



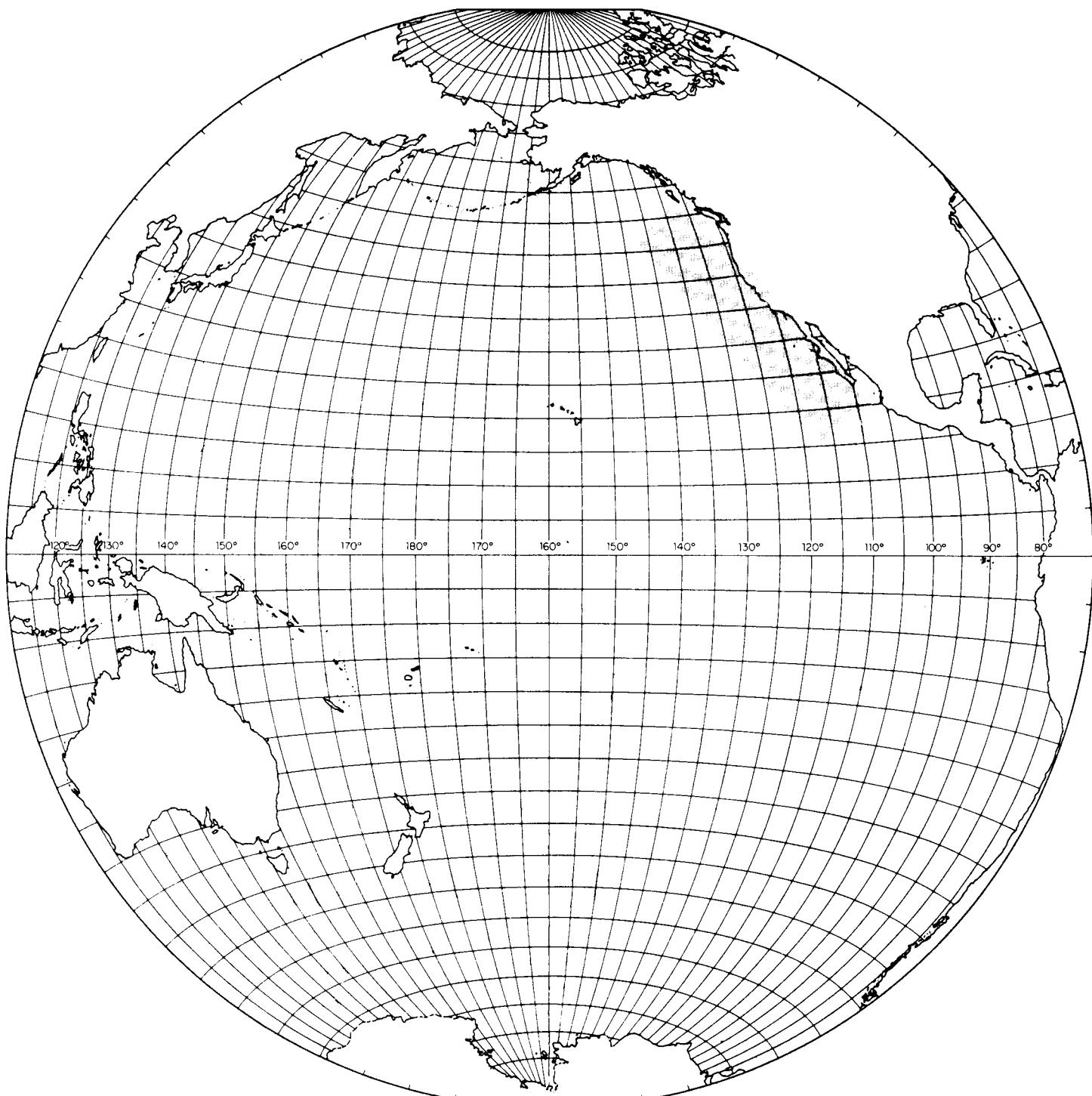
Atlas 9: Kramer, D. and E. H. Ahlstrom. Distributional atlas of fish larvae in the California Current region: northern anchovy, *Engraulis mordax* (Girard), 1951-1965. Published March 1968.

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.

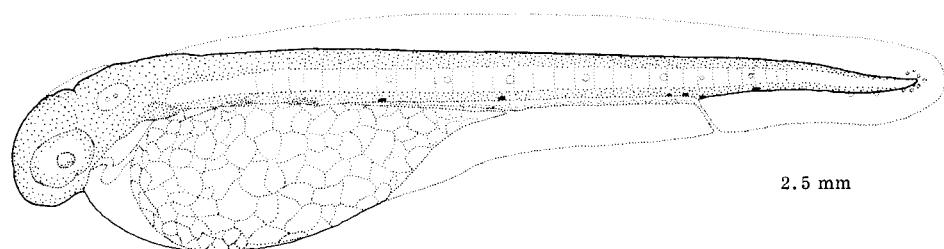
The report for each year usually is published about 7-9 months after the fall cruise, and includes notes about nomenclature changes, etc. The ultimate goal is to update the old ichthyoplankton identifications to current standards; the database is updated as re-identifications for each cruise are completed.

STATE OF CALIFORNIA
MARINE RESEARCH COMMITTEE

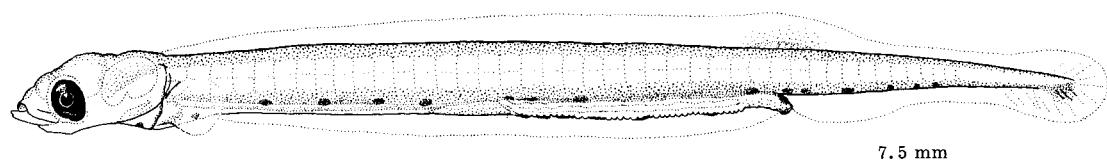


**CALIFORNIA COOPERATIVE OCEANIC
FISHERIES INVESTIGATIONS**

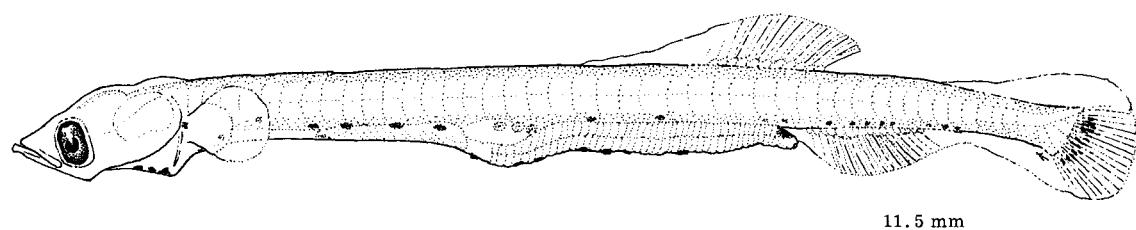
ATLAS No. 9



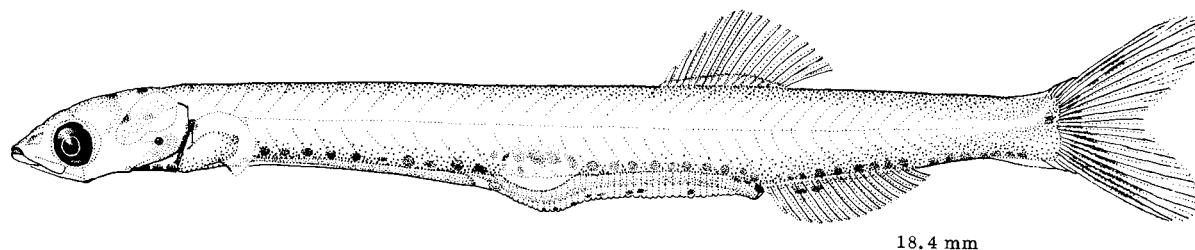
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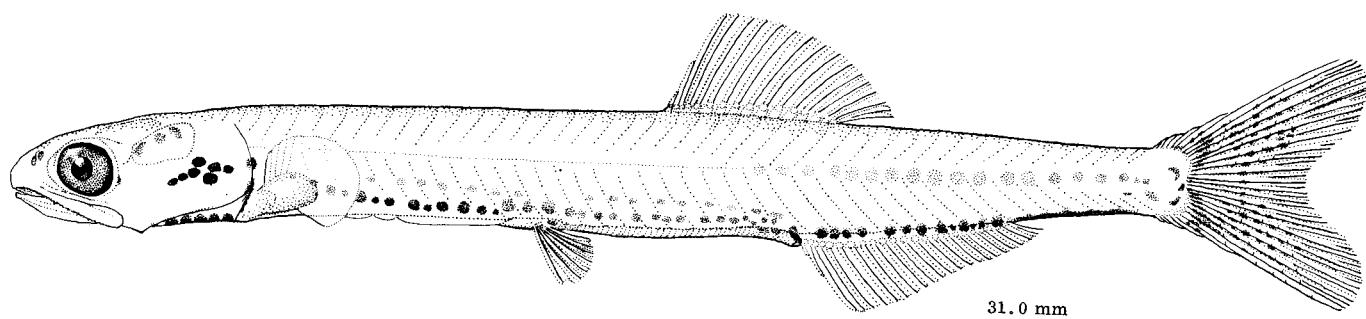
7.5 mm



11.5 mm



18.4 mm



31.0 mm

NORTHERN ANCHOVY

Engraulis mordax

CALIFORNIA
COOPERATIVE
OCEANIC
FISHERIES
INVESTIGATIONS

Atlas No. 9

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

March, 1968

THE CALCOFI ATLAS SERIES

This is the ninth 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 March 1968, 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

Alvariño, 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

Berner, 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.

¹ Usually abbreviated CalCOFI, sometimes CALCOFI or CCOFI.

² For citation this issue in the series should be referred to as CalCOFI Atlas No. 9.

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David Kramer and Elbert H. Ahlstrom

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DISTRIBUTIONAL ATLAS OF FISH LARVAE IN THE
CALIFORNIA CURRENT REGION: NORTHERN ANCHOVY,
ENGRAULIS MORDAX GIRARD, 1951 THROUGH 1965

David Kramer¹ and Elbert H. Ahlstrom¹

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Introduction to the Charts

This atlas depicts the abundance and distribution of the larvae of the northern anchovy, Engraulis mordax Girard, in the region of the California Current off California and Baja California. The charts include the data collected on all cruises (exclusive of special surveys and special stations) conducted by the California Cooperative Oceanic Fisheries Investigations during the years 1951 through 1965 (Ahlstrom, 1953, 1954; Ahlstrom and Kramer, 1955, 1956, 1957; Ahlstrom, 1958, MSS²). Surveys were conducted monthly during the decade 1951 through 1960 and quarterly during 1961 through 1965. Details of sampling methods were described by Ahlstrom (1948, 1953) and Fleminger (1964). Briefly, each sample was collected with the standard CalCOFI net constructed of silk mesh (bolting cloth), mouth diameter one meter and mesh size approximately 0.55 mm. Occasionally, a nylon net of the same mouth opening and mesh size was used. A flowmeter in the mouth of the net permitted calculation of the amount of water strained. Each tow was made by sinking the net at 50 meters per minute to a depth of about 140 meters (200 meters of wire out, depth permitting) and by retrieving it at 20 meters per minute while maintaining a wire angle of 45 degrees. The ship's speed during the tow was about 2 knots.

In the laboratory, samples were sorted for all fish eggs and larvae. In the case of a very large-sized sample examination was made of an aliquot obtained from the Folsom Plankton Sample Splitter (McEwen, Johnson and Folsom, 1954).

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

² Ahlstrom, MSS are preliminary data reports (1) for 1958 and 1959, and (2) for 1960 through 1964, prepared at the Fishery-Oceanography Center for limited distribution. The data for 1965 have not been released before.

The standardized values for fish eggs and larvae are not directly comparable with the standardized values used by authors of previous CalCOFI atlases, where the values were adjusted to volume of water strained. For most stations, the standardized values for anchovies are approximately 1.4 times as large.

Estimates of abundance of larvae and eggs were made comparable between samples by standardizing the values to a unit of ten square meters of sea surface. The standardization factor was derived for each station according to the volume of water strained and the average depth of each haul as follows:

$$S = \frac{10 D}{V} \text{ or } \frac{10 D}{R a p}, \quad (1)$$

where

S = standardized haul factor,

D = average depth of a haul in meters,

V = number of cubic meters of water strained during a haul,

R = number of revolutions registered by the current meter during a haul,

a = cross-sectional area of the net mouth in square meters, and

p = length of the column of water in meters needed to effect one revolution of the current meter at the average speed at which the haul was taken.

Note that

$$V = R a p. \quad (2)$$

The contour intervals of the present charts also differ from those used in previous CalCOFI atlases. Since anchovy larvae are seldom collected in numbers greater than 10,000, and since five contour intervals were desired, each interval was reduced to one-fifth of that used in CalCOFI Atlases 2, 3, 5, 6, 7 and 8.

The strata occupied by anchovy larvae are completely sampled by the standard haul from the surface to 140 meters of depth (Ahlstrom, 1959b). It is known, however, that larvae of various sizes are able to escape the net. Small ones may pass through the 0.55-mm mesh and large ones may swim away from the path of the net, especially during daylight. Therefore, two charts are presented for each cruise, one for the size group most adequately sampled (6.26-12.25 mm), and one for the total numbers caught.

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- Ahlstrom, E. H., 1948. A record of pilchard eggs and larvae collected during surveys made during 1939 to 1941. U. S. Fish and Wildl. Serv. Spec. Sci. Rpt., No. 54: 1-76.
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CalCOFI Basic Station Plan

1

Distribution of Northern Anchovy larvae 2-269. See table below for individual cruises

Months	<u>01</u>	<u>02</u>	<u>03</u>	<u>04</u>	<u>05</u>	<u>06</u>
Years						
<u>1951</u>	2, 3	4, 5	6, 7	8, 9	10, 11	12, 13
<u>52</u>	26, 27	28, 29	30, 31**	32, 33	34, 35	36, 37
<u>53</u>	48, 49	50, 51	52, 53**	54, 55	56, 57	58, 59
<u>54</u>	72, 73	74, 75	76, 77	78, 79	80, 81	82, 83
<u>55</u>	92, 93	94, 95	96, 97	98, 99	100, 101	102, 103
<u>56</u>	114, 115	116, 117	118, 119	120, 121	122, 123	124, 125
<u>57</u>	138, 139	140, 141	142, 143	144, 145	146, 147	148, 149
<u>58</u>	162, 163	164, 165	166, 167	168, 169	170, 171	172, 173
<u>59</u>	186, 187	188, 189	190, 191	192, 193	194, 195	196, 197
<u>60</u>	210, 211	212, 213	214, 215	216, 217	218, 219	220, 221
<u>61</u>	230, 231			232, 233		
<u>62</u>	238, 239			240, 241		
<u>63</u>	246, 247			248, 249		
<u>64</u>	254, 255			256, 257		
<u>1965</u>	262, 263			264, 265		

* The first two figures in the CalCOFI cruise-numbering system represent the year of the cruise; the last two figures, the month.

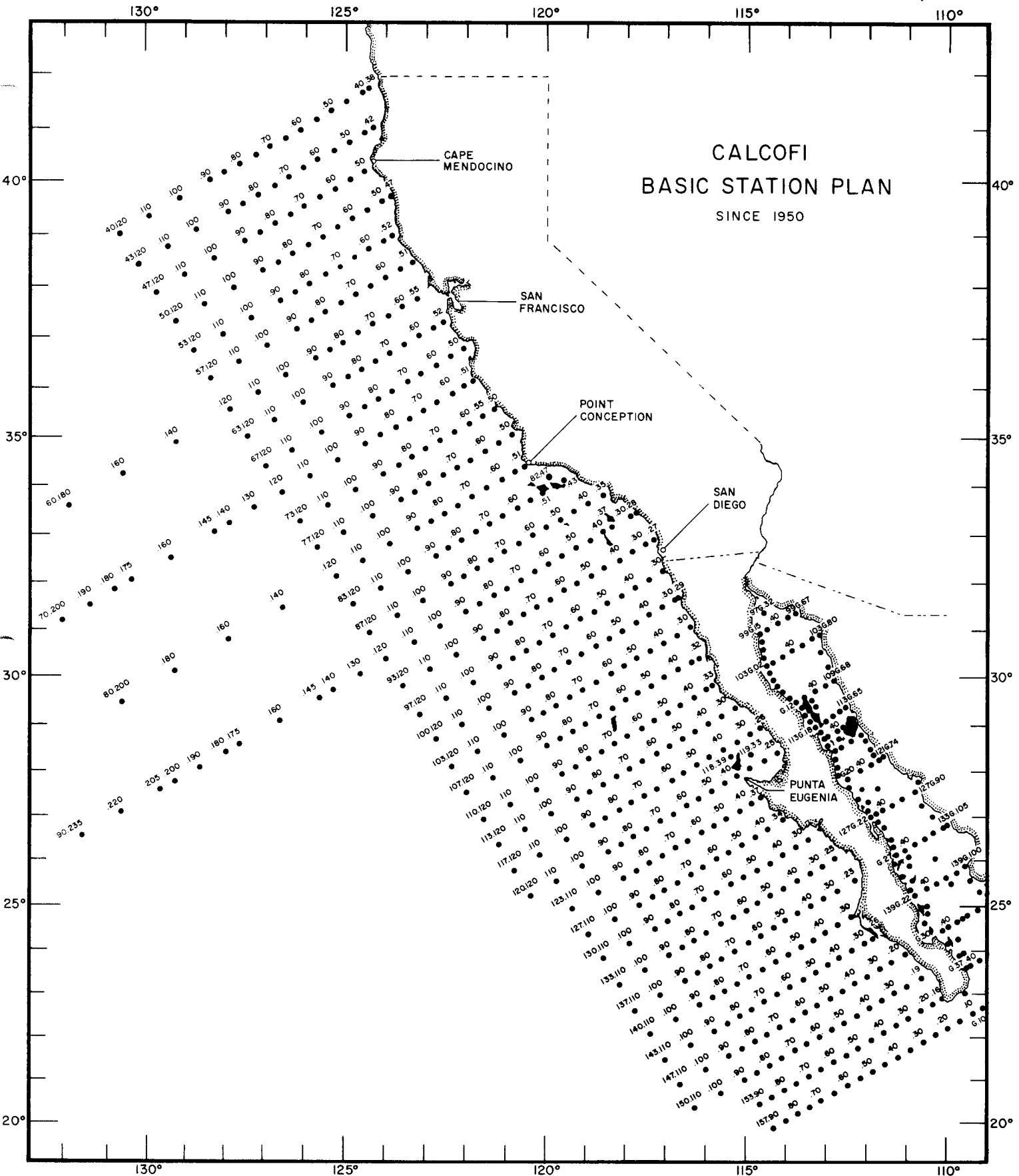
The table below is a cross reference to an earlier system of assigning cruise numbers. The earlier numbers are in parentheses.

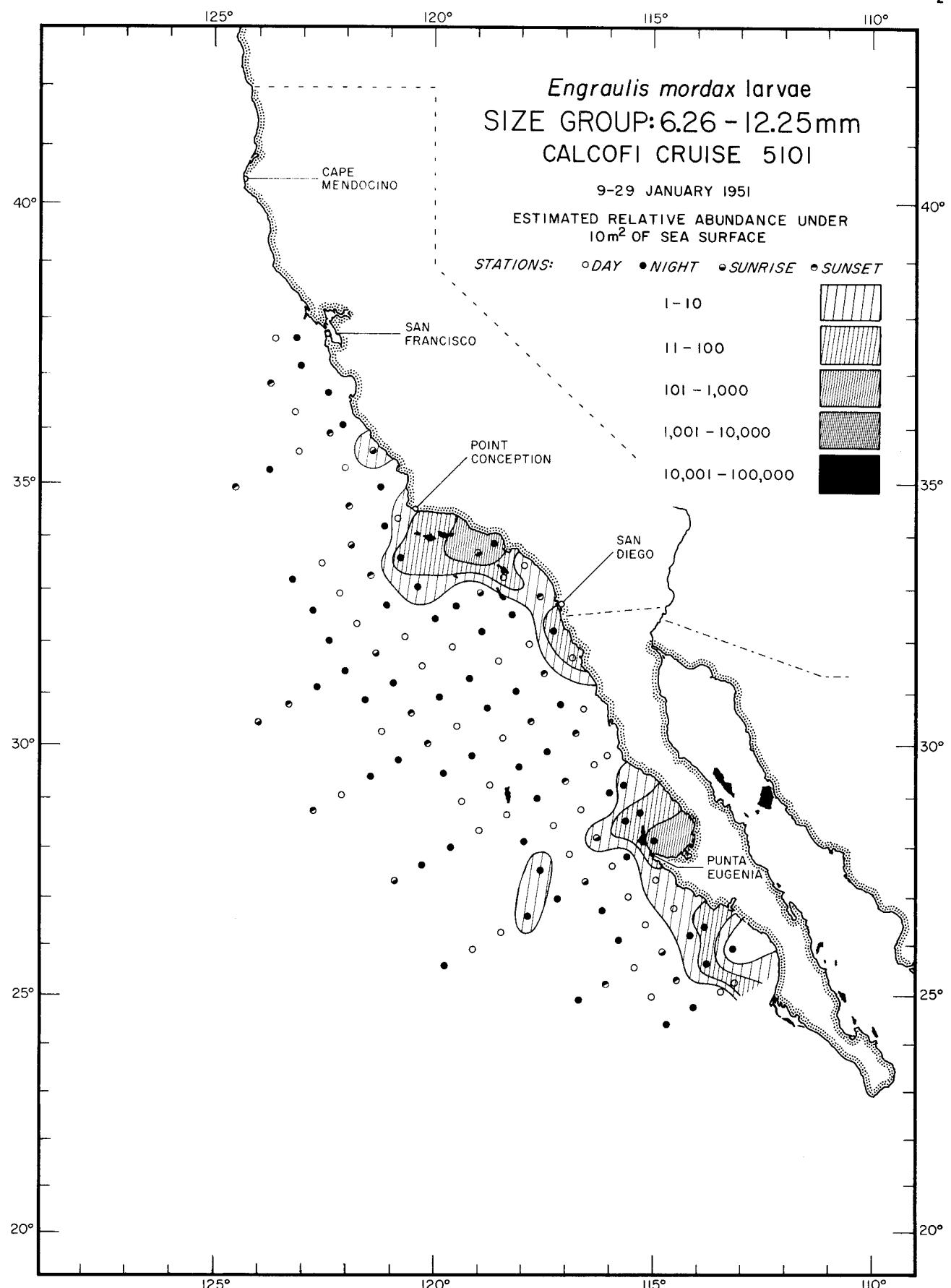
5101 (21)	5105 (25)	5109 (29)	5201 (33)	5204 (36)	5208 (40)
5102 (22)	5106 (26)	5110 (30)	5202 (34)	5205 (37)	5209 (41)
5103 (23)	5107 (27)	5111 (31)	5203 (35)	5206 (38)	5210 (42)
5104 (24)	5108 (28)	5112 (32)	5203 (35)	5207 (39)	5211 (43)

OF CHARTS*

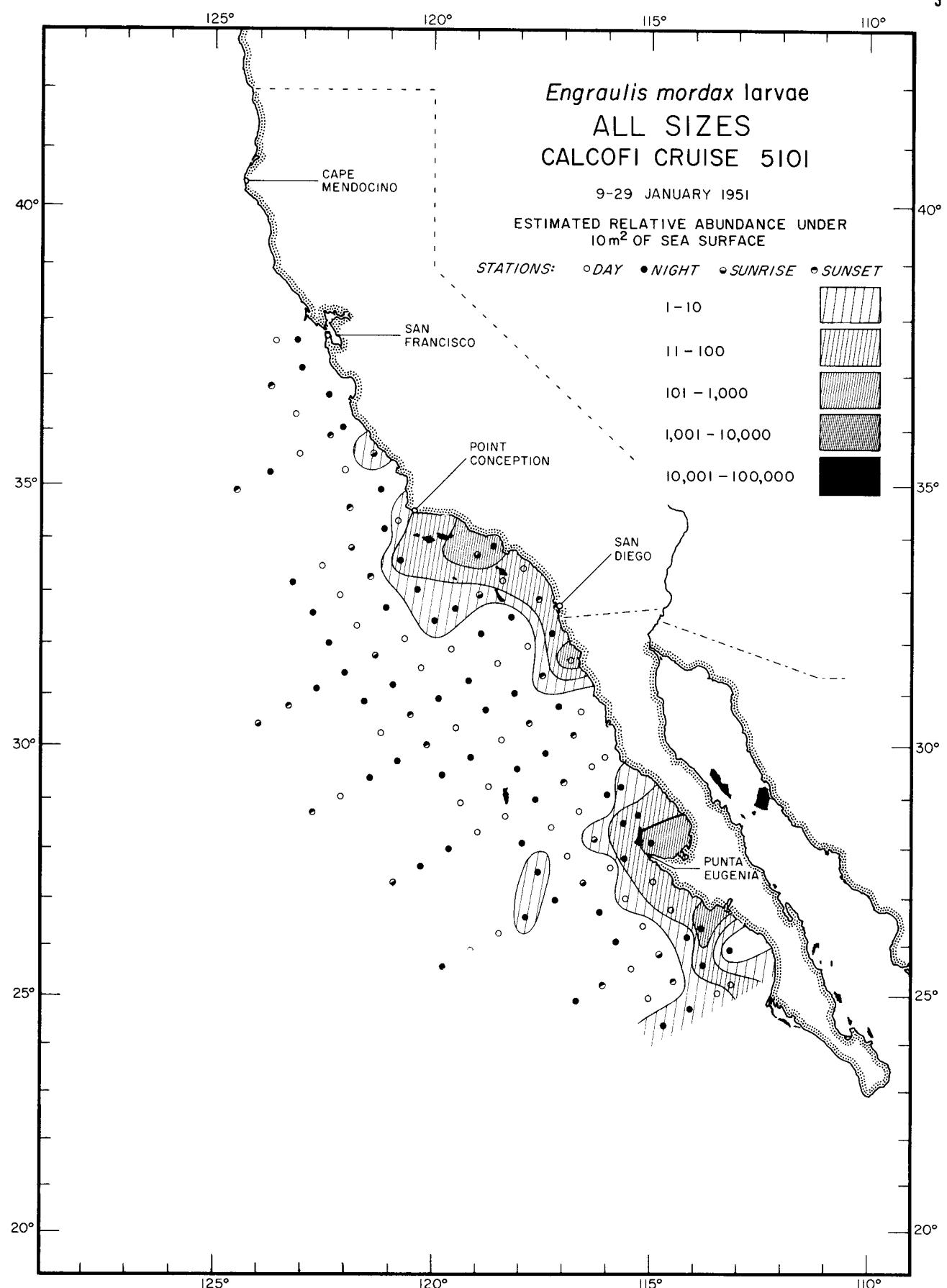
<u>07</u>	<u>08</u>	<u>09</u>	<u>10</u>	<u>11</u>	<u>12</u>	Years
14, 15	16, 17	18, 19	20, 21	22, 23	24, 25	<u>1951</u>
38, 39	40, 41	42, 43	44, 45	46, 47		<u>52</u>
60, 61	62, 63	64, 65	66, 67	68, 69	70, 71	<u>53</u>
84, 85	86, 87		88, 89		90, 91	<u>54</u>
104, 105		106, 107	108, 109	110, 111	112, 113	<u>55</u>
126, 127	128, 129	130, 131	132, 133	134, 135	136, 137	<u>56</u>
150, 151	152, 153	154, 155	156, 157	158, 159	160, 161	<u>57</u>
174, 175	176, 177	178, 179	180, 181	182, 183	184, 185	<u>58</u>
198, 199	200, 201	202, 203	204, 205	206, 207	208, 209	<u>59</u>
222, 223	224, 225	226, 227	228, 229			<u>60</u>
234, 235			236, 237			<u>61</u>
242, 243			244, 245			<u>62</u>
250, 251			252, 253			<u>63</u>
258, 259			260, 261			<u>64</u>
266, 267		268, 269				<u>1965</u>

** In March 1952 and March 1953, surveys were conducted twice a month. The results of the repetitive cruises are shown separately on the same page.



