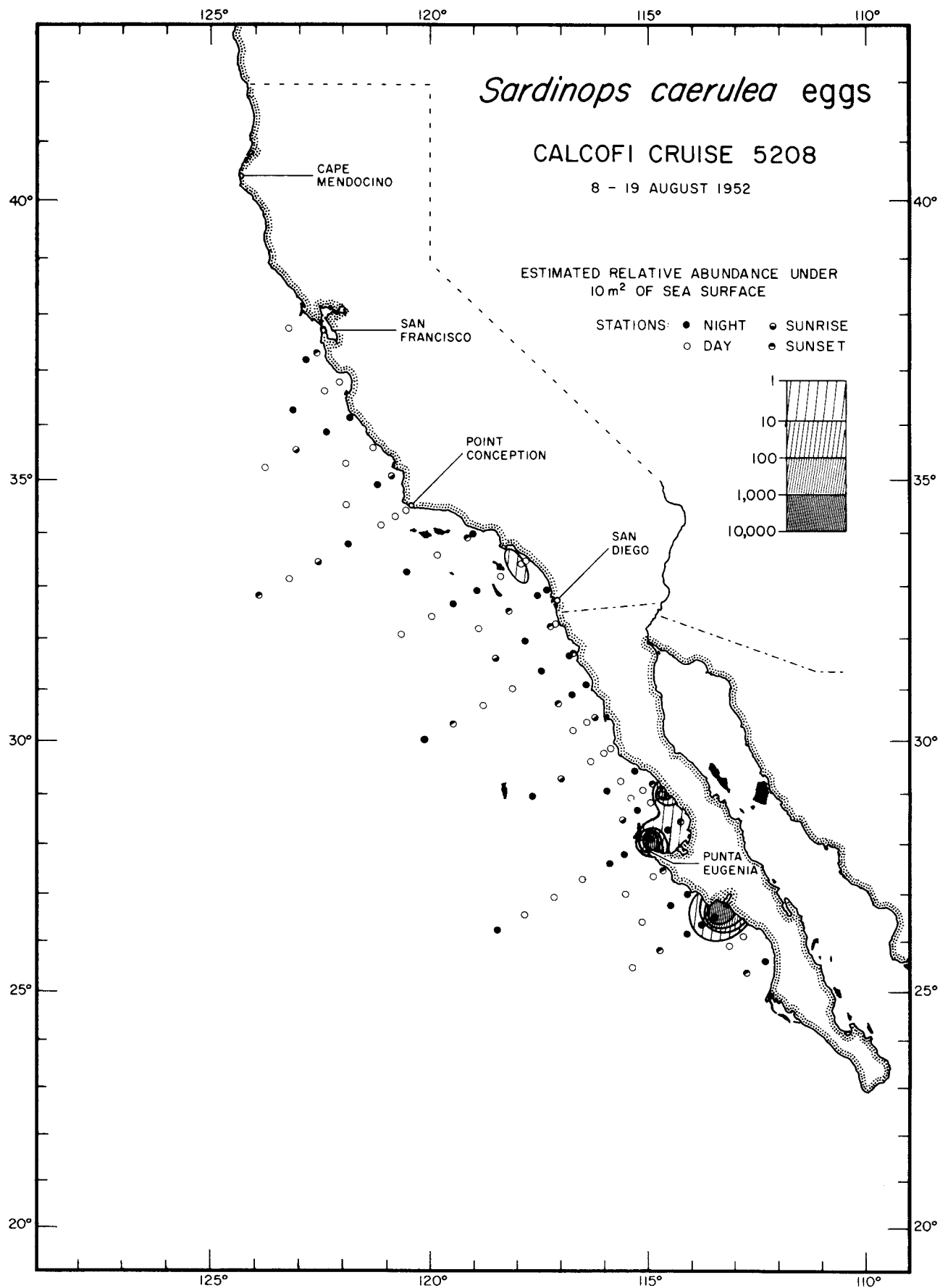
Sardinops caerulea eggs

5108



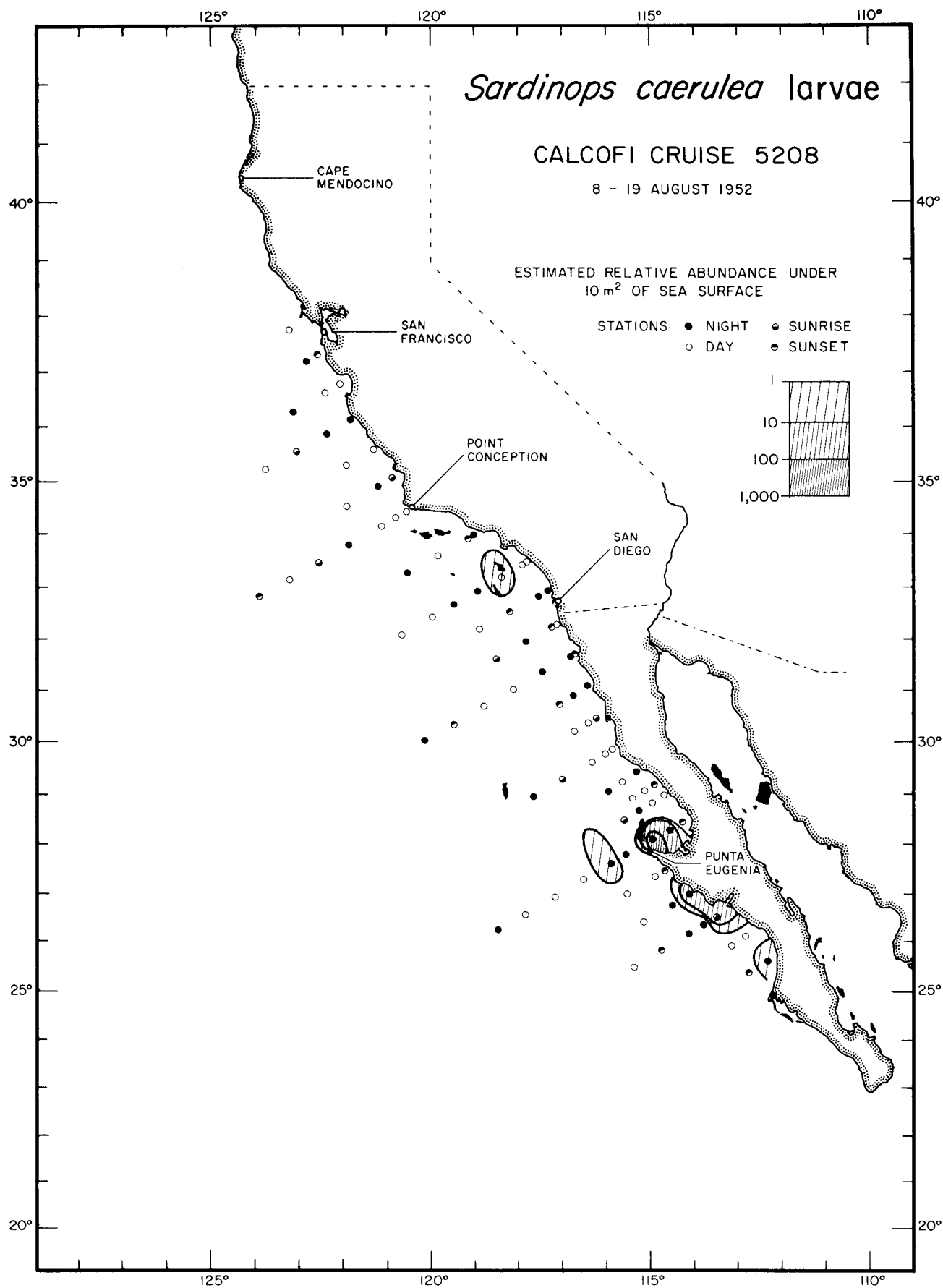
Sardinops caerulea larvae

5108



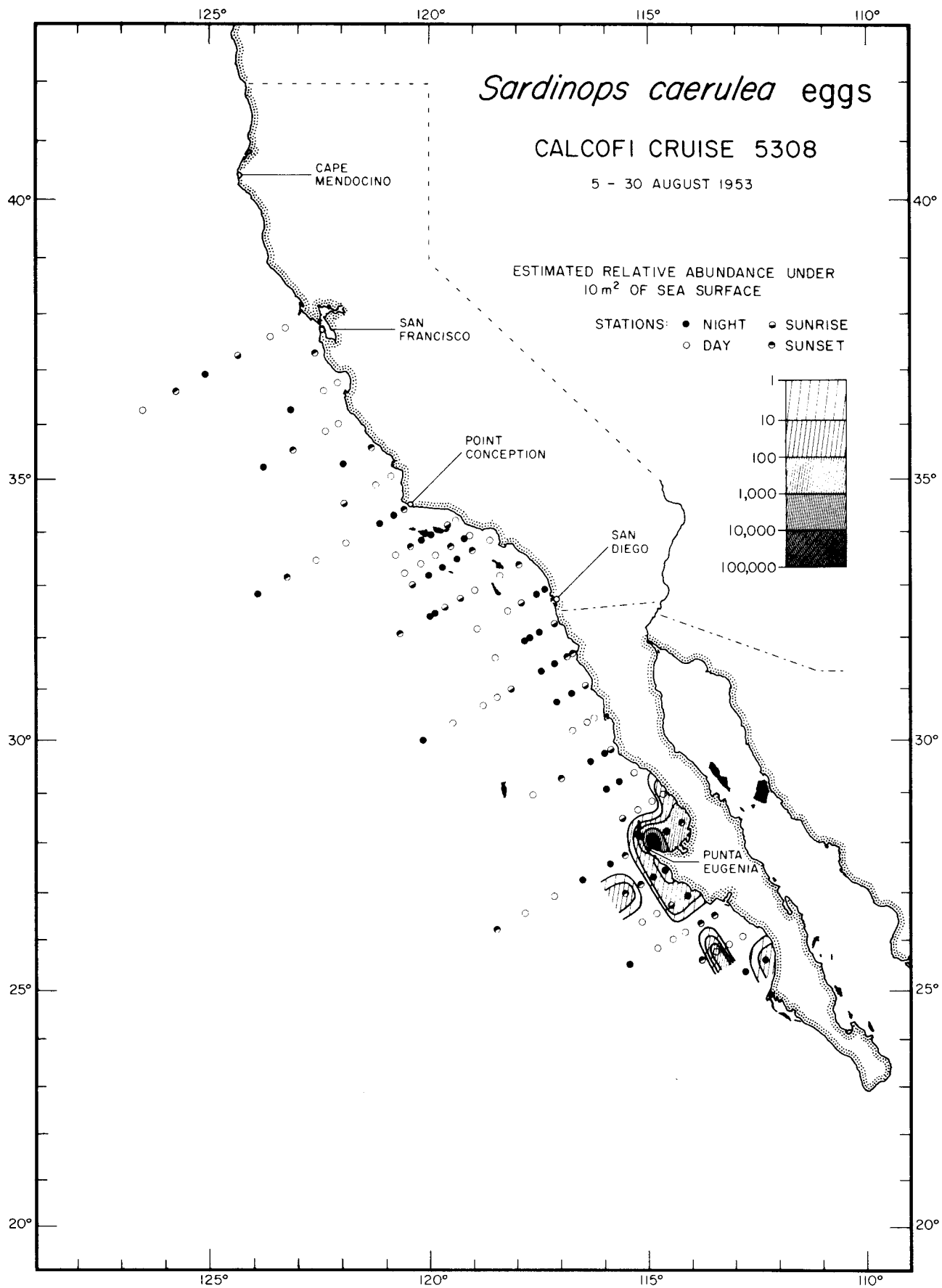
Sardinops caerulea eggs

5208

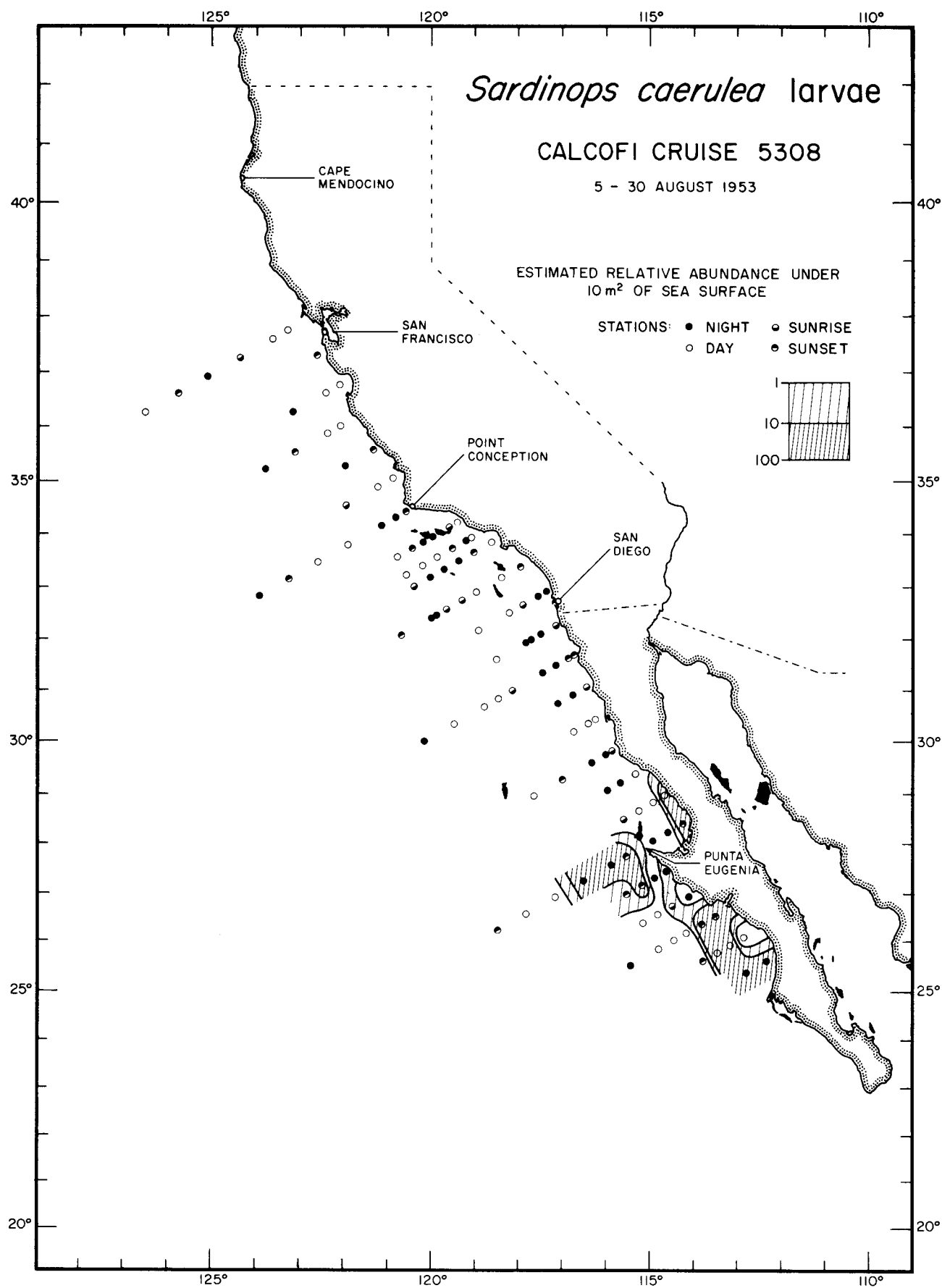


Sardinops caerulea larvae

5208

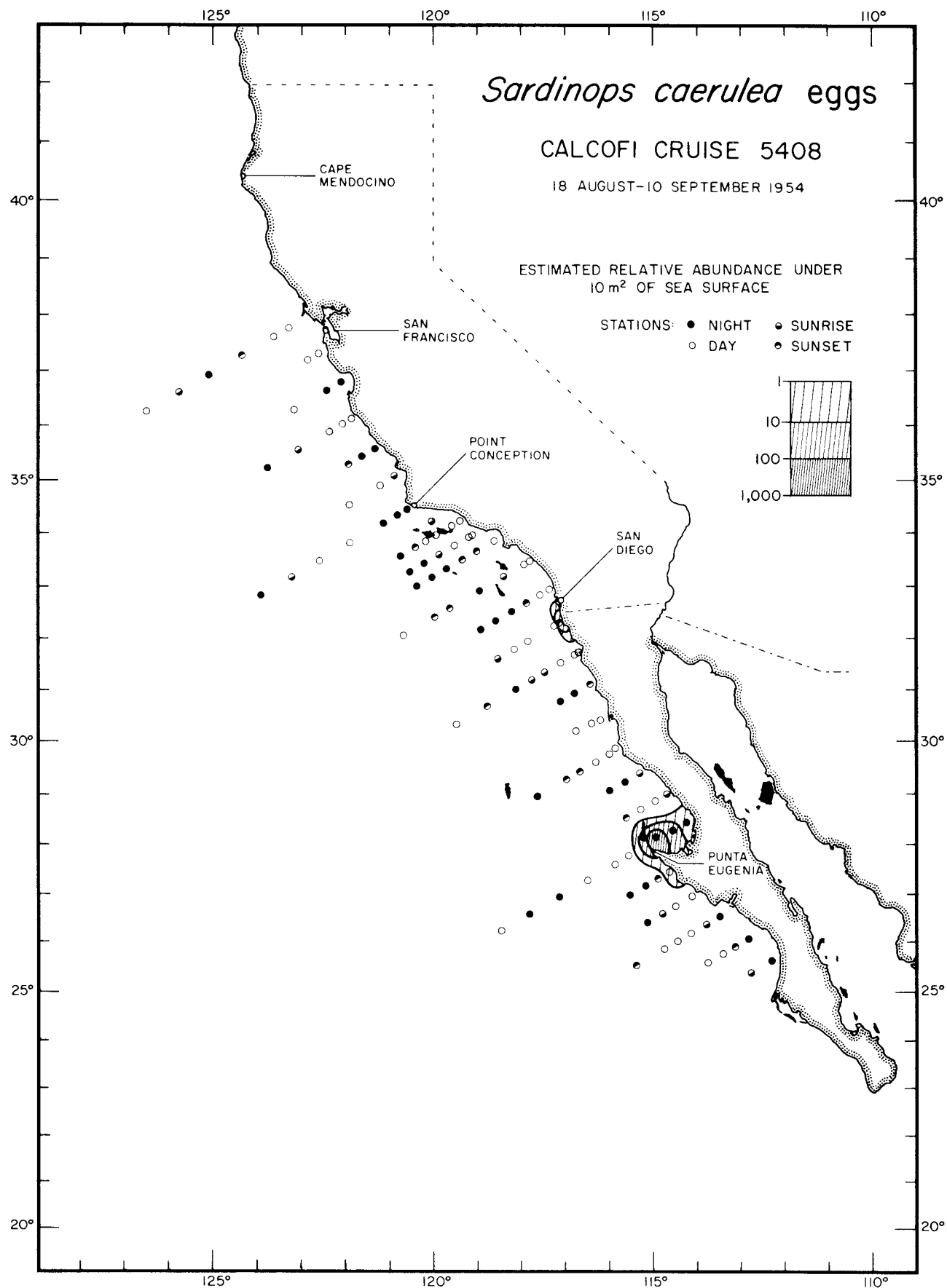
*Sardinops caerulea* eggs

5308

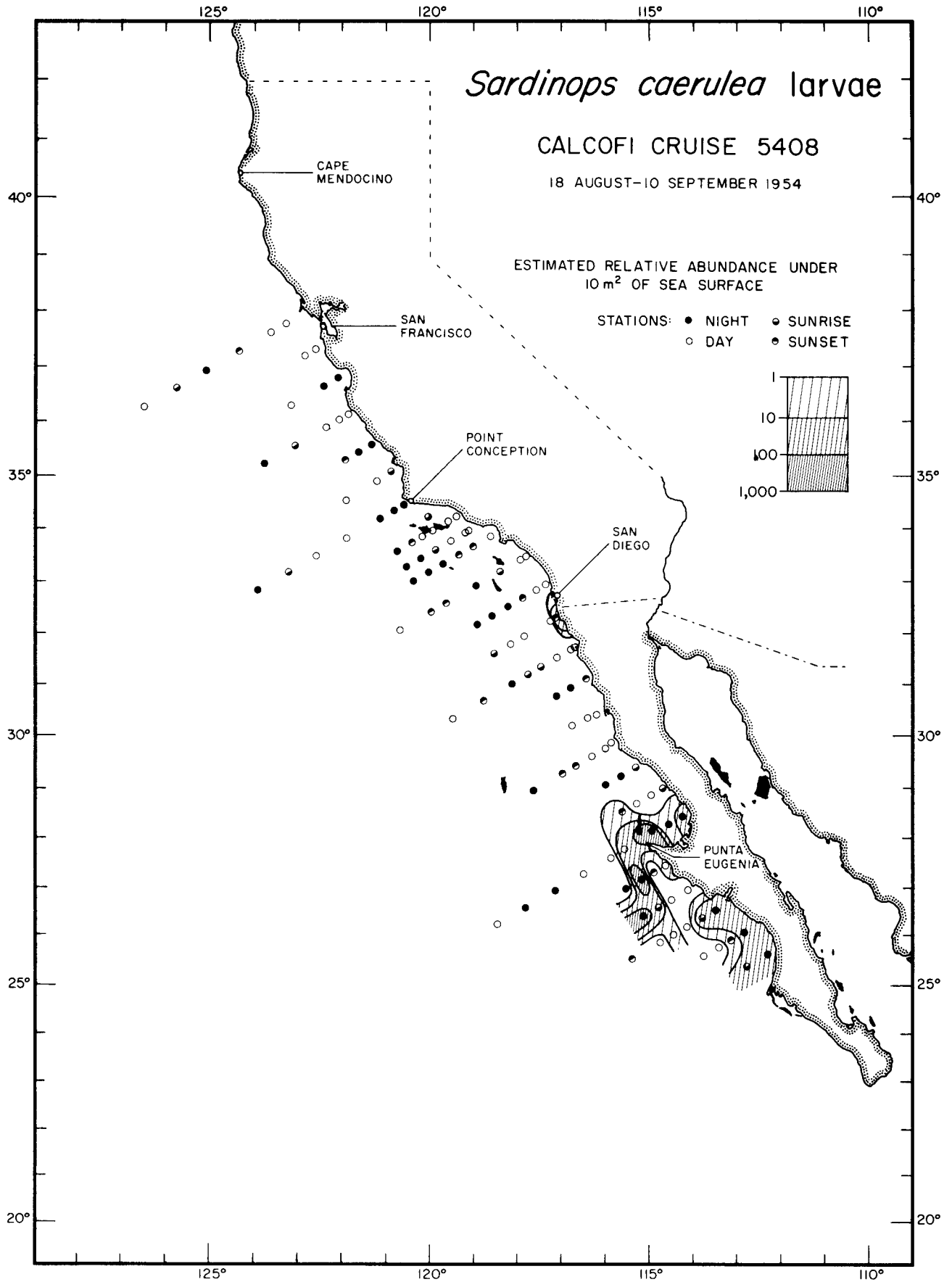


Sardinops caerulea larvae

5308

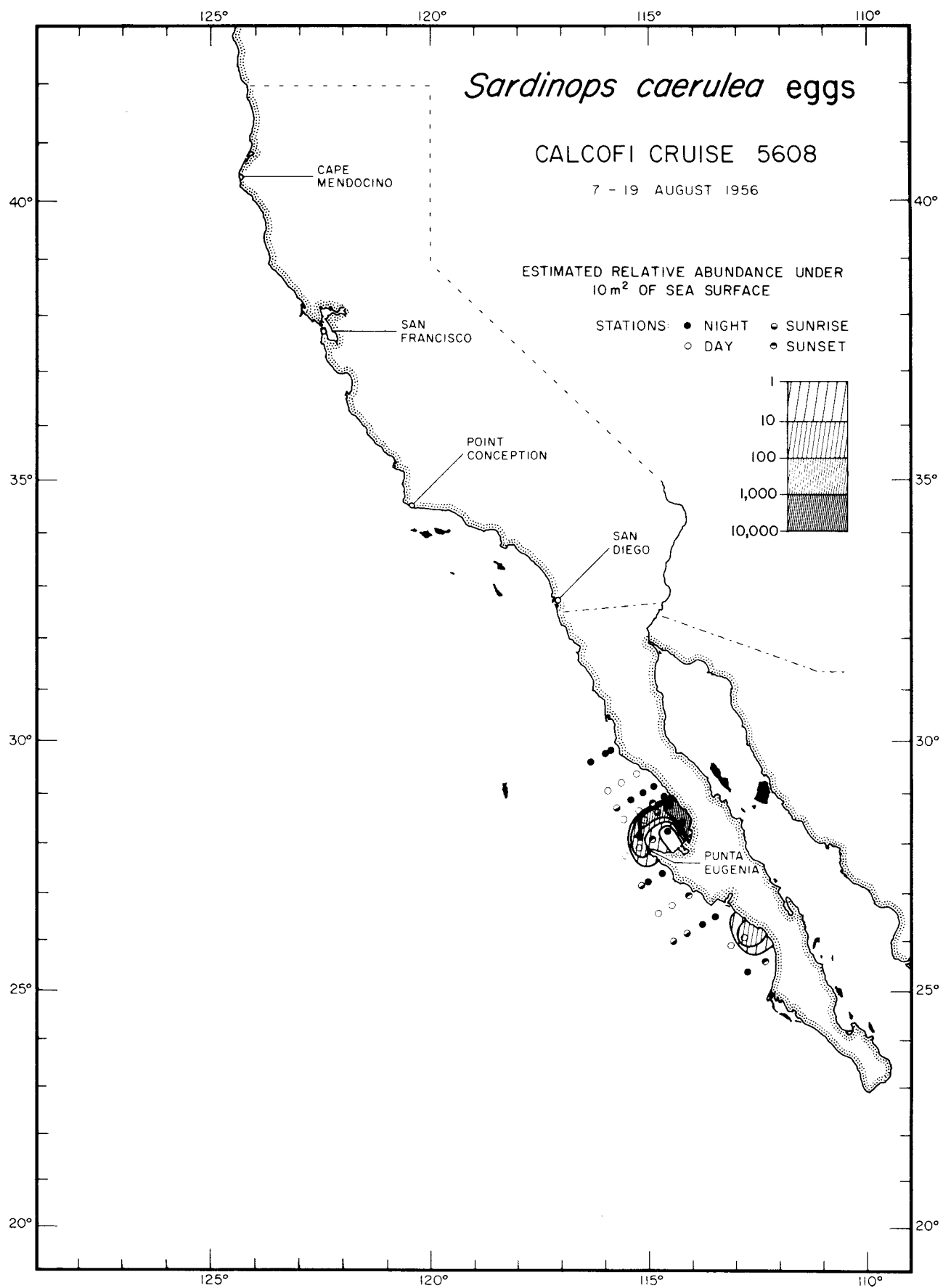


Sardinops caerulea eggs
5408



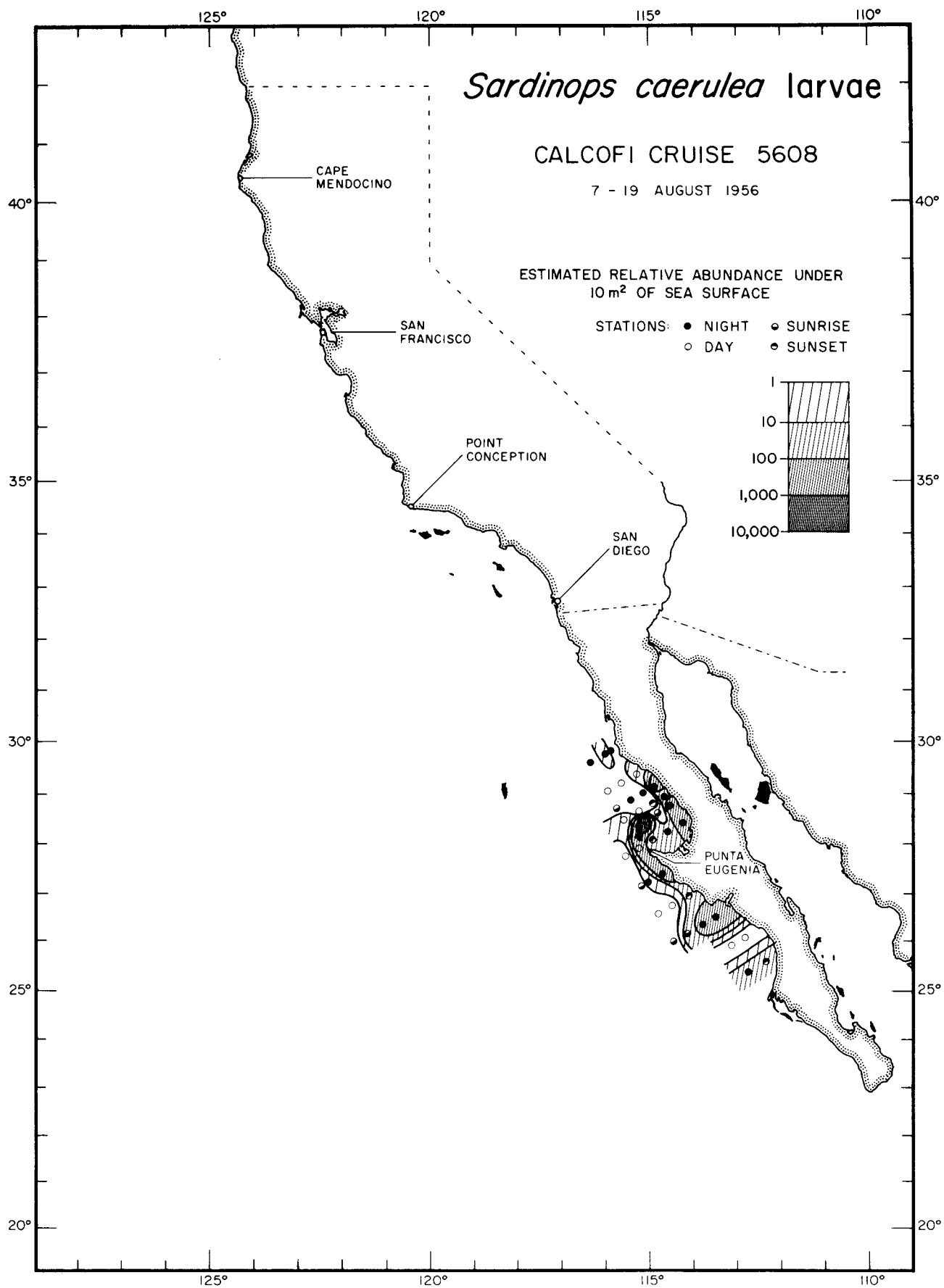
Sardinops caerulea larvae

5408



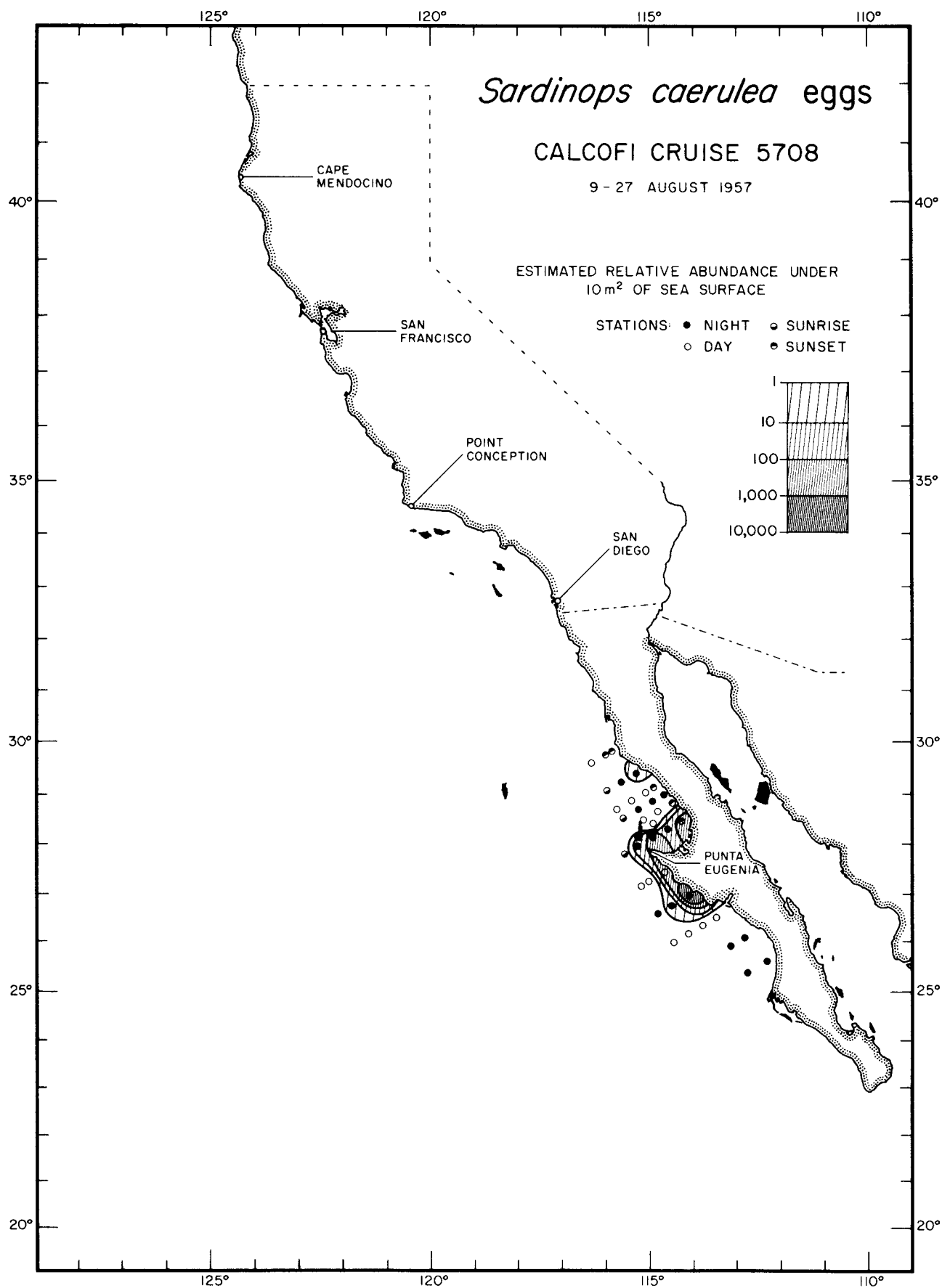
Sardinops caerulea eggs

5608

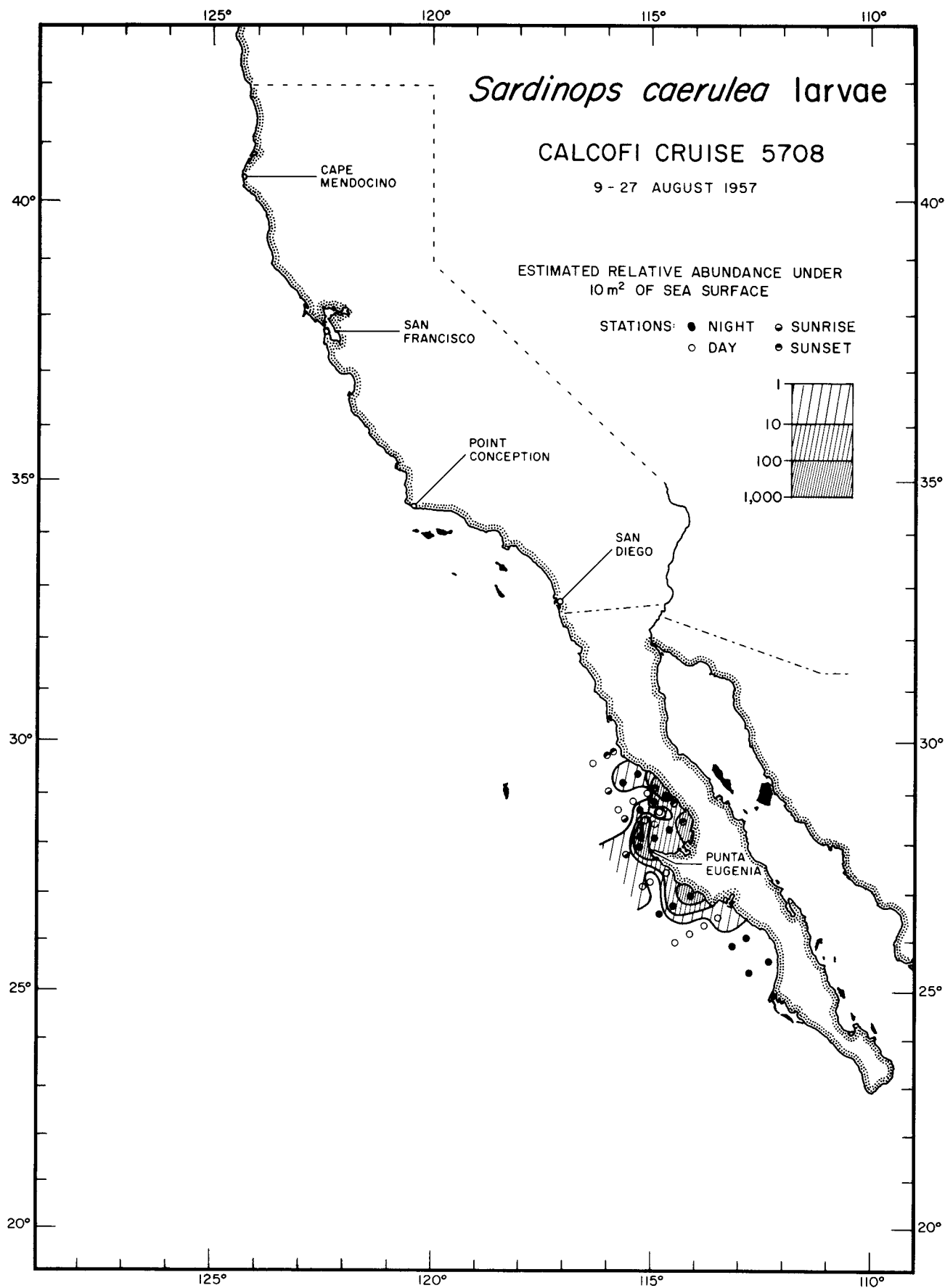


Sardinops caerulea larvae

5608

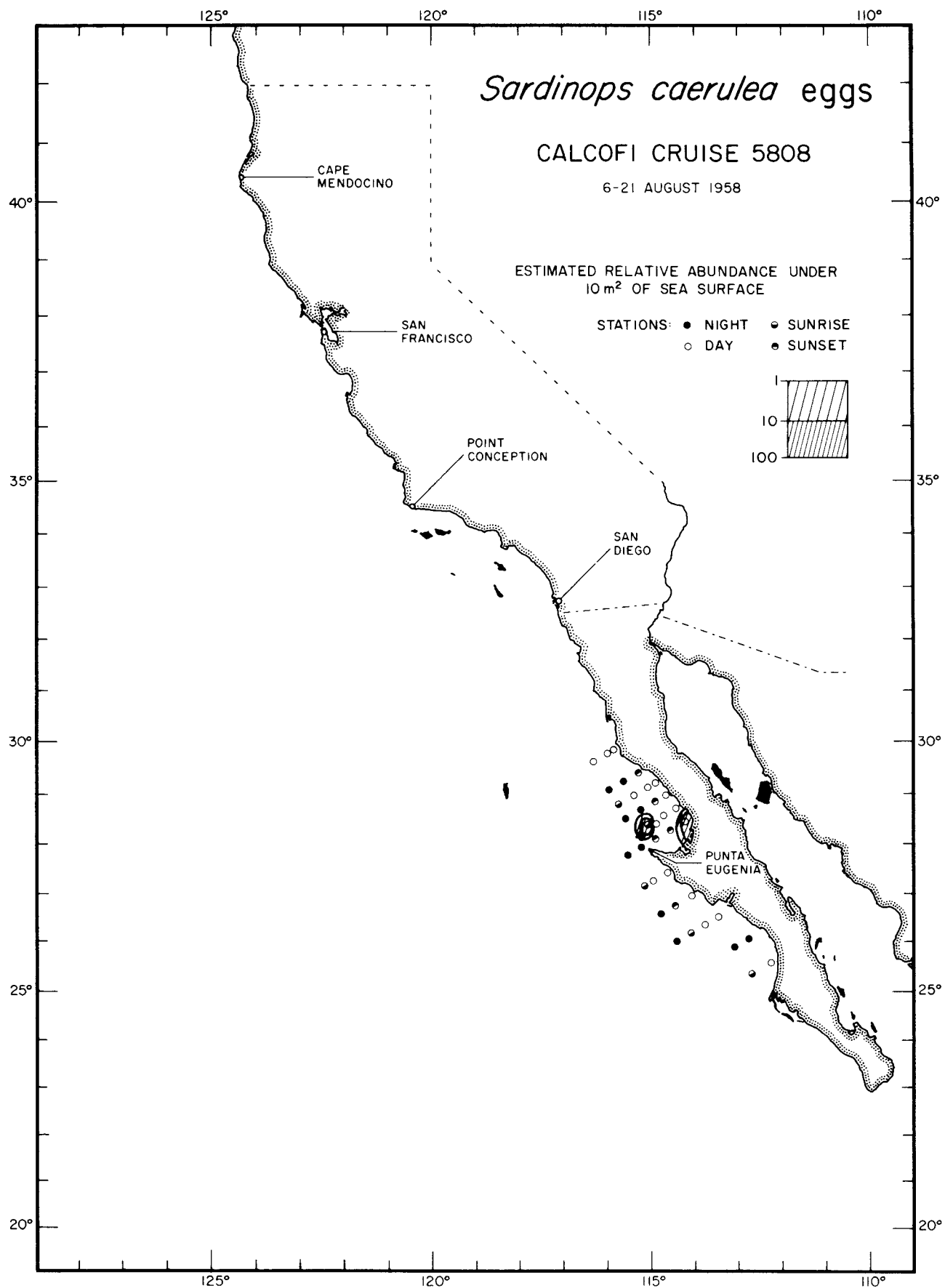


Sardinops caerulea eggs
5708

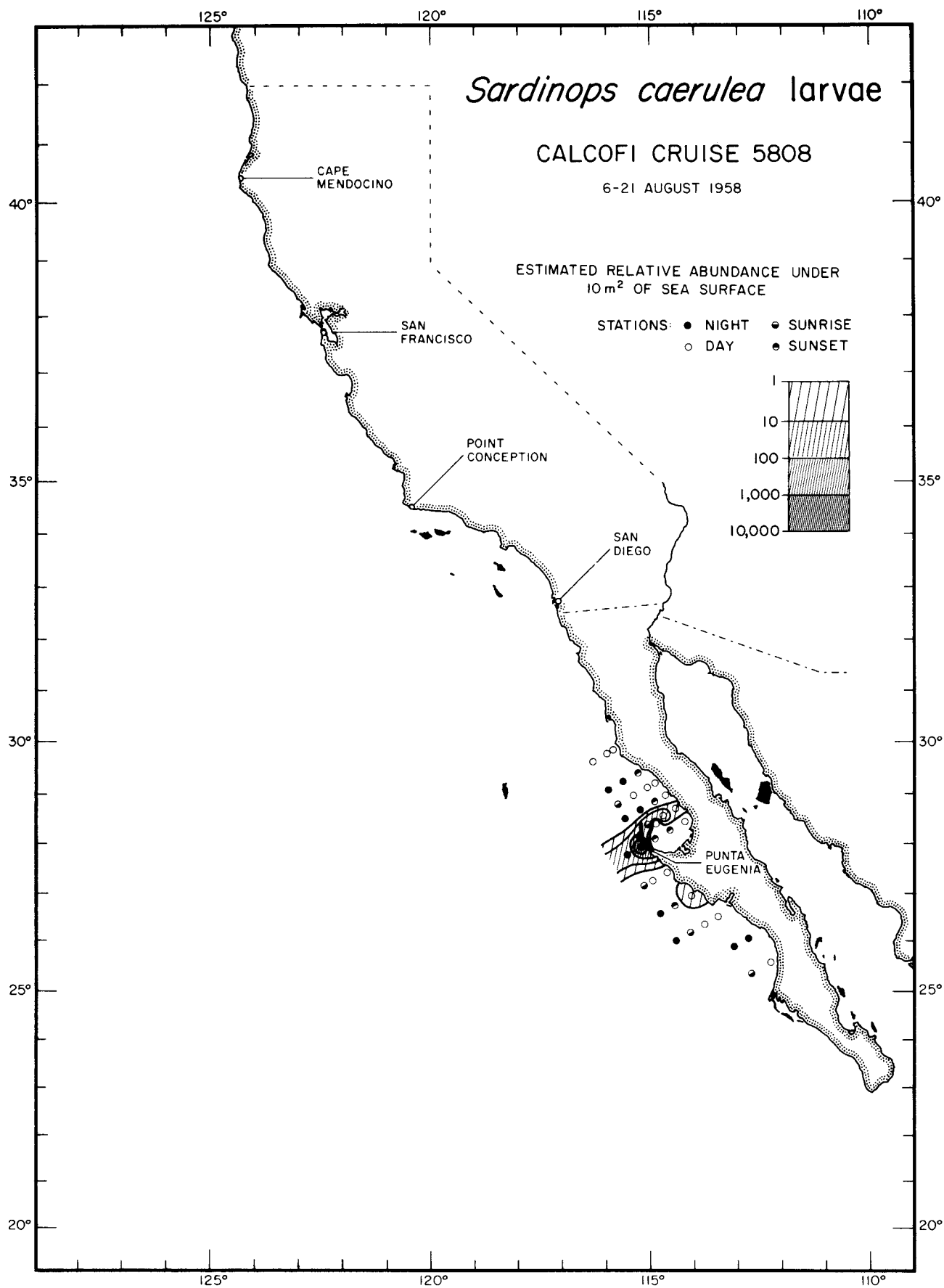


Sardinops caerulea larvae

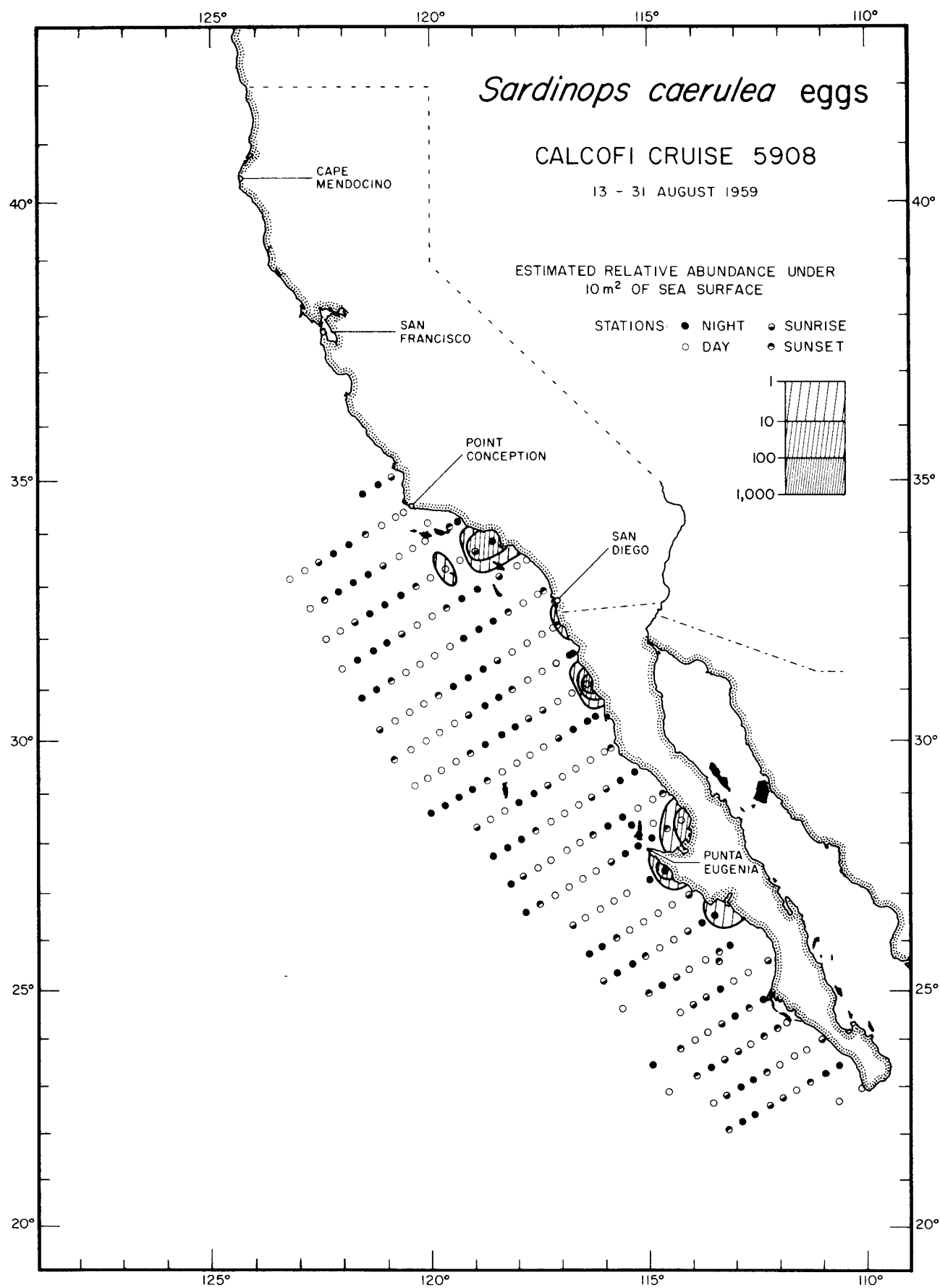
5708

*Sardinops caerulea* eggs

5808