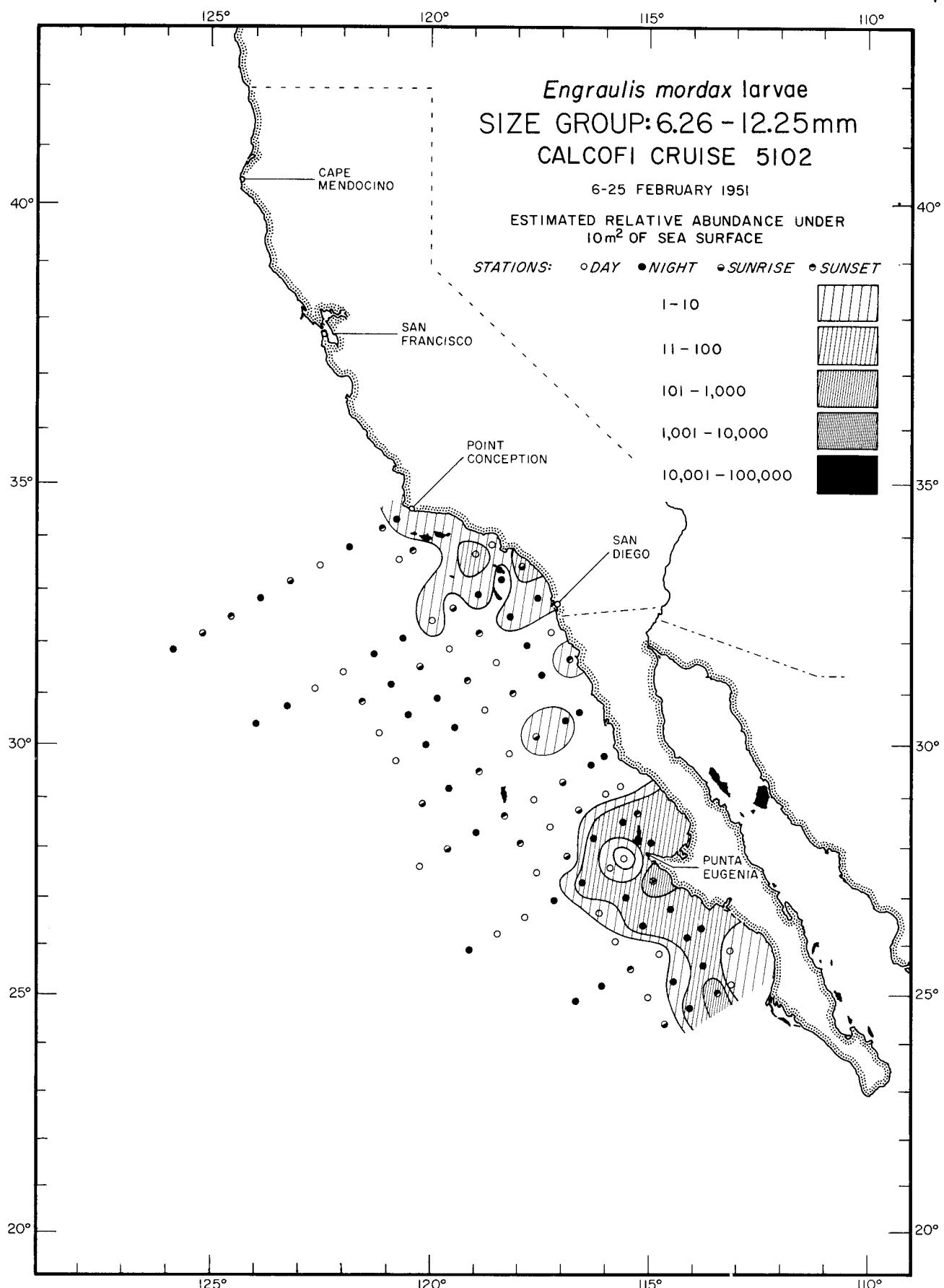


Engraulis mordax larvae
Size Group: 6.26-12.25mm
5101

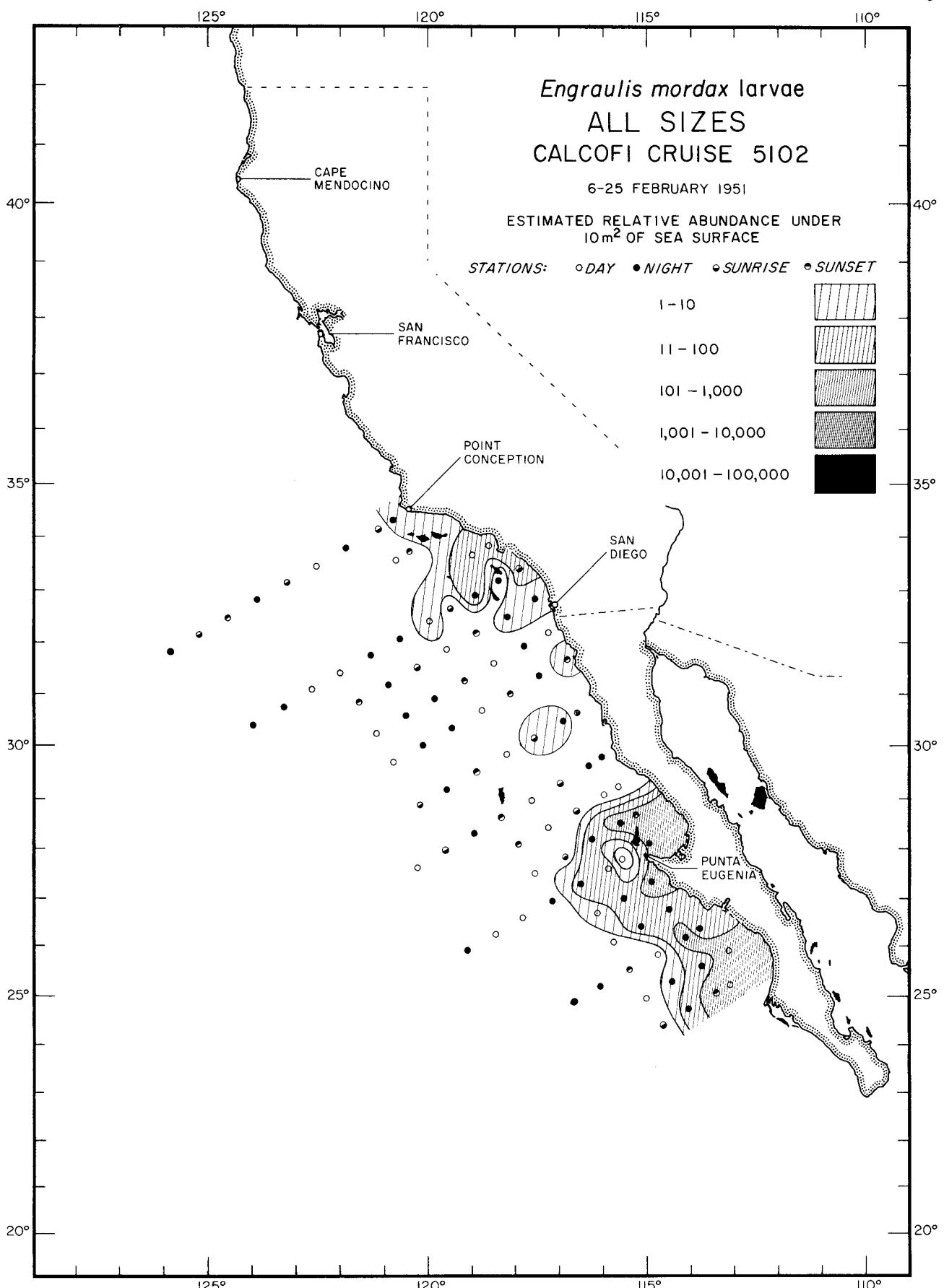
*Engraulis mordax* larvae

All Sizes

5101

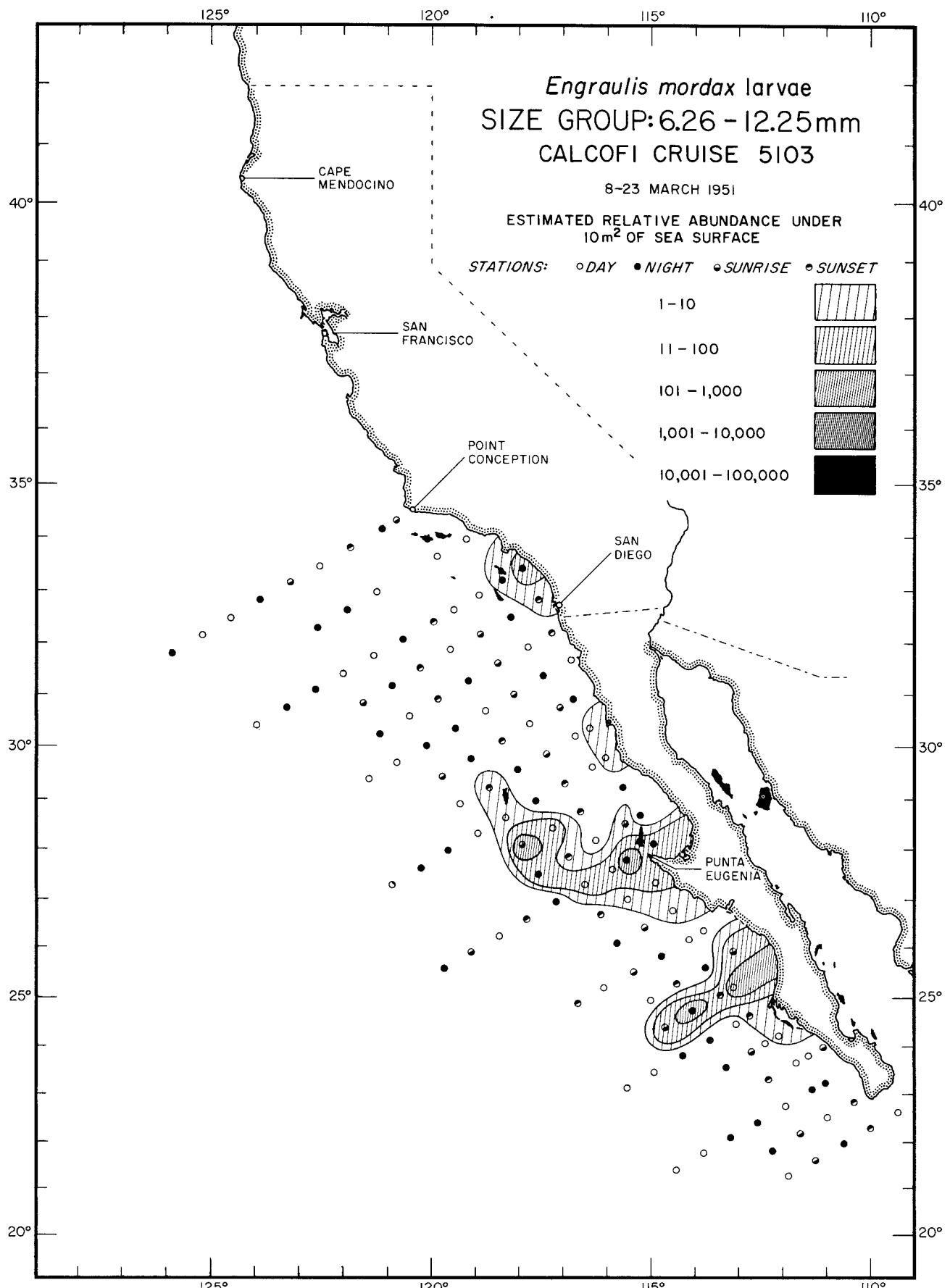


Engraulis mordax larvae
Size Group: 6.26-12.25mm
5102

*Engraulis mordax* larvae

All Sizes

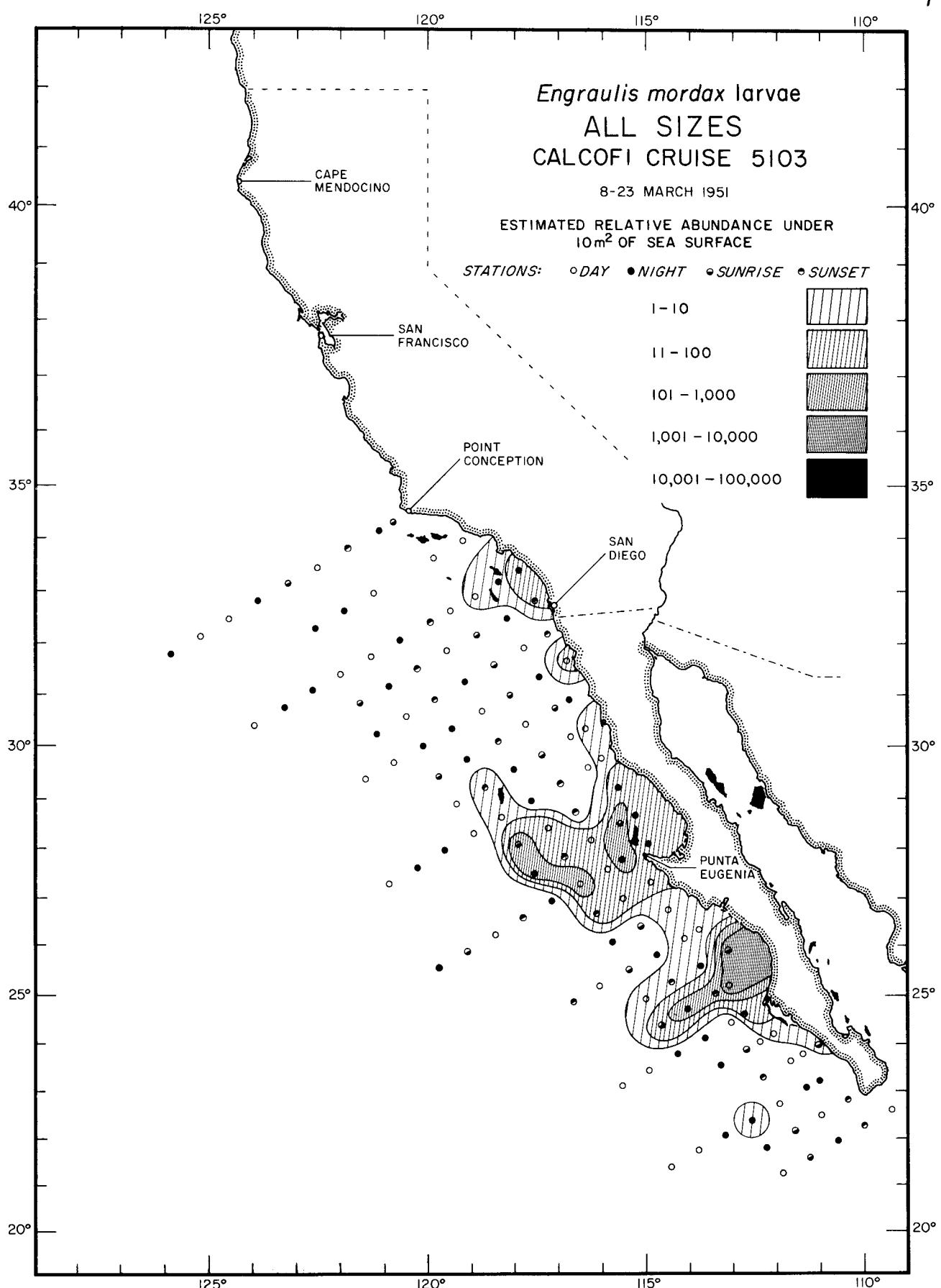
5102



Engraulis mordax larvae

Size Group: 6.26-12.25mm

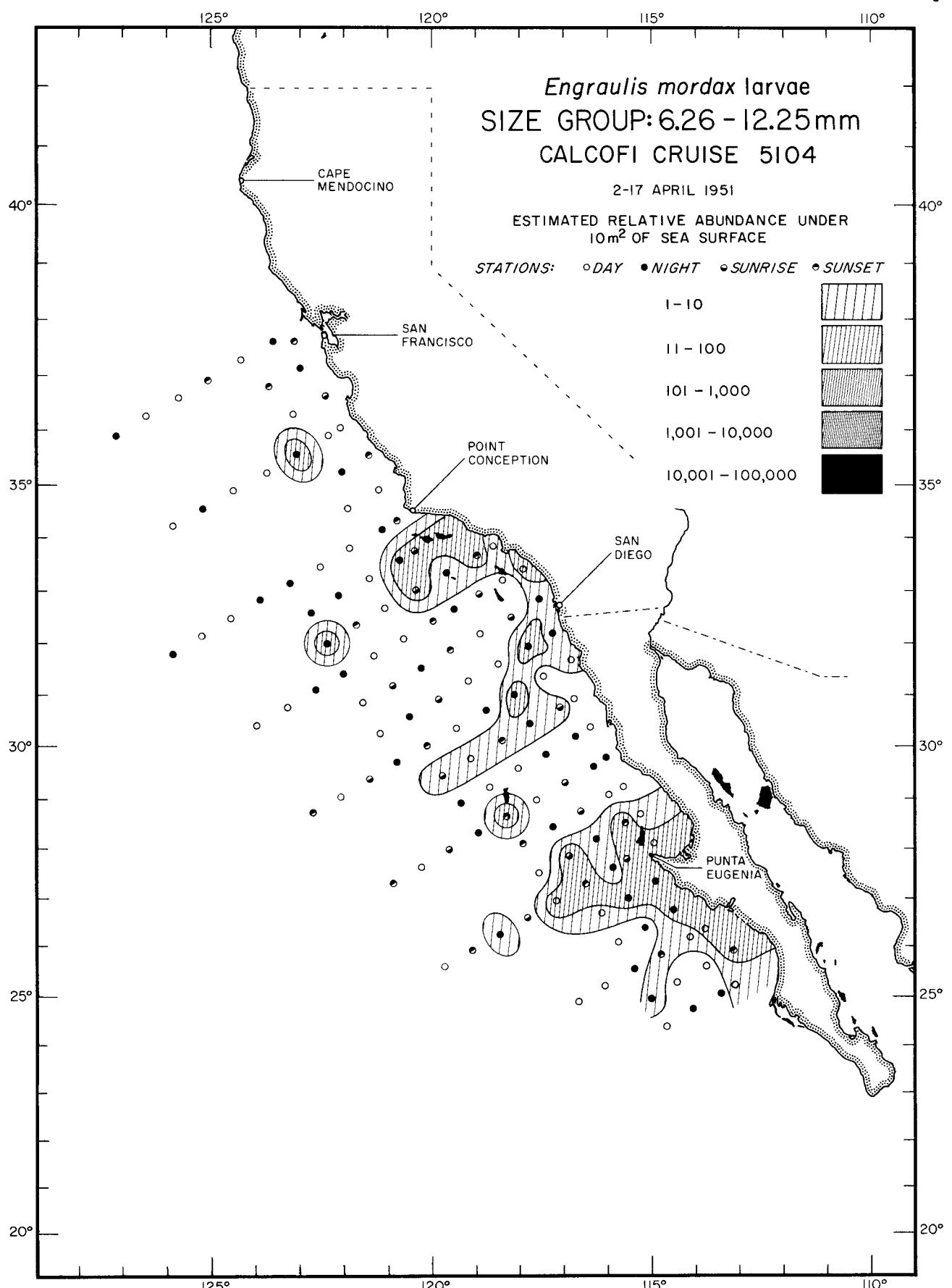
5103



Engraulis mordax larvae

All Sizes

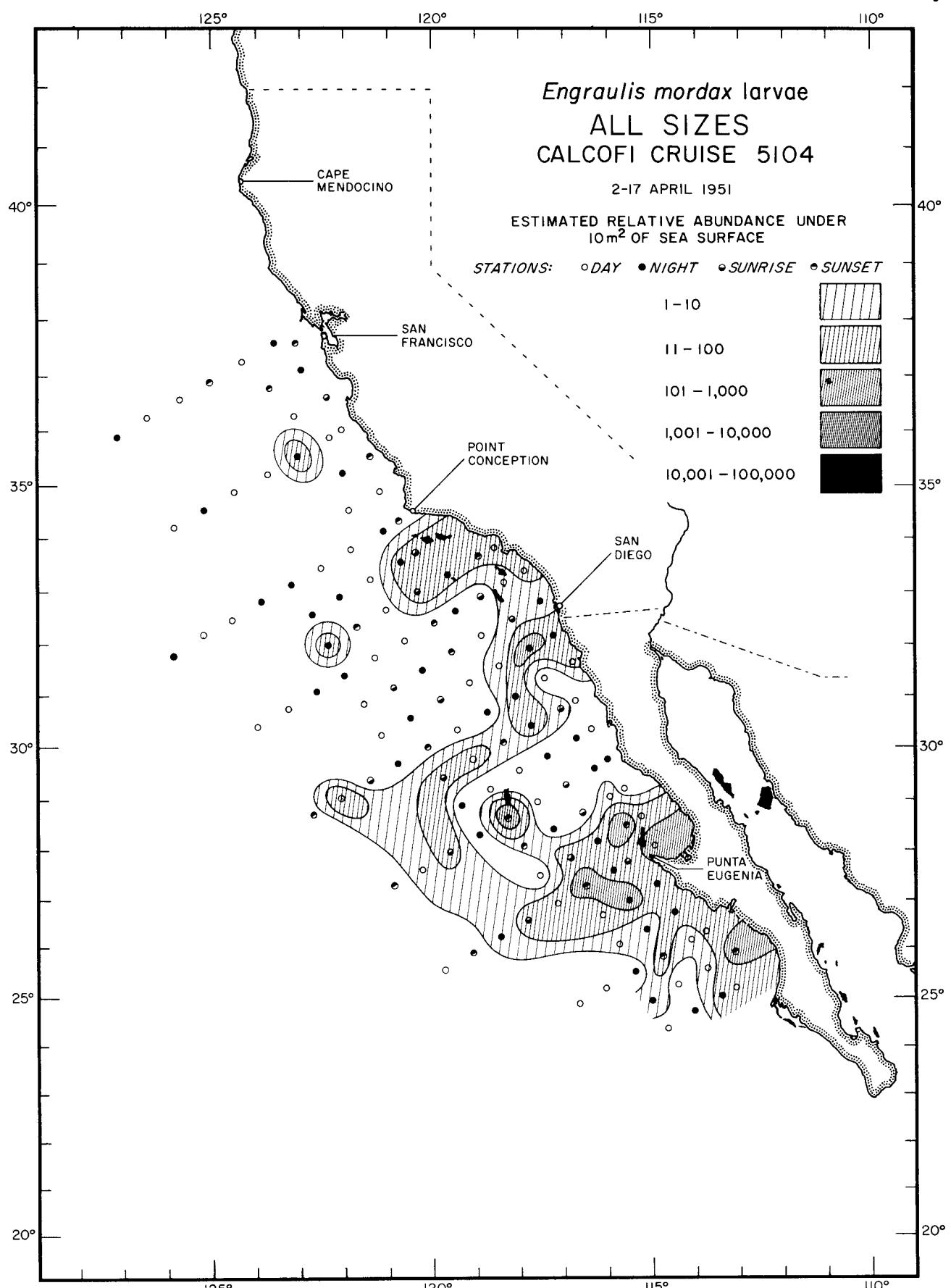
5103



Engraulis mordax larvae

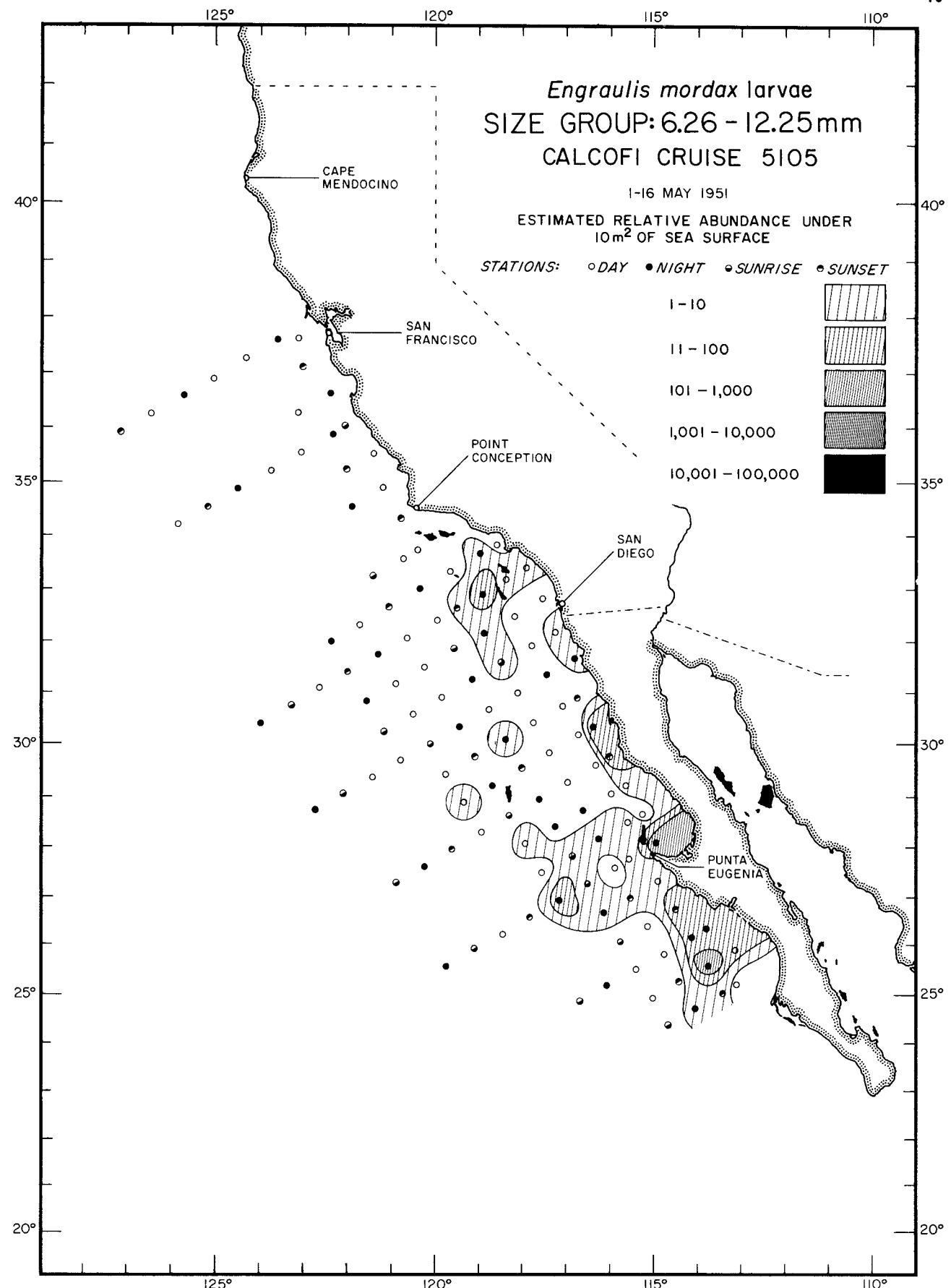
Size Group: 6.26-12.25mm

5104

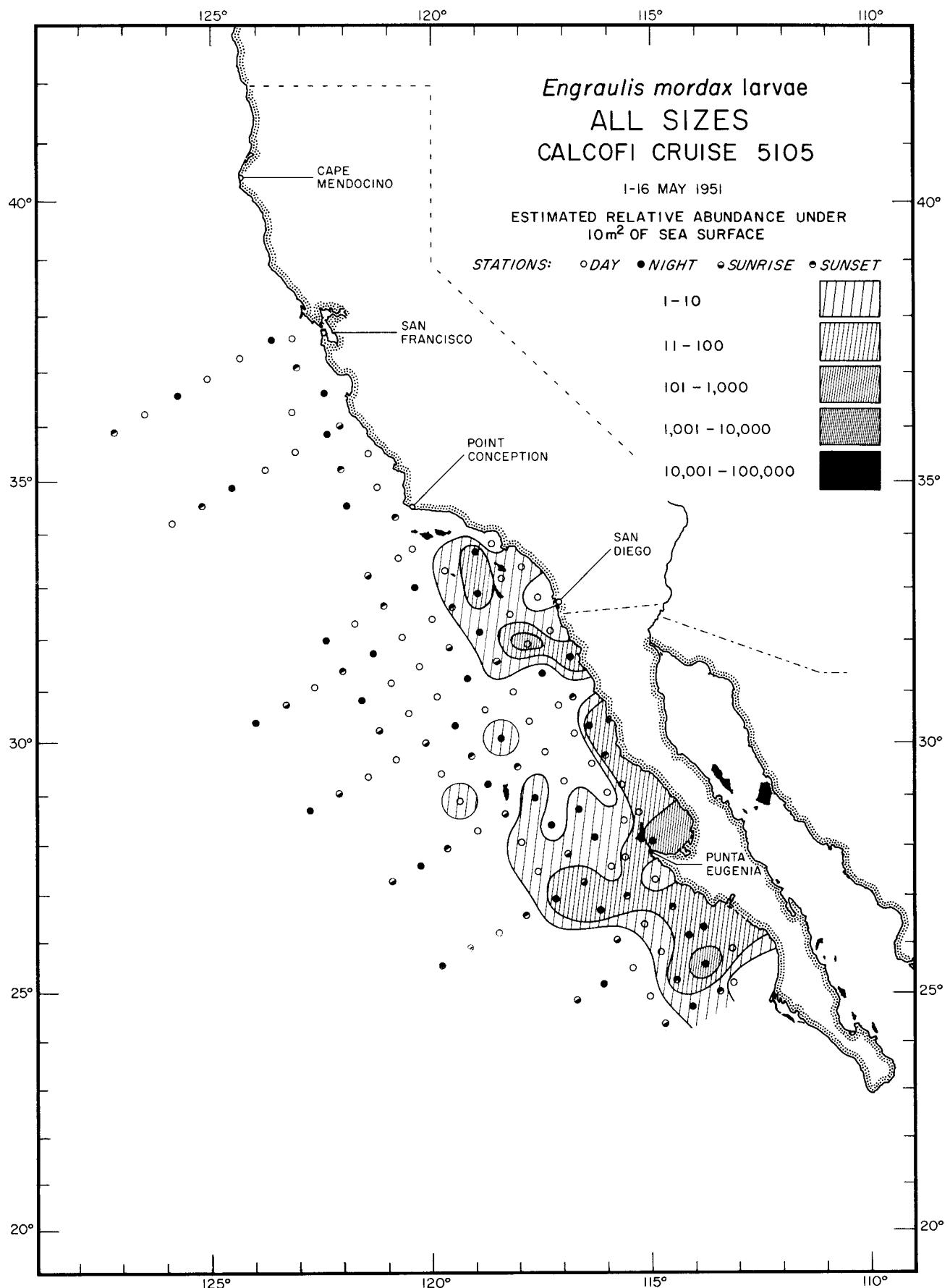
*Engraulis mordax* larvae

All Sizes

5104

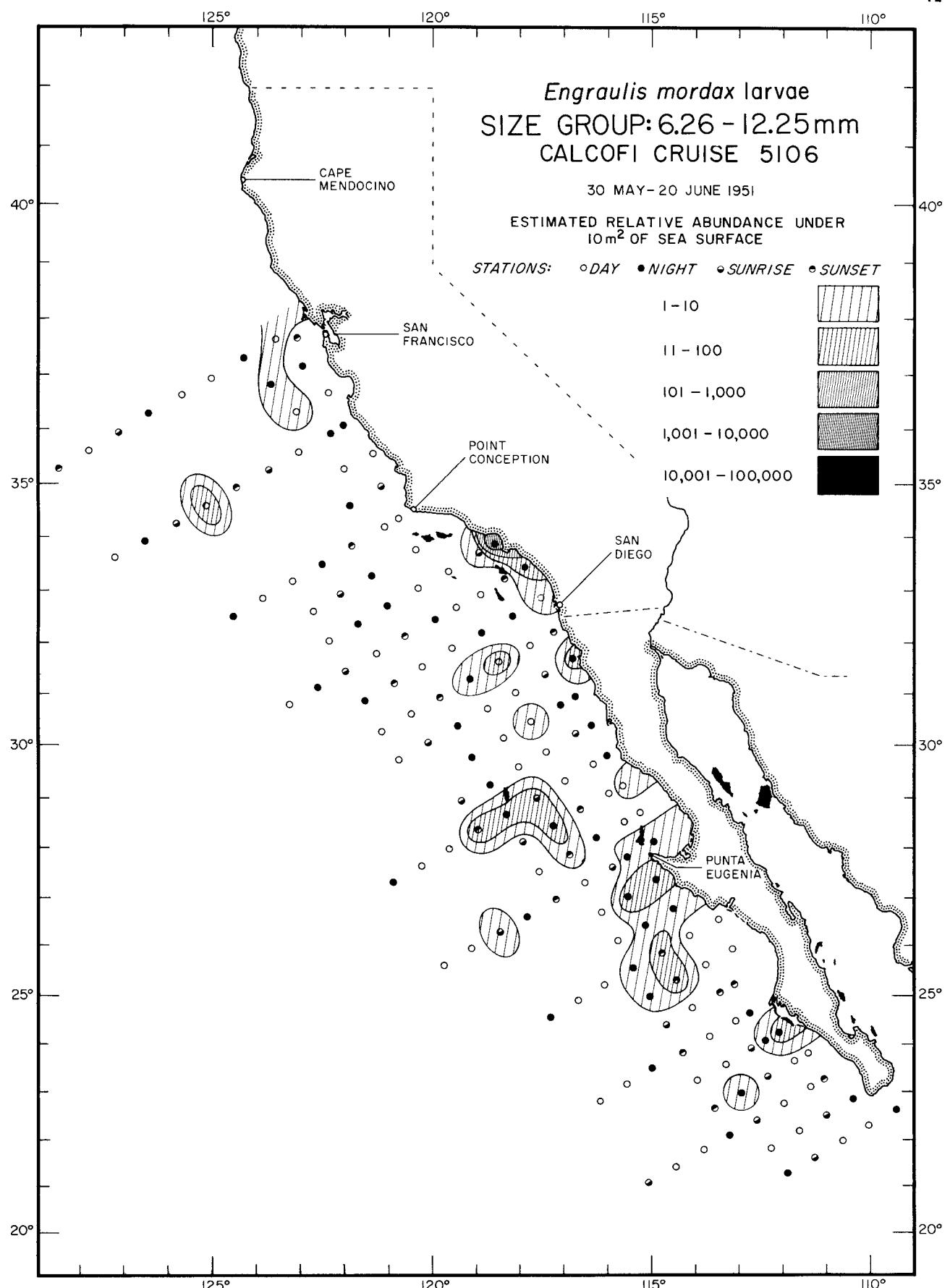


Engraulis mordax larvae
Size Group: 6.26-12.25mm
5105

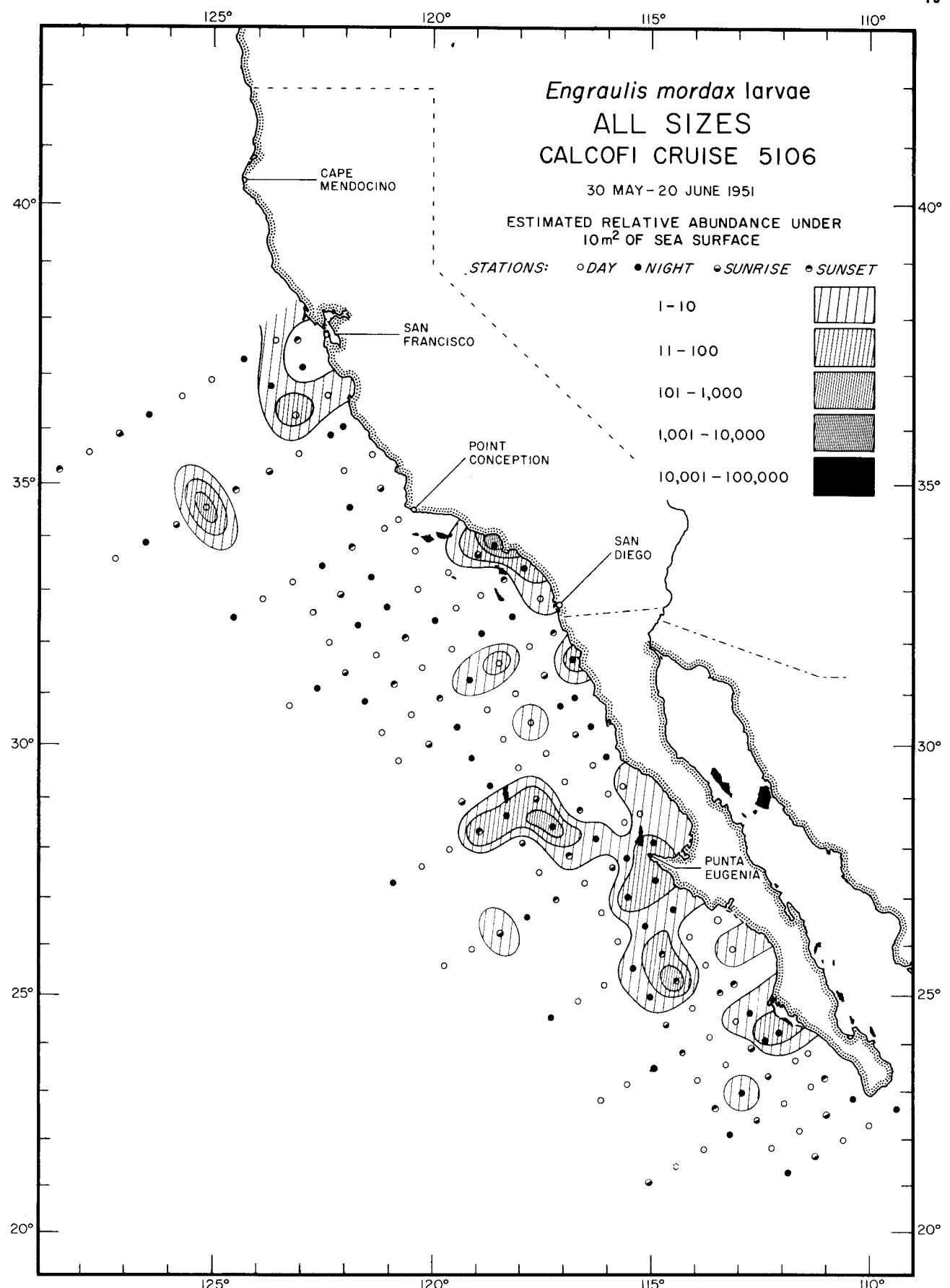
*Engraulis mordax* larvae

All Sizes

5105

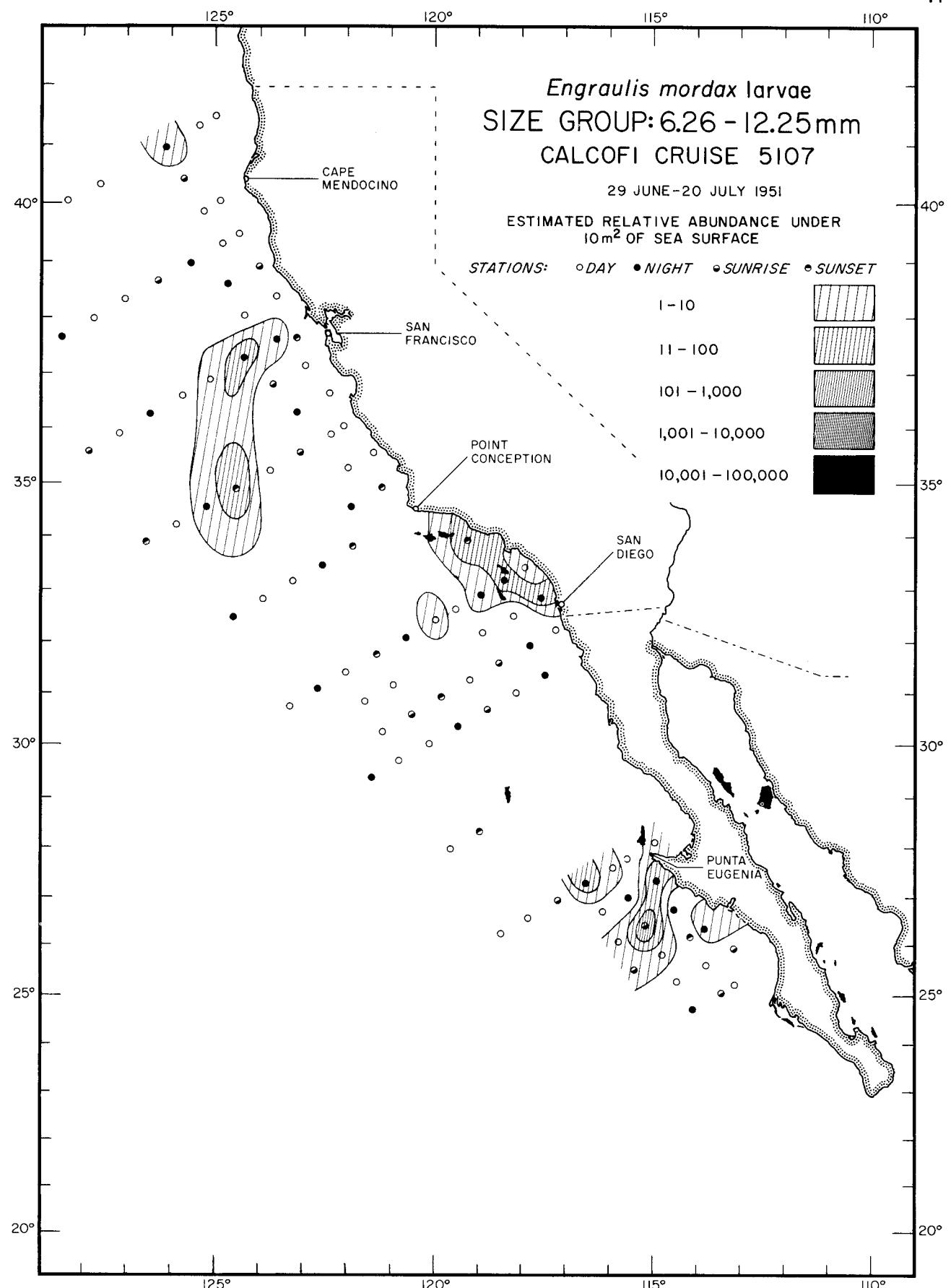


Engraulis mordax larvae
Size Group: 6.26-12.25mm
5106

*Engraulis mordax* larvae

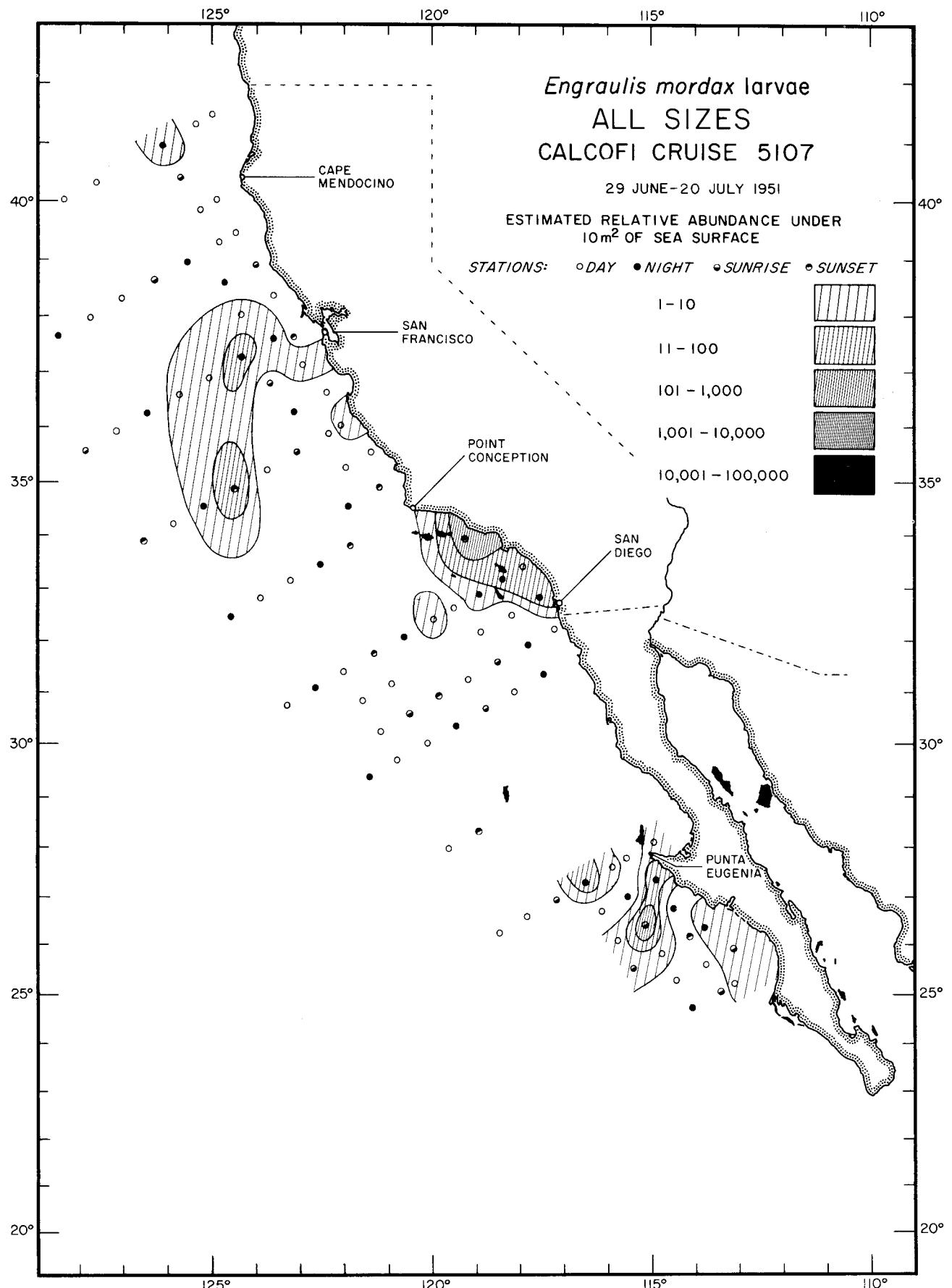
All Sizes

5106

*Engraulis mordax* larvae

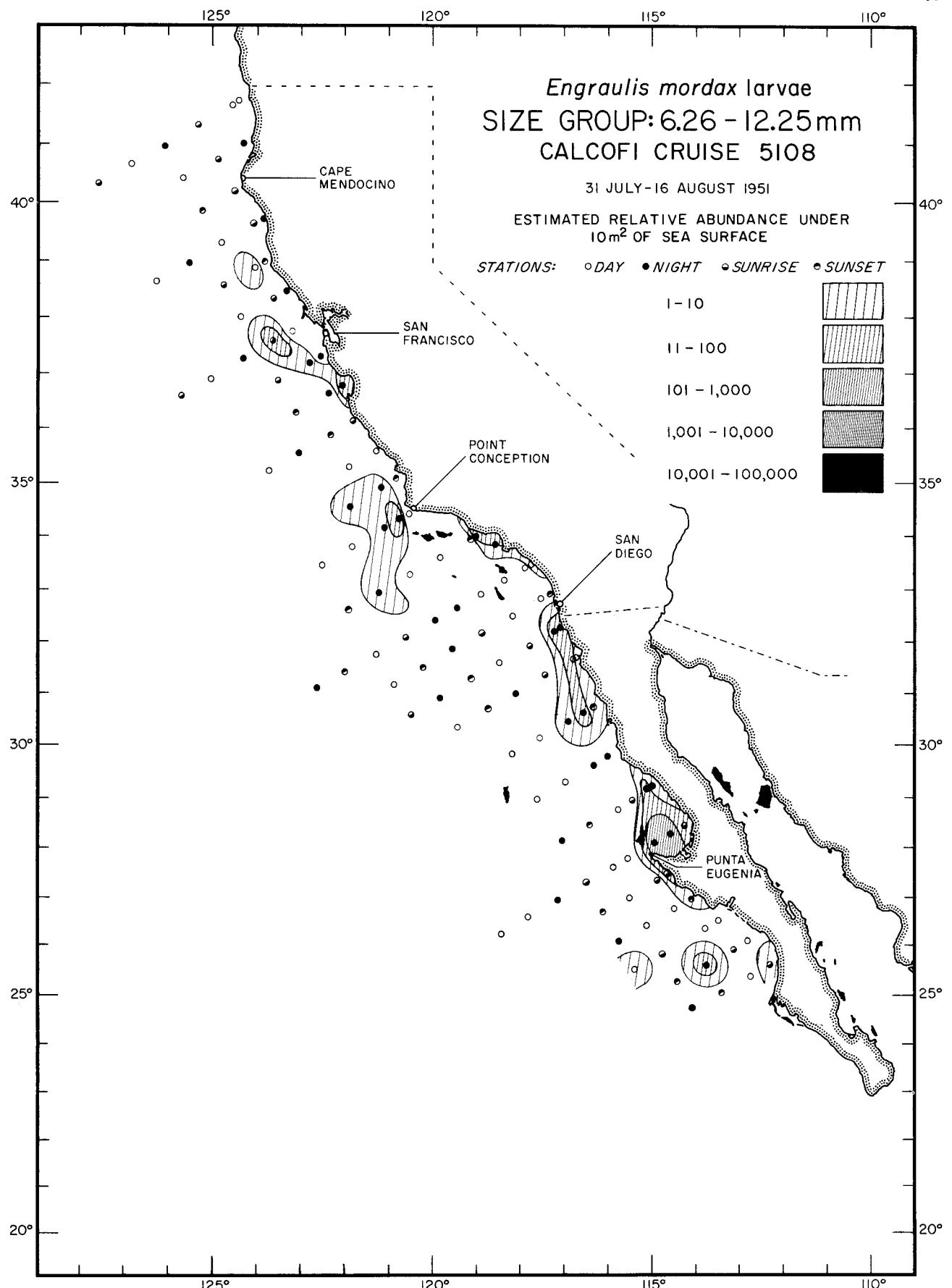
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5107

*Engraulis mordax* larvae

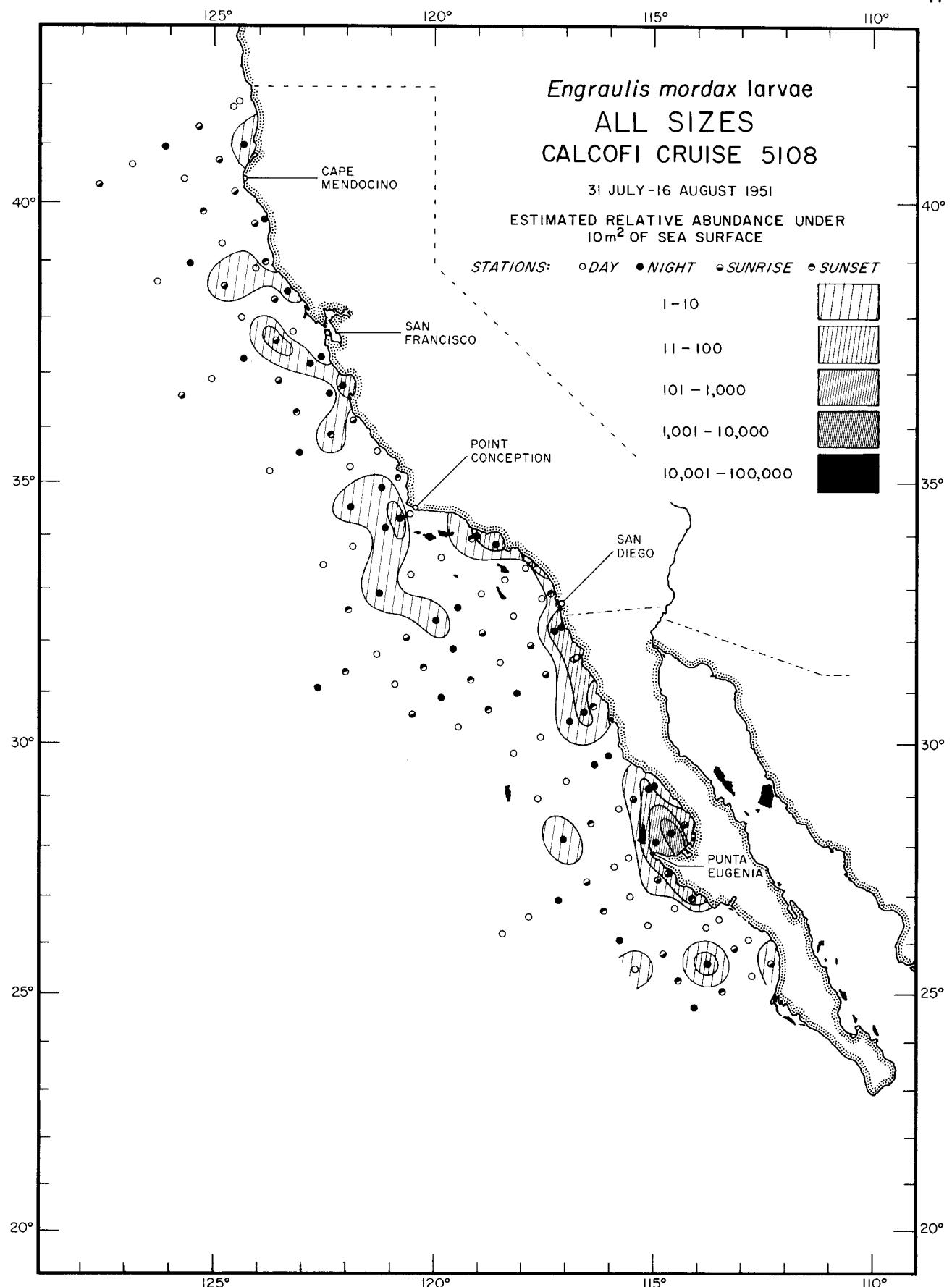
All Sizes

5107

*Engraulis mordax* larvae

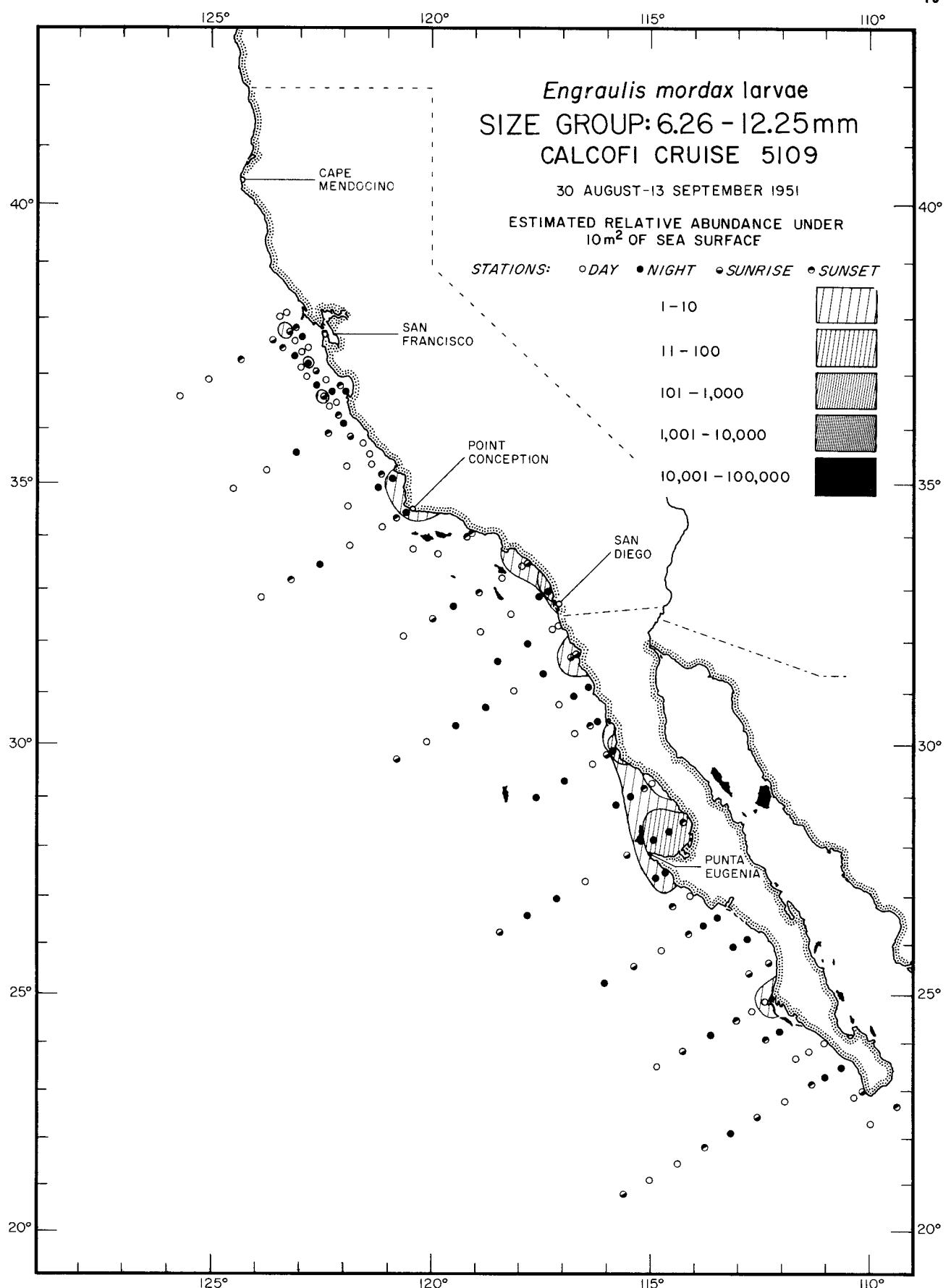
Size Group: 6.26-12.25mm

5108

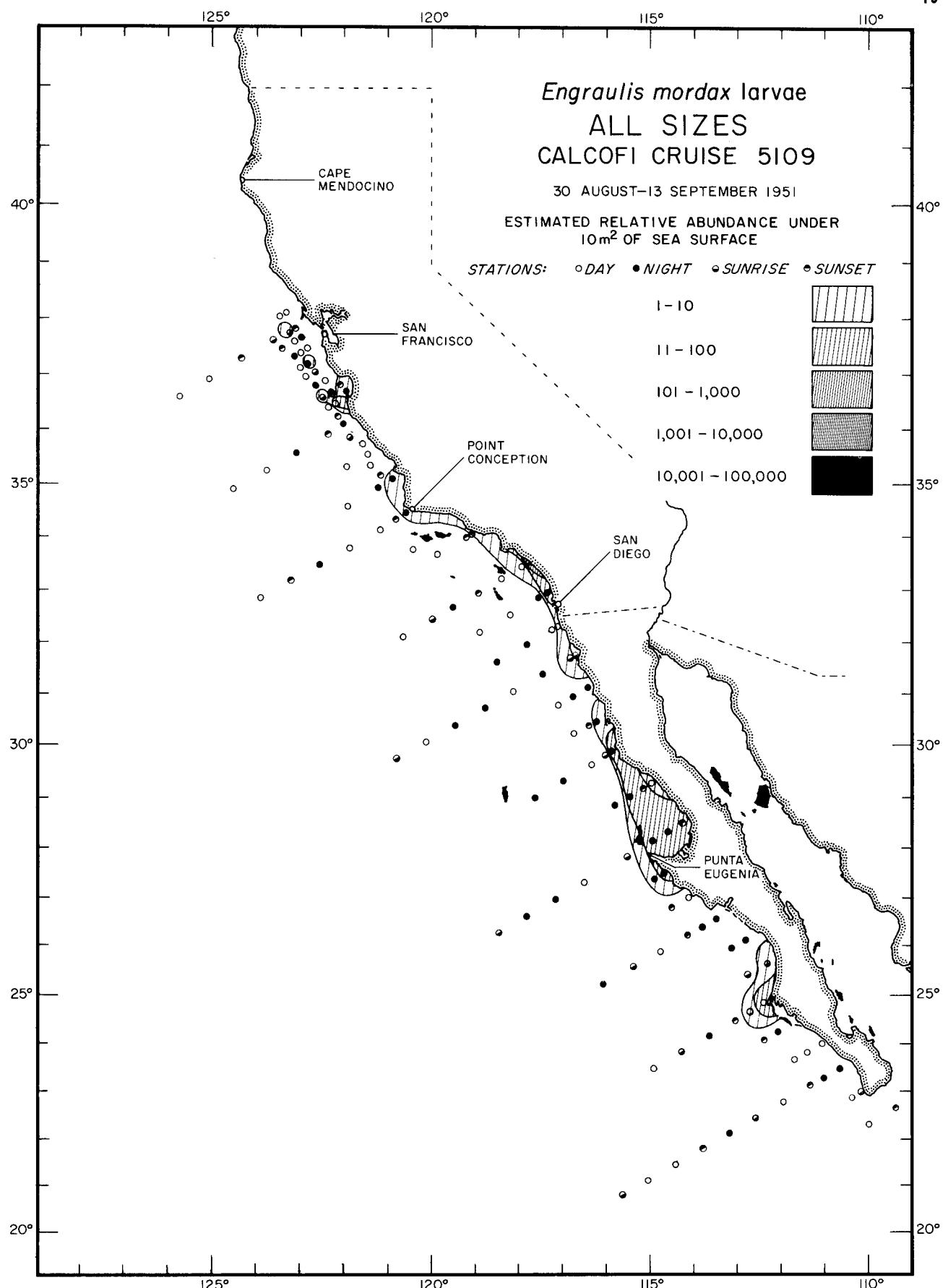
*Engraulis mordax* larvae

All Sizes

5108

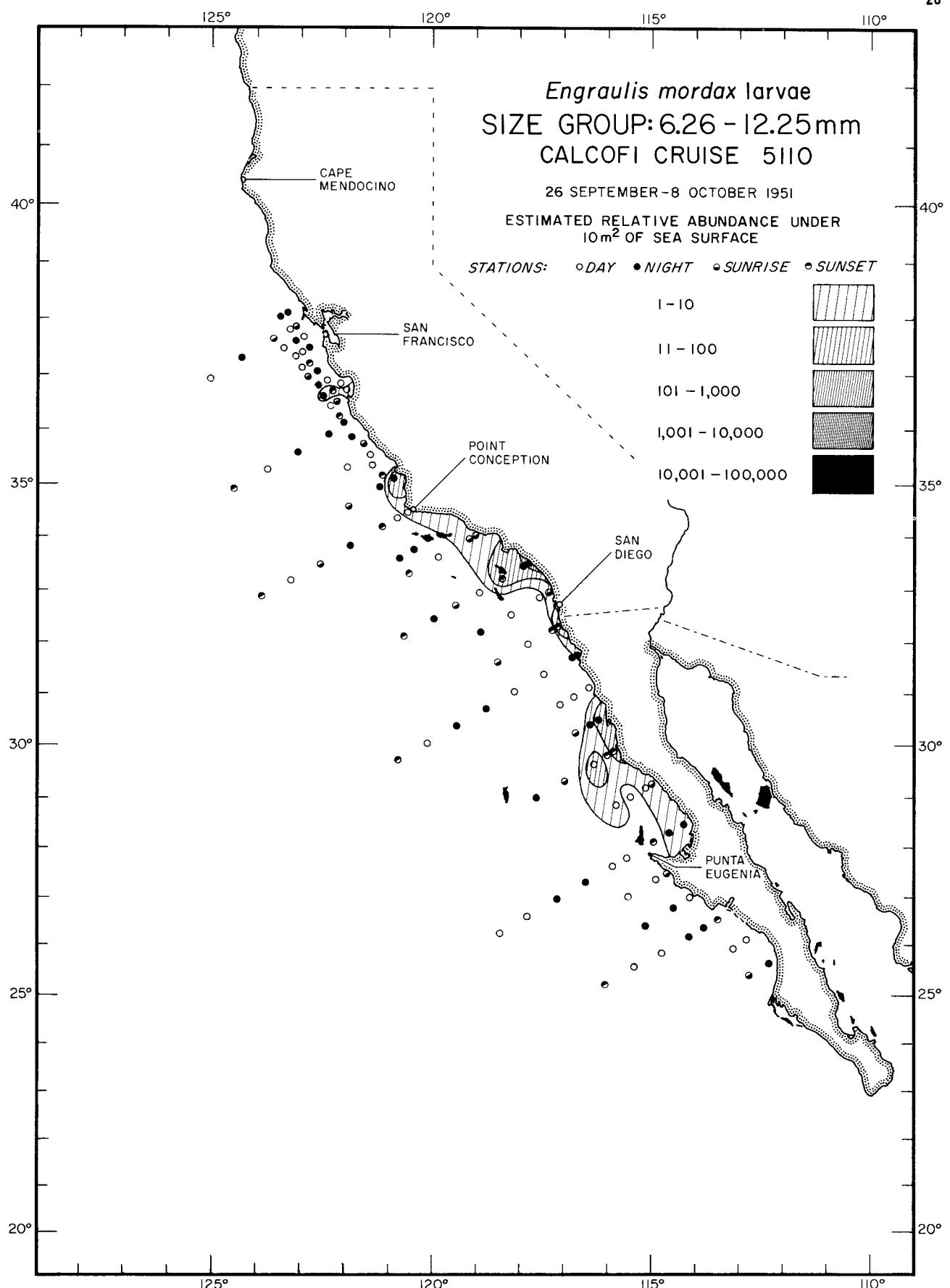


Engraulis mordax larvae
Size Group: 6.26-12.25mm
5109

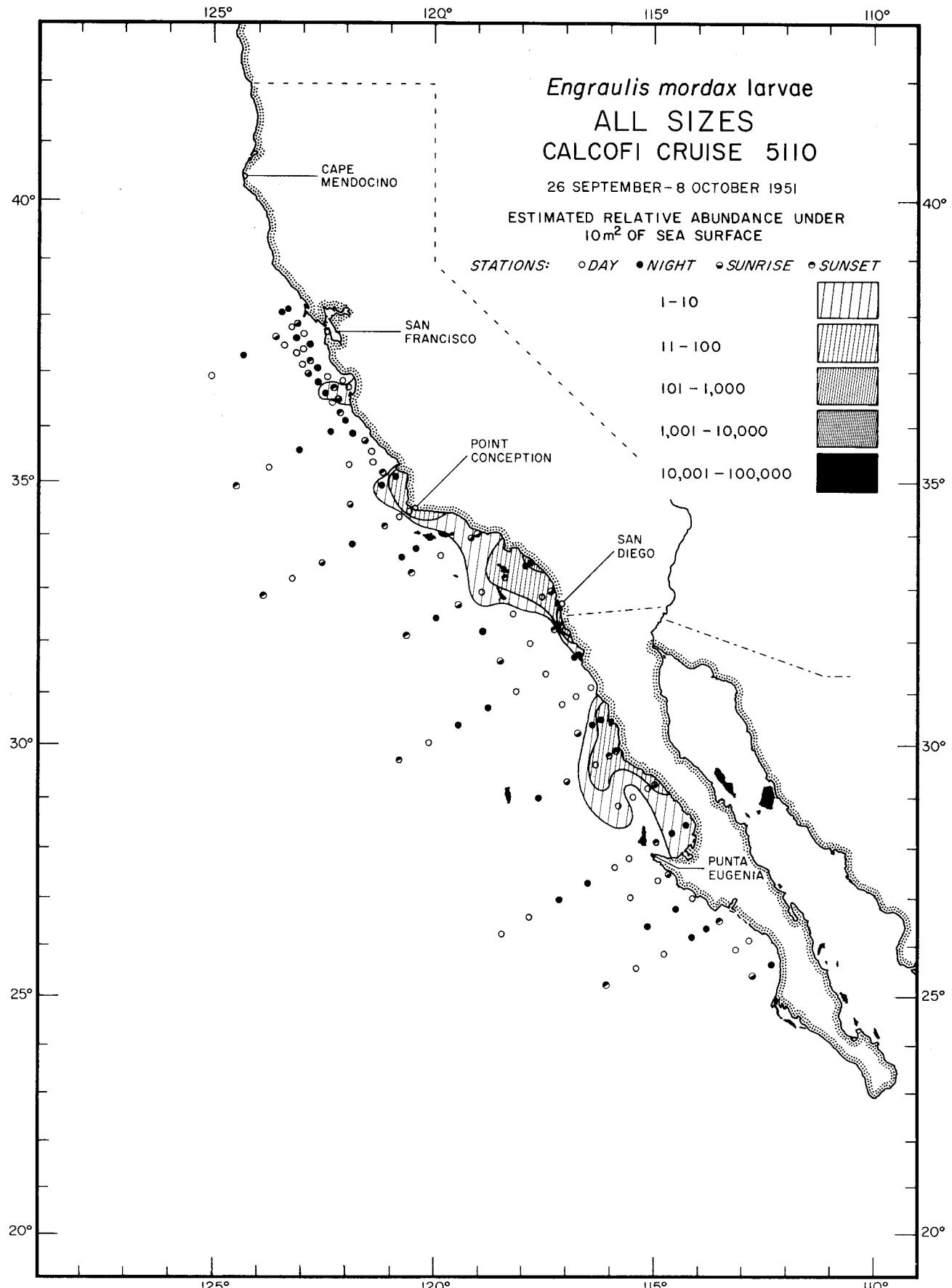
*Engraulis mordax* larvae

All Sizes

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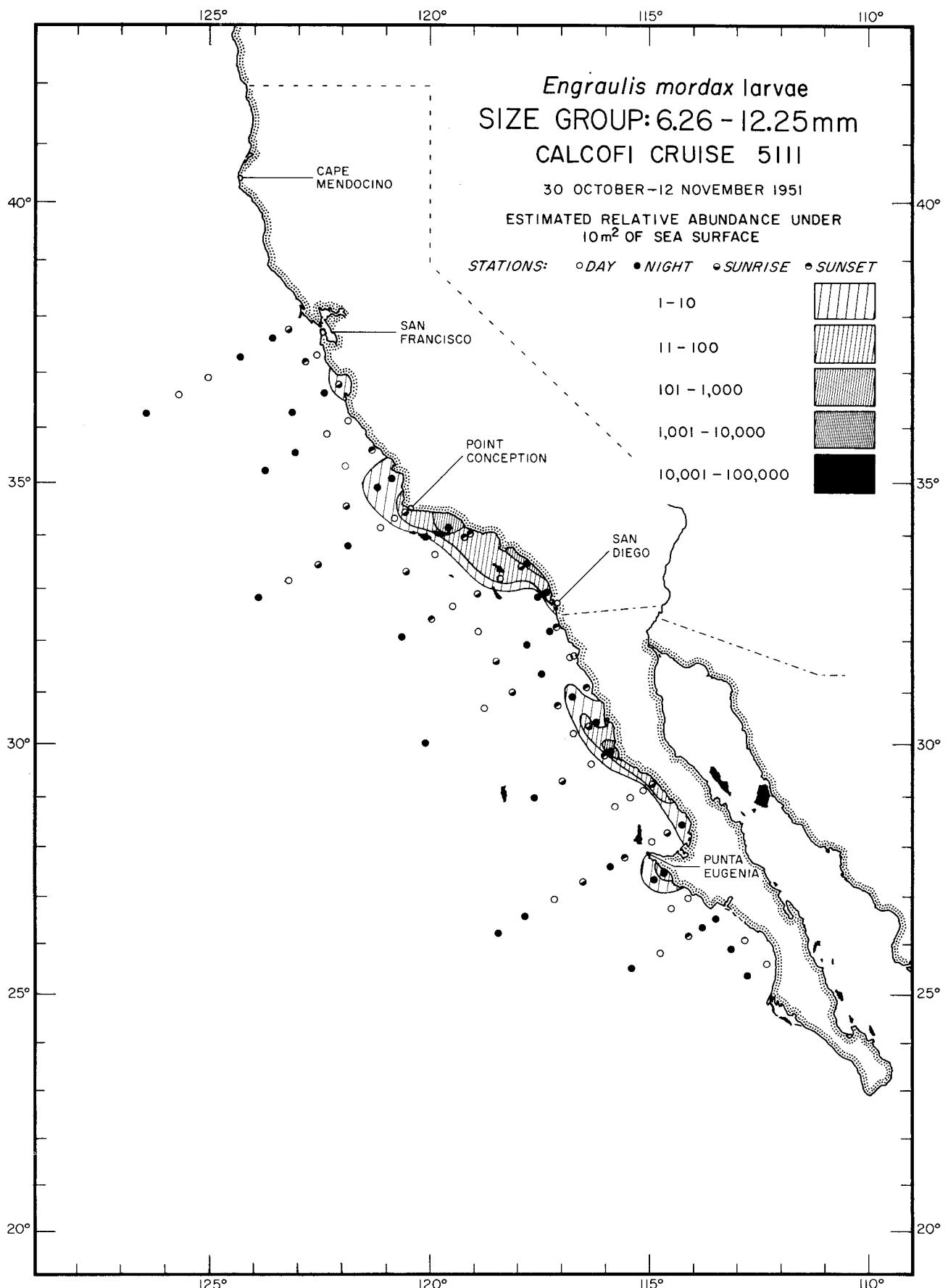


Engraulis mordax larvae
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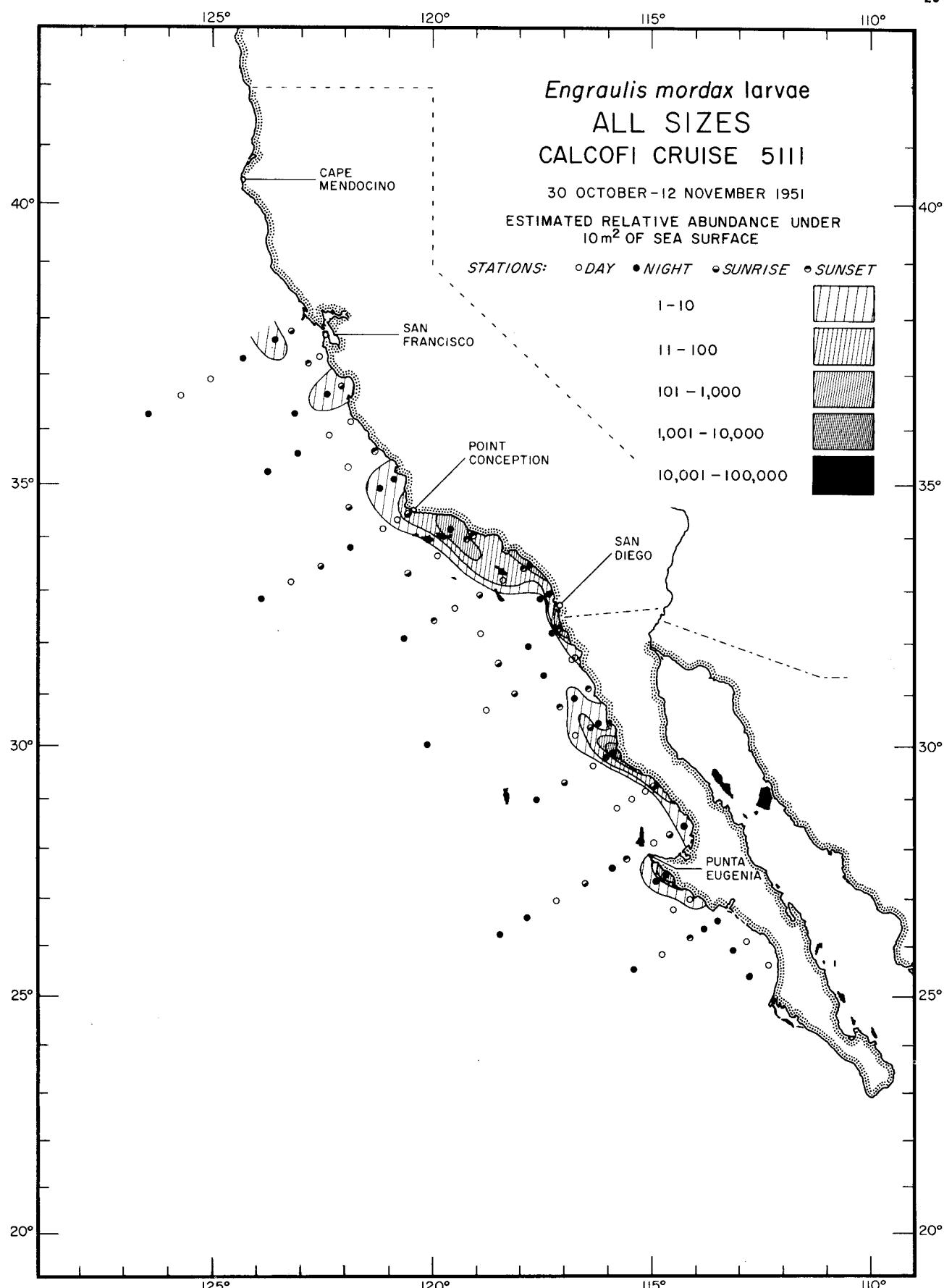
*Engraulis mordax* larvae

All Sizes

5110

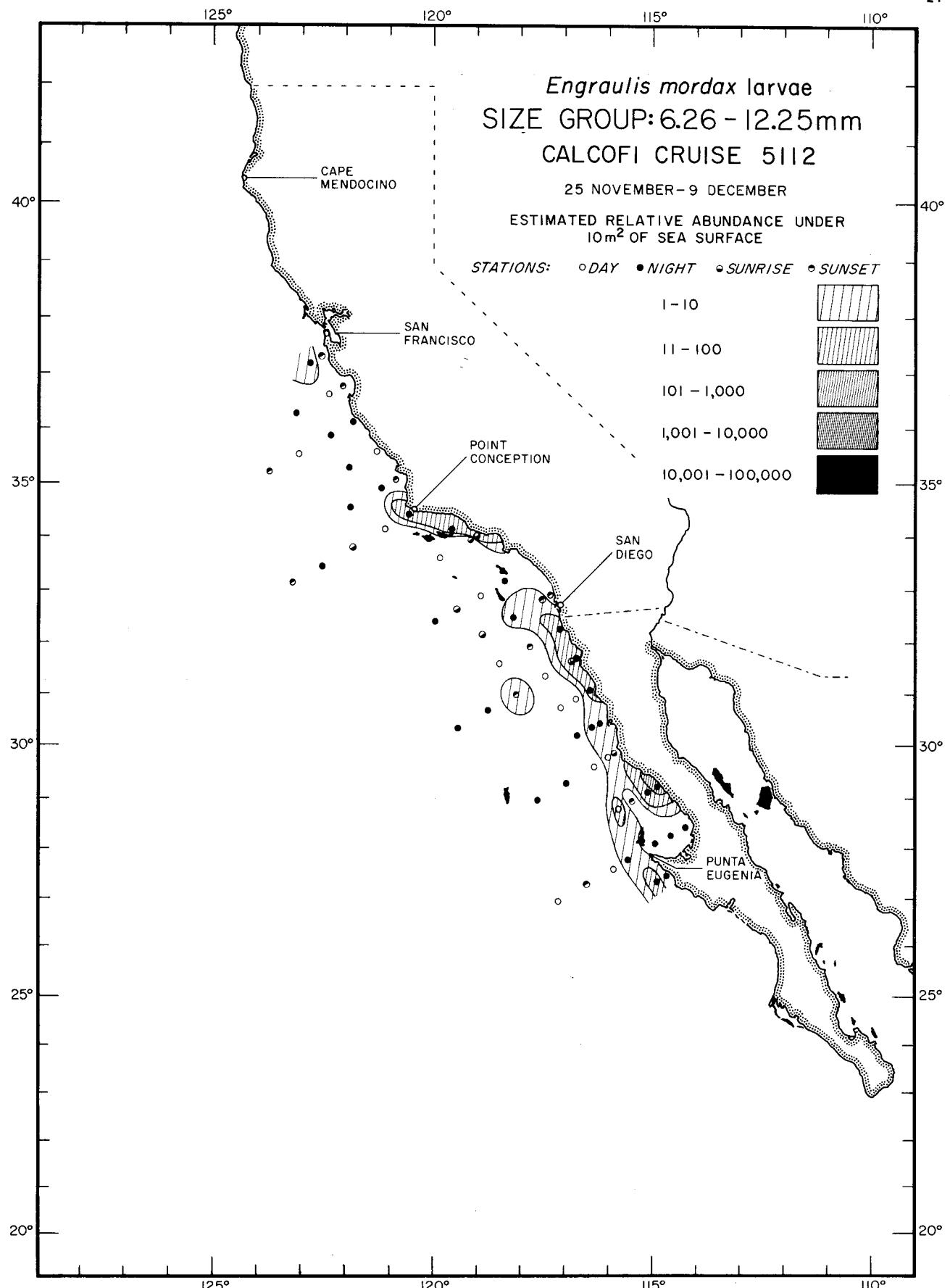


Engraulis mordax larvae
Size Group: 6.26-12.25mm
5111

*Engraulis mordax* larvae

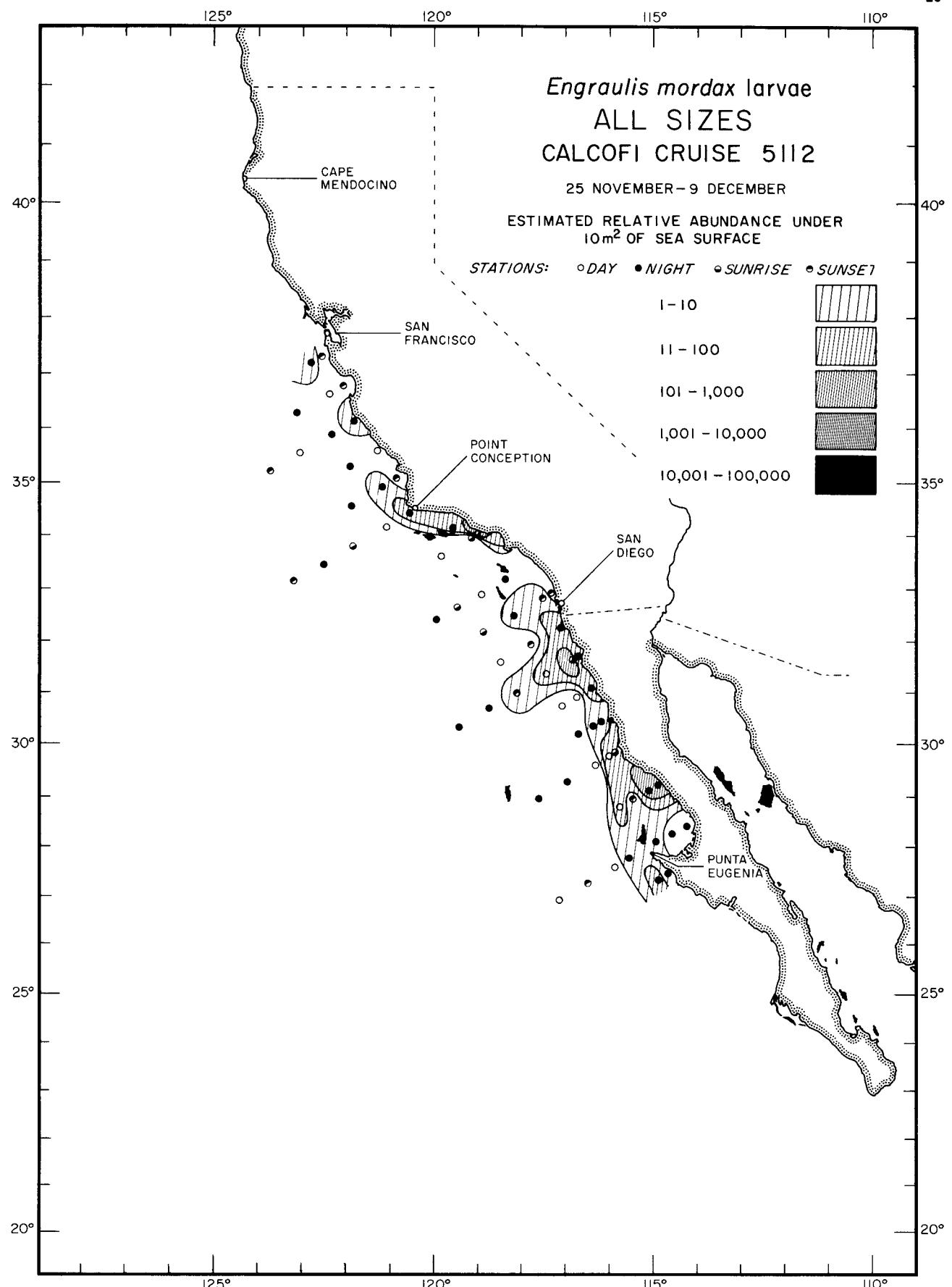
All Sizes

5111

*Engraulis mordax* larvae

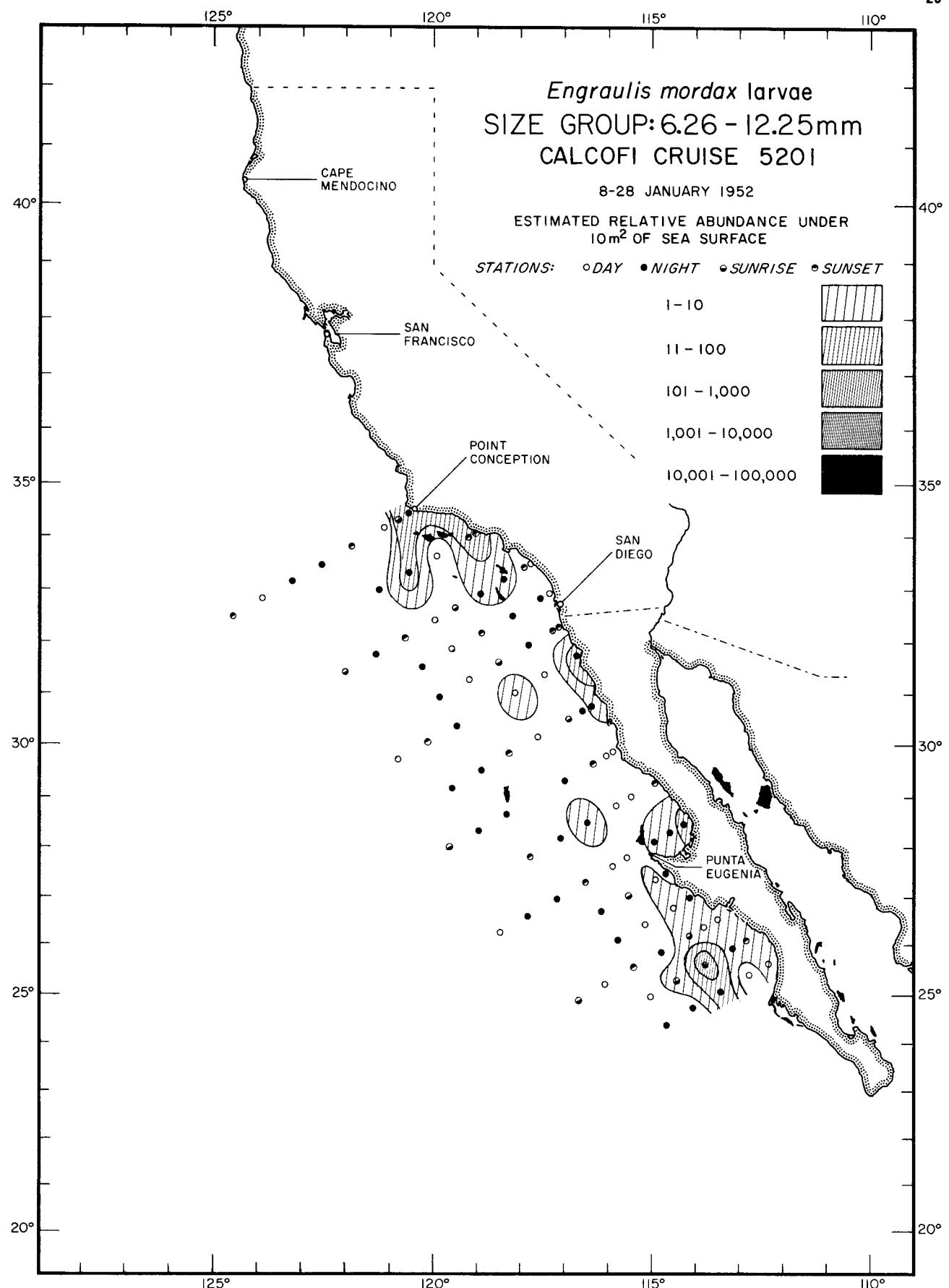
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5112