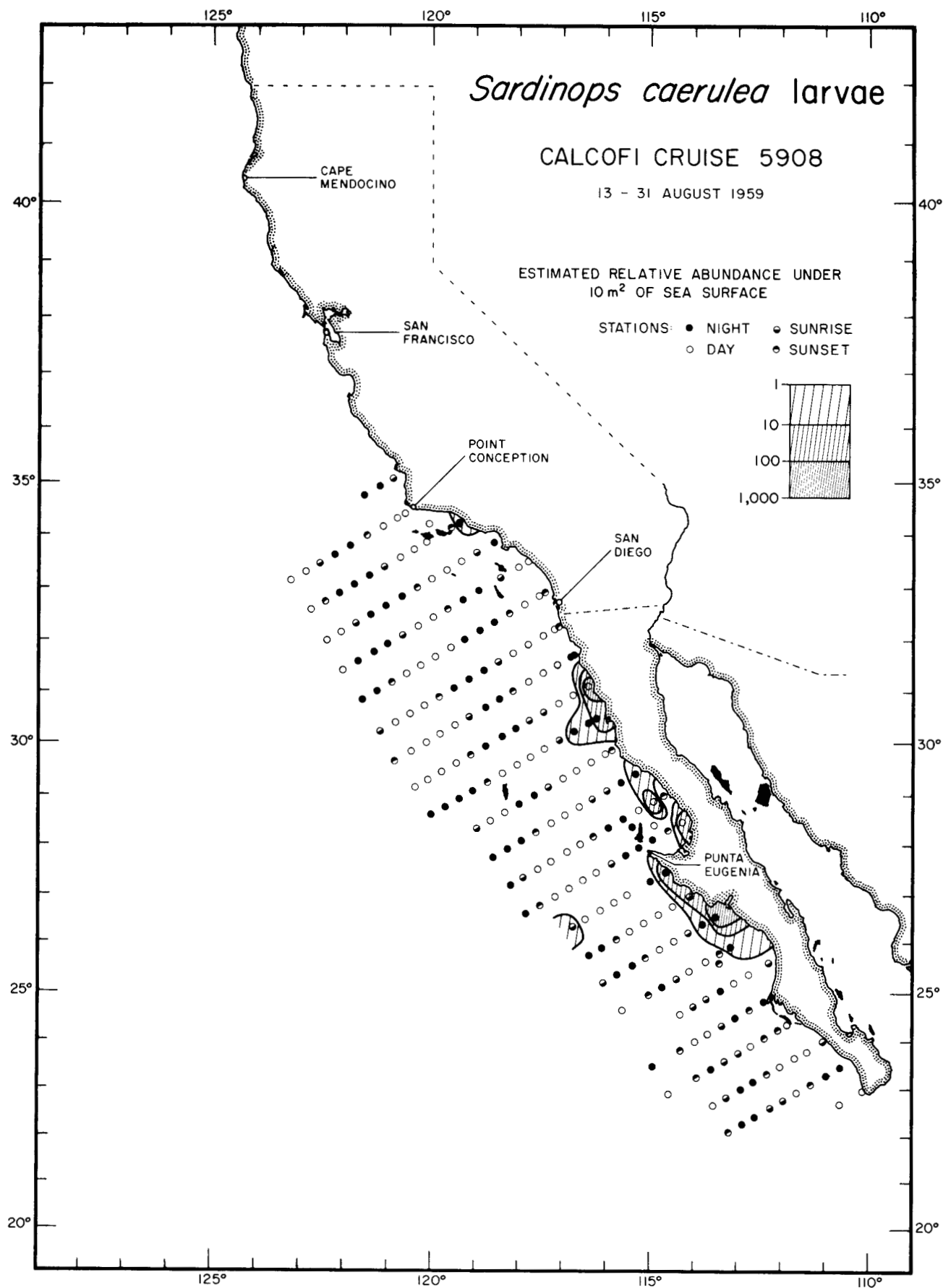
*Sardinops caerulea* larvae

5808



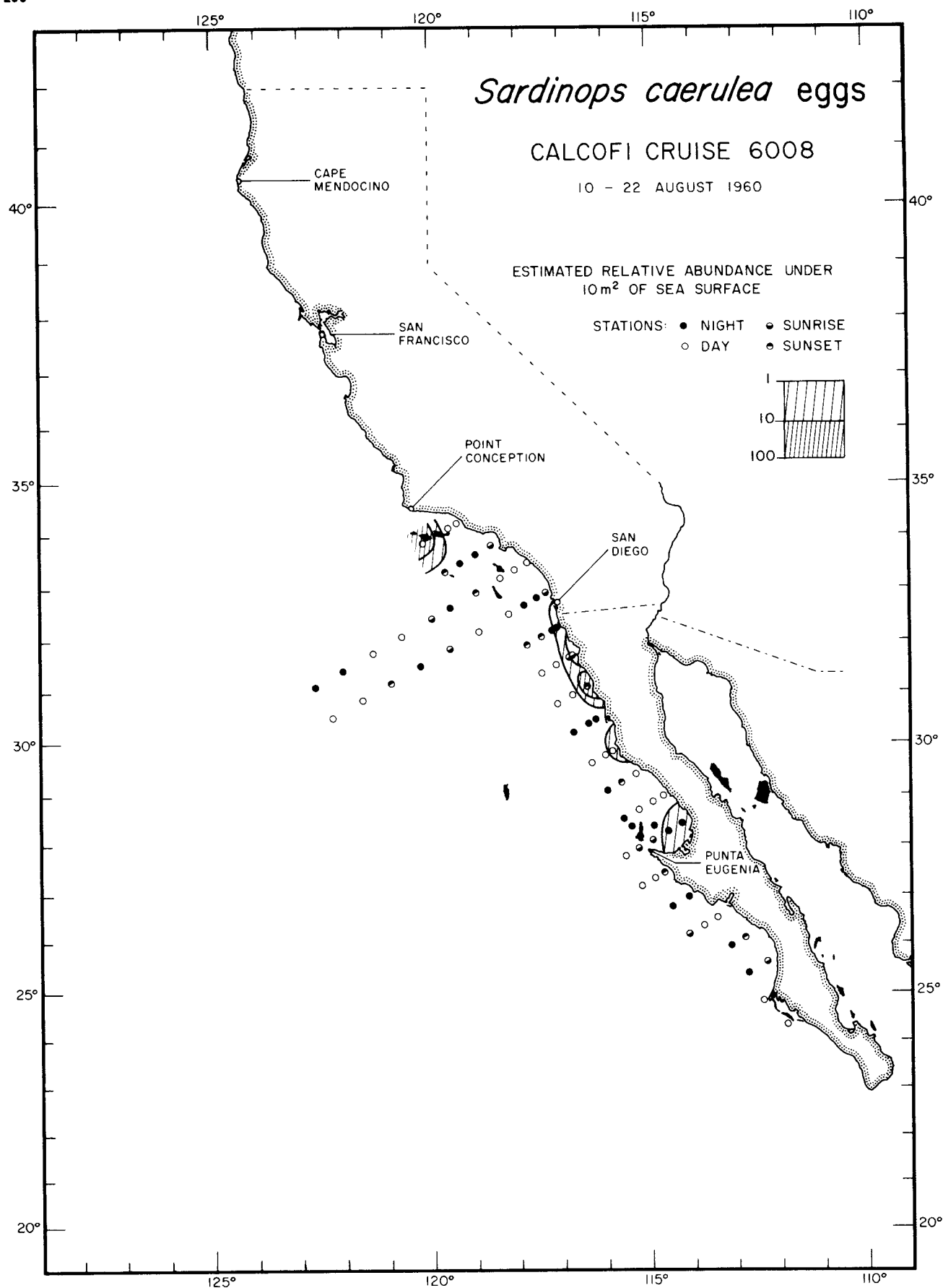
Sardinops caerulea eggs

5908

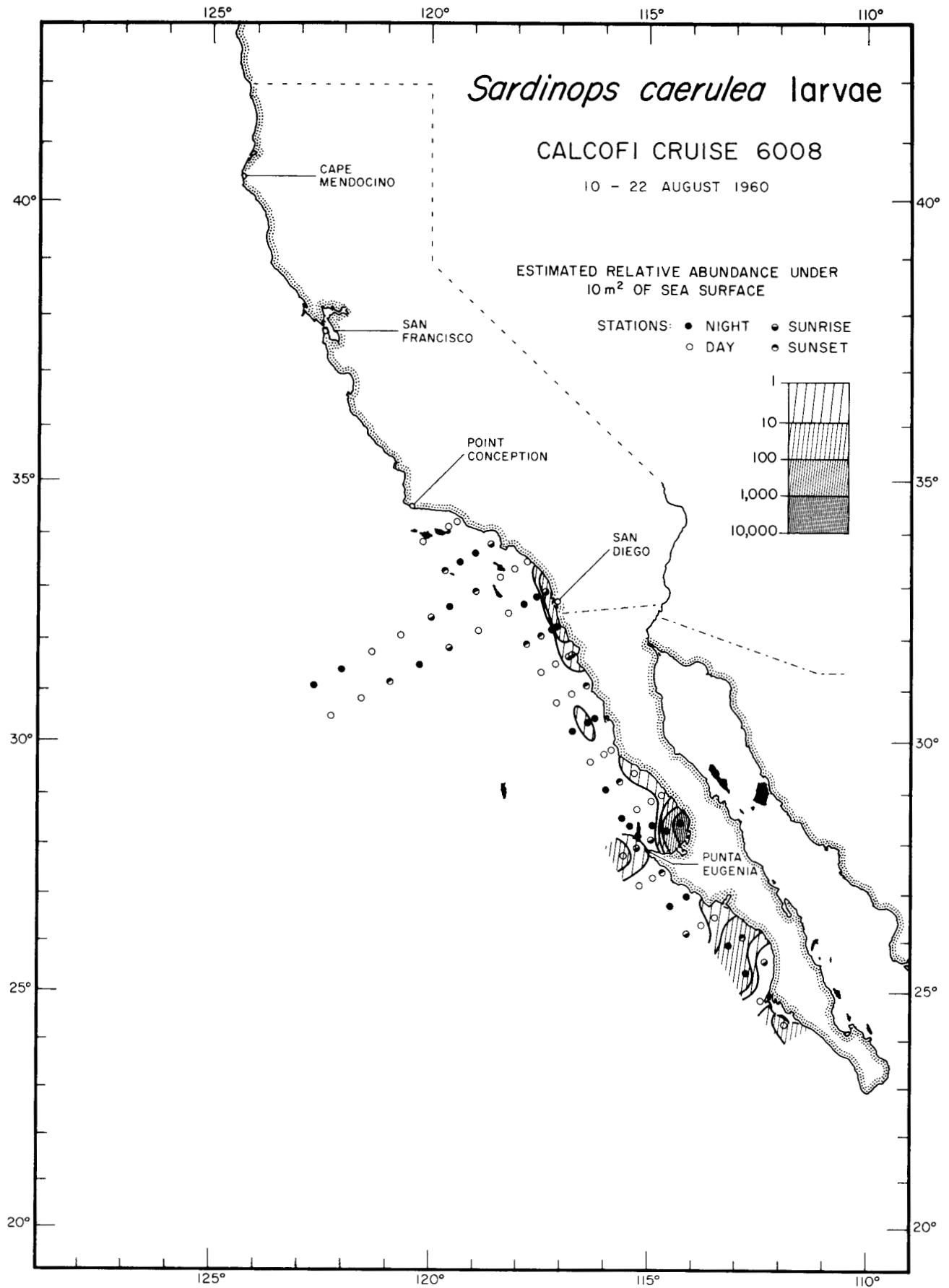


Sardinops caerulea larvae

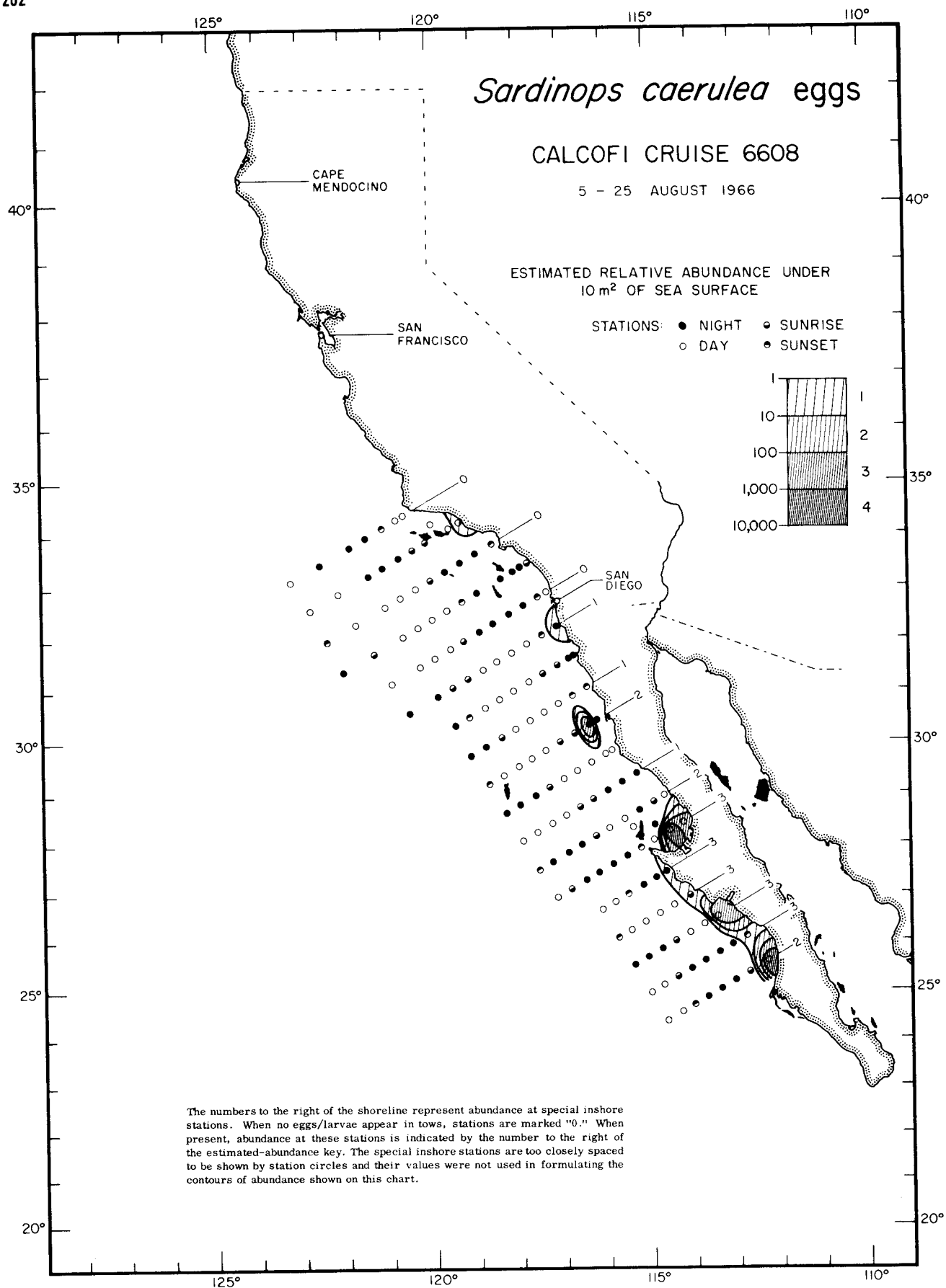
5908

*Sardinops caerulea* eggs

6008

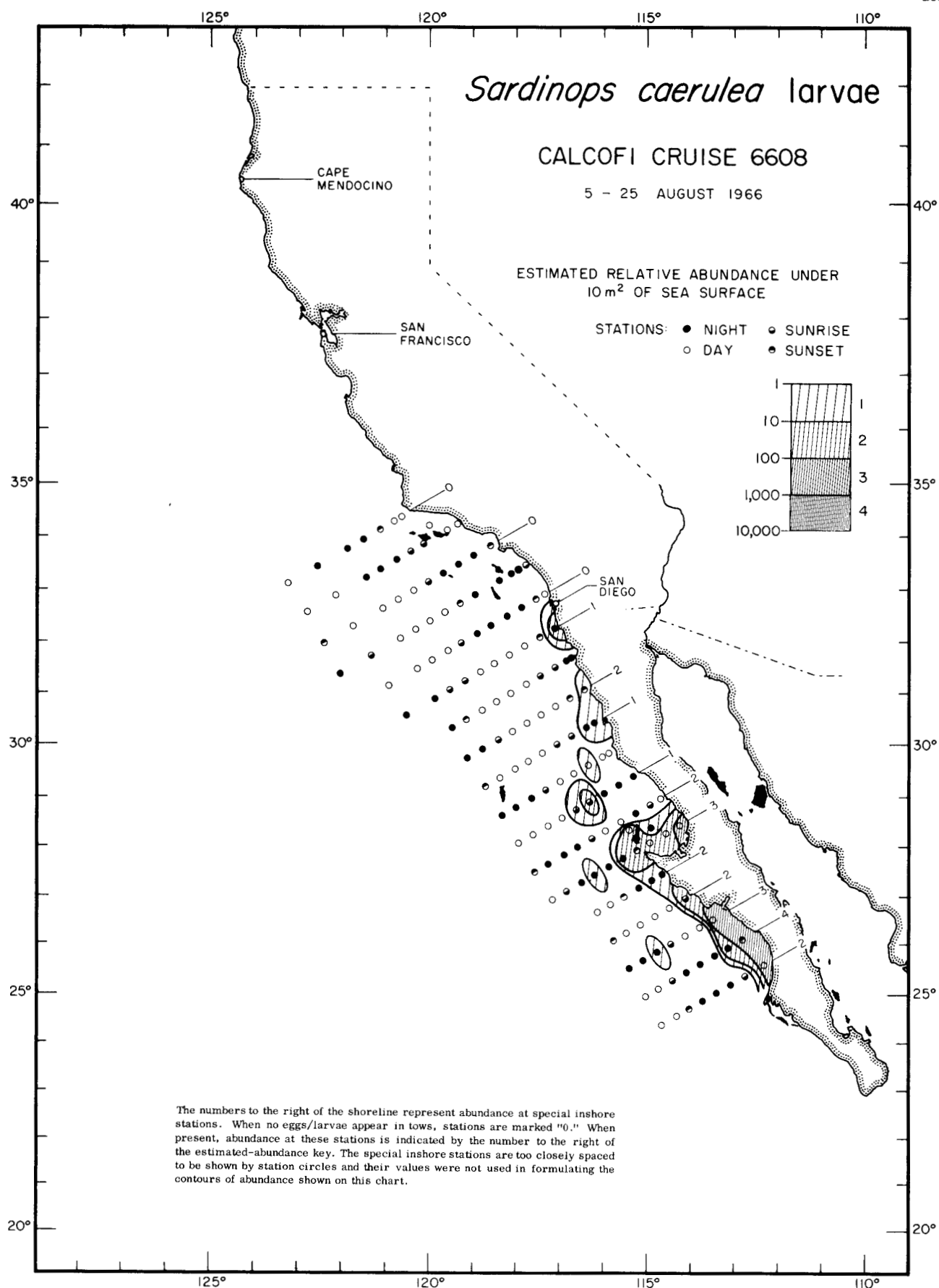
*Sardinops caerulea* larvae

6008



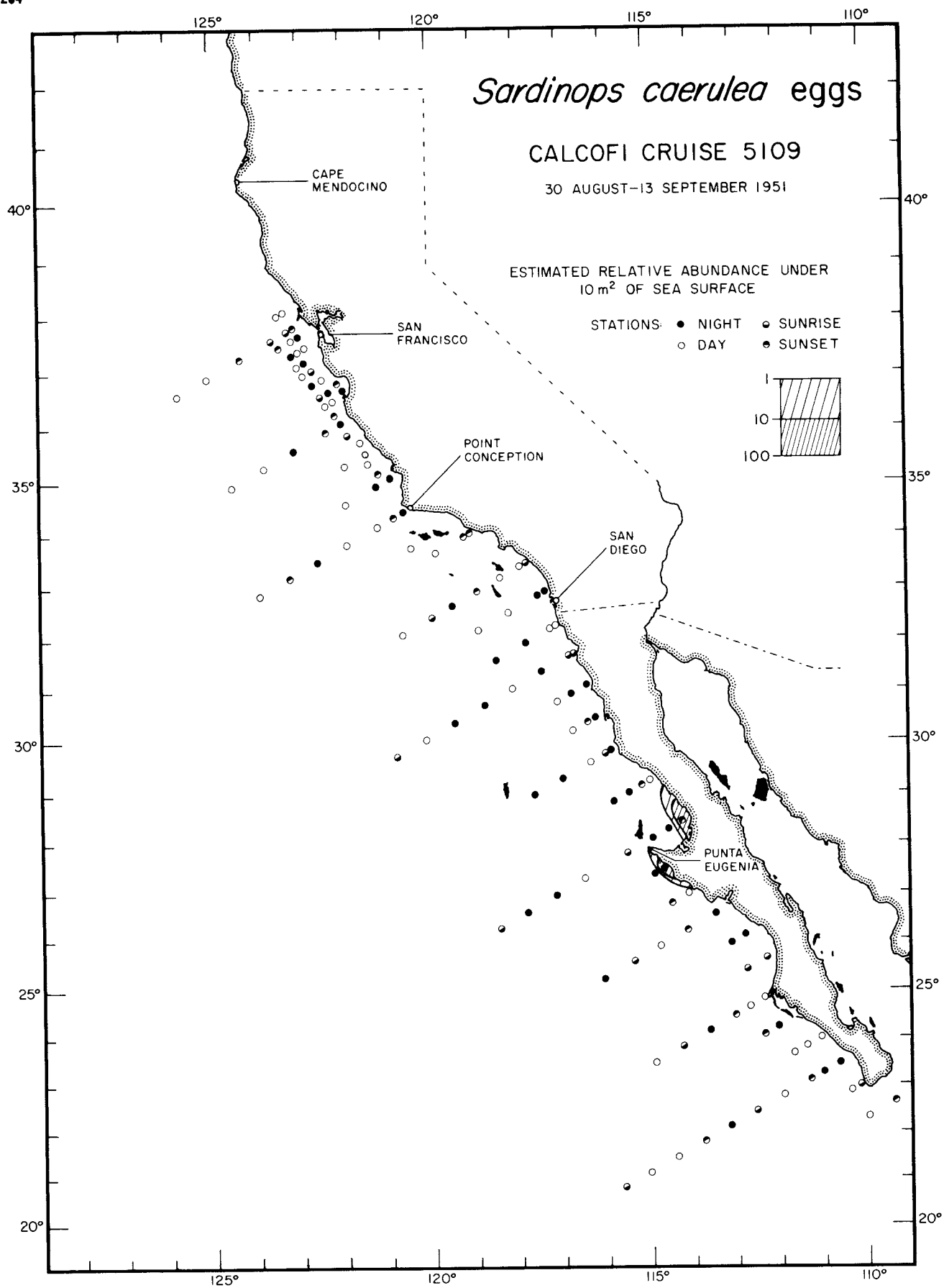
Sardinops caerulea eggs

6608



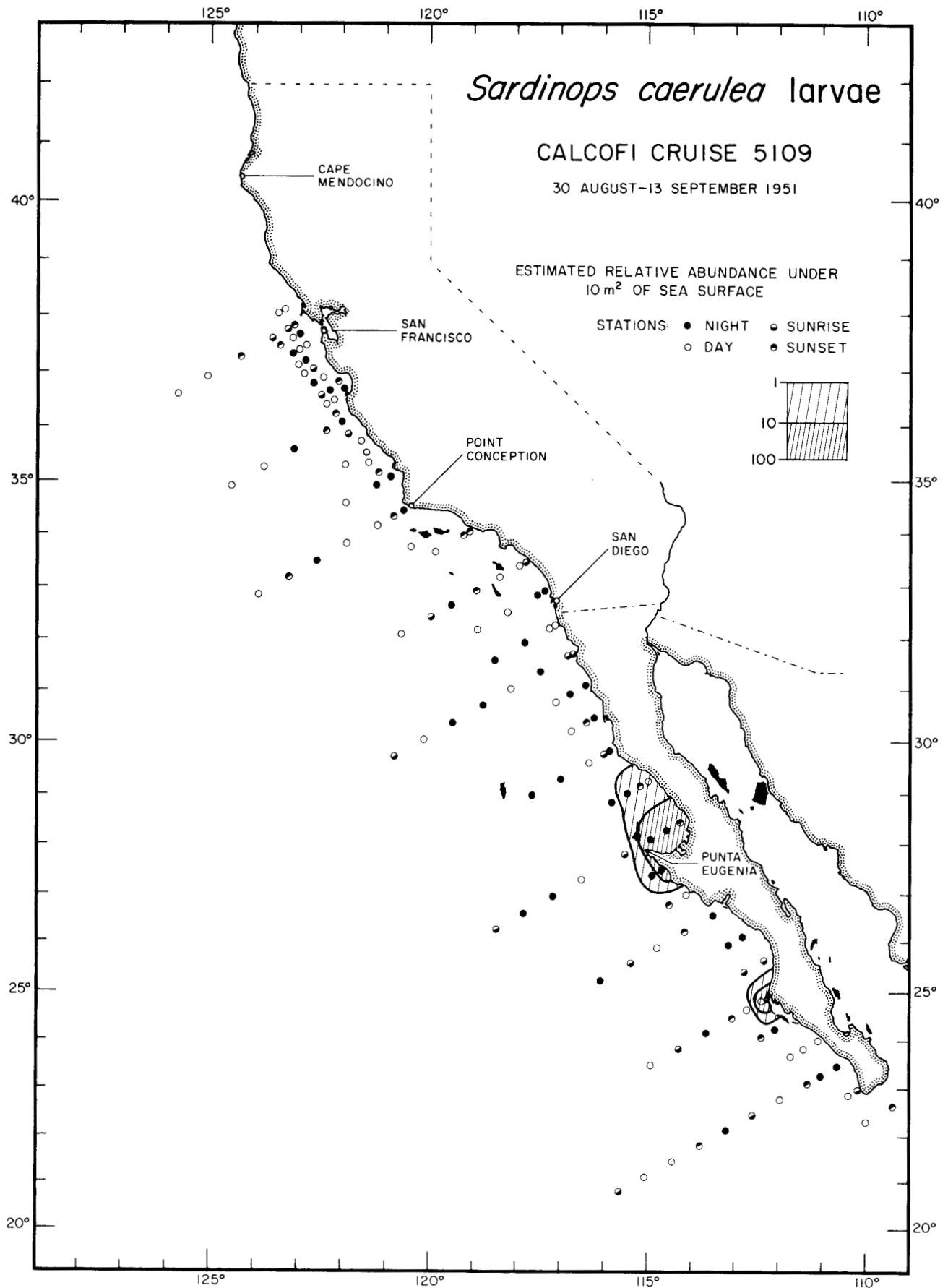
Sardinops caerulea larvae

6608



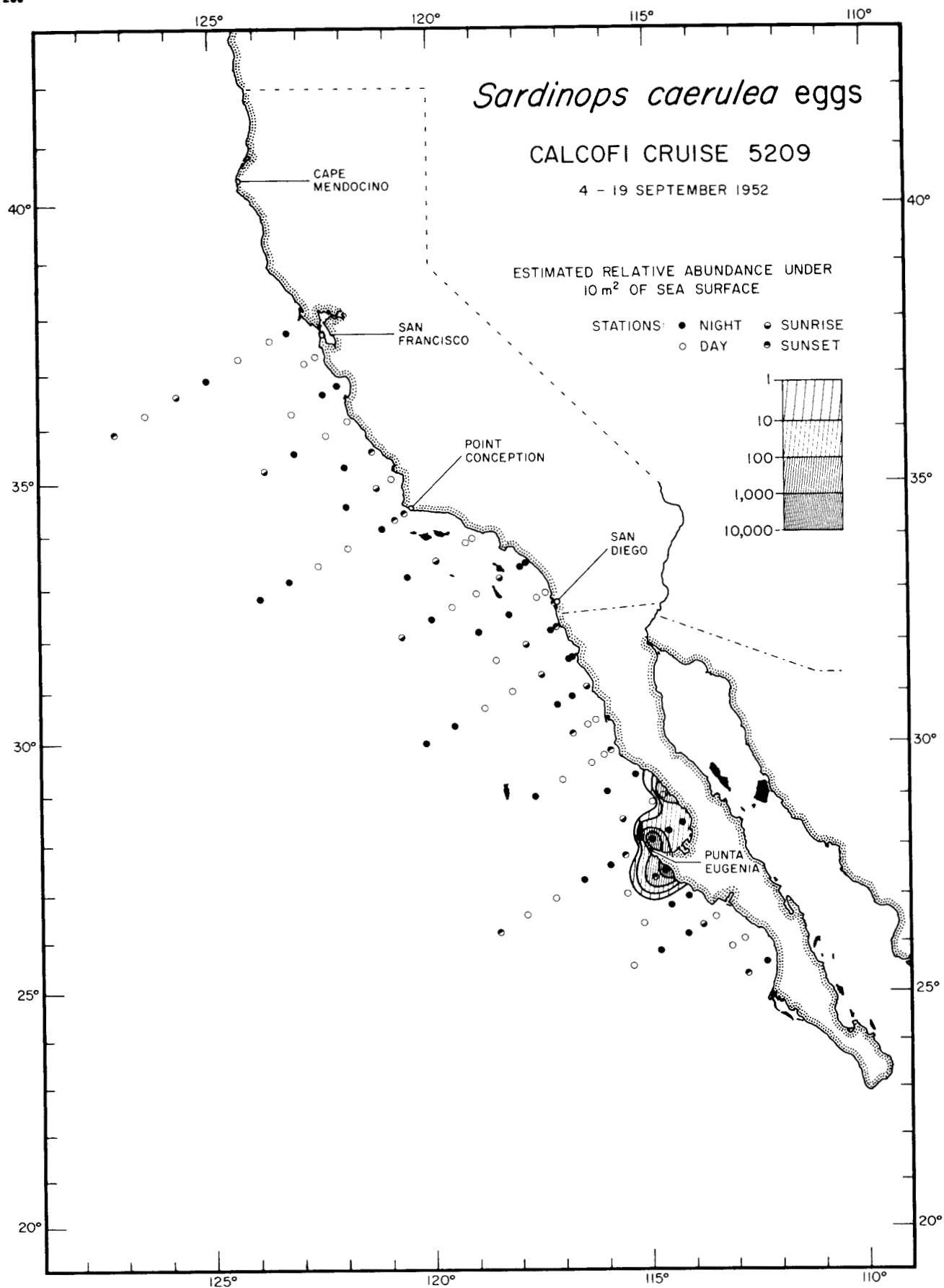
Sardinops caerulea eggs

5109



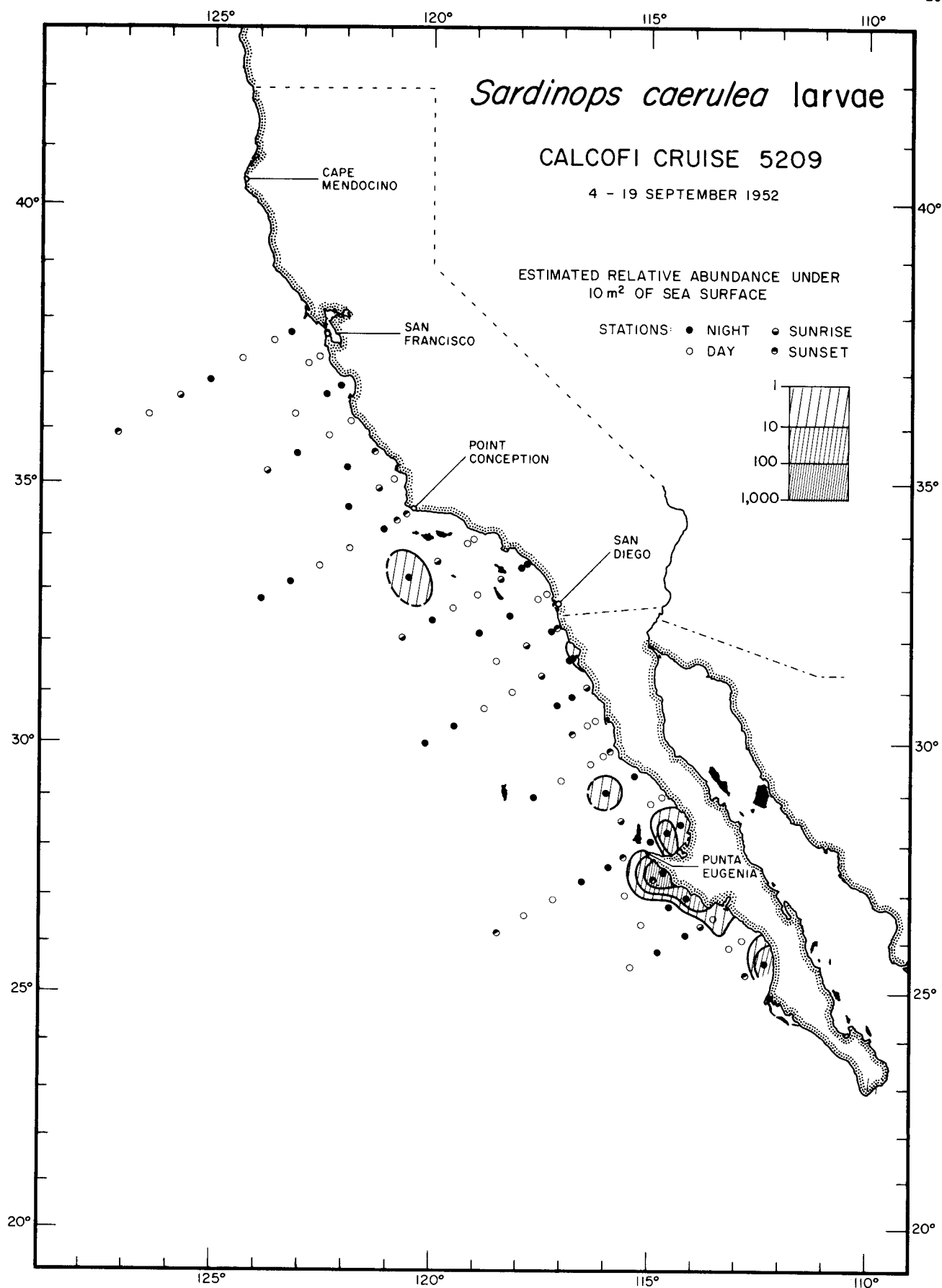
Sardinops caerulea larvae

5109



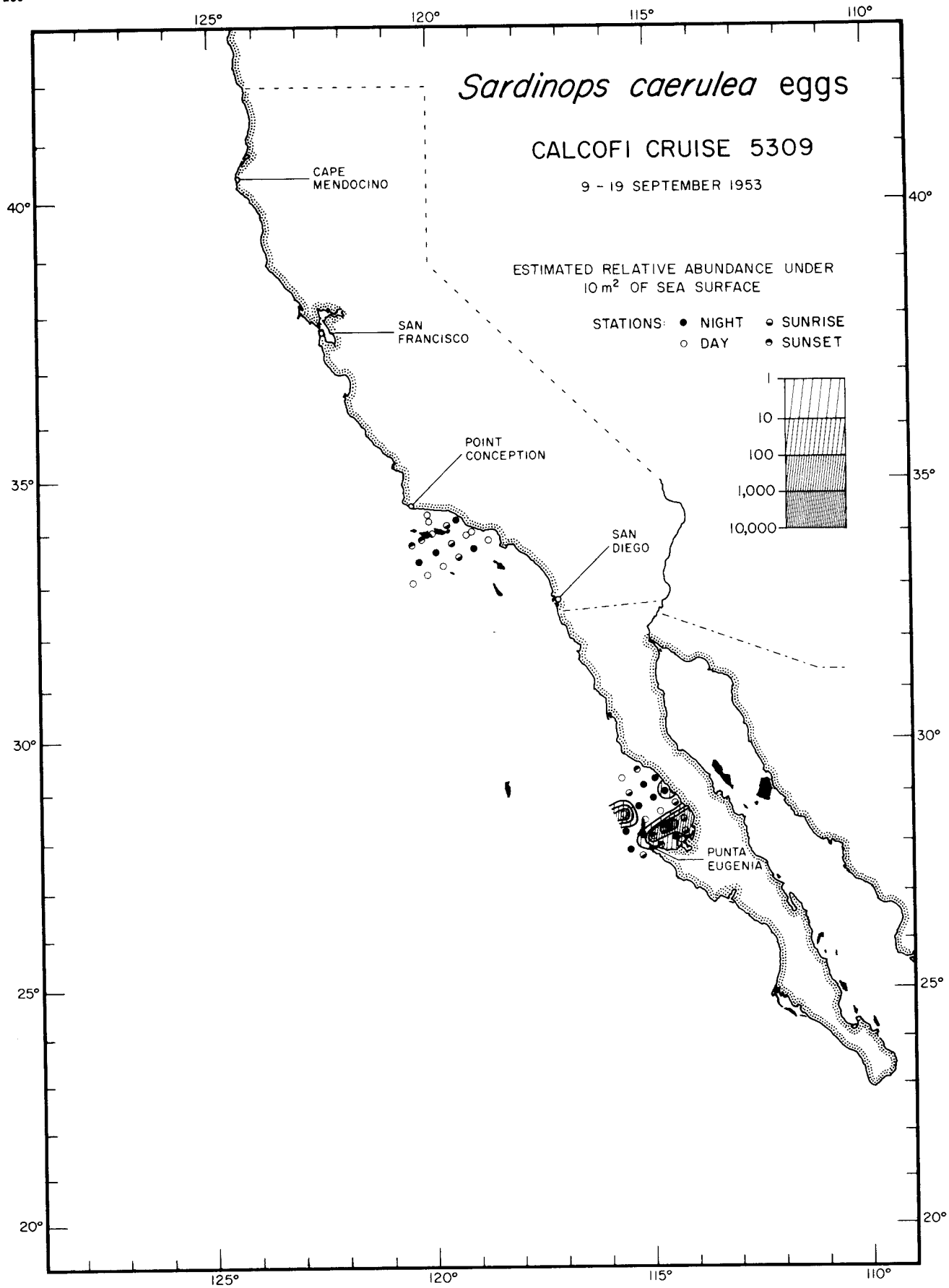
Sardinops caerulea eggs

5209



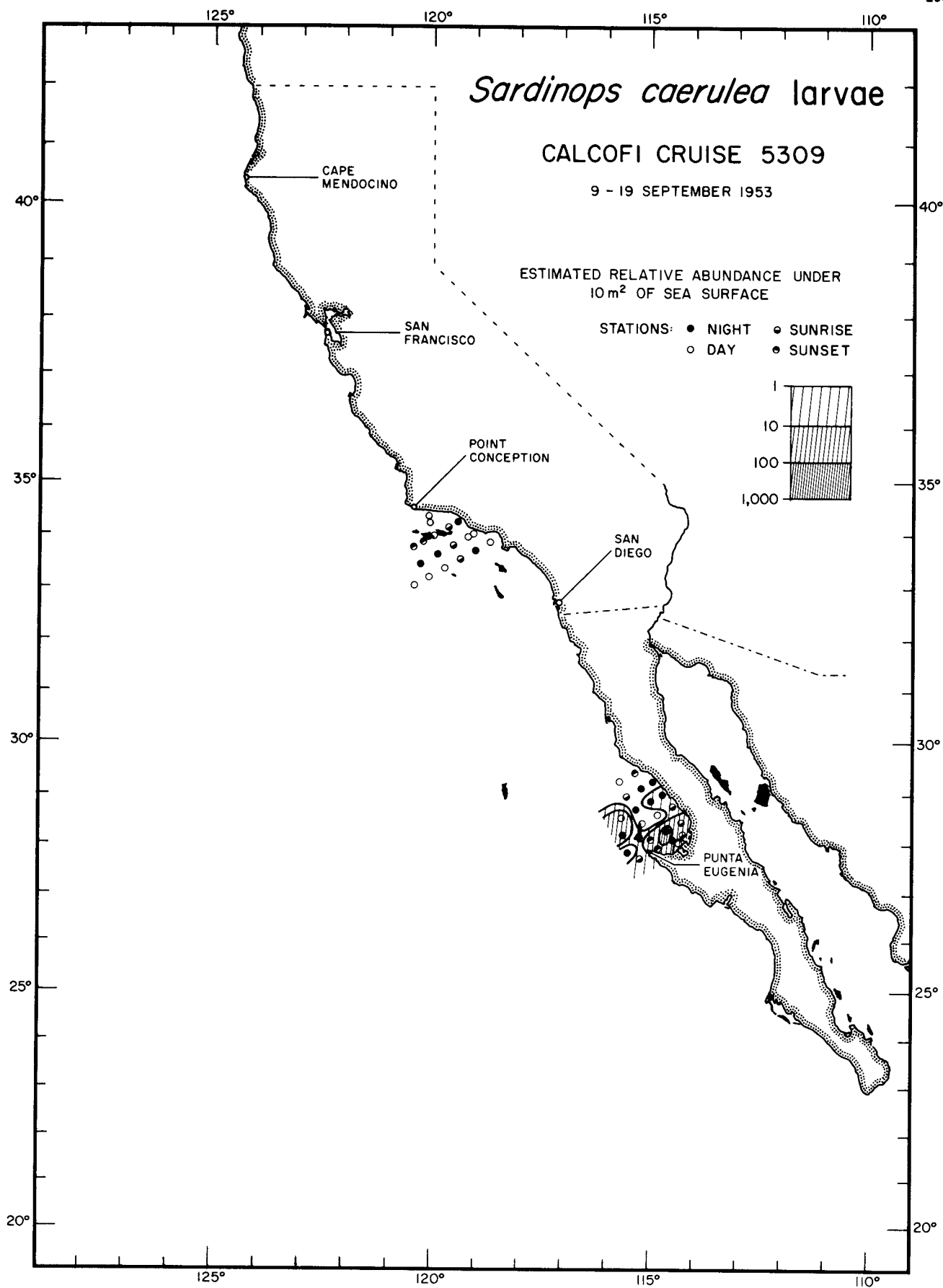
Sardinops caerulea larvae

5209

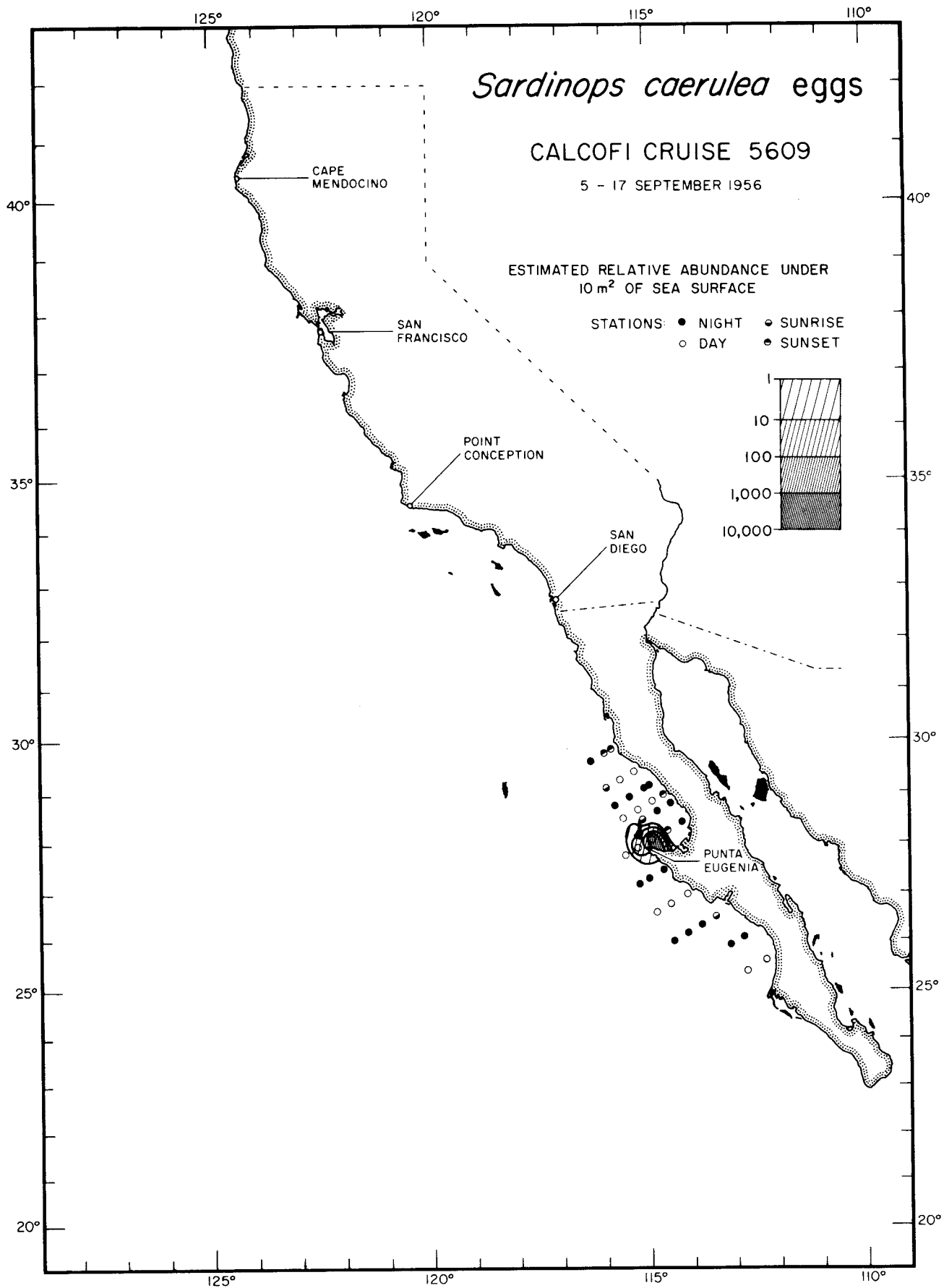


Sardinops caerulea eggs

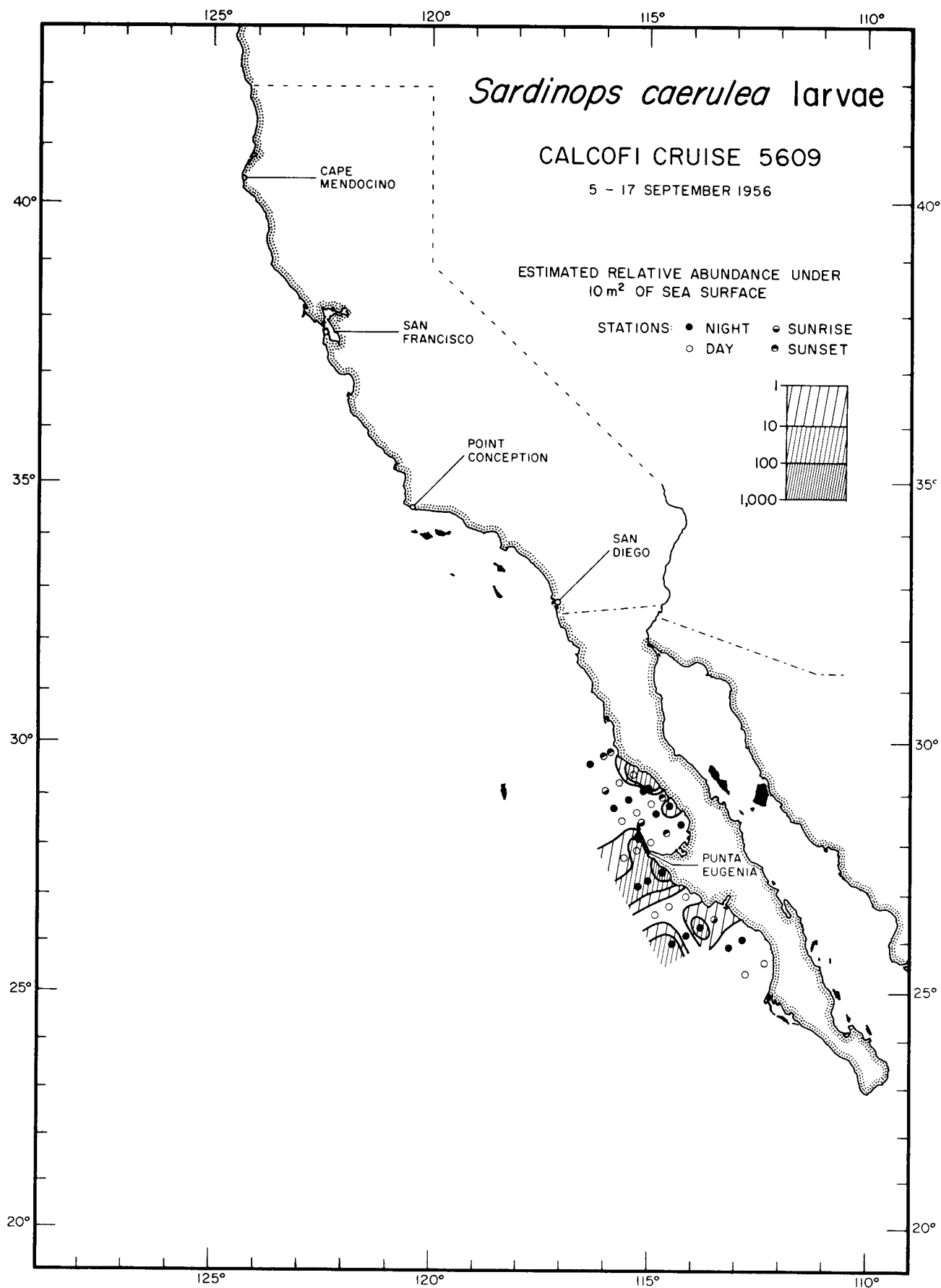
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*Sardinops caerulea* larvae