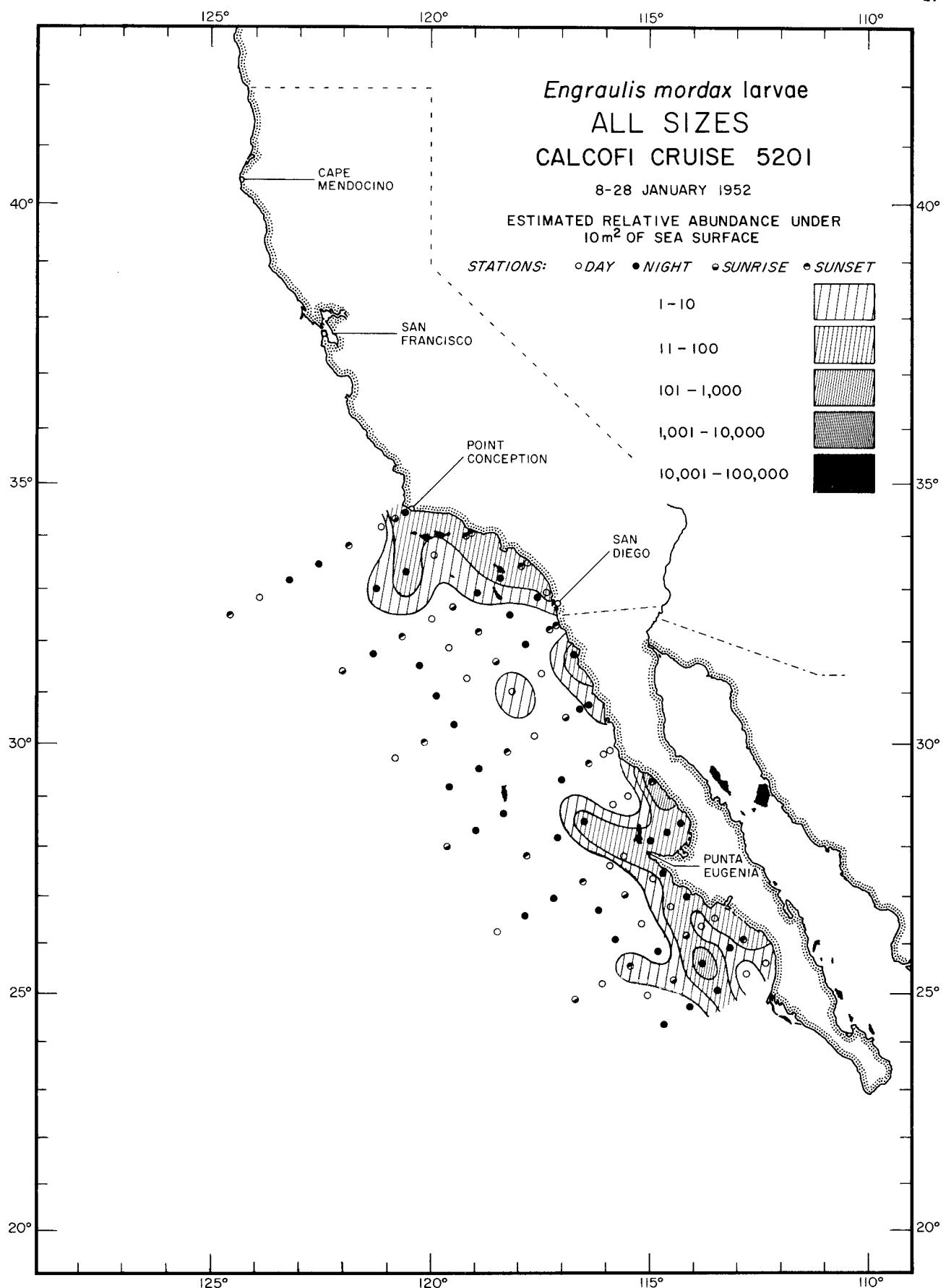
*Engraulis mordax* larvae

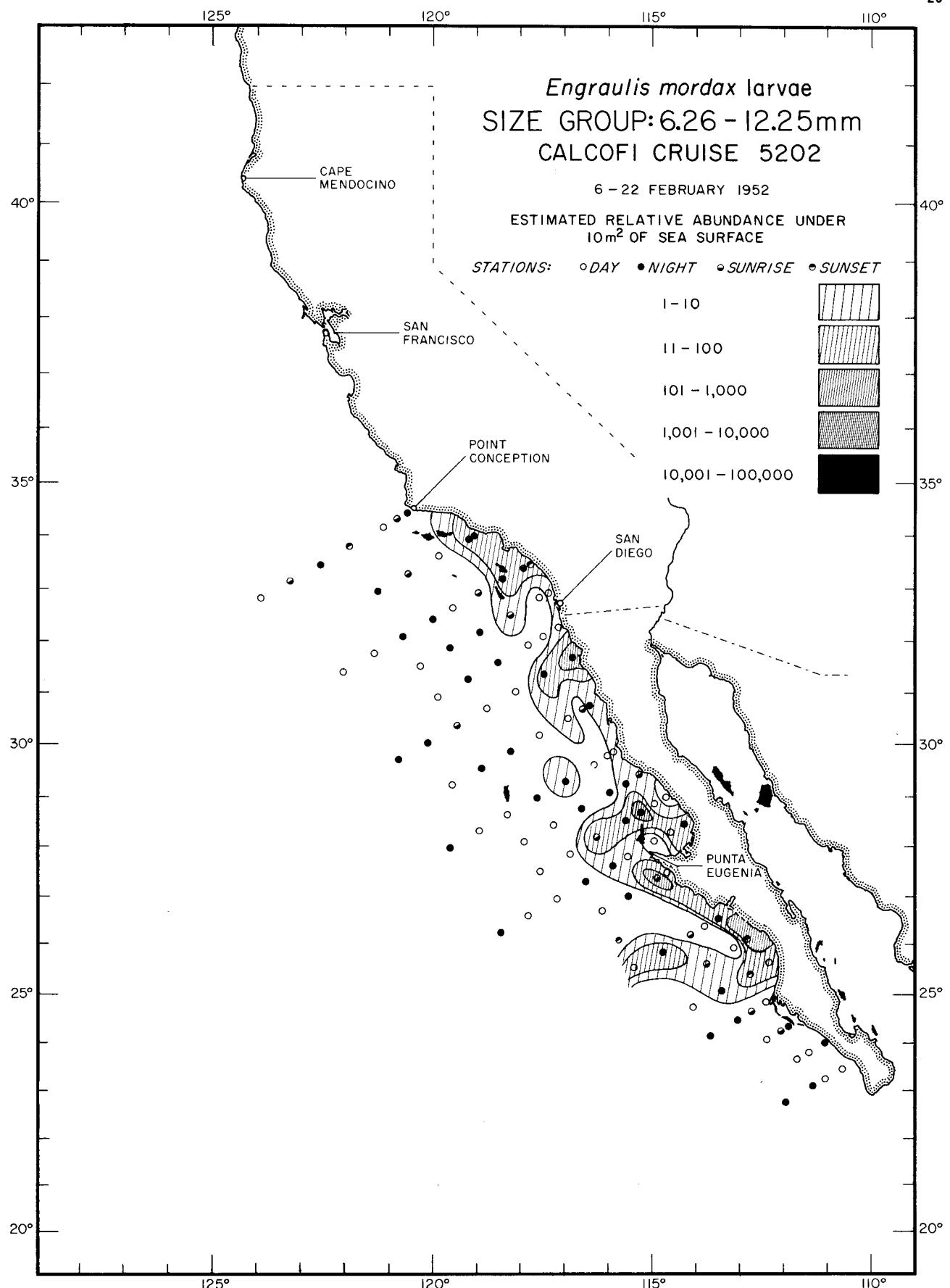
All Sizes

5112

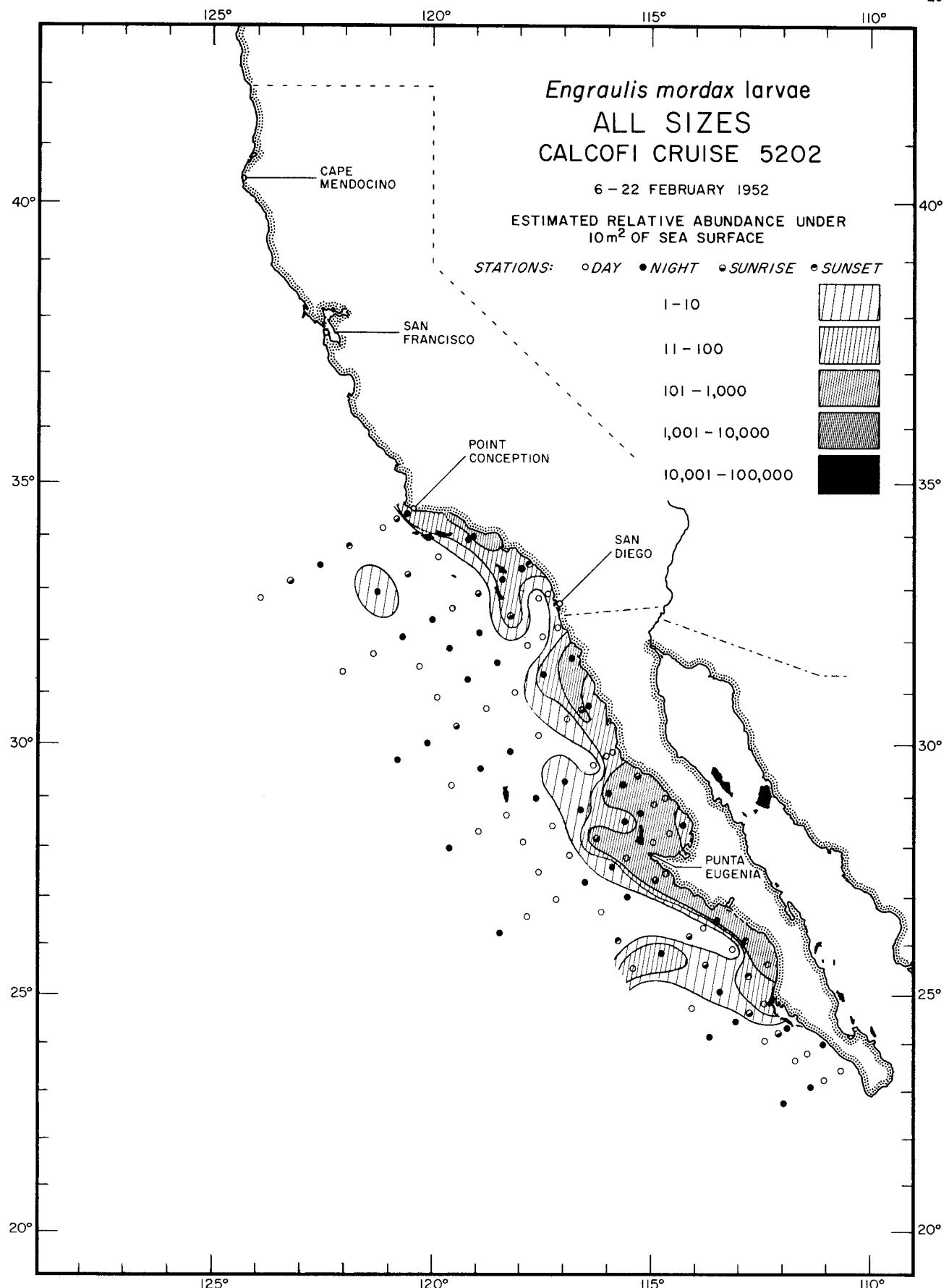


Engraulis mordax larvae
Size Group: 6.26-12.25mm
5201

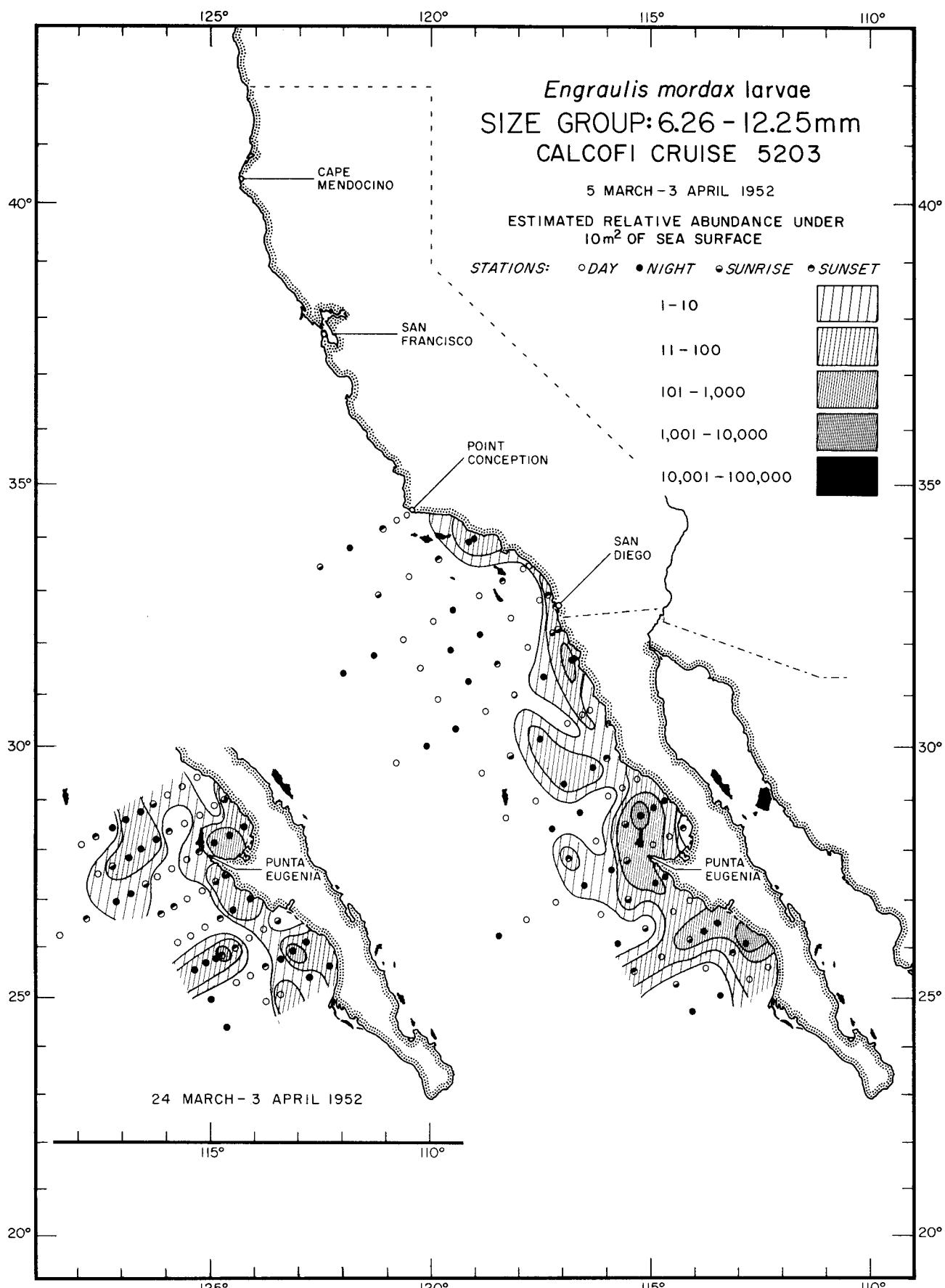
*Engraulis mordax* larvaeAll Sizes
5201



Engraulis mordax larvae
Size Group: 6.26-12.25mm
5202

*Engraulis mordax* larvae

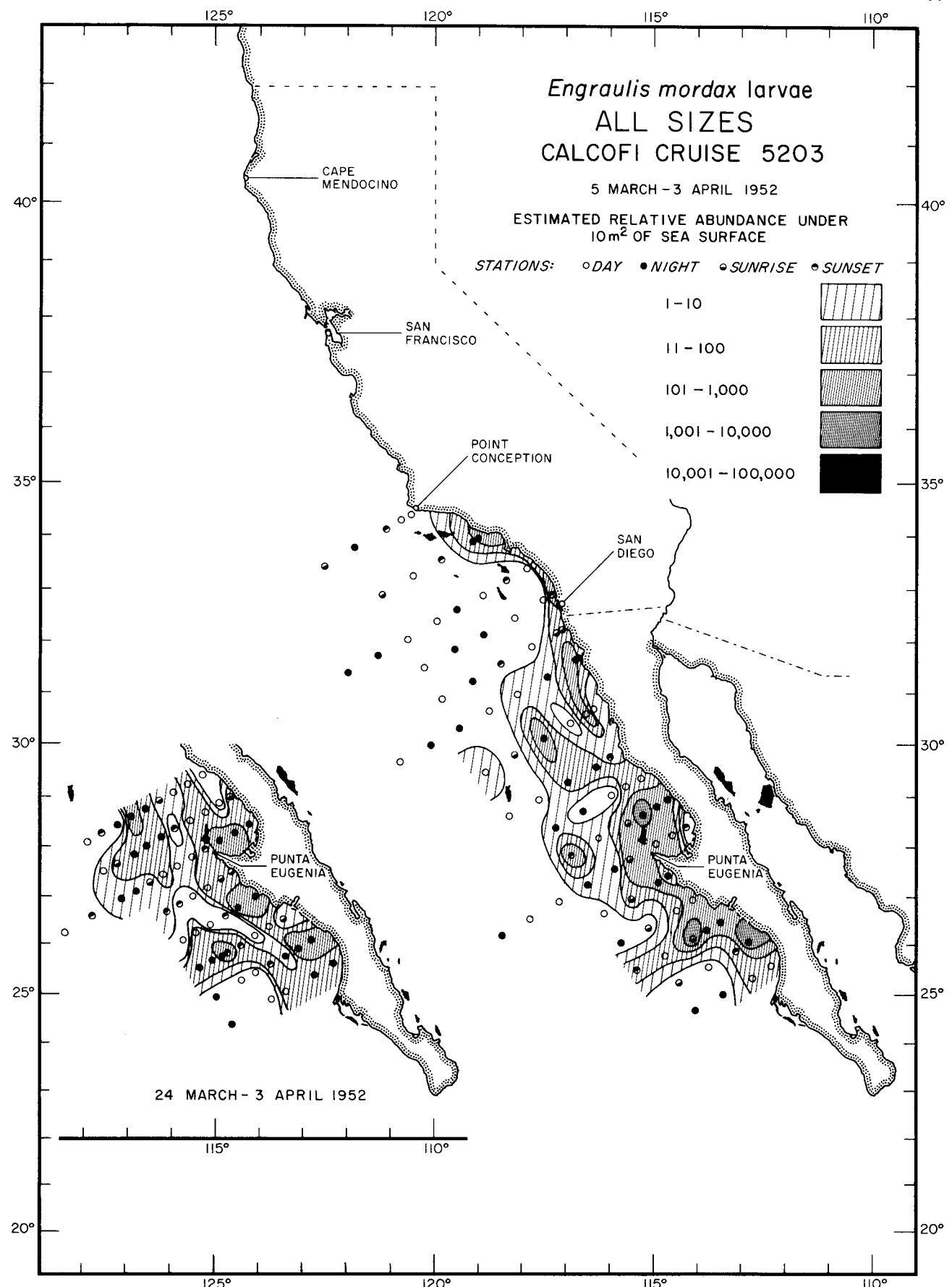
All Sizes
5202



Engraulis mordax larvae

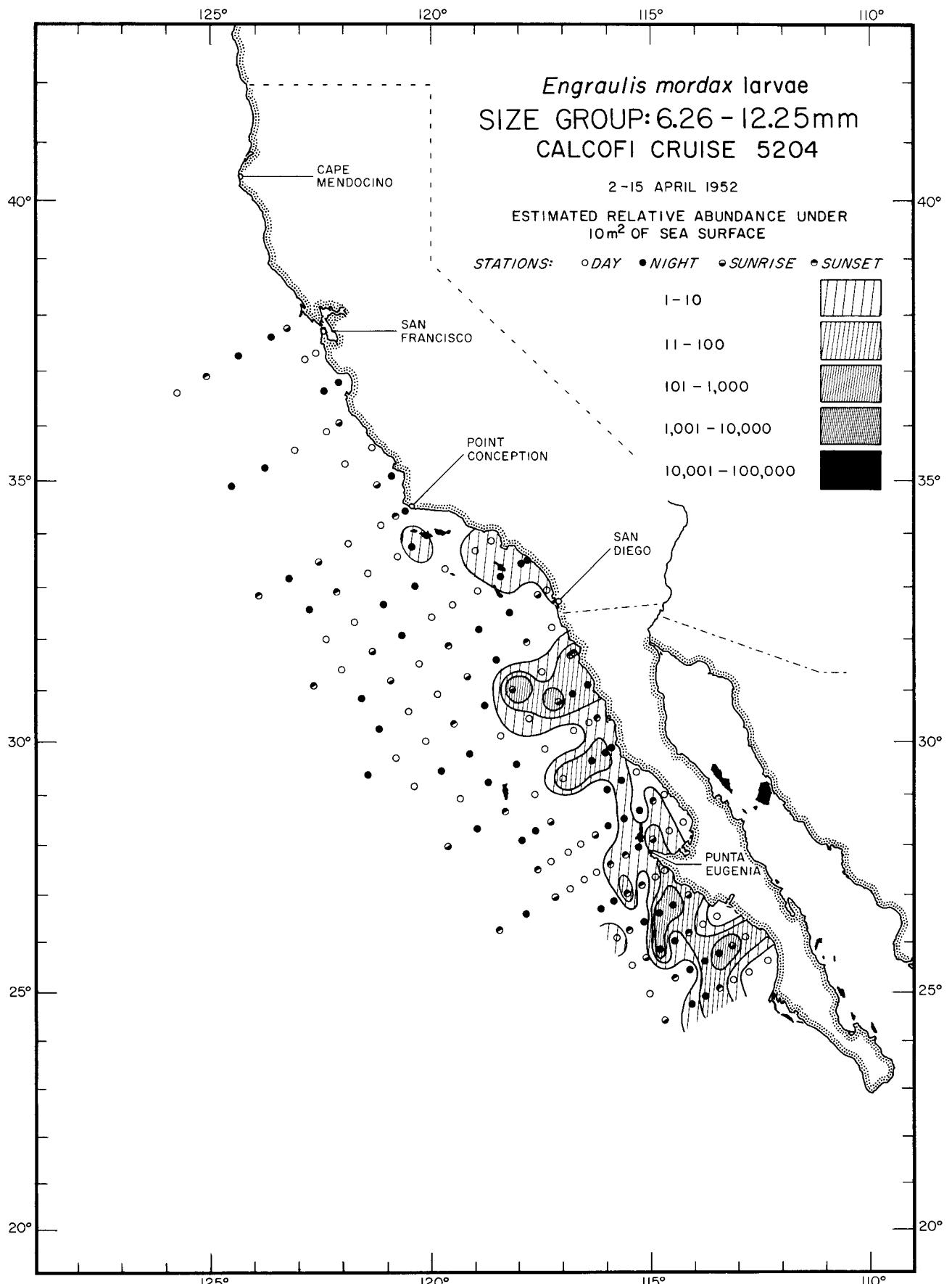
Size Group: 6.26-12.25mm

5203

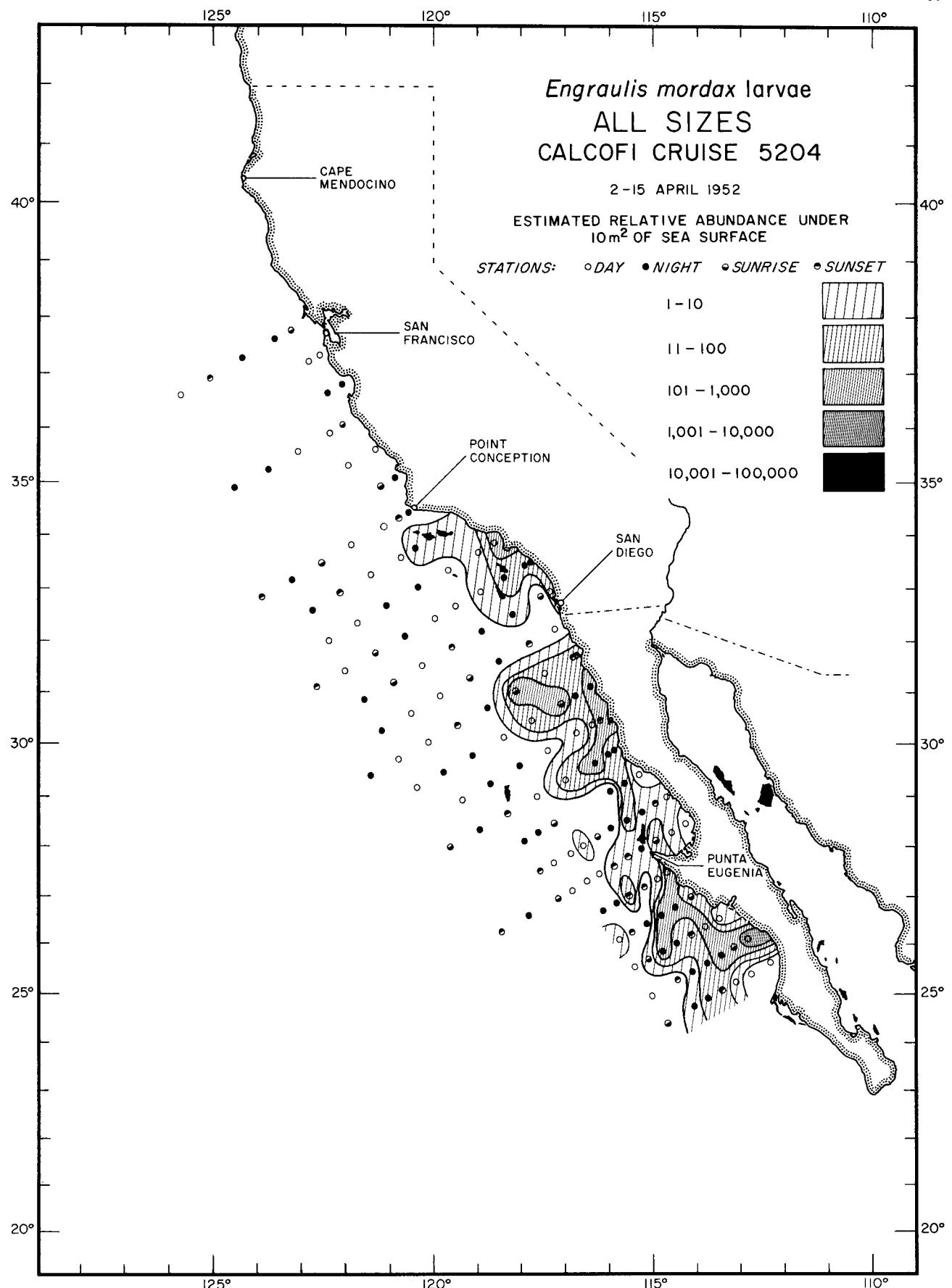
*Engraulis mordax* larvae

All Sizes

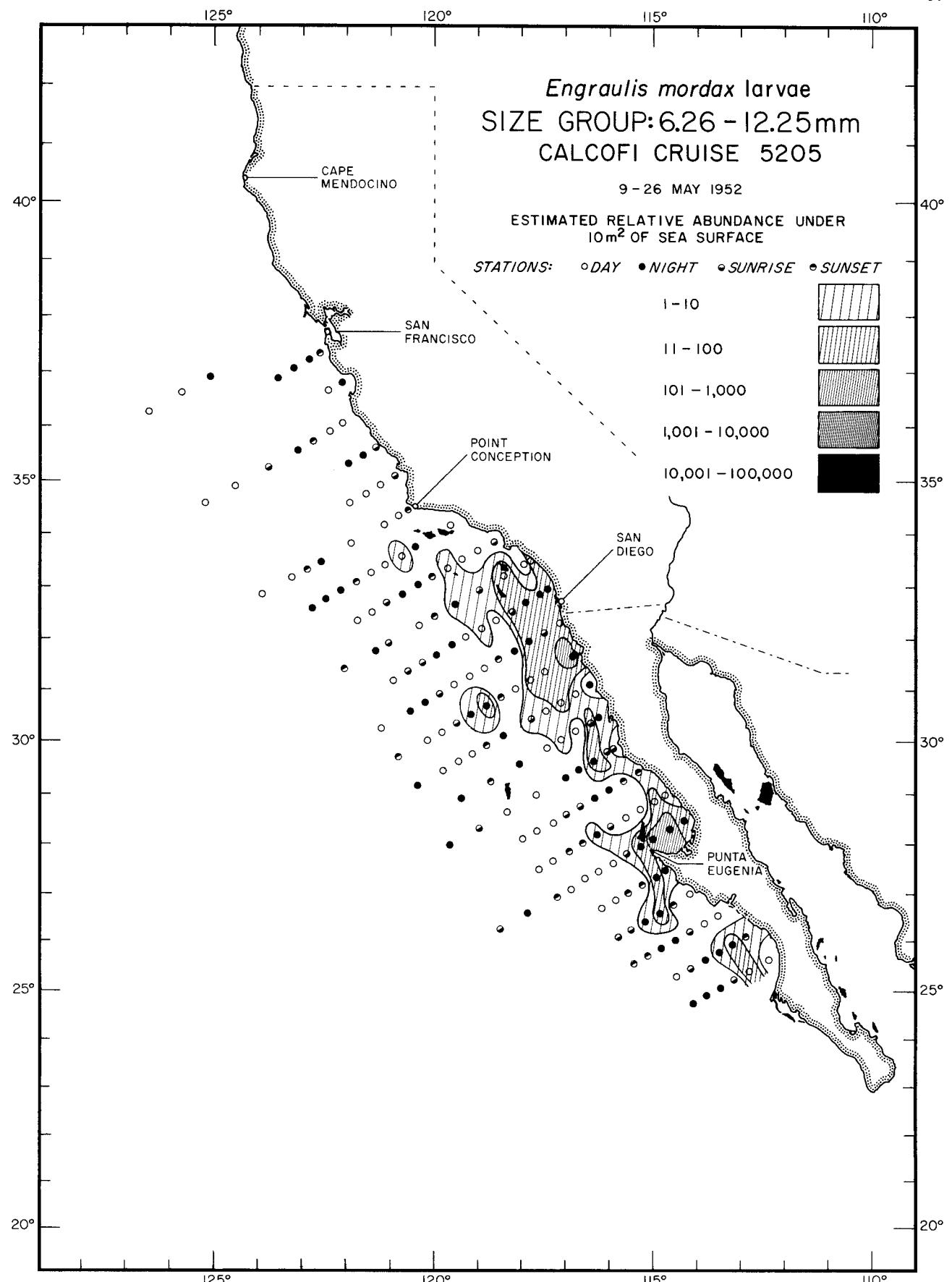
5203



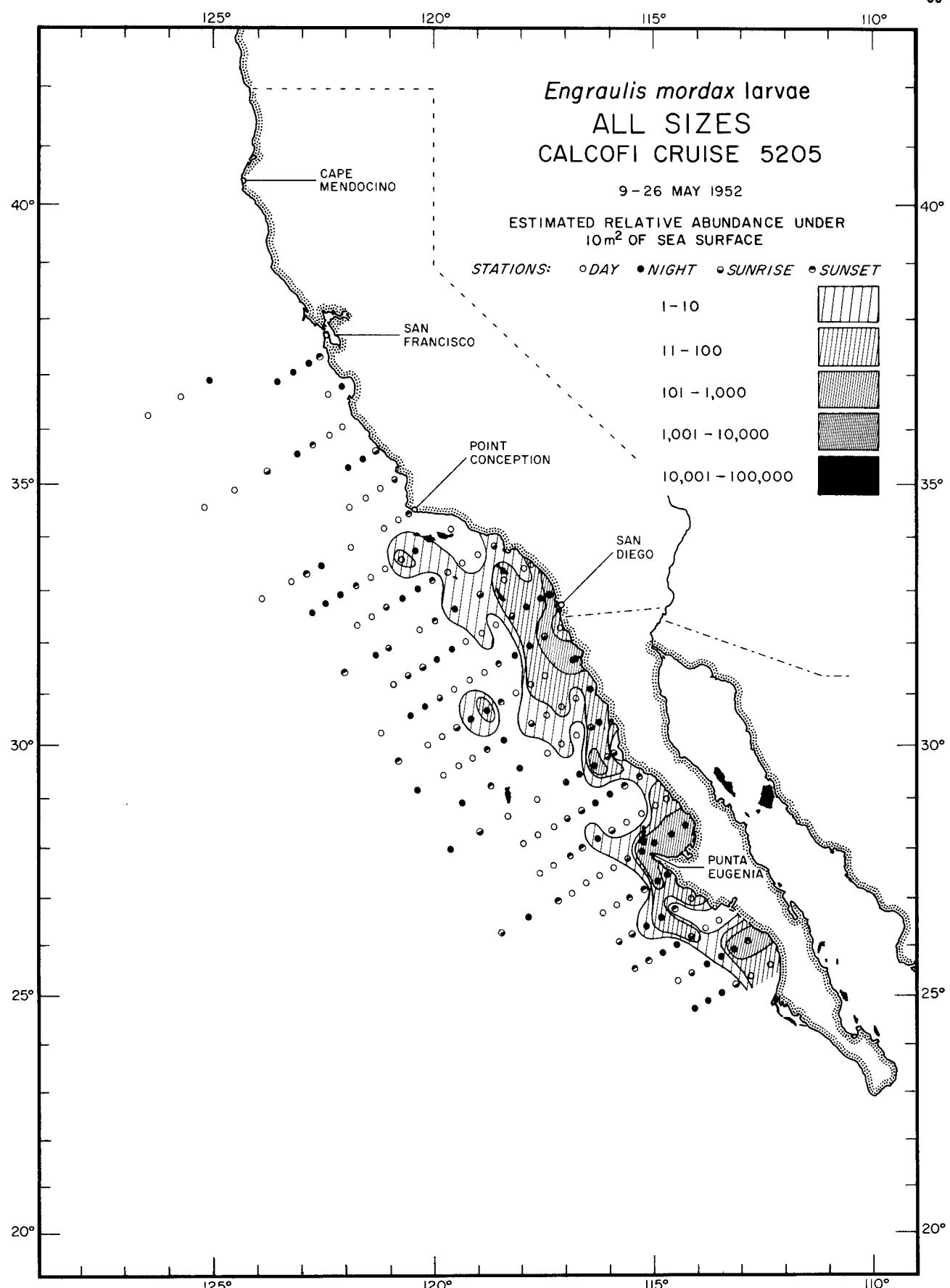
Engraulis mordax larvae
Size Group: 6.26-12.25mm
5204



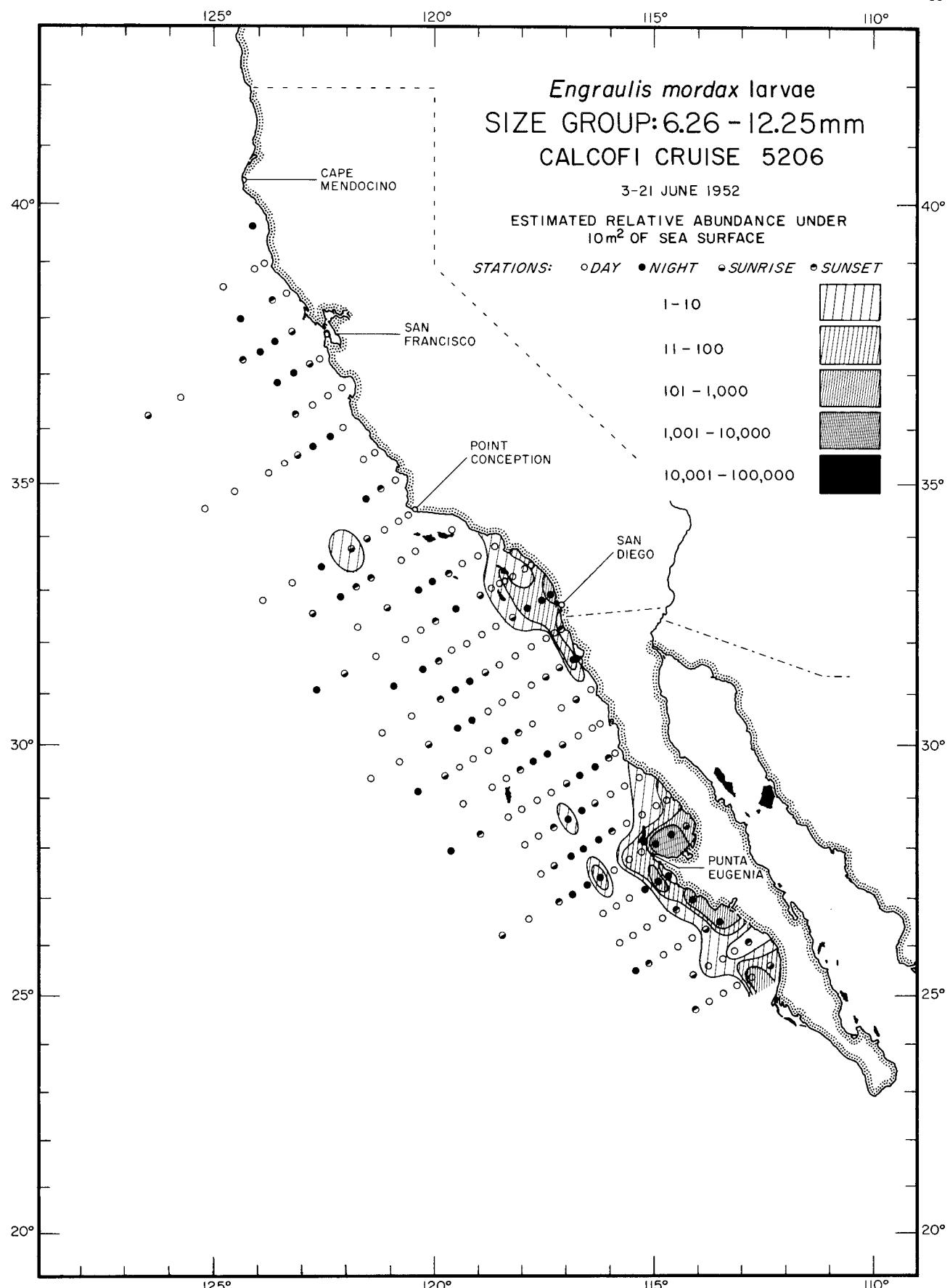
Engraulis mordax larvae
All Sizes
5204



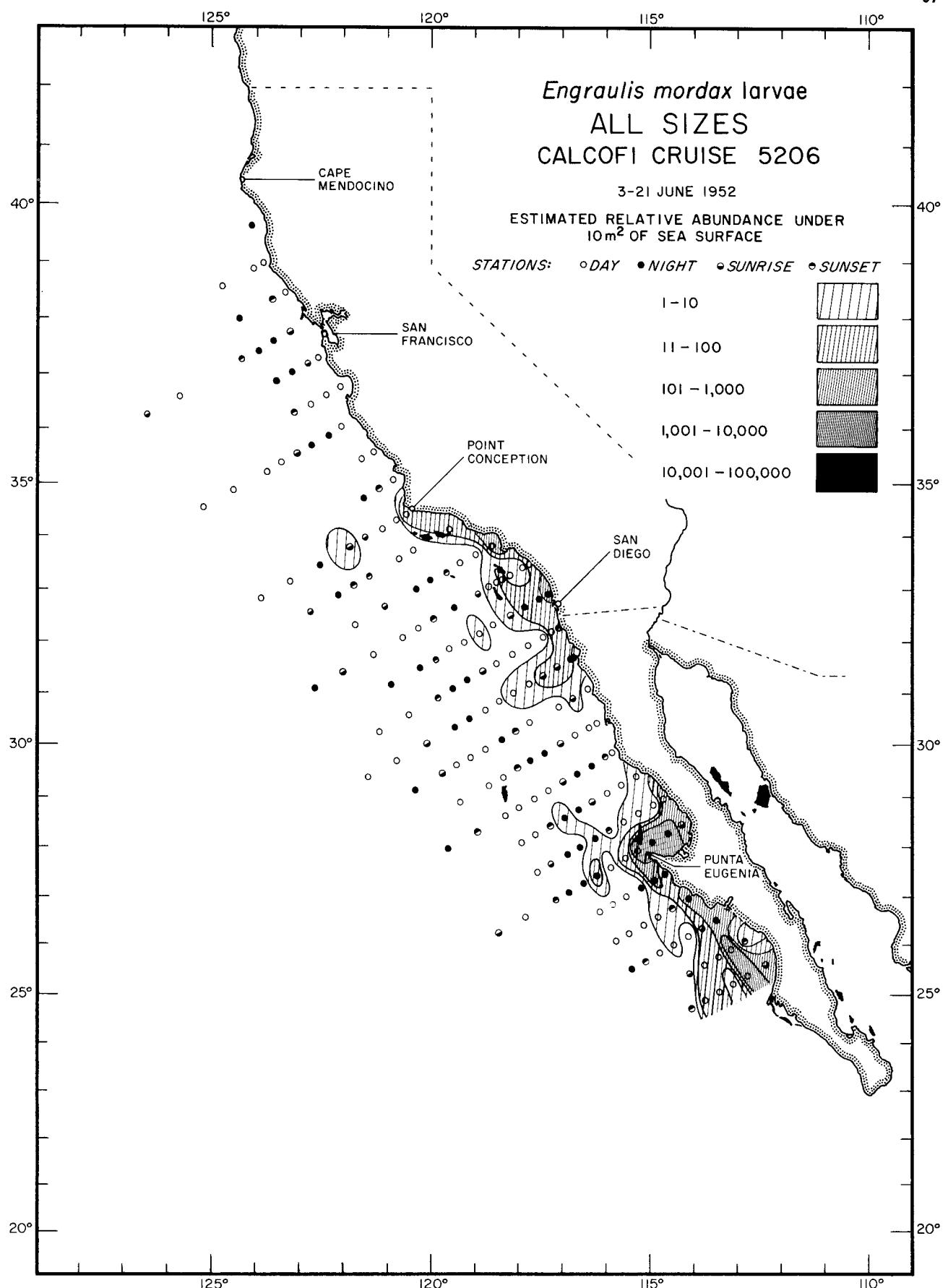
Engraulis mordax larvae
Size Group: 6.26-12.25mm
5205



Engraulis mordax larvae
All Sizes
5205

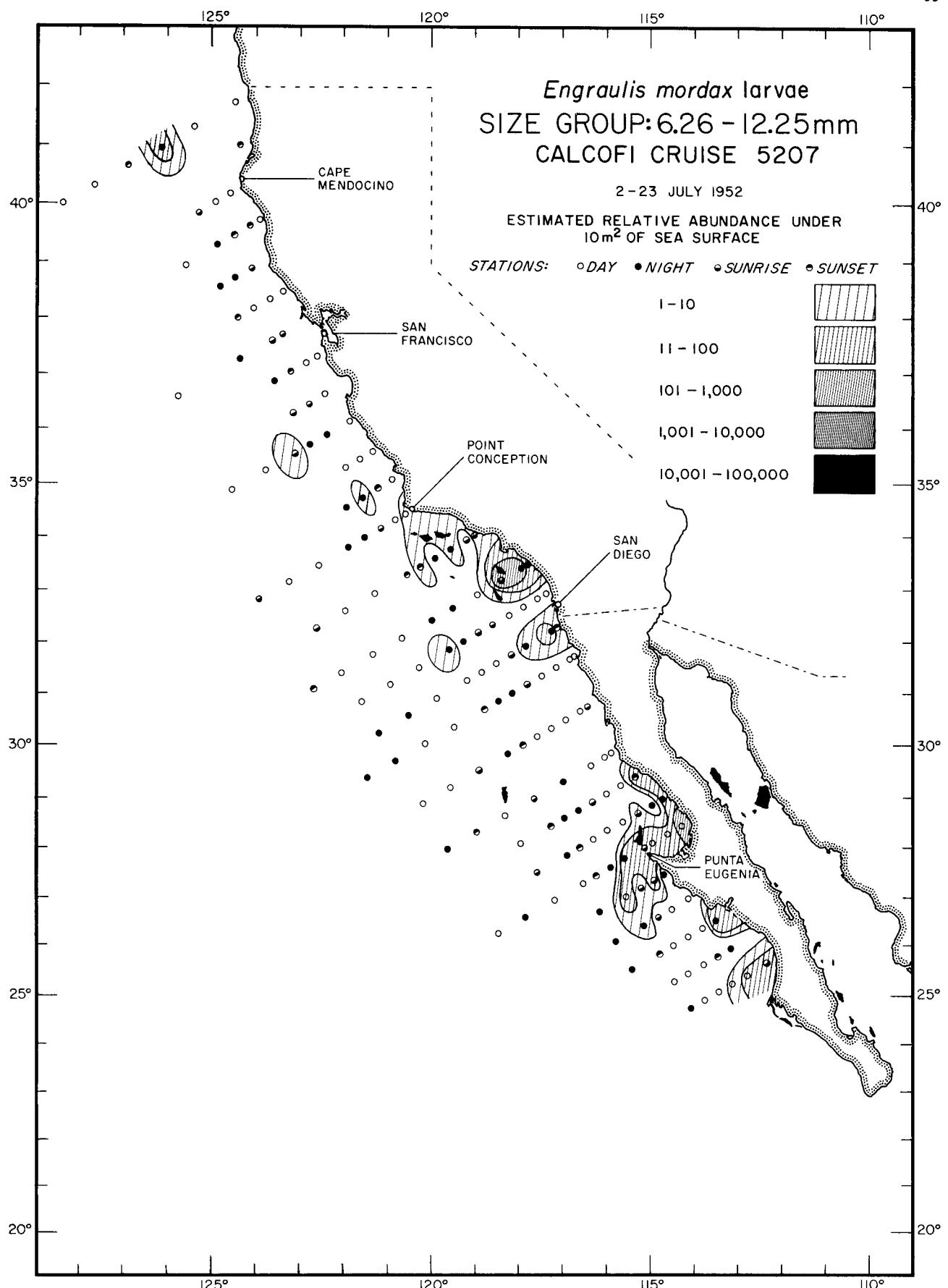


Engraulis mordax larvae
Size Group: 6.26-12.25mm
5206

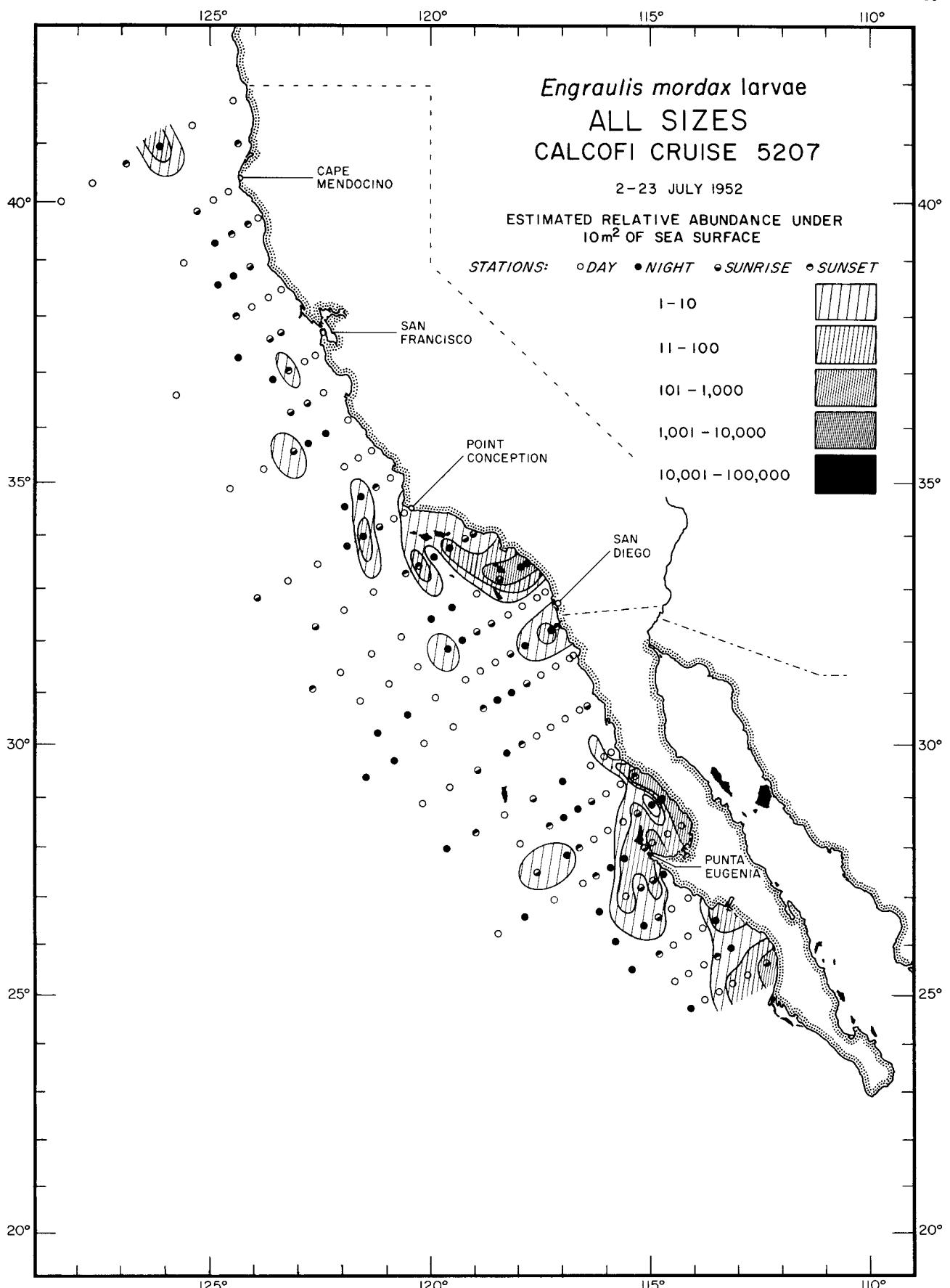
*Engraulis mordax* larvae

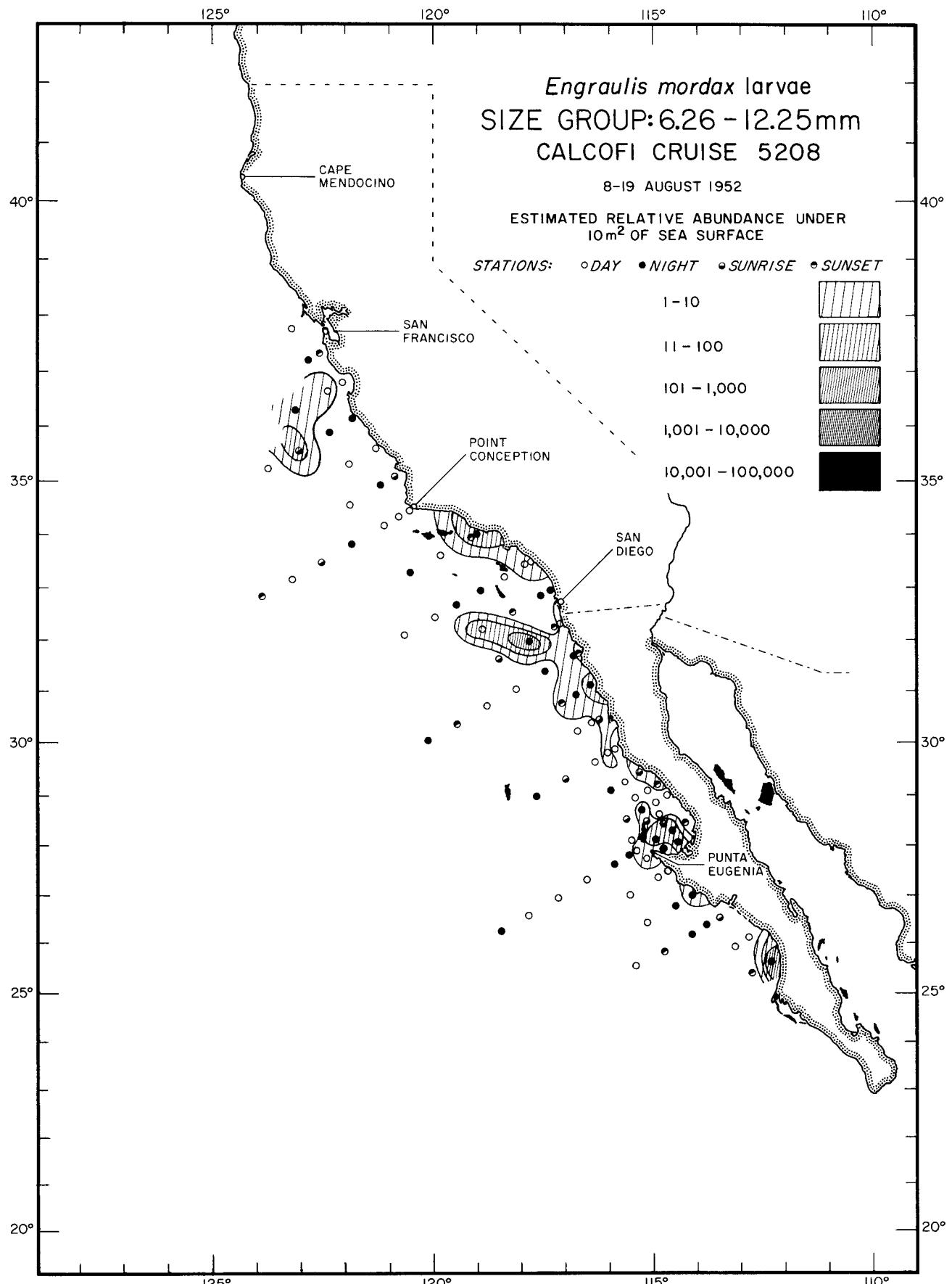
All Sizes

5206

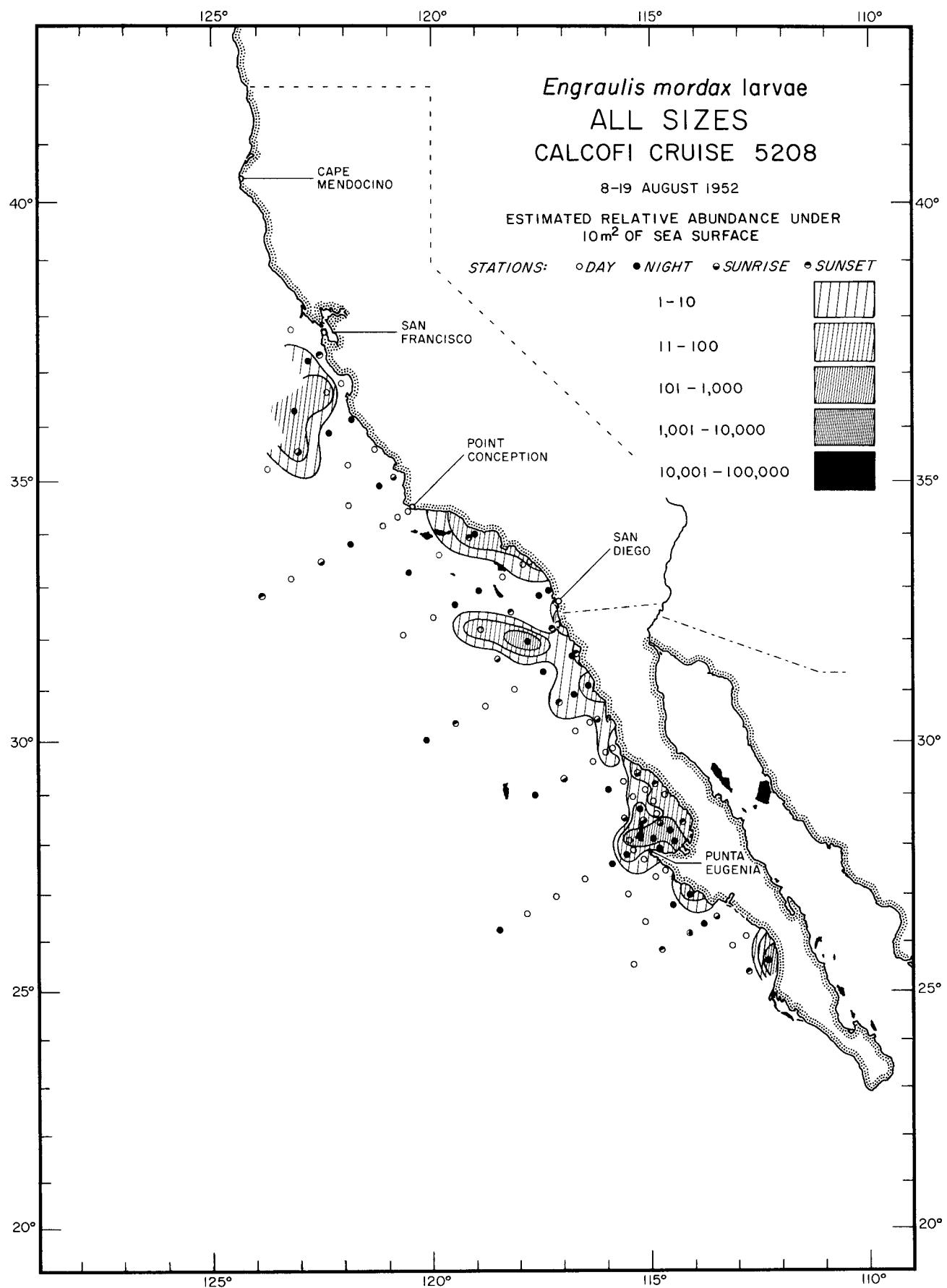


Engraulis mordax larvae
Size Group: 6.26-12.25mm
5207

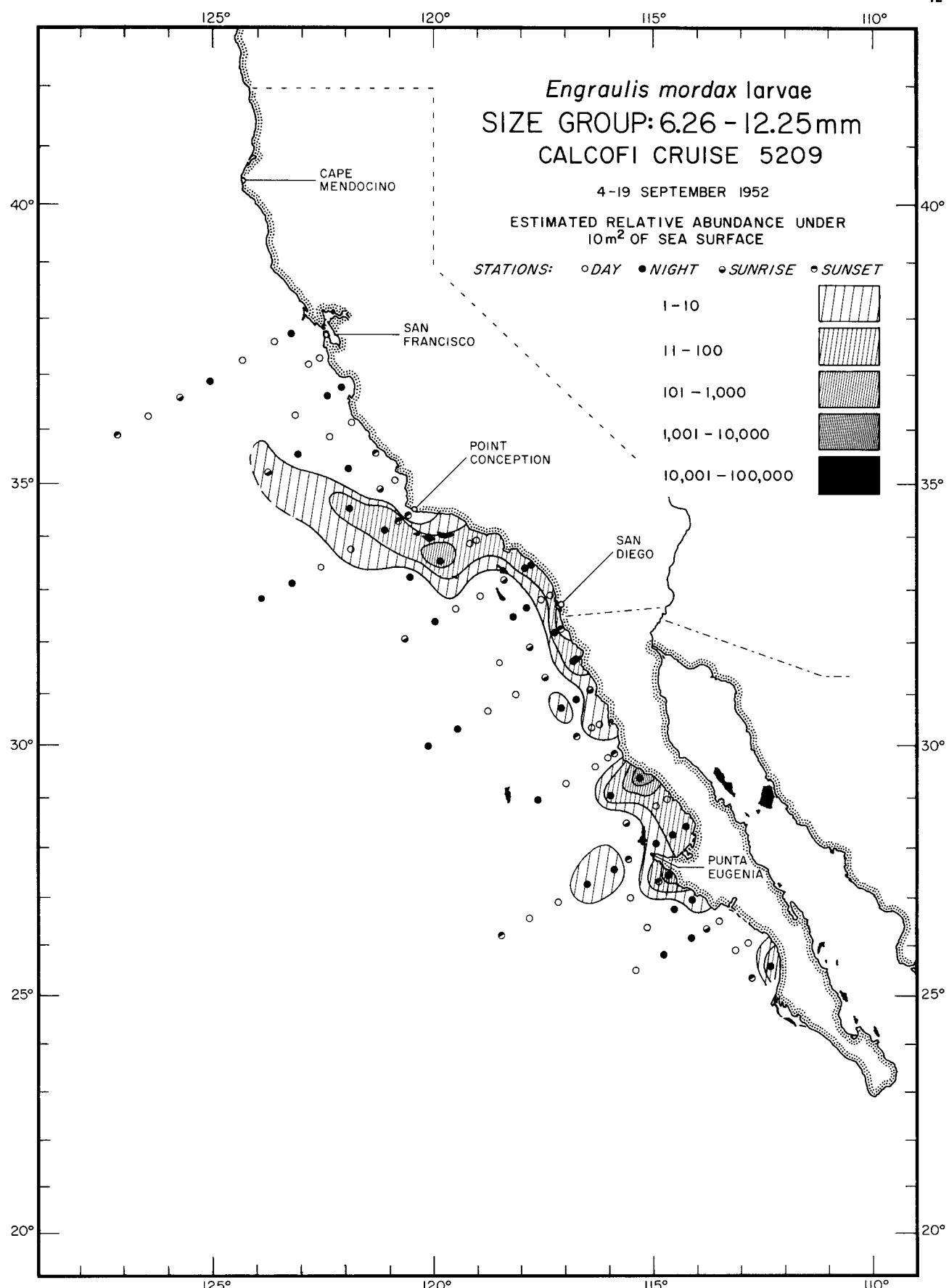
*Engraulis mordax* larvaeAll Sizes
5207



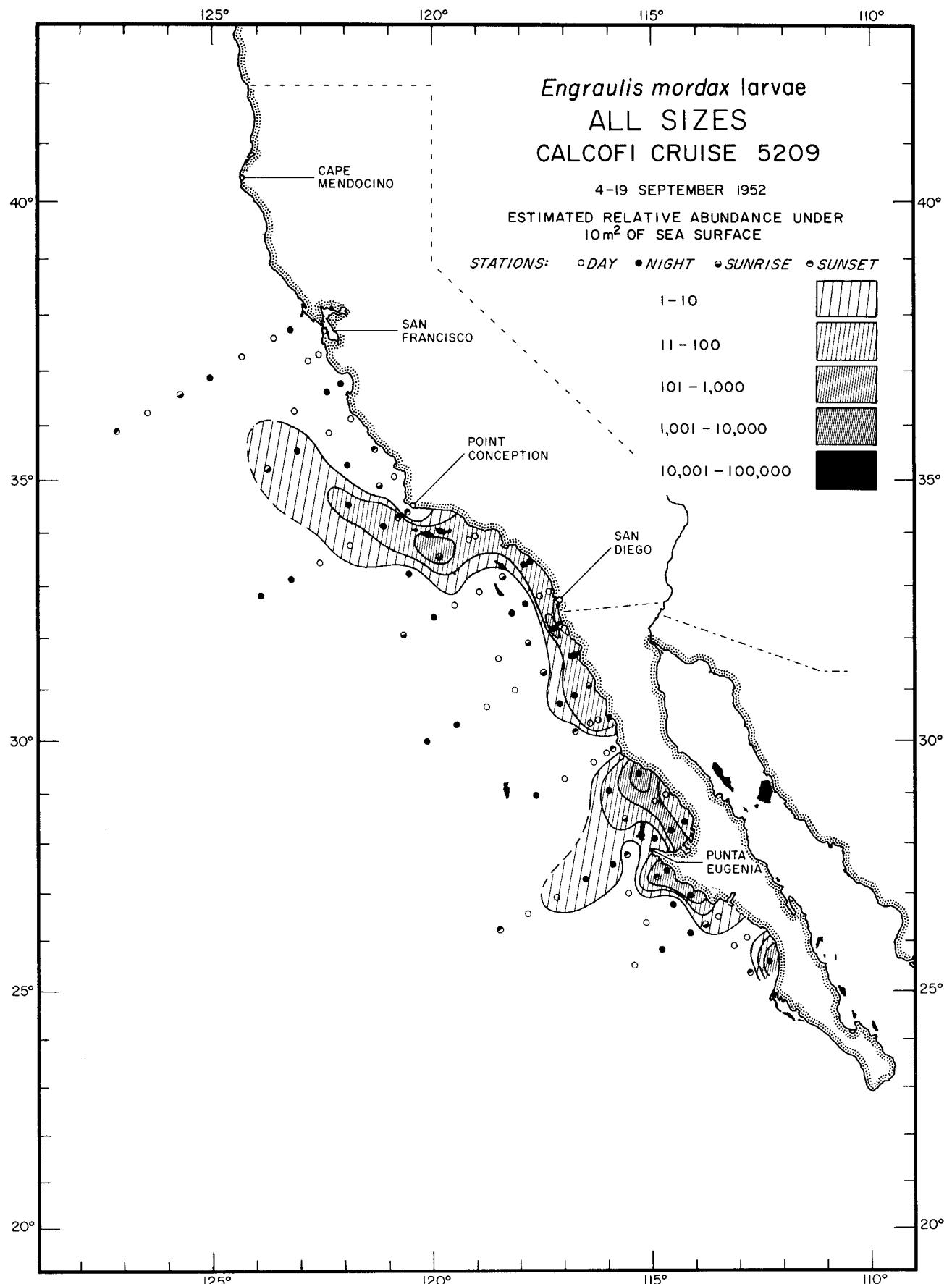
Engraulis mordax larvae
Size Group: 6.26 - 12.25mm
5208



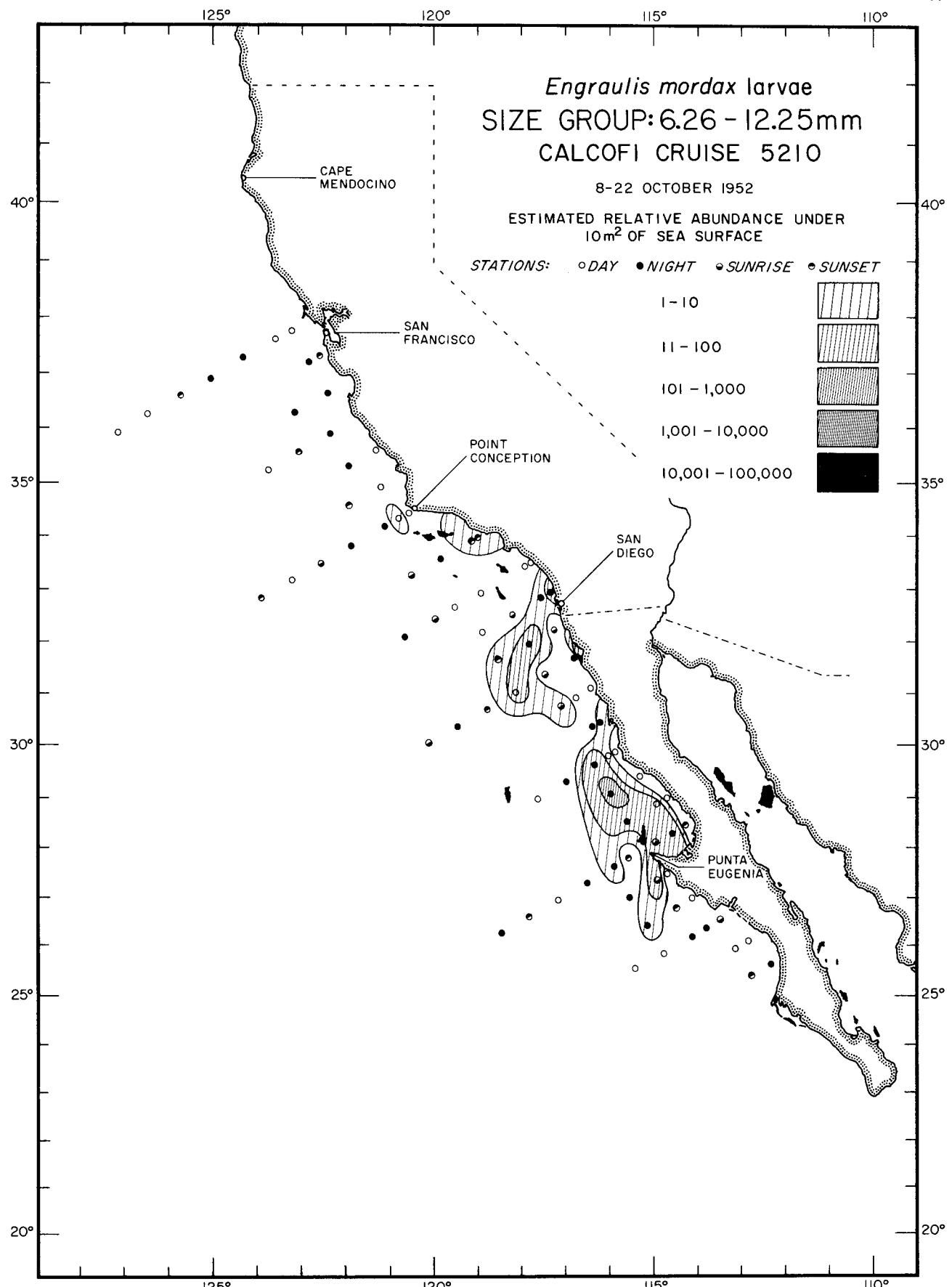
Engraulis mordax larvae
All Sizes
5208



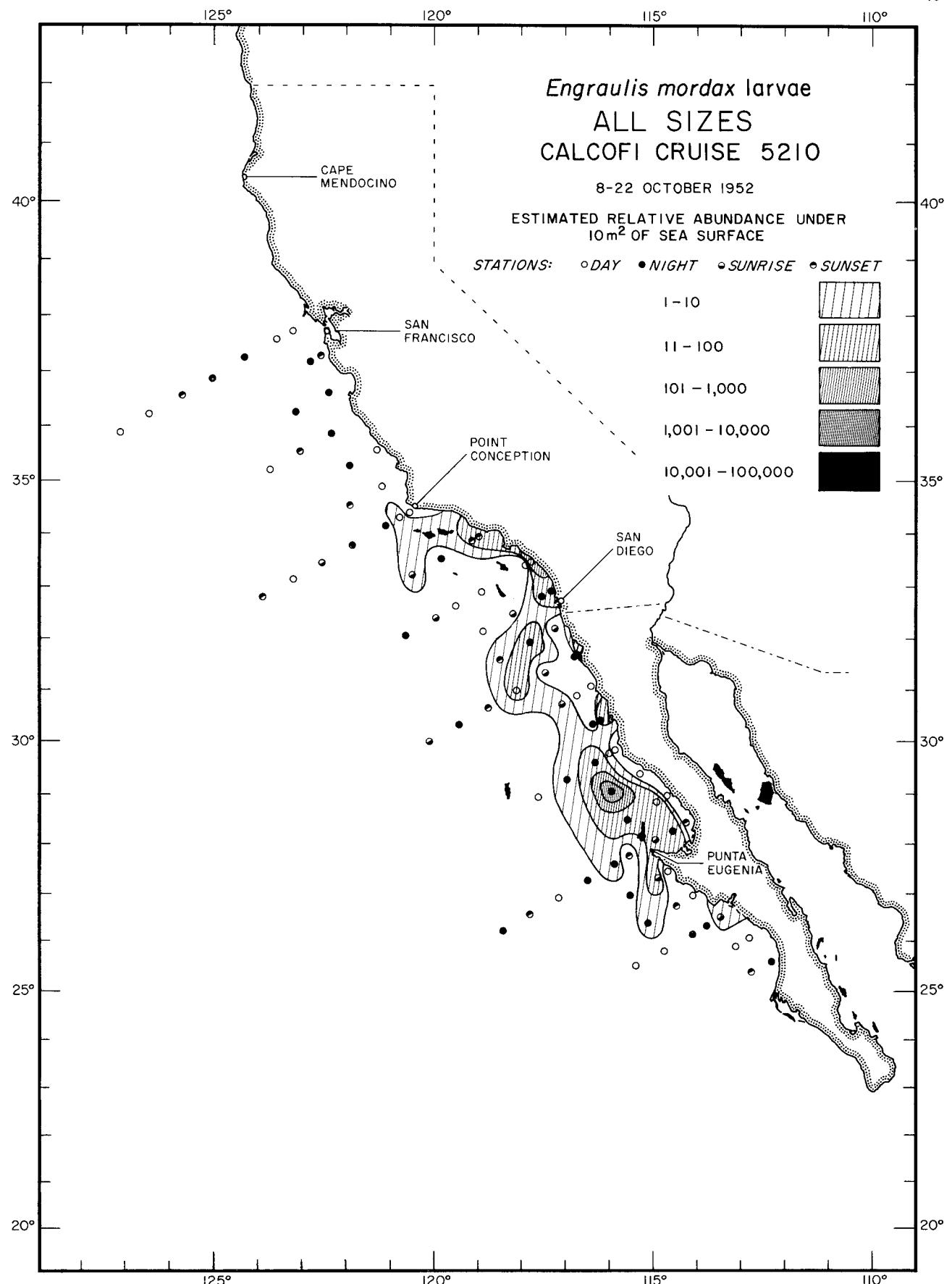
Engraulis mordax larvae
Size Group: 6.26-12.25mm
5209



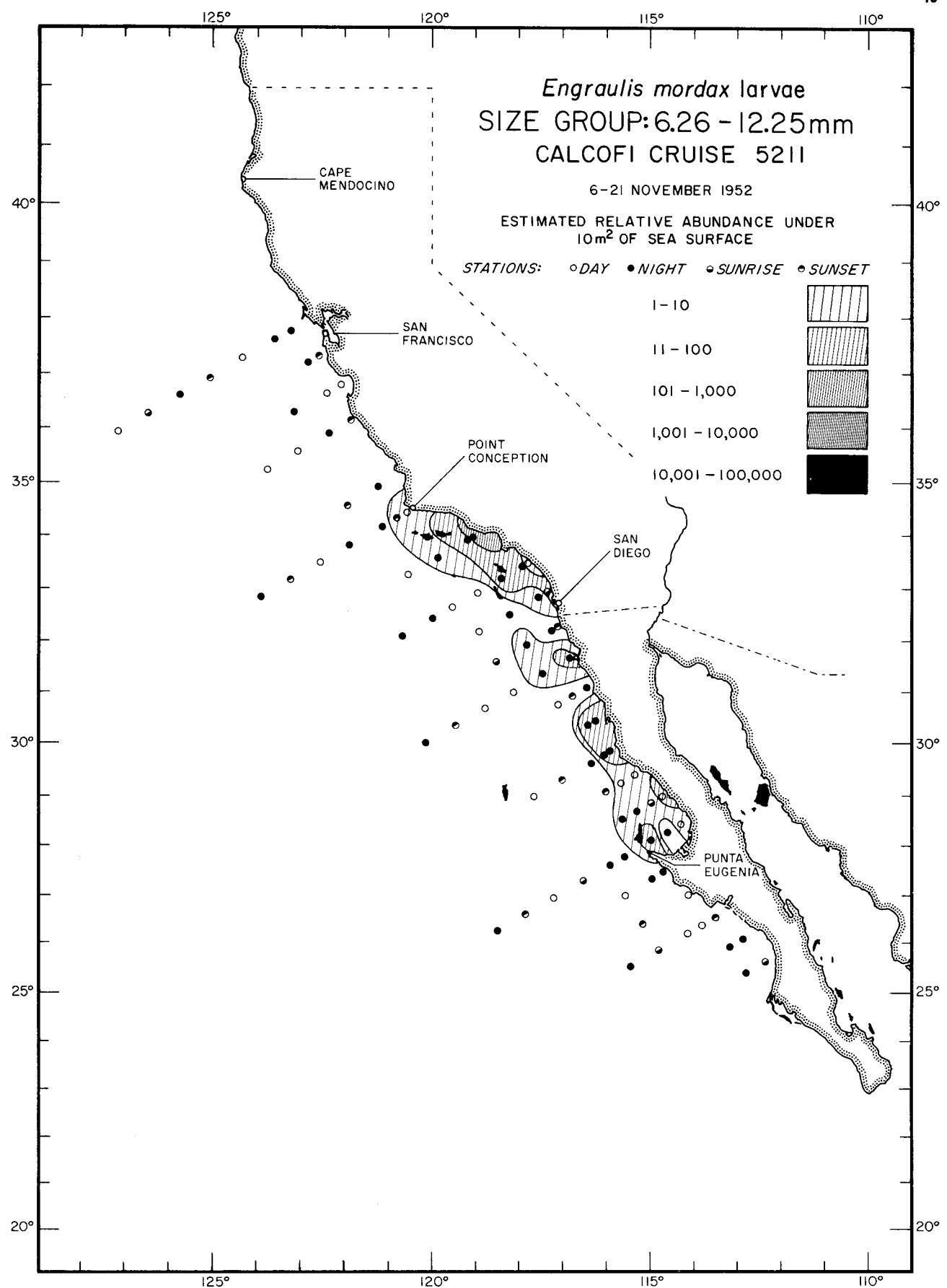
Engraulis mordax larvae
All Sizes
5209



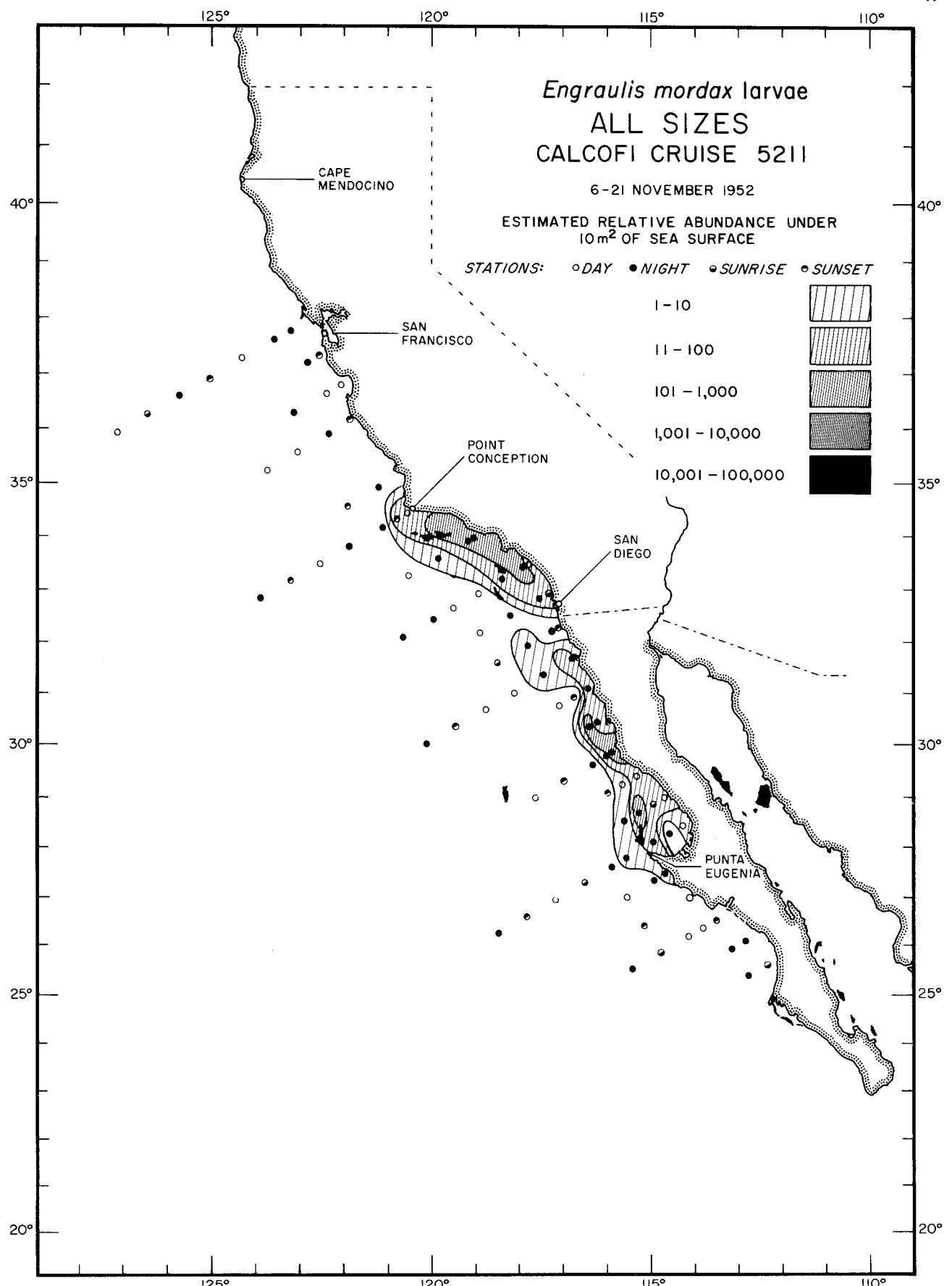
Engraulis mordax larvae
Size Group: 6.26-12.25mm
5210



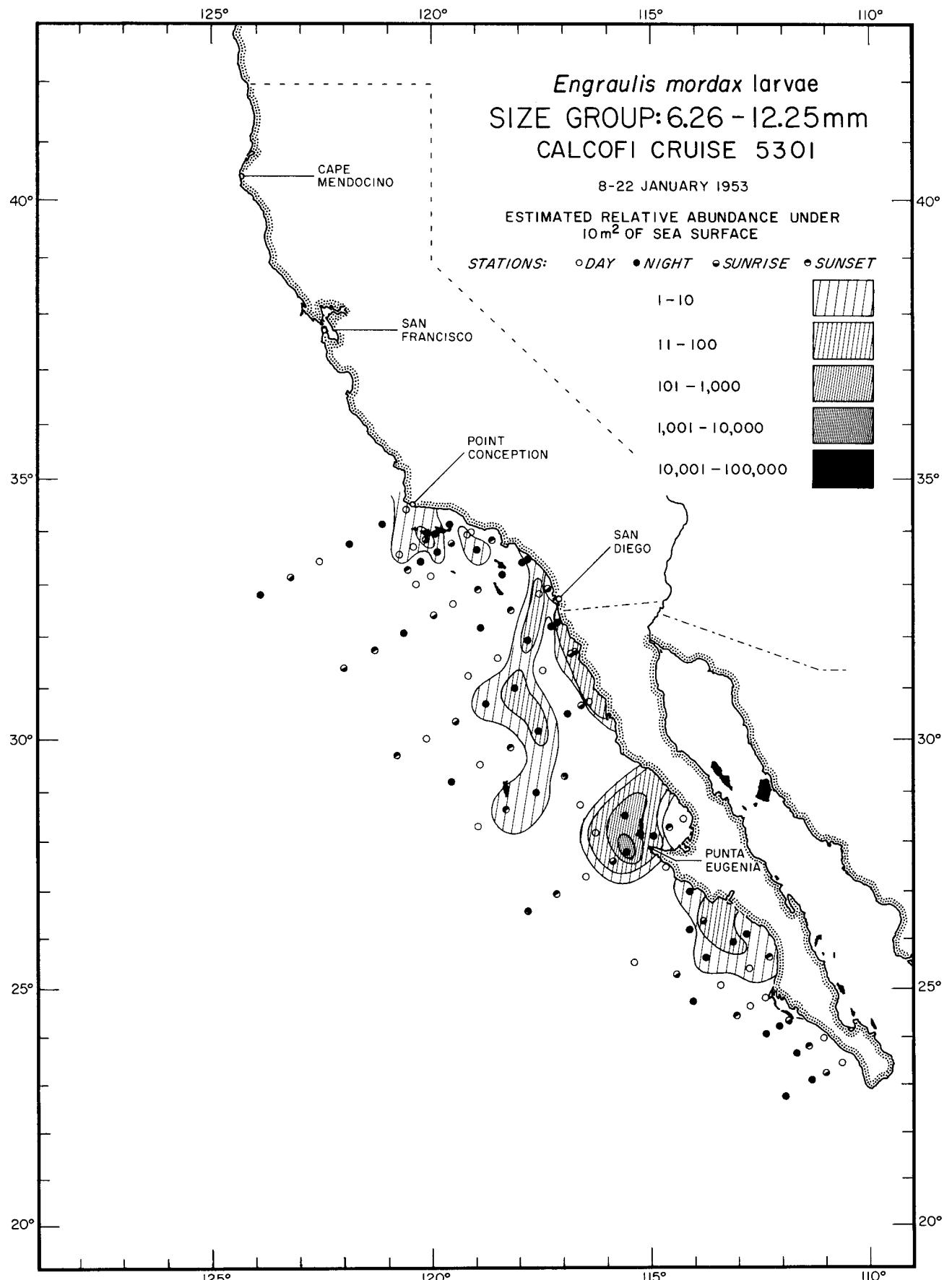
Engraulis mordax larvae
All Sizes
5210



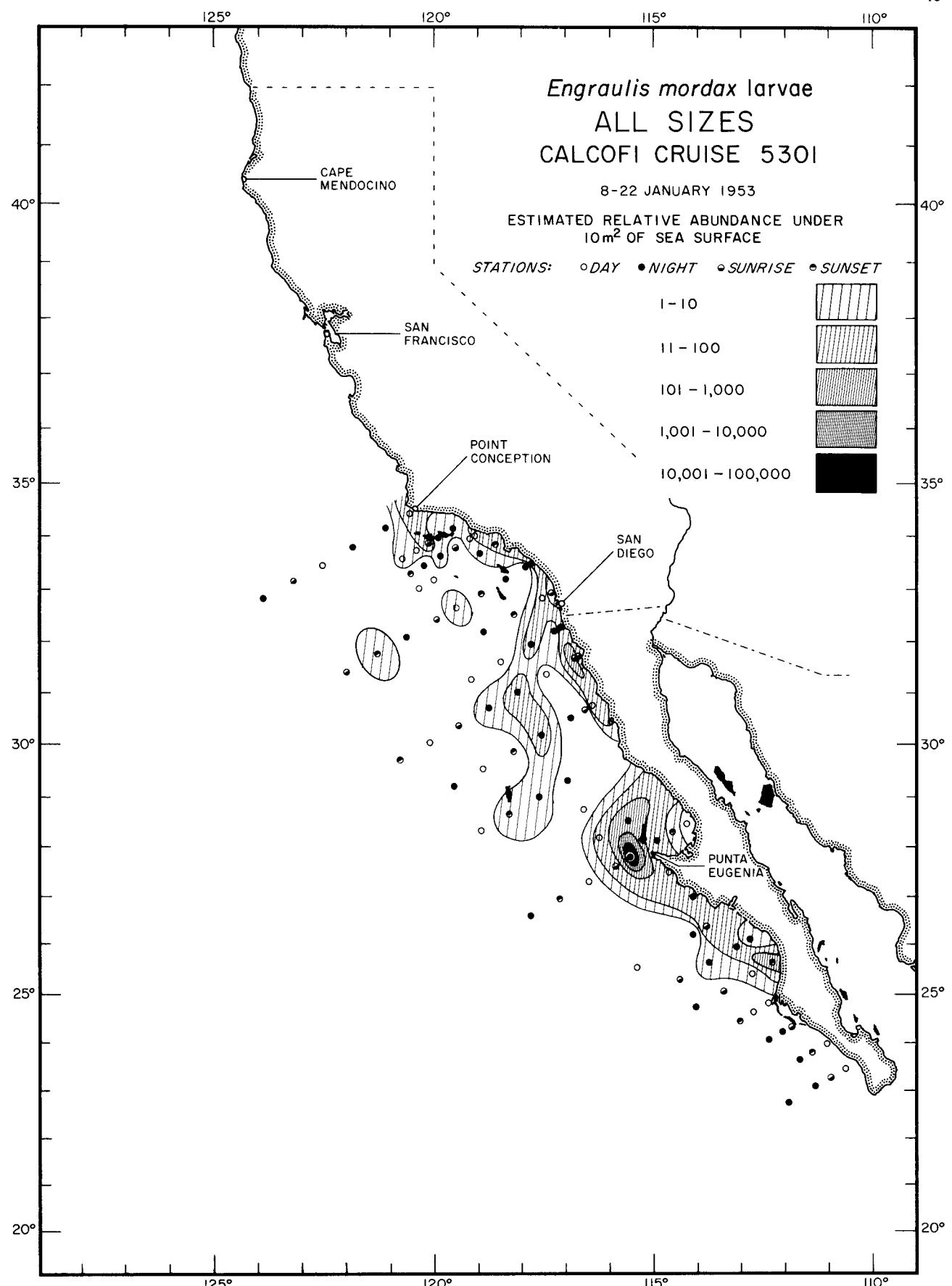
Engraulis mordax larvae
Size Group: 6.26-12.25mm
5211



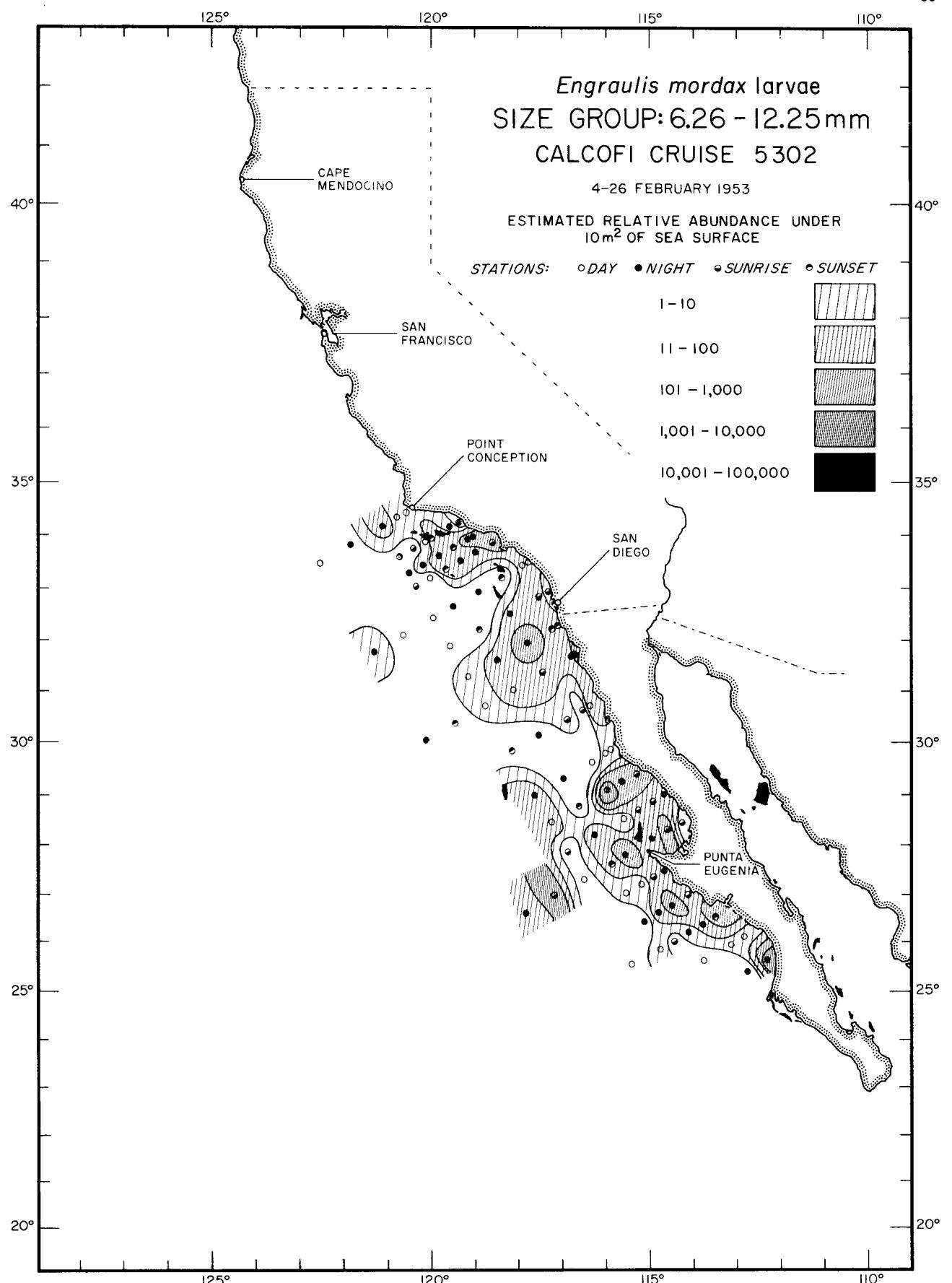
Engraulis mordax larvae
All Sizes
5211



Engraulis mordax larvae
Size Group: 6.26-12.25mm
5301



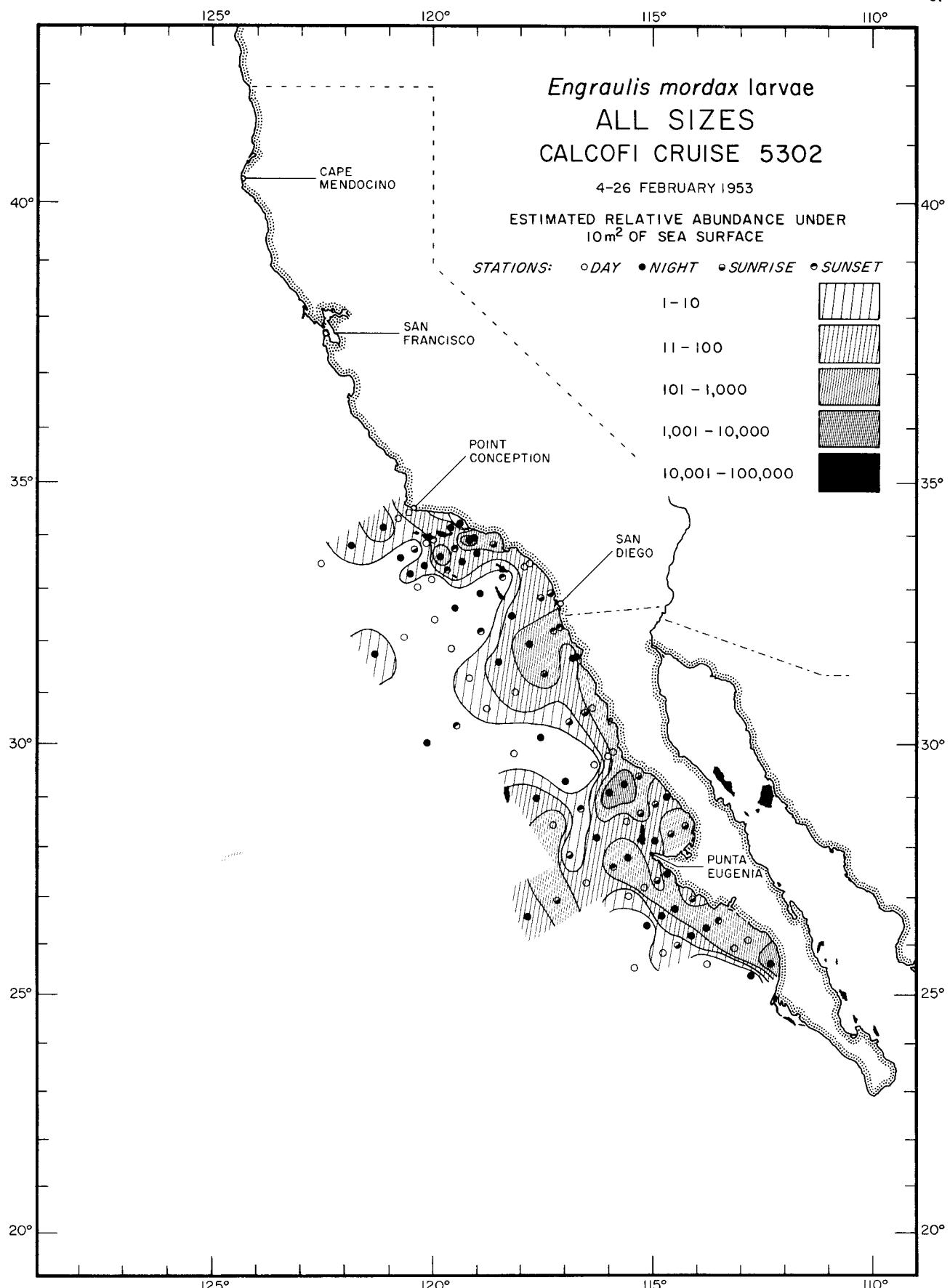
Engraulis mordax larvae
All Sizes
5301



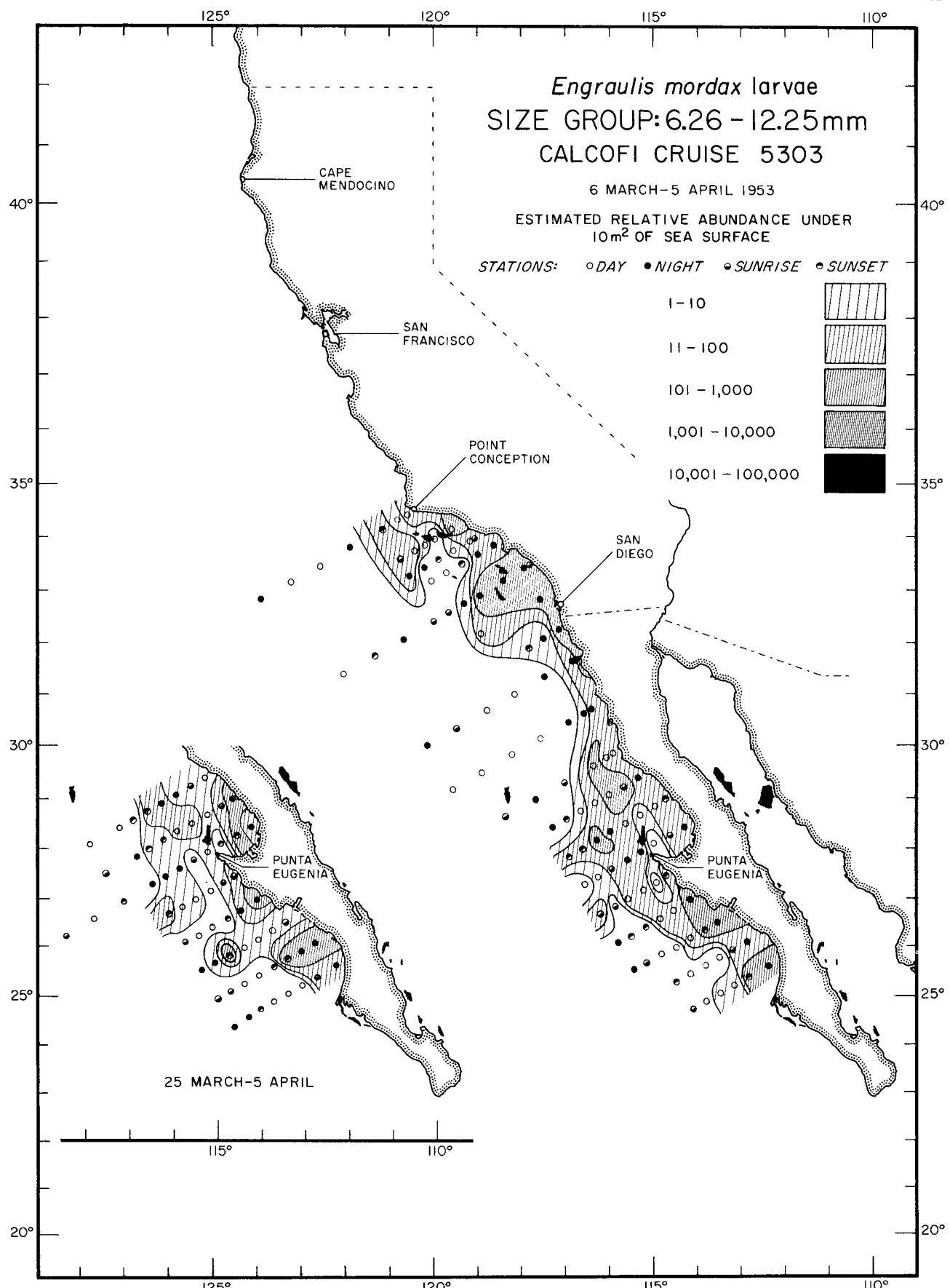
Engraulis mordax larvae

Size Group: 6.26-12.25mm

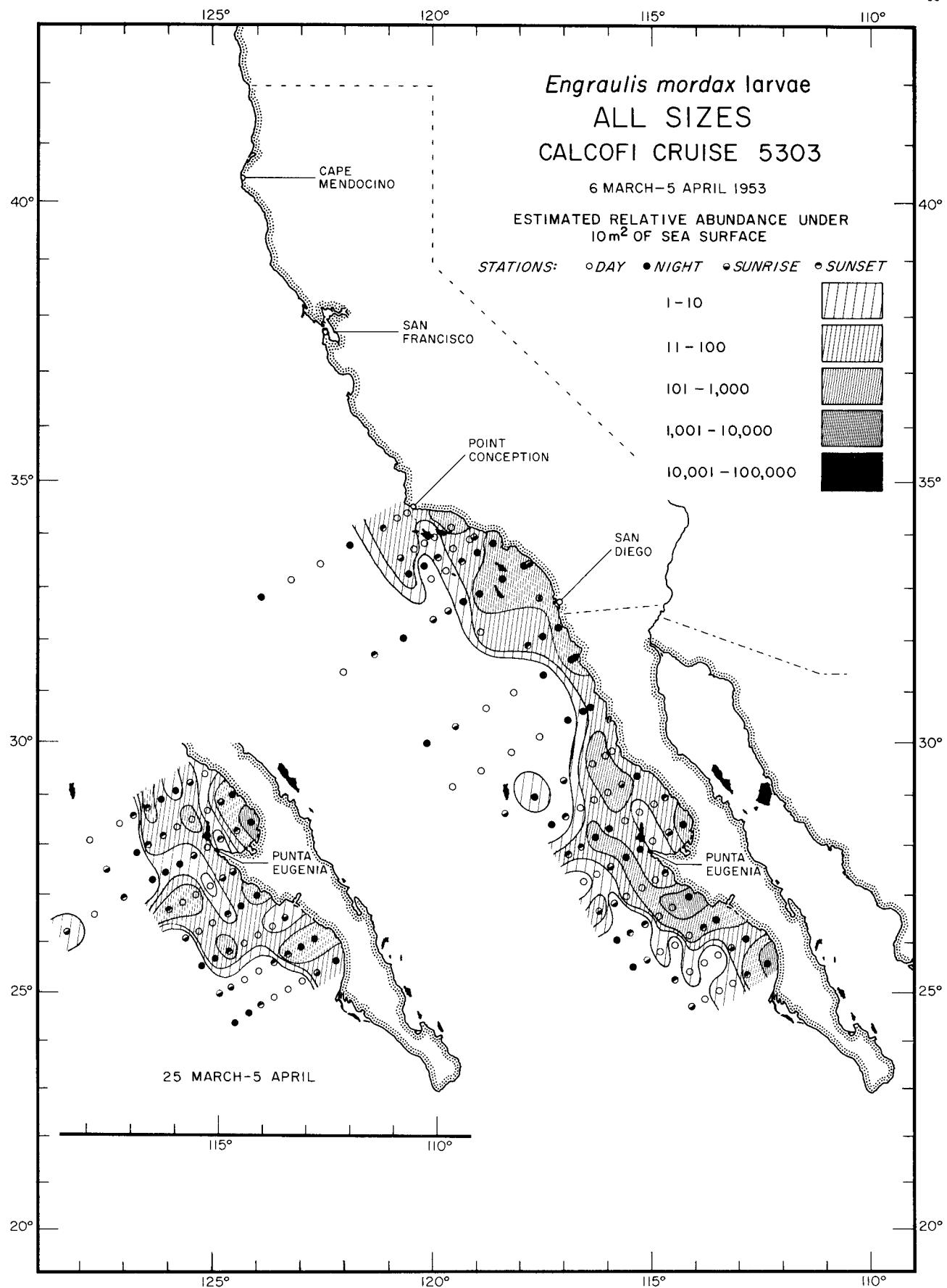
5302



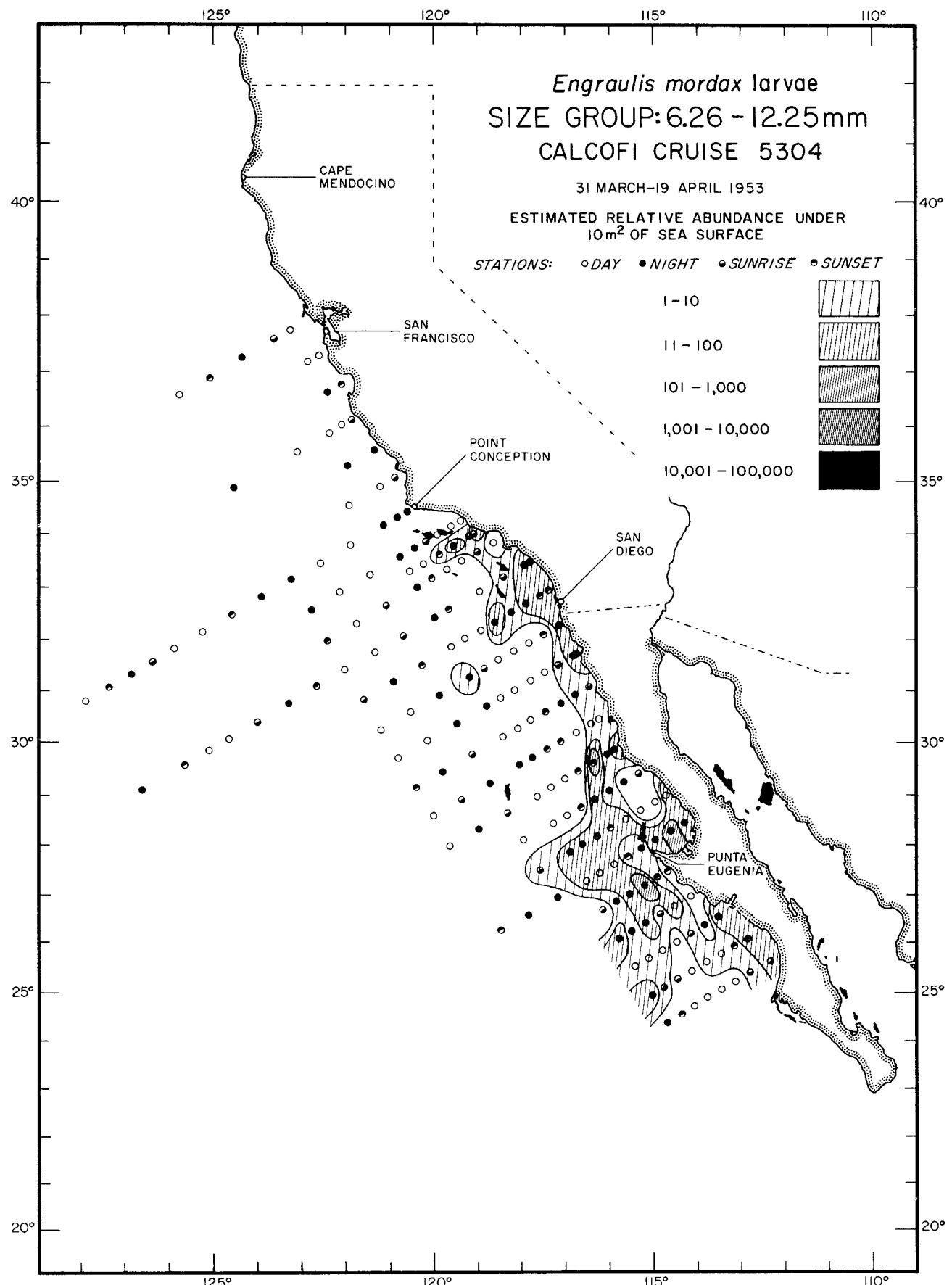
Engraulis mordax larvae
All Sizes
5302



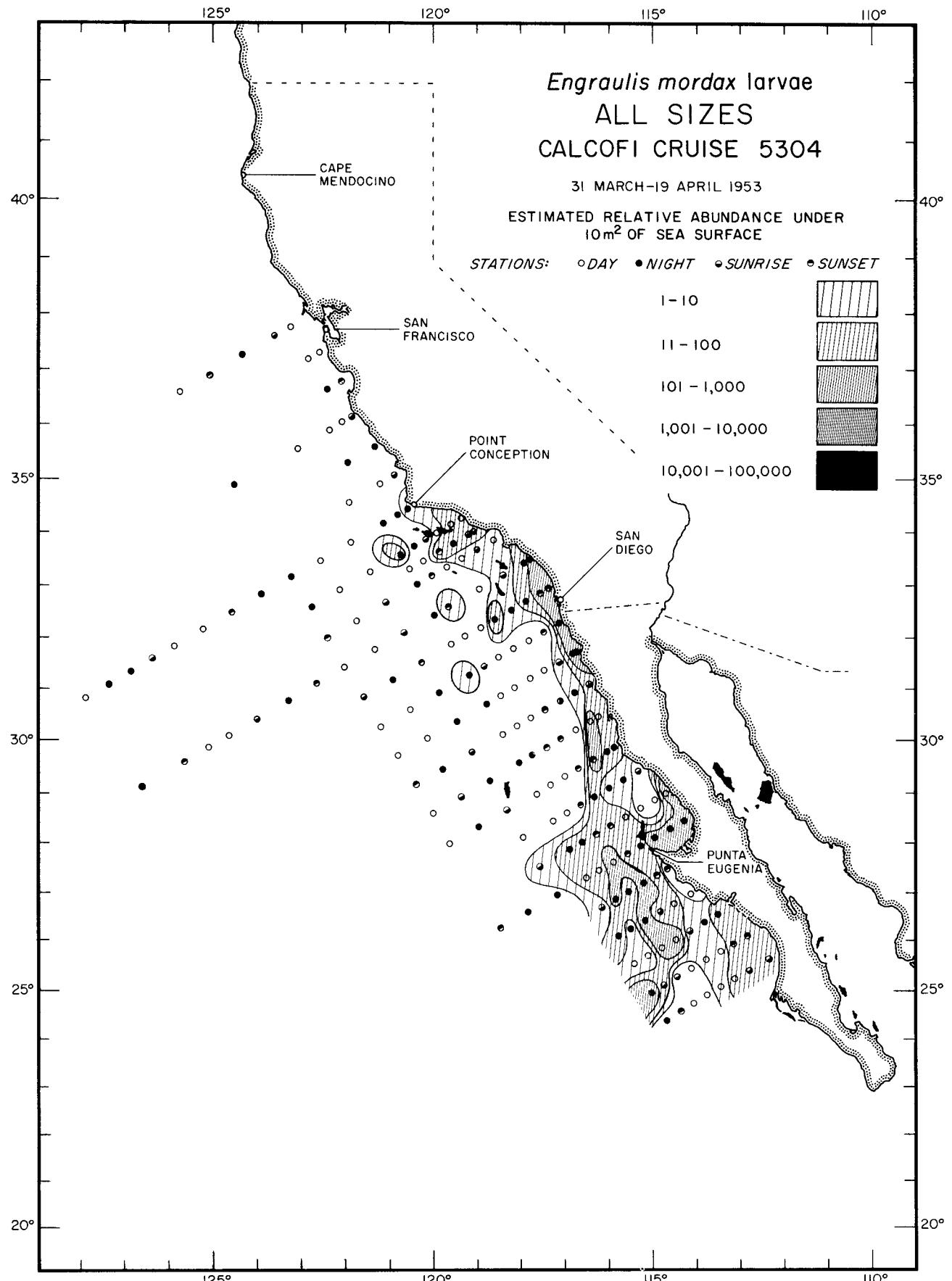
Engraulis mordax larvae
Size Group: 6.26-12.25mm
5303



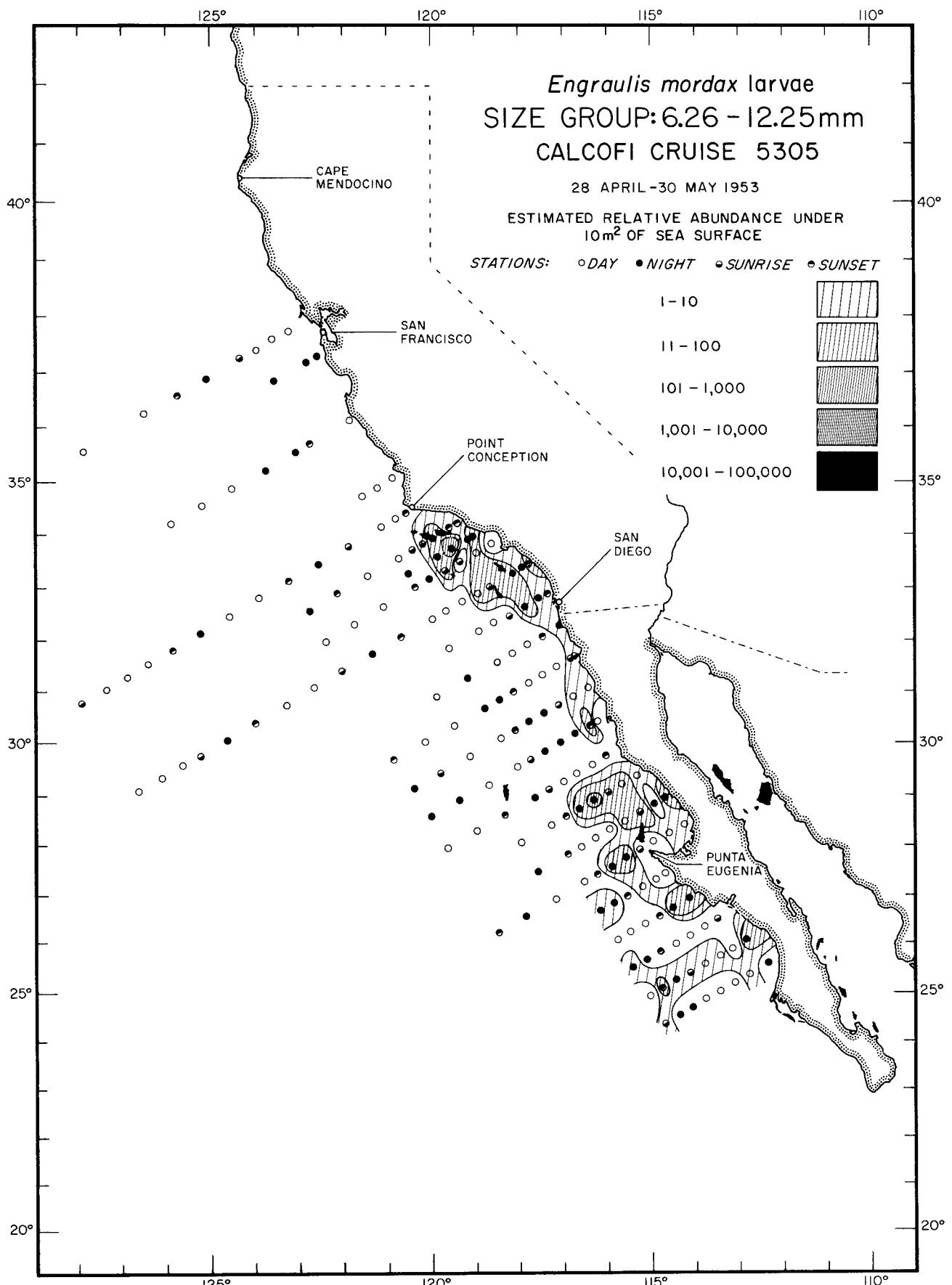
Engraulis mordax larvae
All Sizes
5303



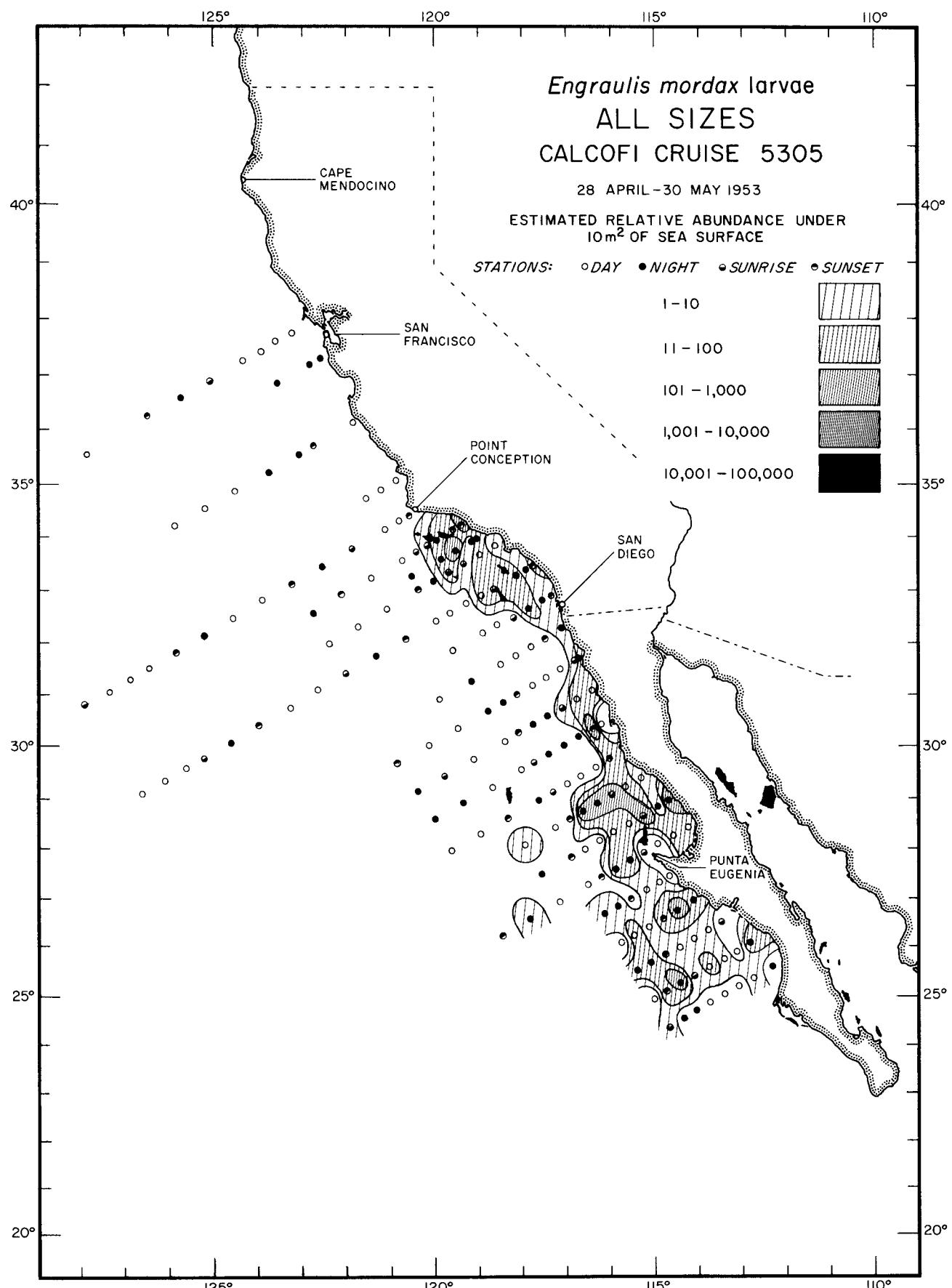
Engraulis mordax larvae
Size Group: 6.26-12.25mm
5304



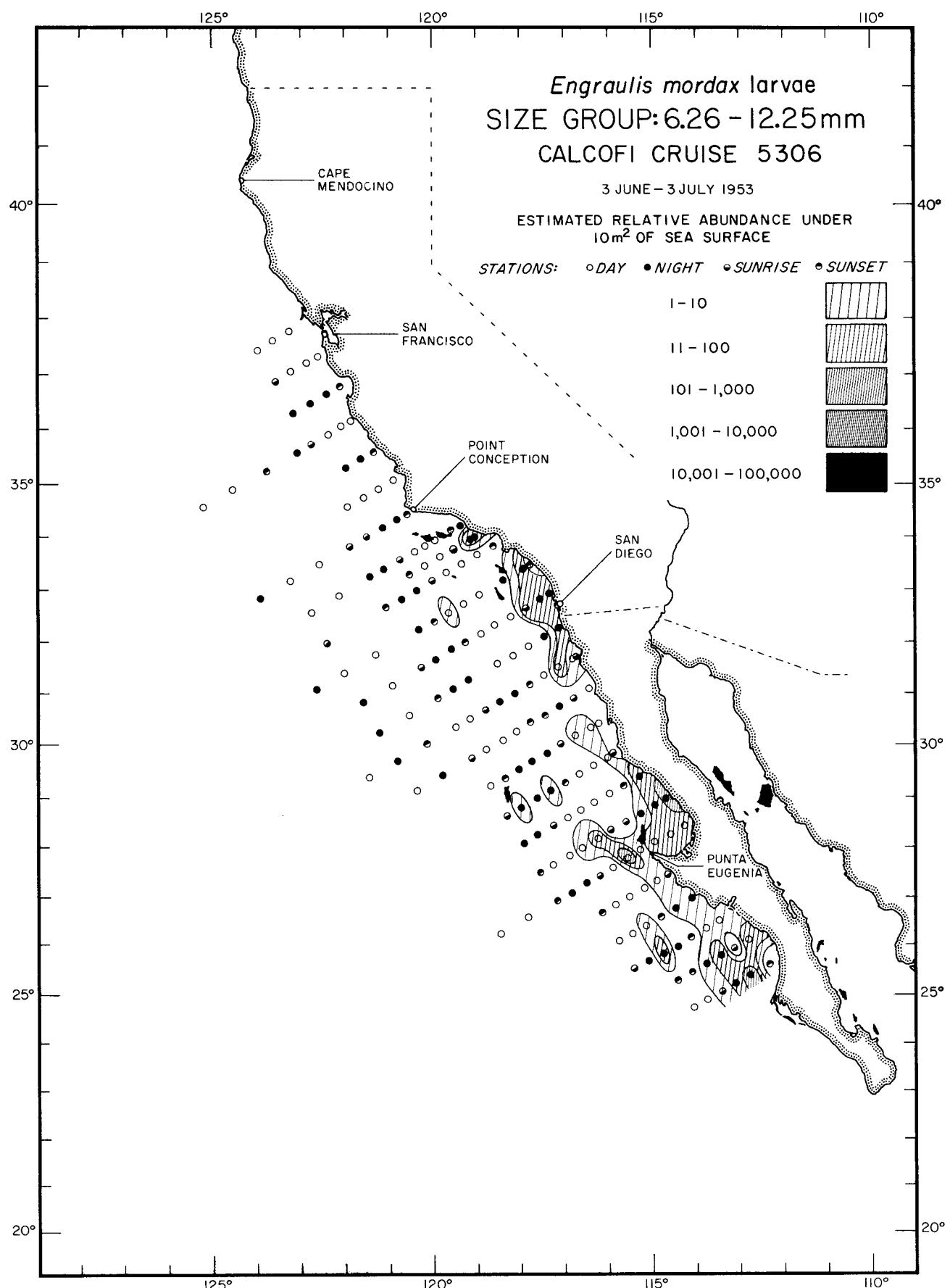
Engraulis mordax larvae
All Sizes
5304



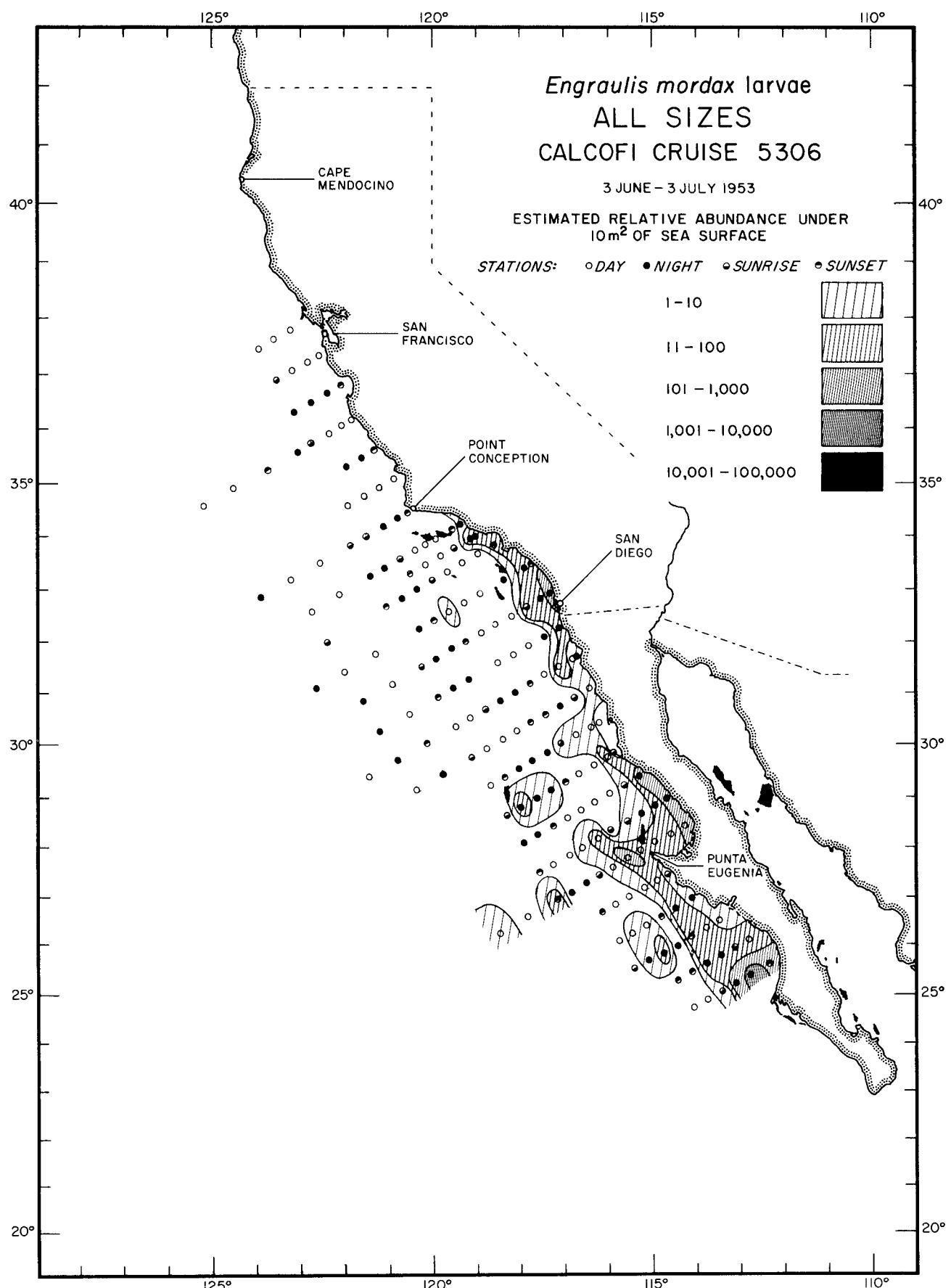
Engraulis mordax larvae
 Size Group: 6.26-12.25mm
 5305



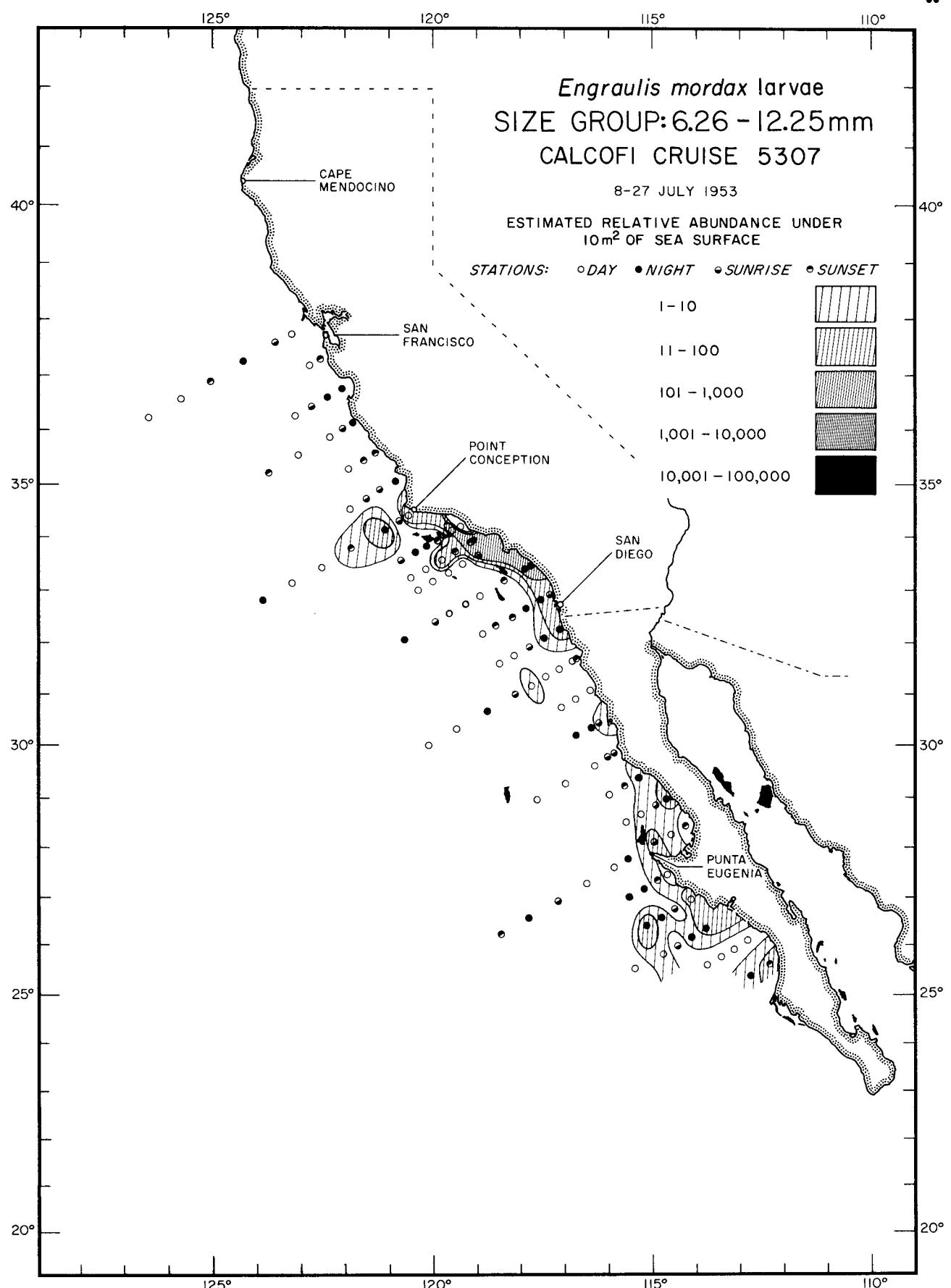
Engraulis mordax larvae
All Sizes
5305



Engraulis mordax larvae
Size Group: 6.26 - 12.25mm
5306

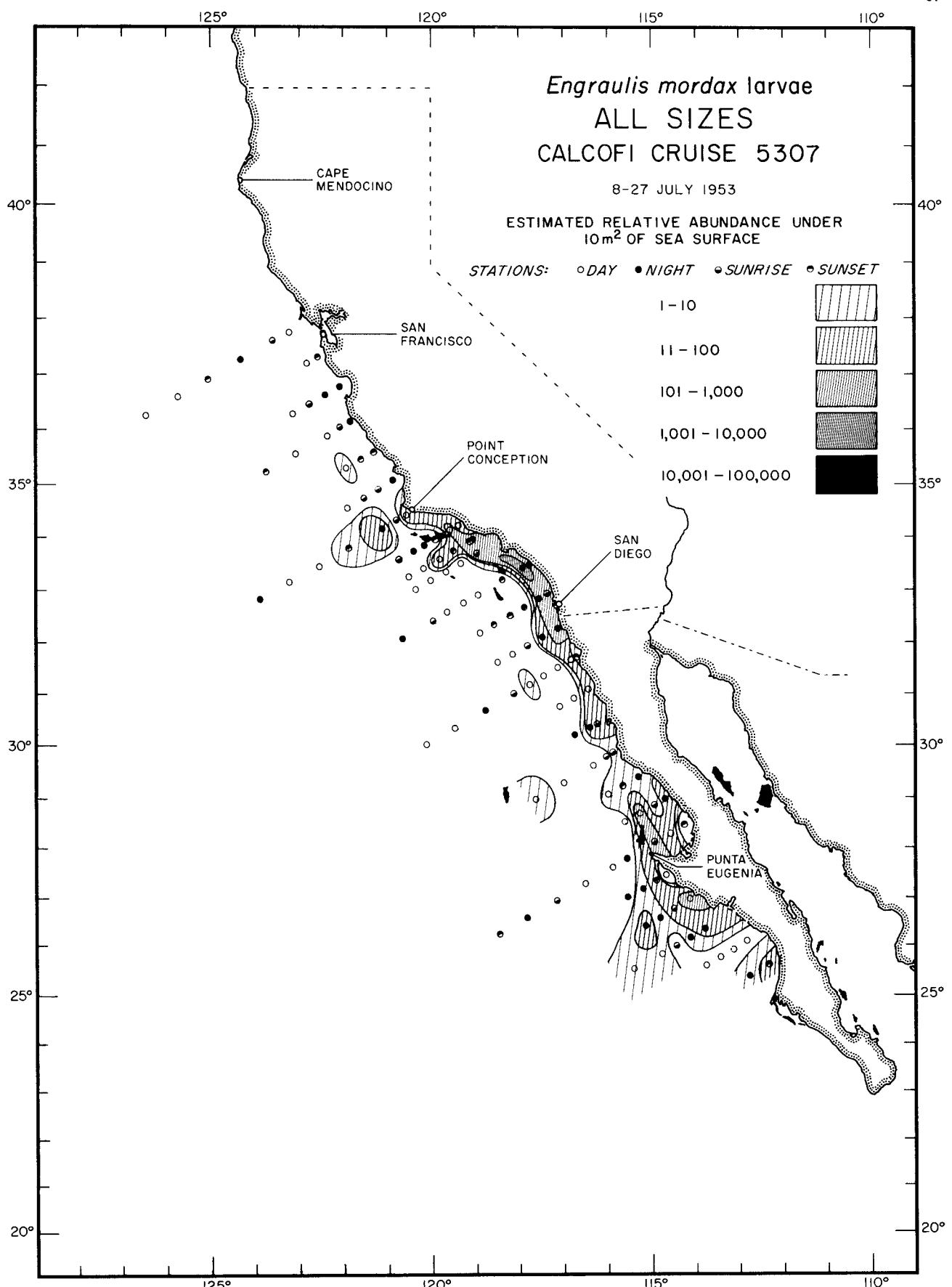


Engraulis mordax larvae
All Sizes
5306

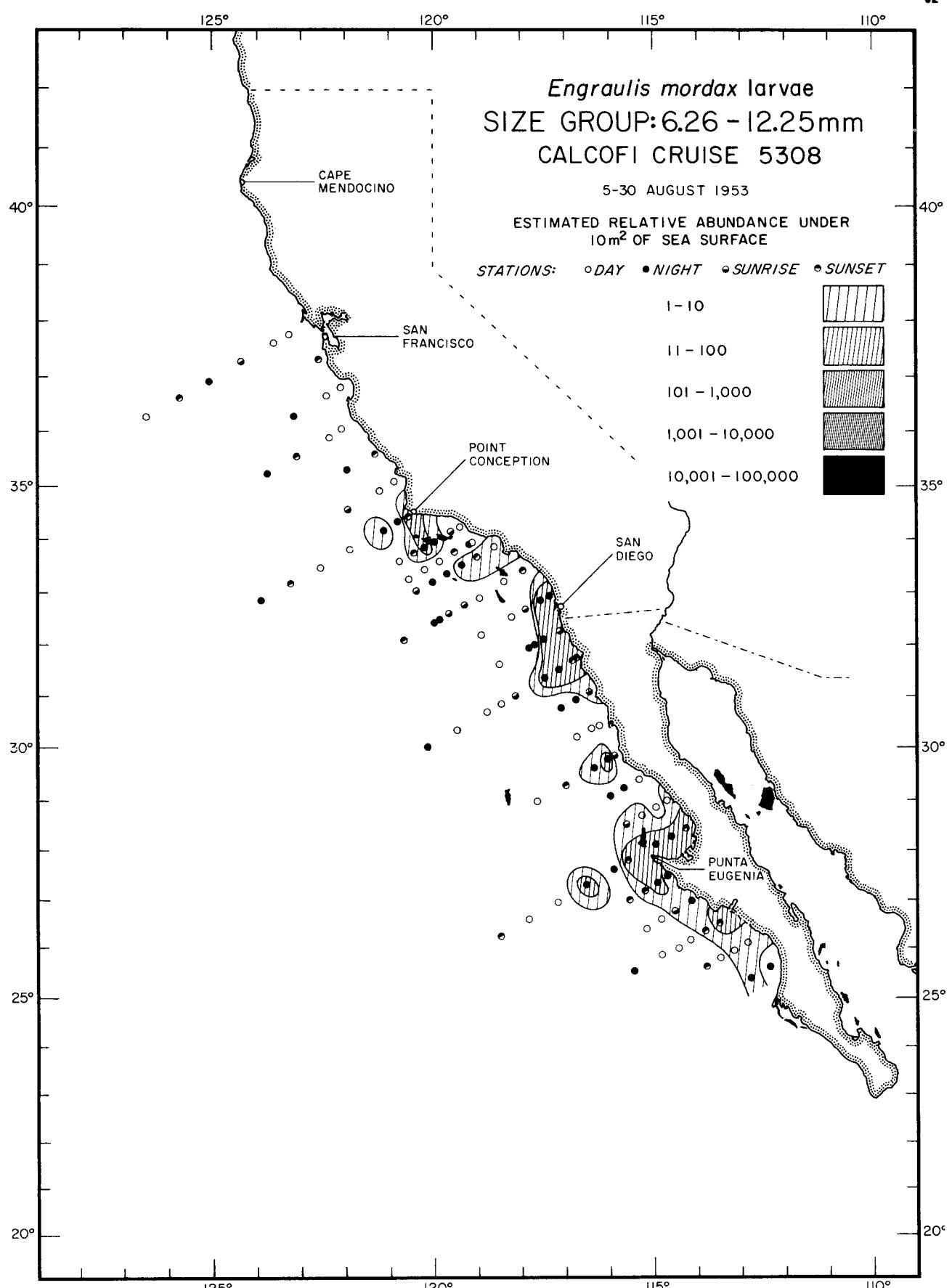
*Engraulis mordax* larvae

Size Group: 6.26-12.25mm

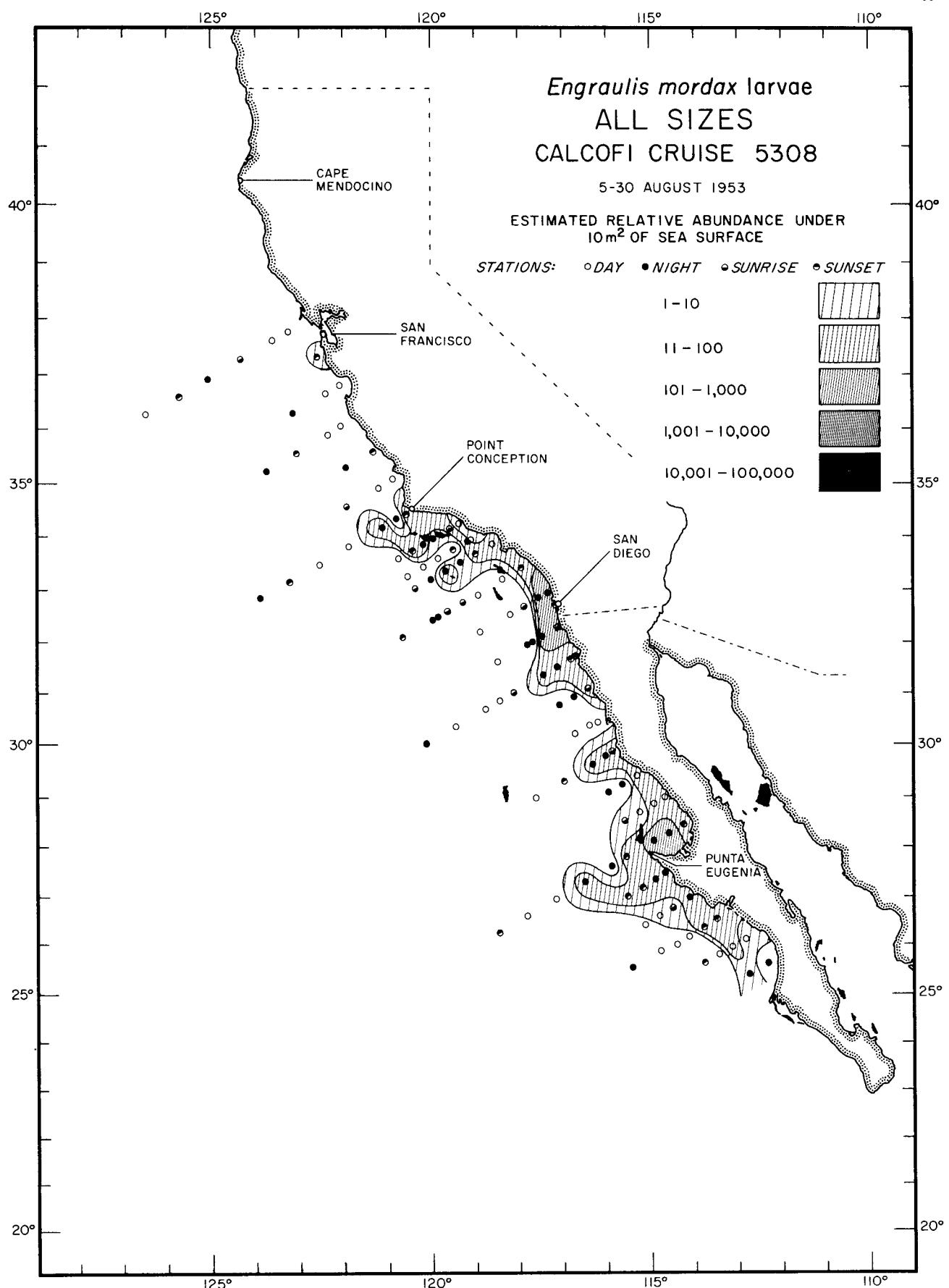
5307



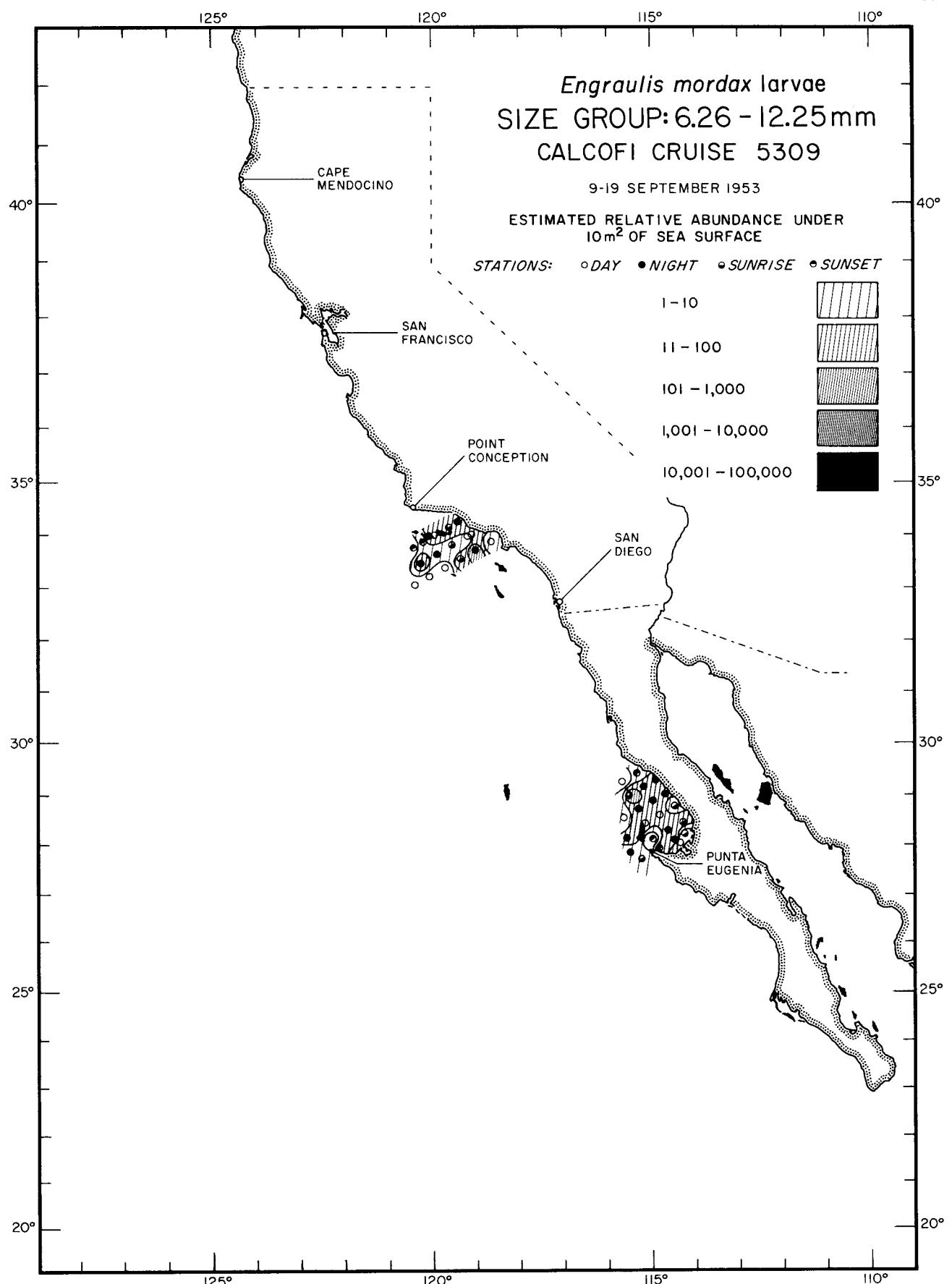
Engraulis mordax larvae
All Sizes
5307



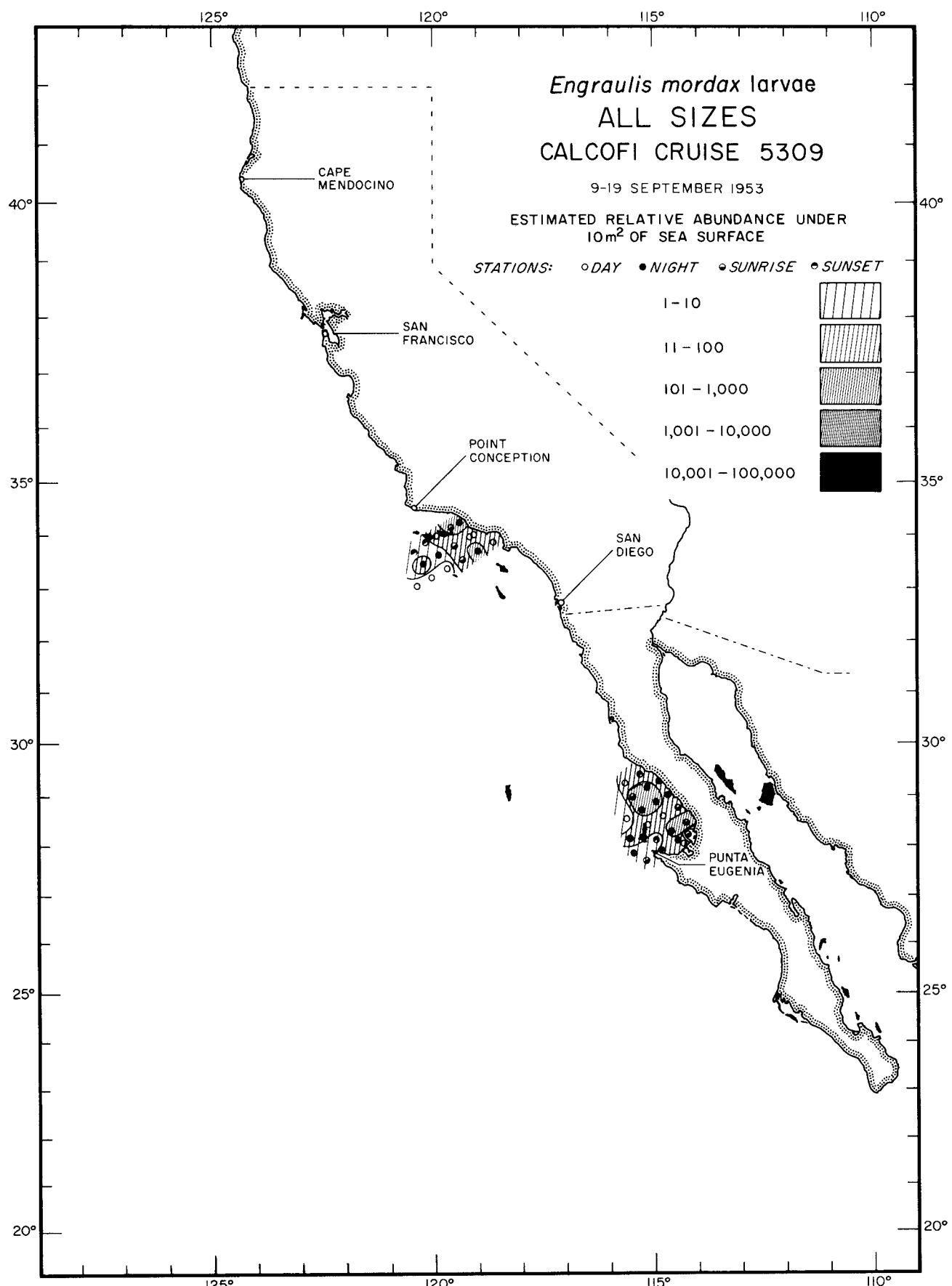
Engraulis mordax larvae
Size Group: 6.26 - 12.25mm
5308