5309

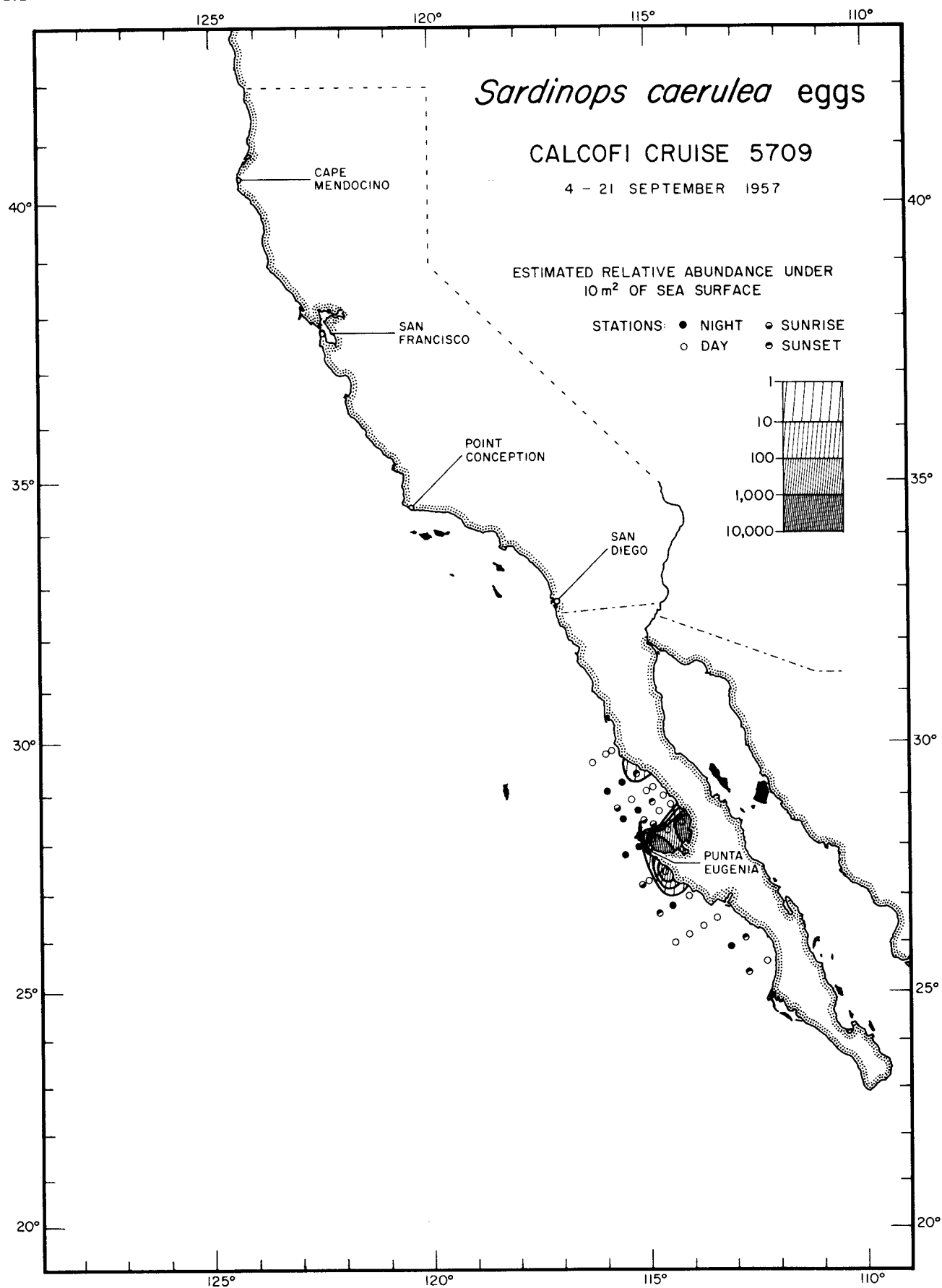
*Sardinops caerulea* eggs

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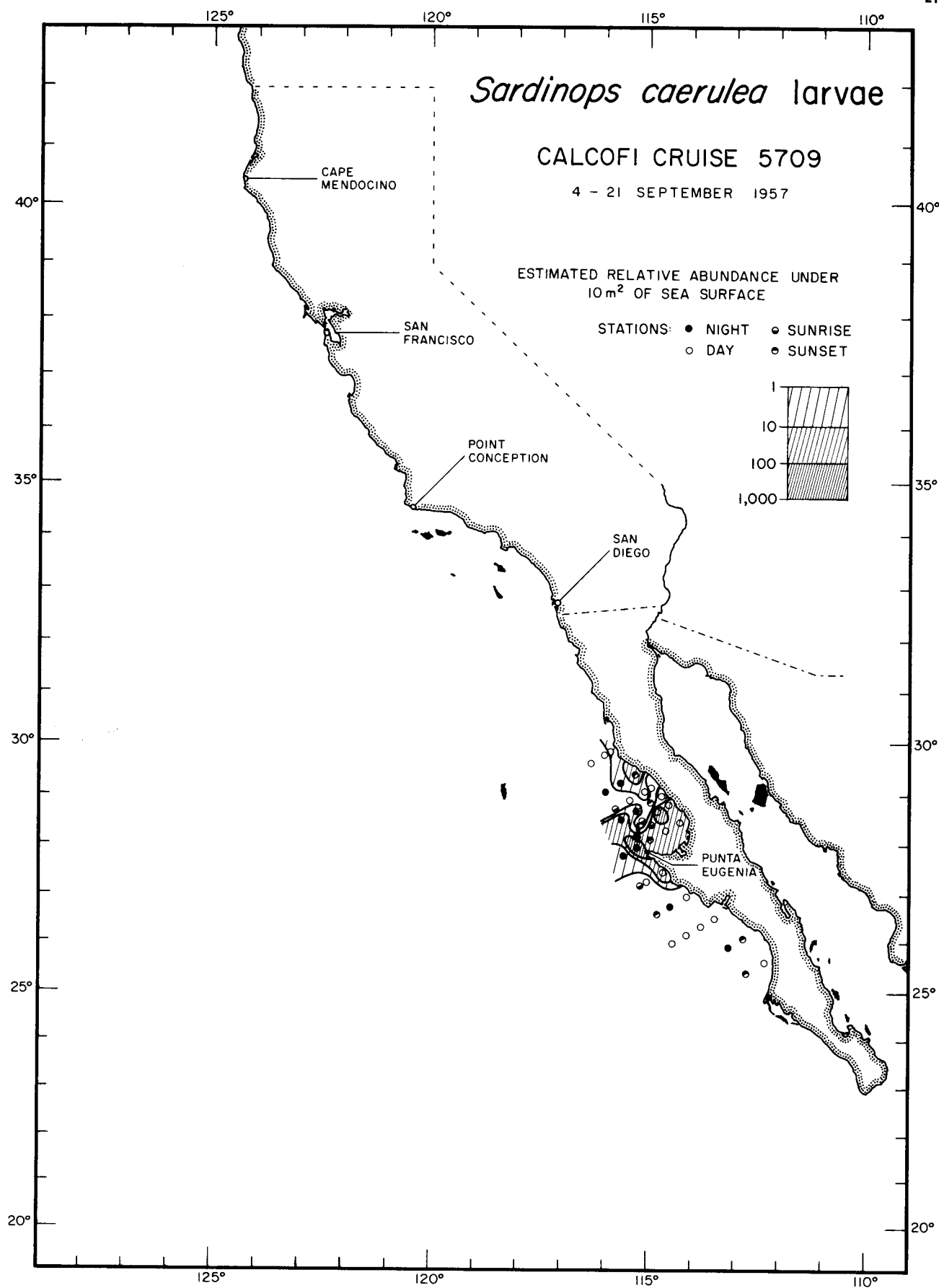
Sardinops caerulea larvae

5609



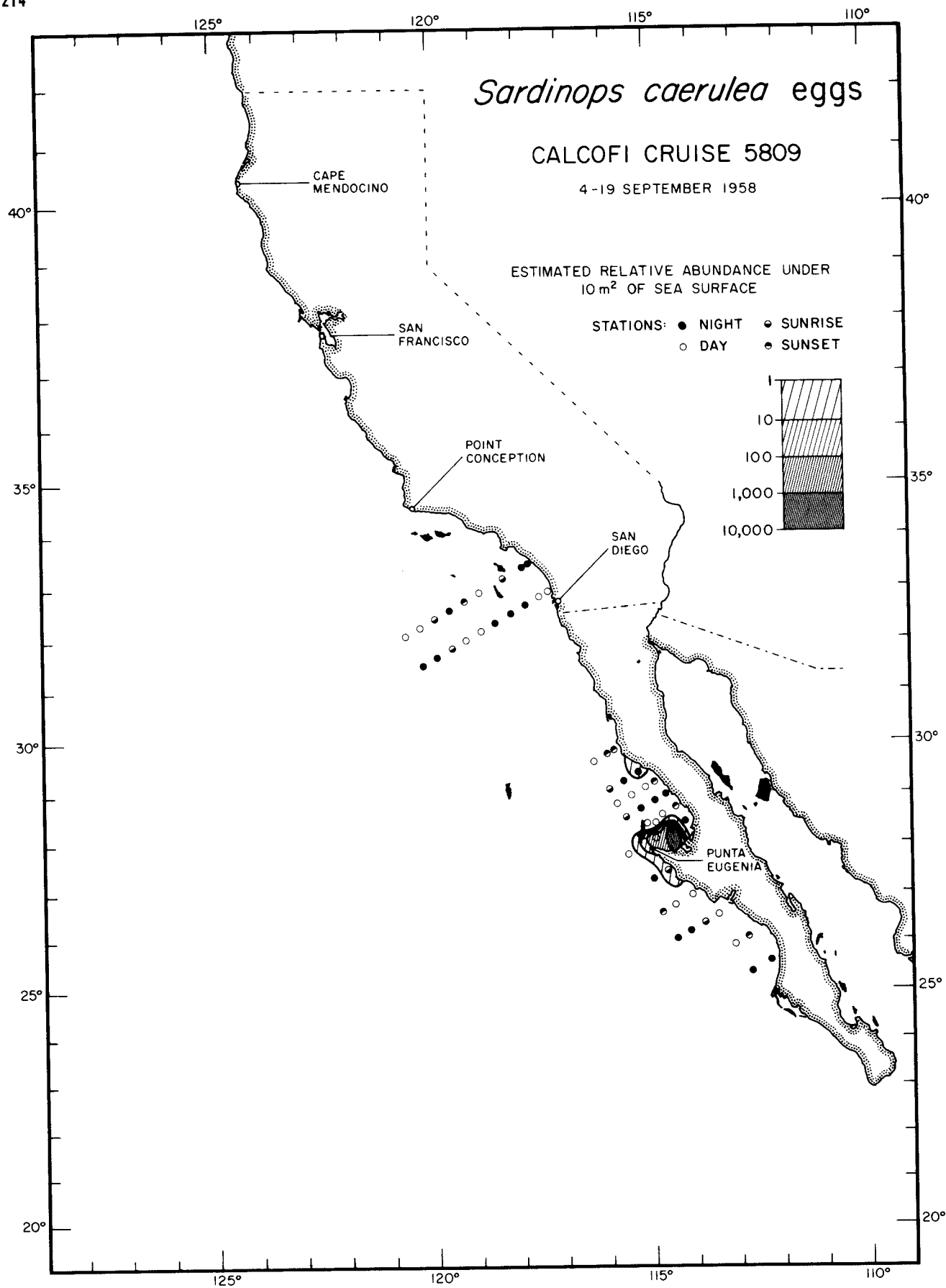
Sardinops caerulea eggs

5709

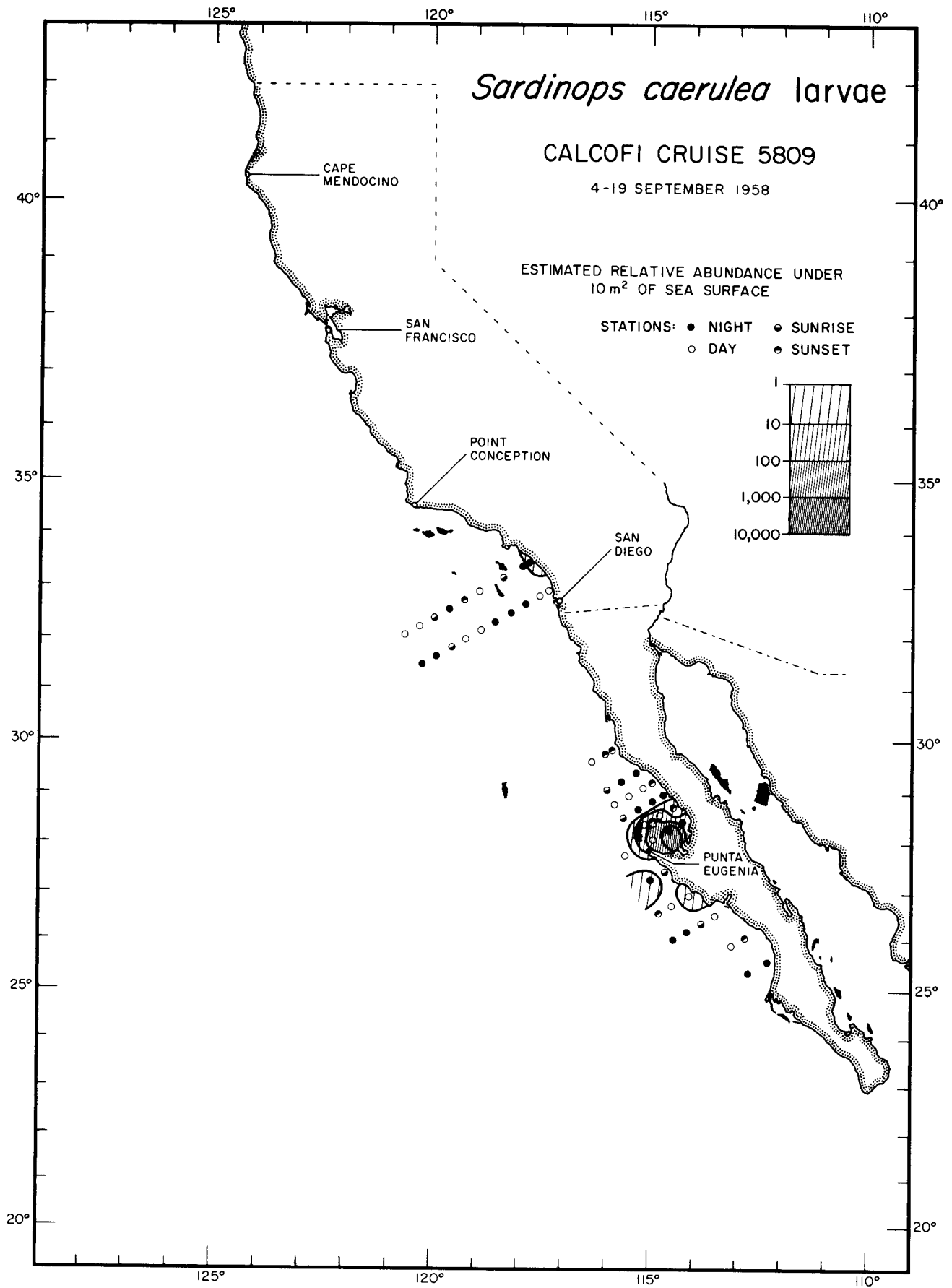


Sardinops caerulea larvae

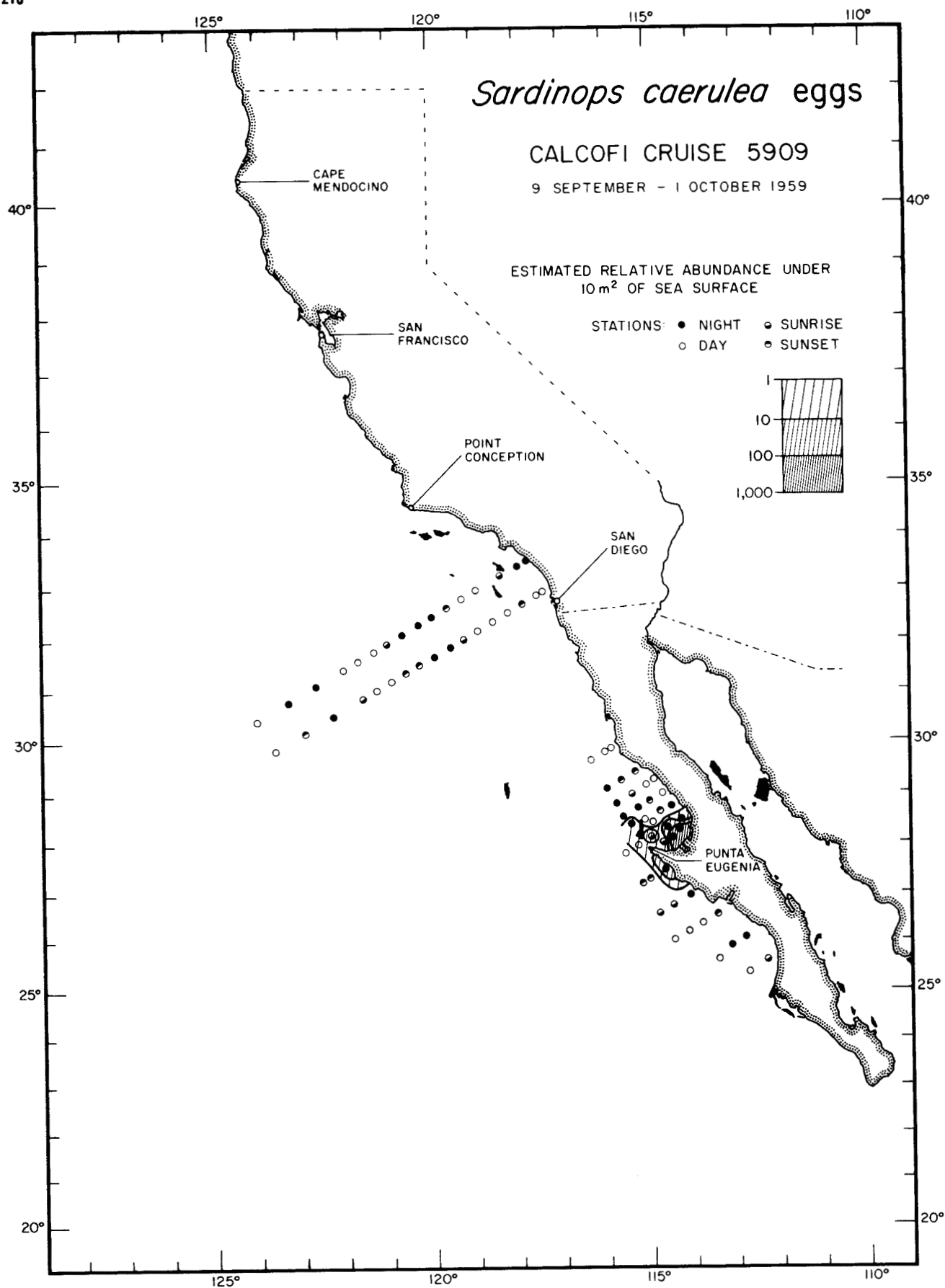
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*Sardinops caerulea* eggs

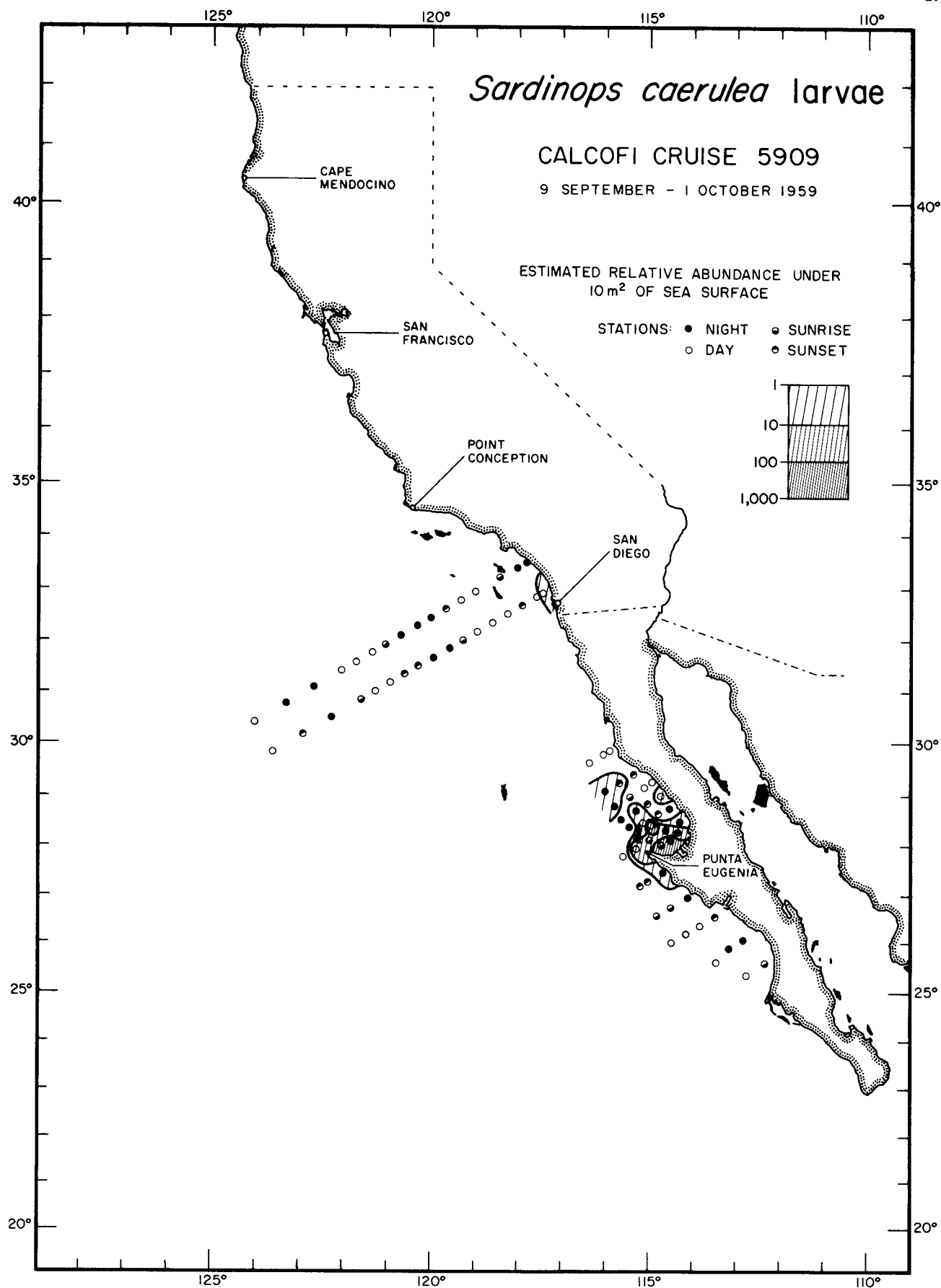
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*Sardinops caerulea* larvae

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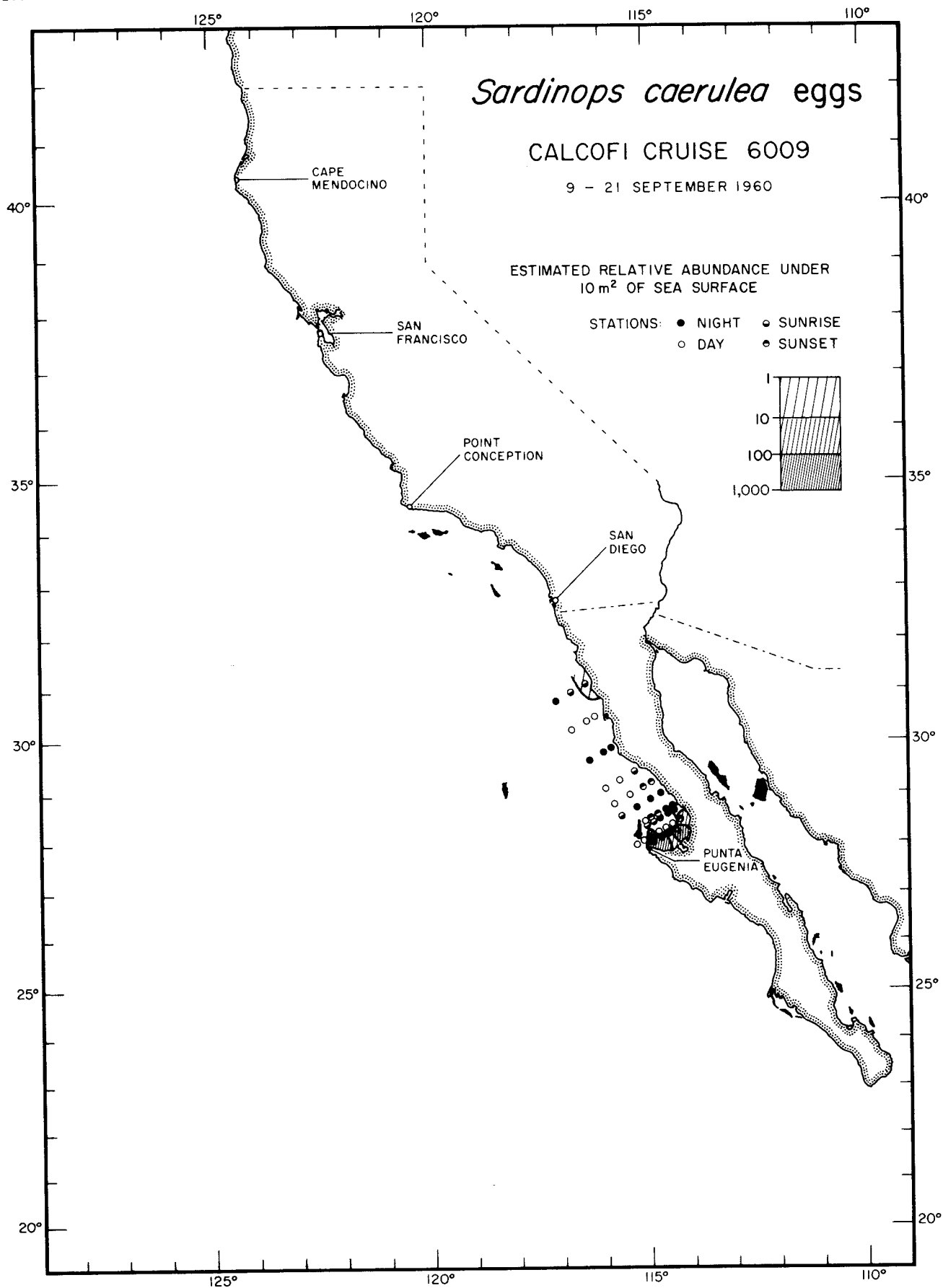
*Sardinops caerulea* eggs

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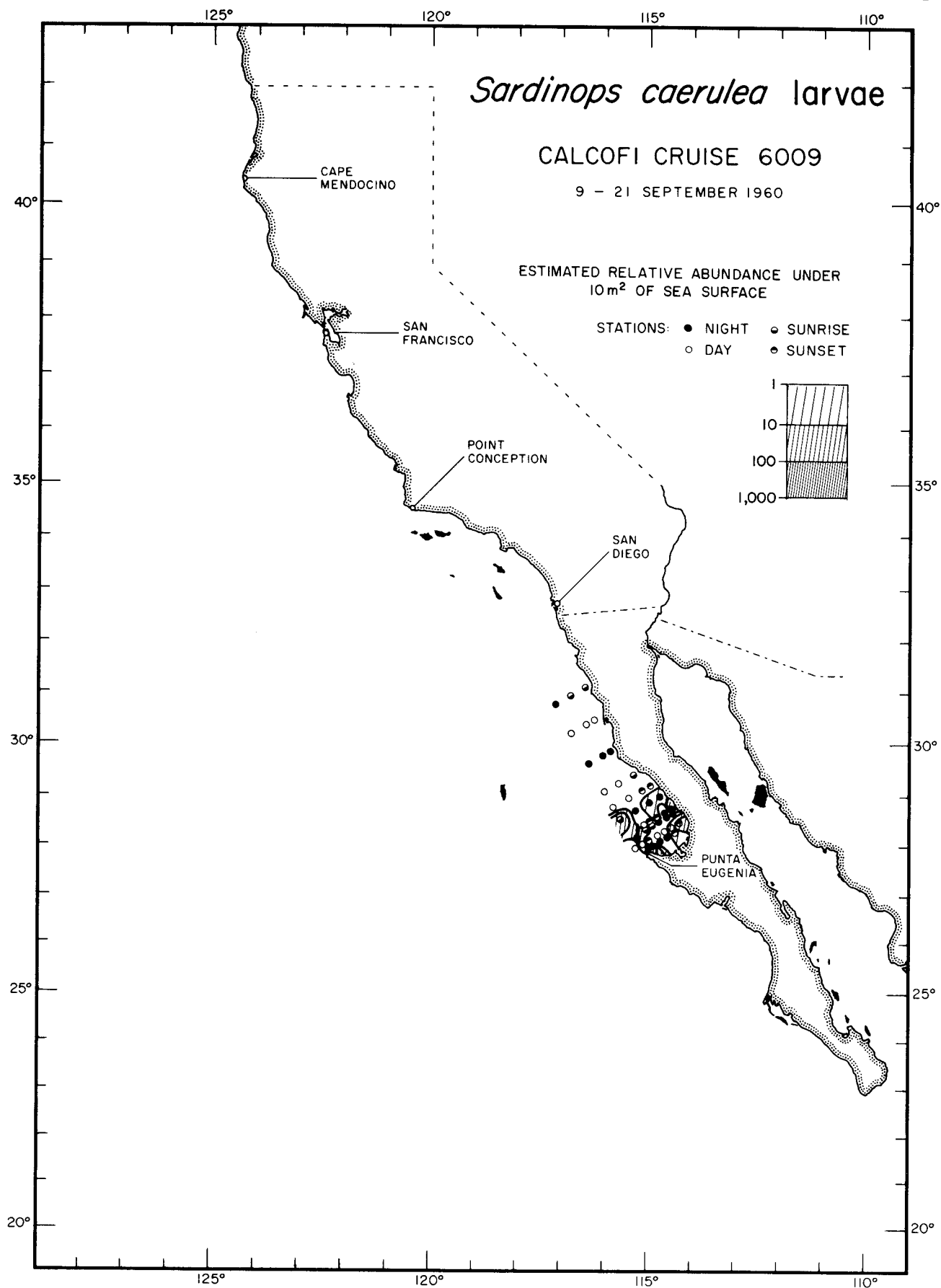


Sardinops caerulea larvae

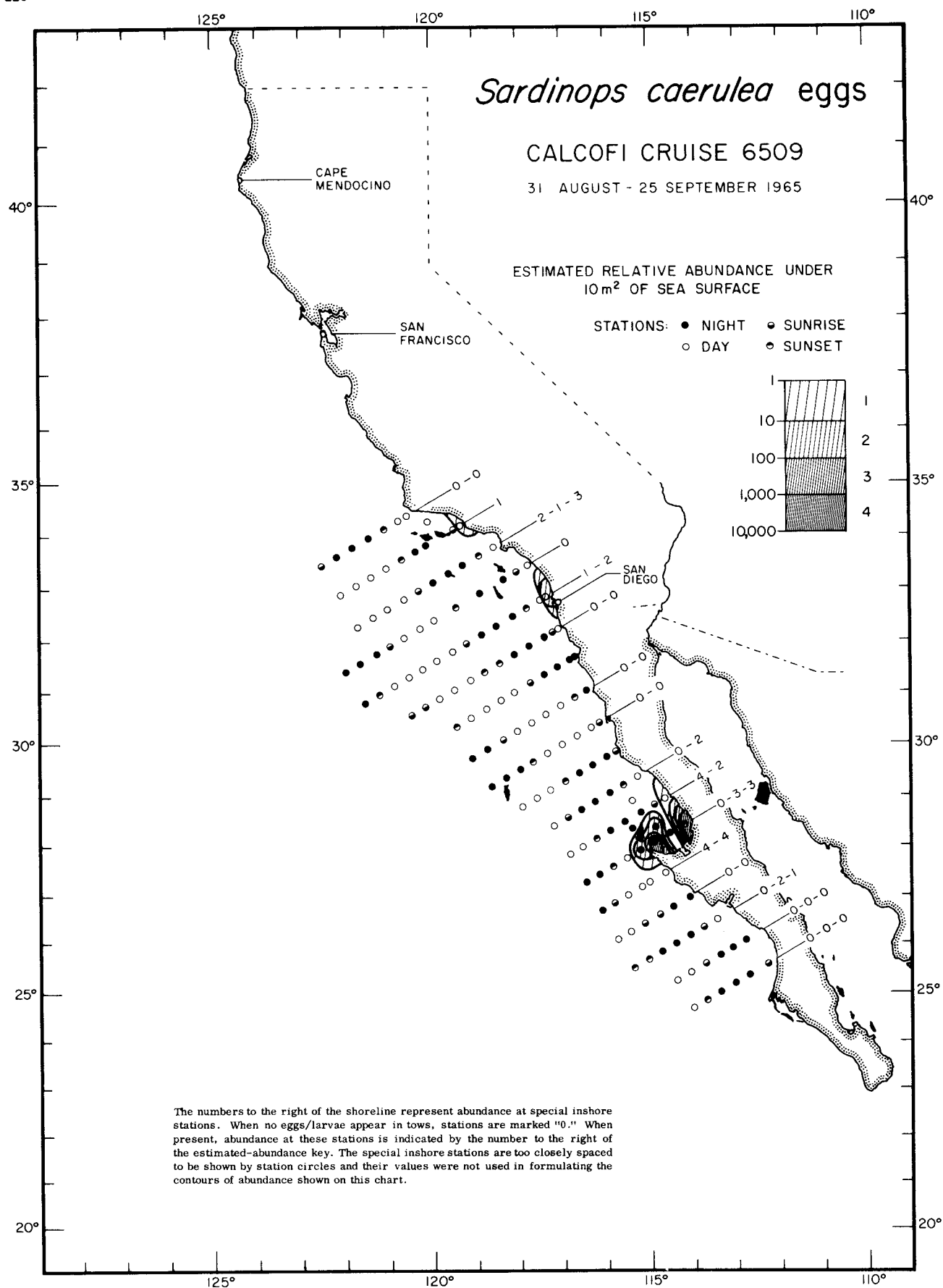
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*Sardinops caerulea* eggs