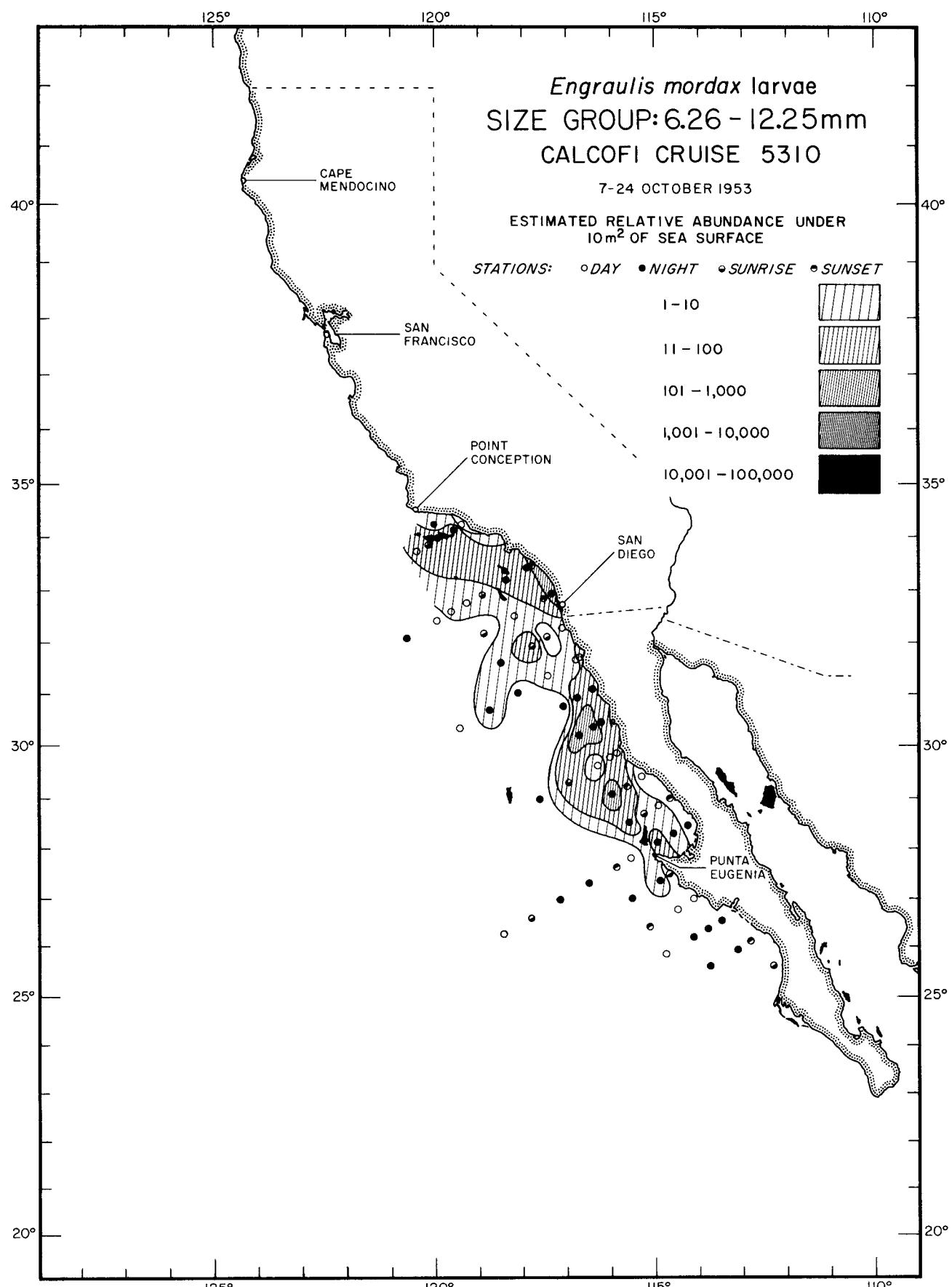
Engraulis mordax larvae
All Sizes
5308



Engraulis mordax larvae
Size Group: 6.26-12.25mm
5309



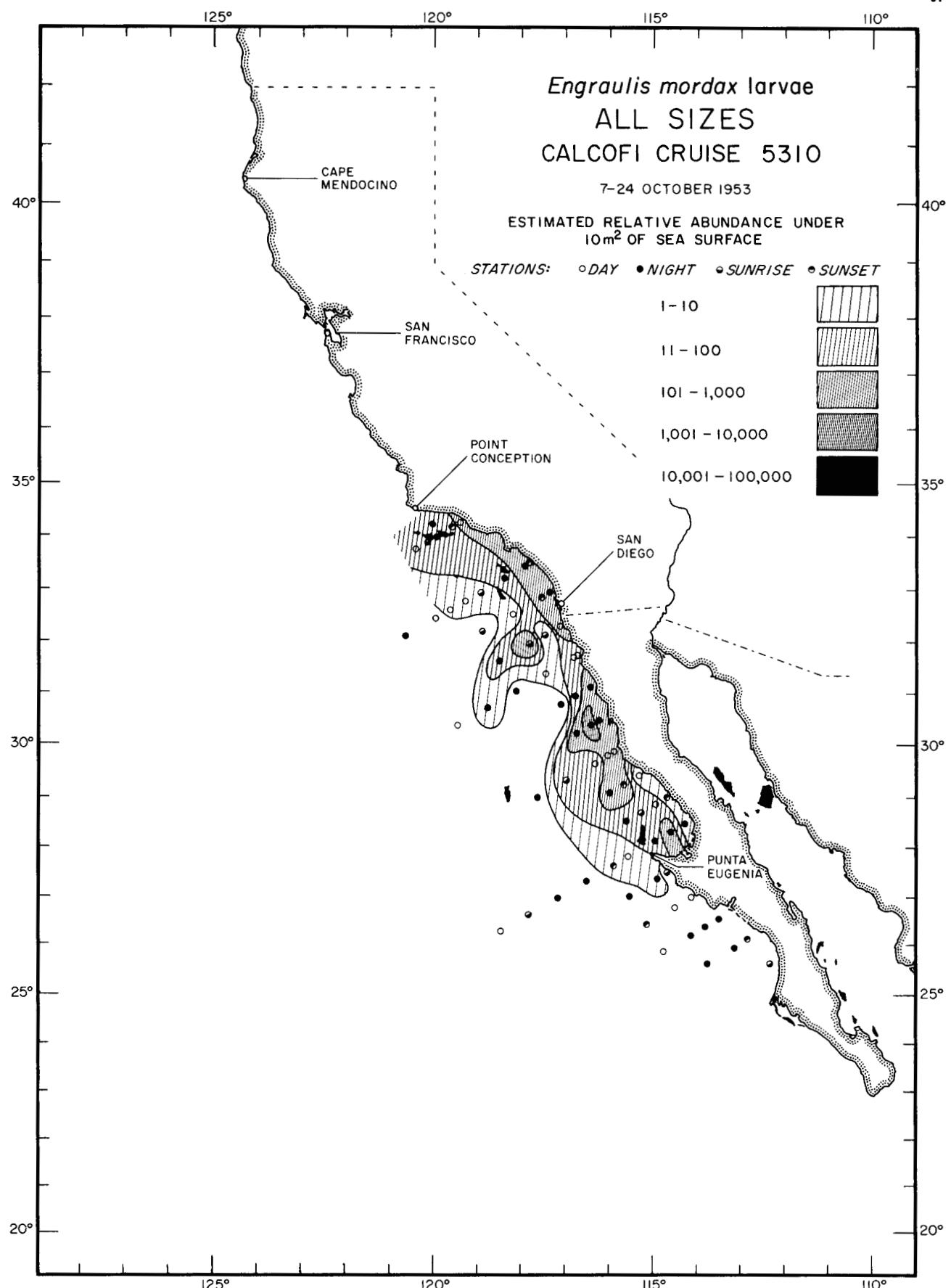
Engraulis mordax larvae
All Sizes
5309



Engraulis mordax larvae

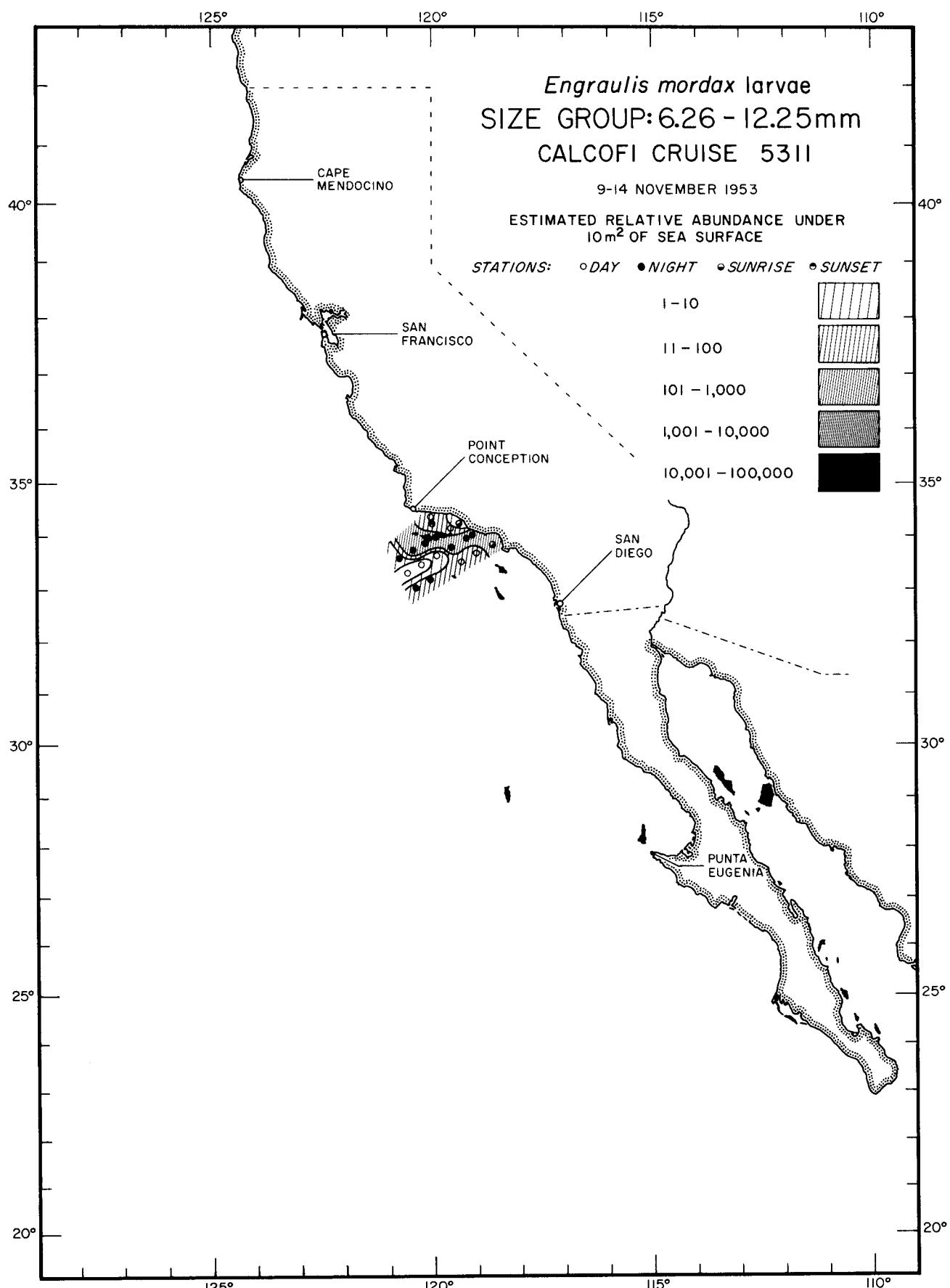
Size Group: 6.26-12.25mm

5310



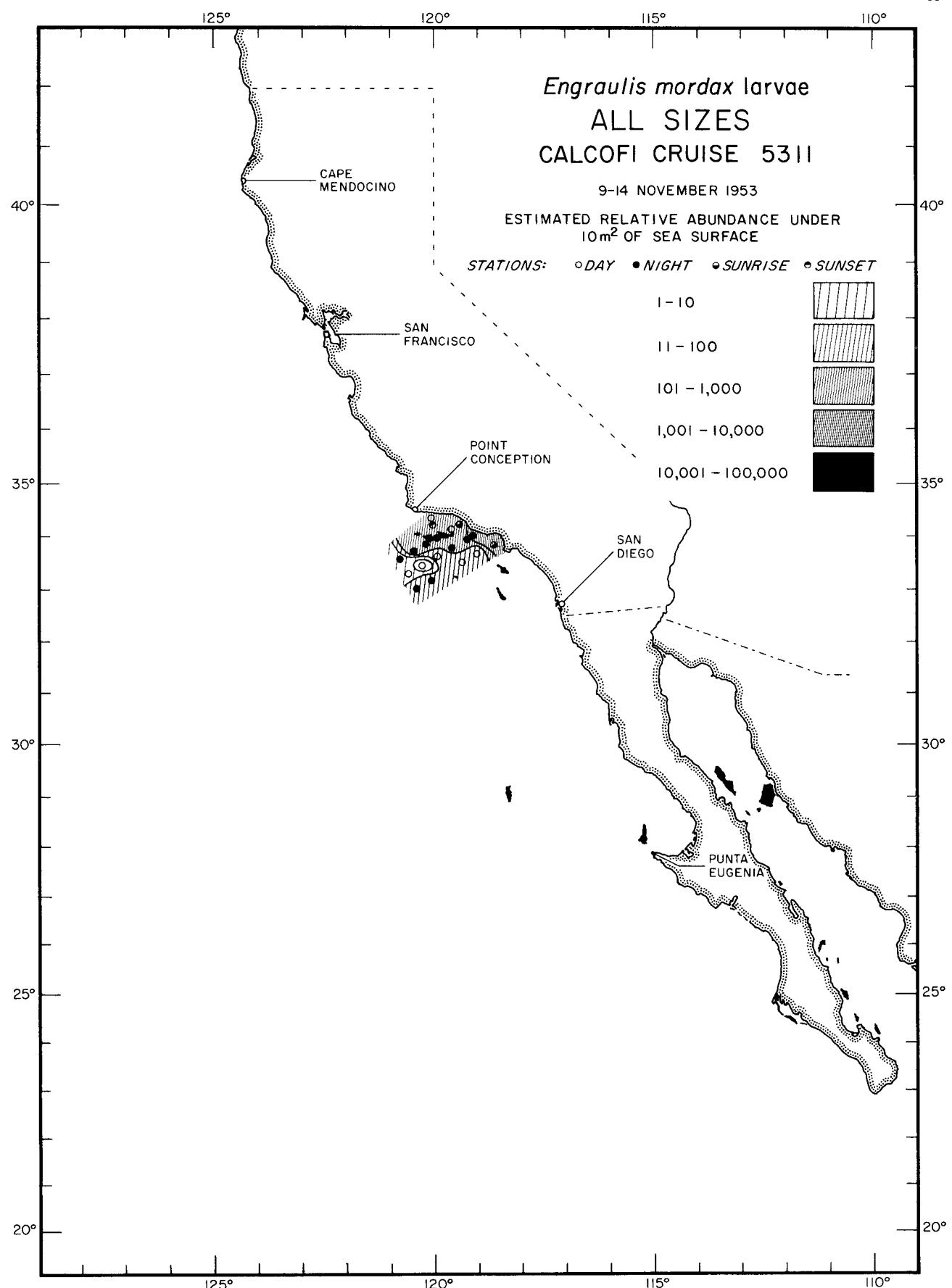
Engraulis mordax larvae

All Sizes
5310

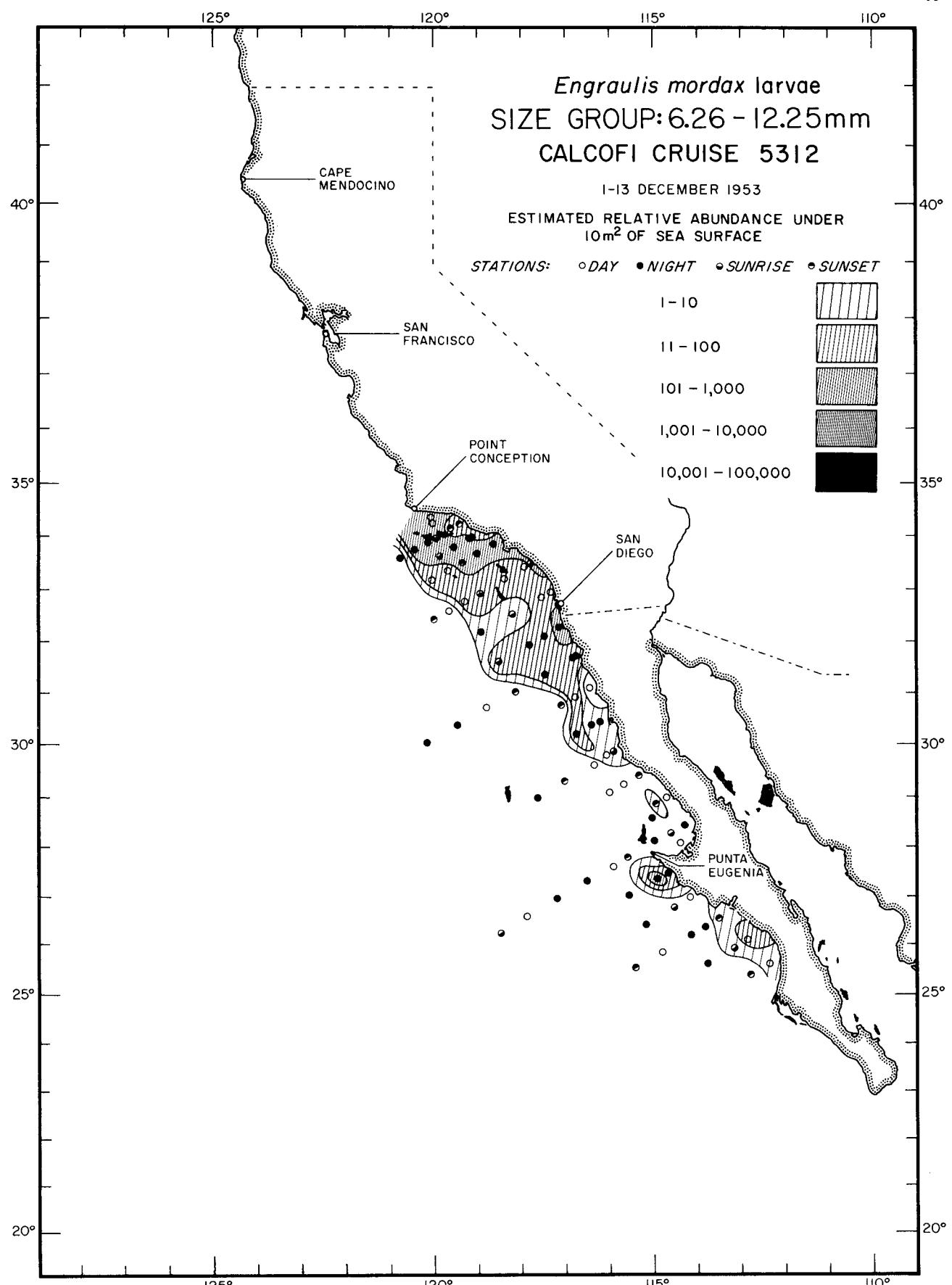
*Engraulis mordax* larvae

Size Group: 6.26-12.25mm

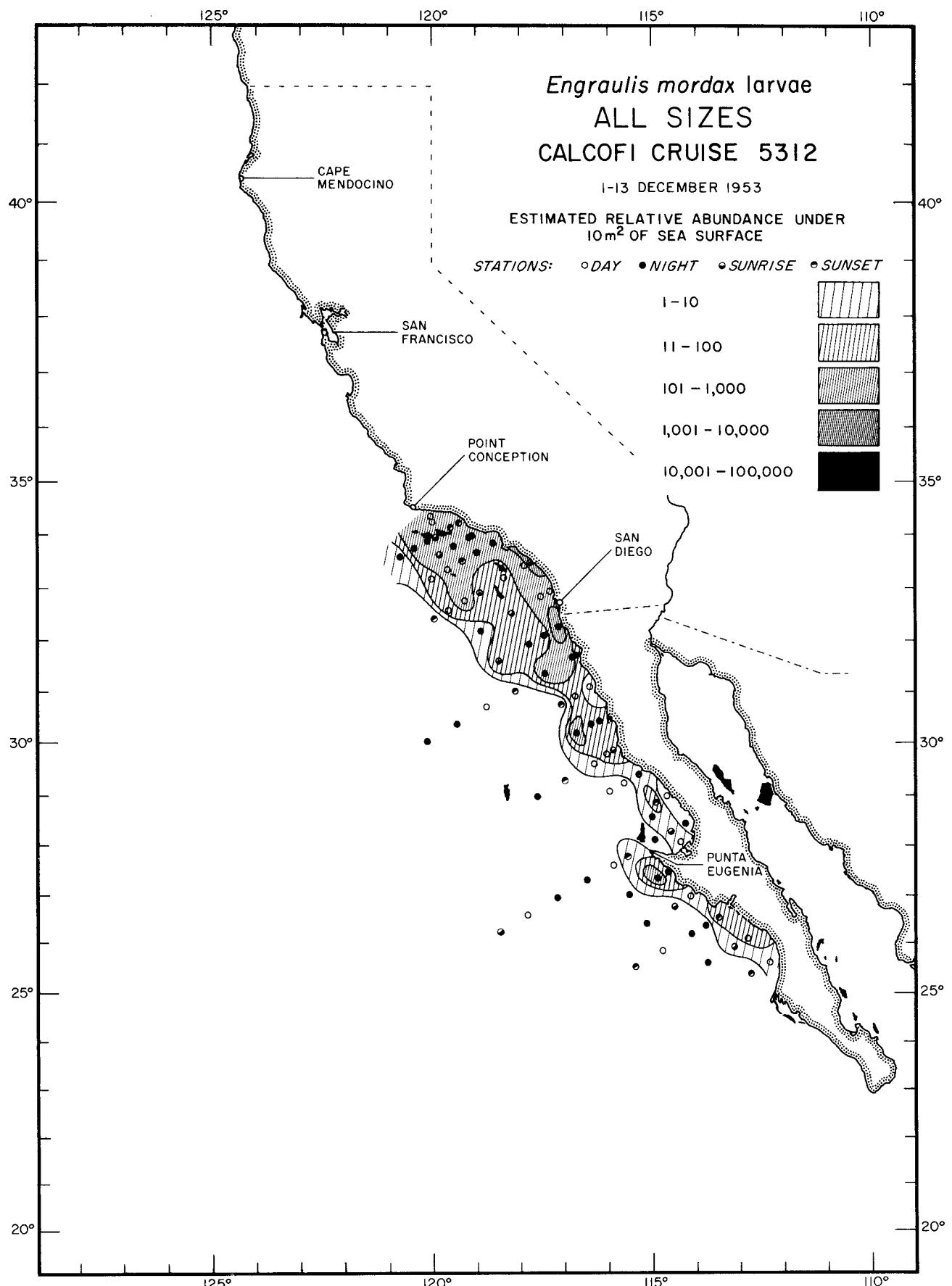
53II

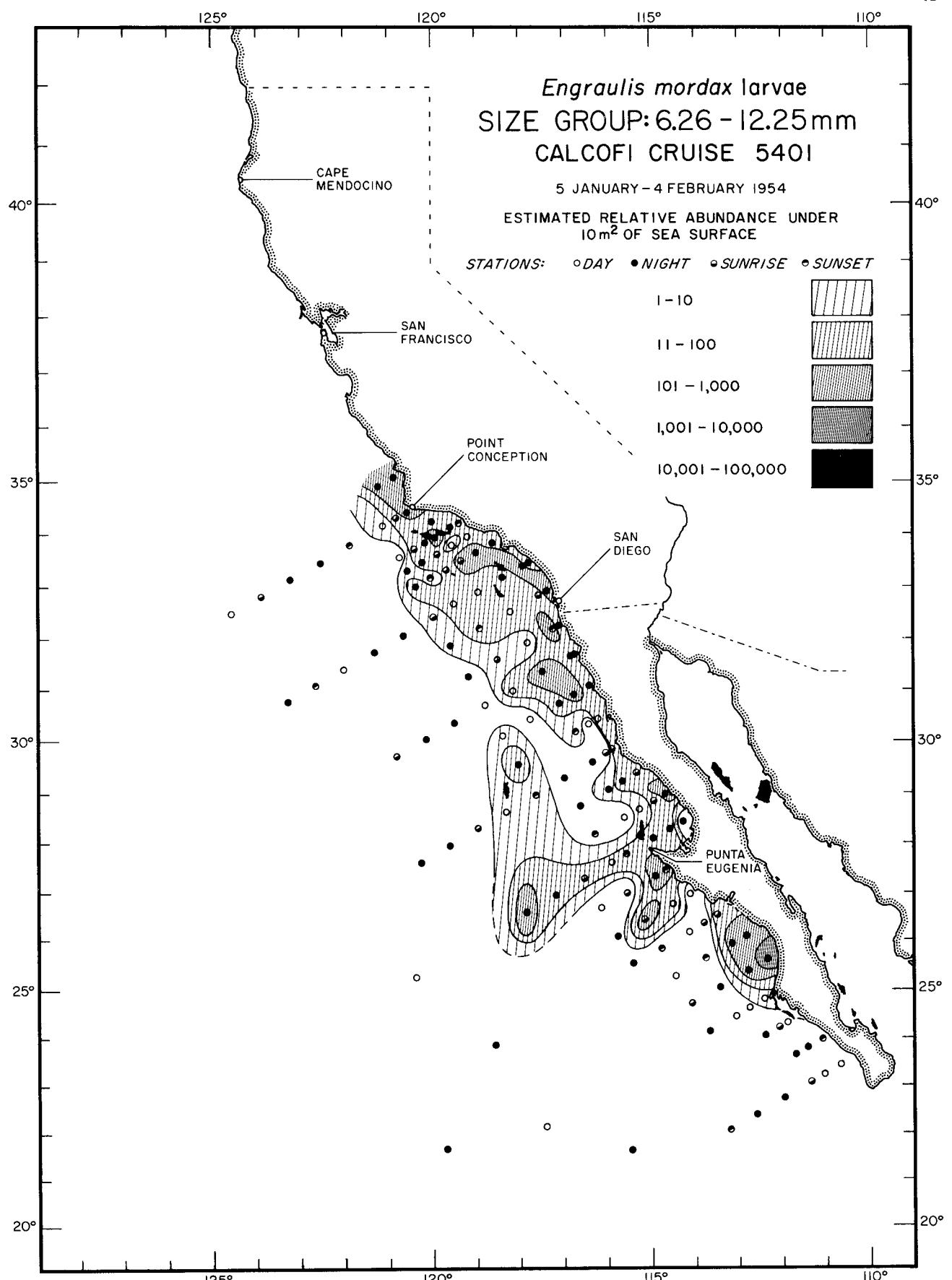


Engraulis mordax larvae
All Sizes
53II

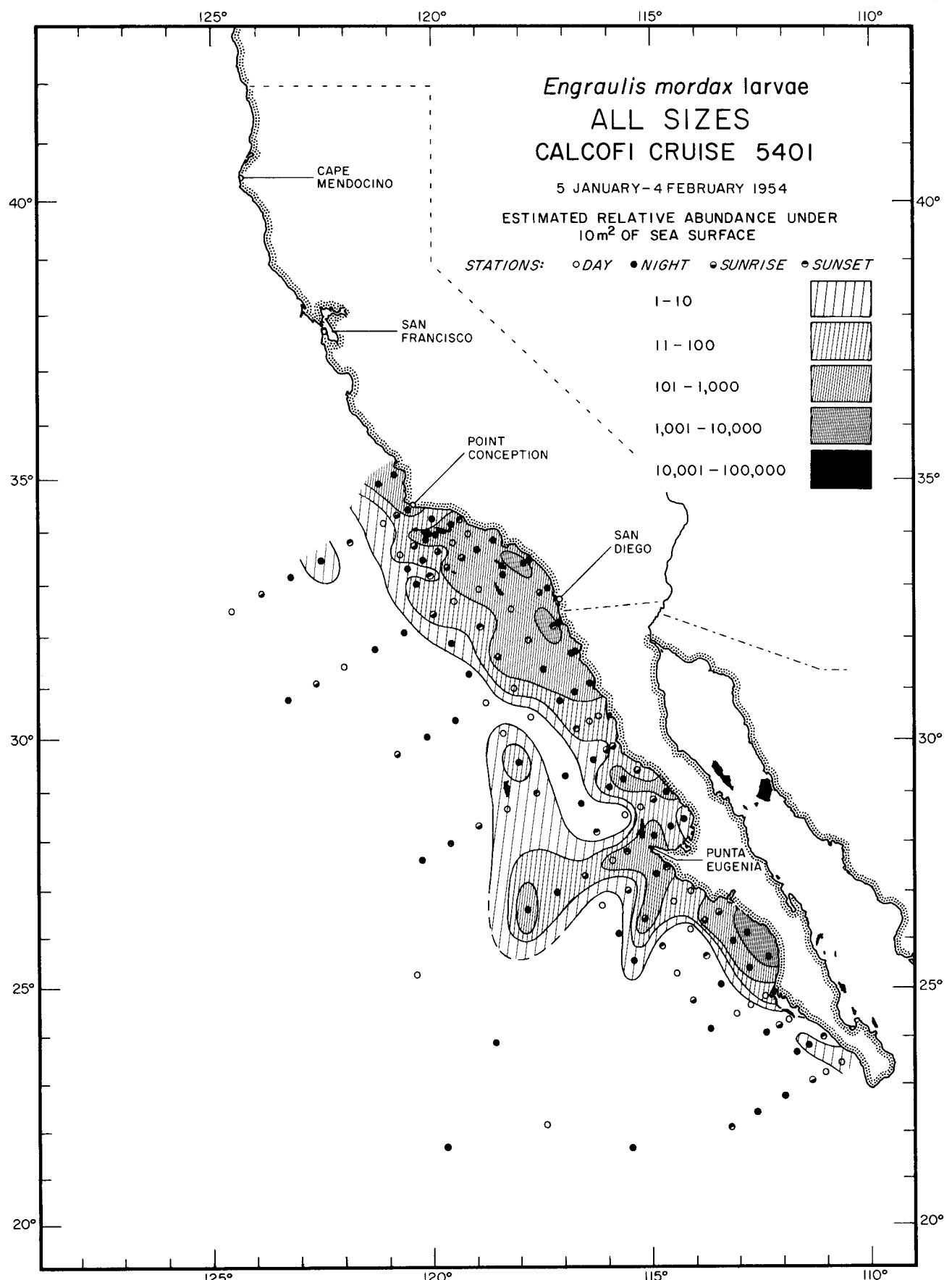


Engraulis mordax larvae
Size Group: 6.26-12.25mm
5312

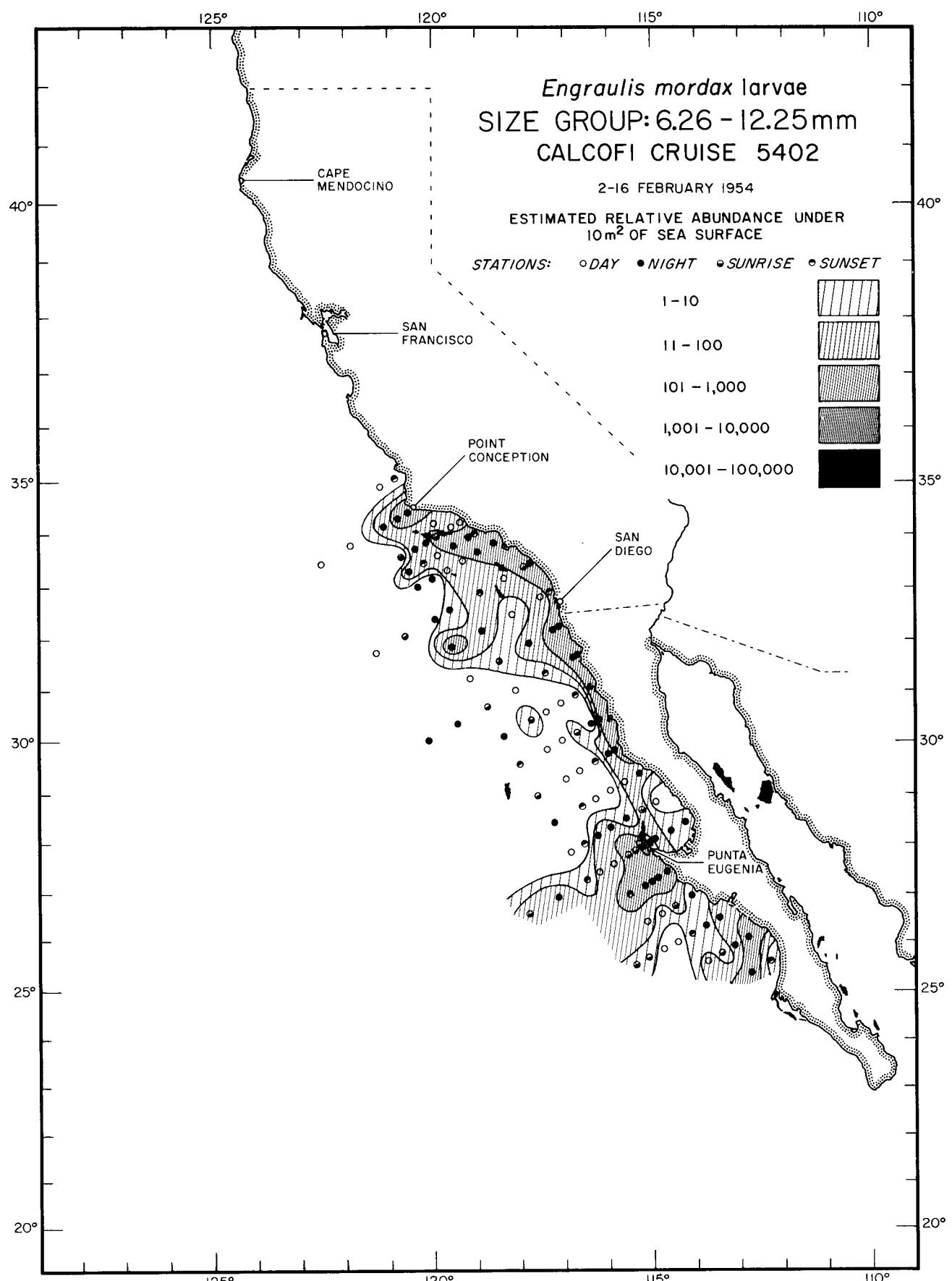
*Engraulis mordax* larvaeAll Sizes
5312



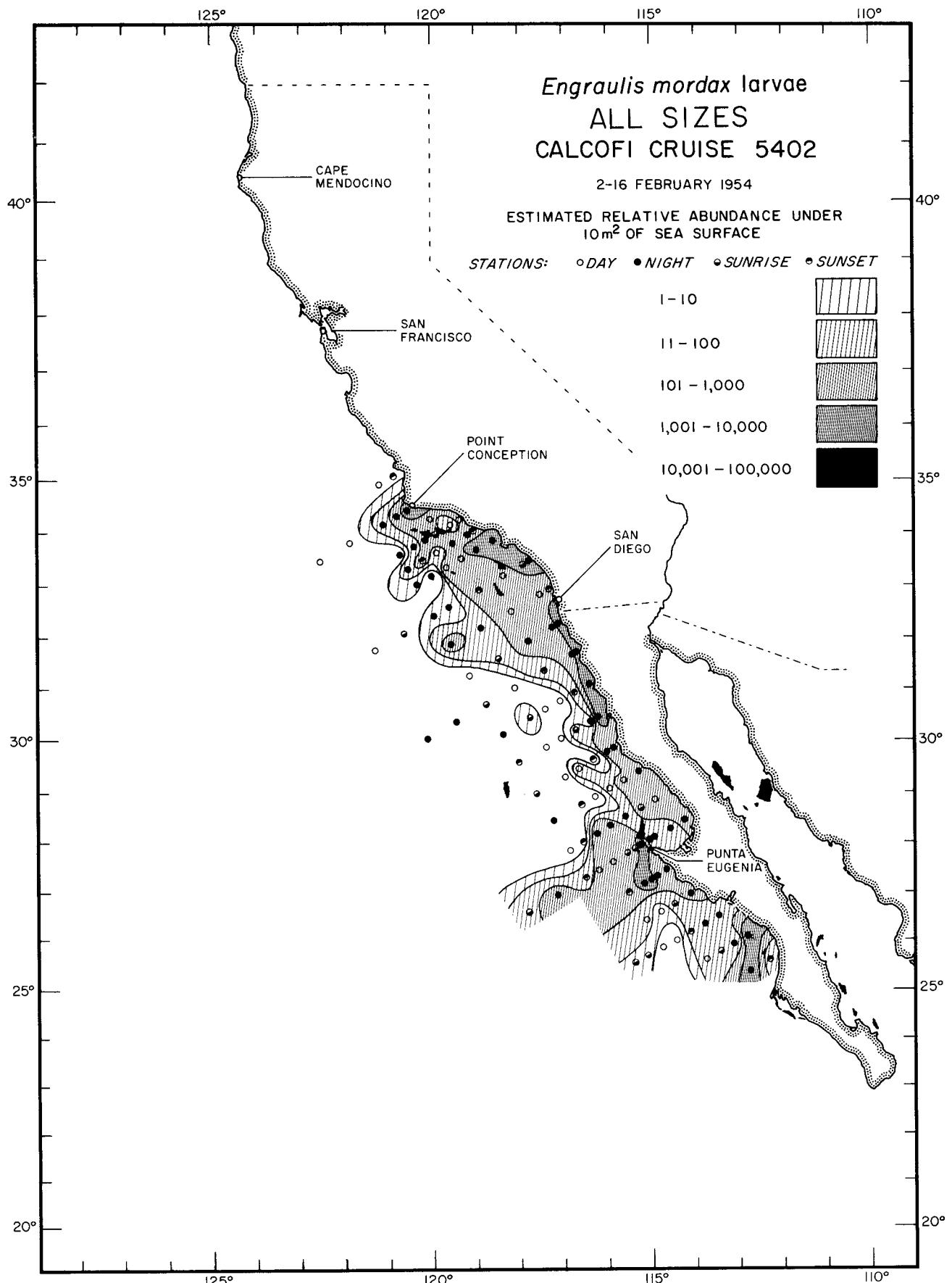
Engraulis mordax larvae
Size Group: 6.26-12.25mm
5401



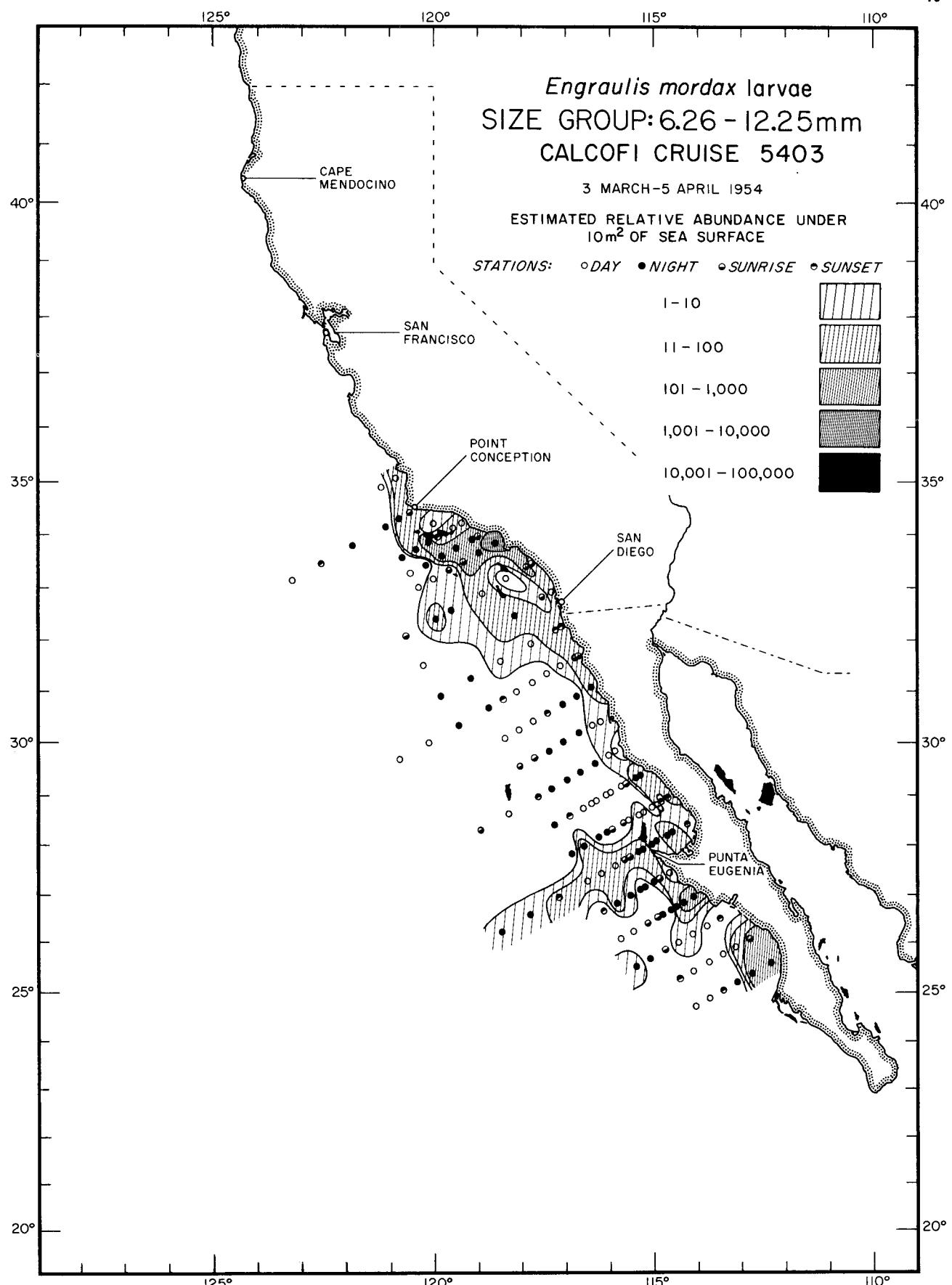
Engraulis mordax larvae
All Sizes
5401



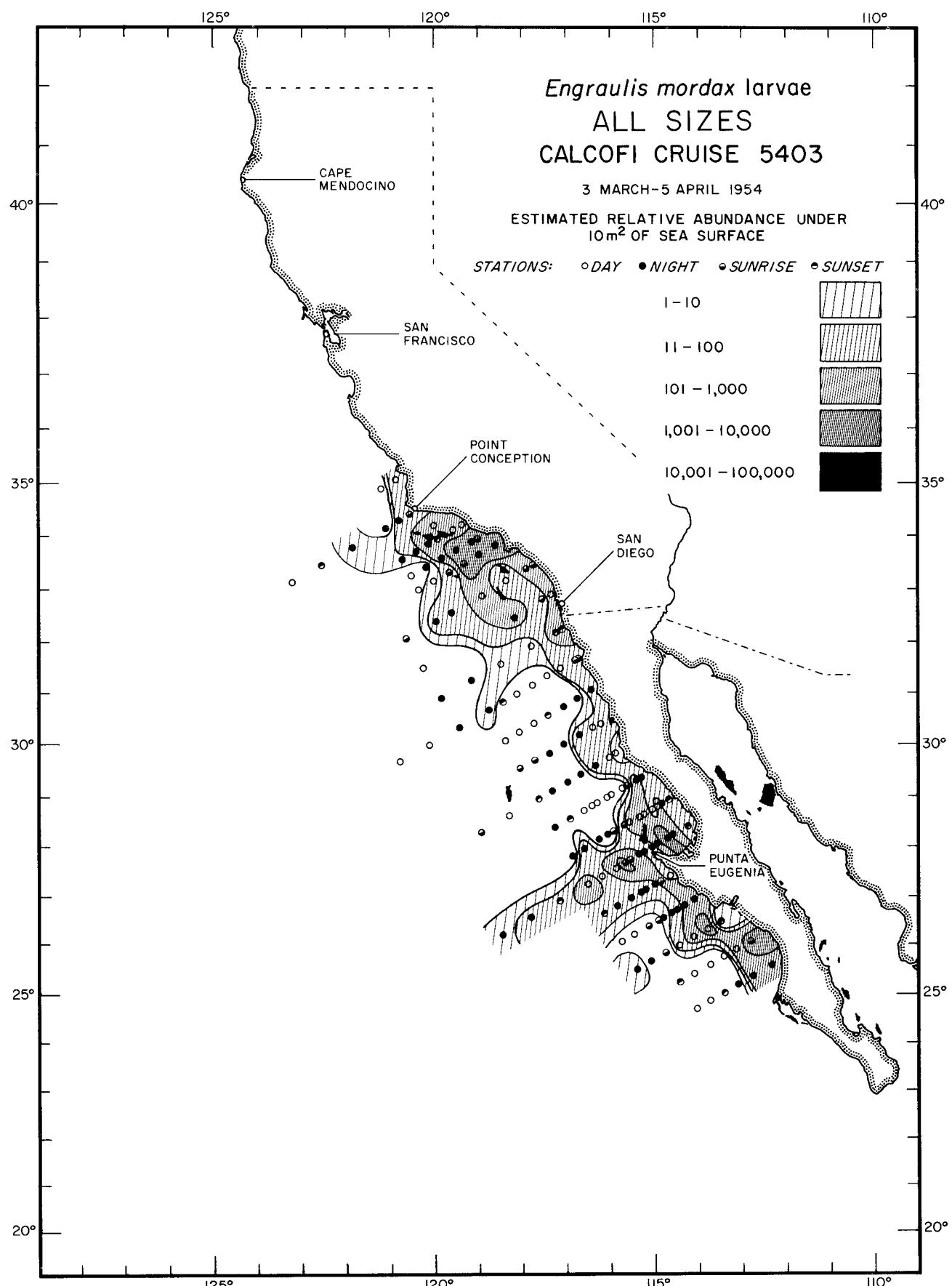
Engraulis mordax larvae
Size Group: 6.26-12.25mm
5402



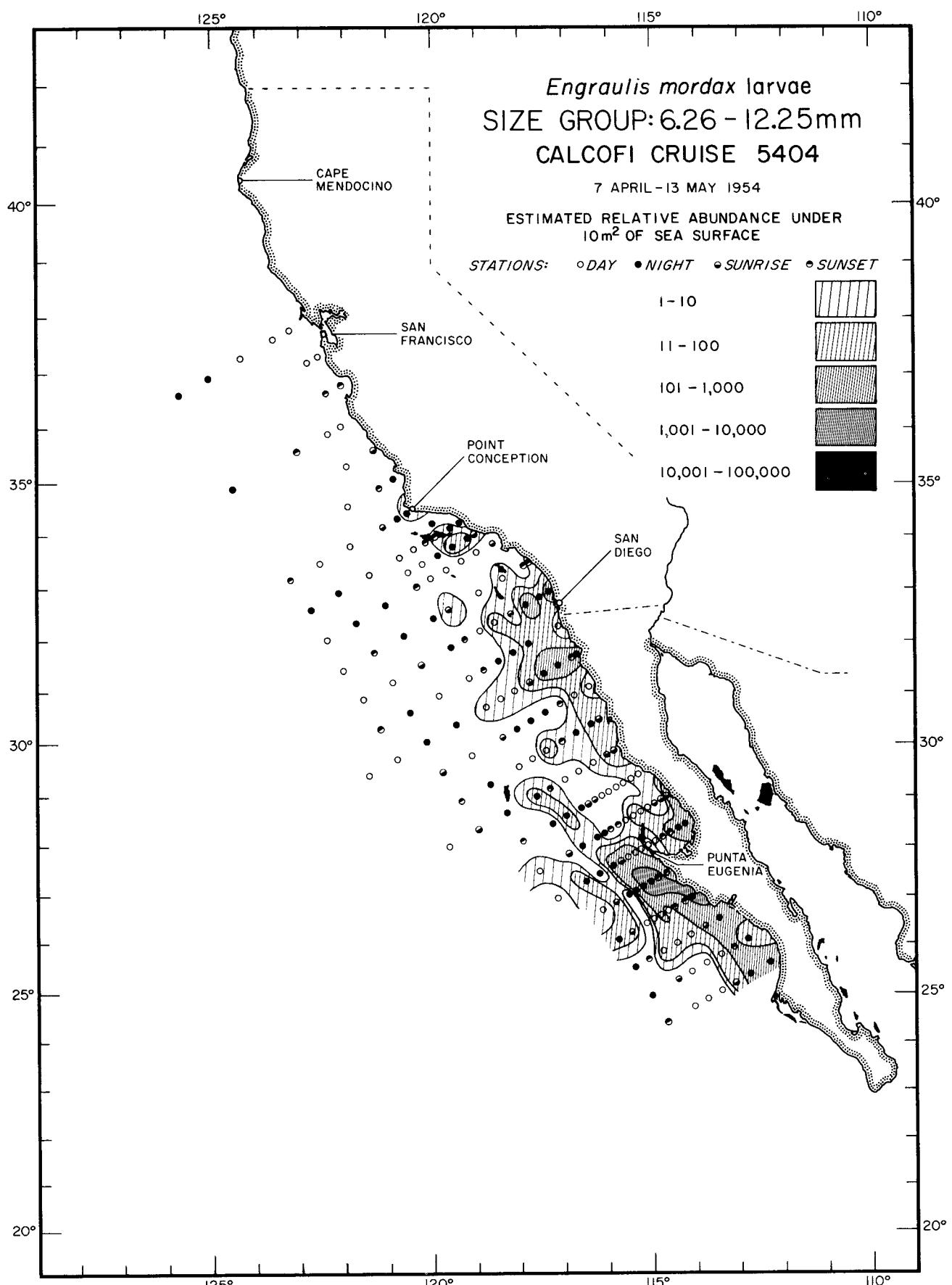
Engraulis mordax larvae
All Sizes
5402



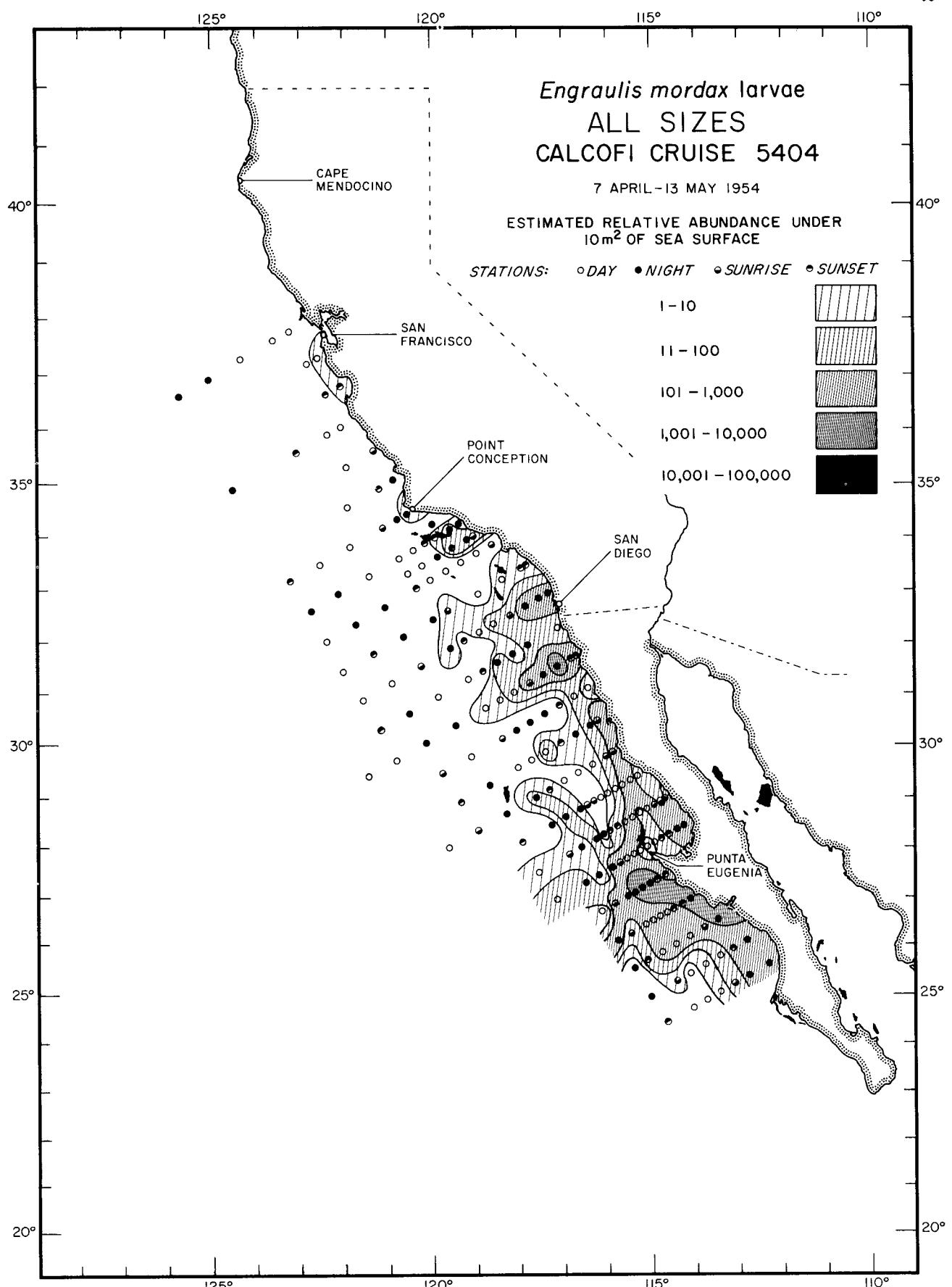
Engraulis mordax larvae
Size Group: 6.26-12.25mm
5403