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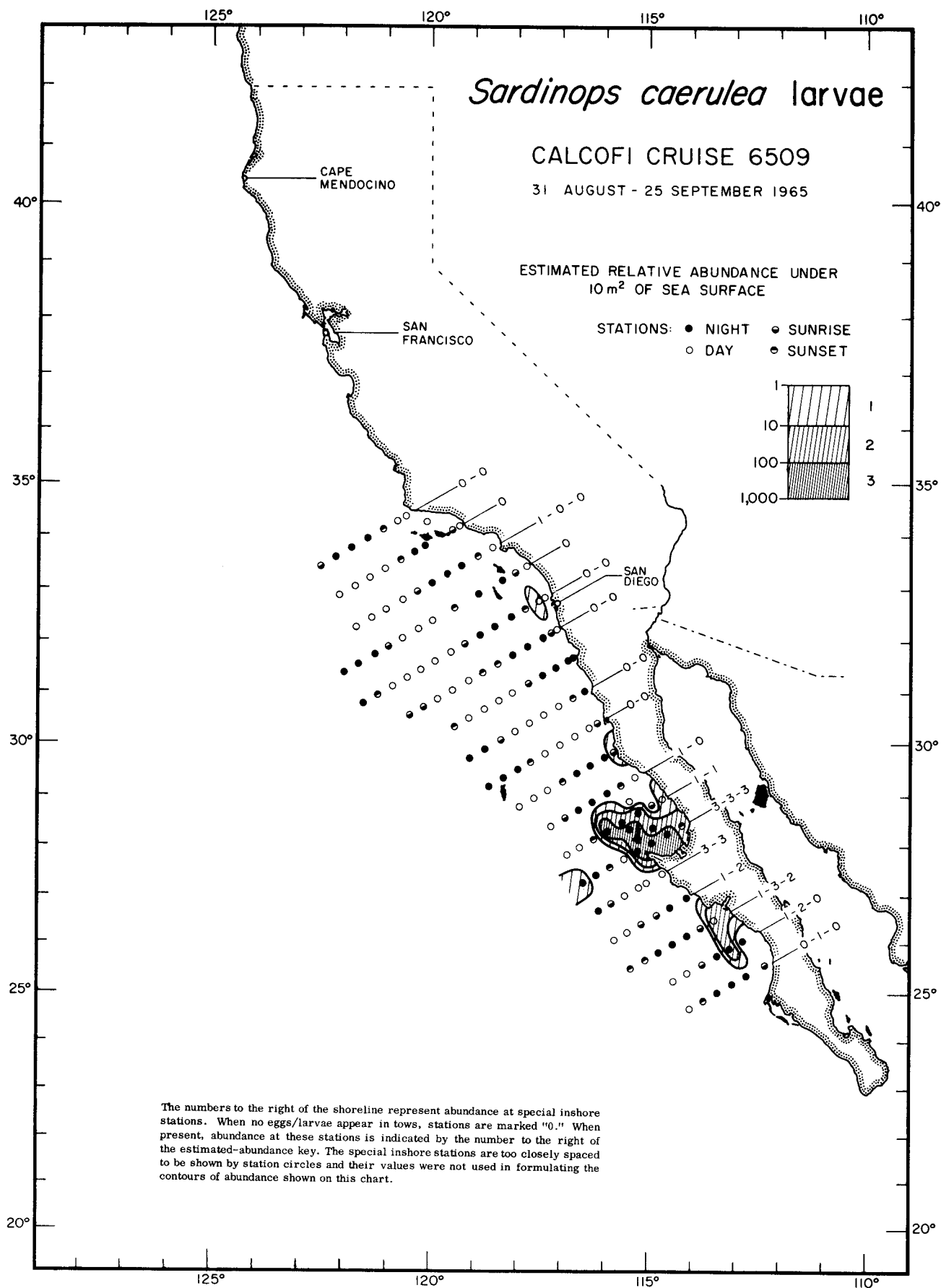
*Sardinops caerulea* larvae

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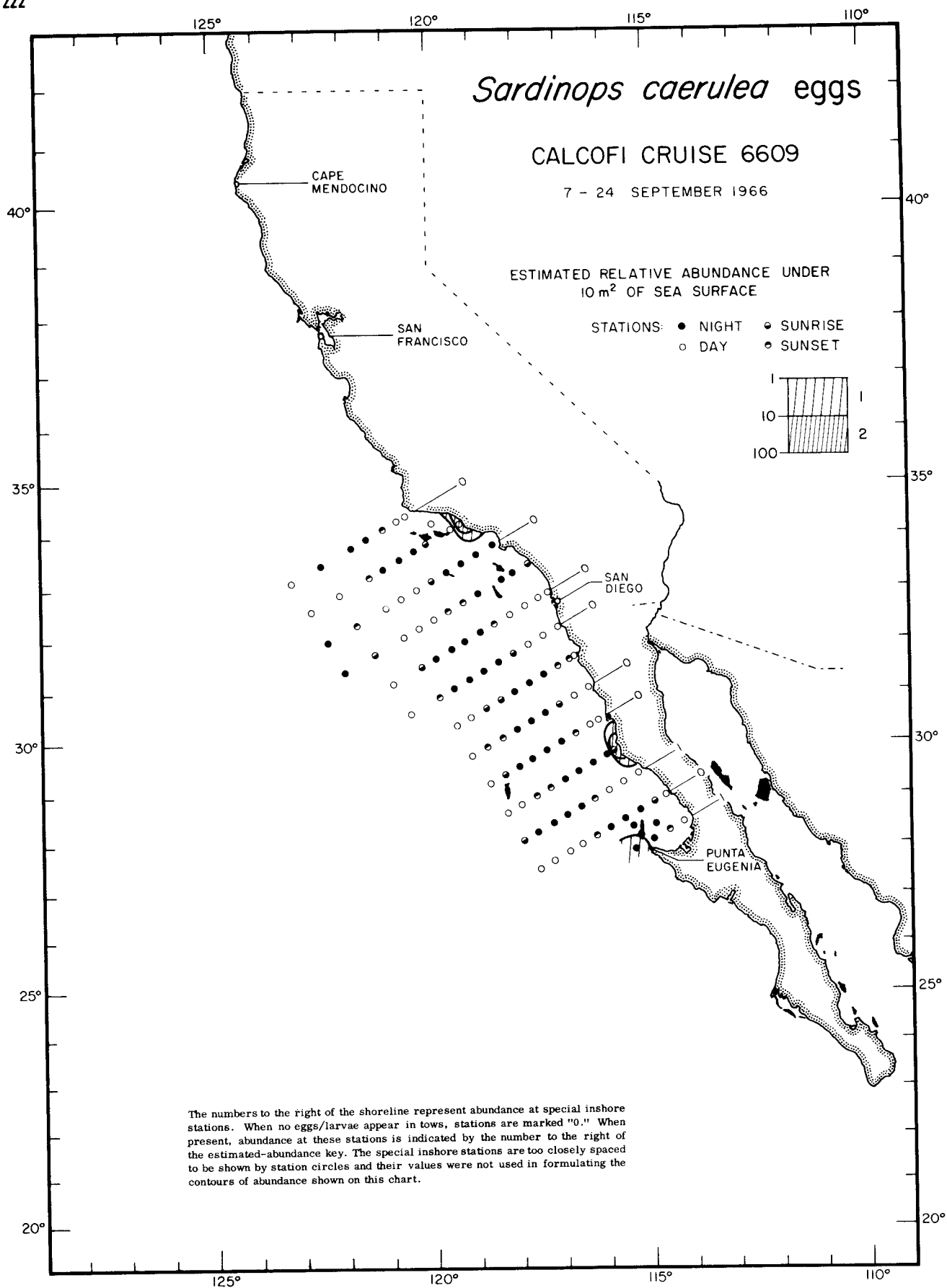
Sardinops caerulea eggs

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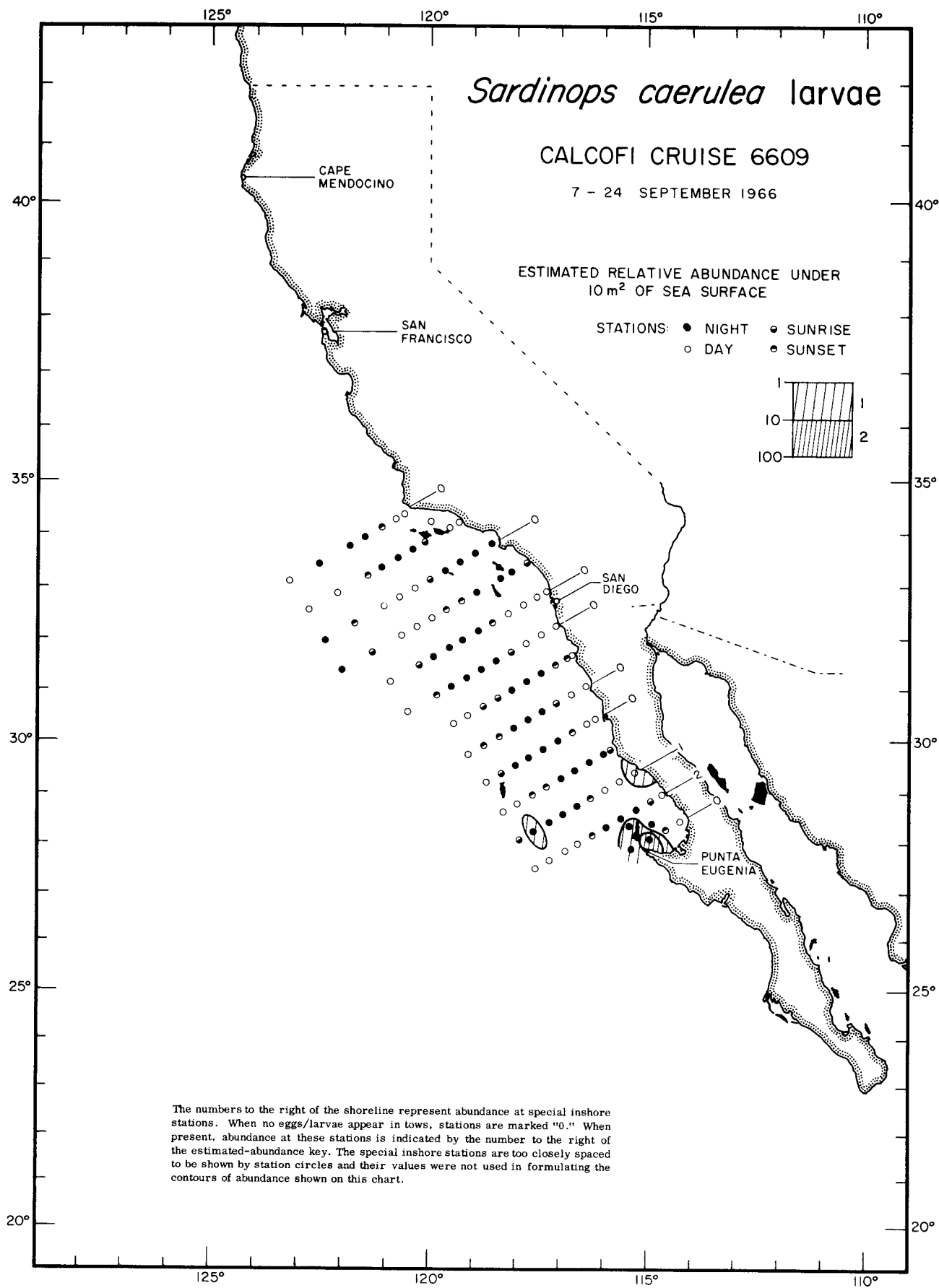


Sardinops caerulea larvae

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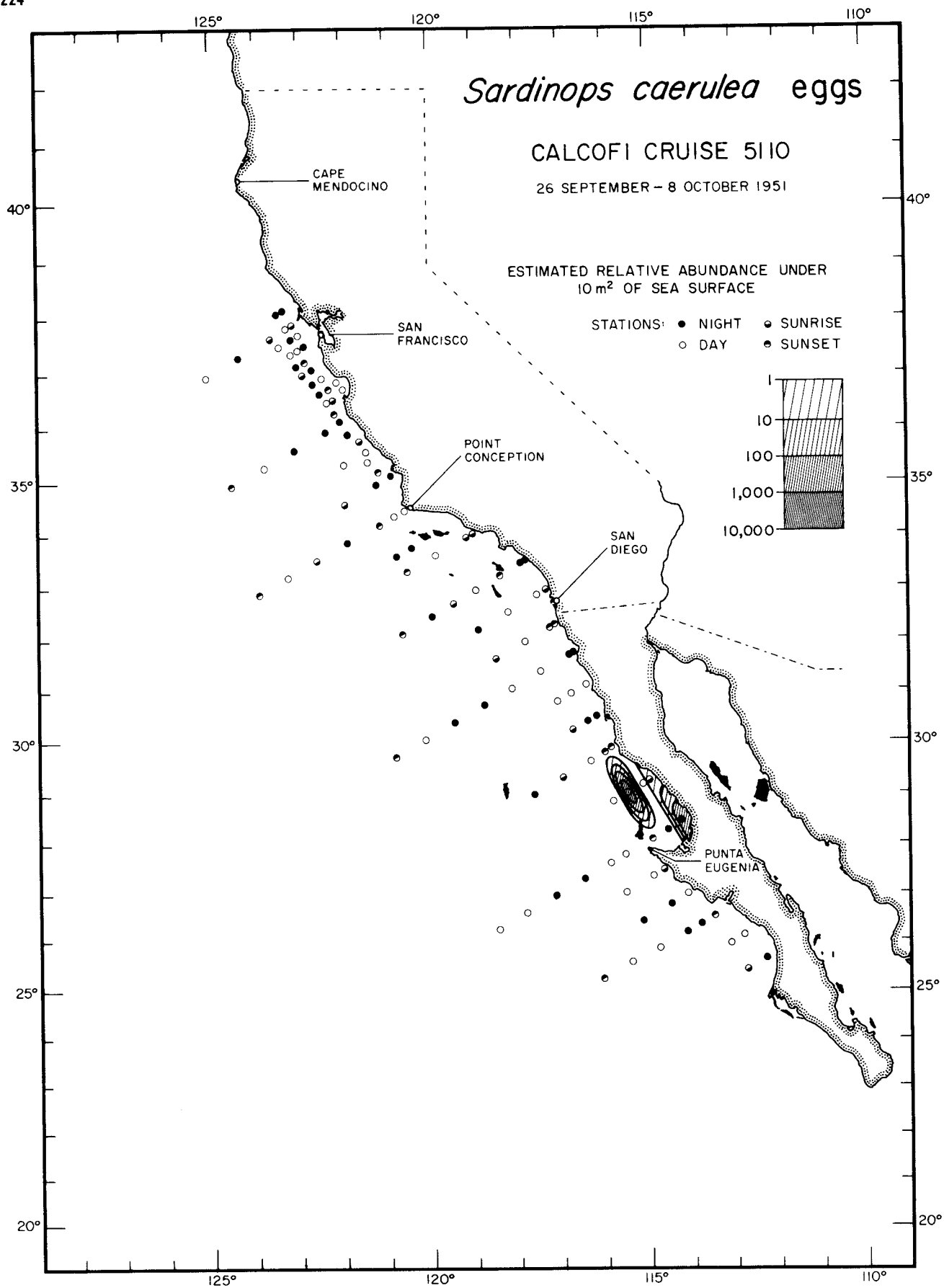
*Sardinops caerulea* eggs

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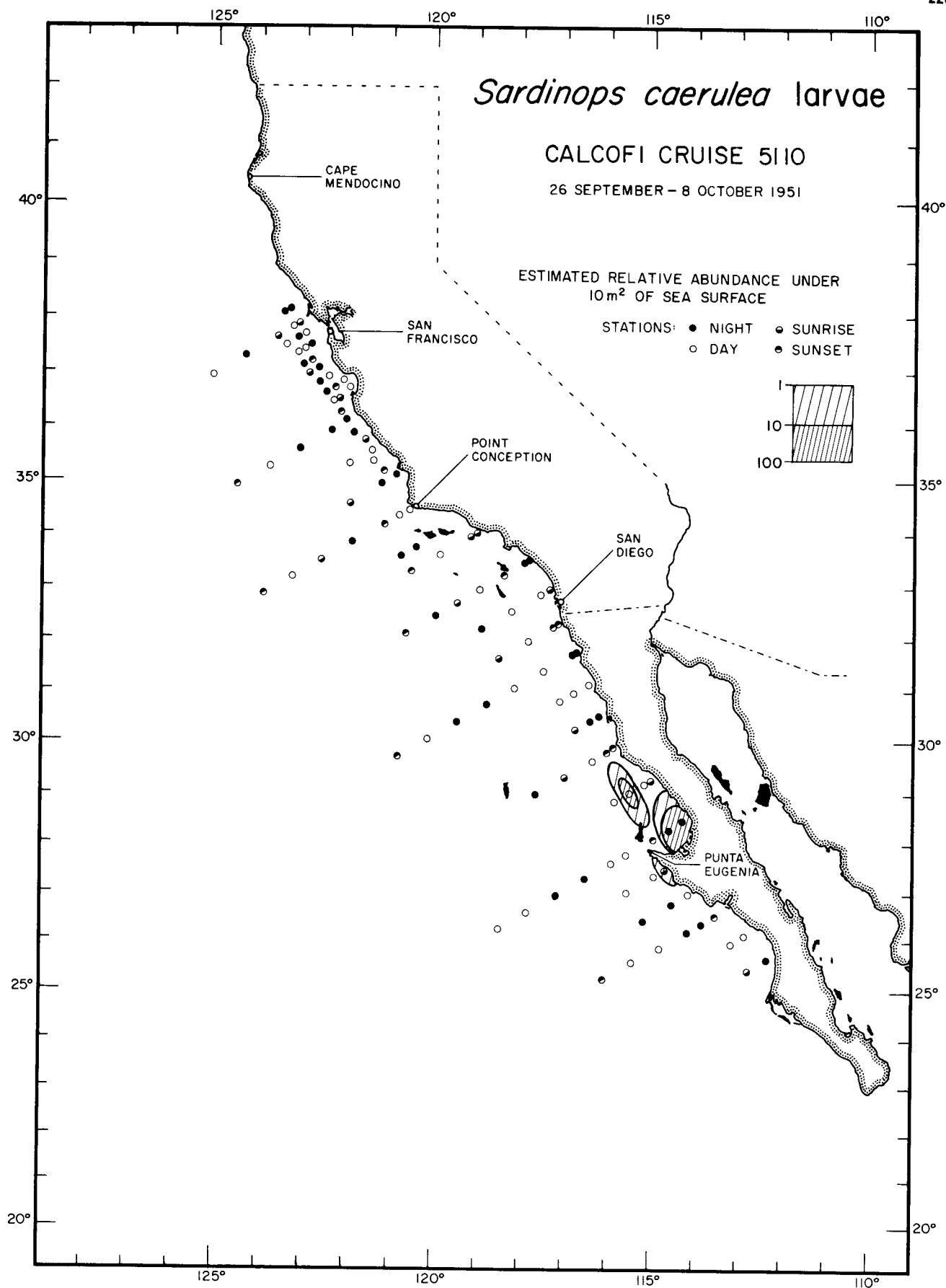
Sardinops caerulea larvae

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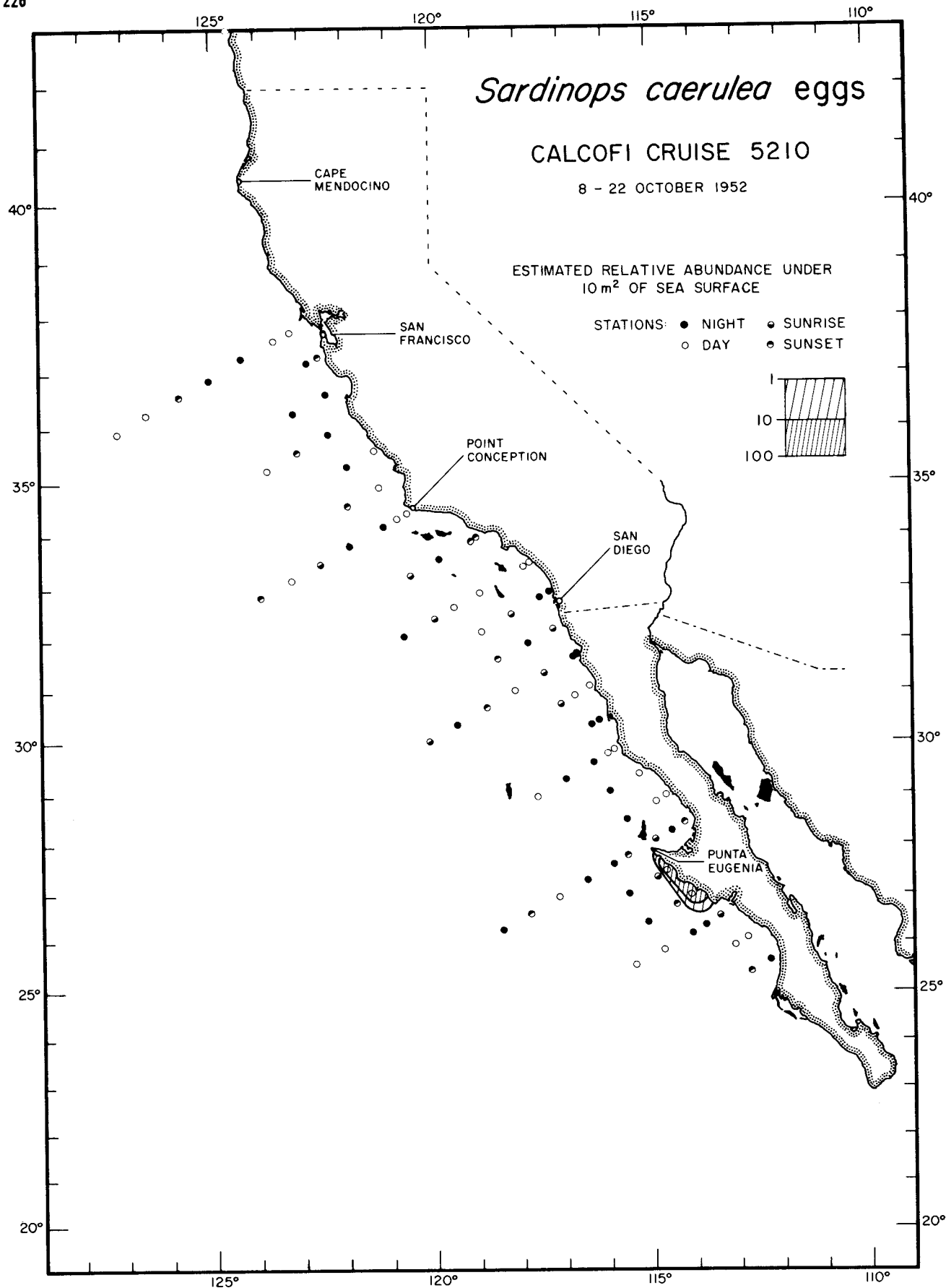


Sardinops caerulea eggs

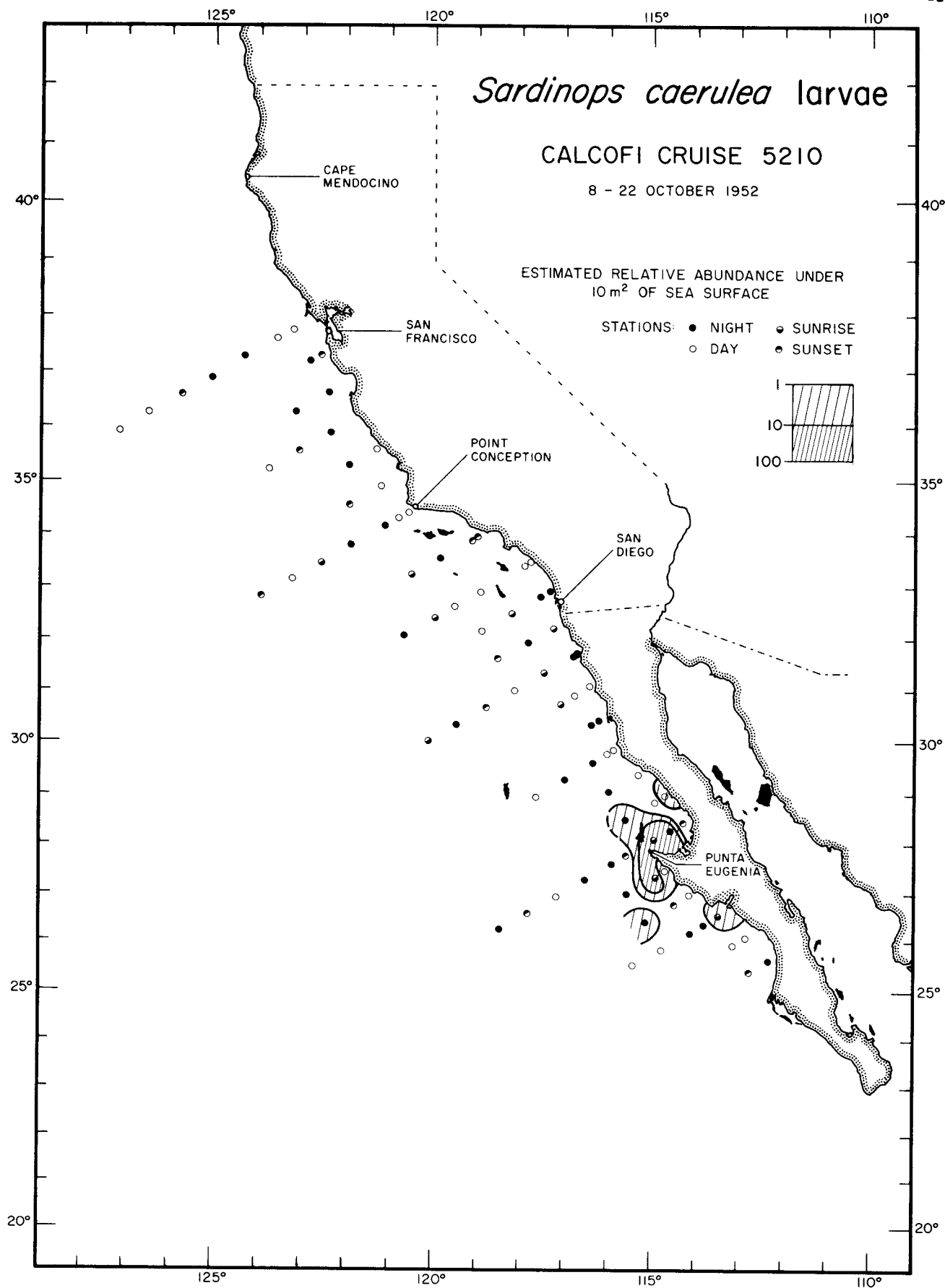
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*Sardinops caerulea* larvae

5110

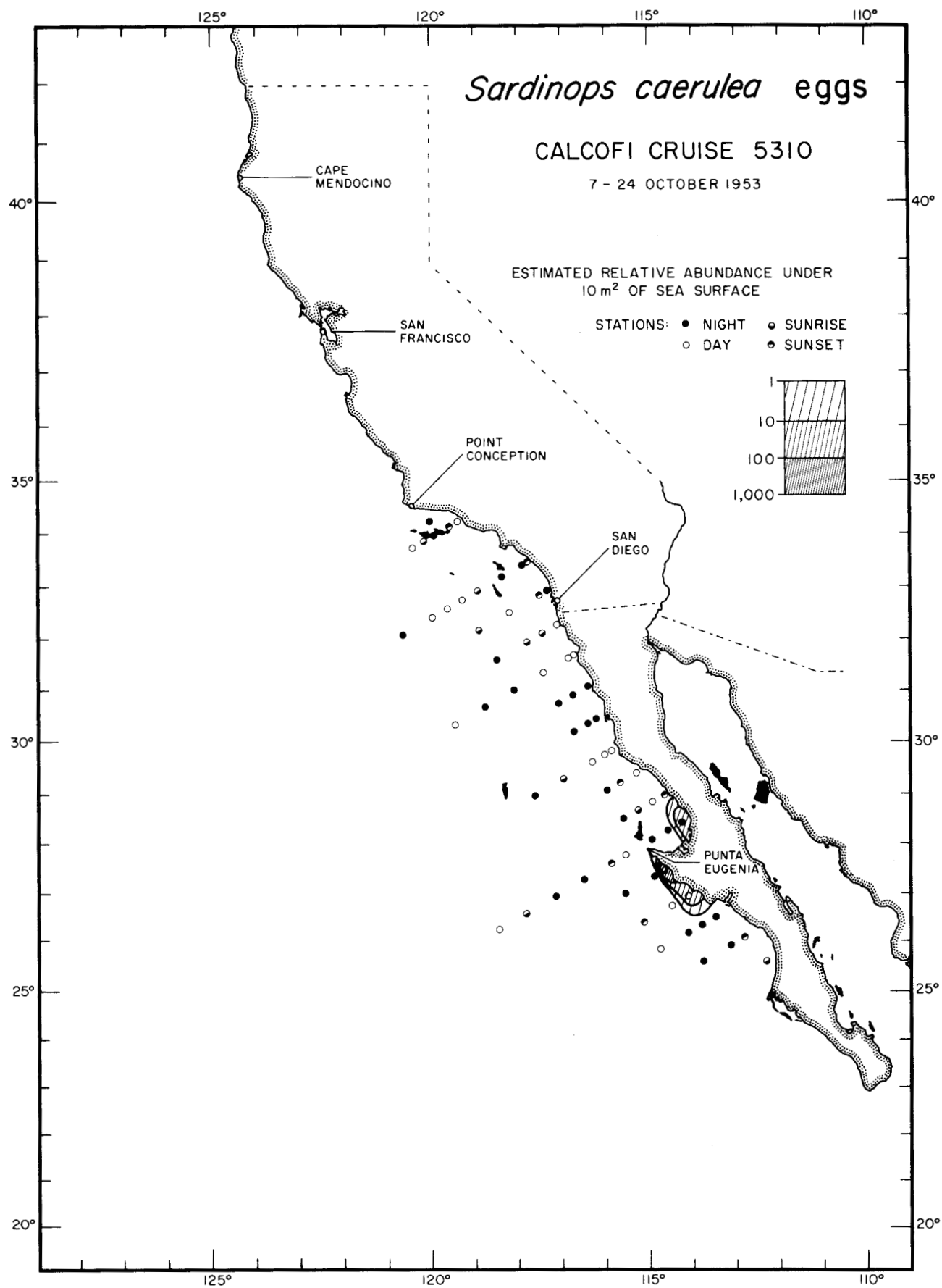
*Sardinops caerulea* eggs

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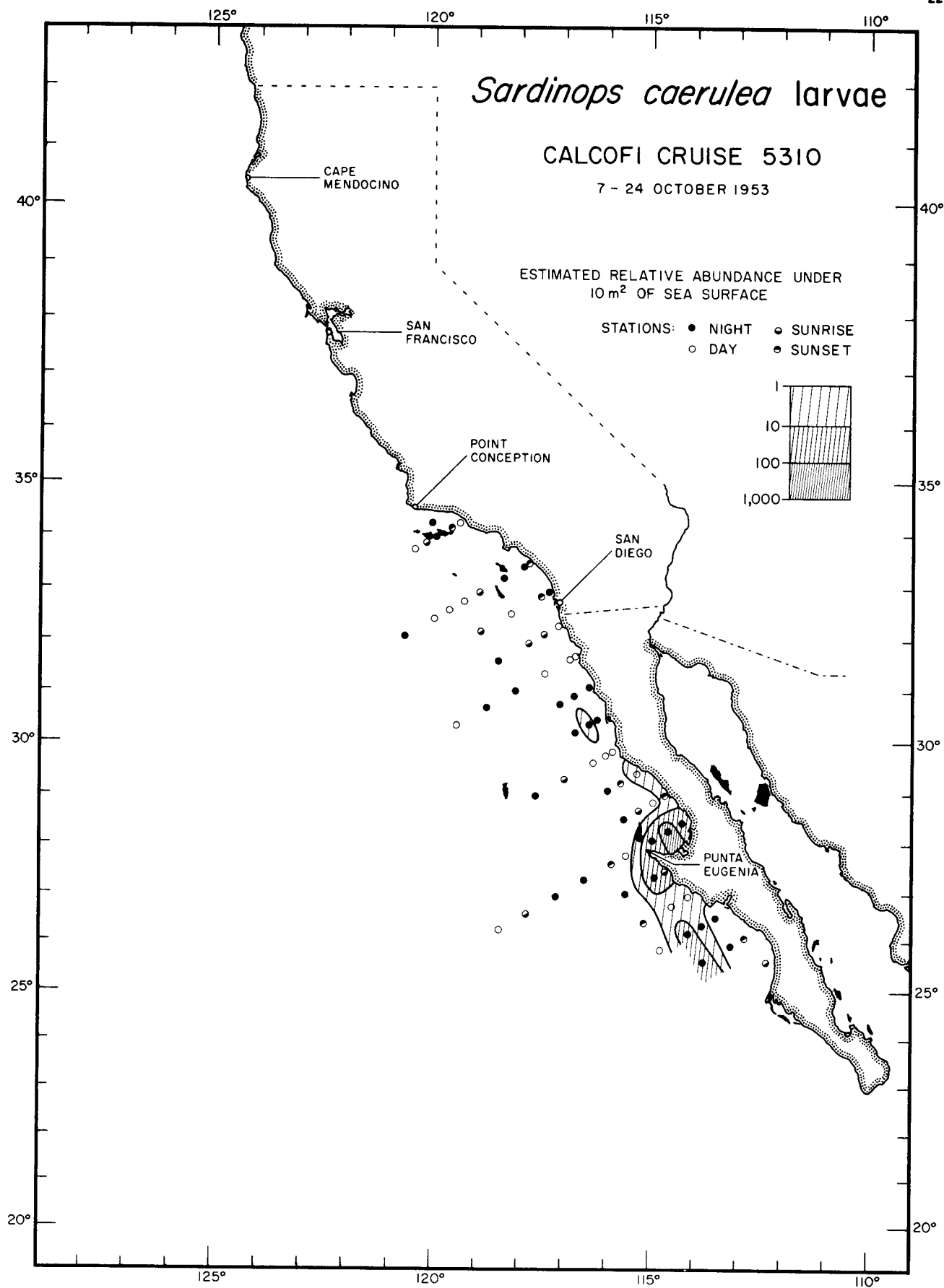
Sardinops caerulea larvae

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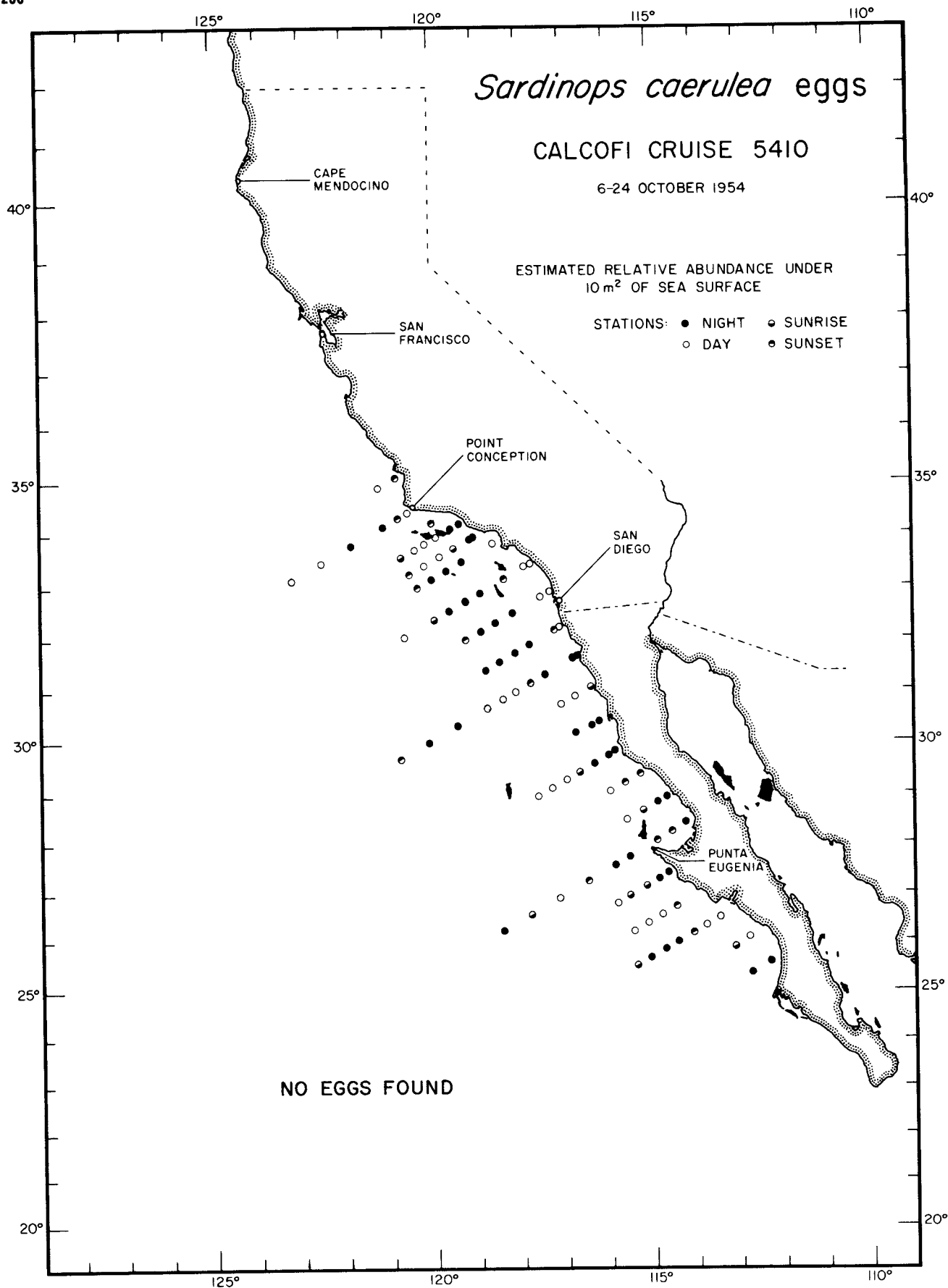
Sardinops caerulea eggs

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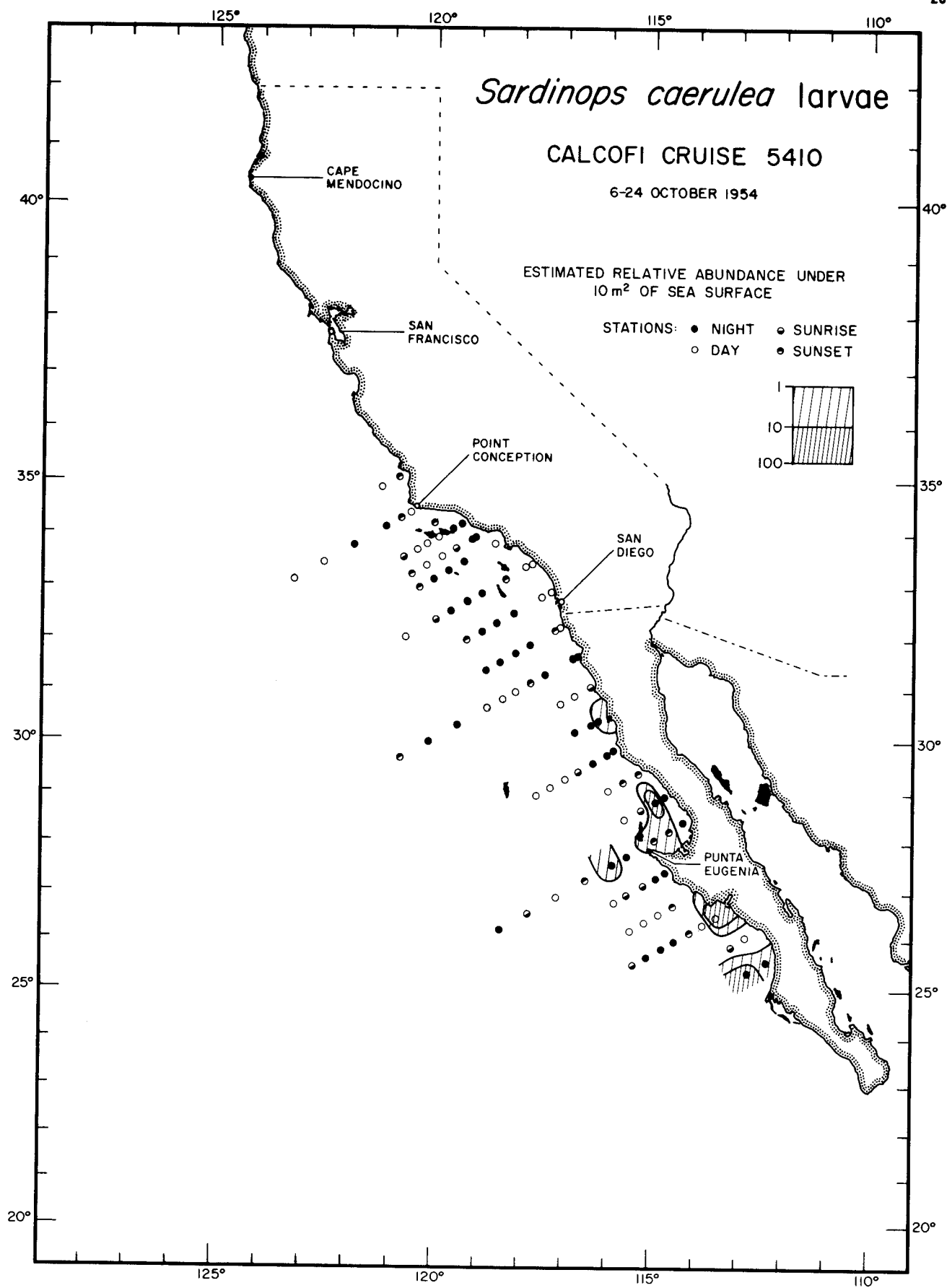


Sardinops caerulea larvae

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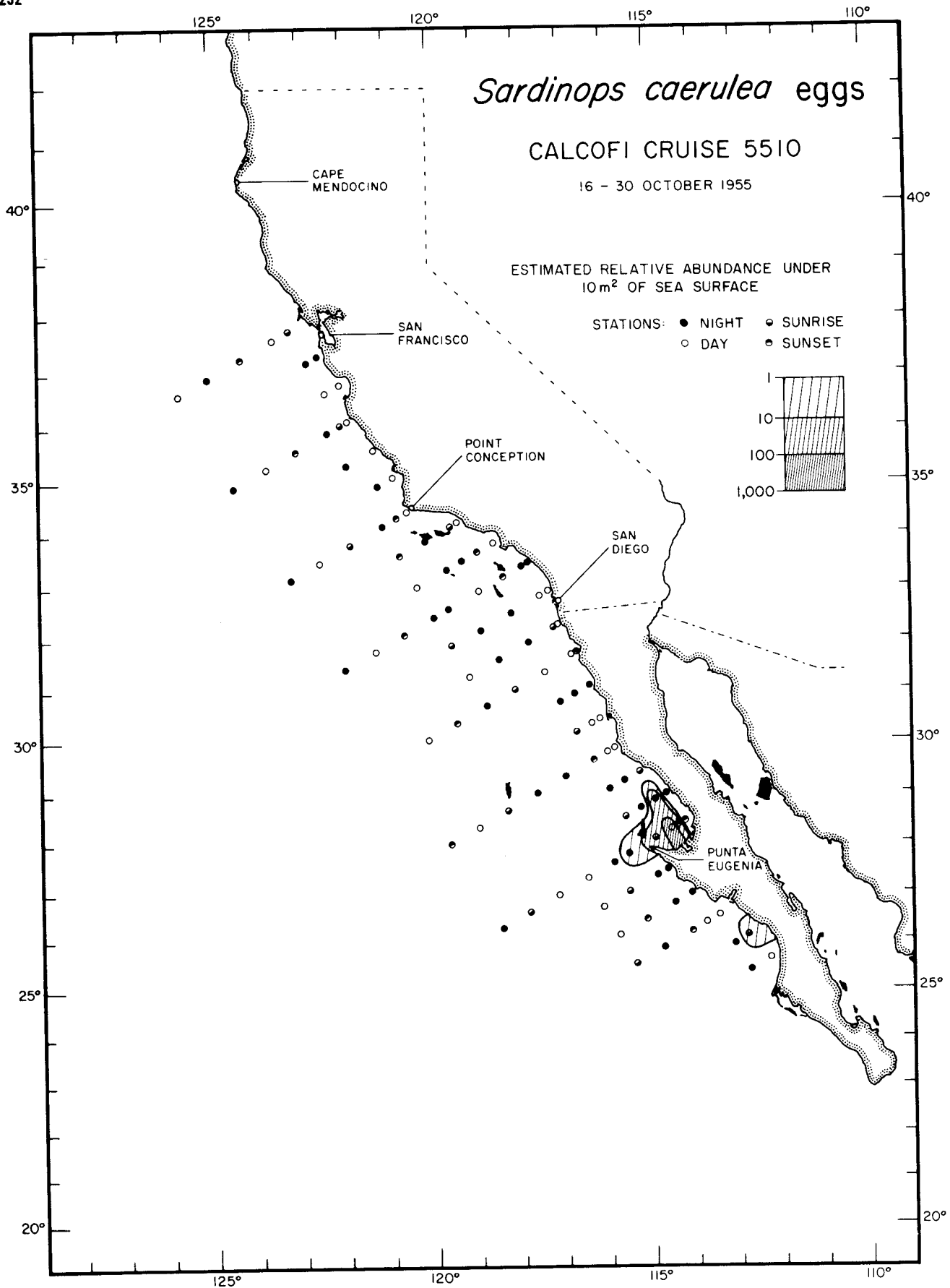
*Sardinops caerulea* eggs

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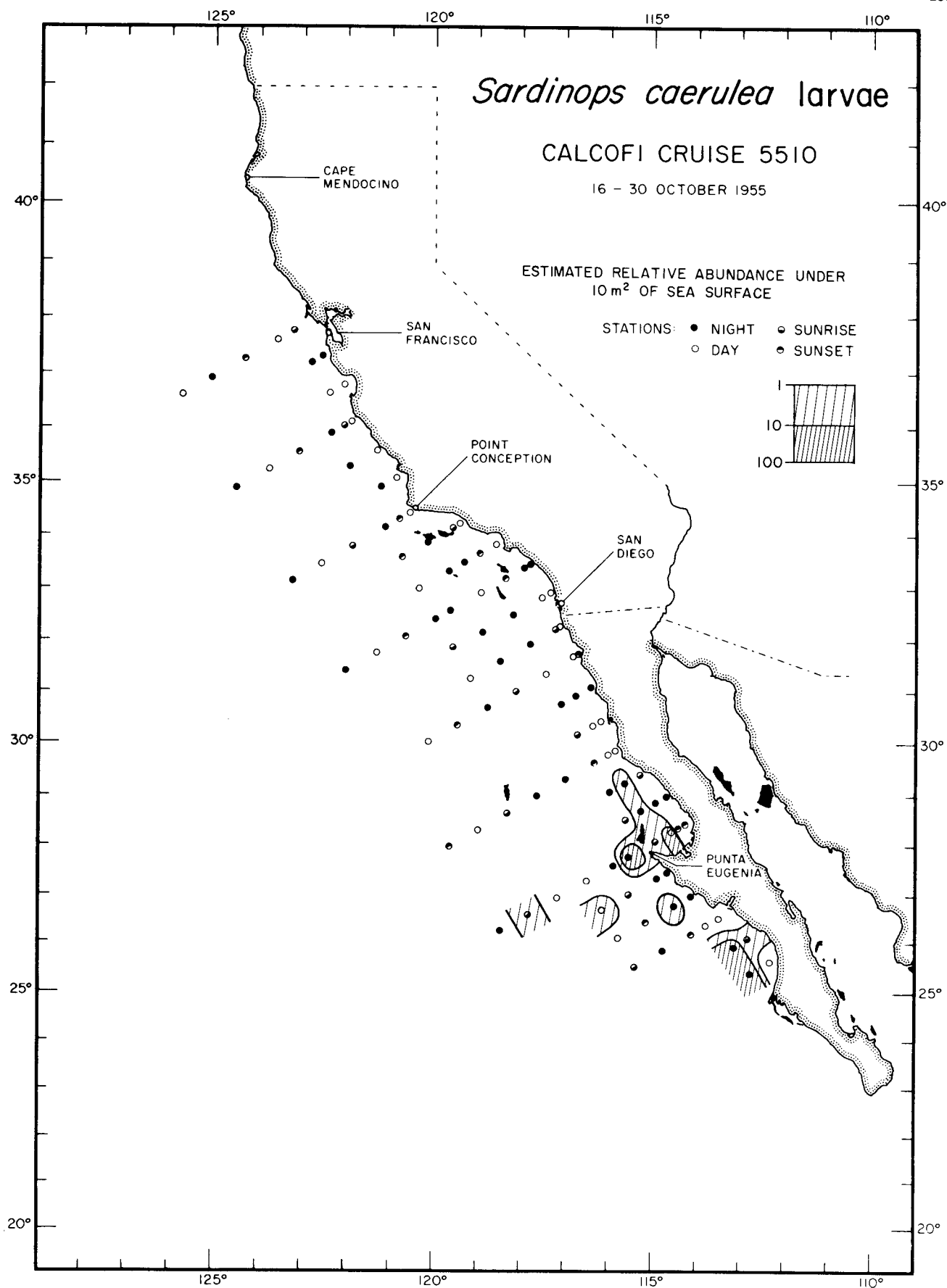
Sardinops caerulea larvae

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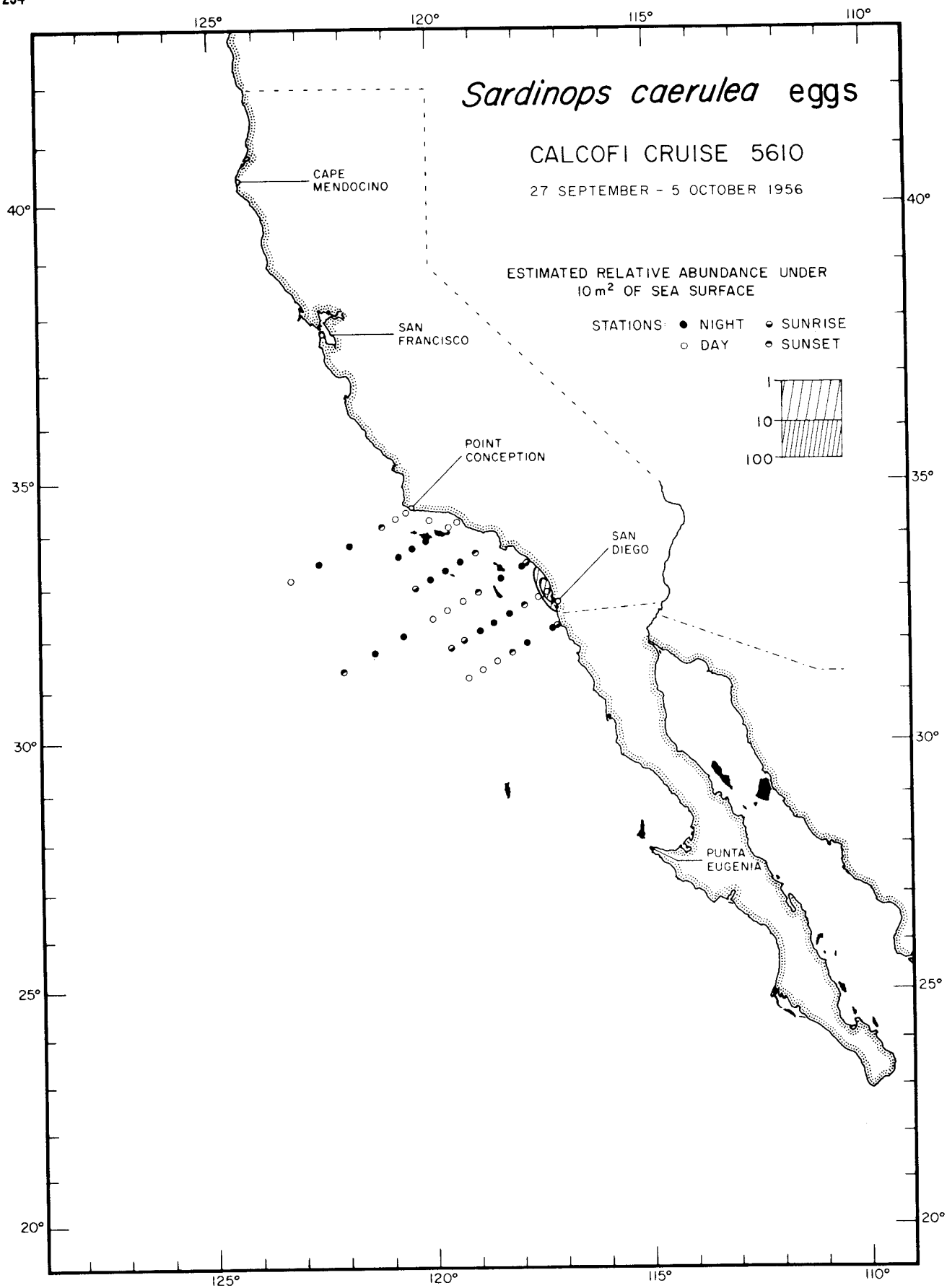
Sardinops caerulea eggs

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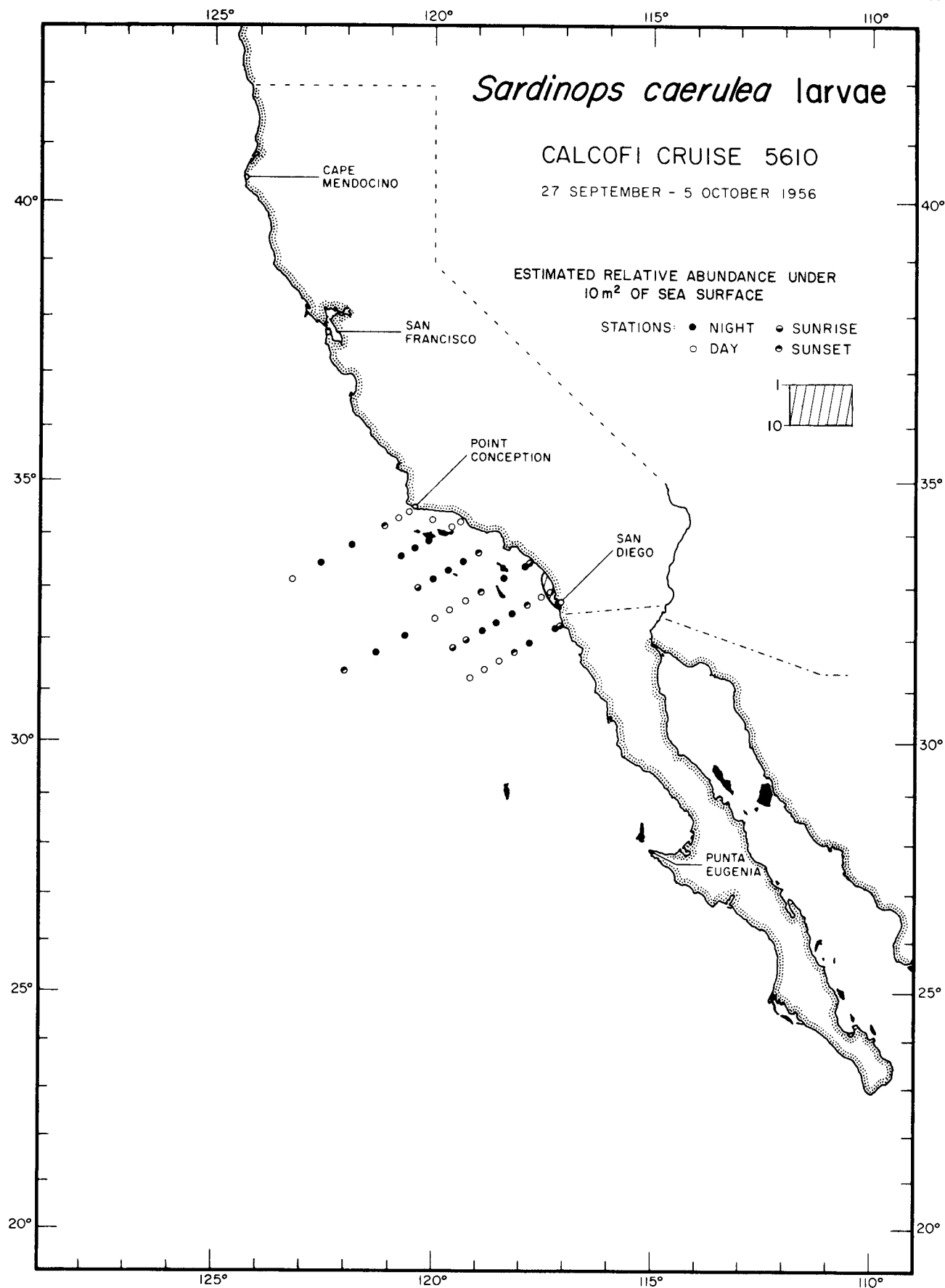
Sardinops caerulea larvae

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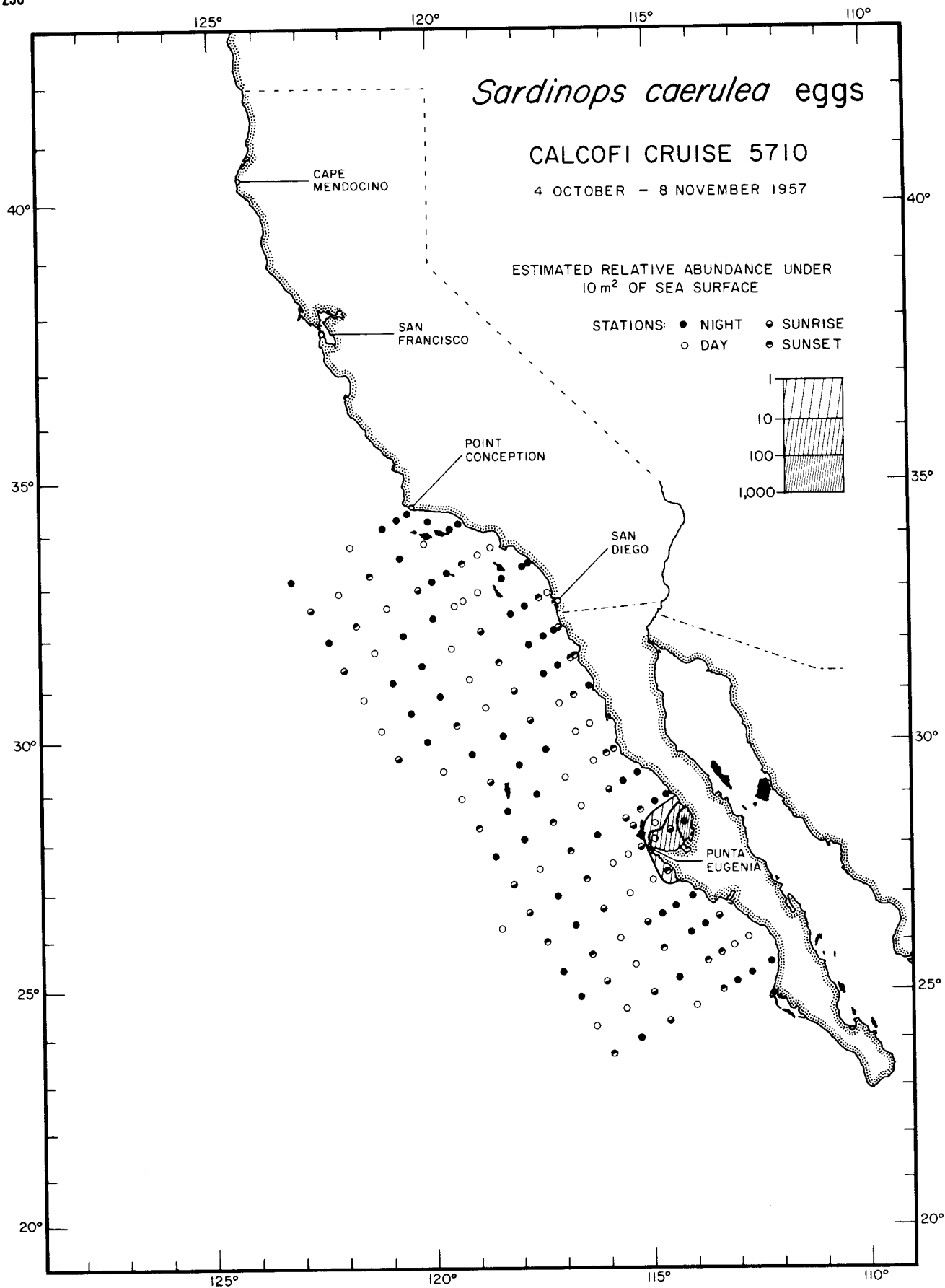


Sardinops caerulea eggs

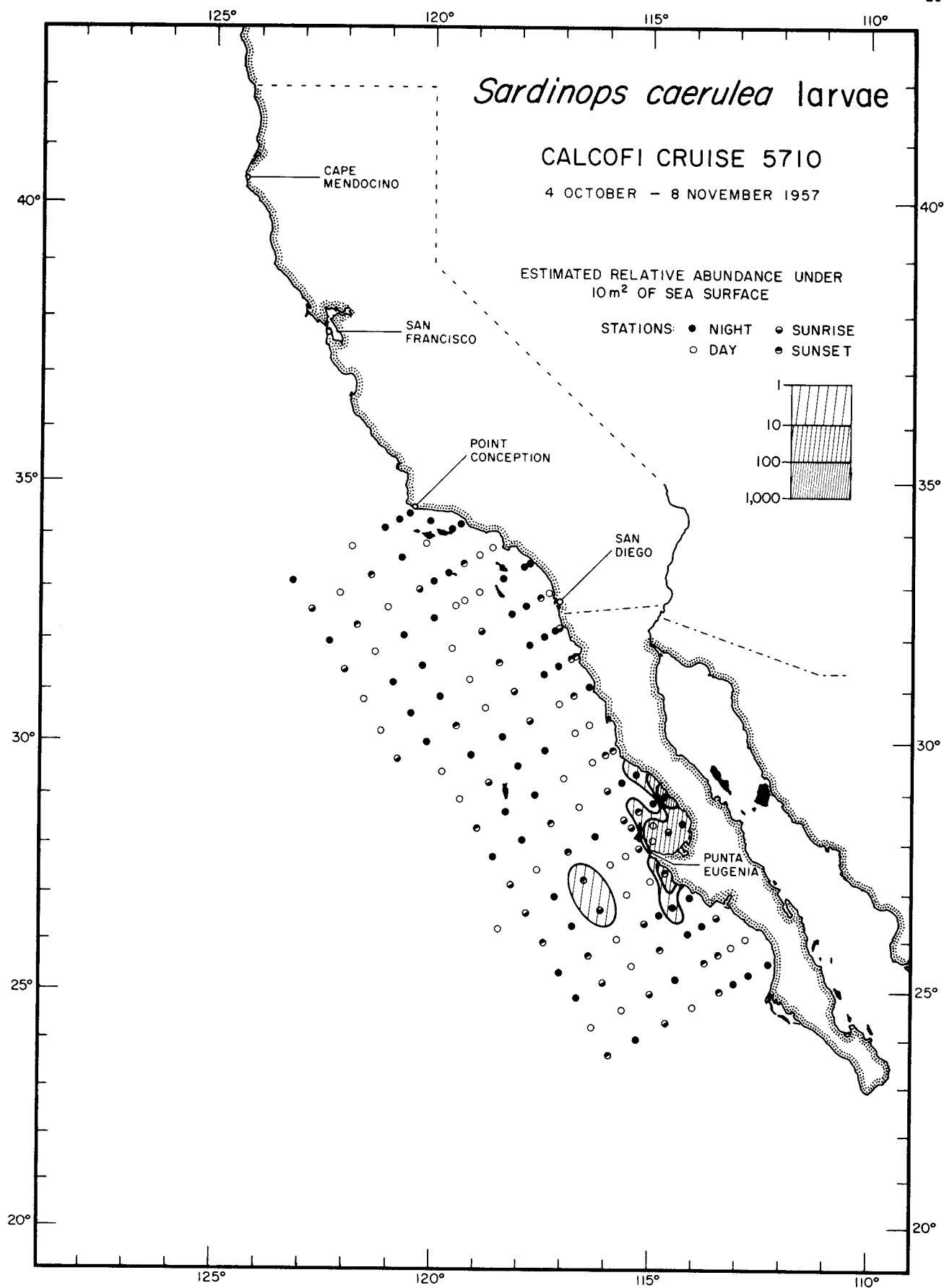
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*Sardinops caerulea* larvae

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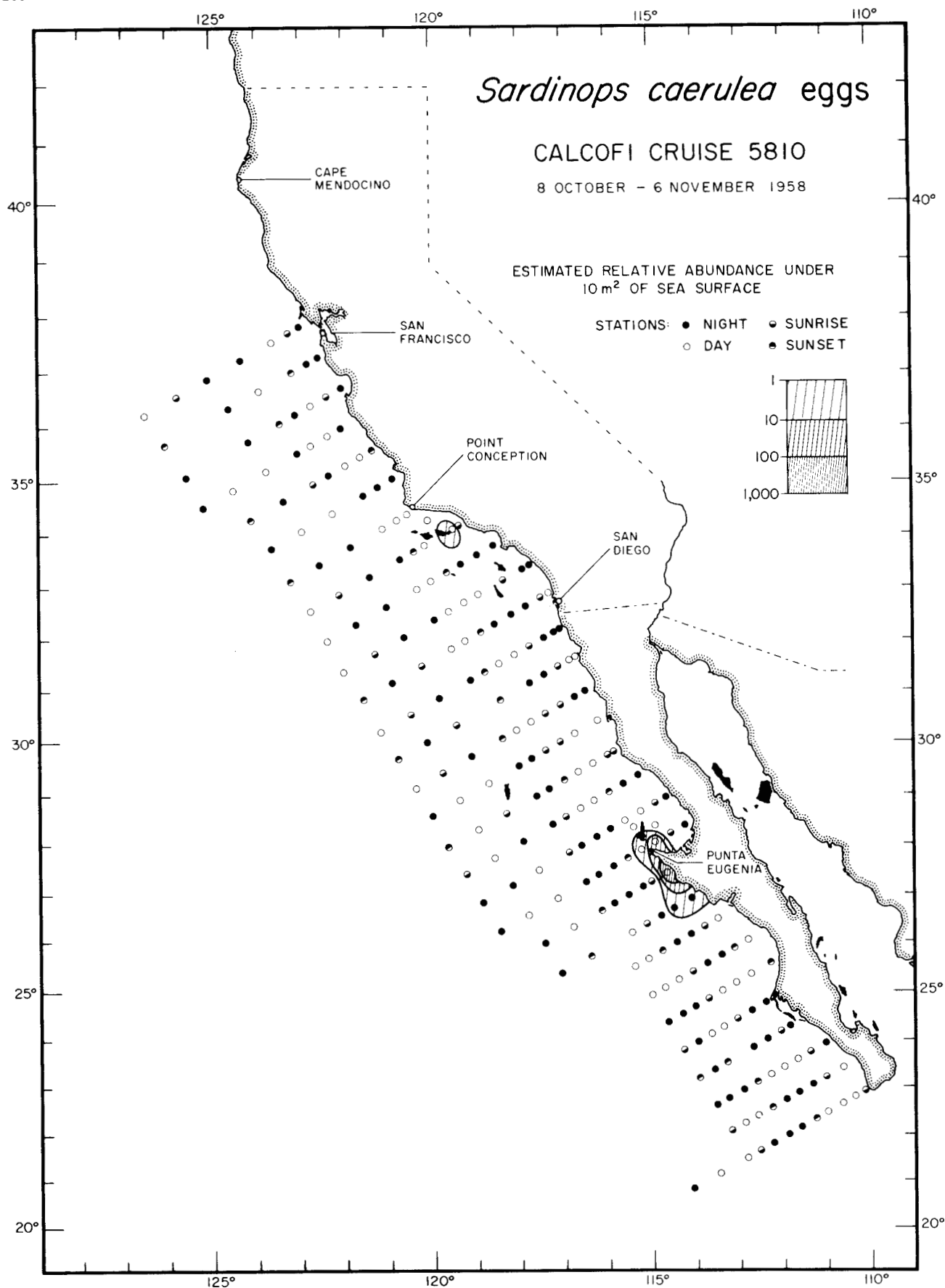
*Sardinops caerulea* eggs

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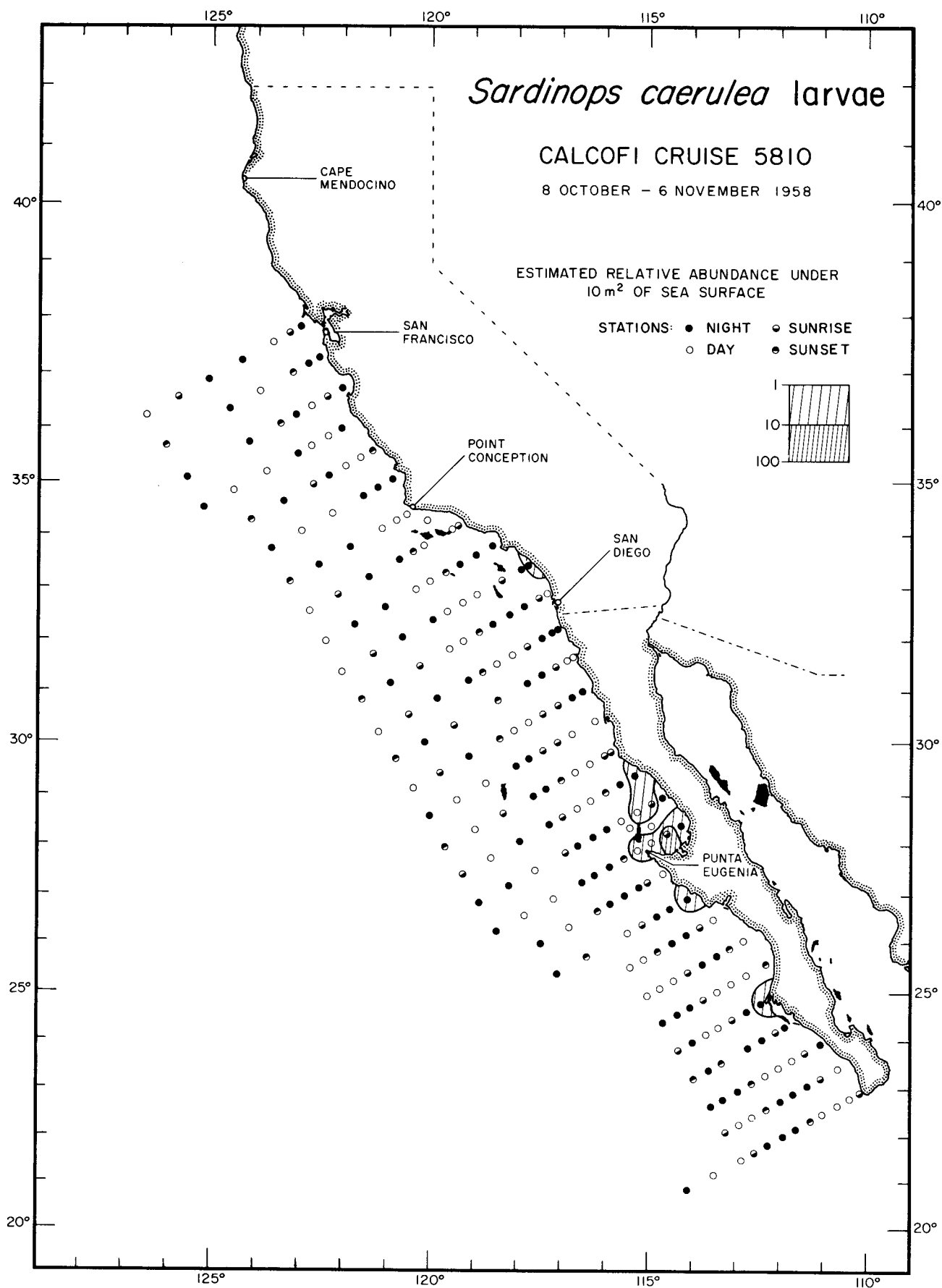


Sardinops caerulea larvae

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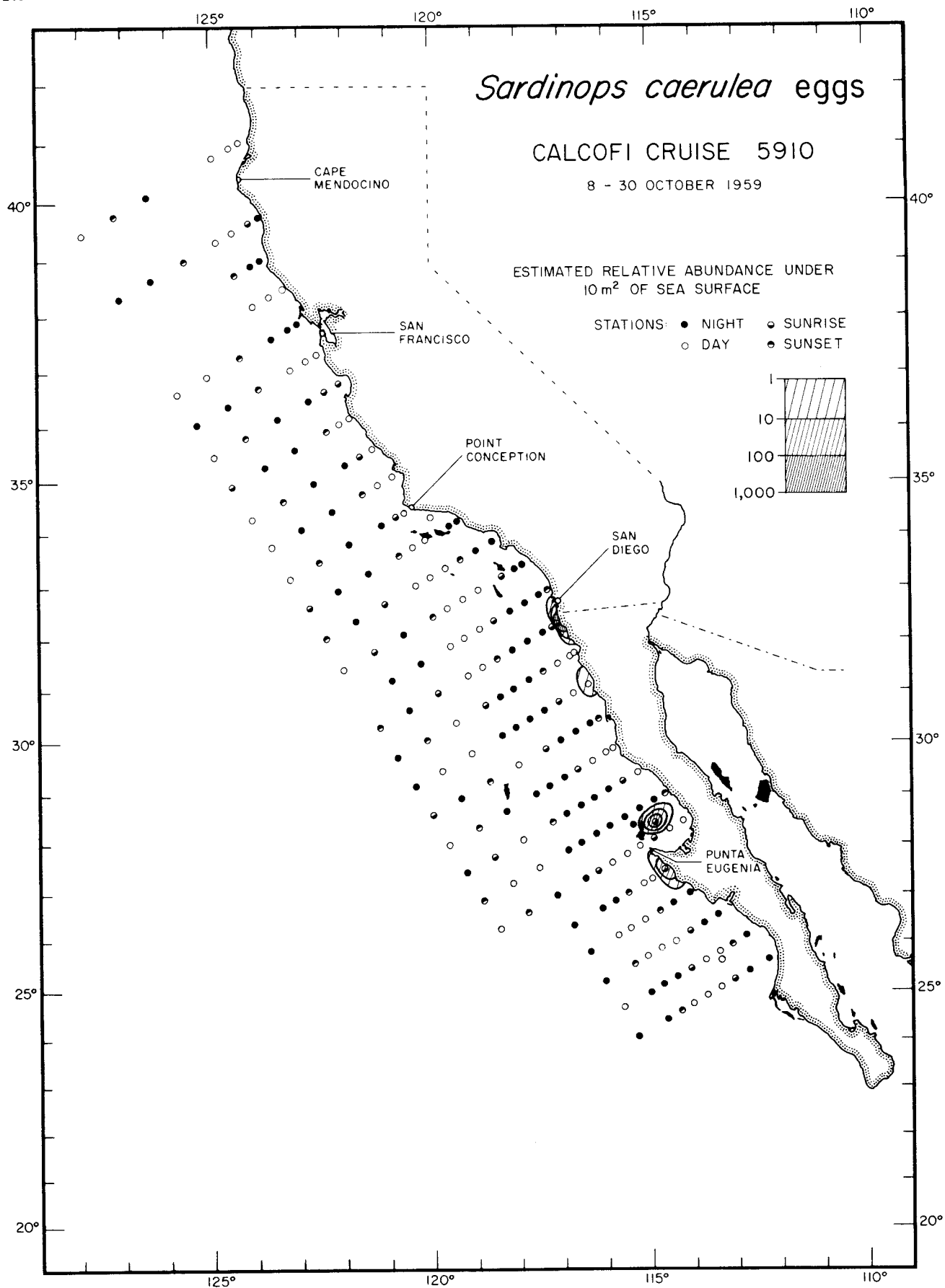
*Sardinops caerulea* eggs

5810

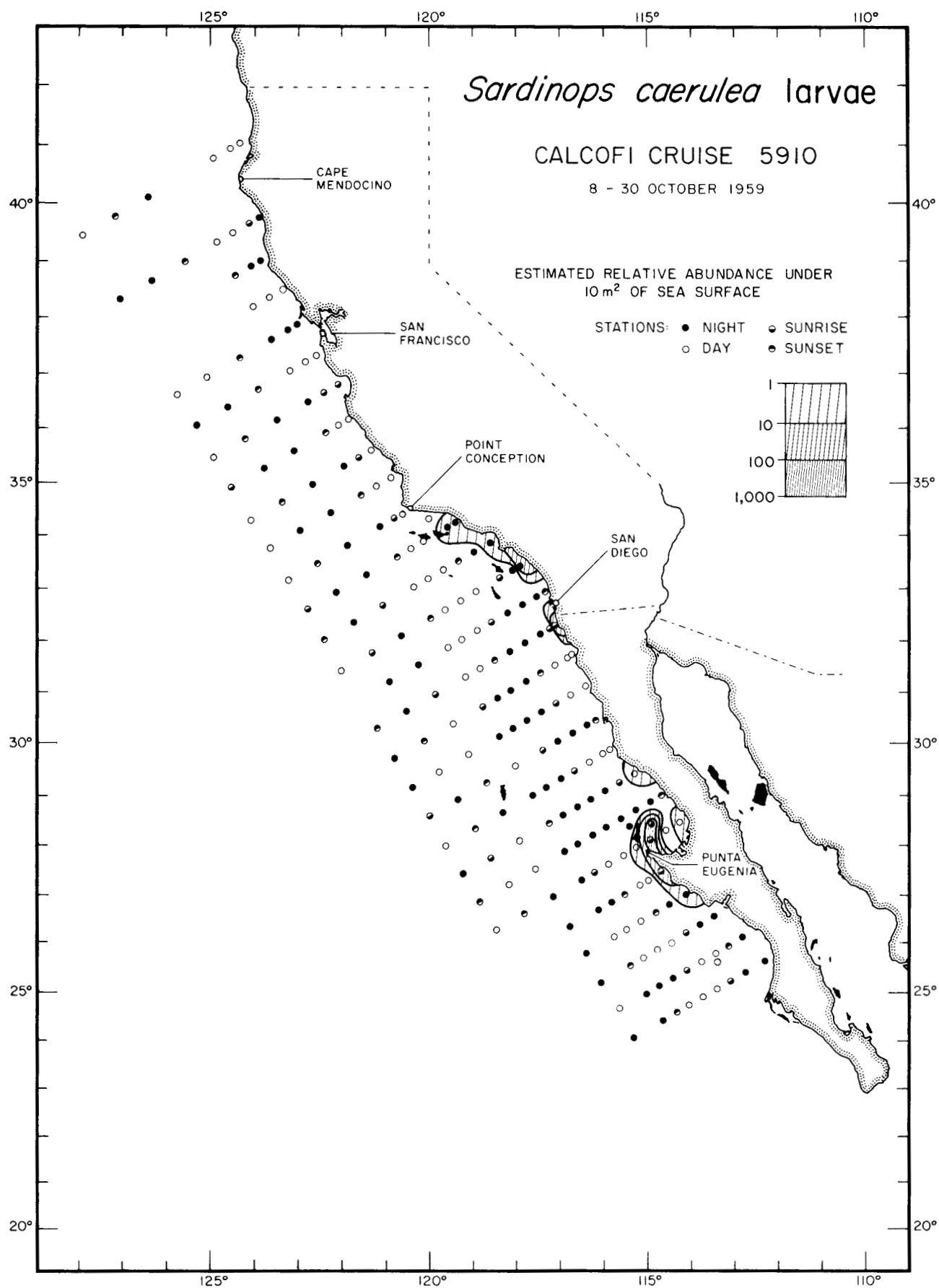


Sardinops caerulea larvae

5810

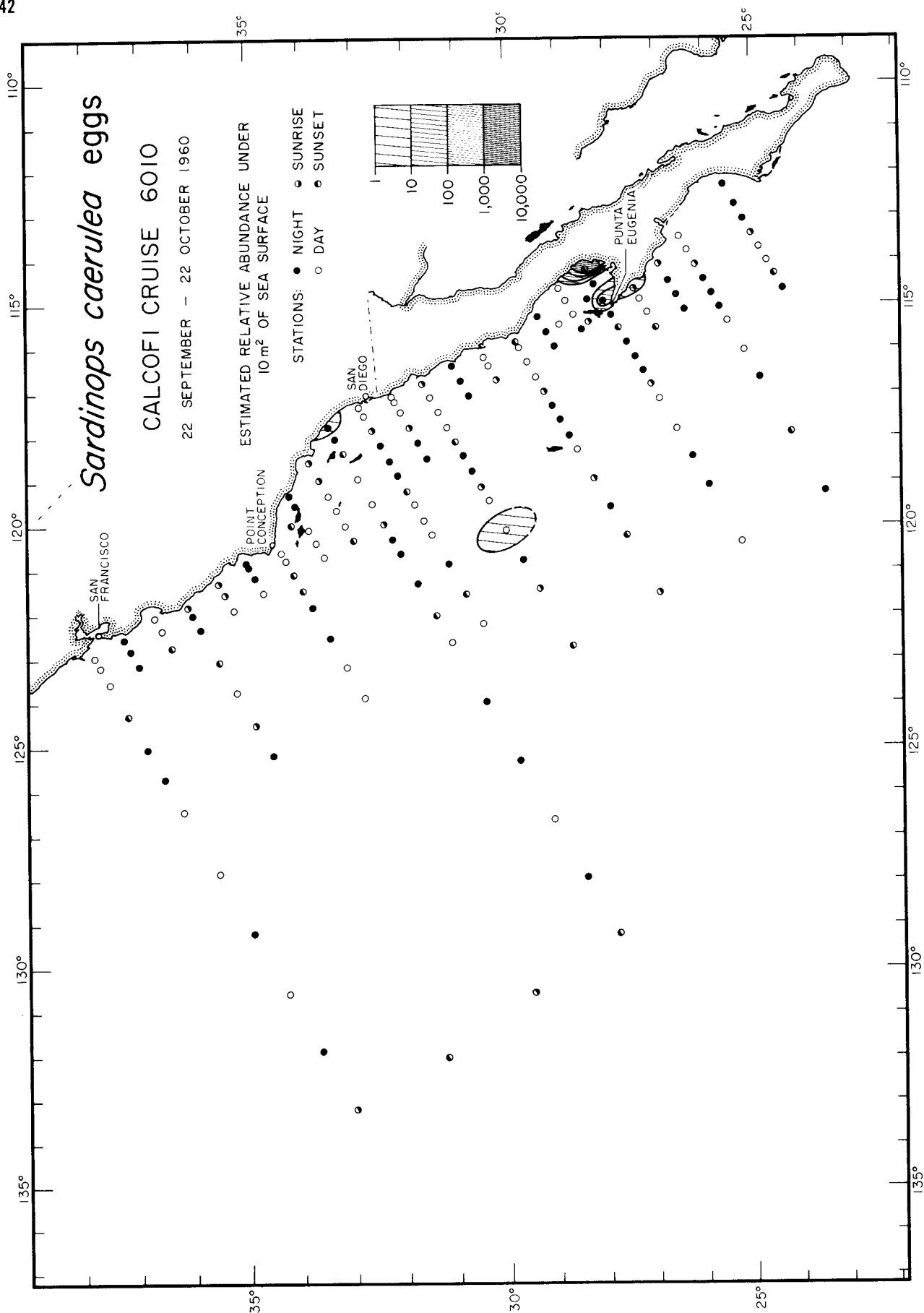
*Sardinops caerulea* eggs

5910



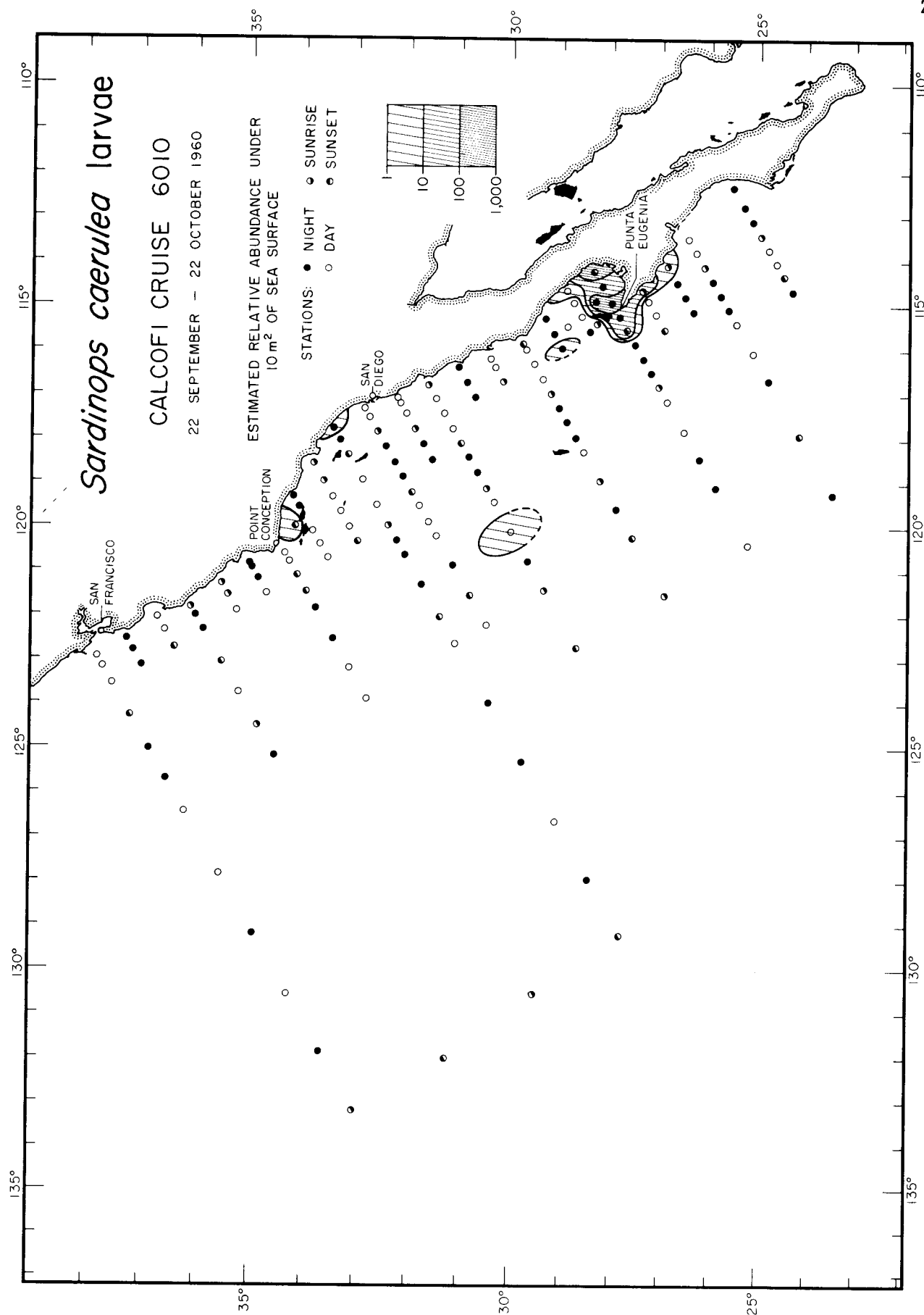
Sardinops caerulea larvae

5910

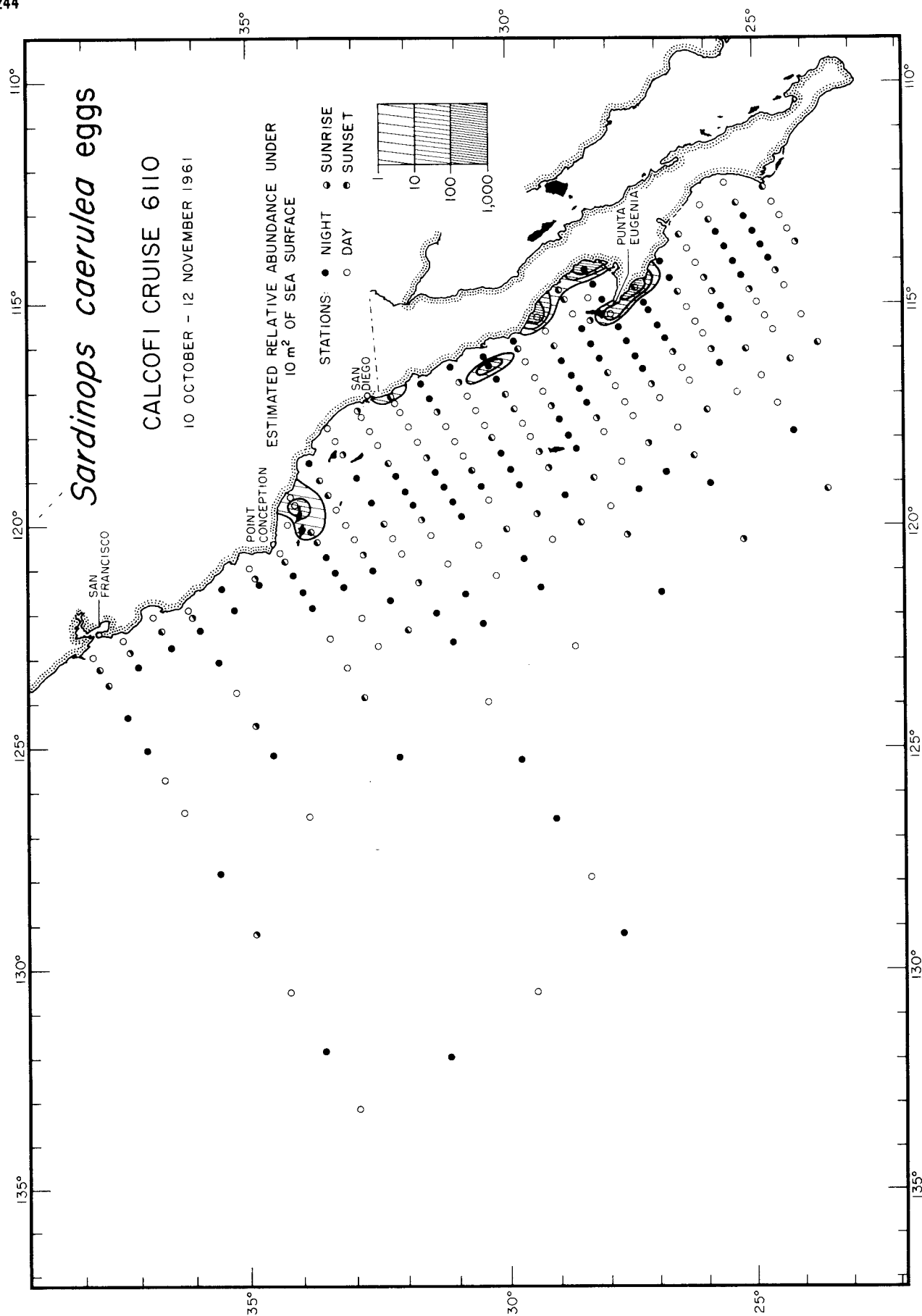


Sardinops caerulea eggs

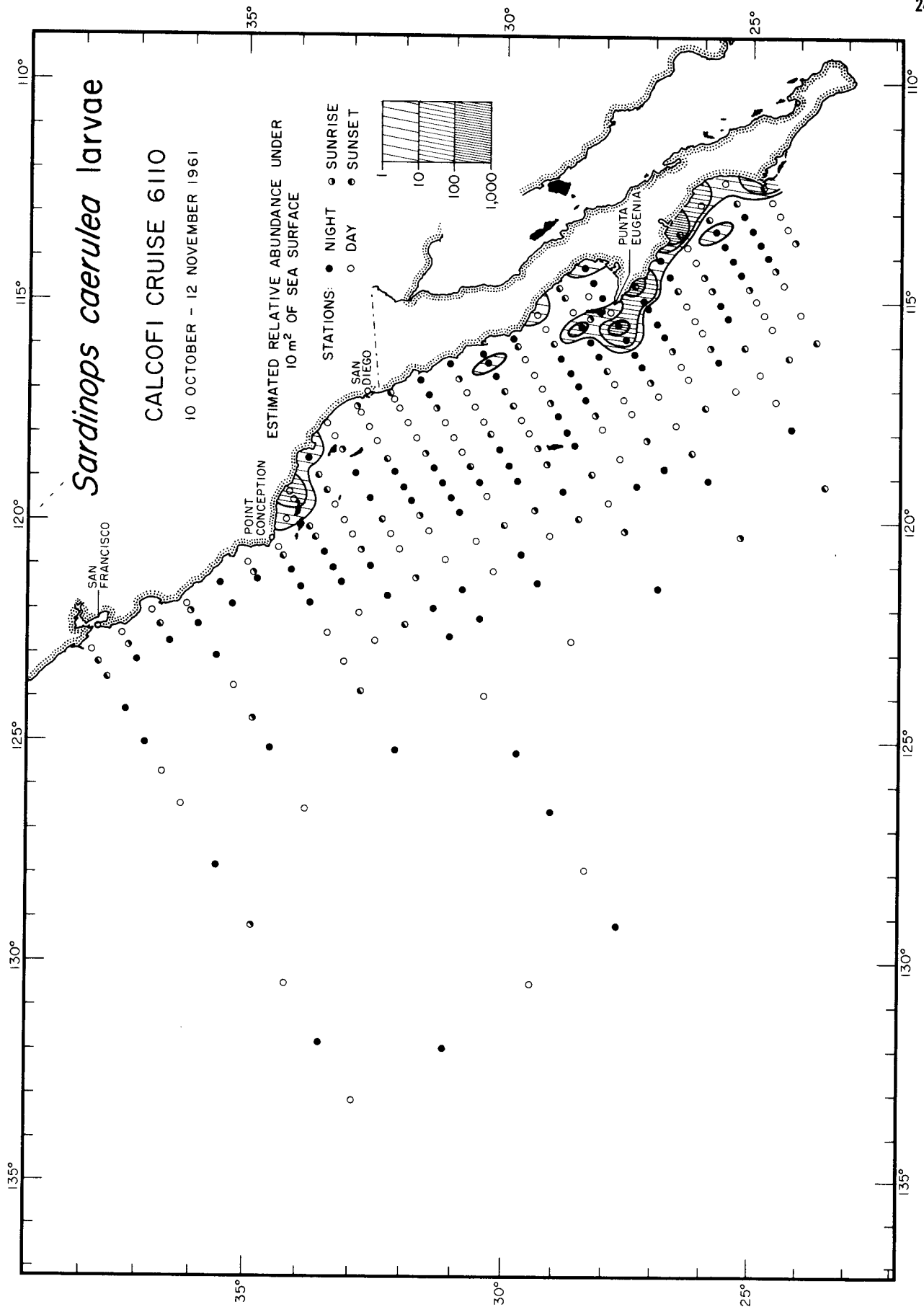
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*Sardinops caerulea* larvae