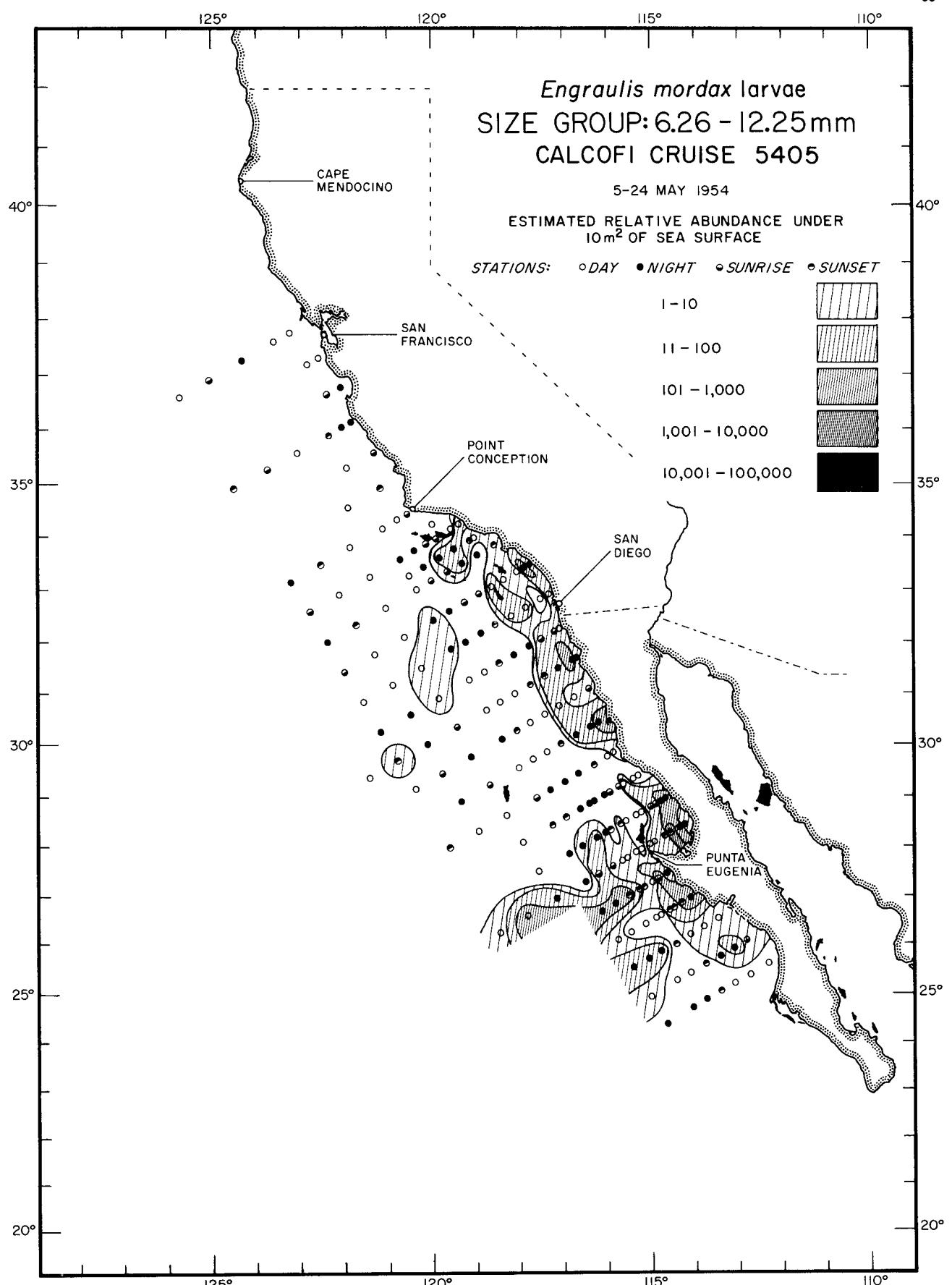
Engraulis mordax larvae
All Sizes
5403



Engraulis mordax larvae
Size Group: 6.26 - 12.25mm
5404

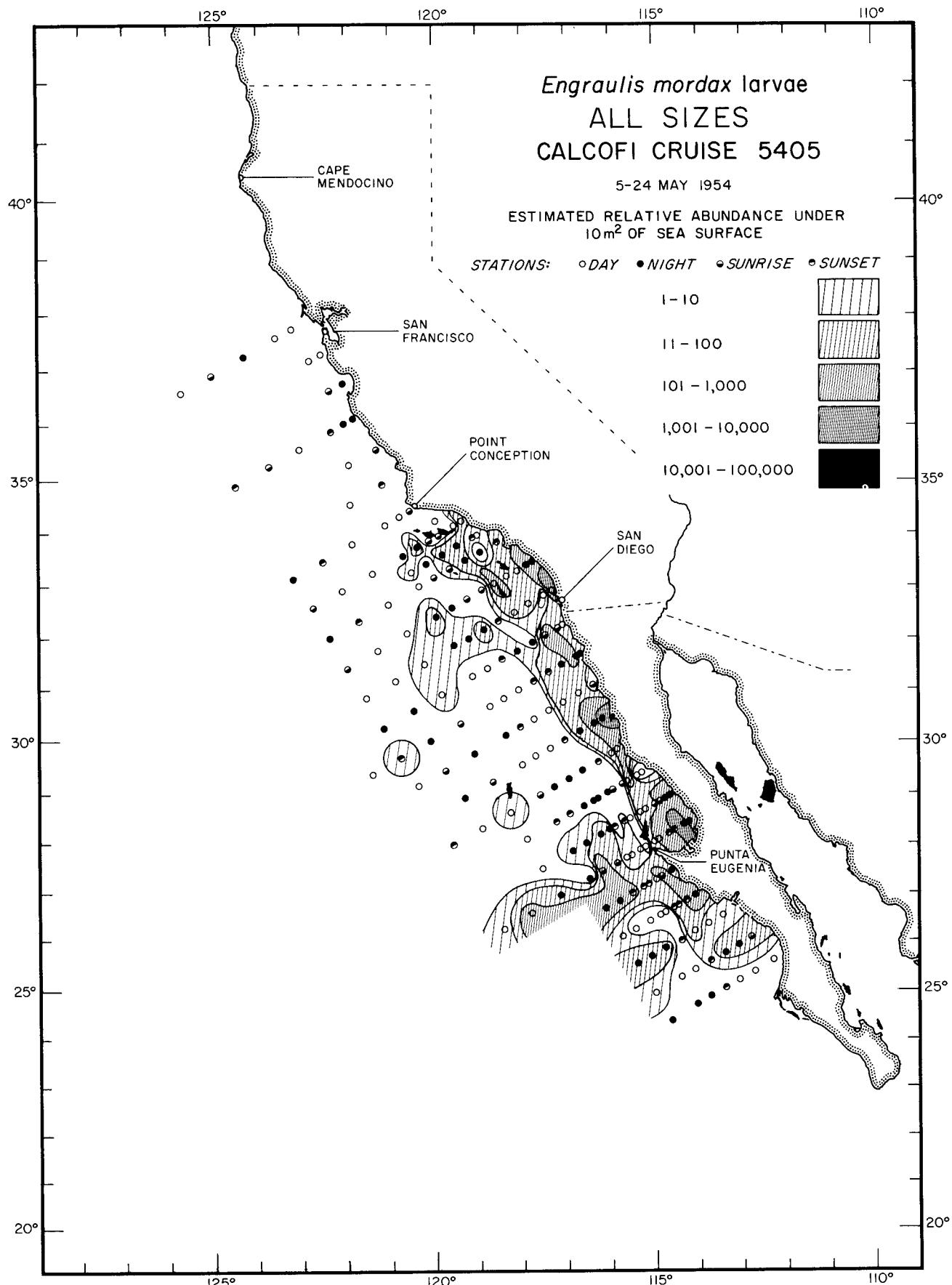


Engraulis mordax larvae
All Sizes
5404

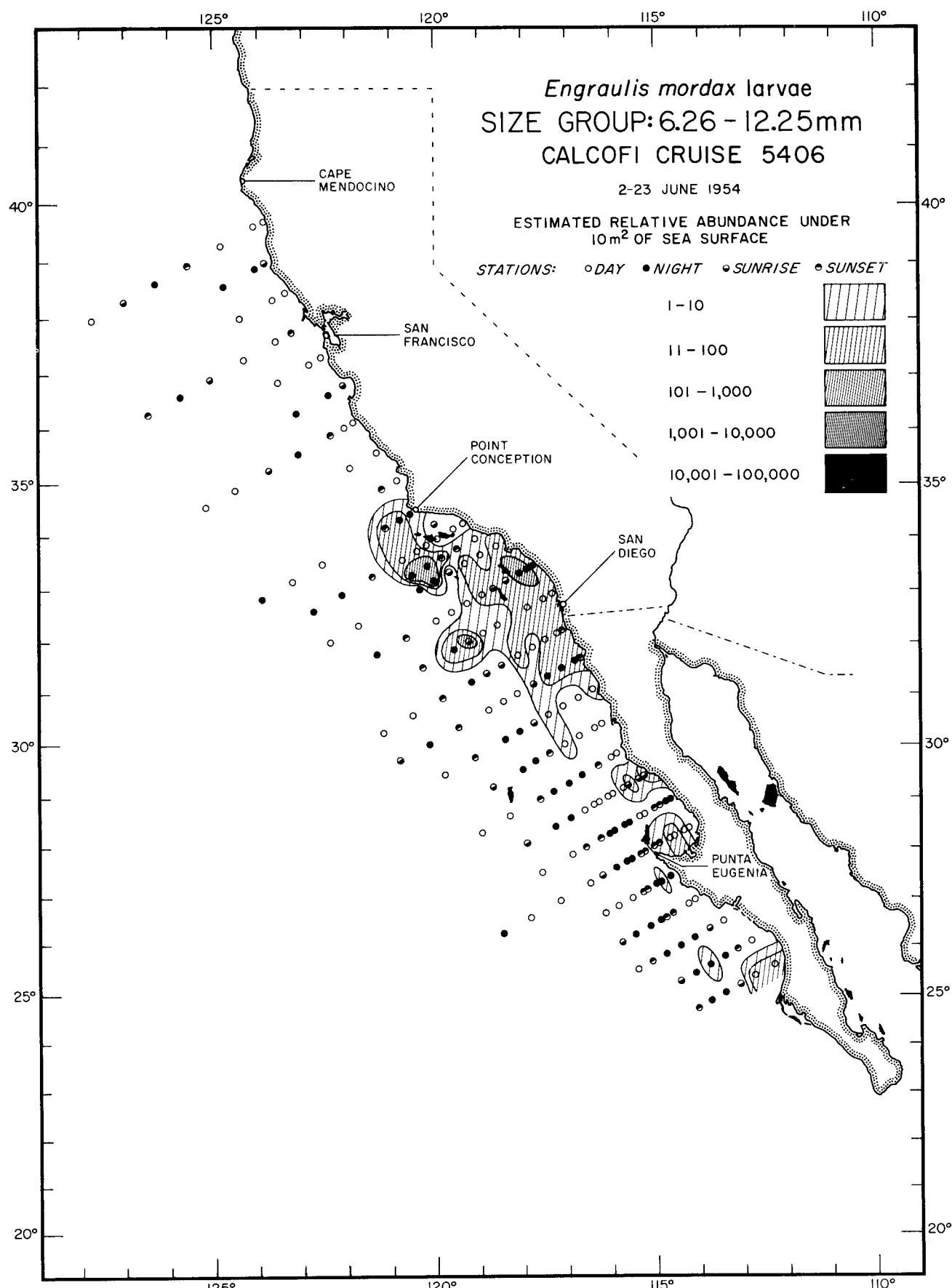
*Engraulis mordax* larvae

Size Group: 6.26-12.25mm

5405



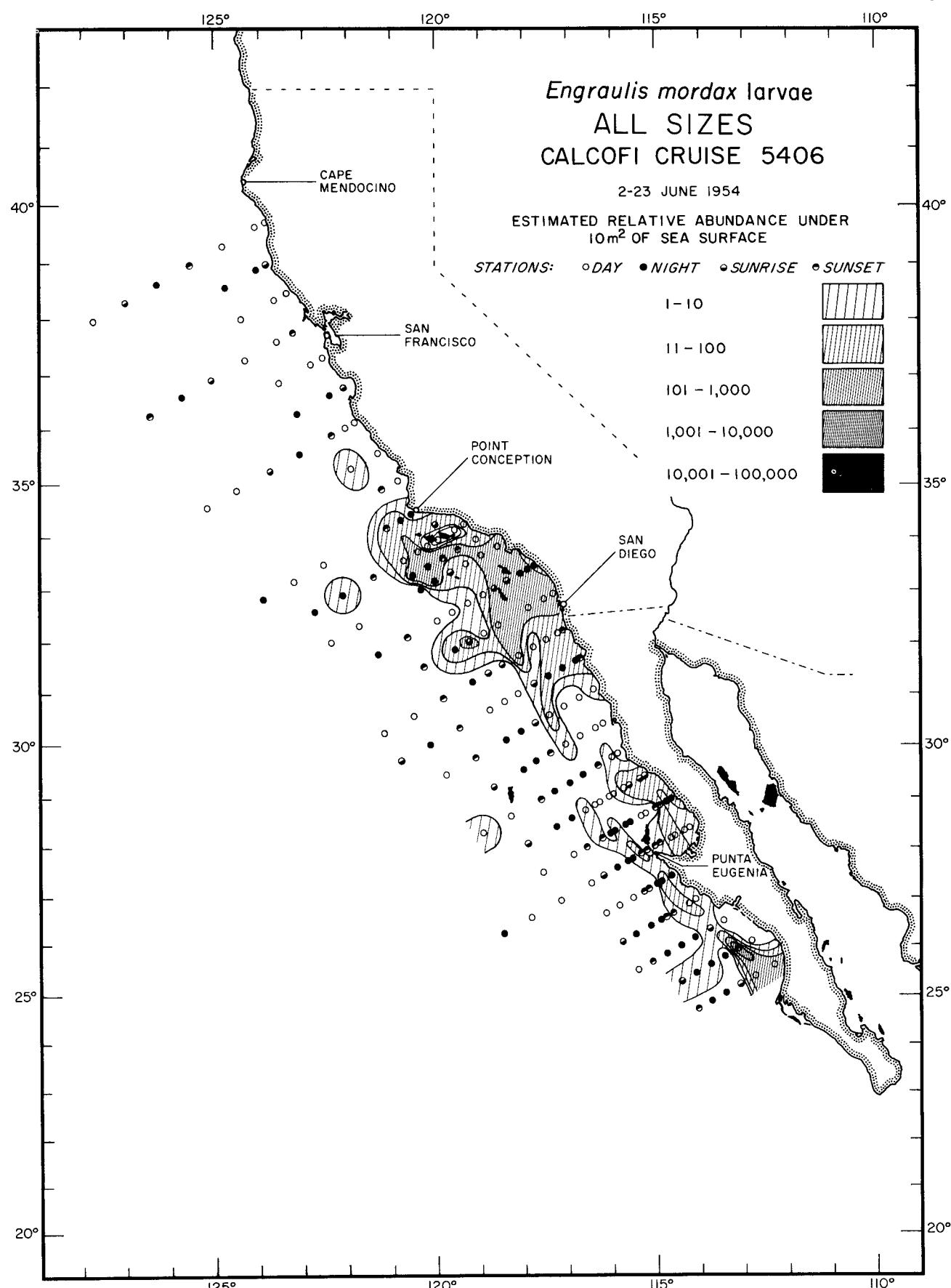
Engraulis mordax larvae
All Sizes
5405



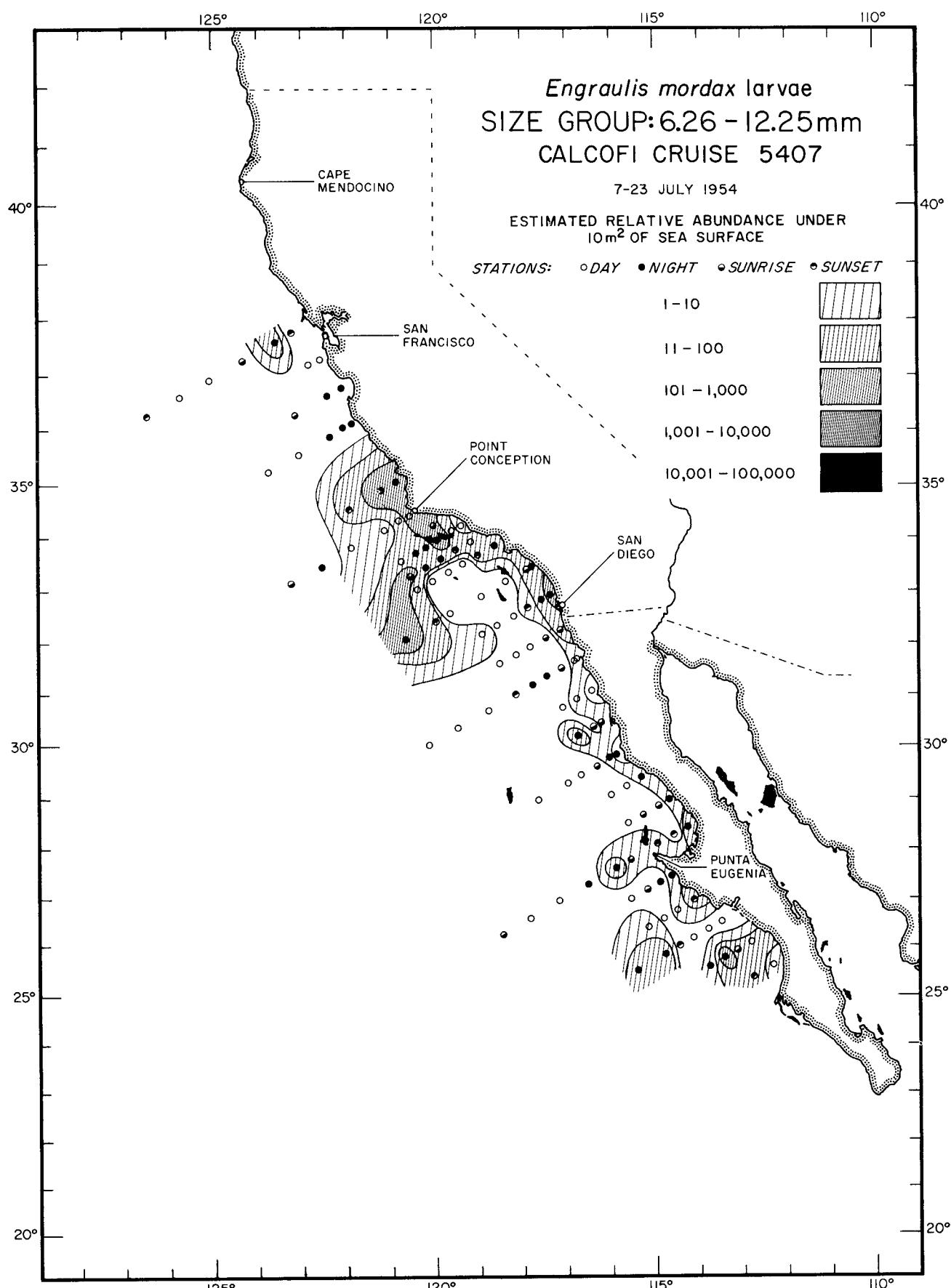
Engraulis mordax larvae

Size Group: 6.26-12.25mm

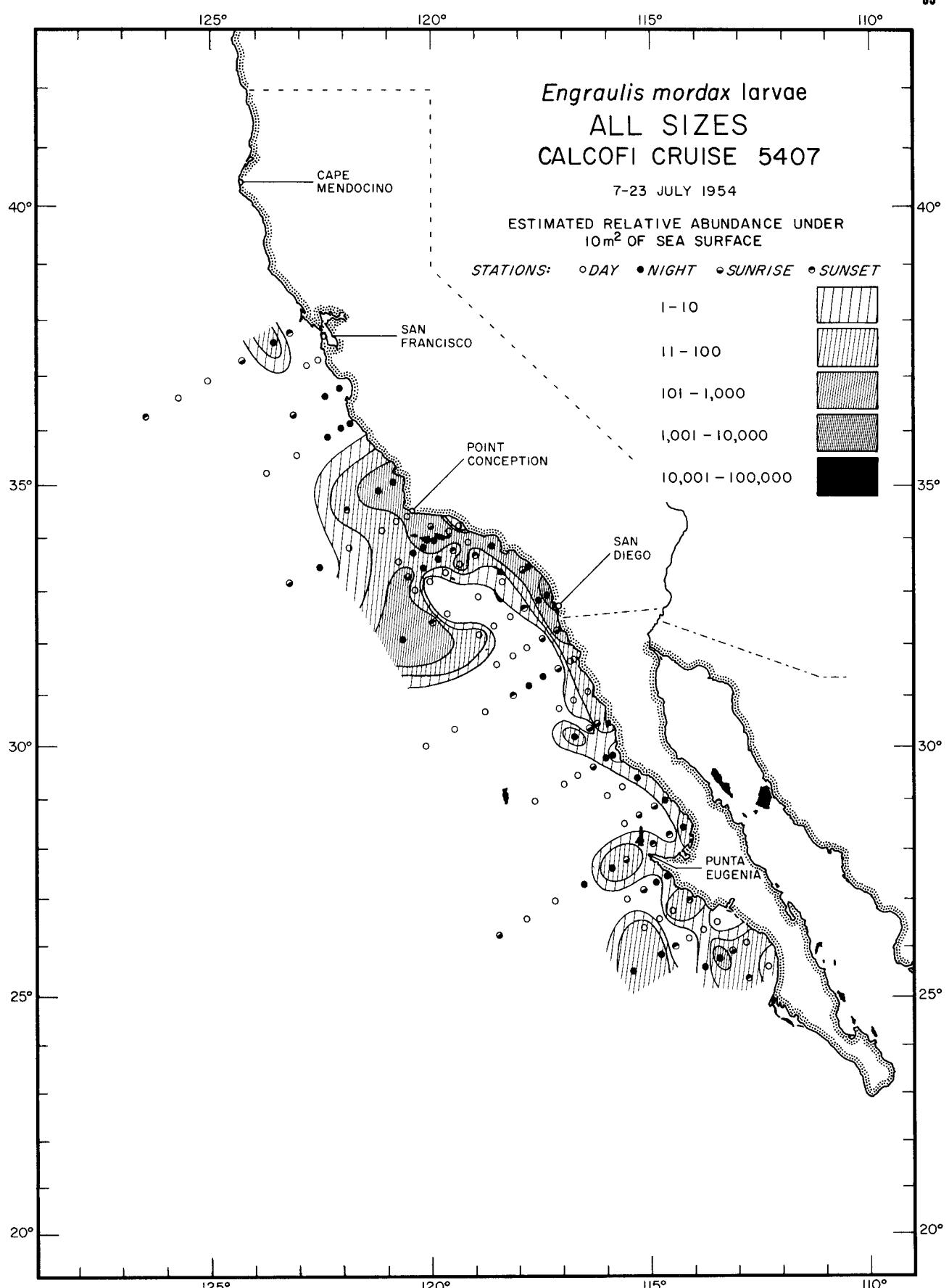
5406



Engraulis mordax larvae
All Sizes
5406

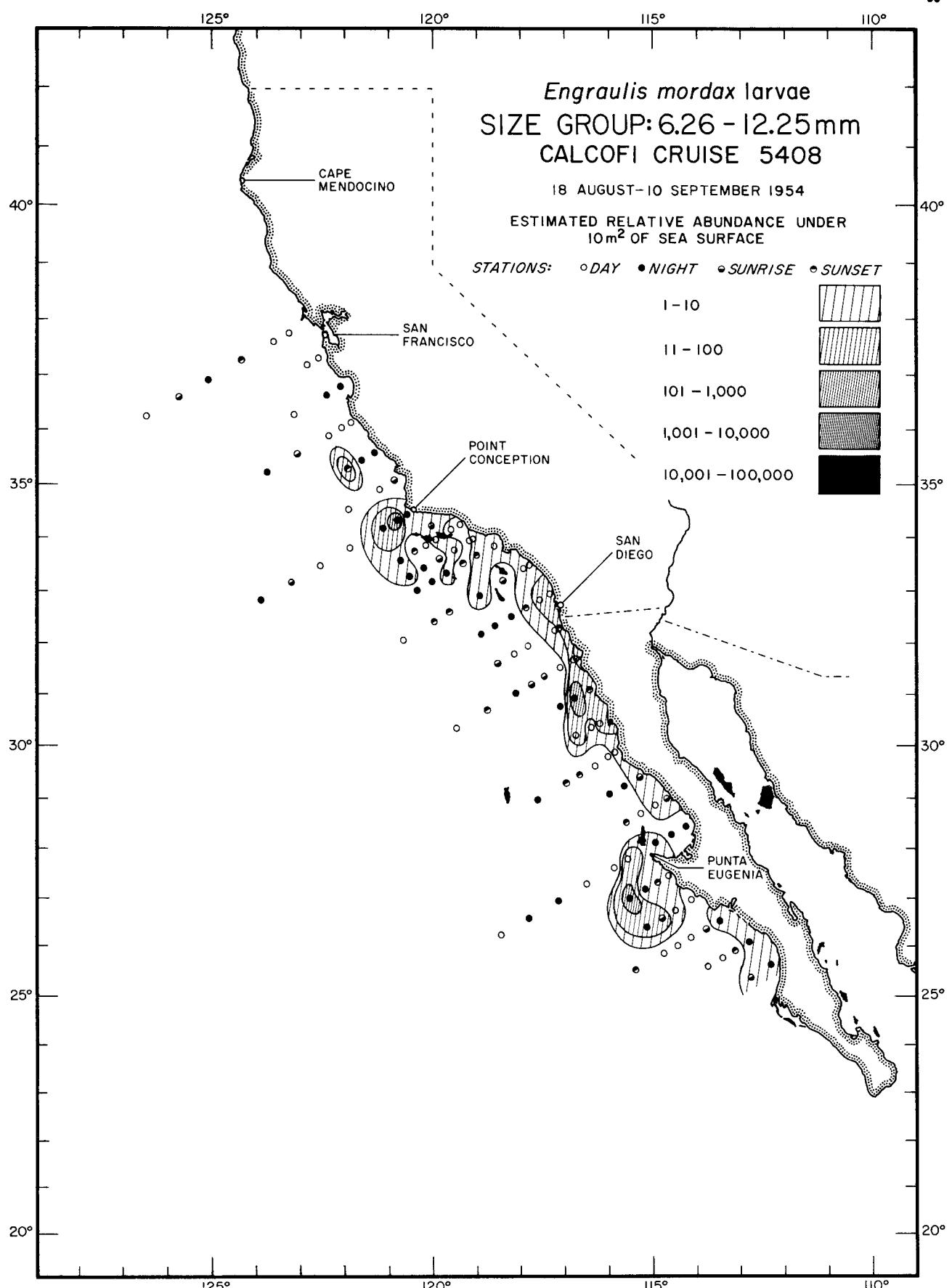


Engraulis mordax larvae
Size Group: 6.26-12.25mm
5407

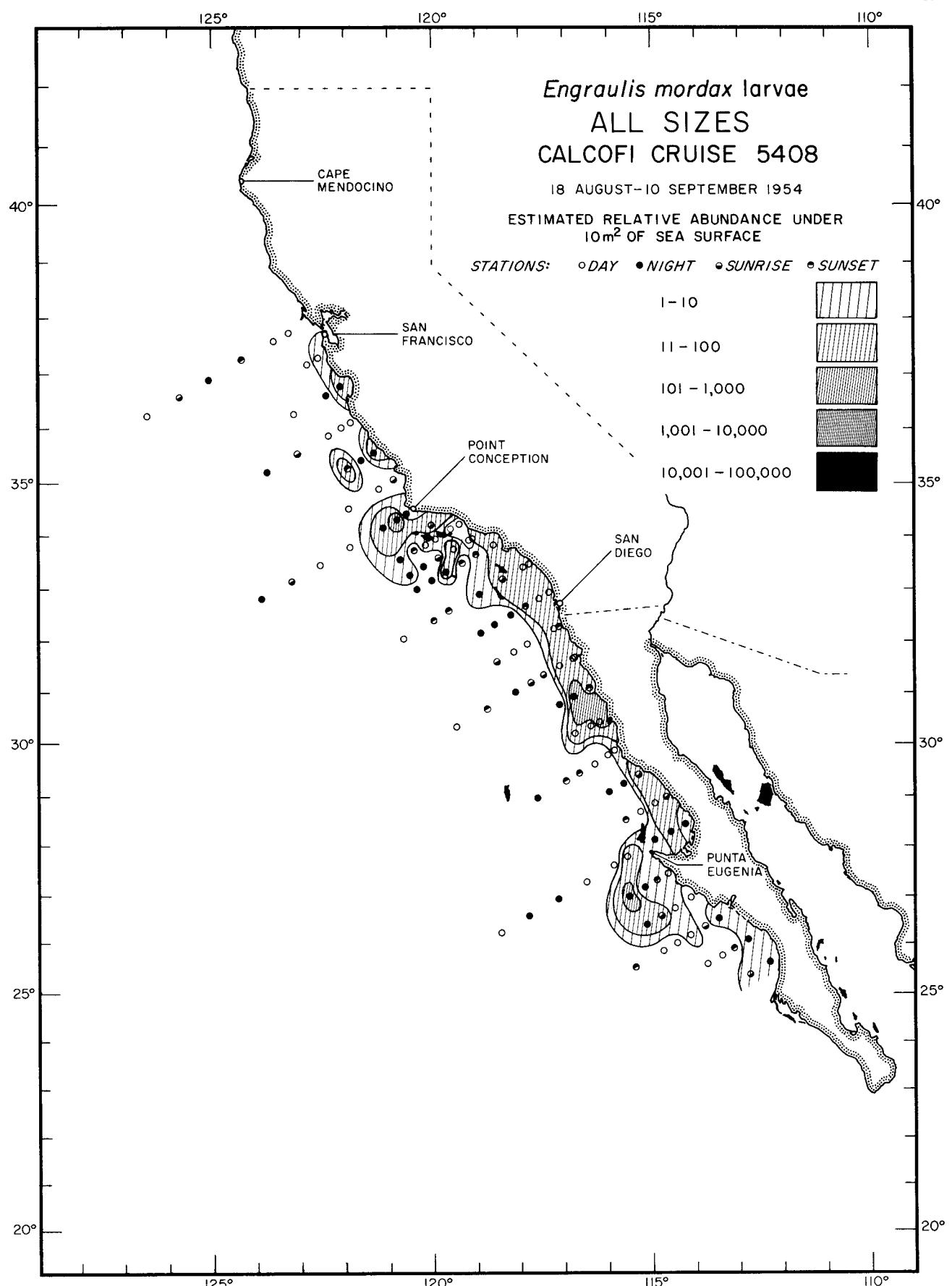
*Engraulis mordax* larvae

All Sizes

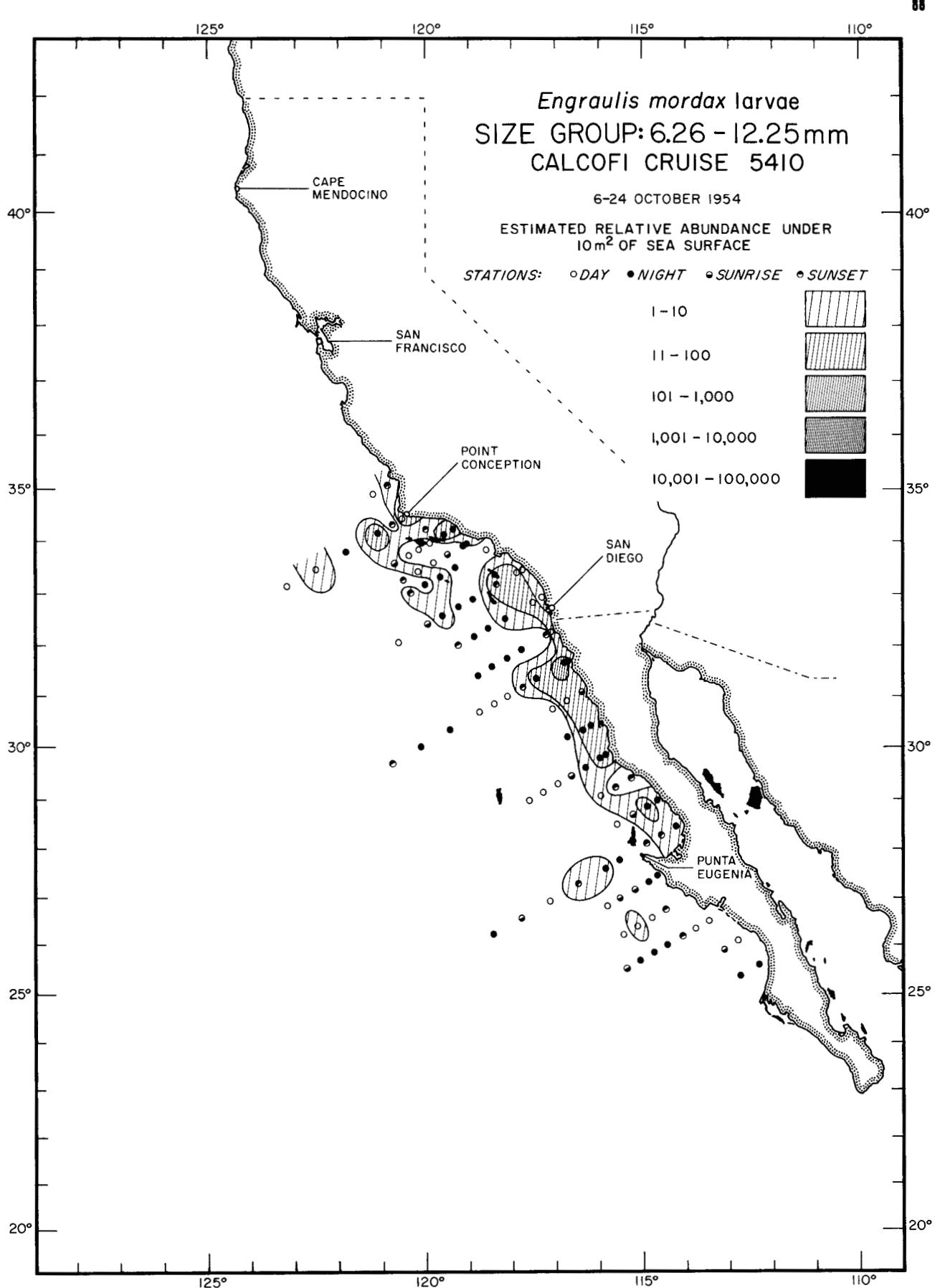
5407



Engraulis mordax larvae
Size Group: 6.26-12.25mm
5408



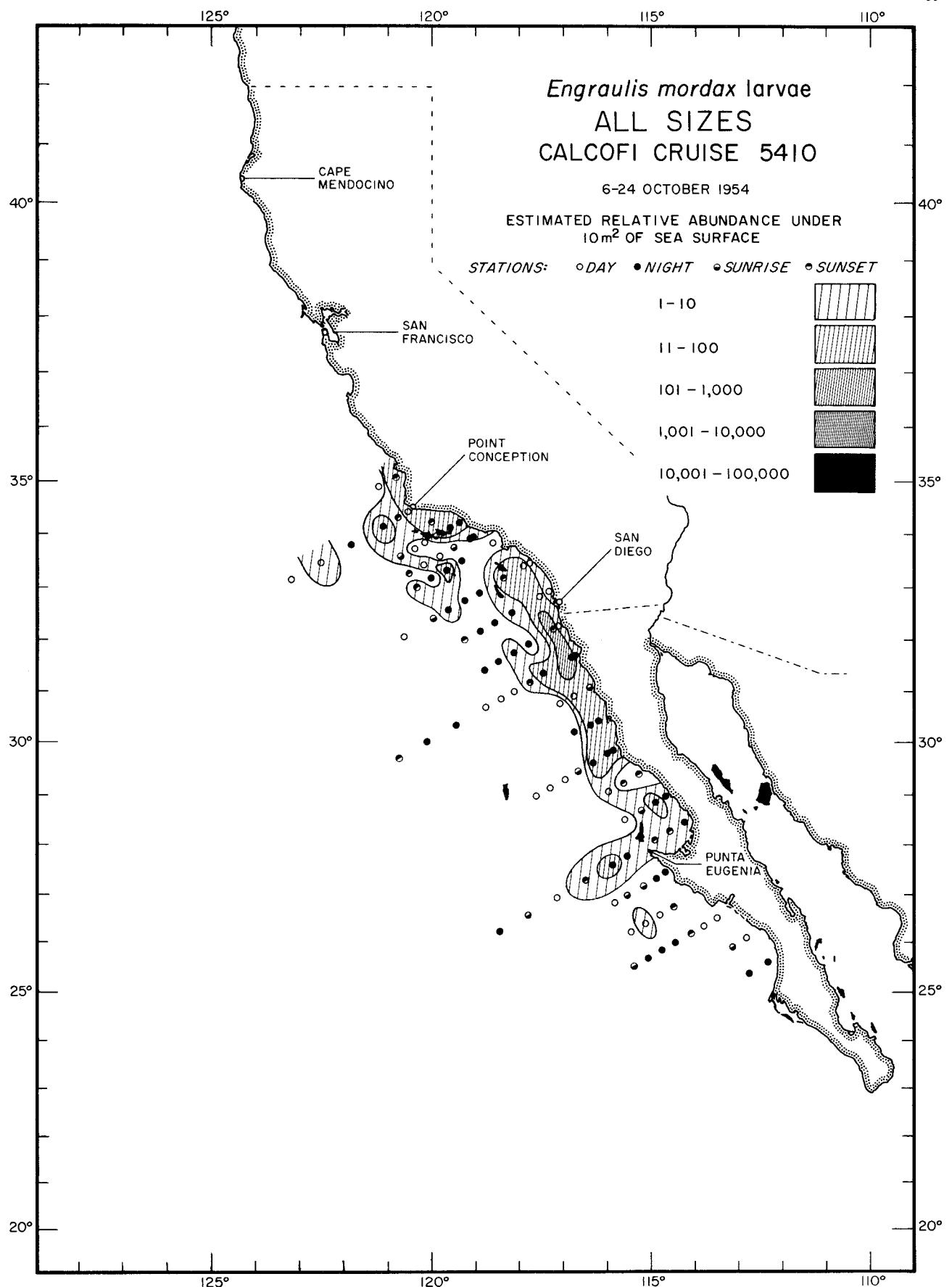
Engraulis mordax larvae
All Sizes
5408



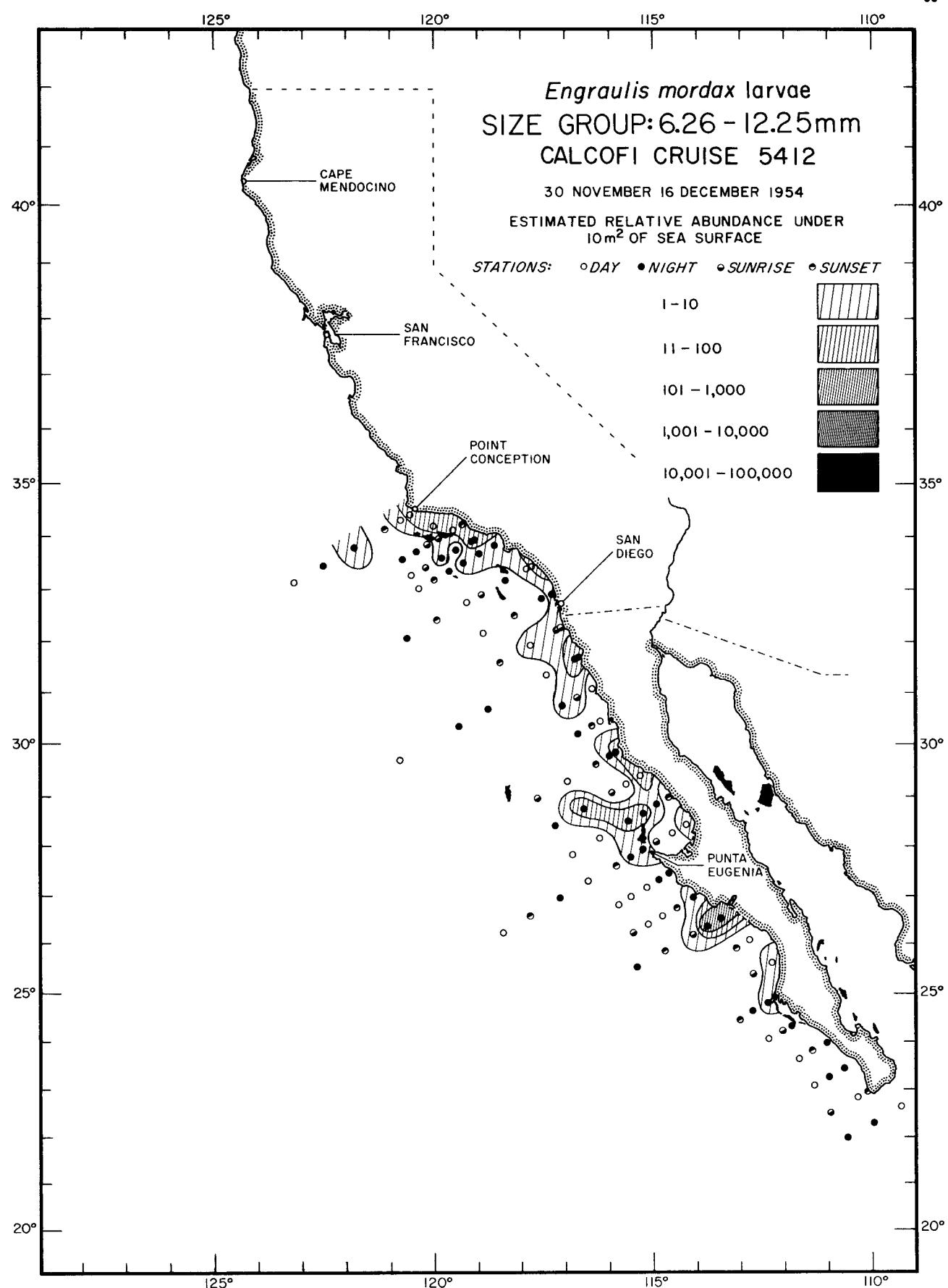
Engraulis mordax larvae

Size Group: 6.26-12.25mm

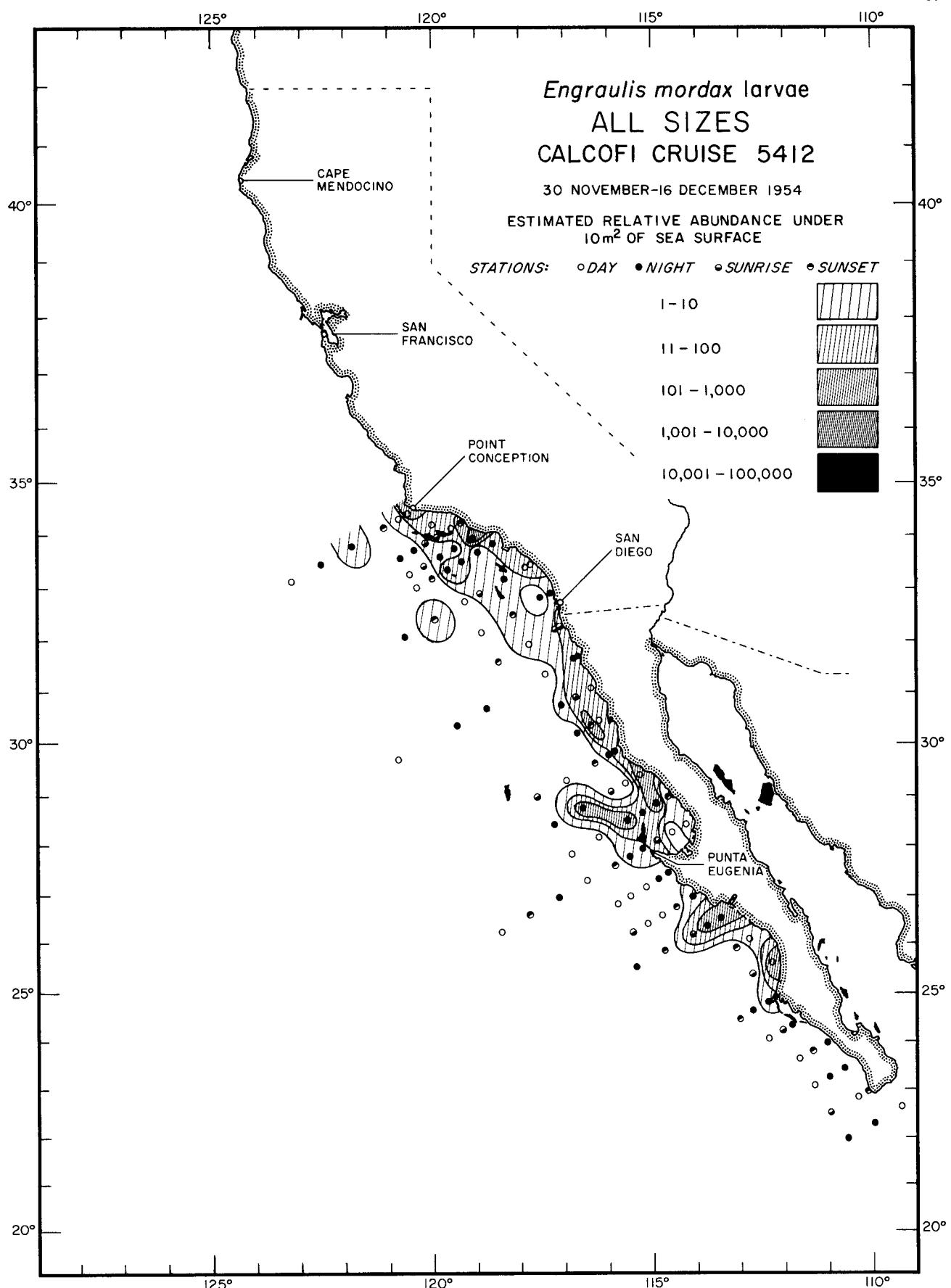
5410



Engraulis mordax larvae
All Sizes
5410

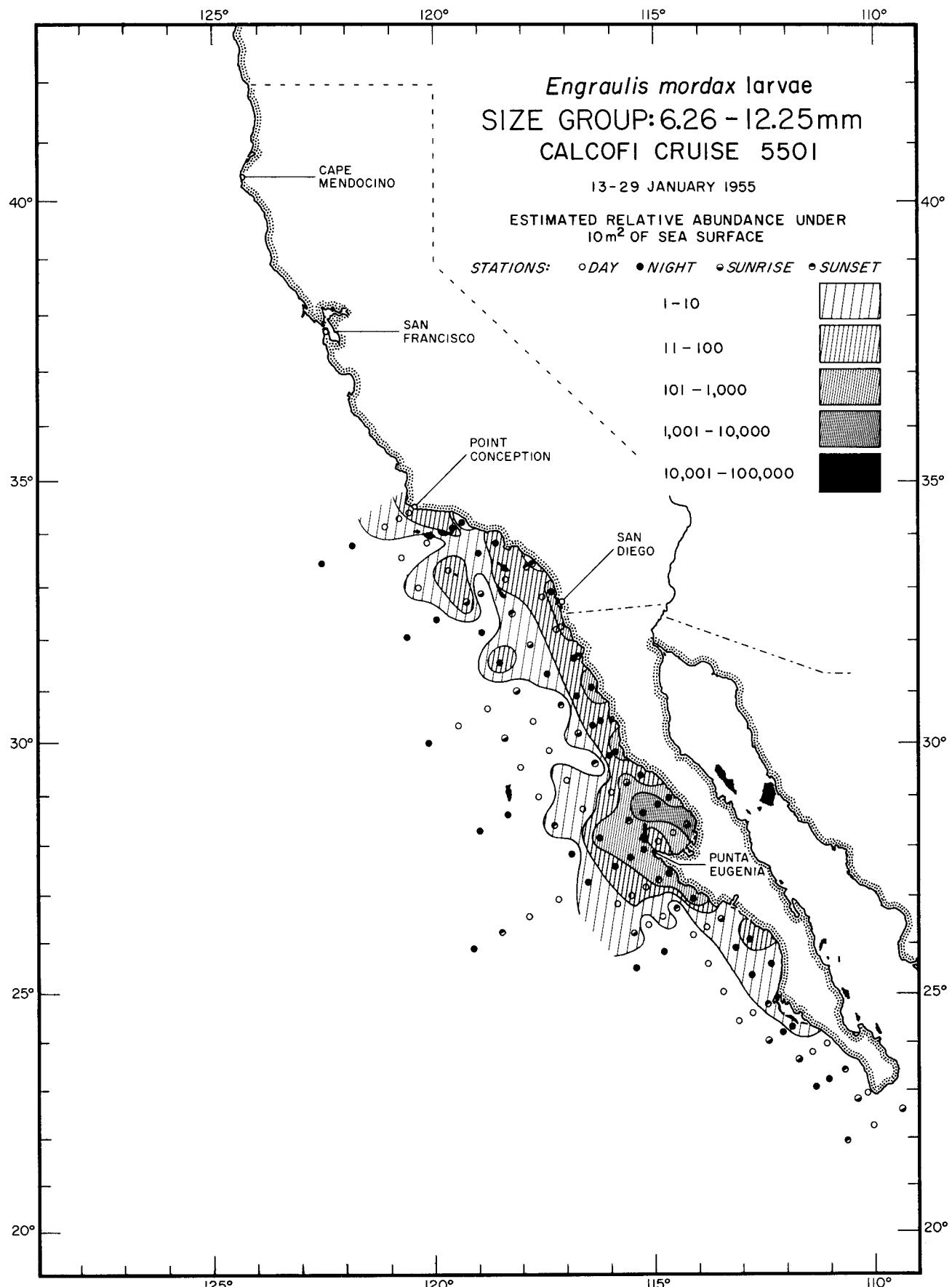


Engraulis mordax larvae
Size Group: 6.26-12.25mm
5412

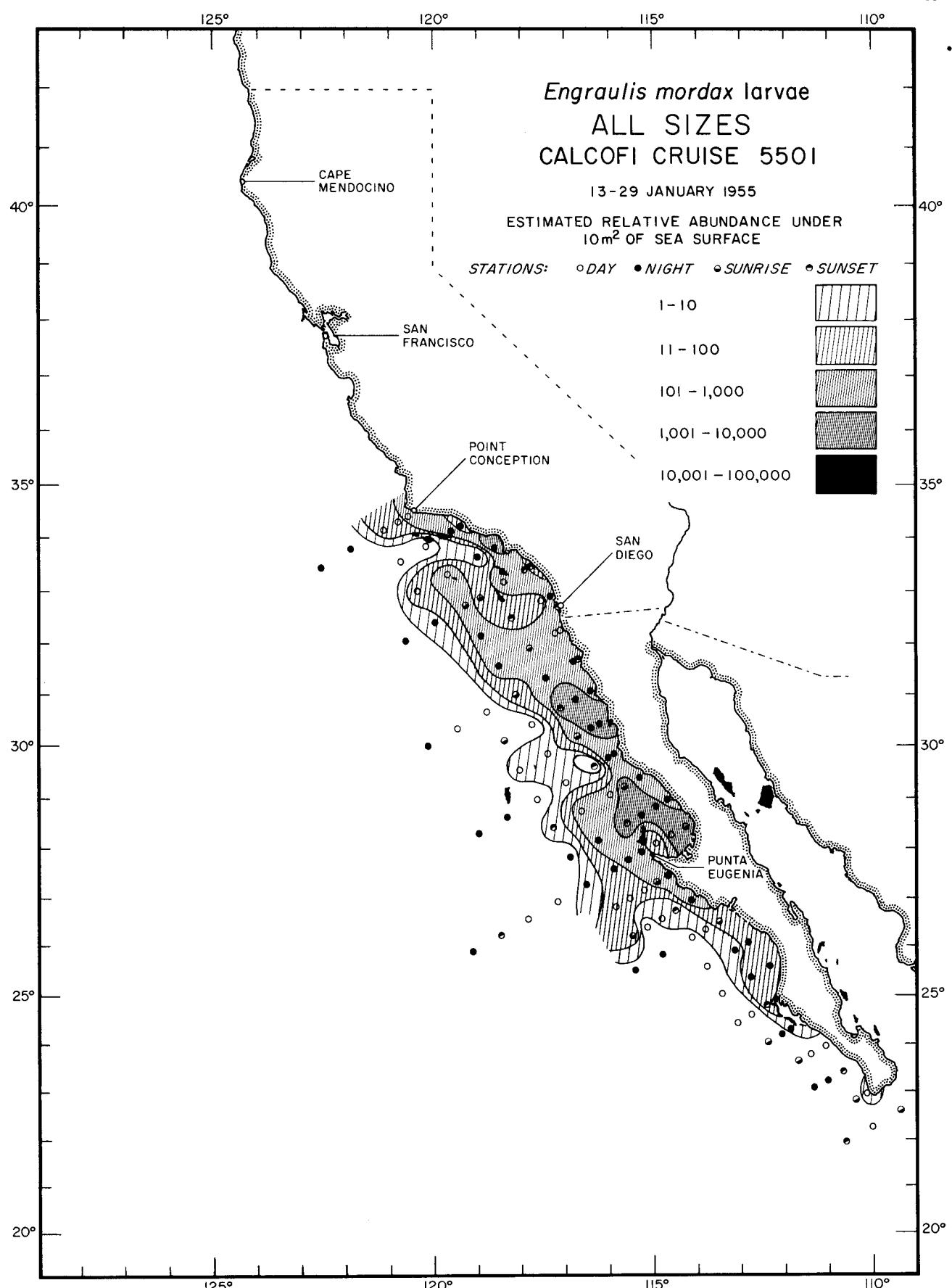
*Engraulis mordax* larvae

All Sizes

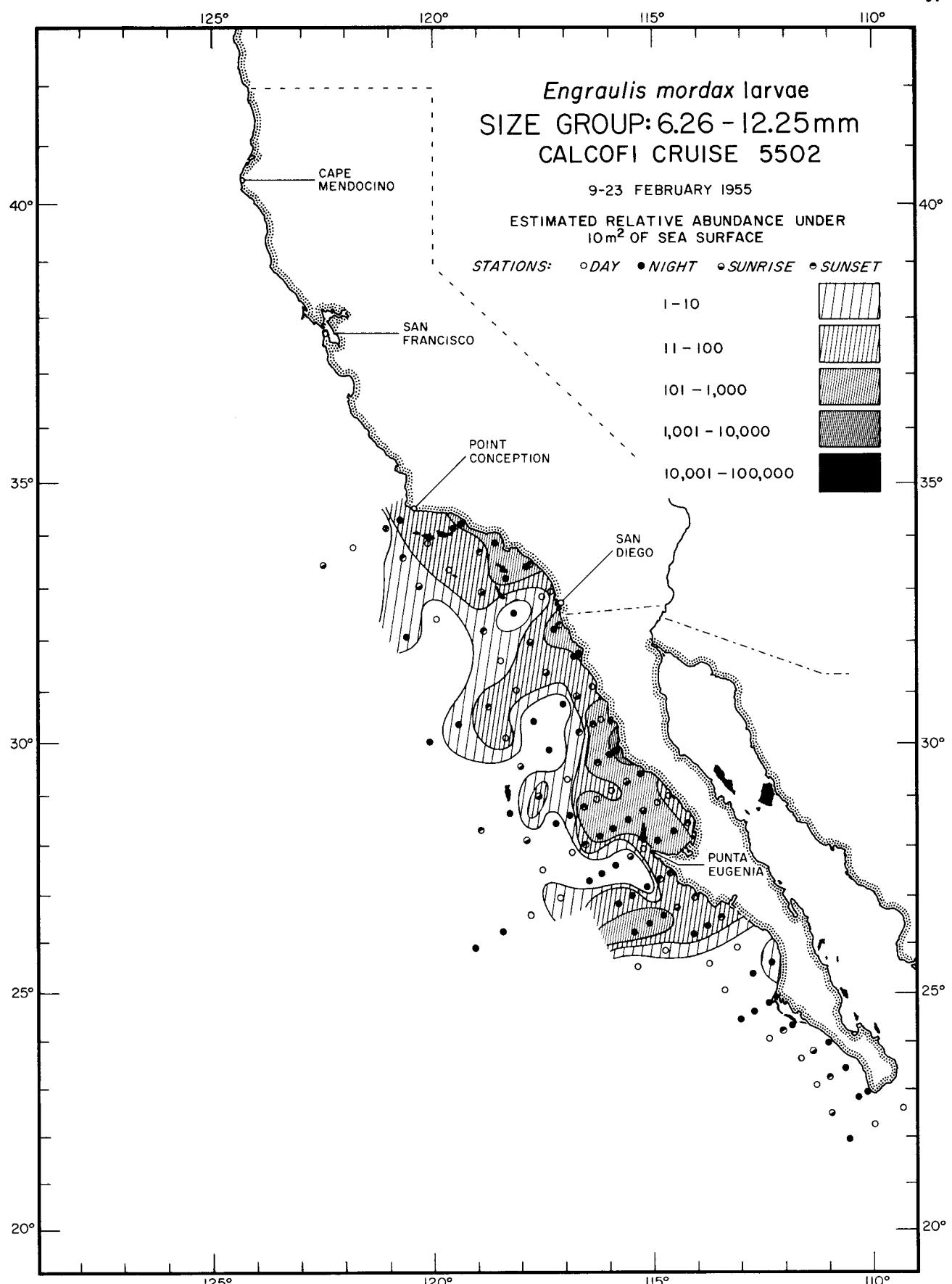
5412



Engraulis mordax larvae
Size Group: 6.26-12.25mm
5501

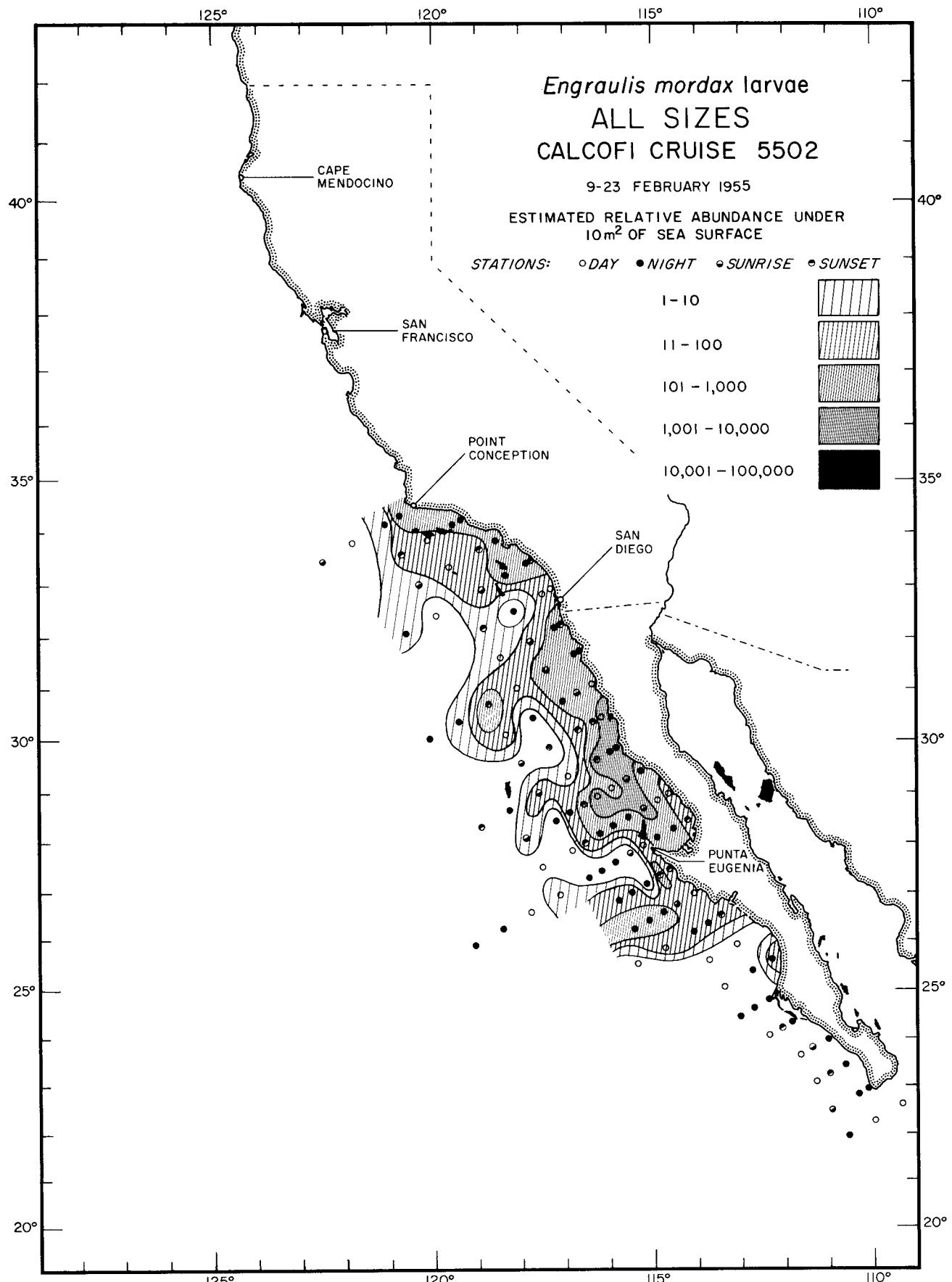


Engraulis mordax larvae
All Sizes
5501

*Engraulis mordax* larvae

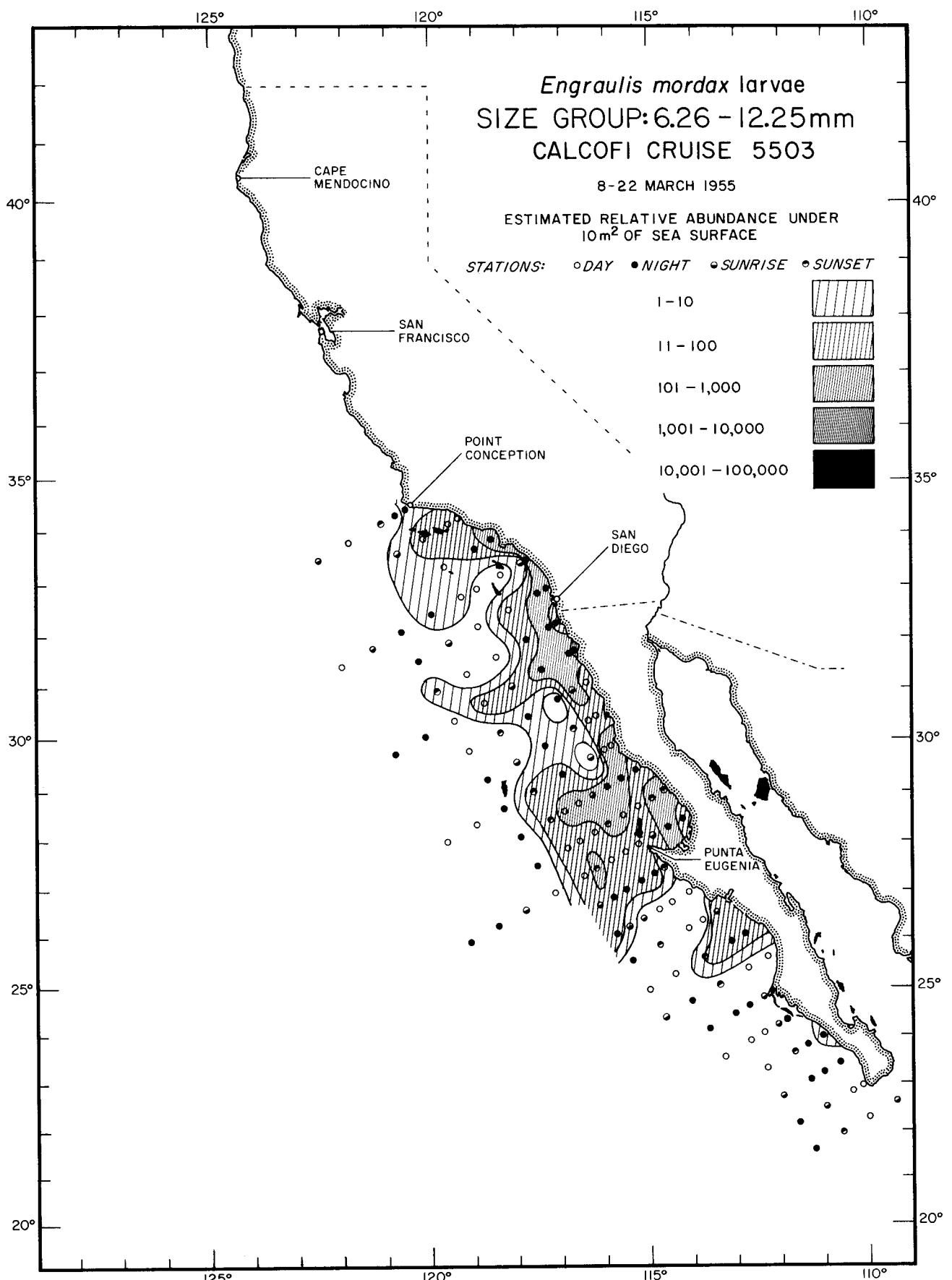
Size Group: 6.26-12.25mm

5502

*Engraulis mordax* larvae

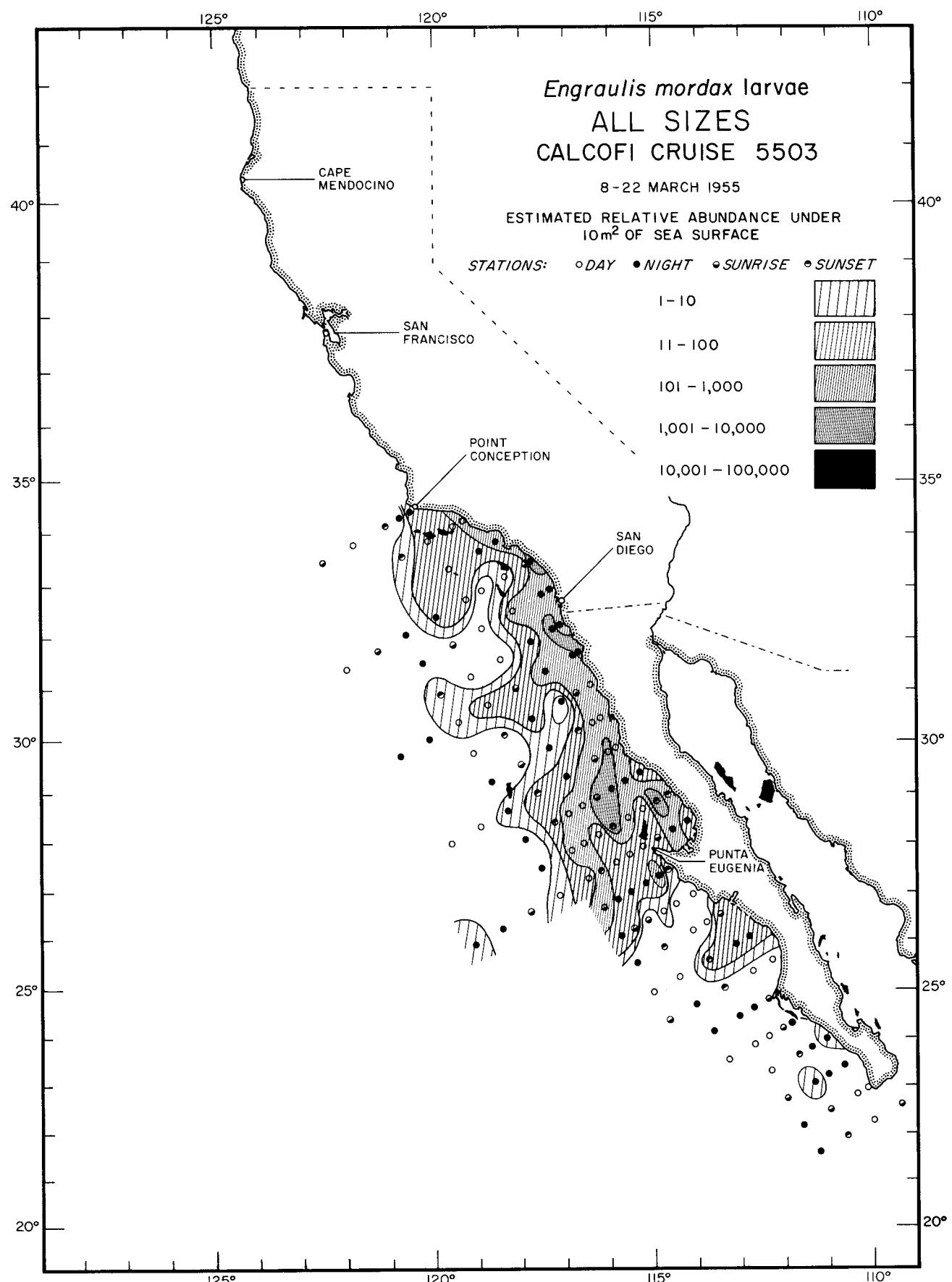
All Sizes

5502

*Engraulis mordax* larvae

Size Group: 6.26-12.25mm

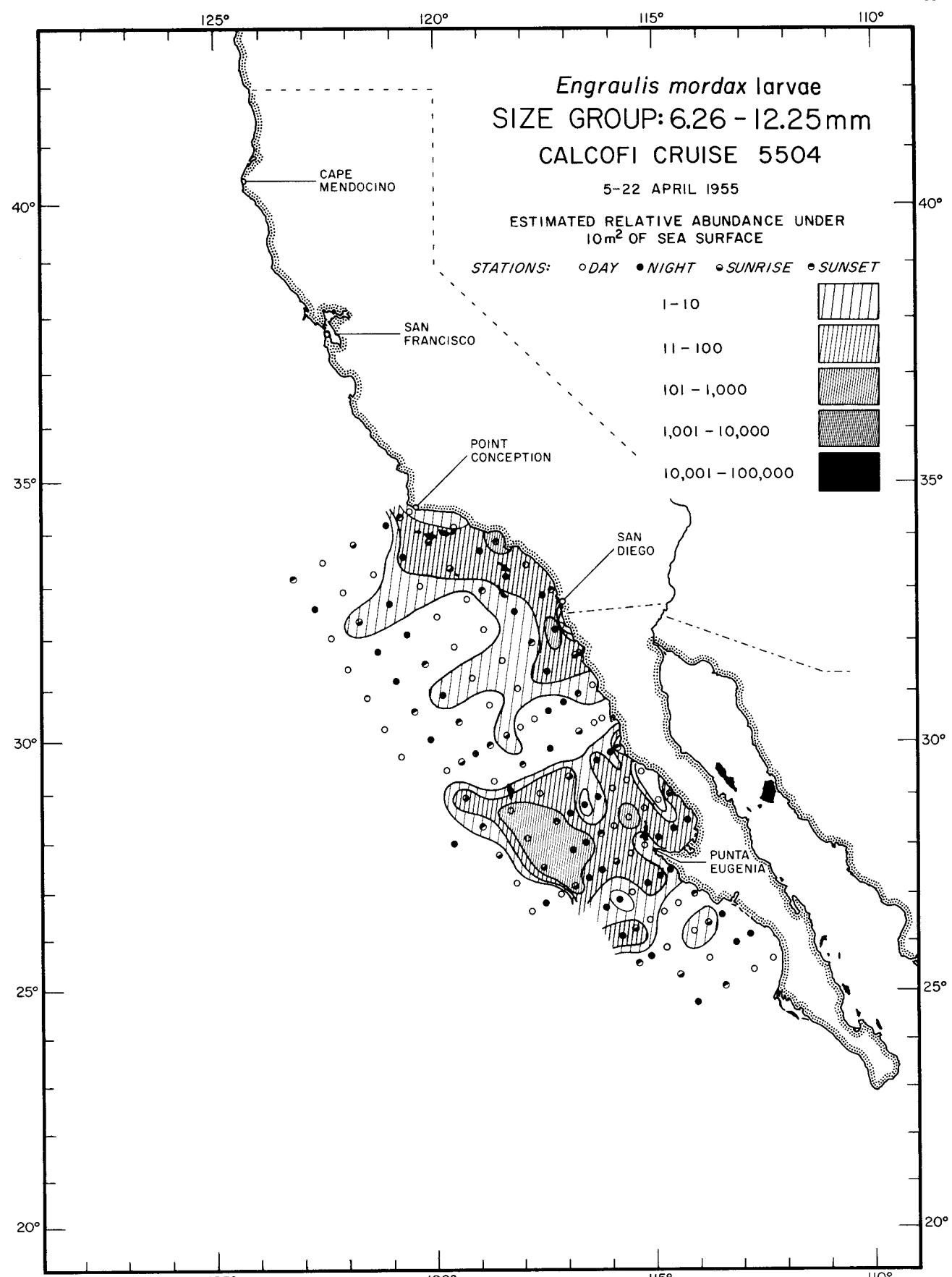
5503



Engraulis mordax larvae

All Sizes

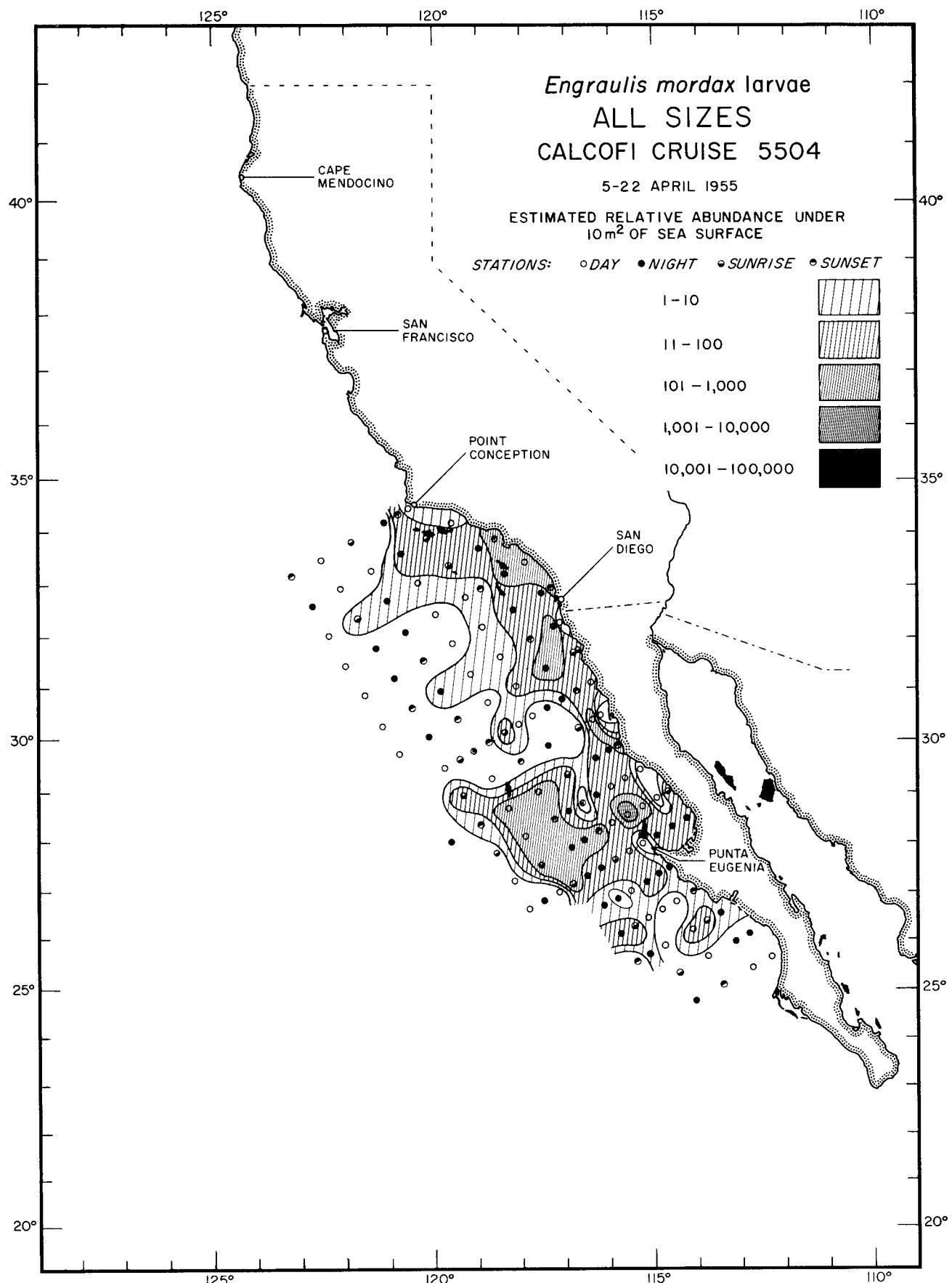
5503



Engraulis mordax larvae

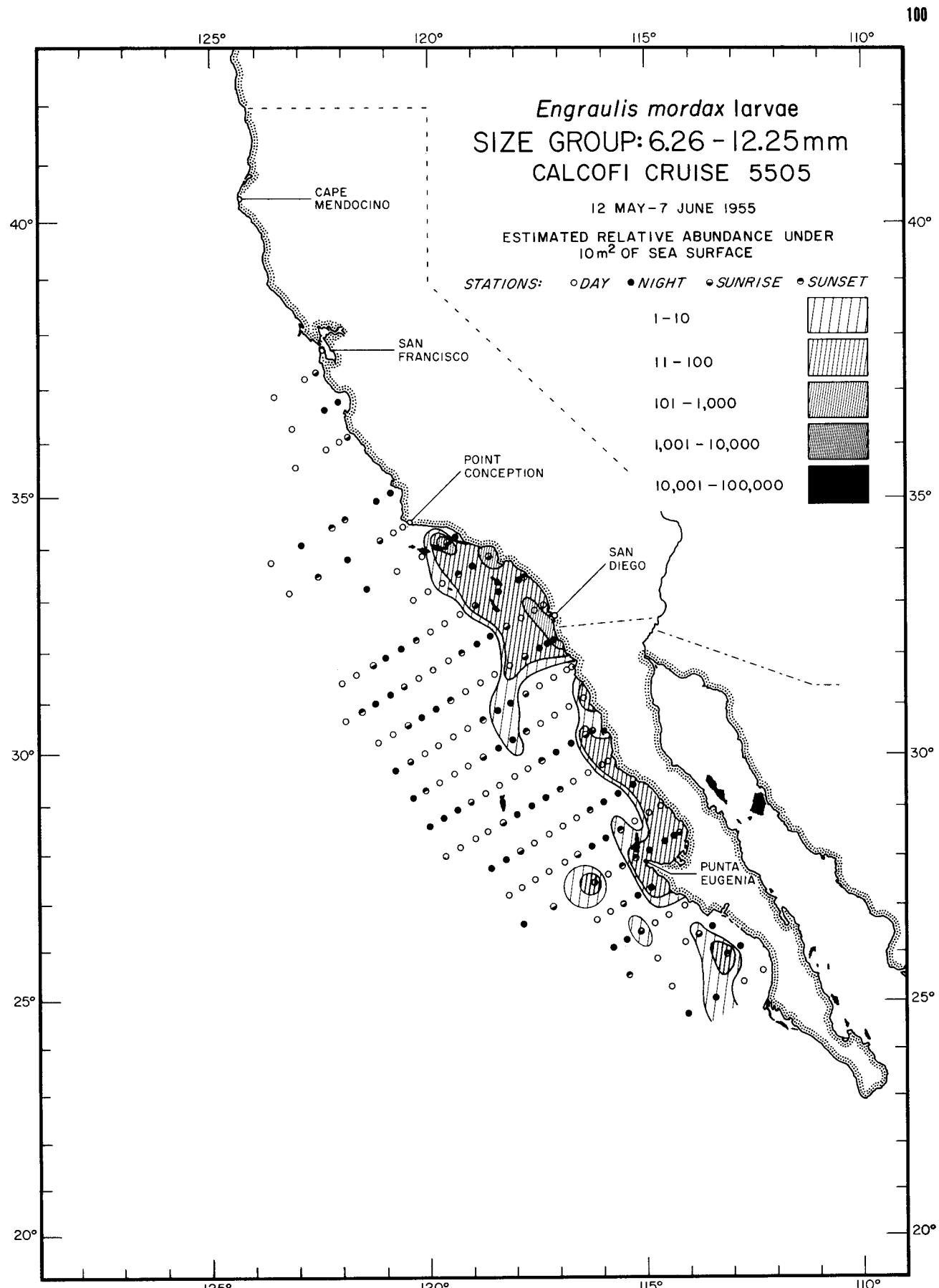
Size Group: 6.26-12.25mm

5504

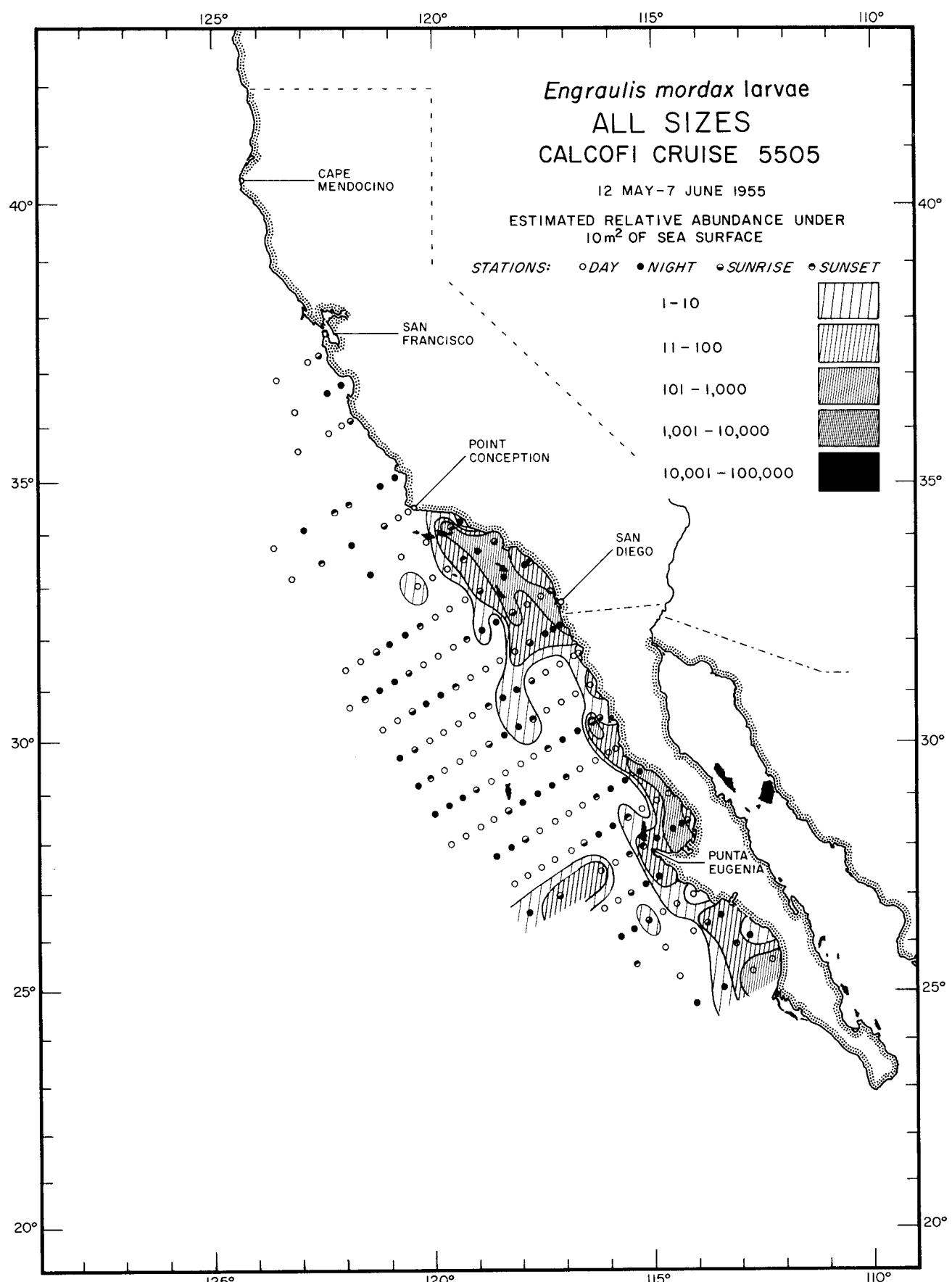
*Engraulis mordax* larvae

All Sizes

5504

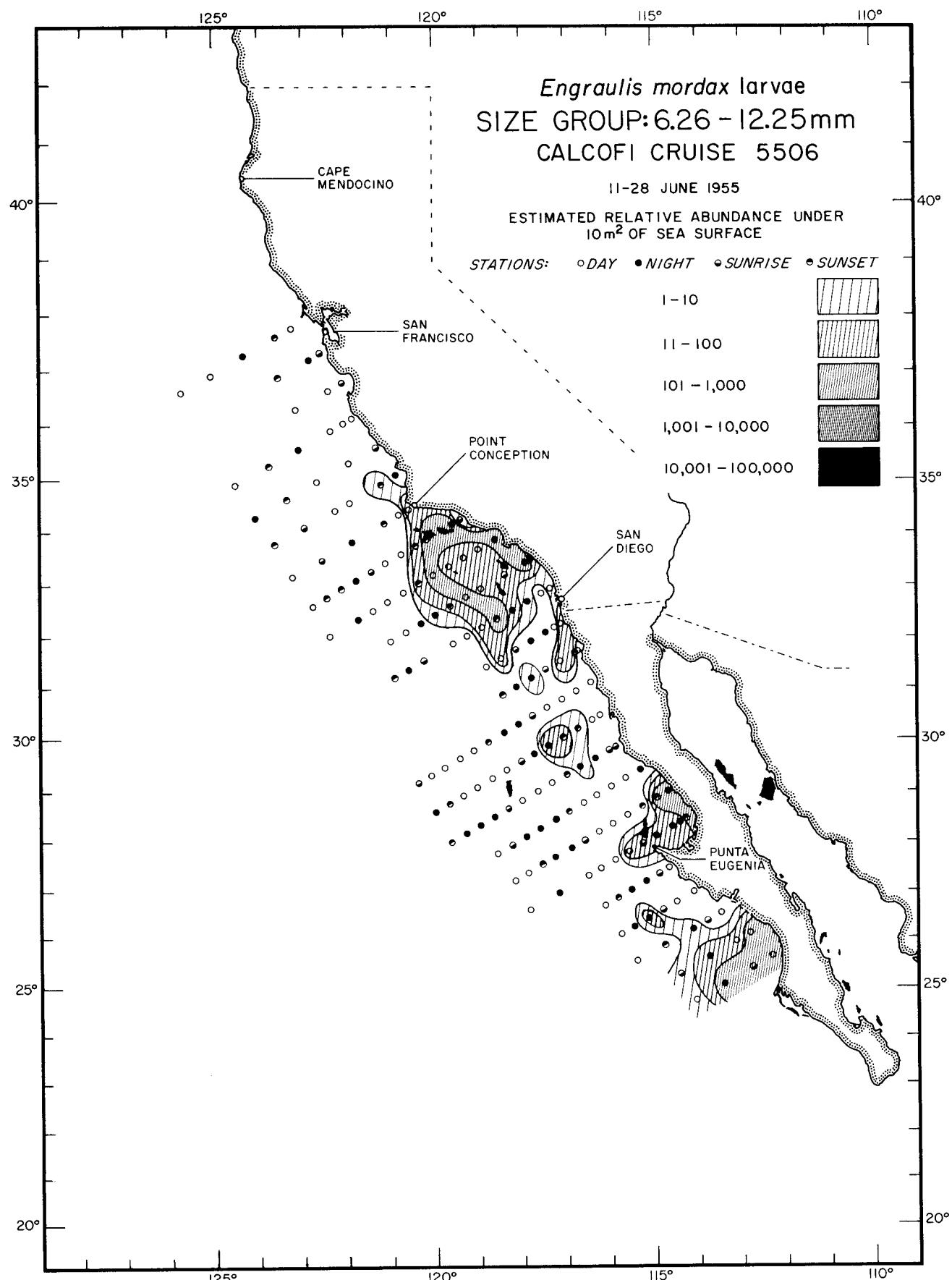


Engraulis mordax larvae
Size Group: 6.26-12.25mm
5505

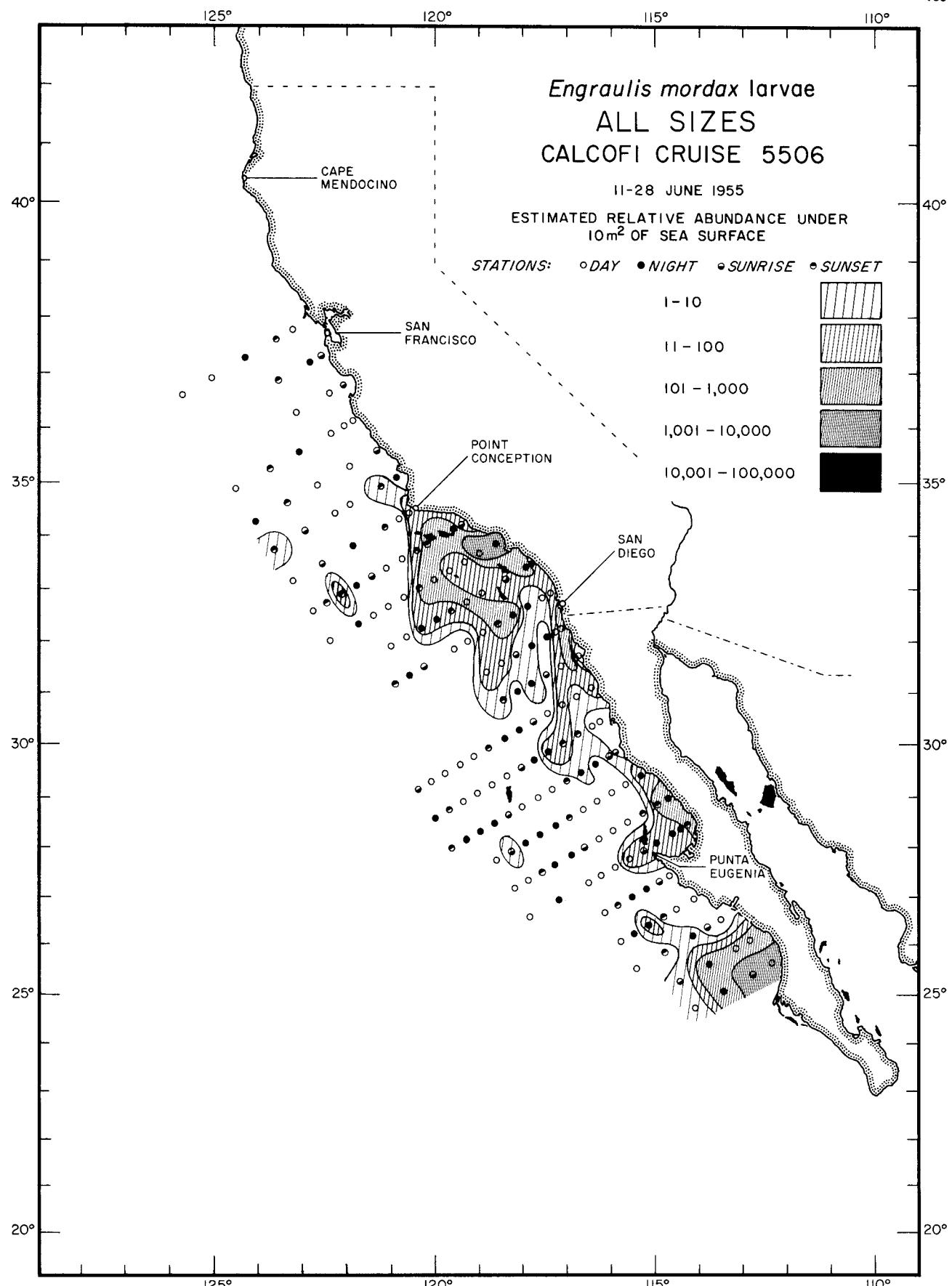
*Engraulis mordax* larvae

All Sizes

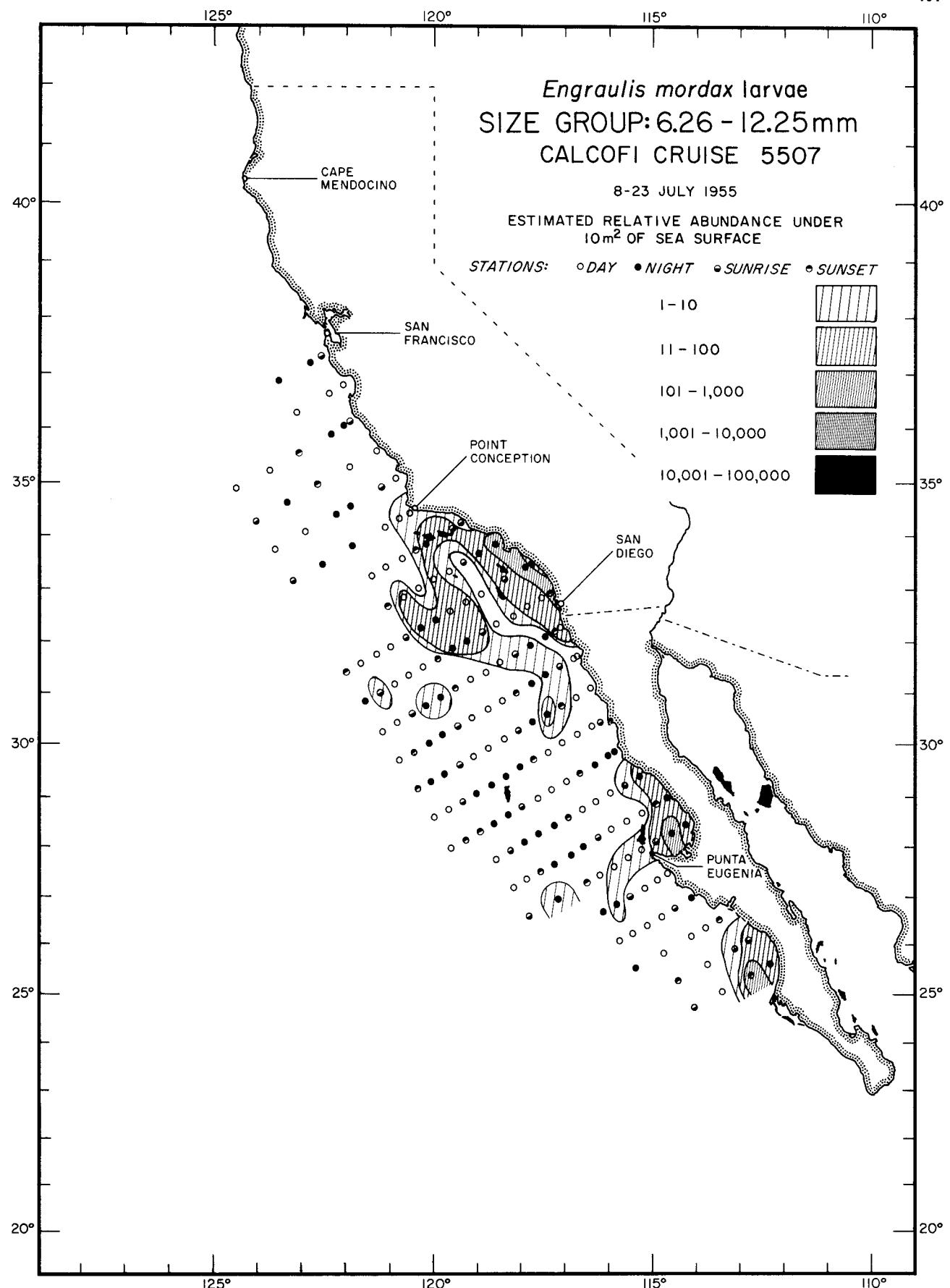
5505



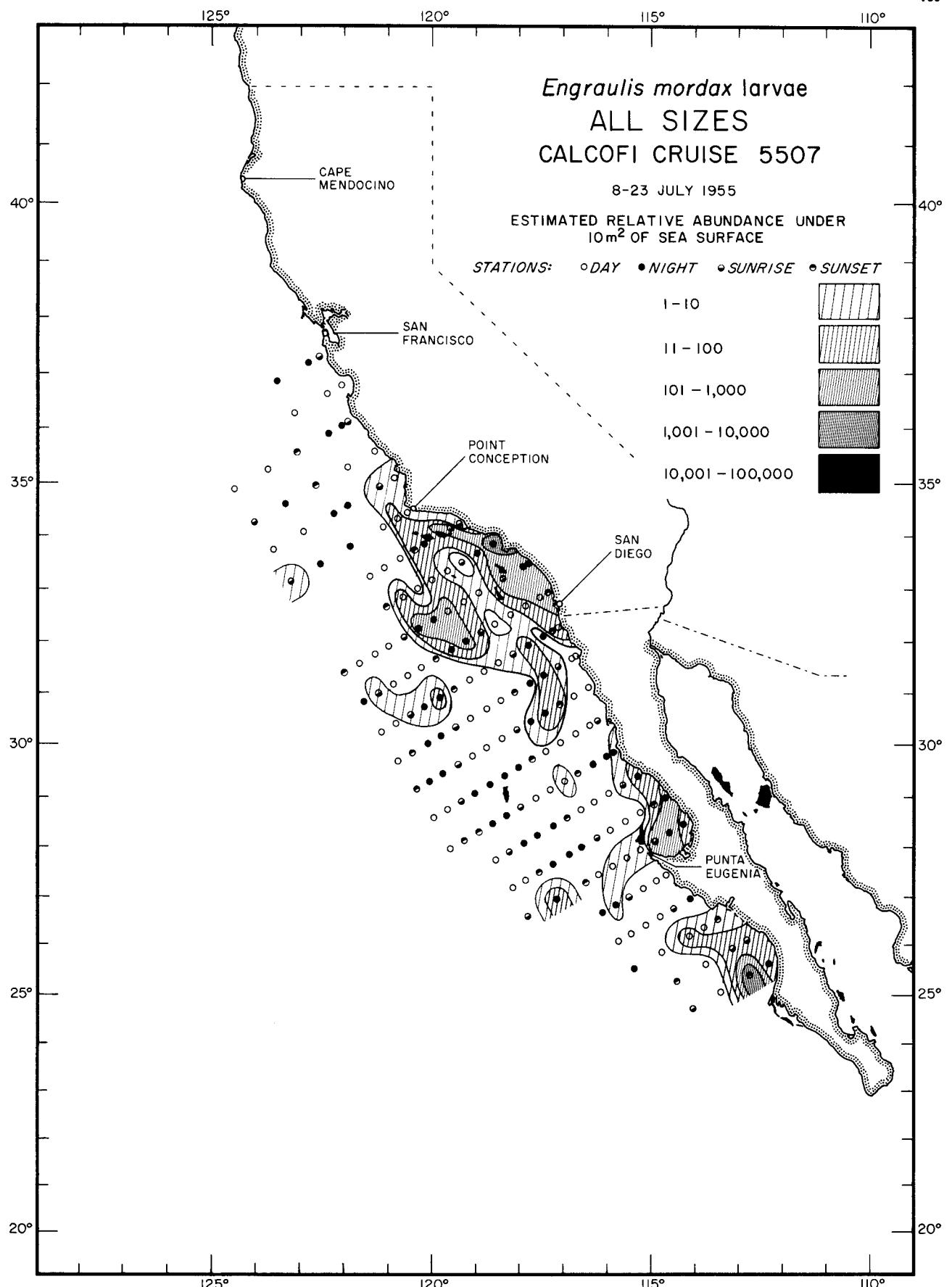
Engraulis mordax larvae
Size Group: 6.26-12.25mm
5506



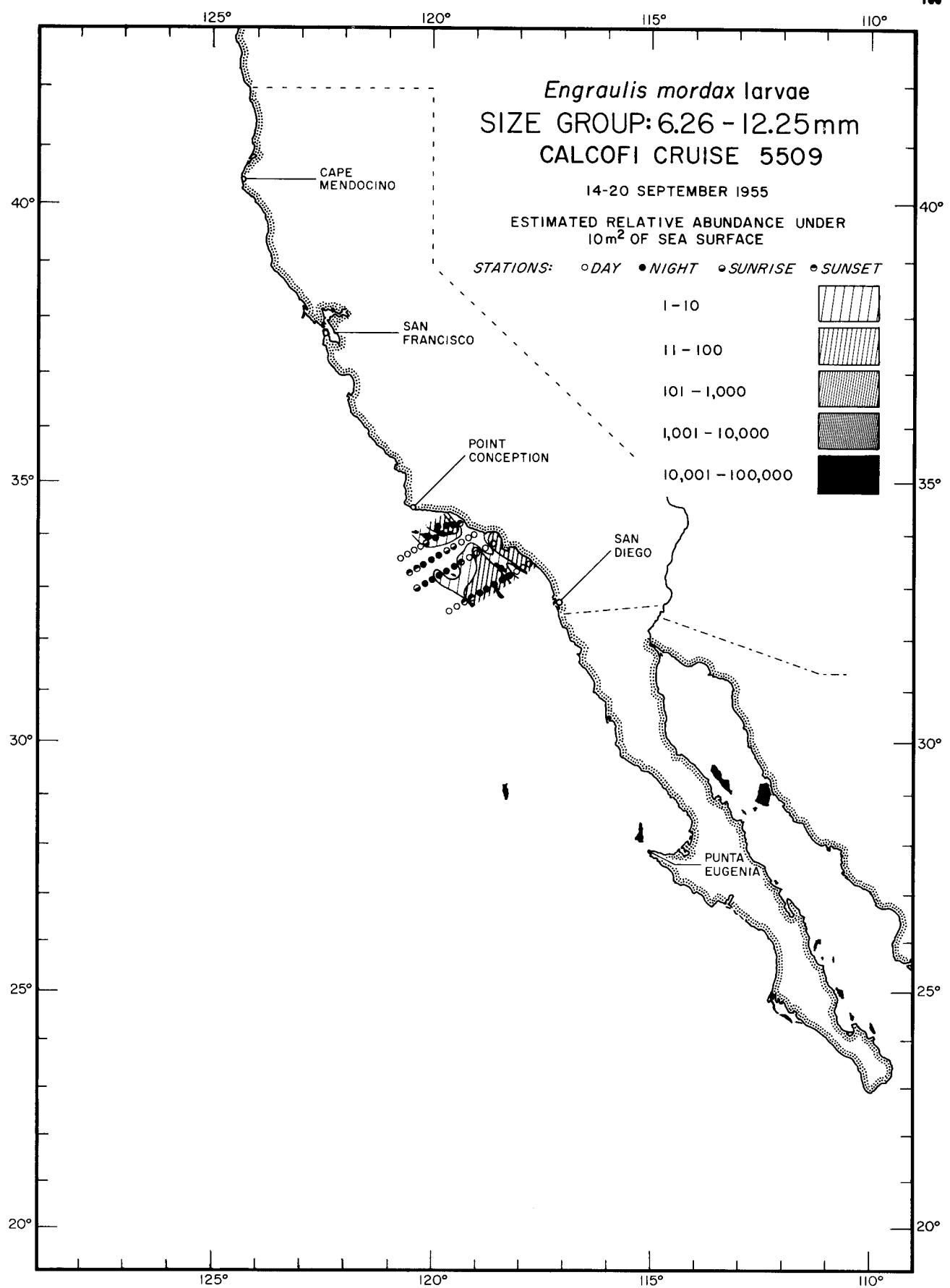
Engraulis mordax larvae
All Sizes
5506



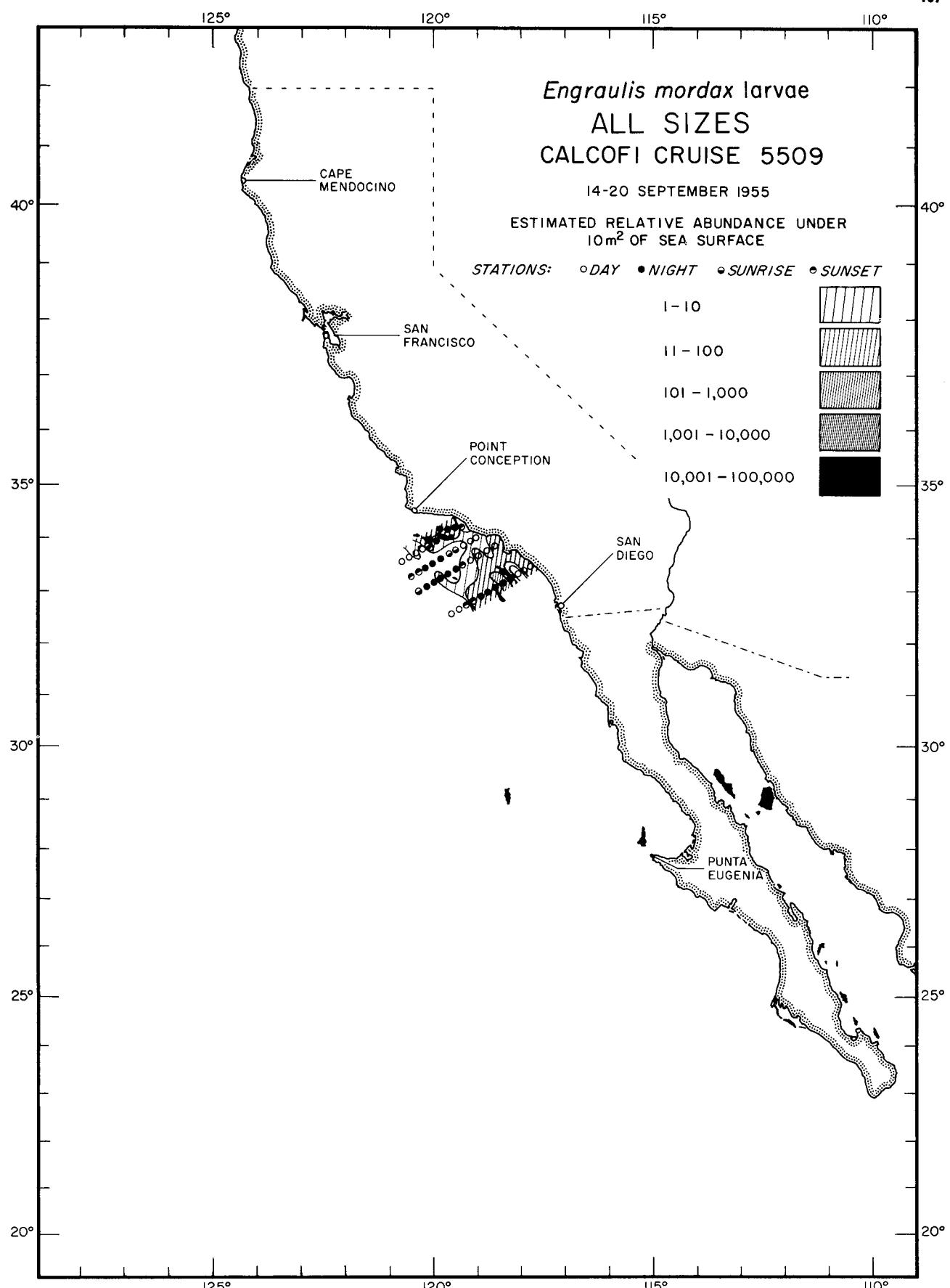
Engraulis mordax larvae
Size Group: 6.26-12.25mm
5507



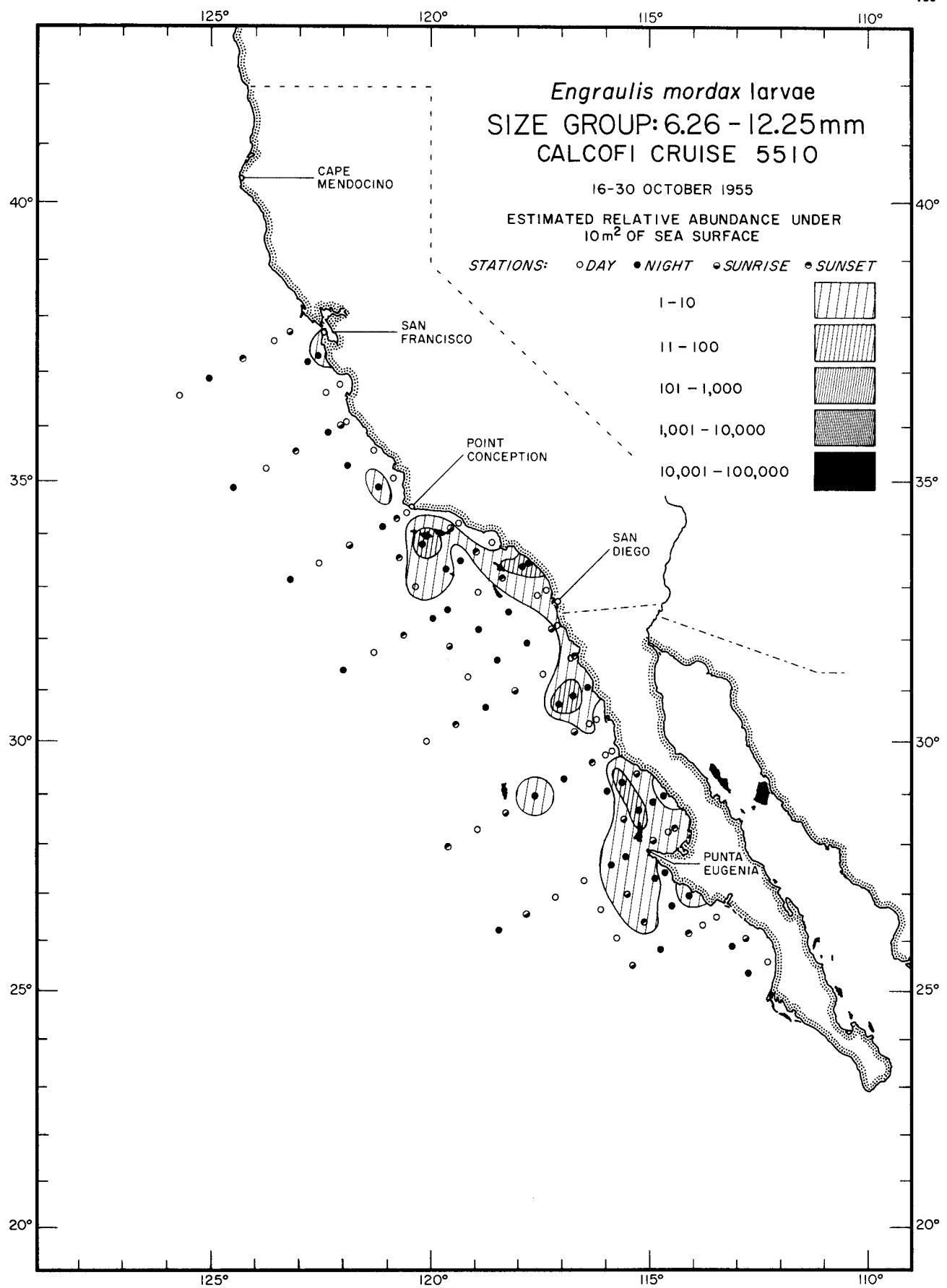
Engraulis mordax larvae
All Sizes
5507



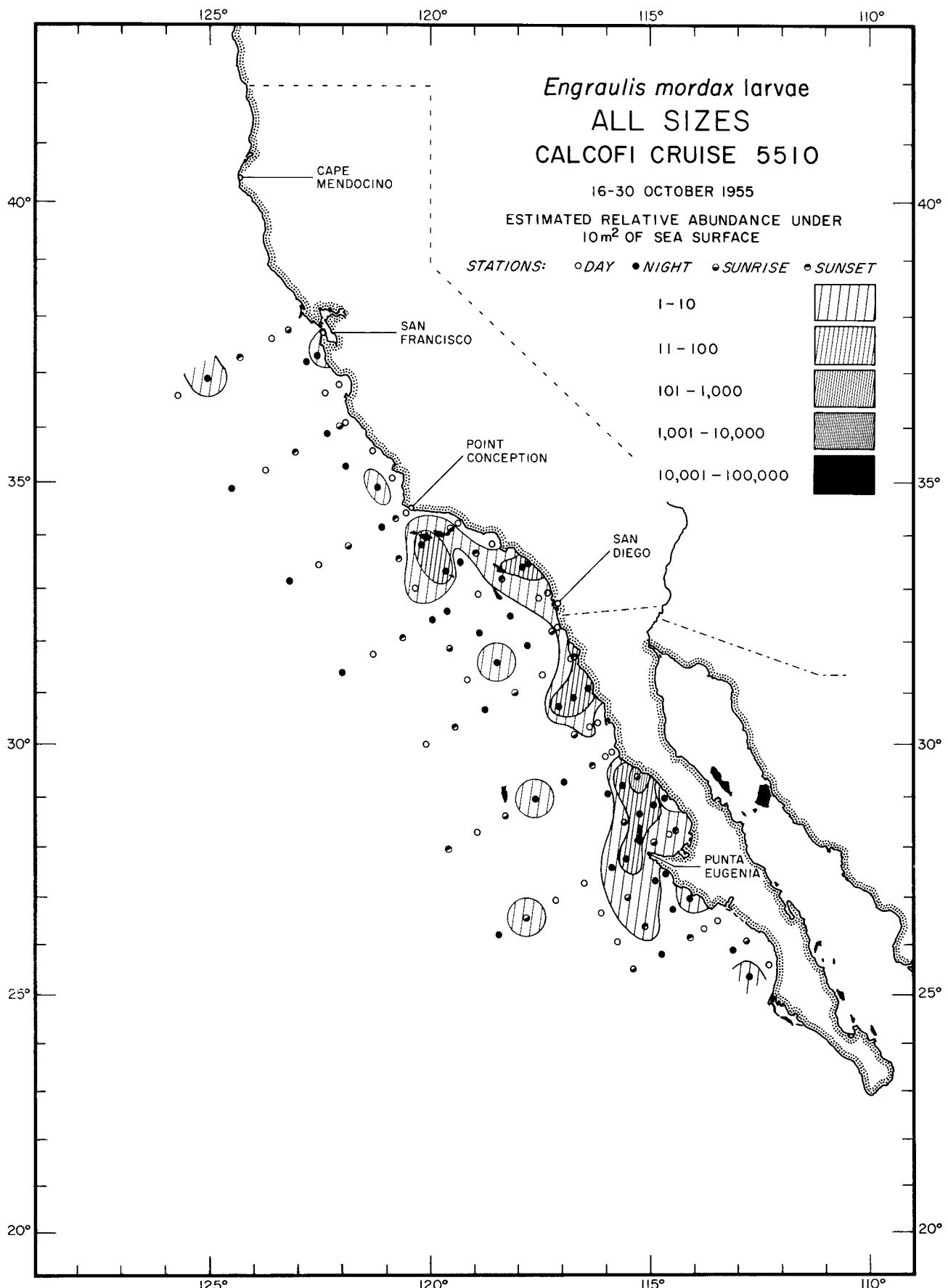
Engraulis mordax larvae
Size Group: 6.26-12.25mm
5509

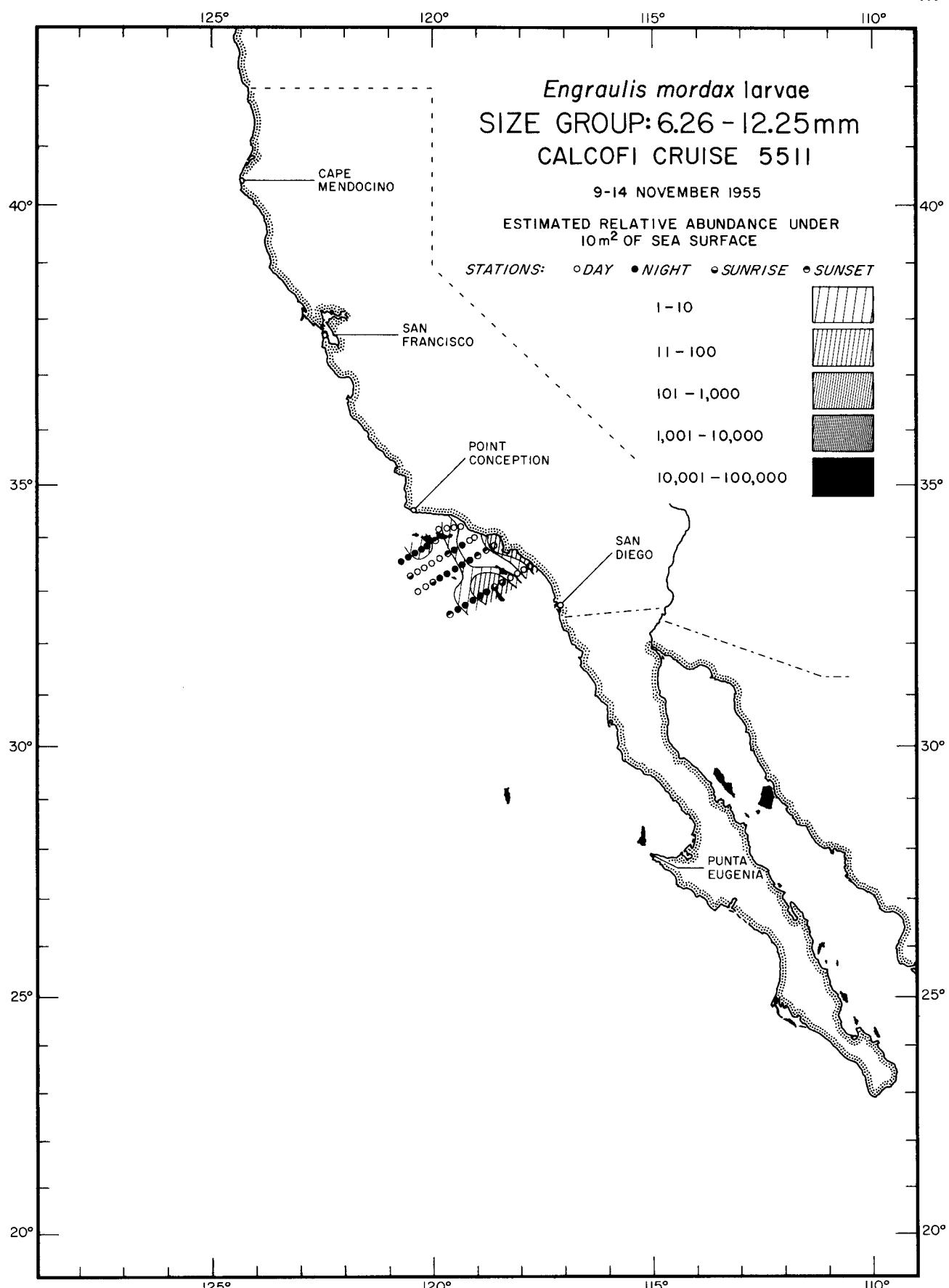


Engraulis mordax larvae
All Sizes
5509

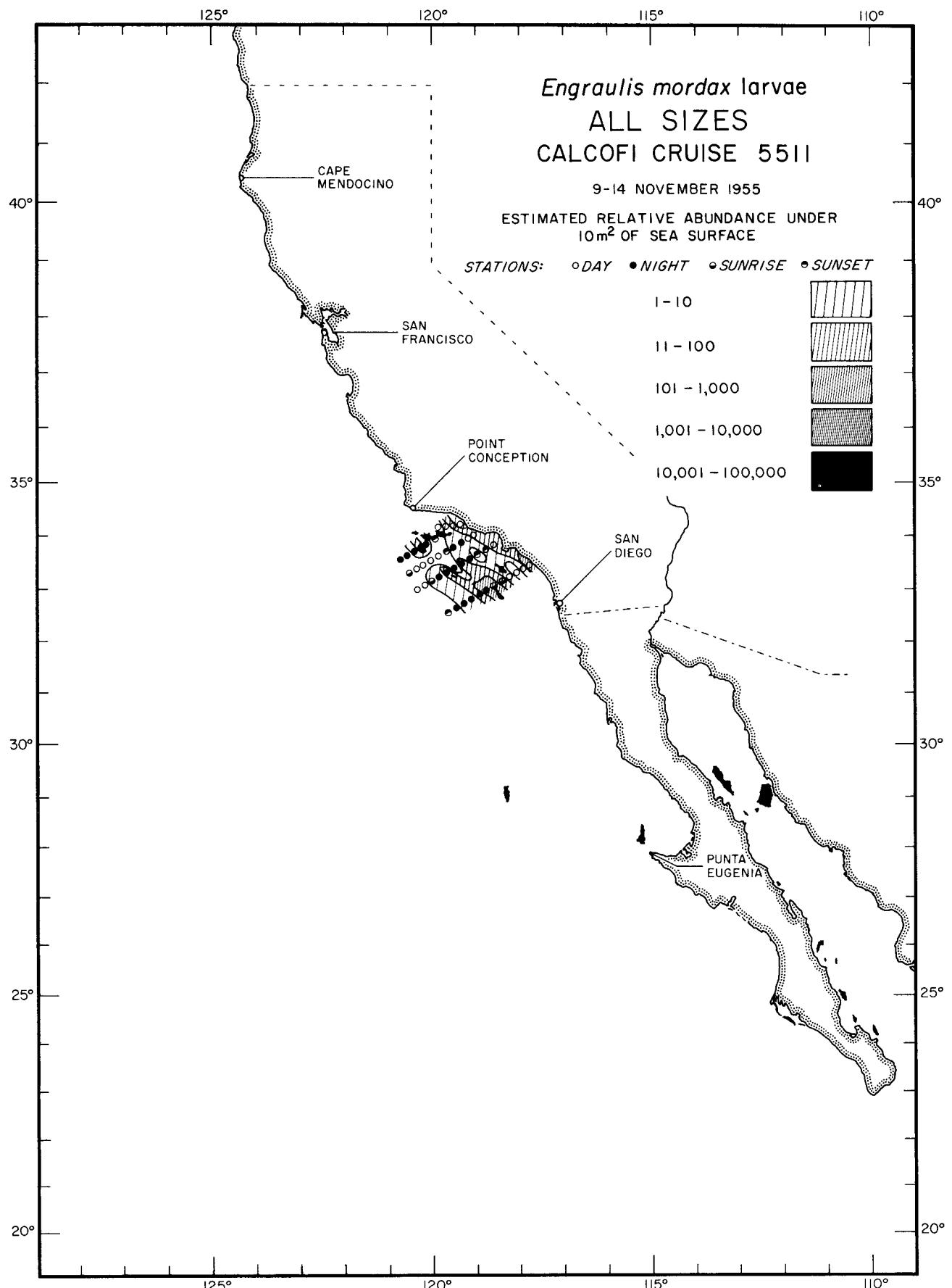


Engraulis mordax larvae
Size Group: 6.26-12.25mm
5510

*Engraulis mordax* larvaeAll Sizes
5510

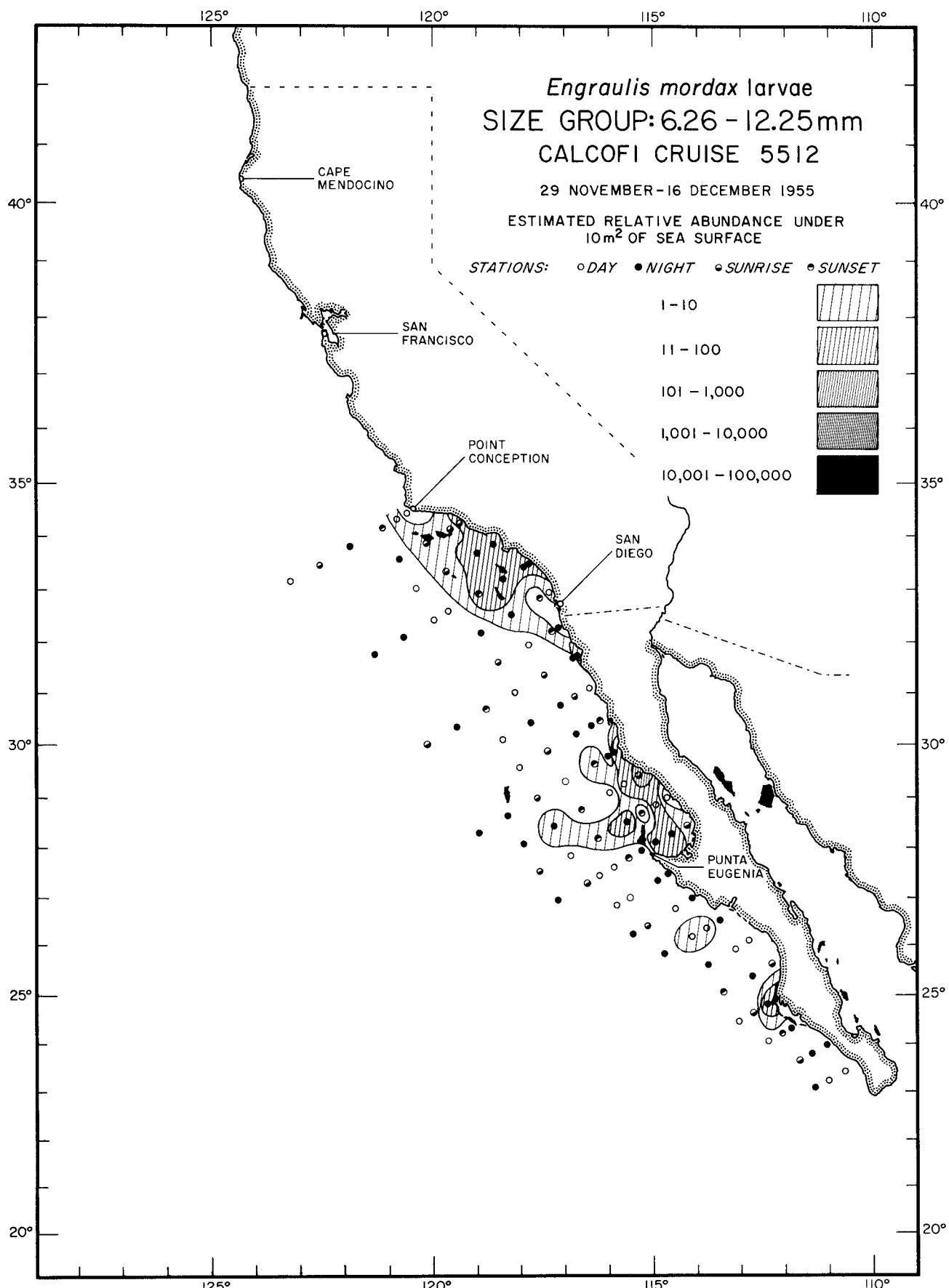


Engraulis mordax larvae
 Size Group: 6.26-12.25mm
 5511

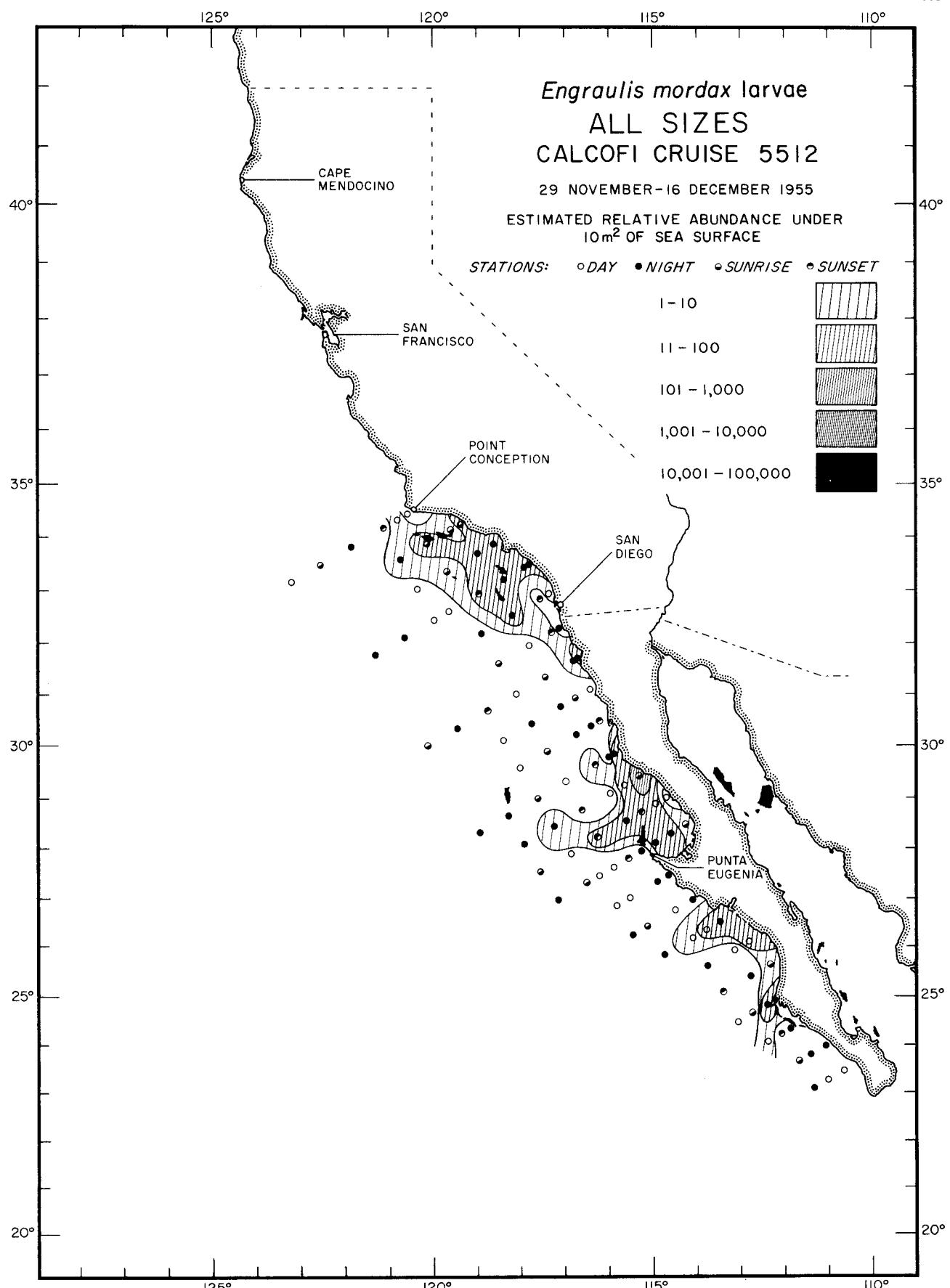
*Engraulis mordax* larvae

All Sizes

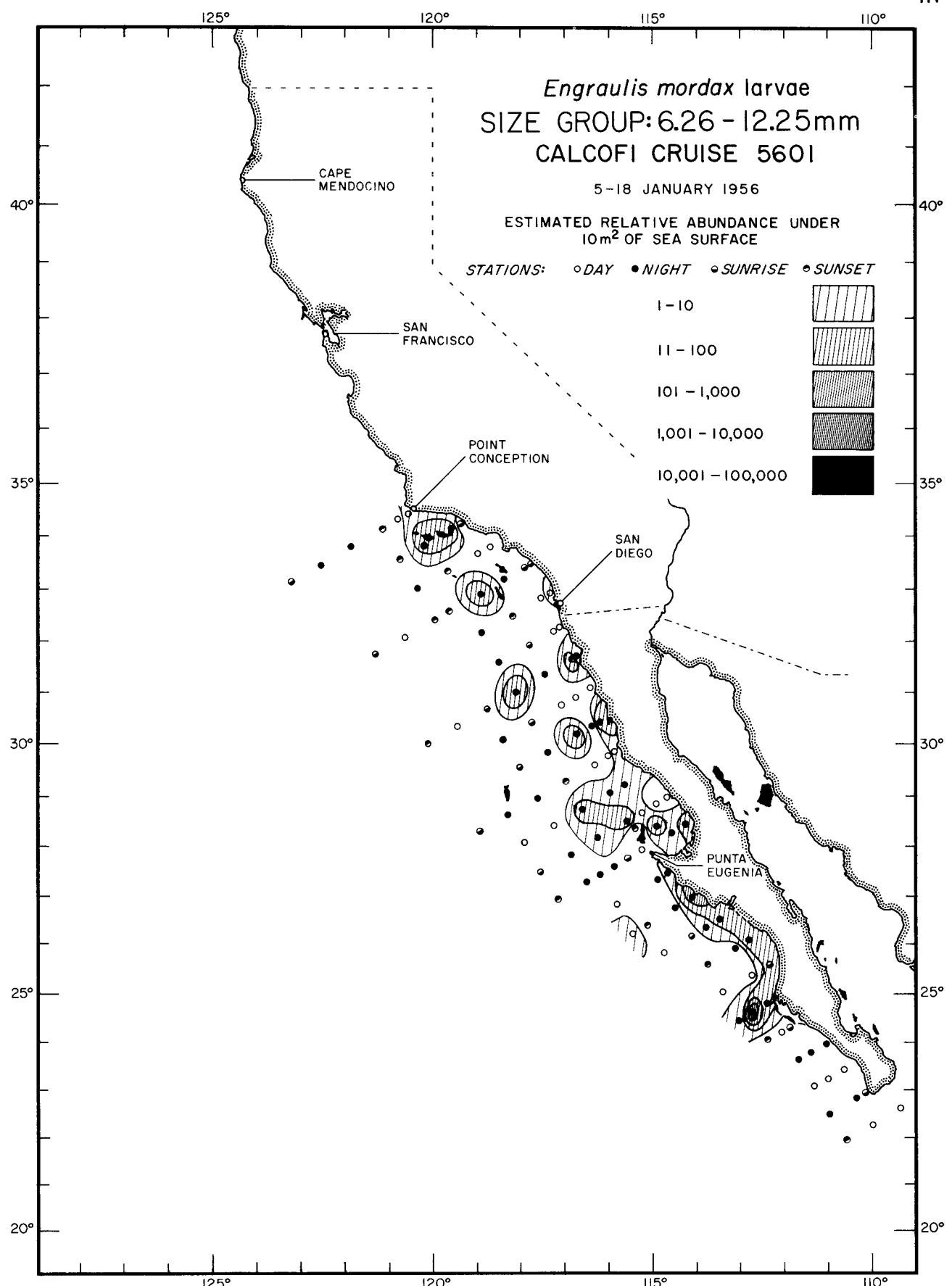
5511



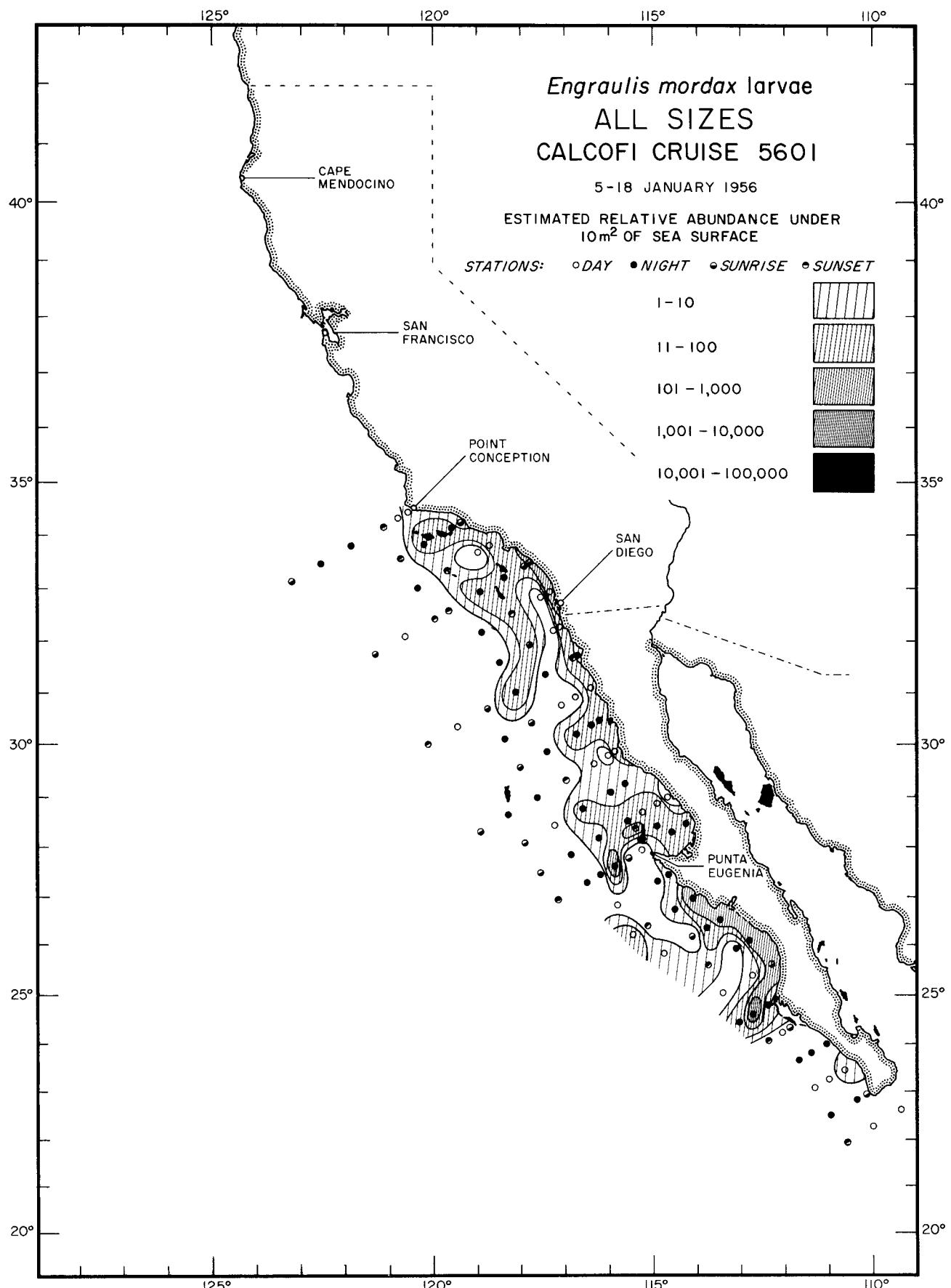
Engraulis mordax larvae
Size Group: 6.26-12.25mm
5512