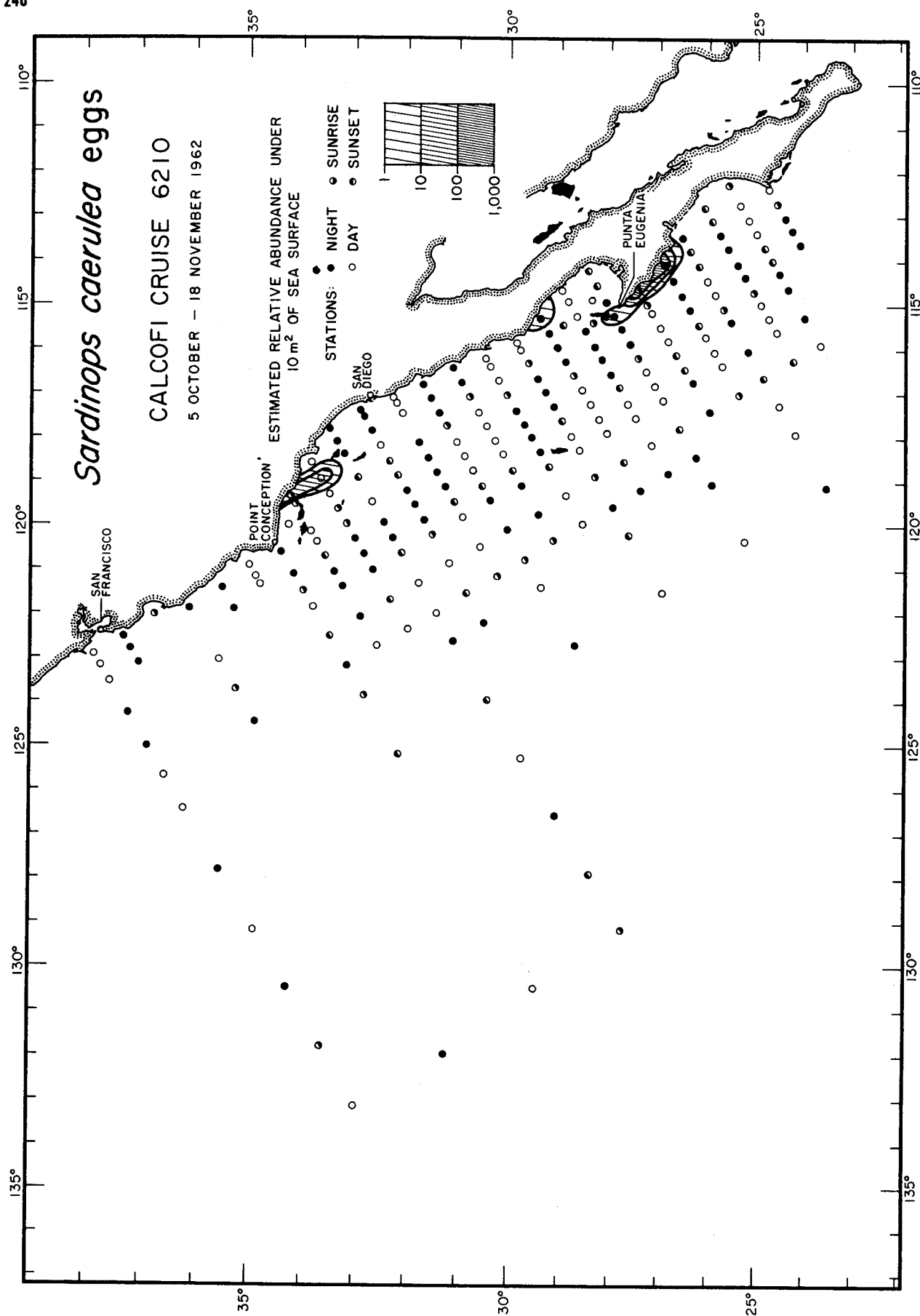
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*Sardinops caerulea* eggs

6110

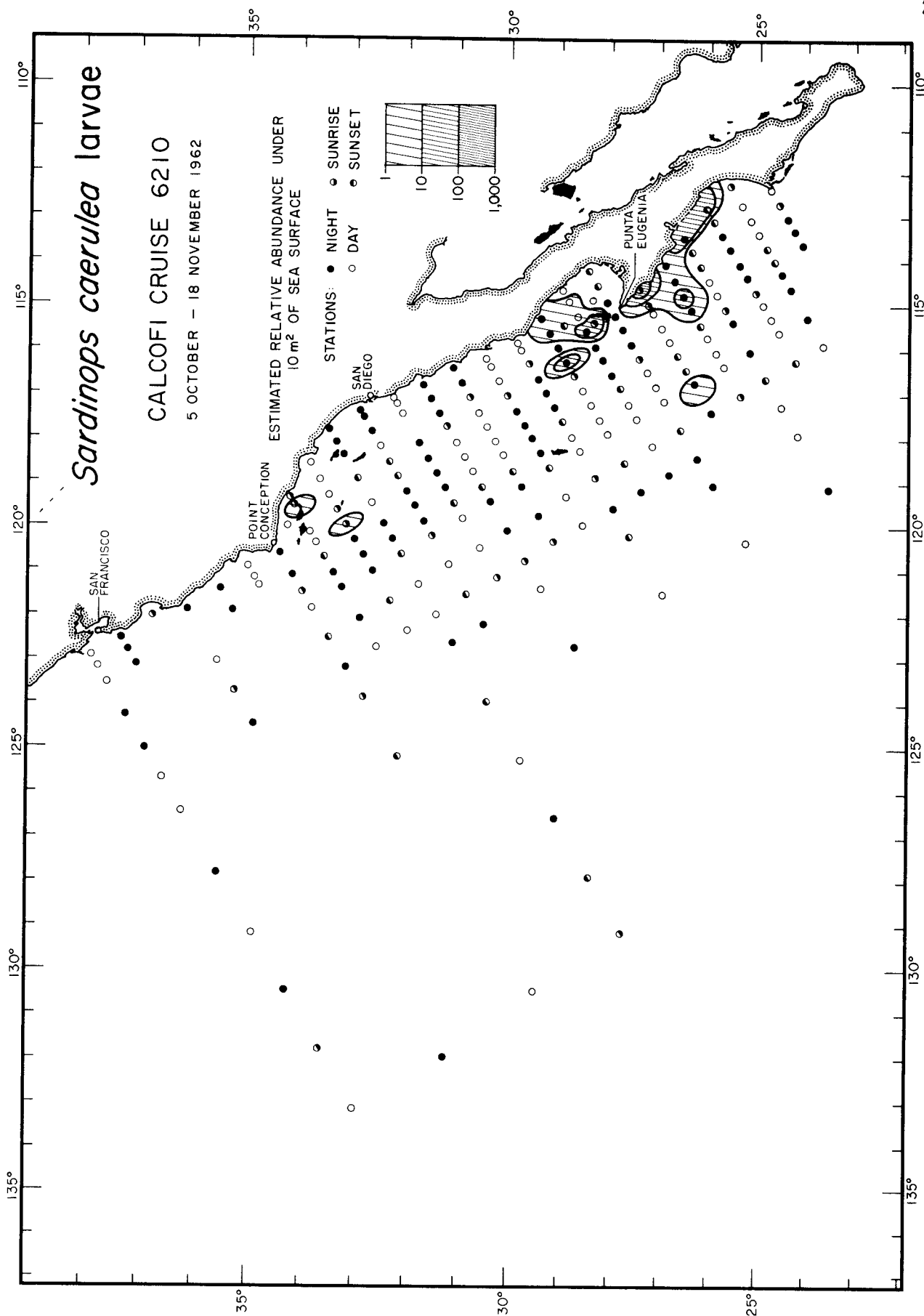
*Sardinops caerulea* larvae

6110

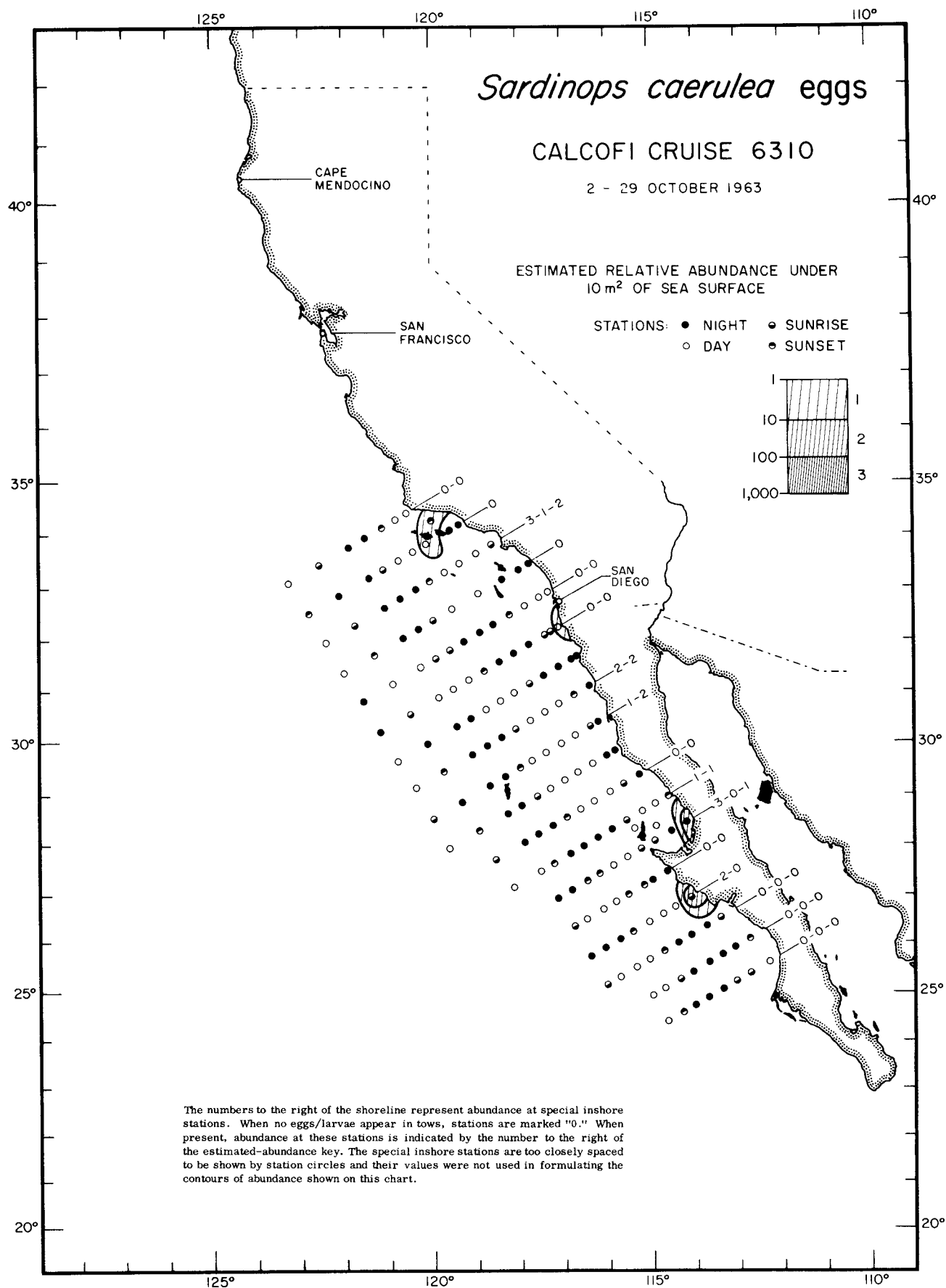


Sardinops caerulea eggs

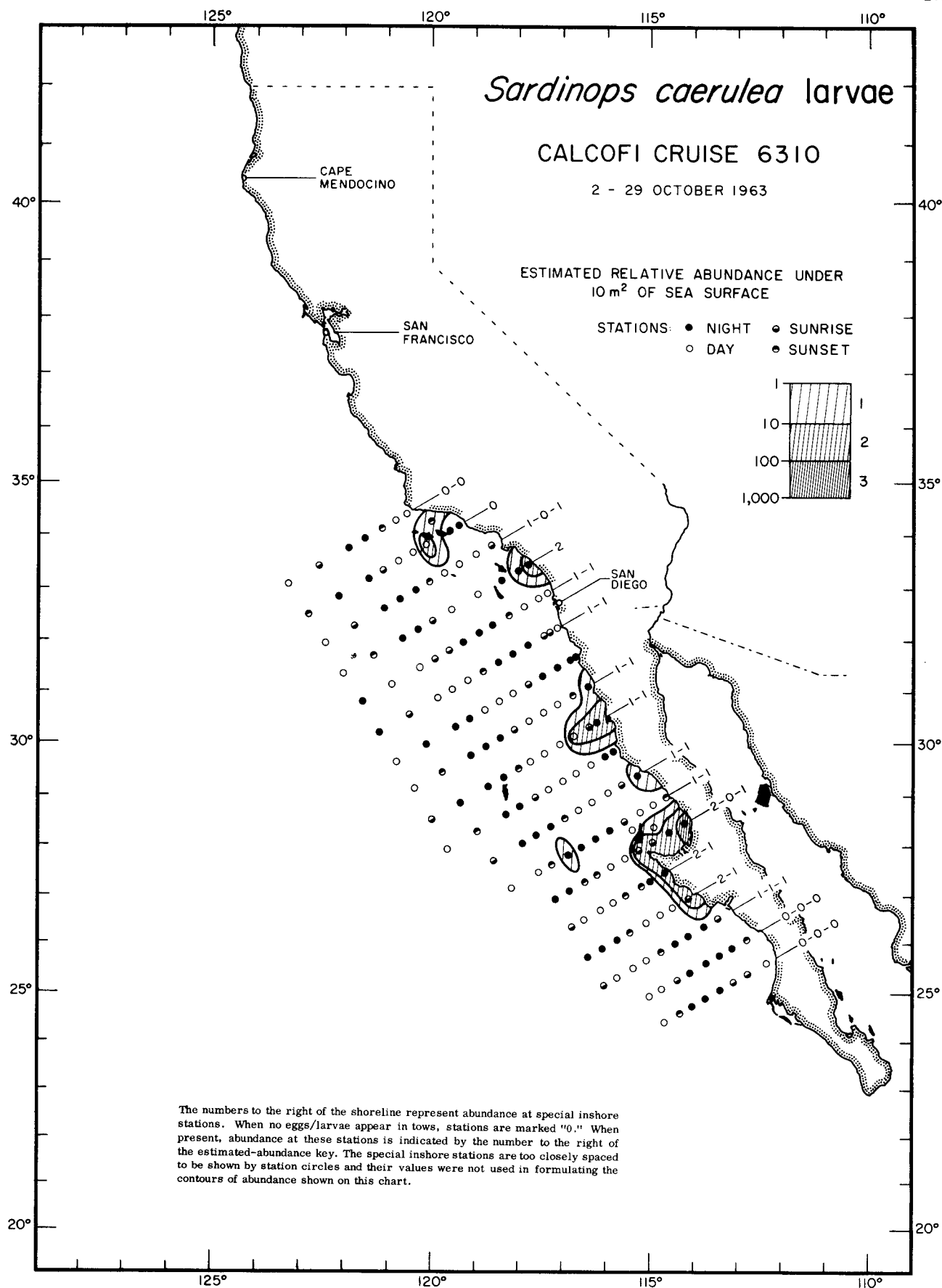
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*Sardinops caerulea* larvae

6210

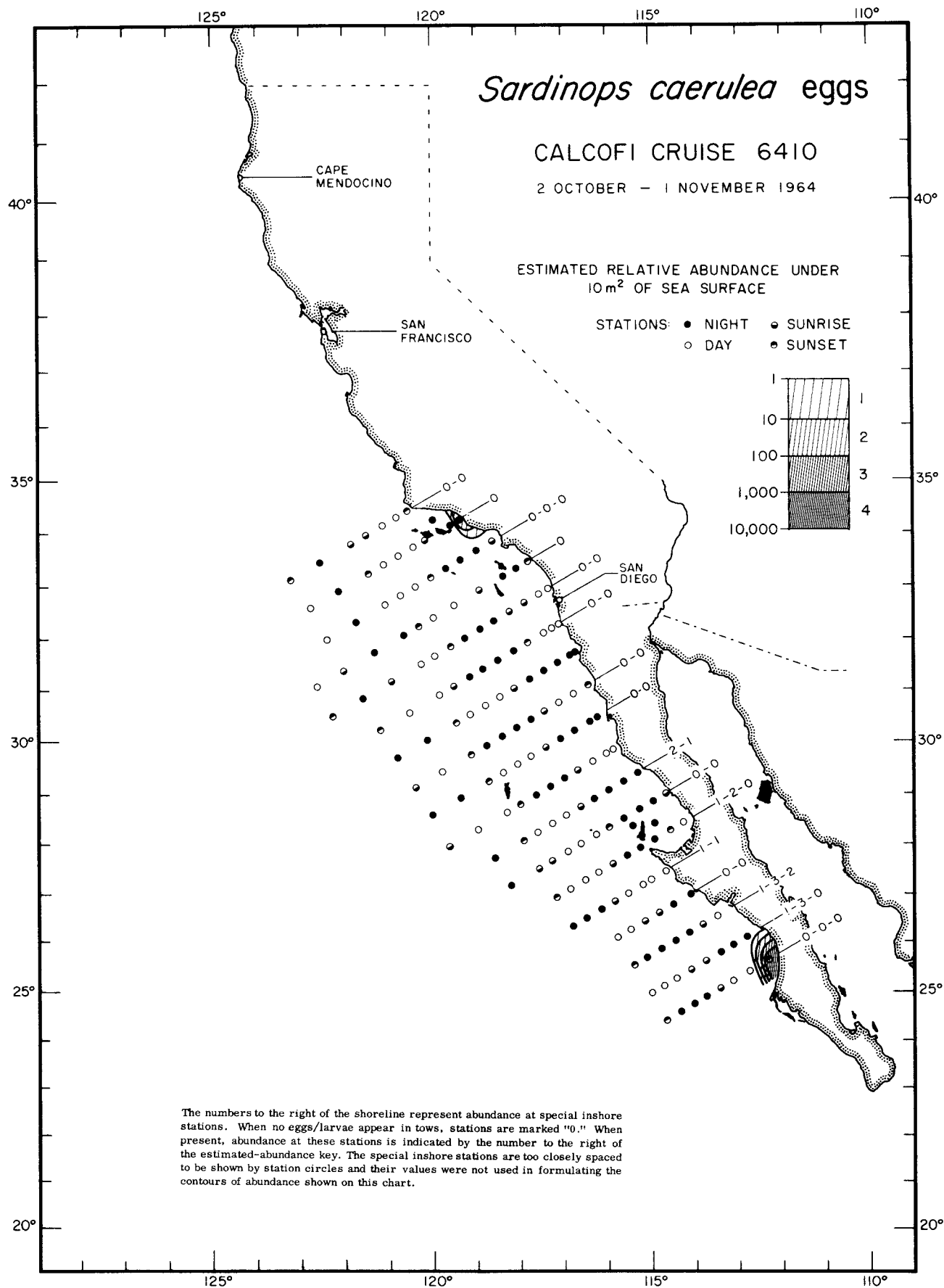
*Sardinops caerulea* eggs

6310



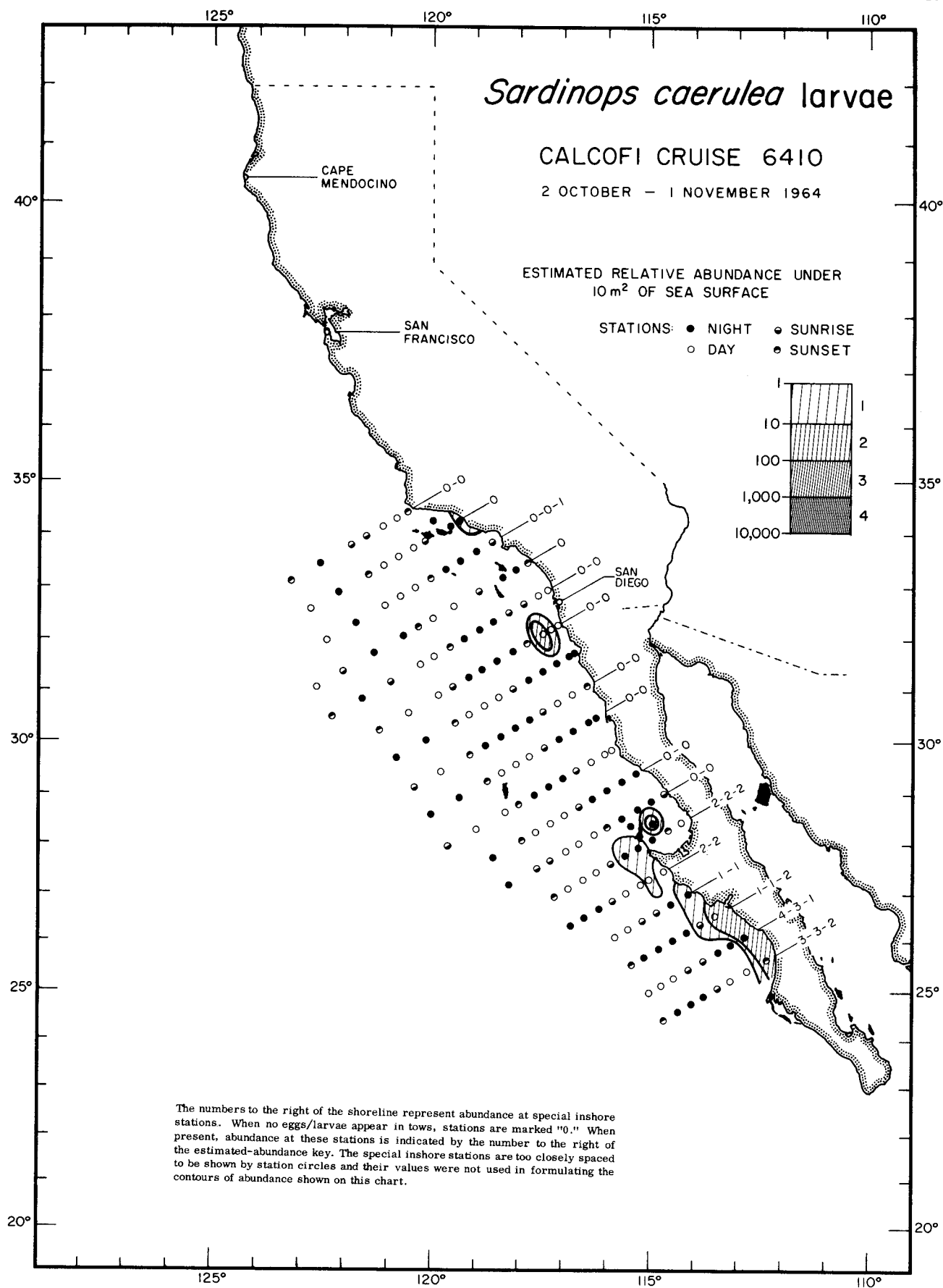
Sardinops caerulea larvae

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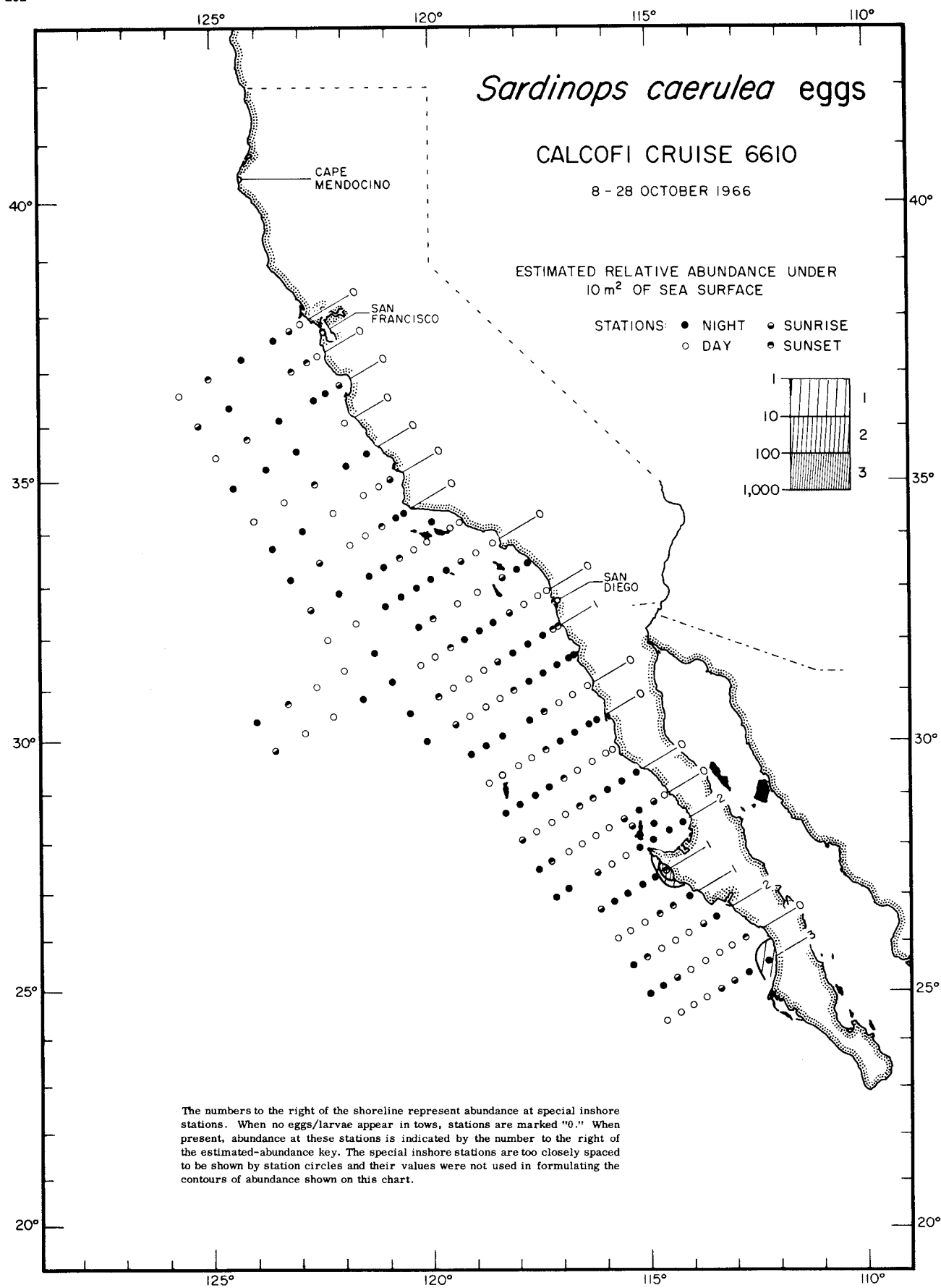
Sardinops caerulea eggs

6410



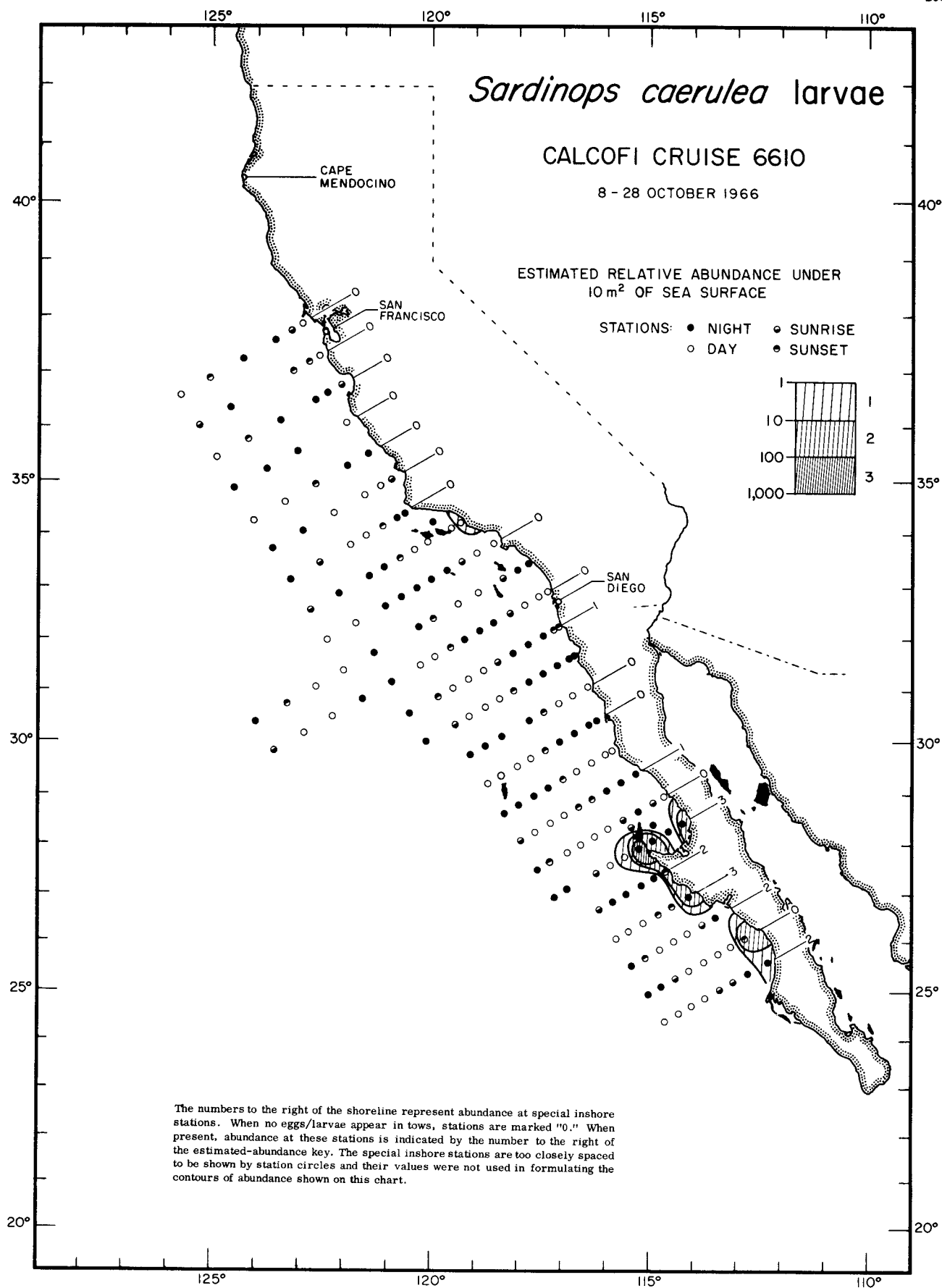
Sardinops caerulea larvae

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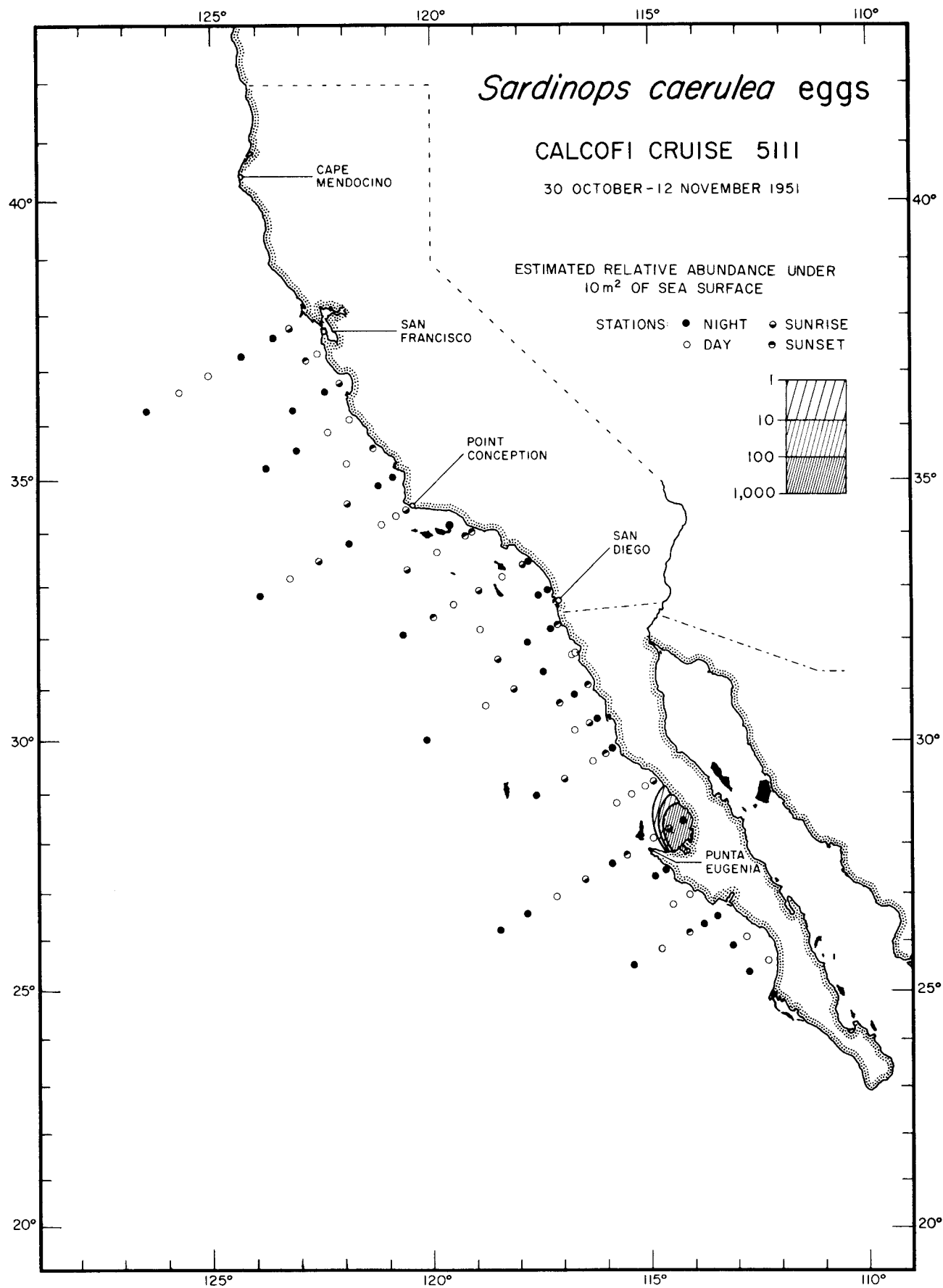
Sardinops caerulea eggs

6610



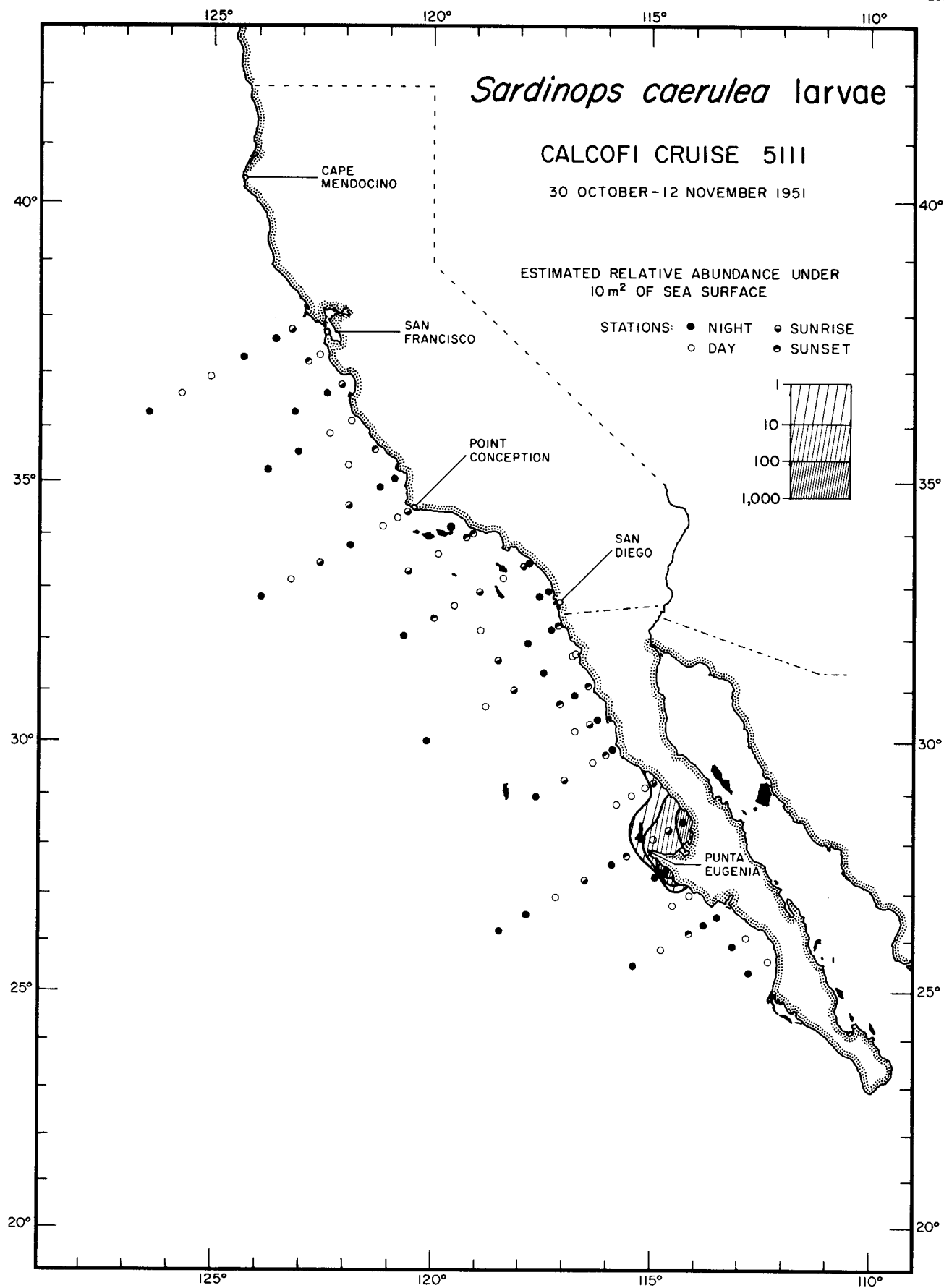
Sardinops caerulea larvae

6610



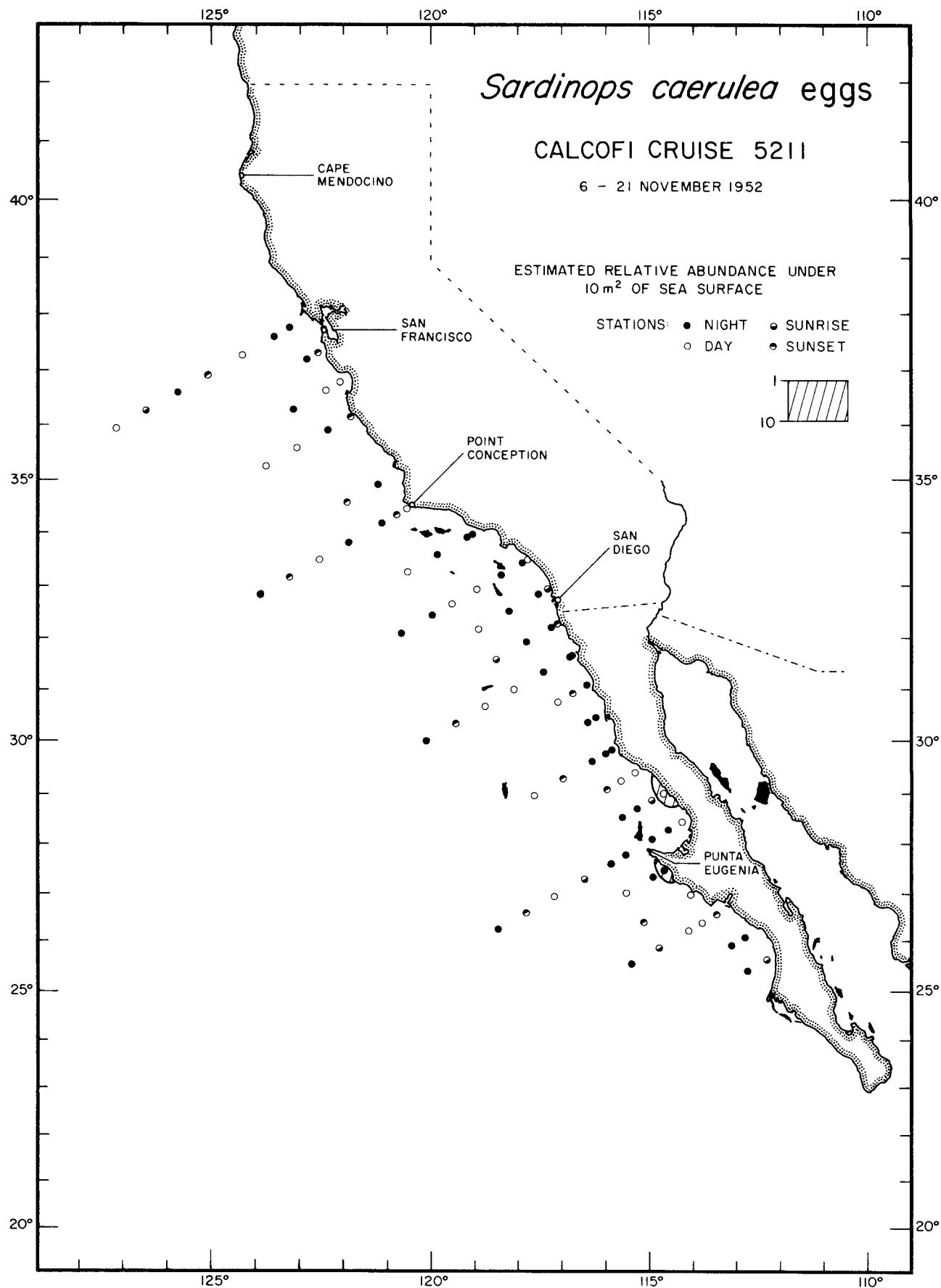
Sardinops caerulea eggs

5111



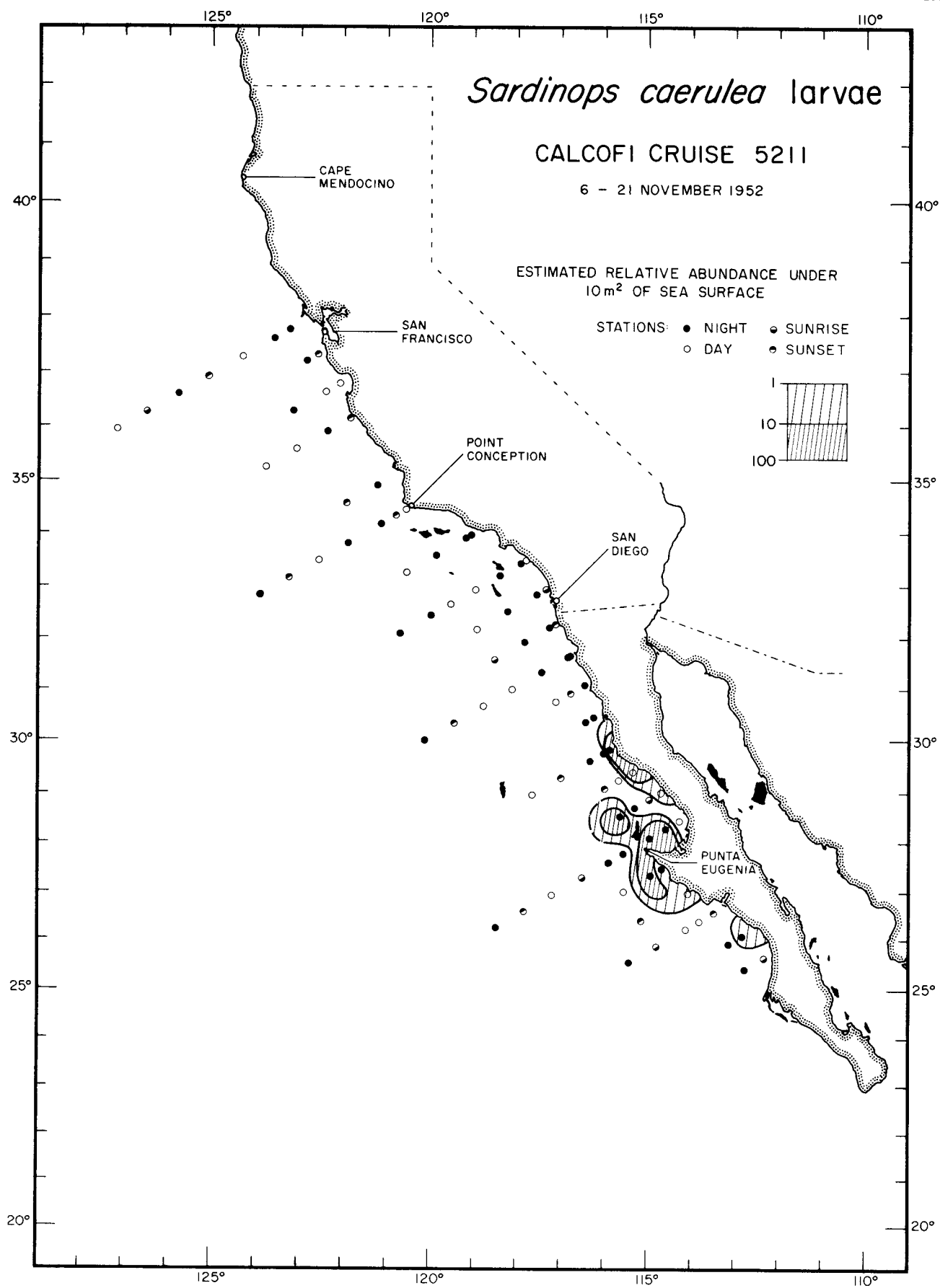
Sardinops caerulea larvae

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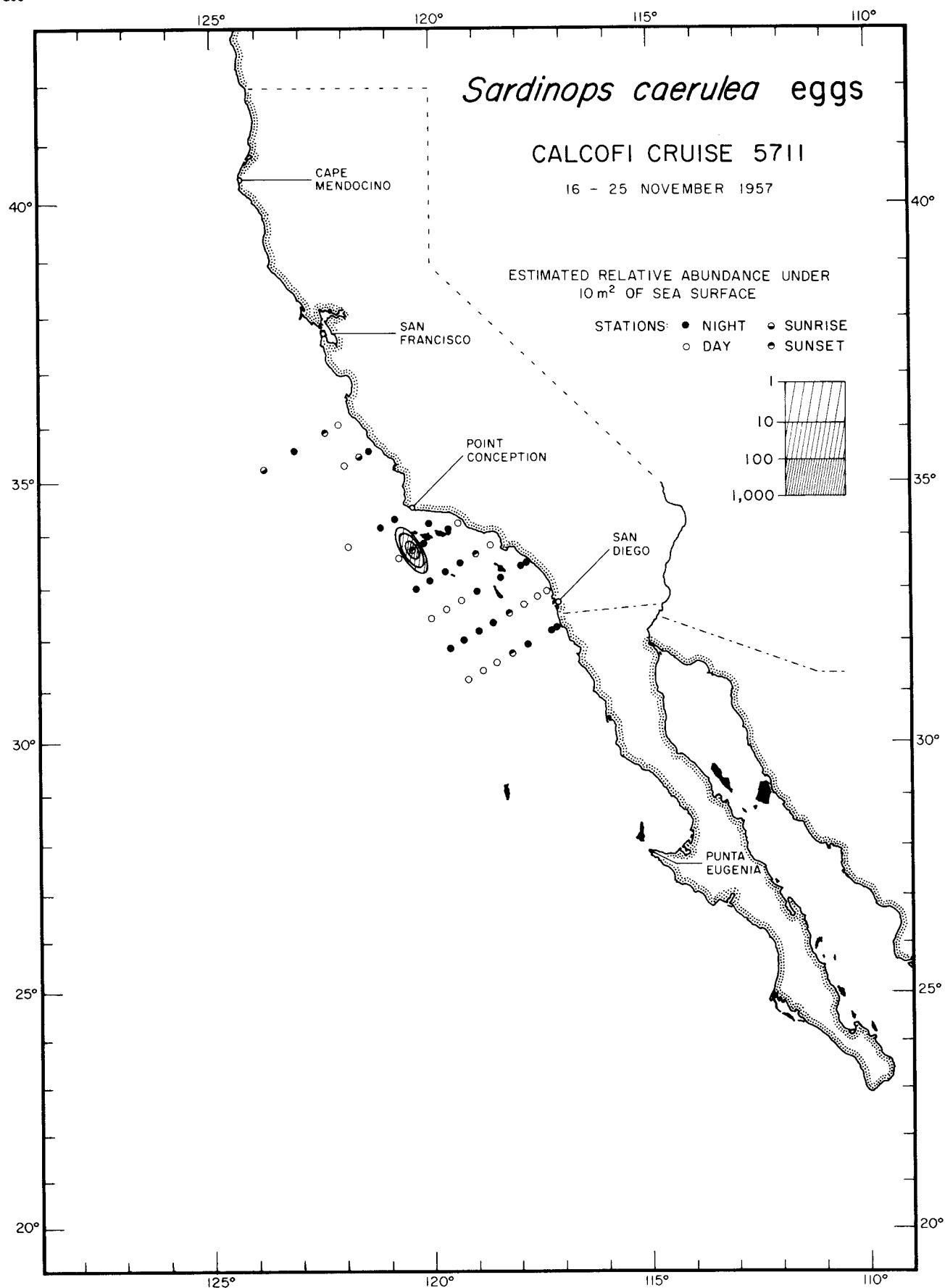
Sardinops caerulea eggs

5211



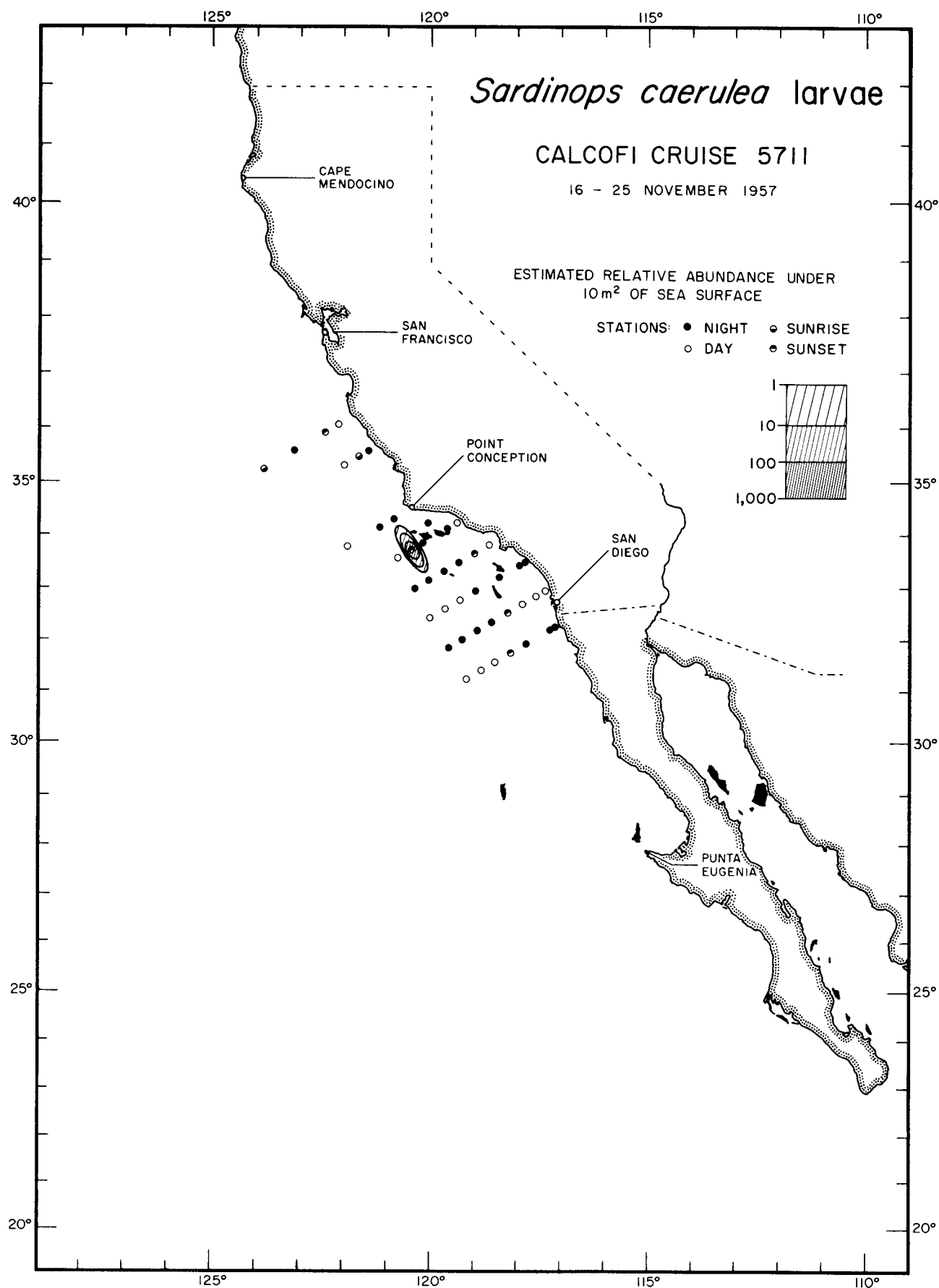
Sardinops caerulea larvae

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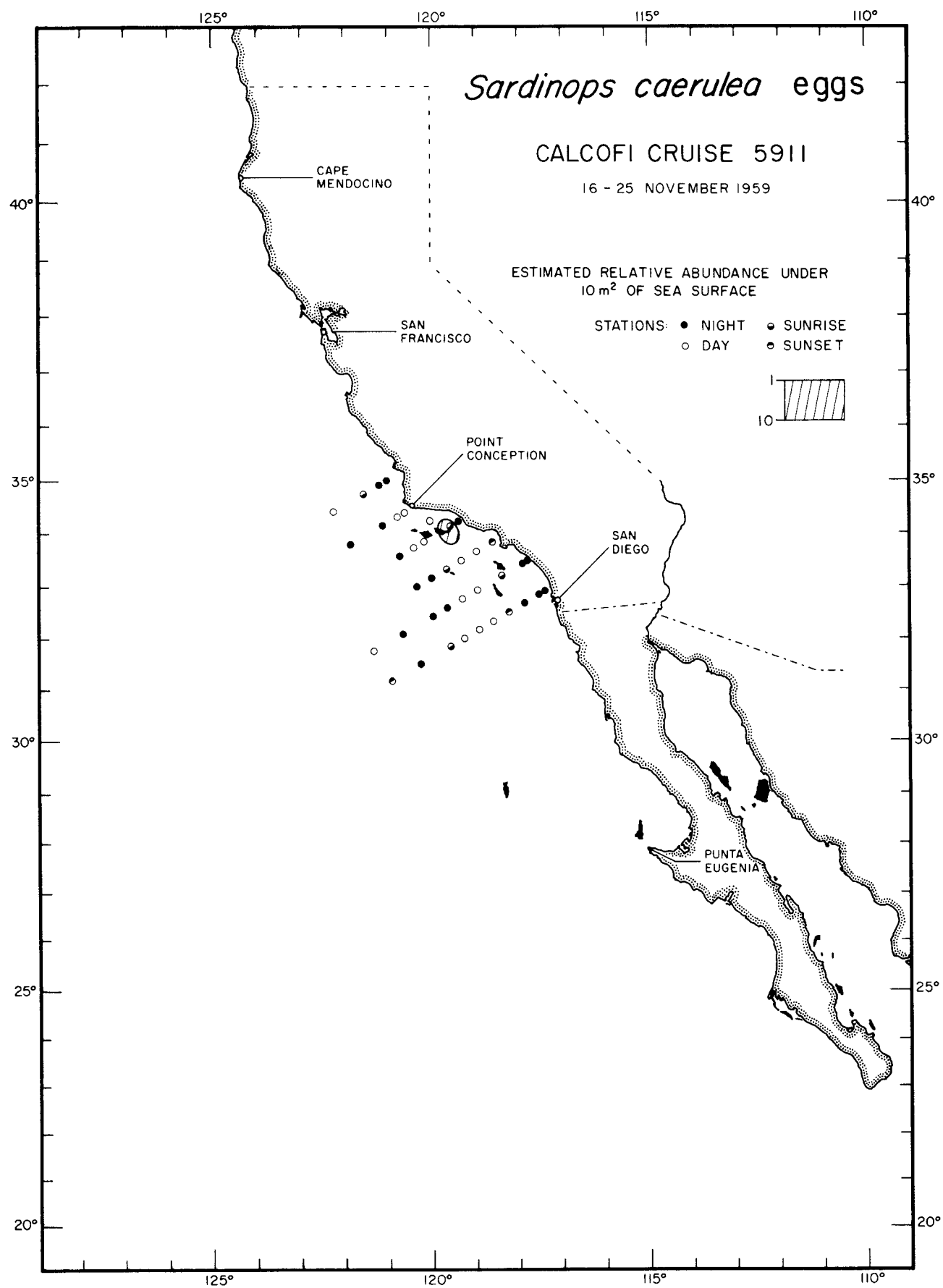
Sardinops caerulea eggs

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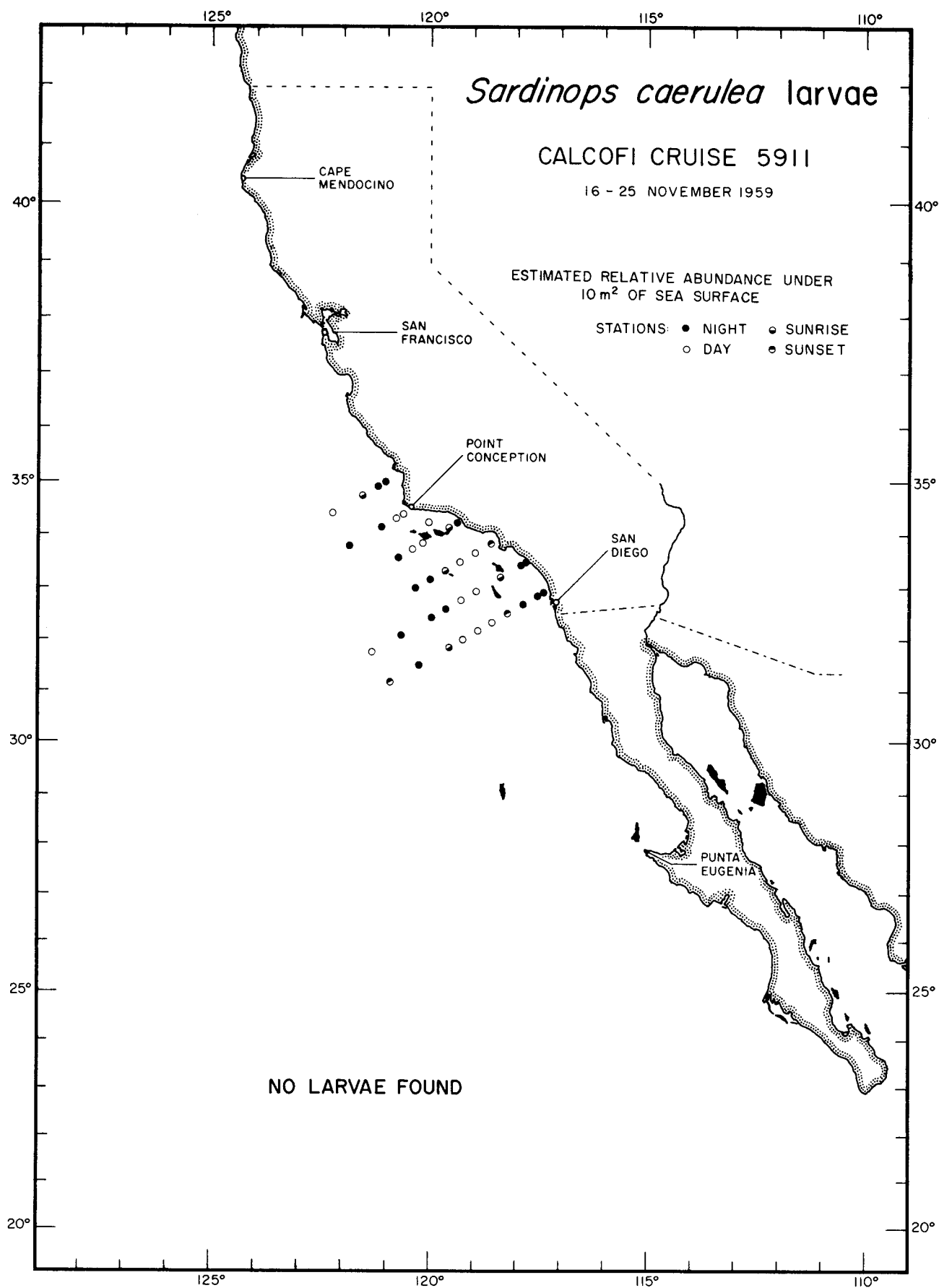
Sardinops caerulea larvae

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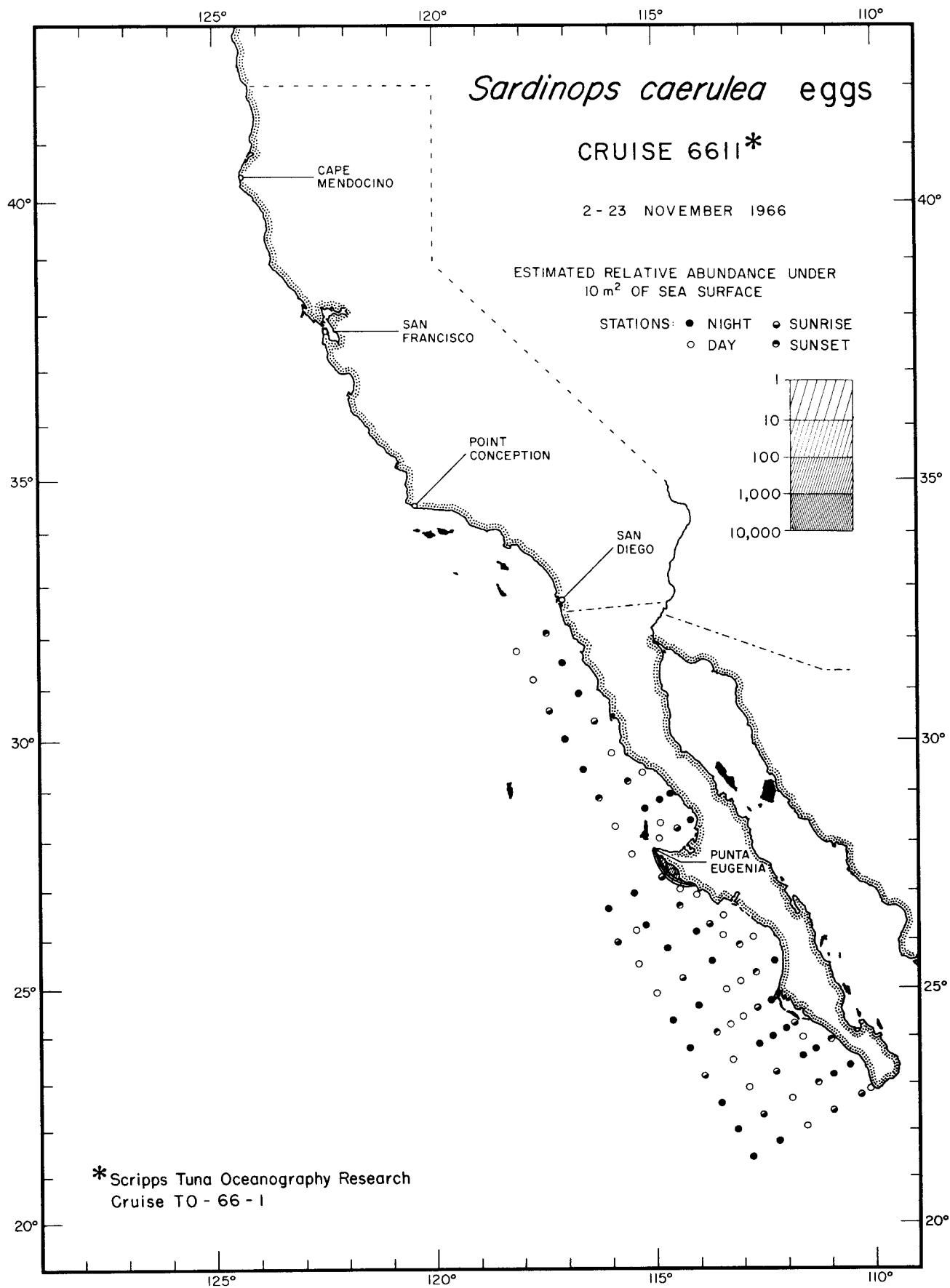


Sardinops caerulea eggs

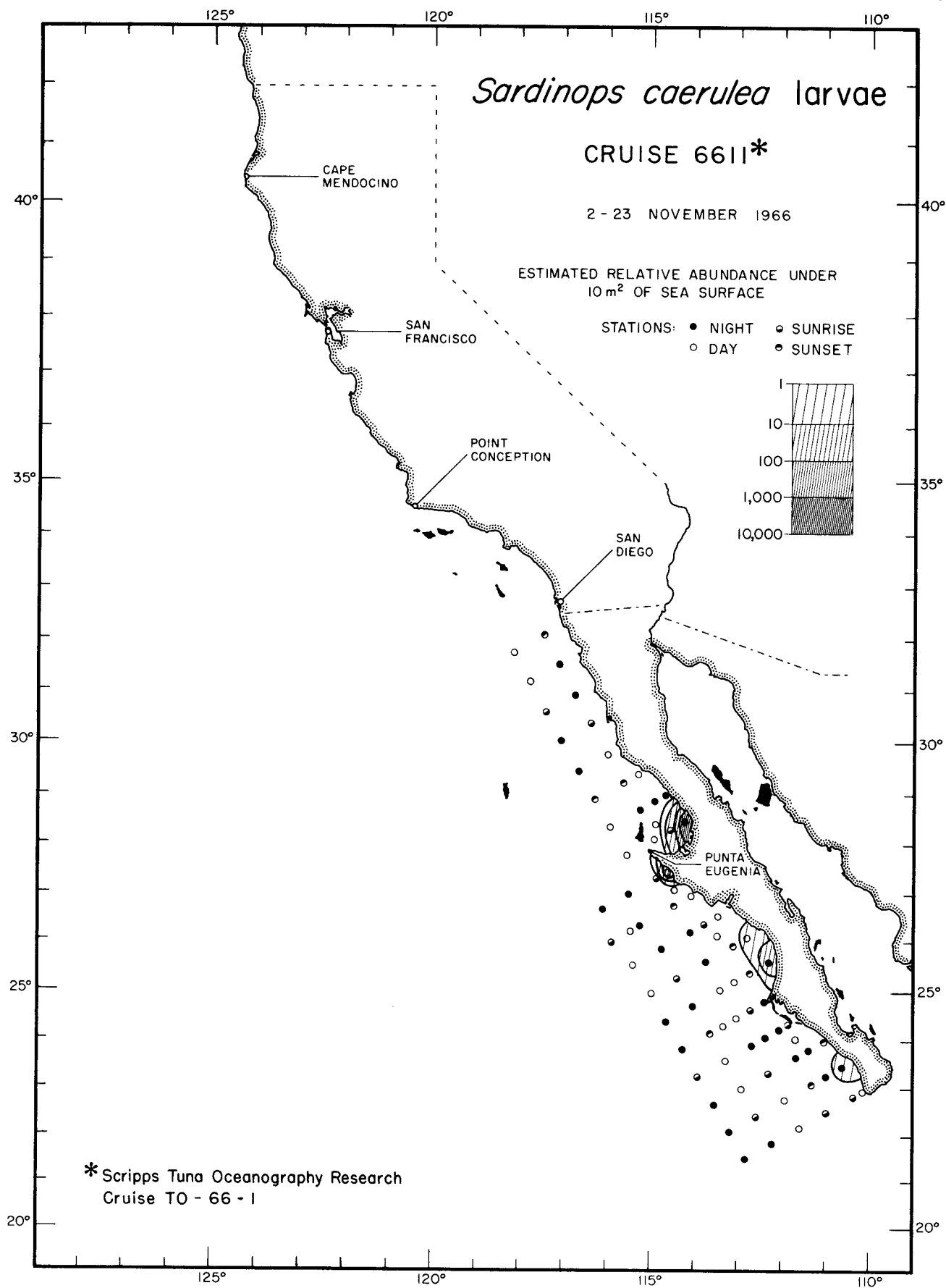
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*Sardinops caerulea* larvae

5911

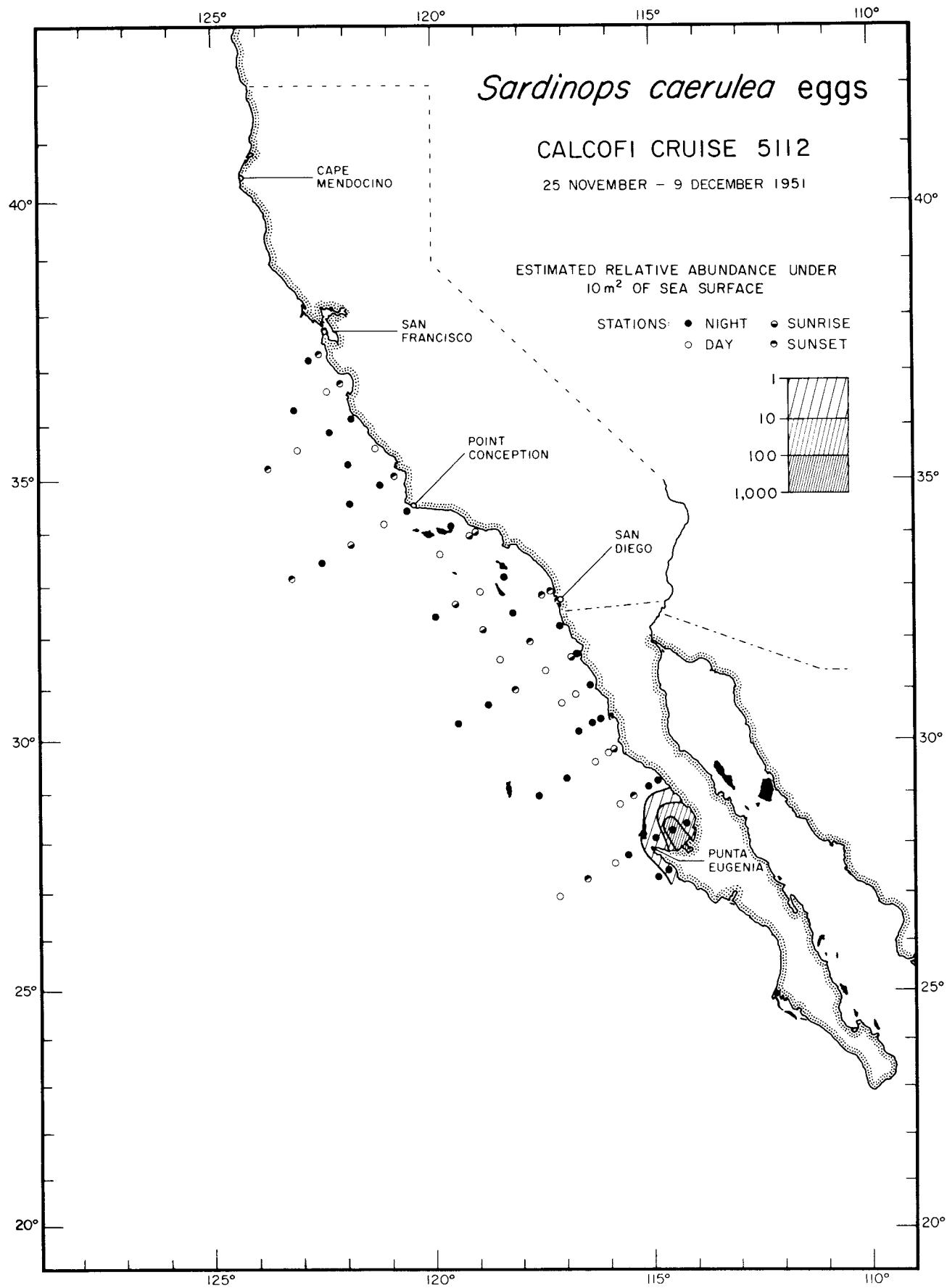
*Sardinops caerulea* eggs

6611

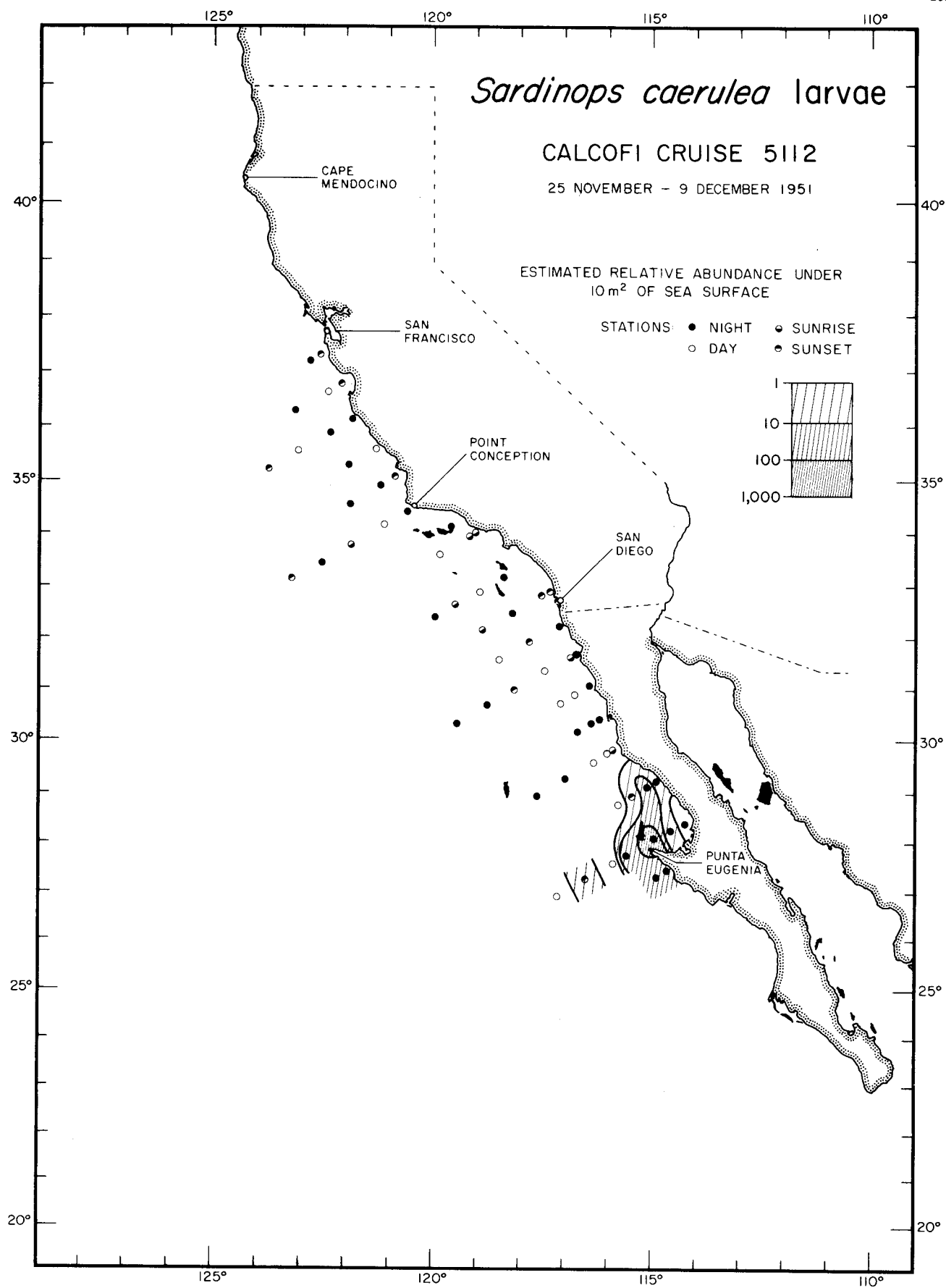


Sardinops caerulea larvae

6611

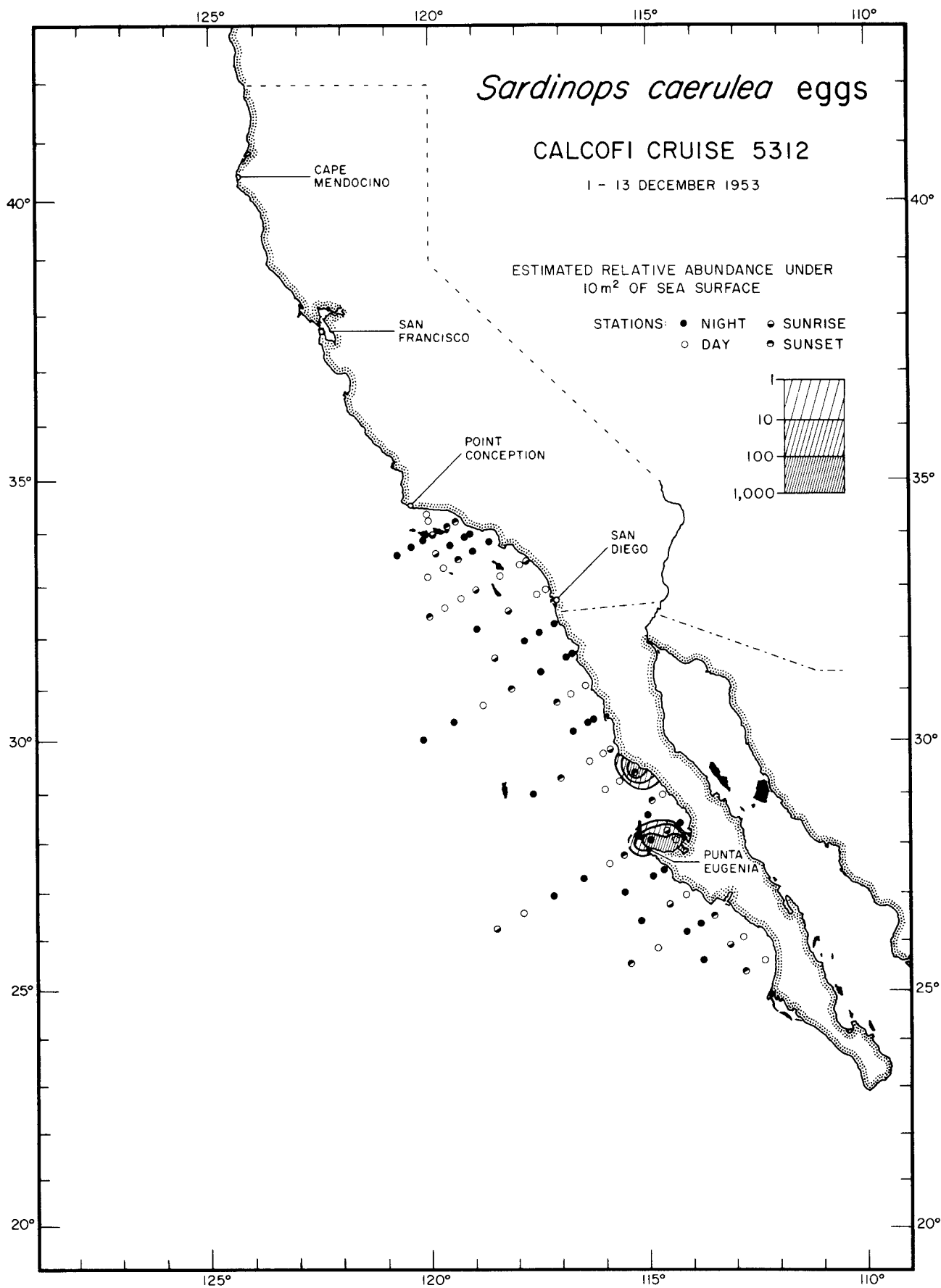
*Sardinops caerulea* eggs

5112



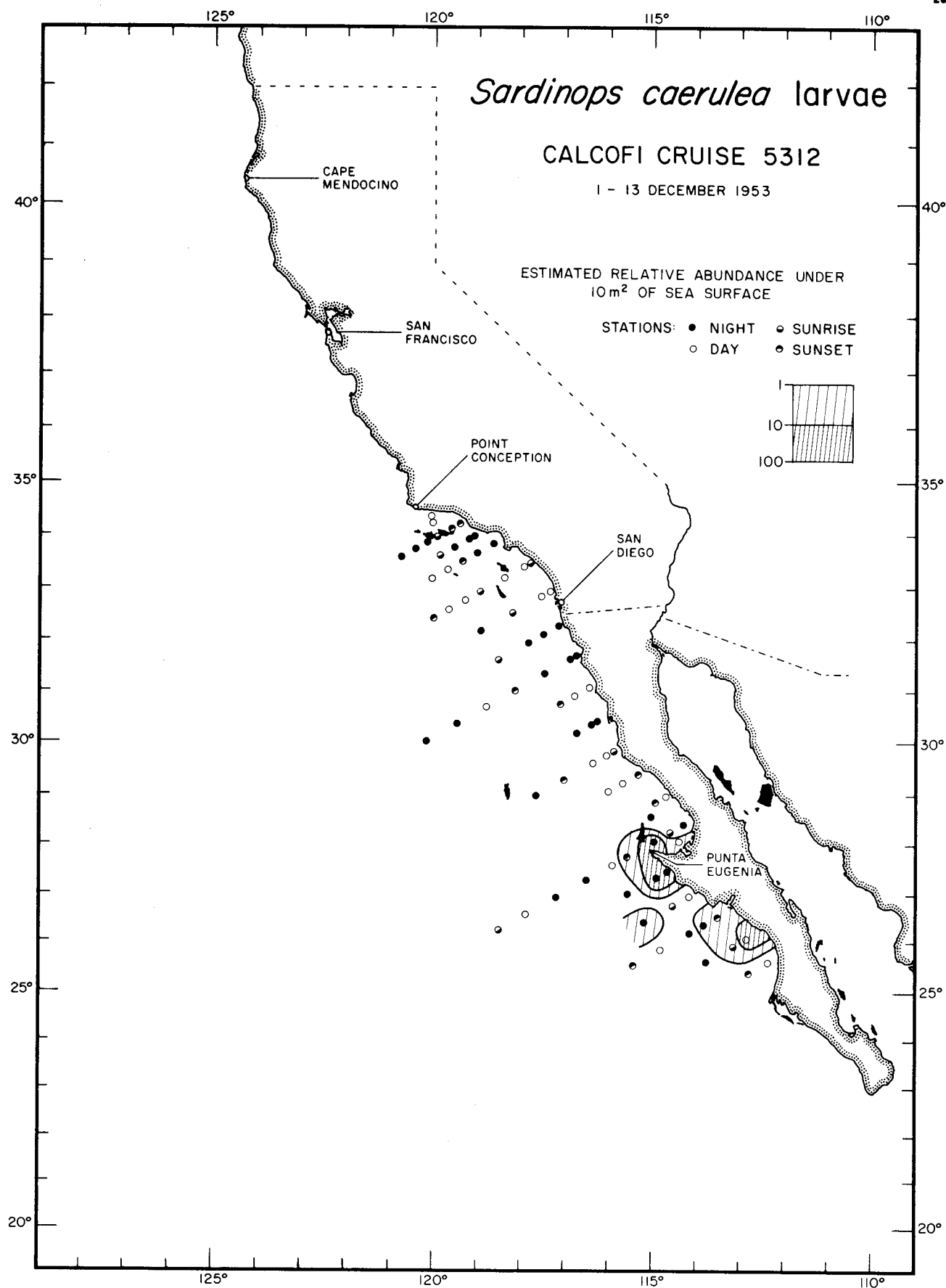
Sardinops caerulea larvae

5112



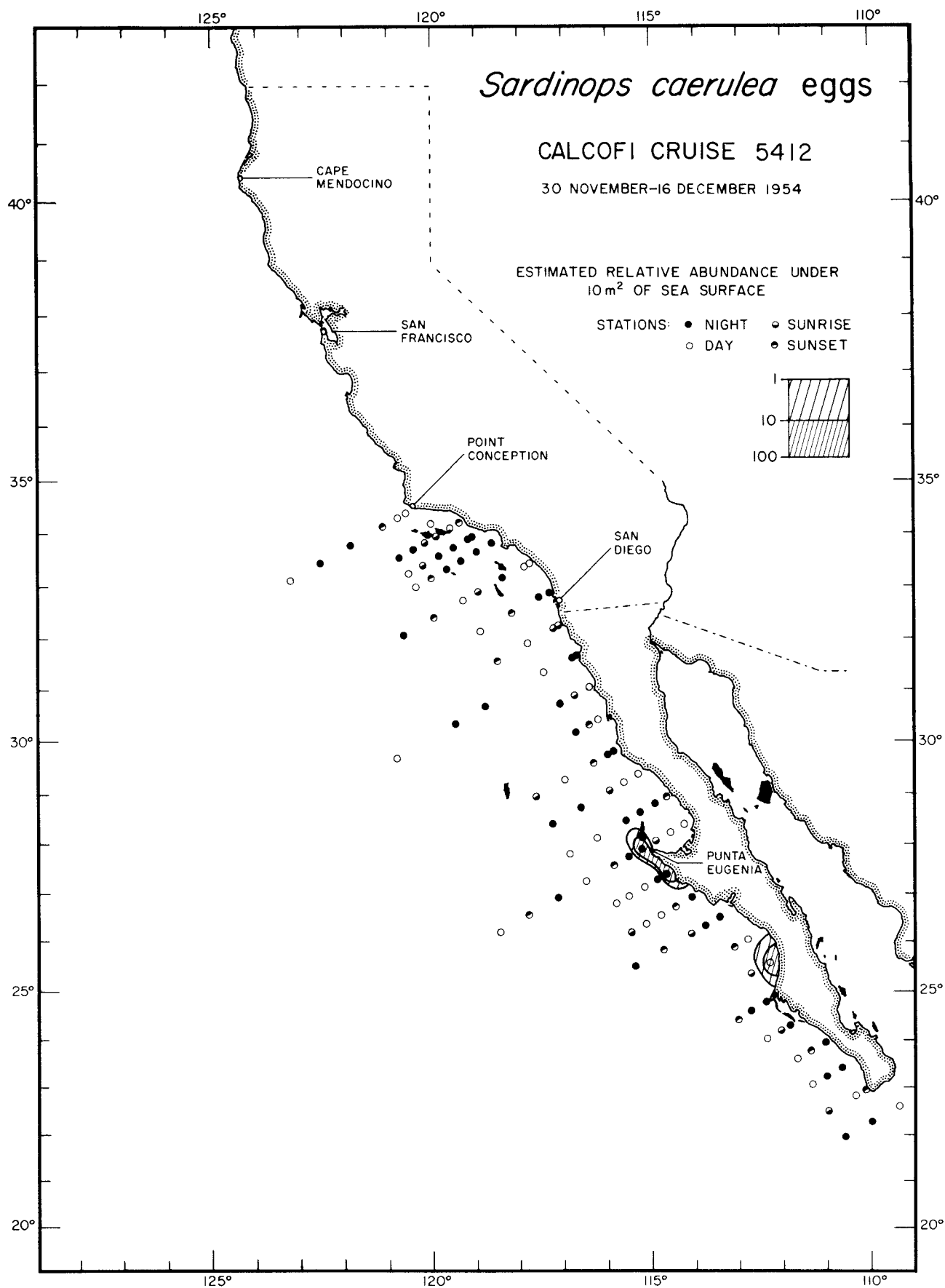
Sardinops caerulea eggs

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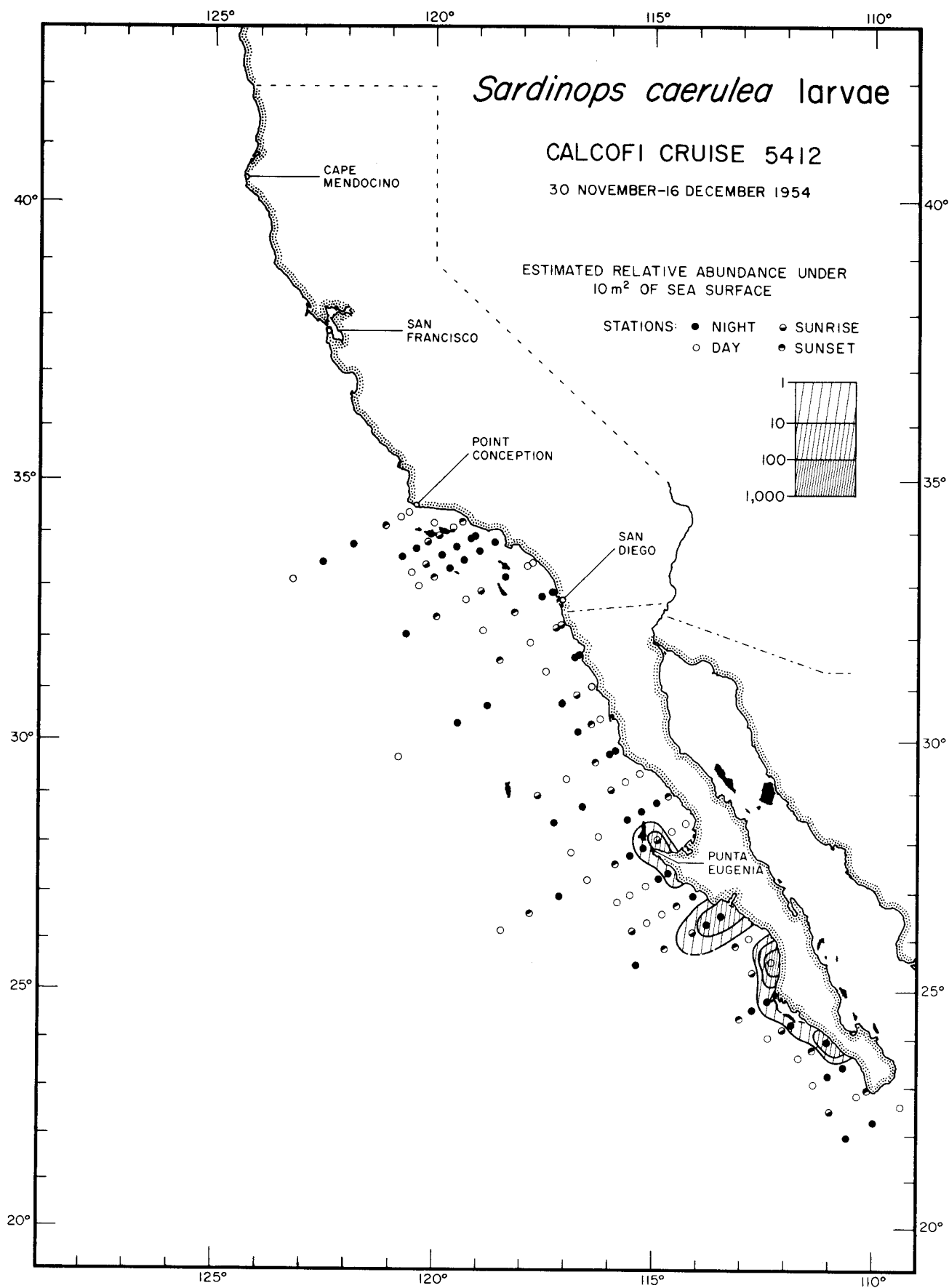


Sardinops caerulea larvae

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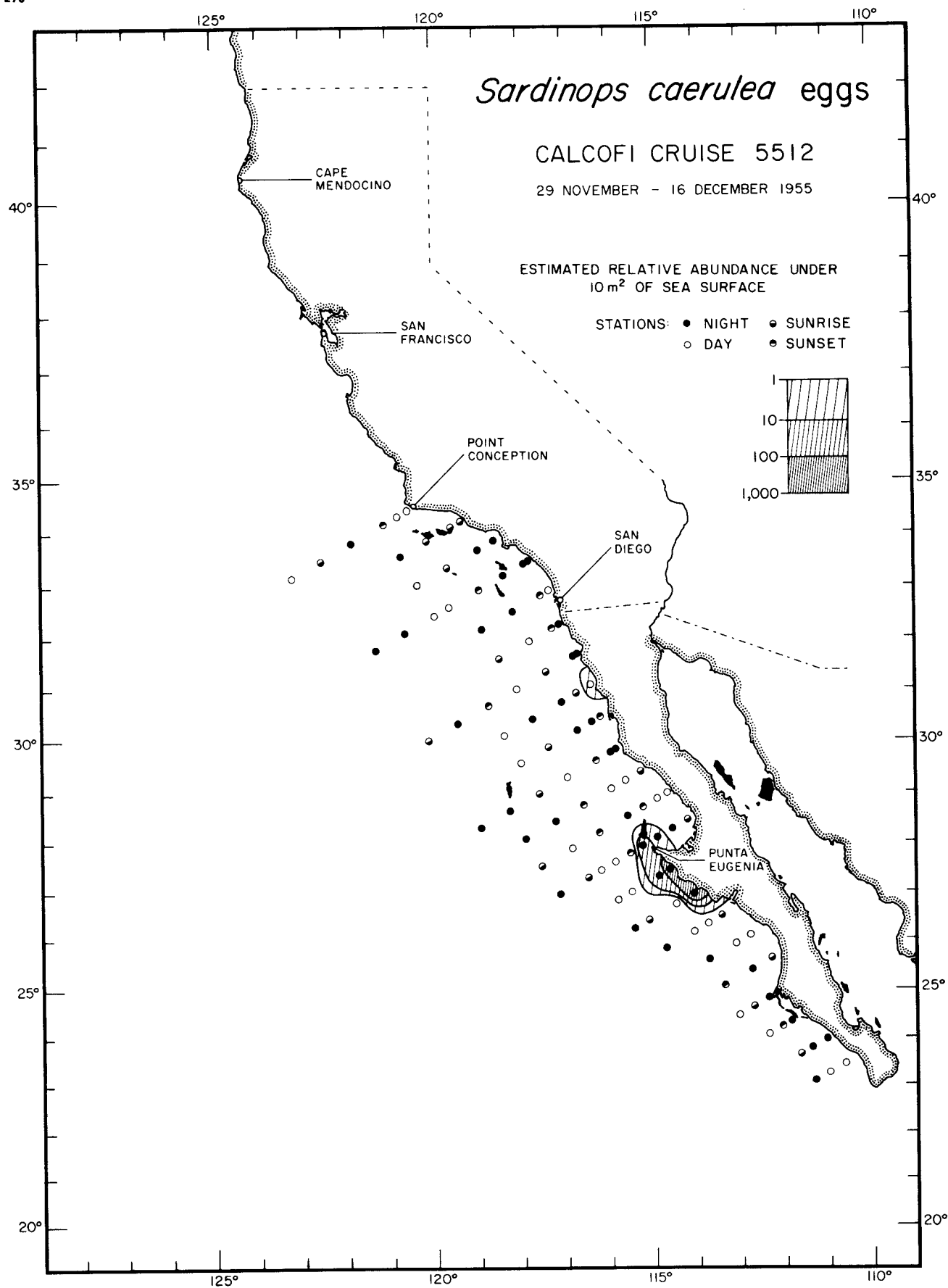
*Sardinops caerulea* eggs

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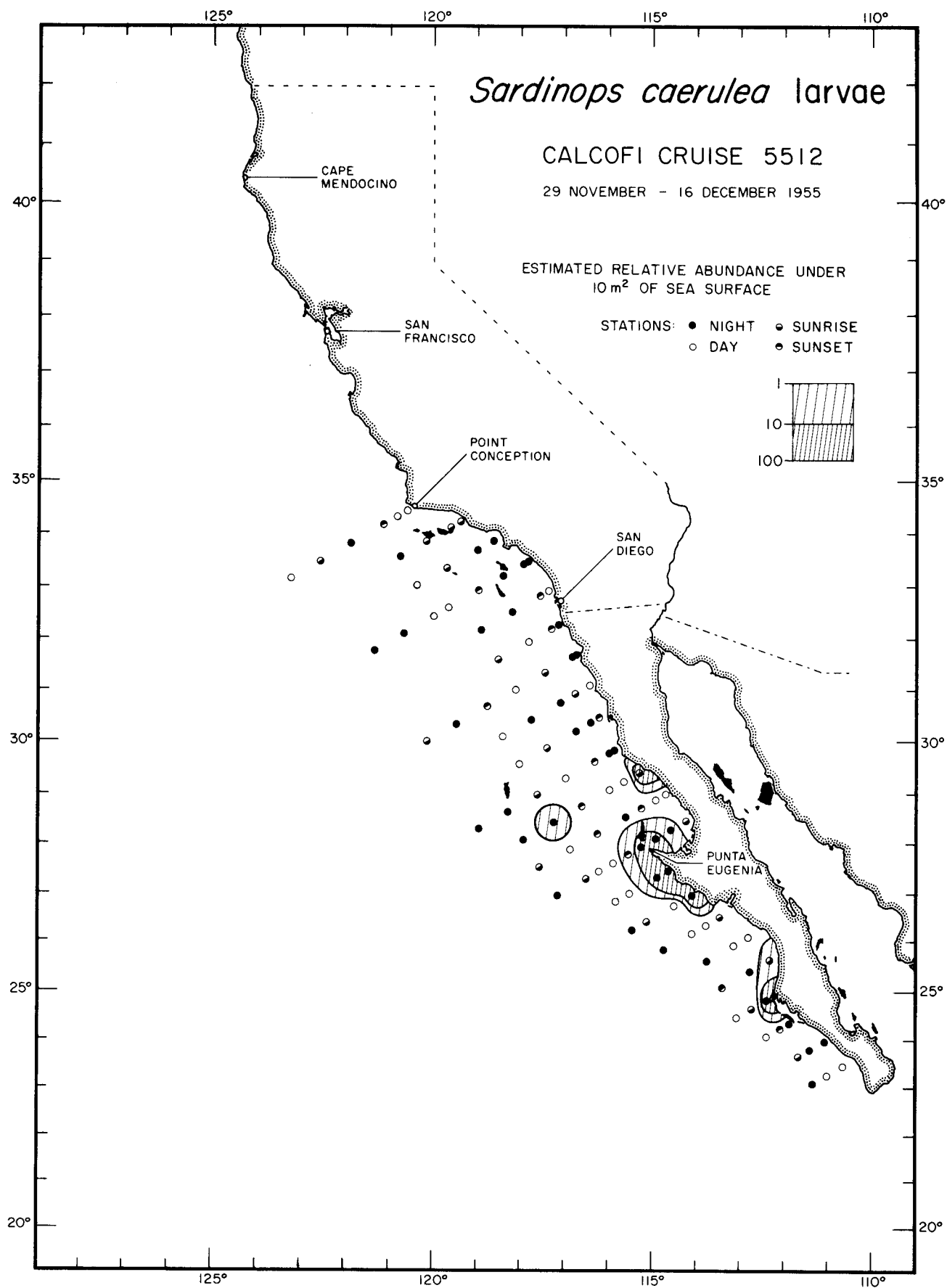


Sardinops caerulea larvae

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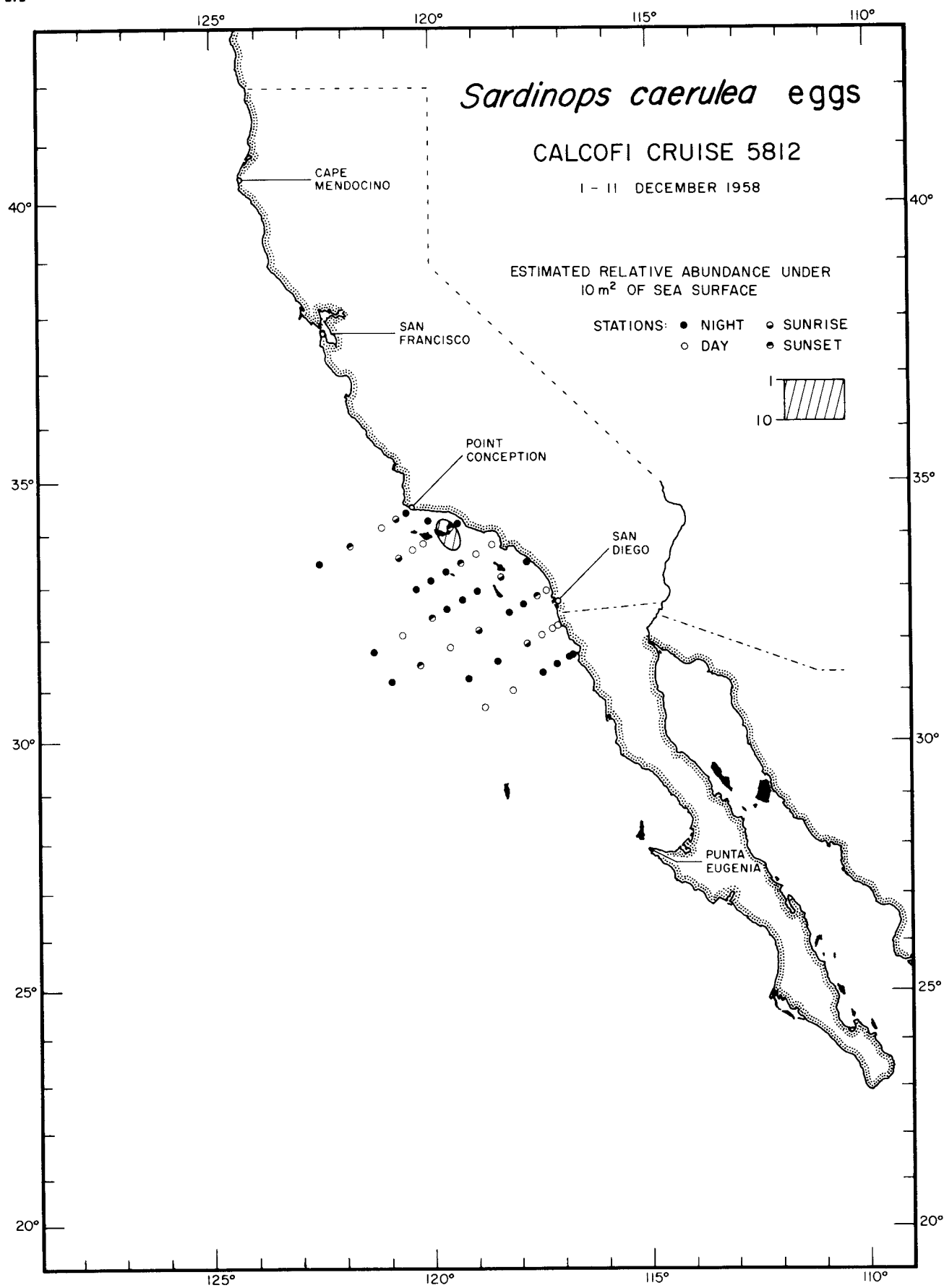
*Sardinops caerulea* eggs

5512



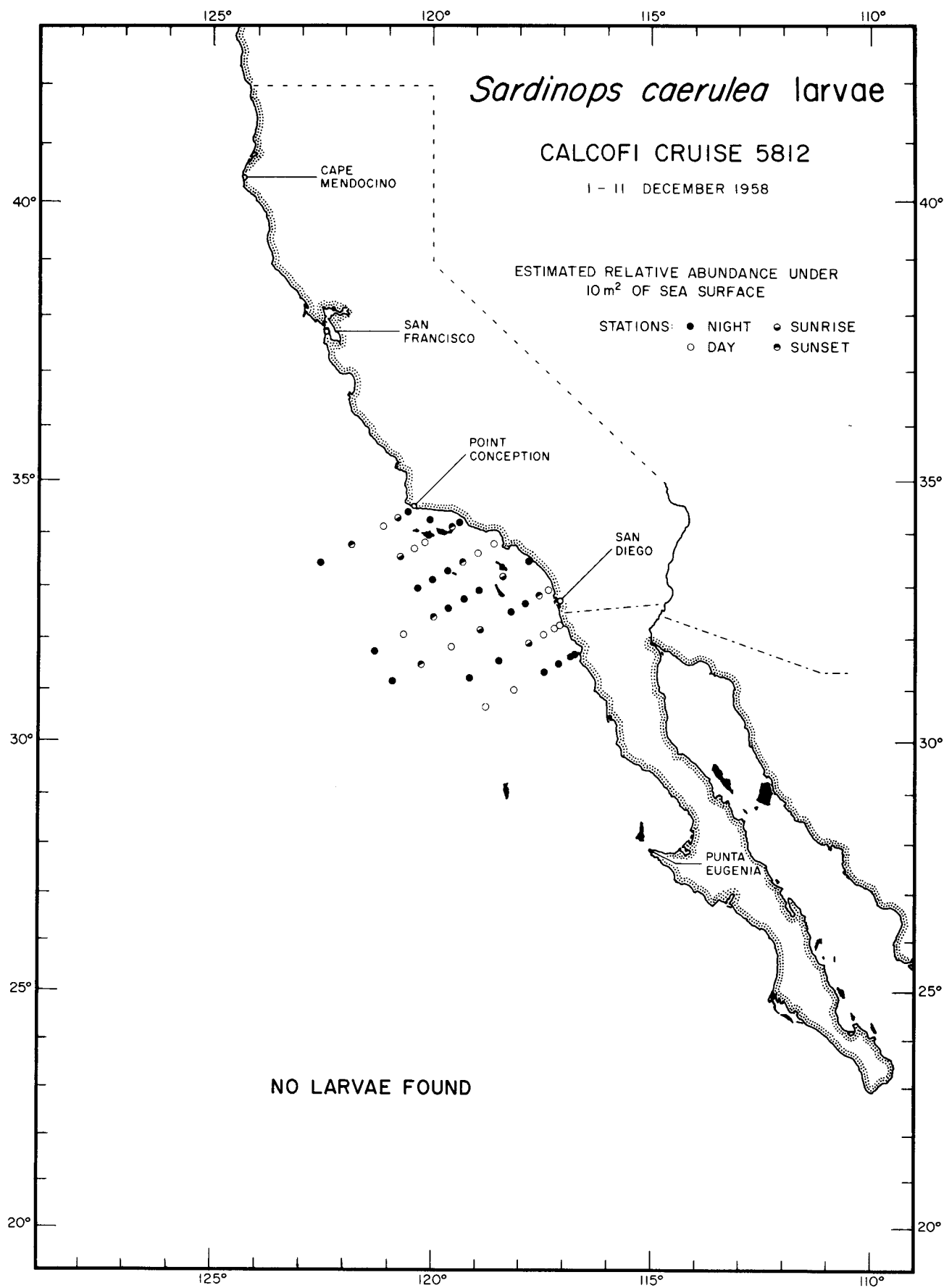
Sardinops caerulea larvae

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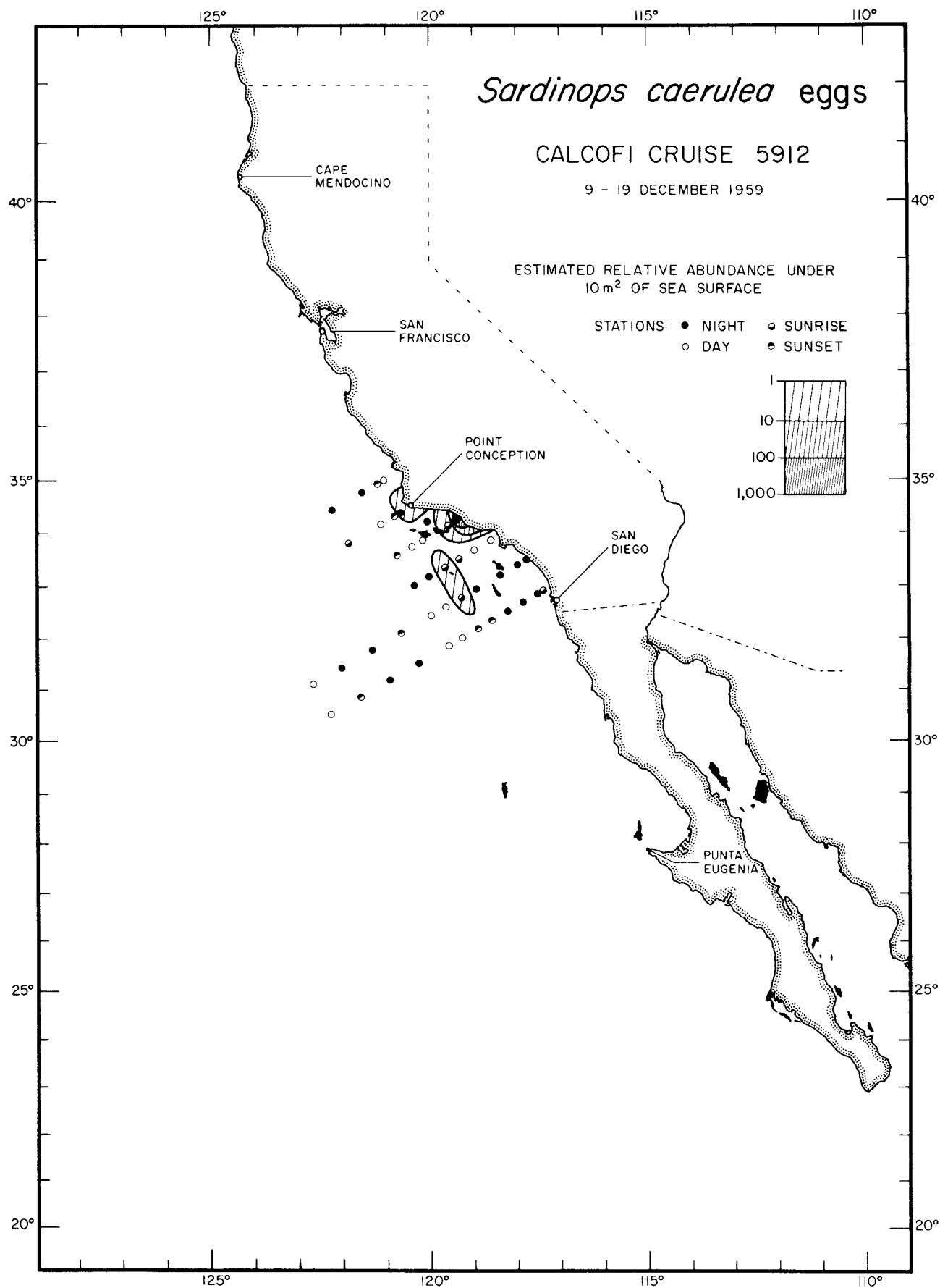


Sardinops caerulea eggs

5812

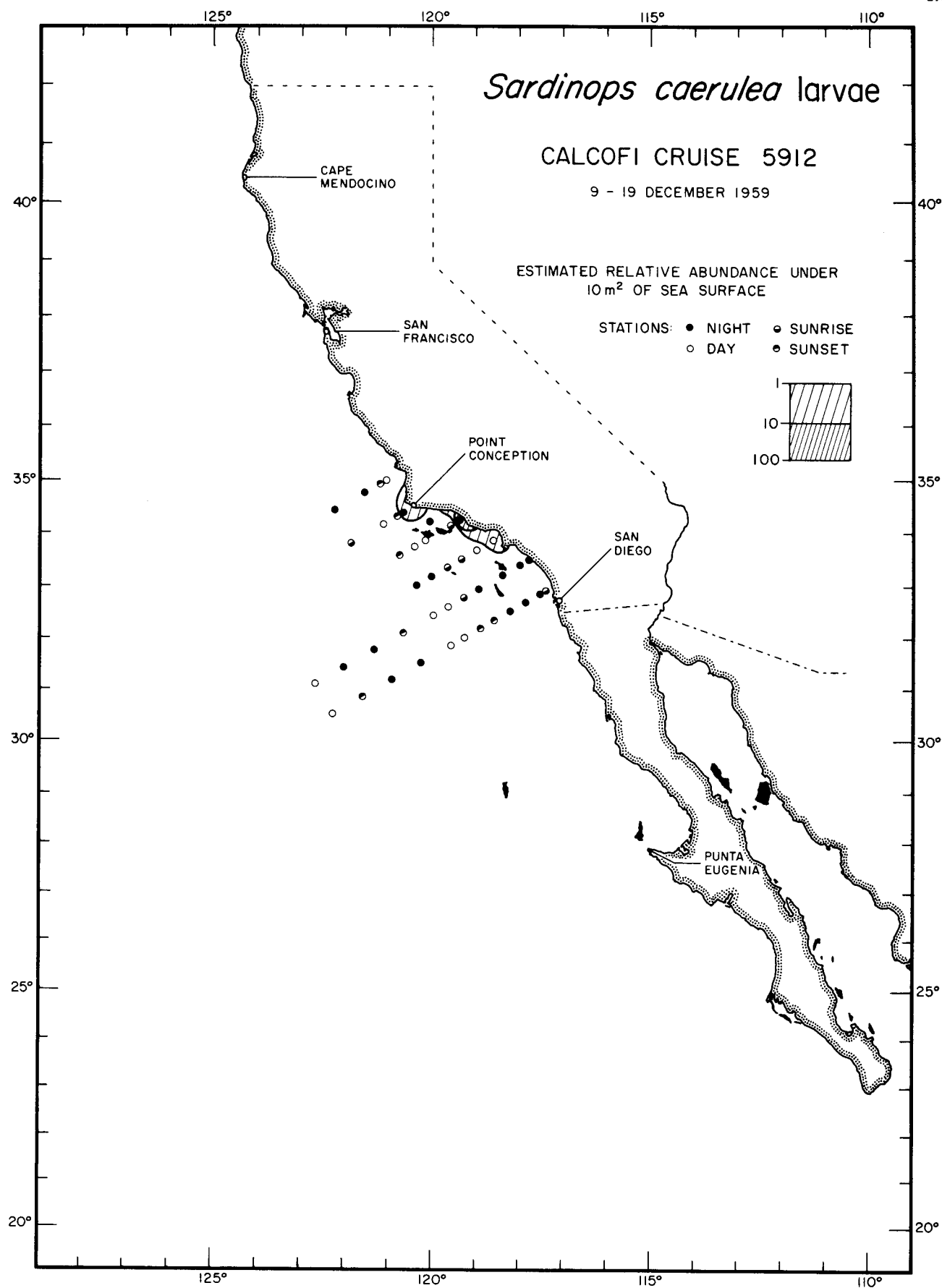
*Sardinops caerulea* larvae

5812

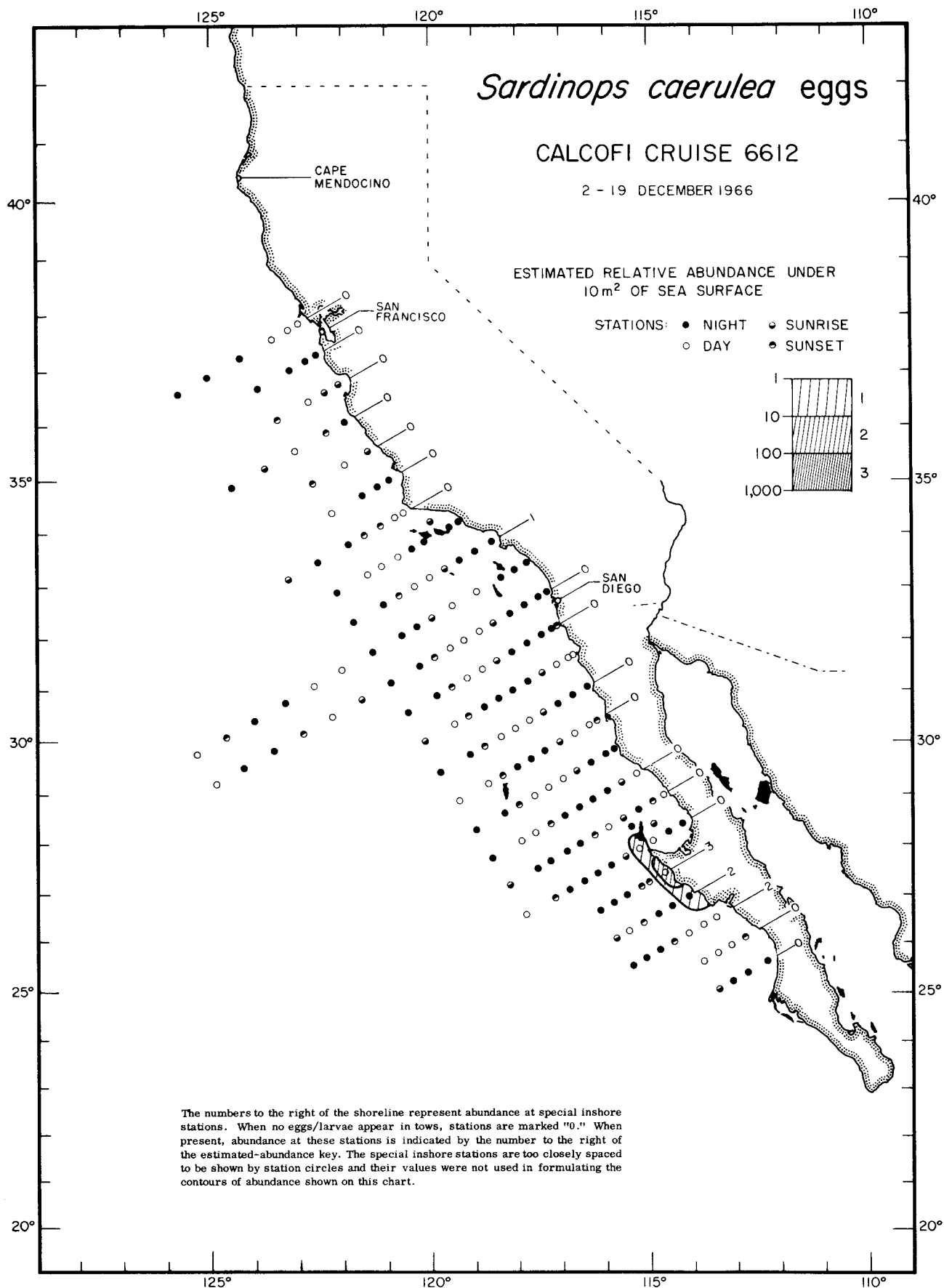


Sardinops caerulea eggs

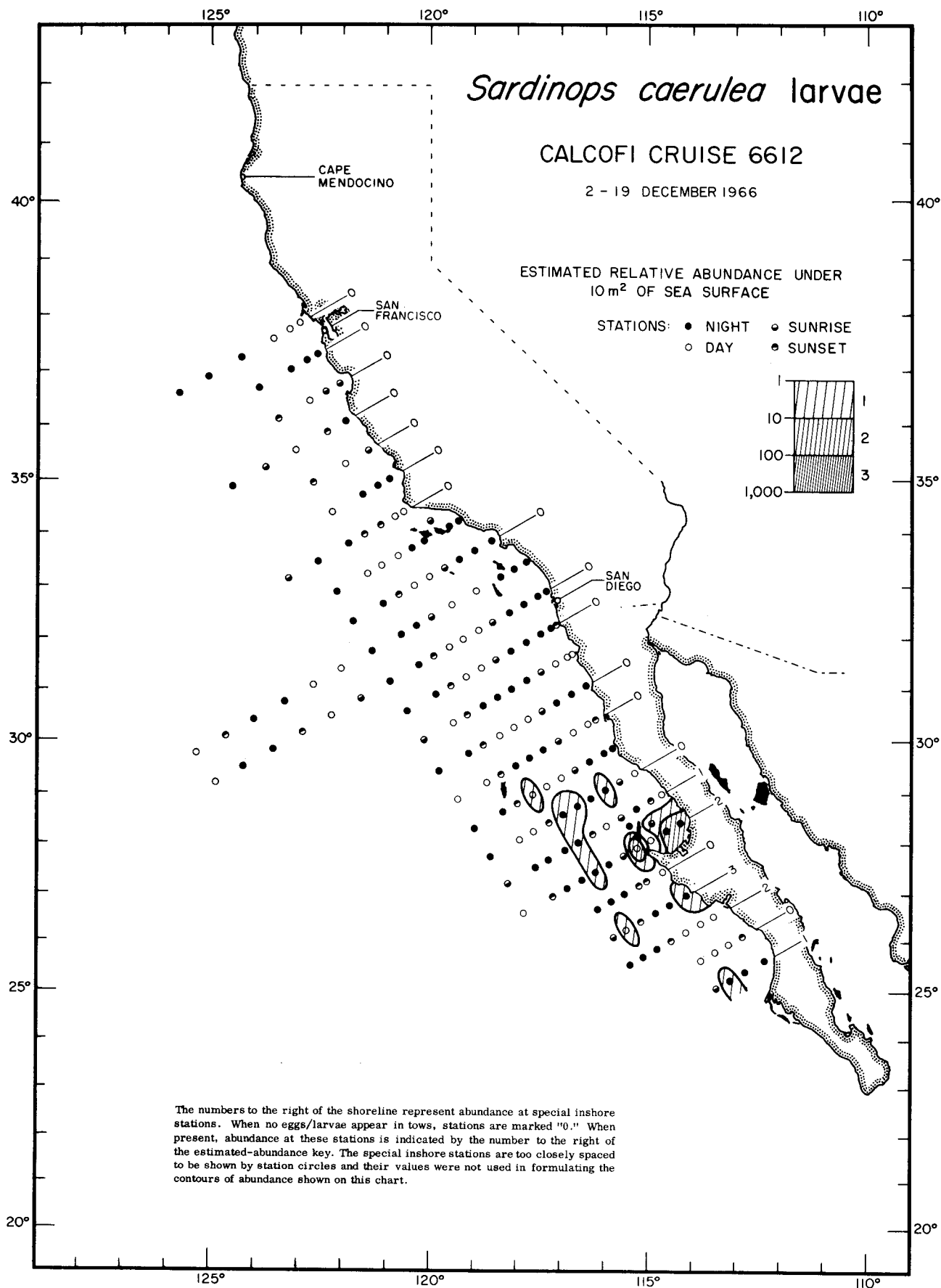
5912

*Sardinops caerulea* larvae

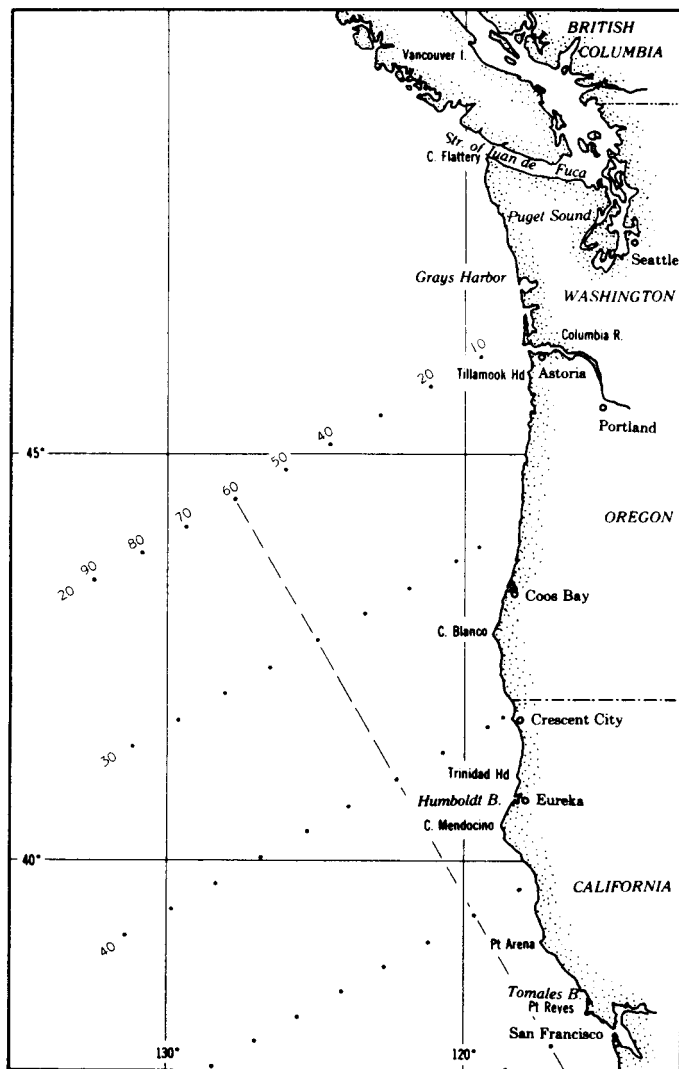
5912

*Sardinops caerulea* eggs

6612

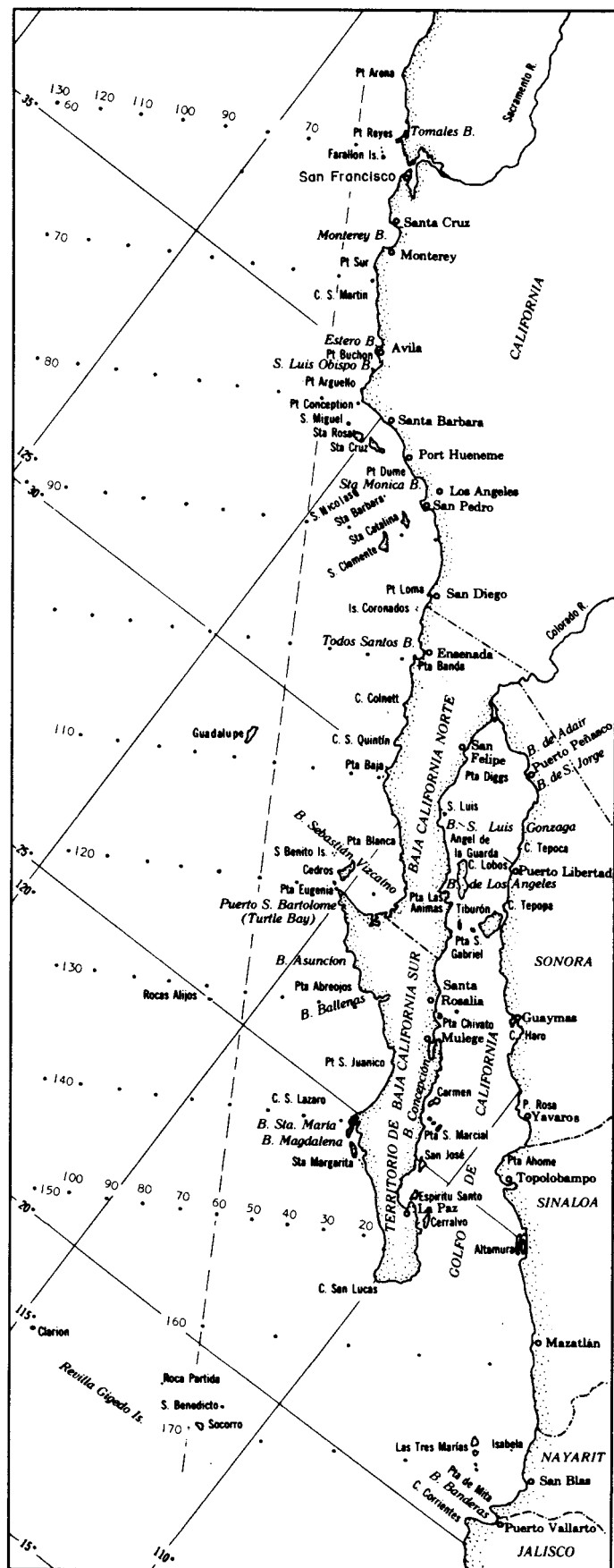
*Sardinops caerulea* larvae

6612



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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