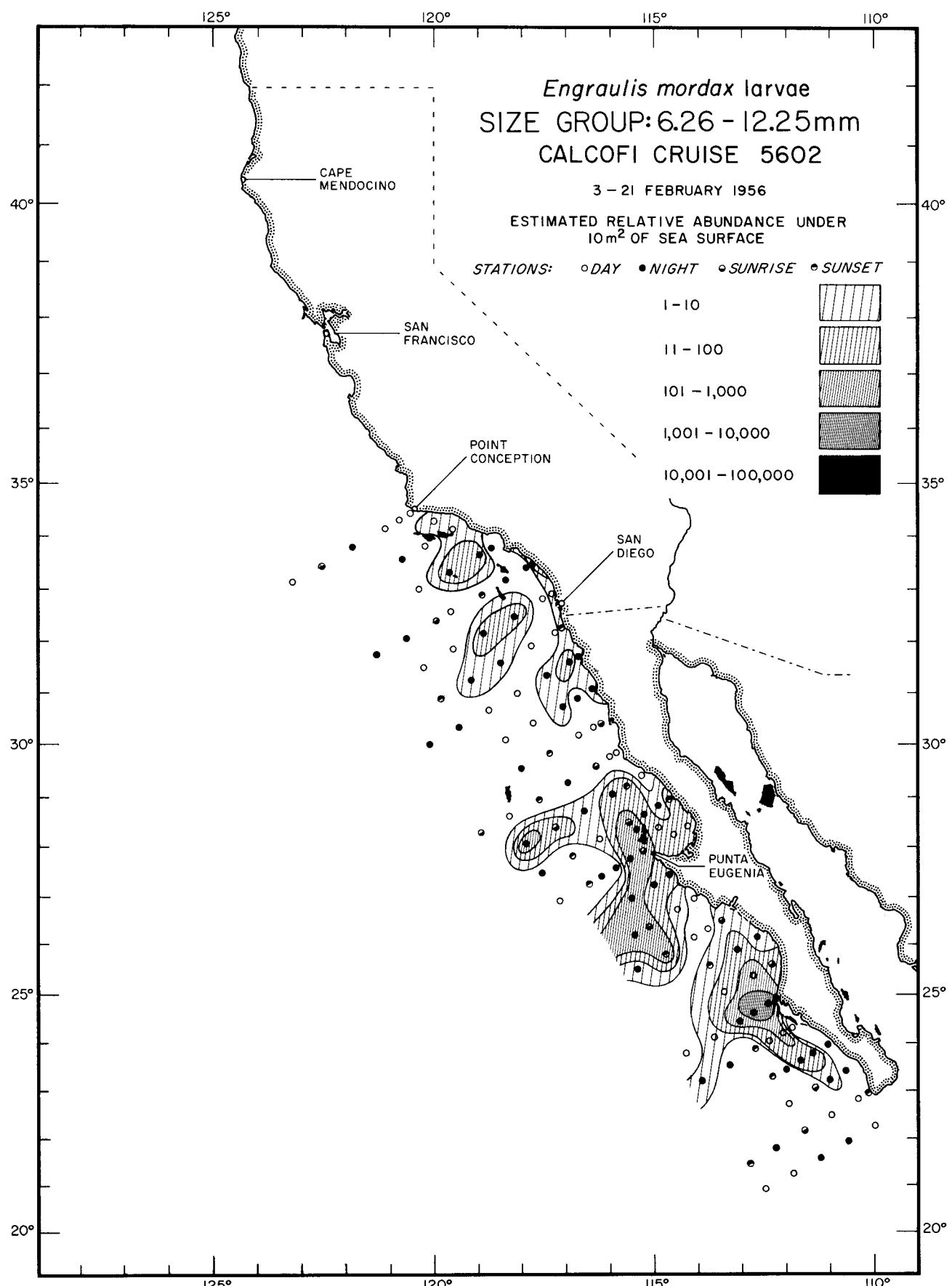
Engraulis mordax larvae
All Sizes
5512



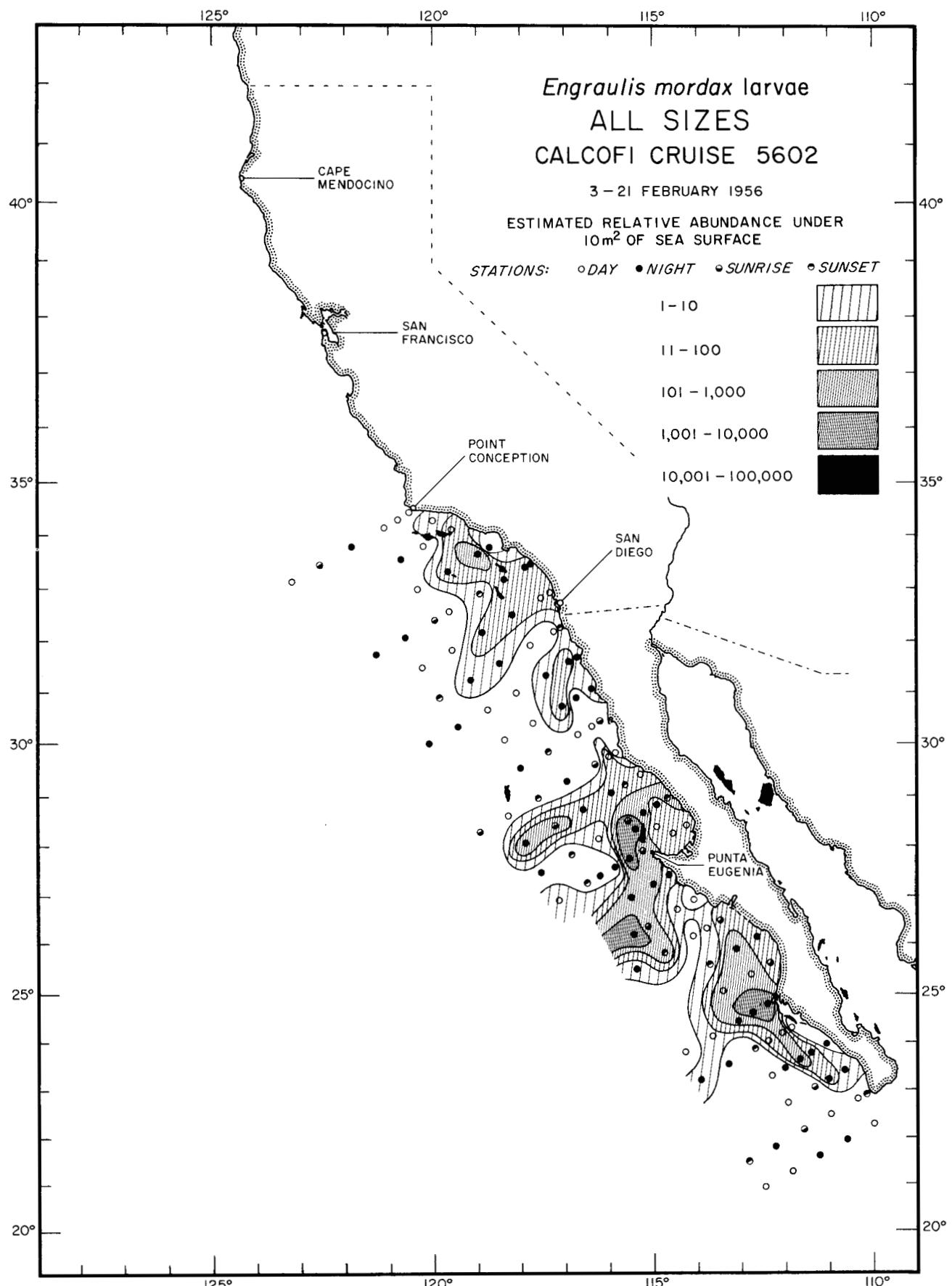
Engraulis mordax larvae
Size Group: 6.26-12.25mm
5601



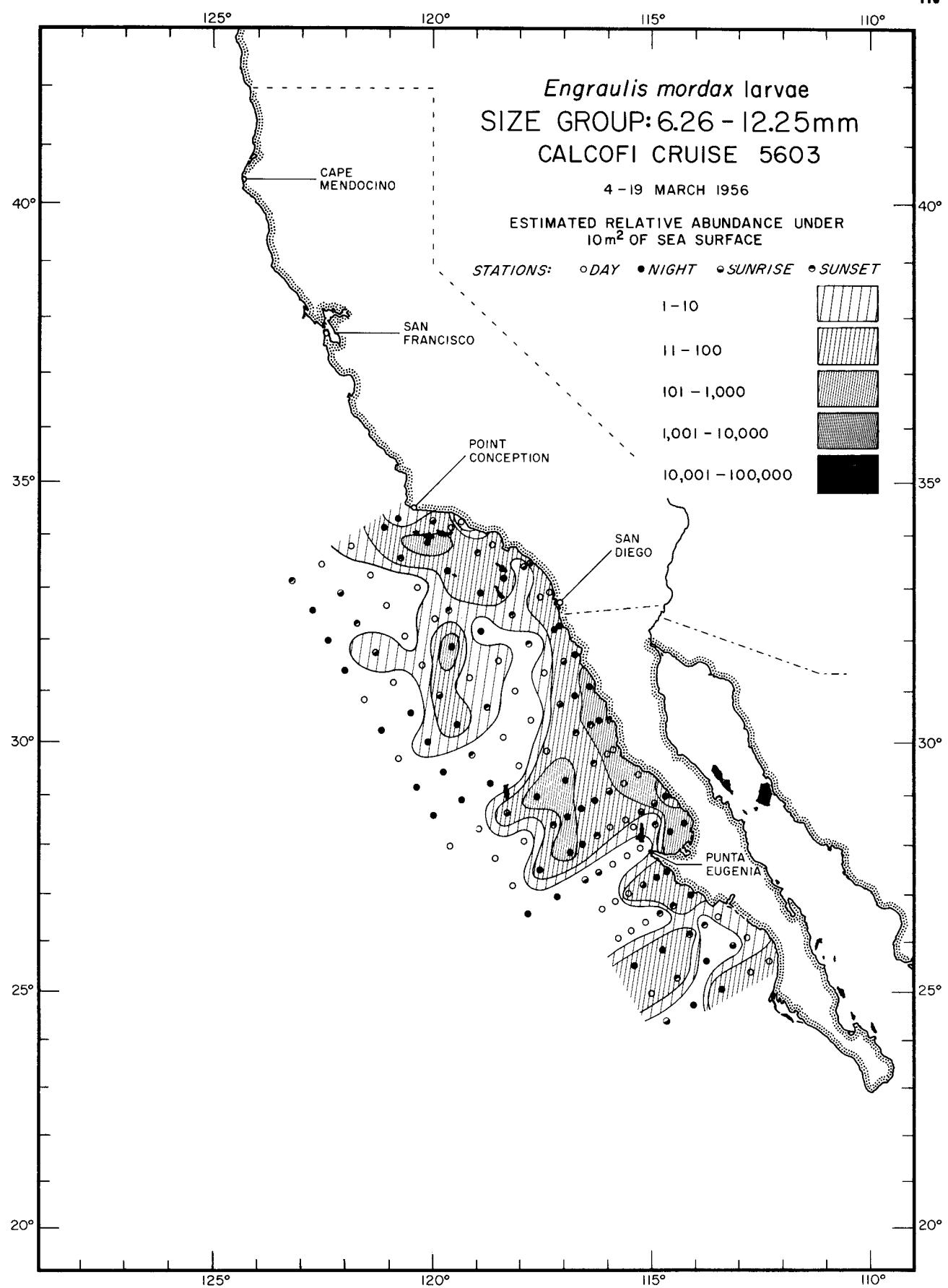
Engraulis mordax larvae
All Sizes
5601



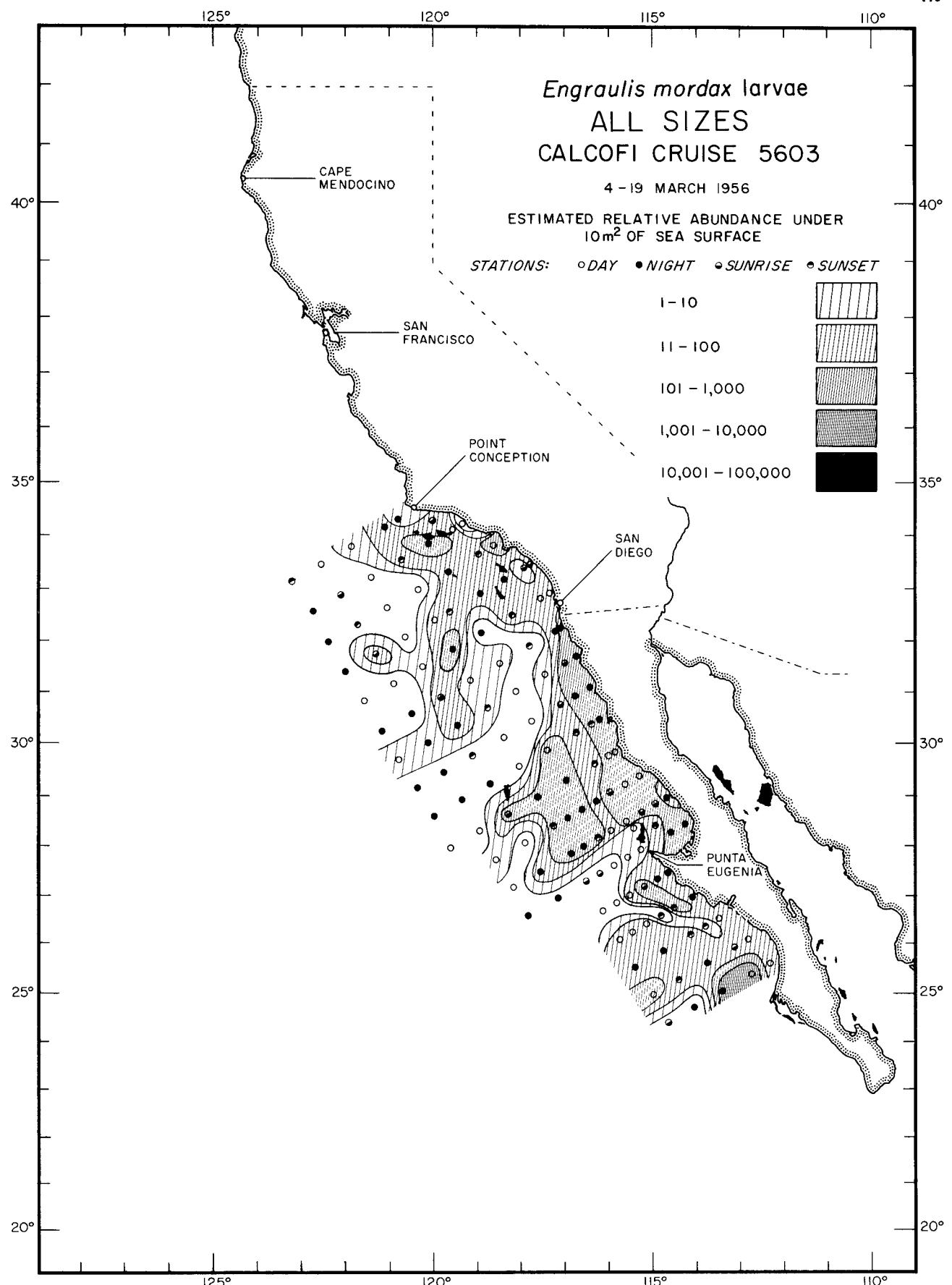
Engraulis mordax larvae
Size Group: 6.26-12.25mm
5602



Engraulis mordax larvae
All Sizes
5602

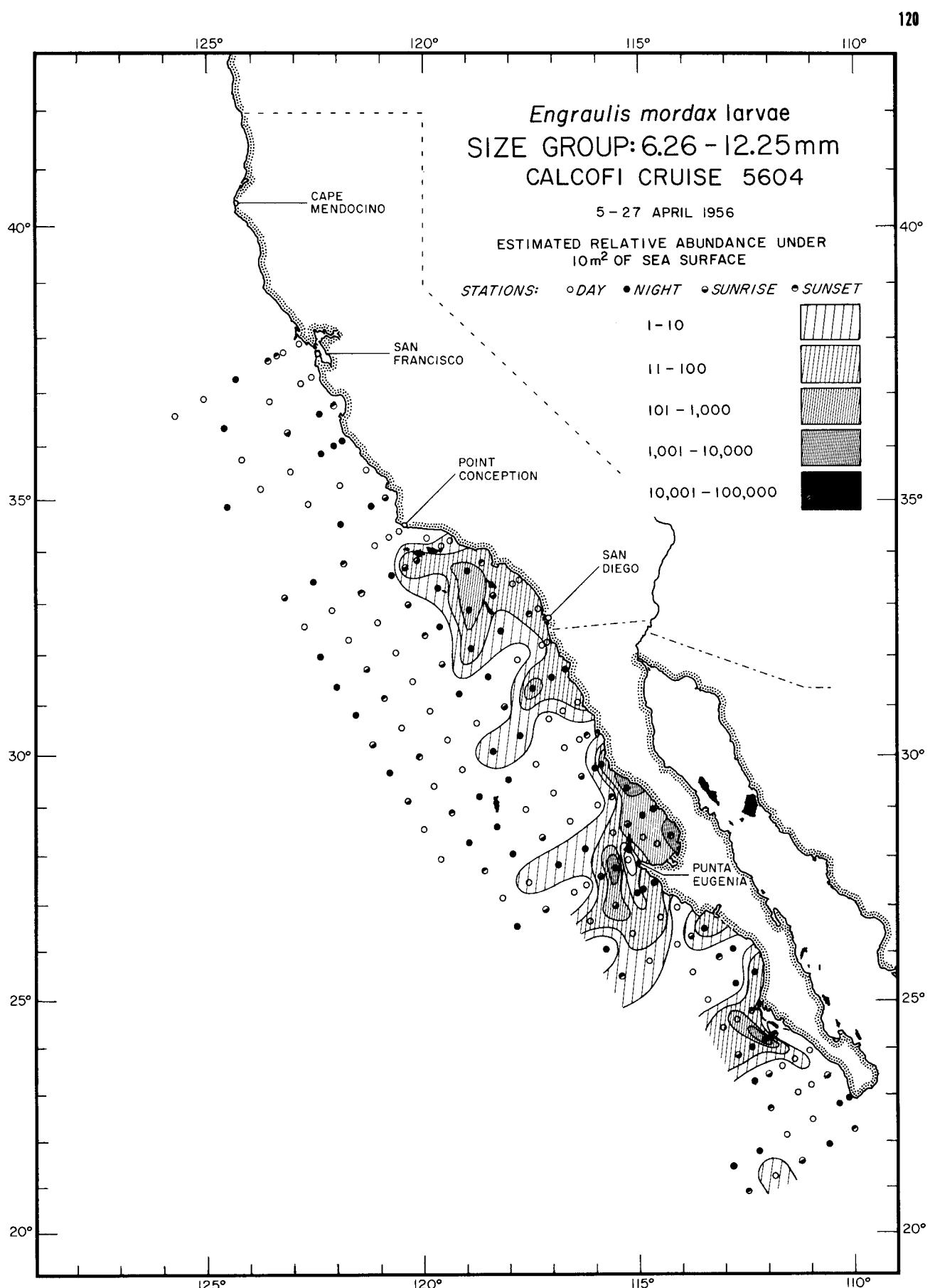


Engraulis mordax larvae
Size Group: 6.26-12.25mm
5603

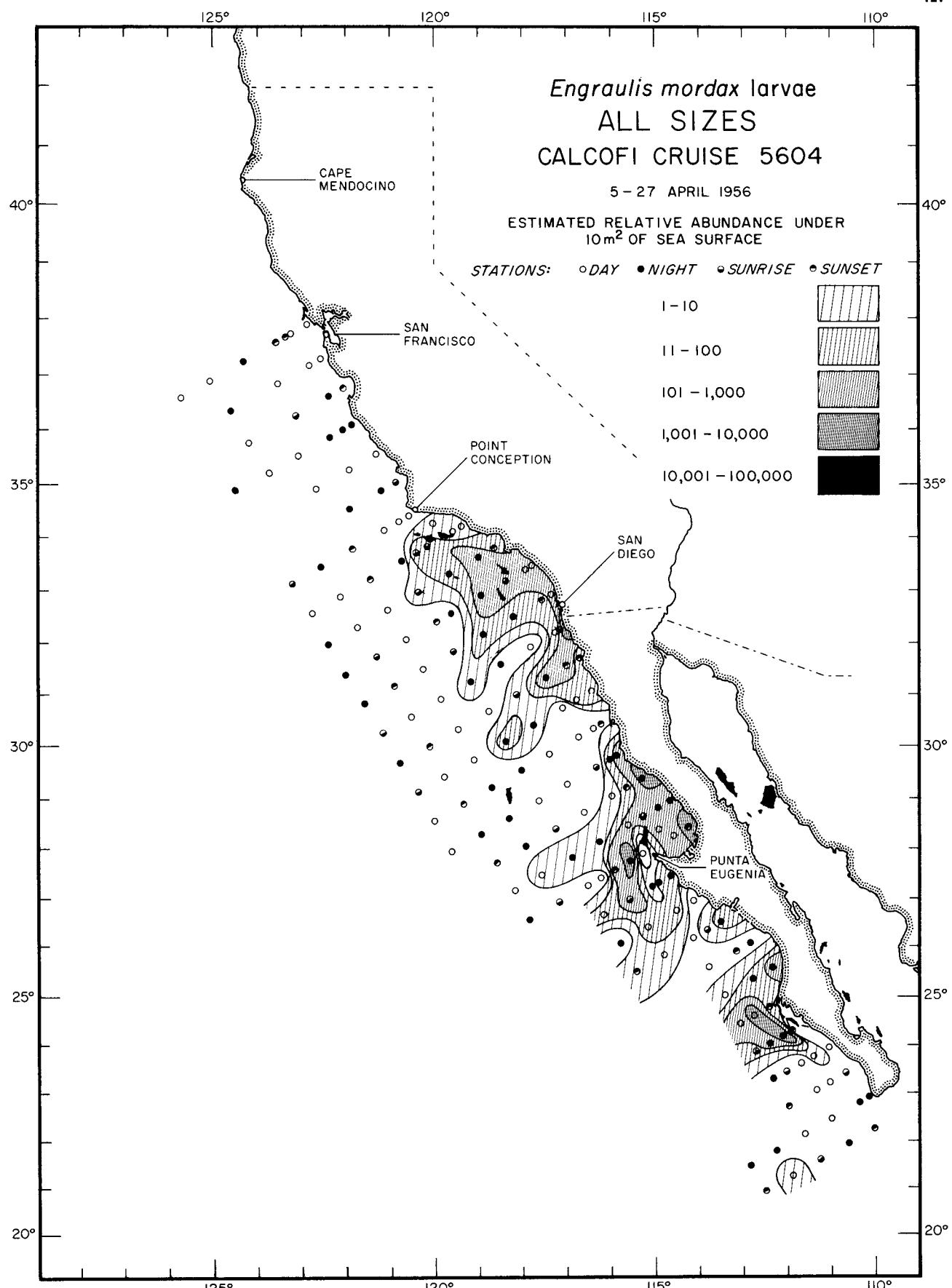
*Engraulis mordax* larvae

All Sizes

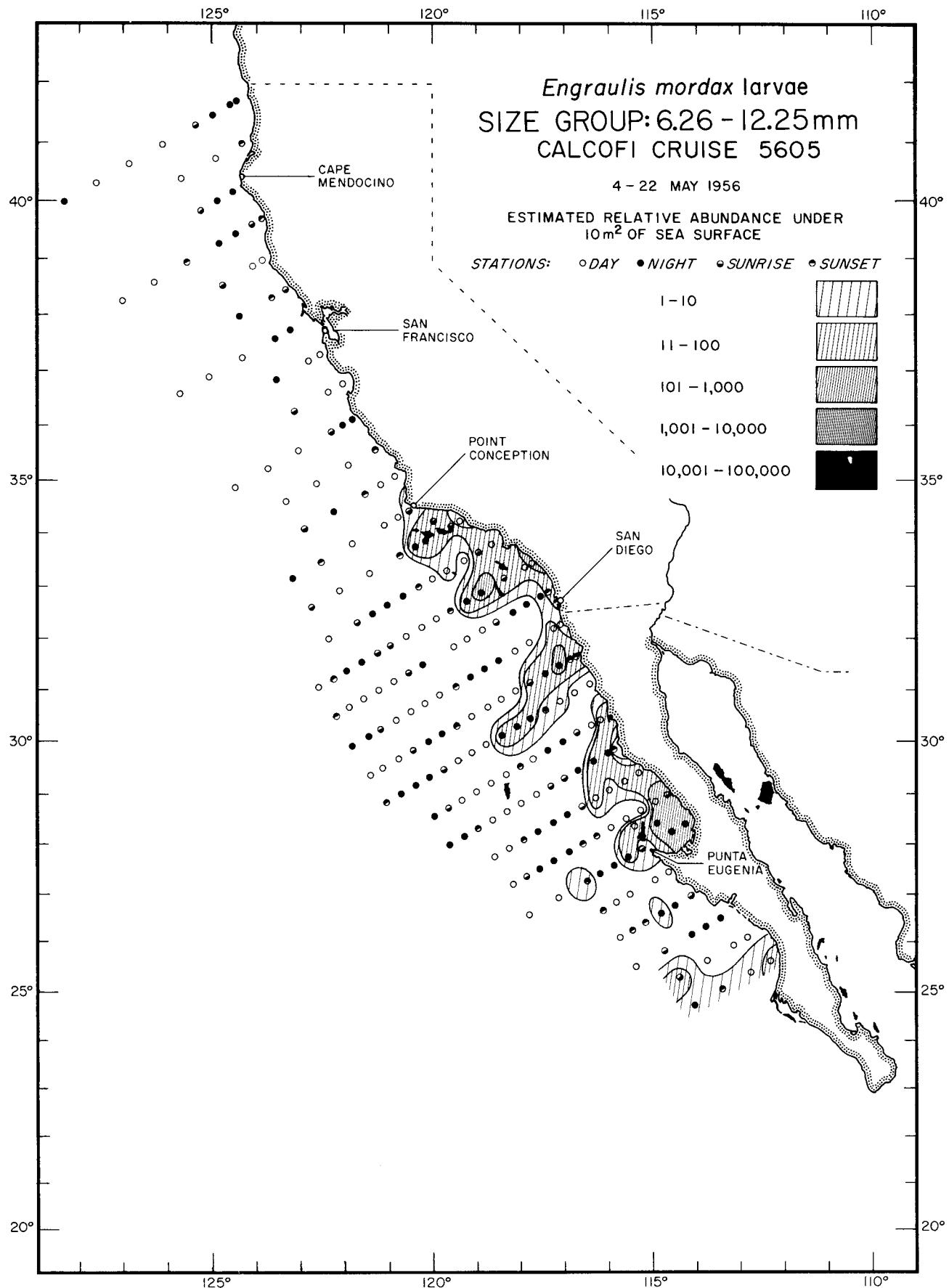
5603



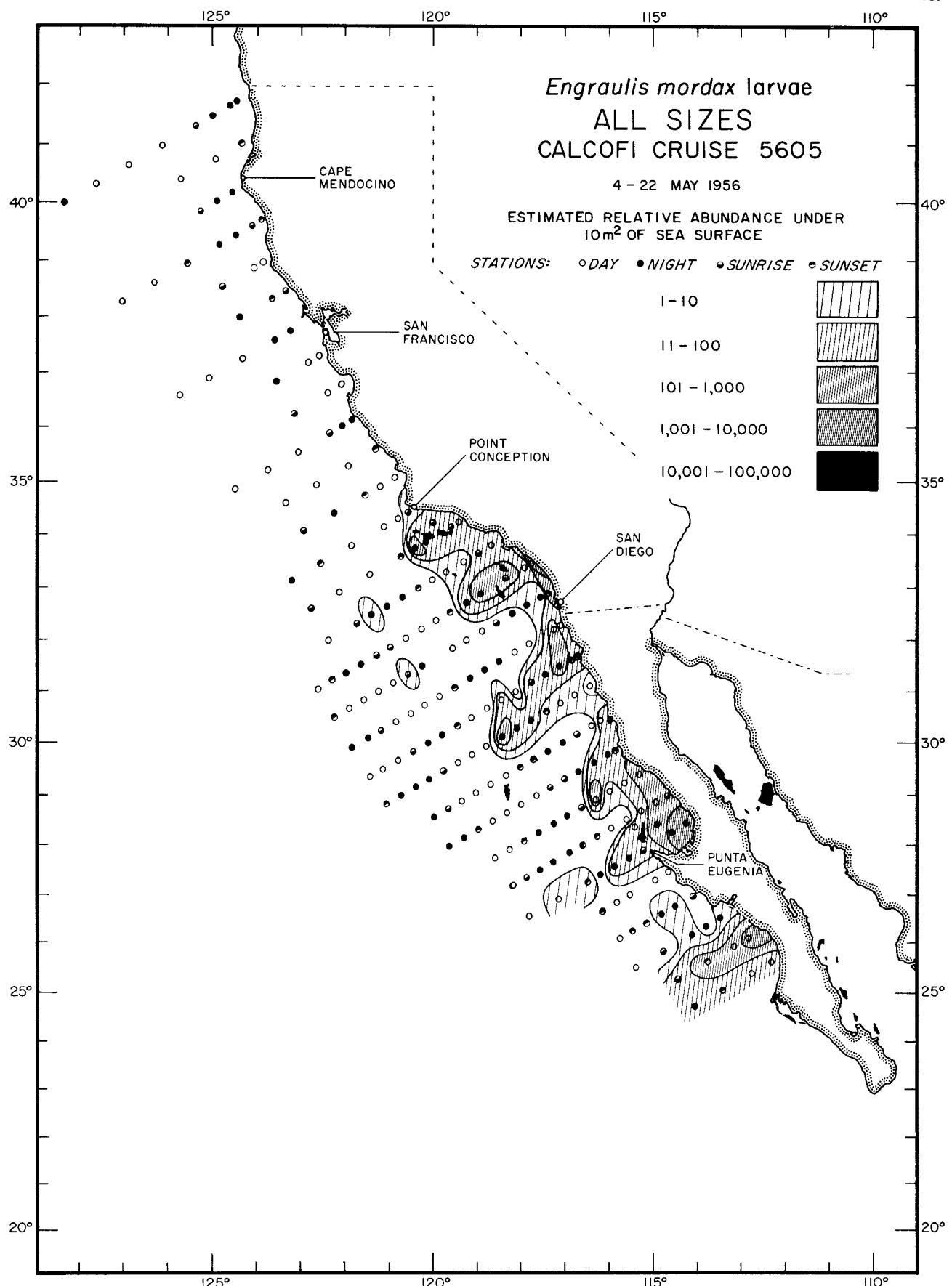
Engraulis mordax larvae
Size Group: 6.26-12.25mm
5604



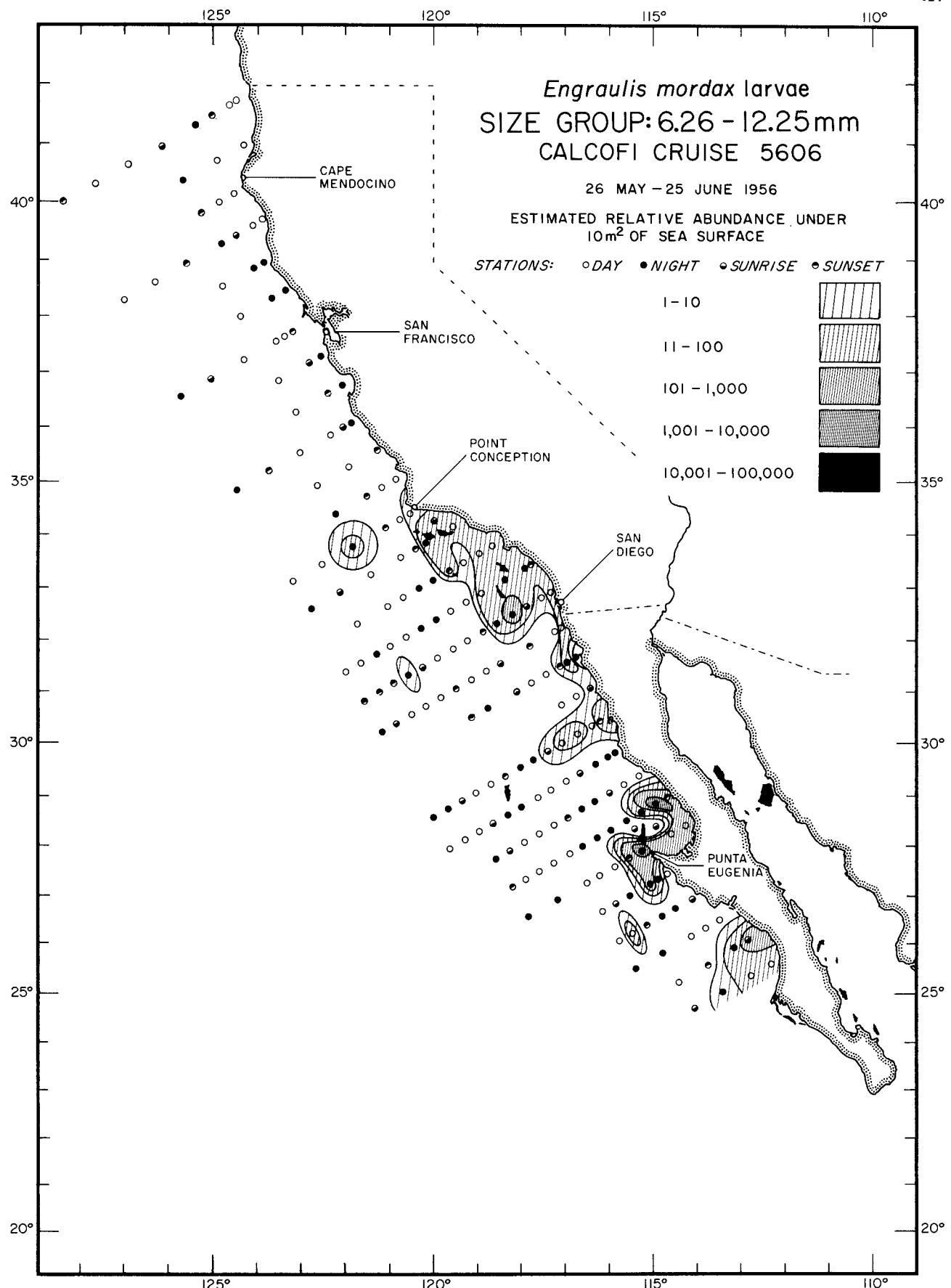
Engraulis mordax larvae
All Sizes
5604



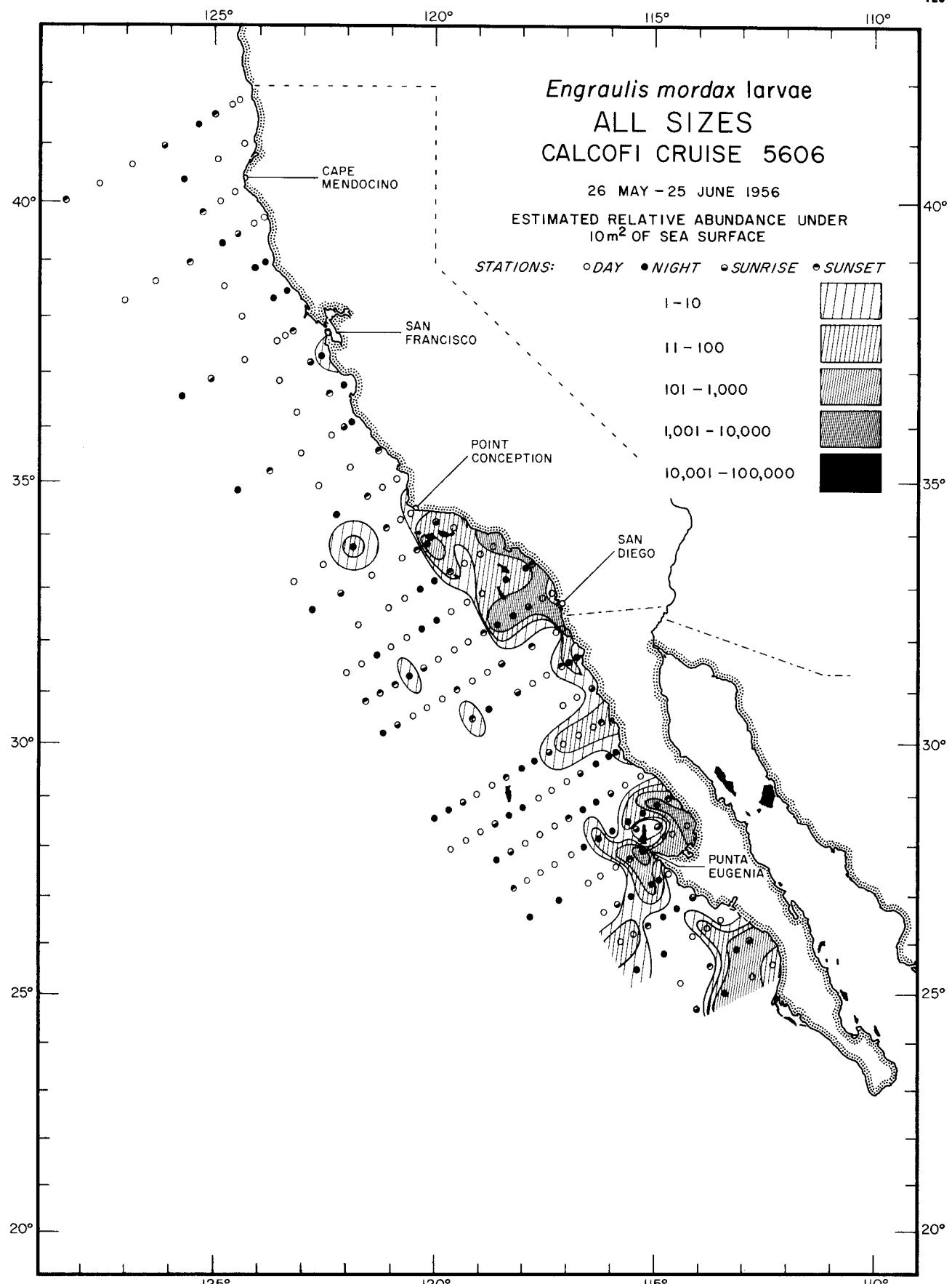
Engraulis mordax larvae
Size Group: 6.26-12.25mm
5605



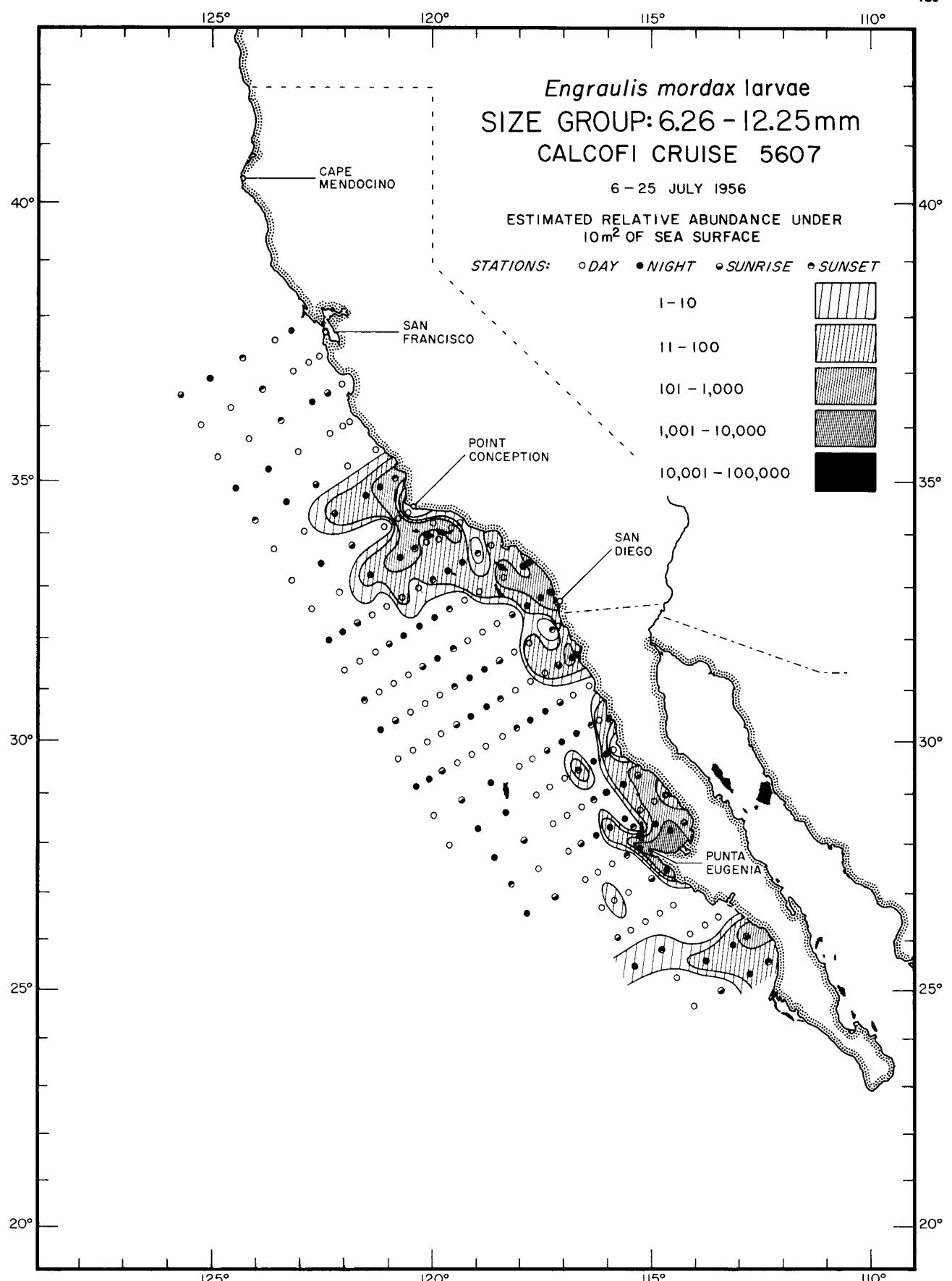
Engraulis mordax larvae
All Sizes
5605



Engraulis mordax larvae
Size Group: 6.26-12.25mm
5606



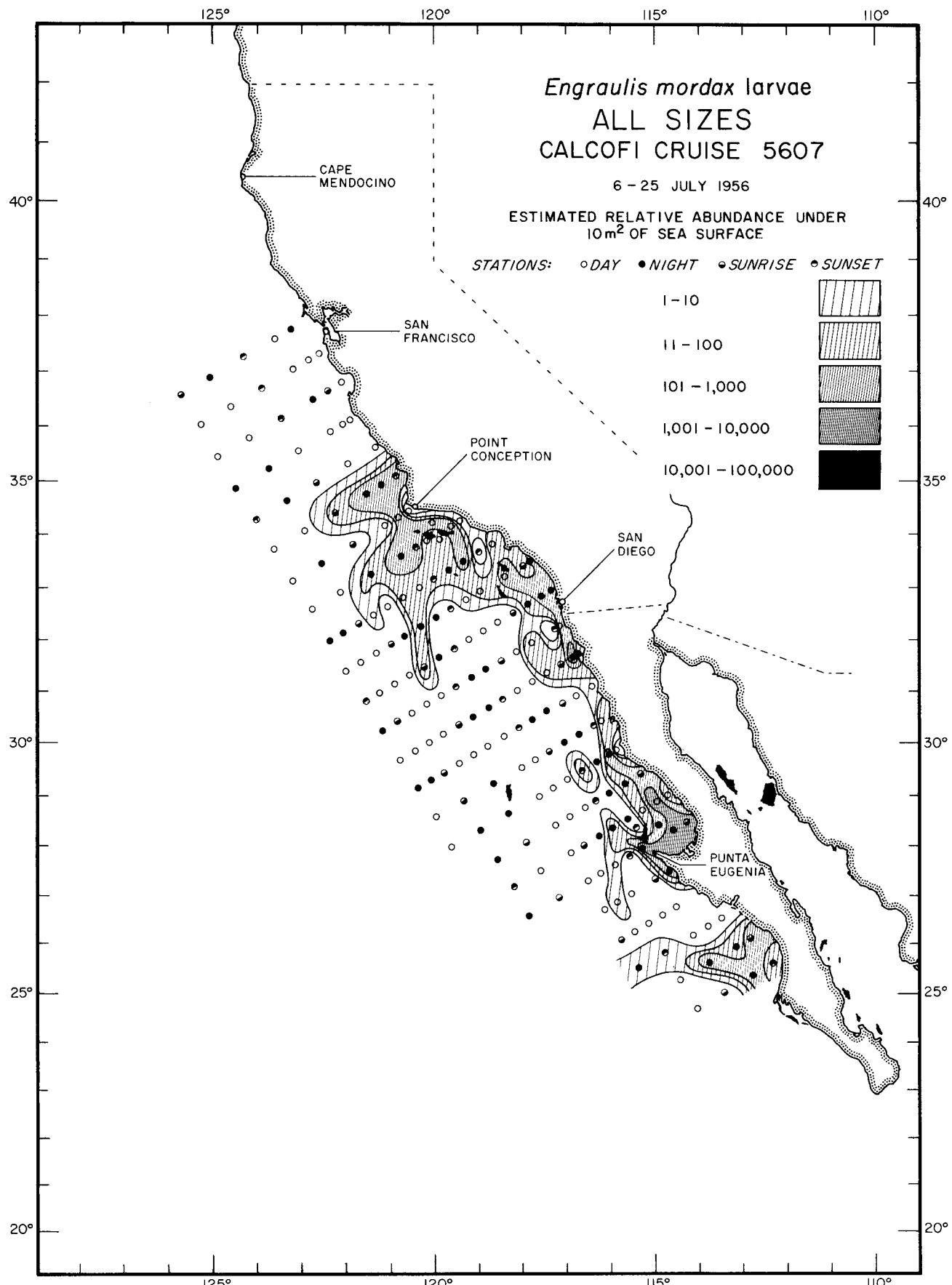
Engraulis mordax larvae
All Sizes
5606



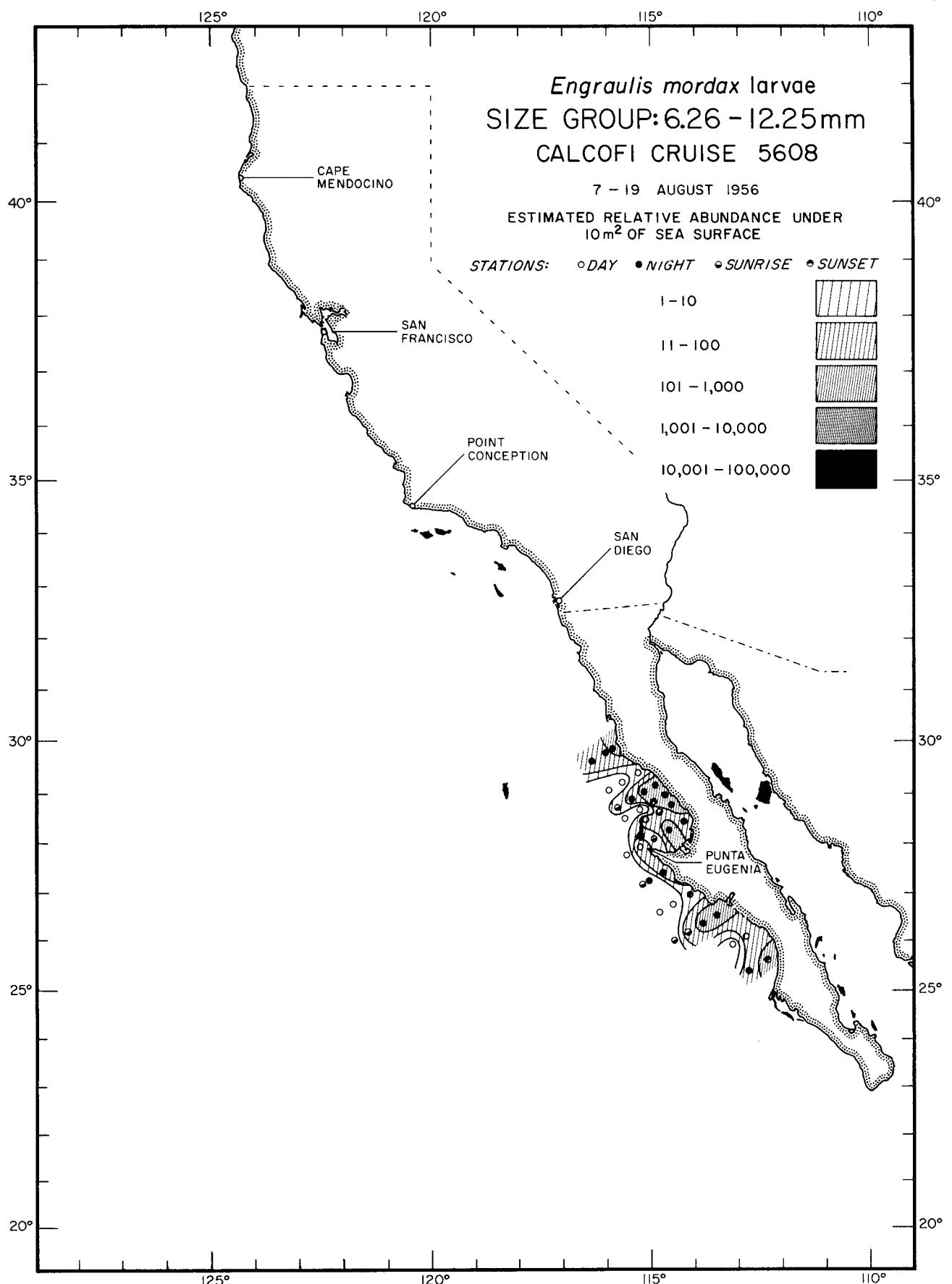
Engraulis mordax larvae

Size Group: 6.26-12.25mm

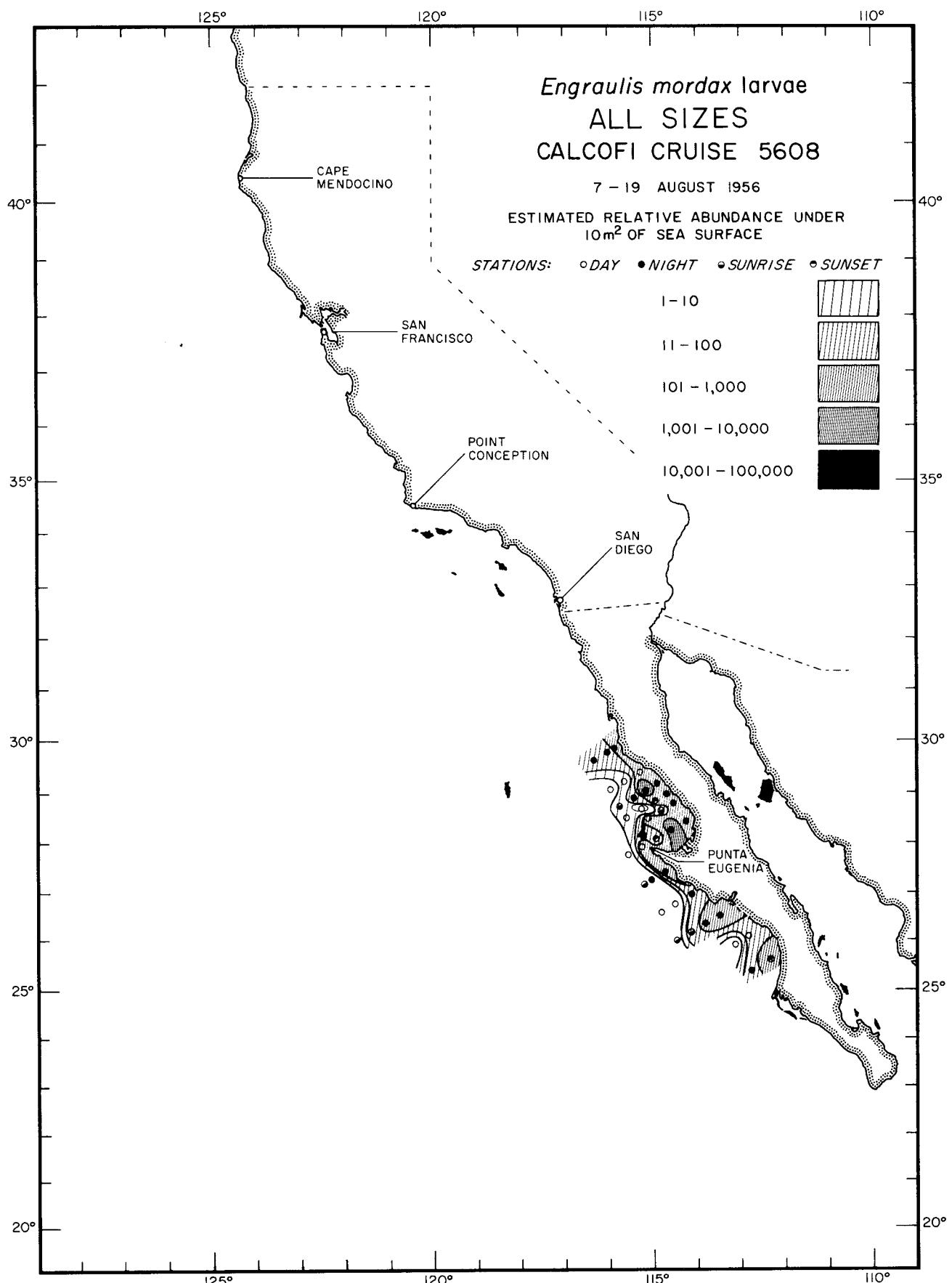
5607



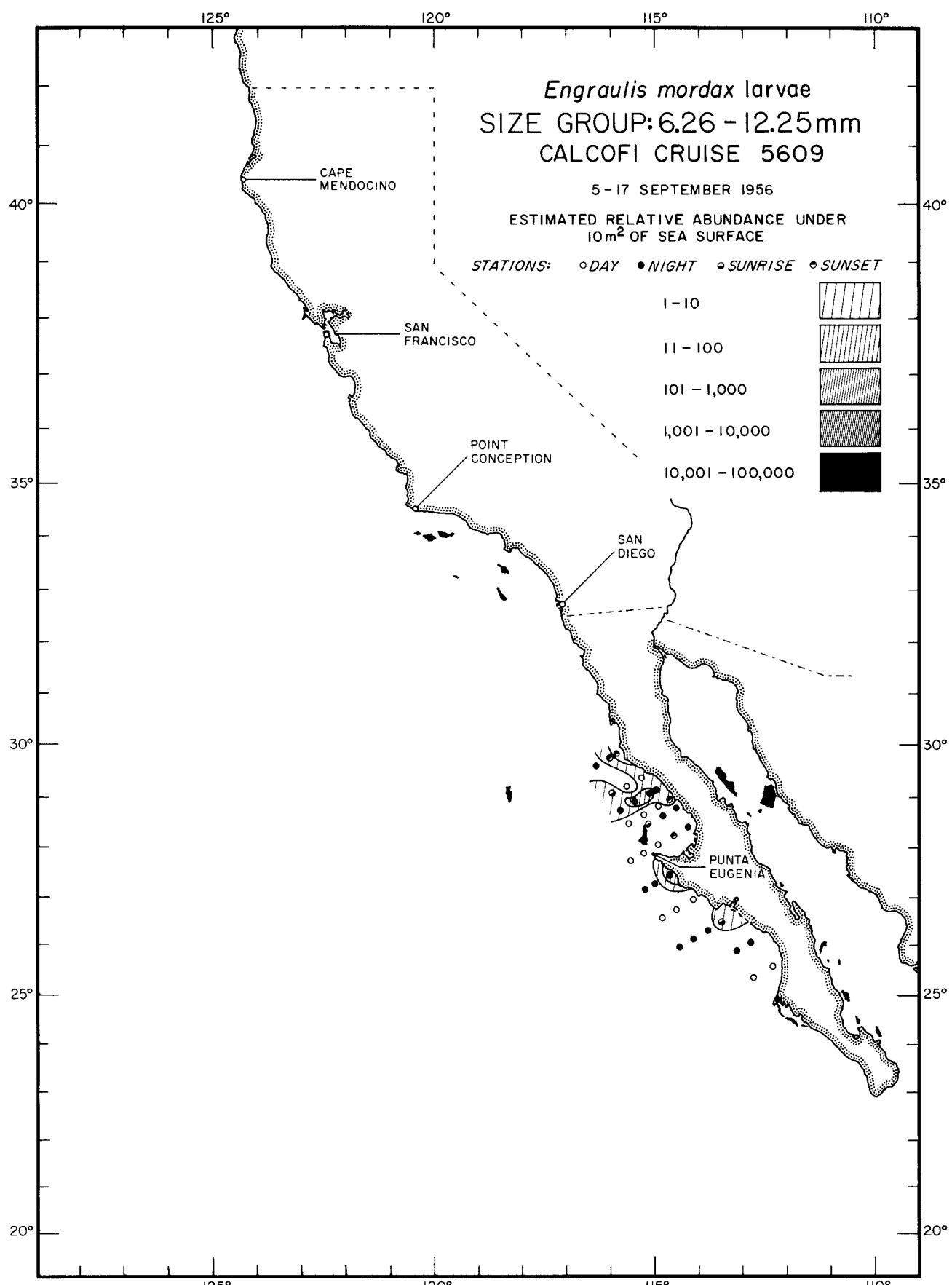
Engraulis mordax larvae
All Sizes
5607



Engraulis mordax larvae
 Size Group: 6.26-12.25mm
 5608



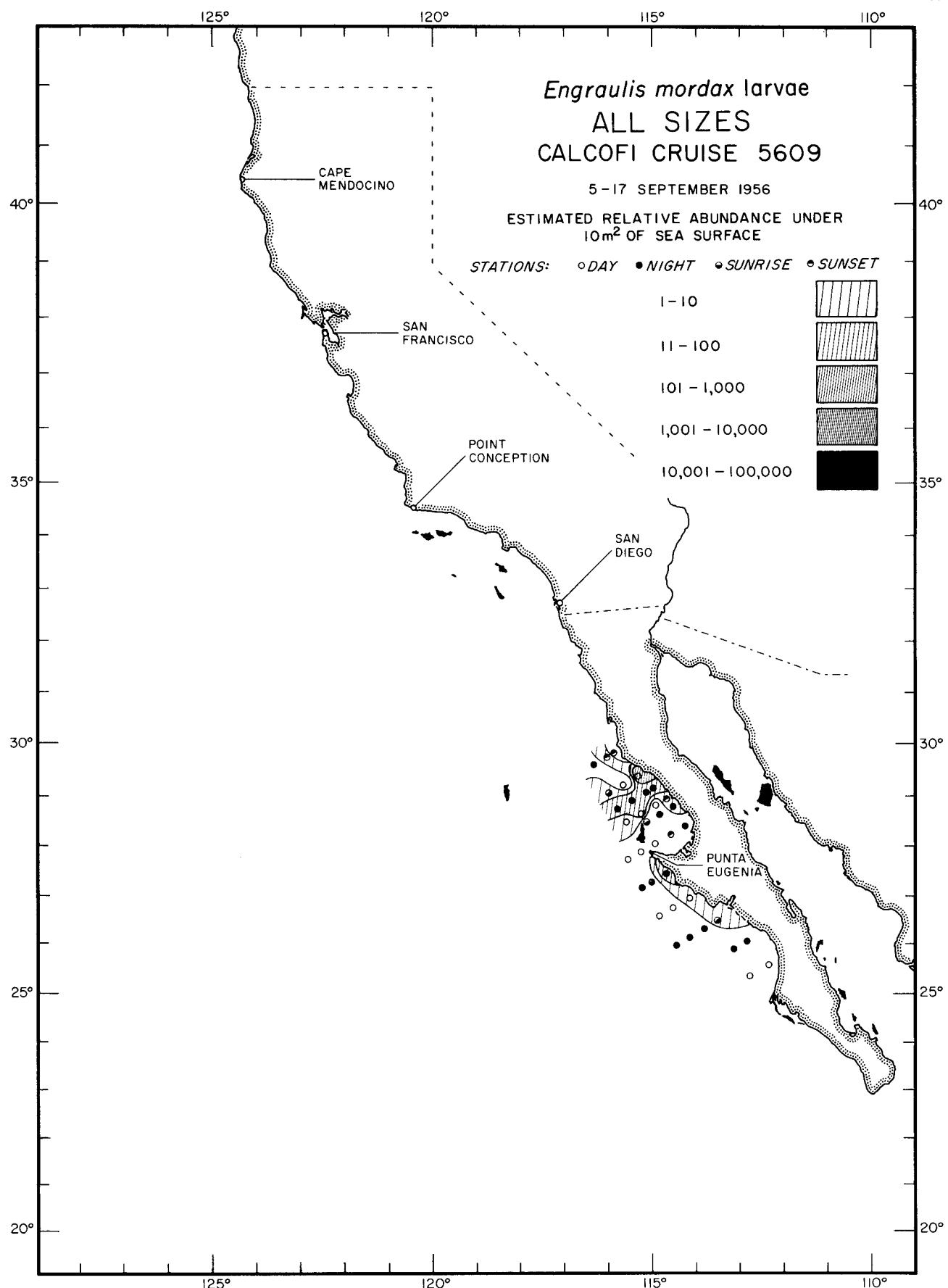
Engraulis mordax larvae
All Sizes
5608



Engraulis mordax larvae

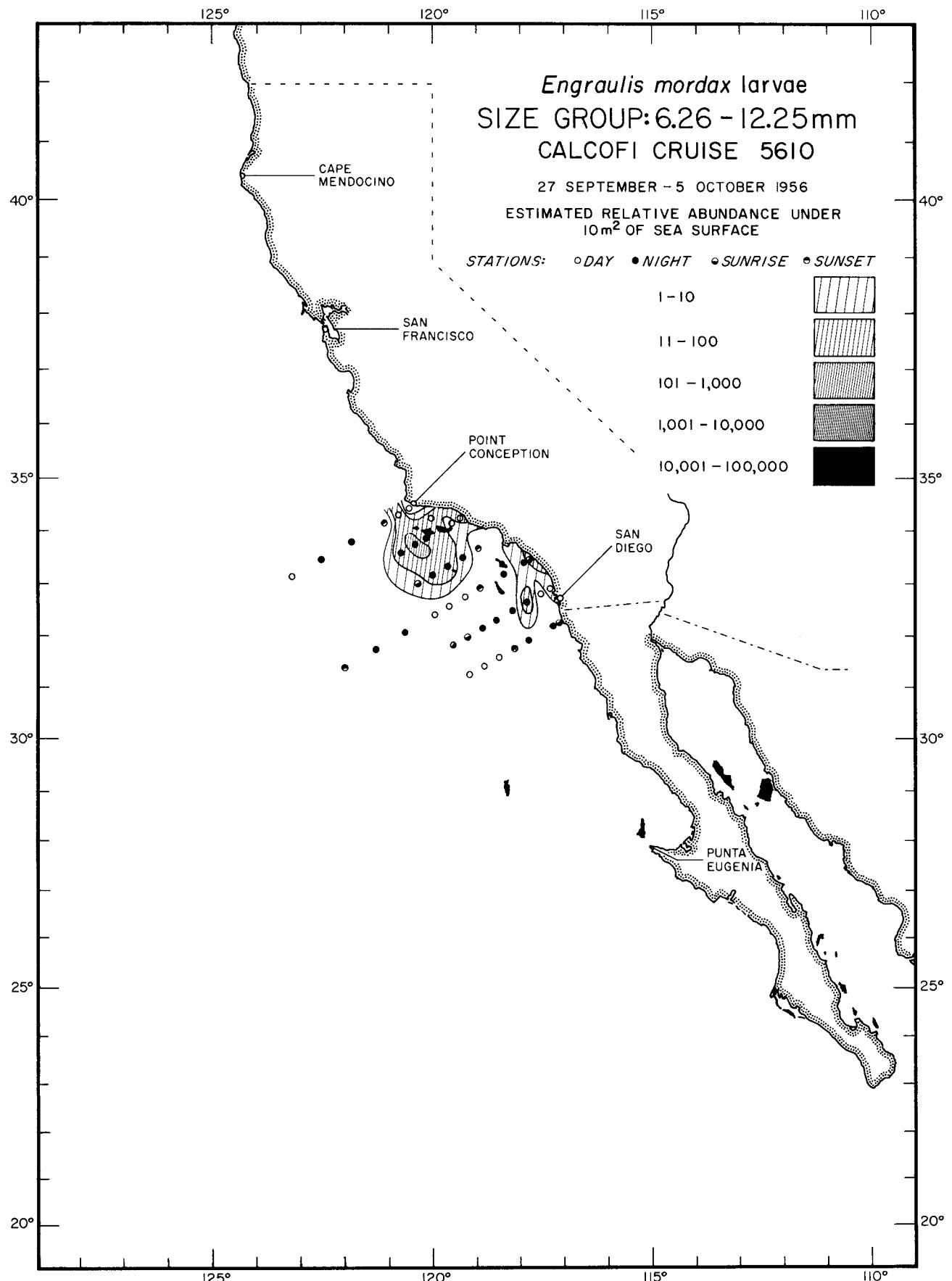
Size Group: 6.26-12.25mm

5609

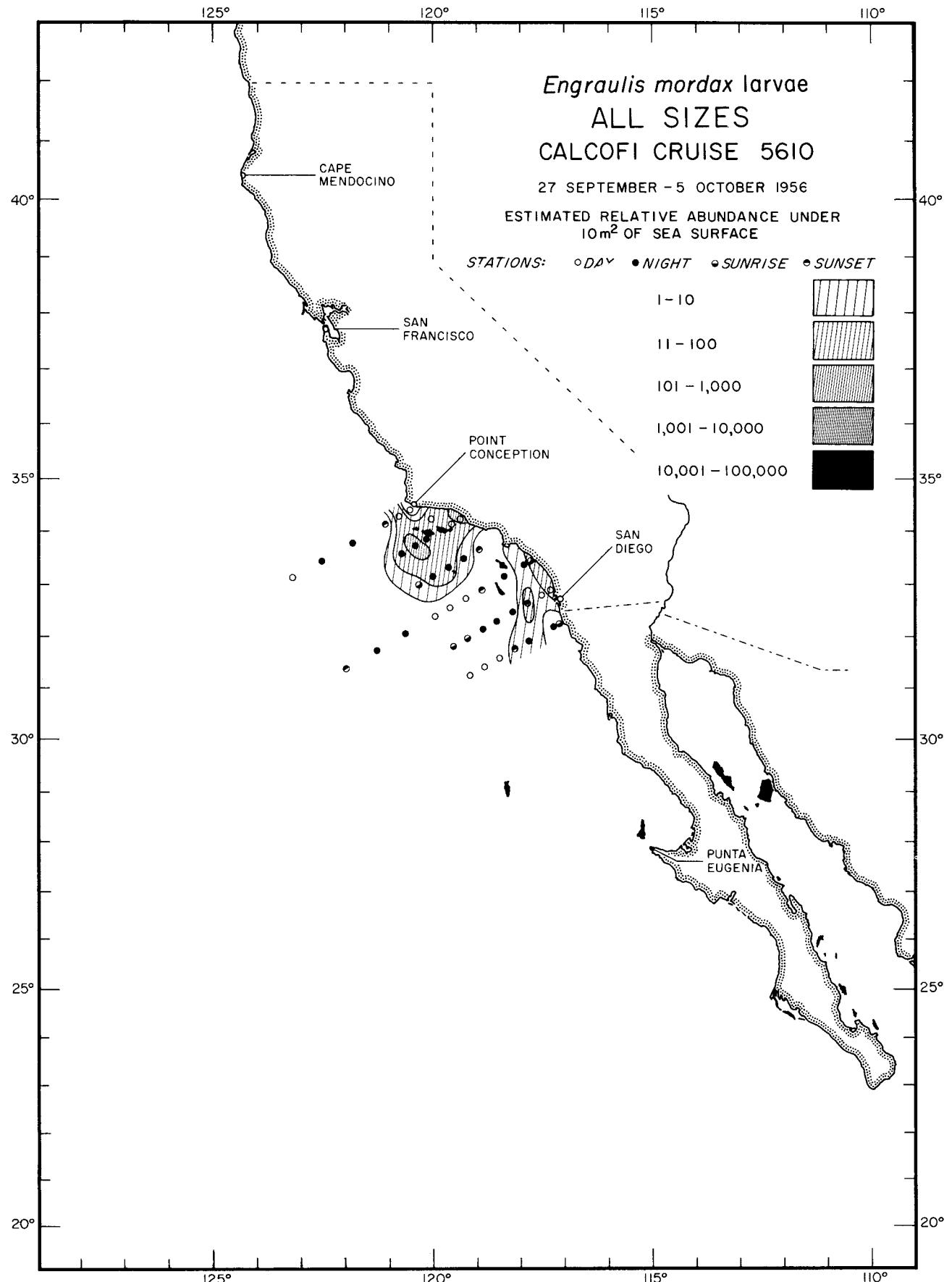
*Engraulis mordax* larvae

All Sizes

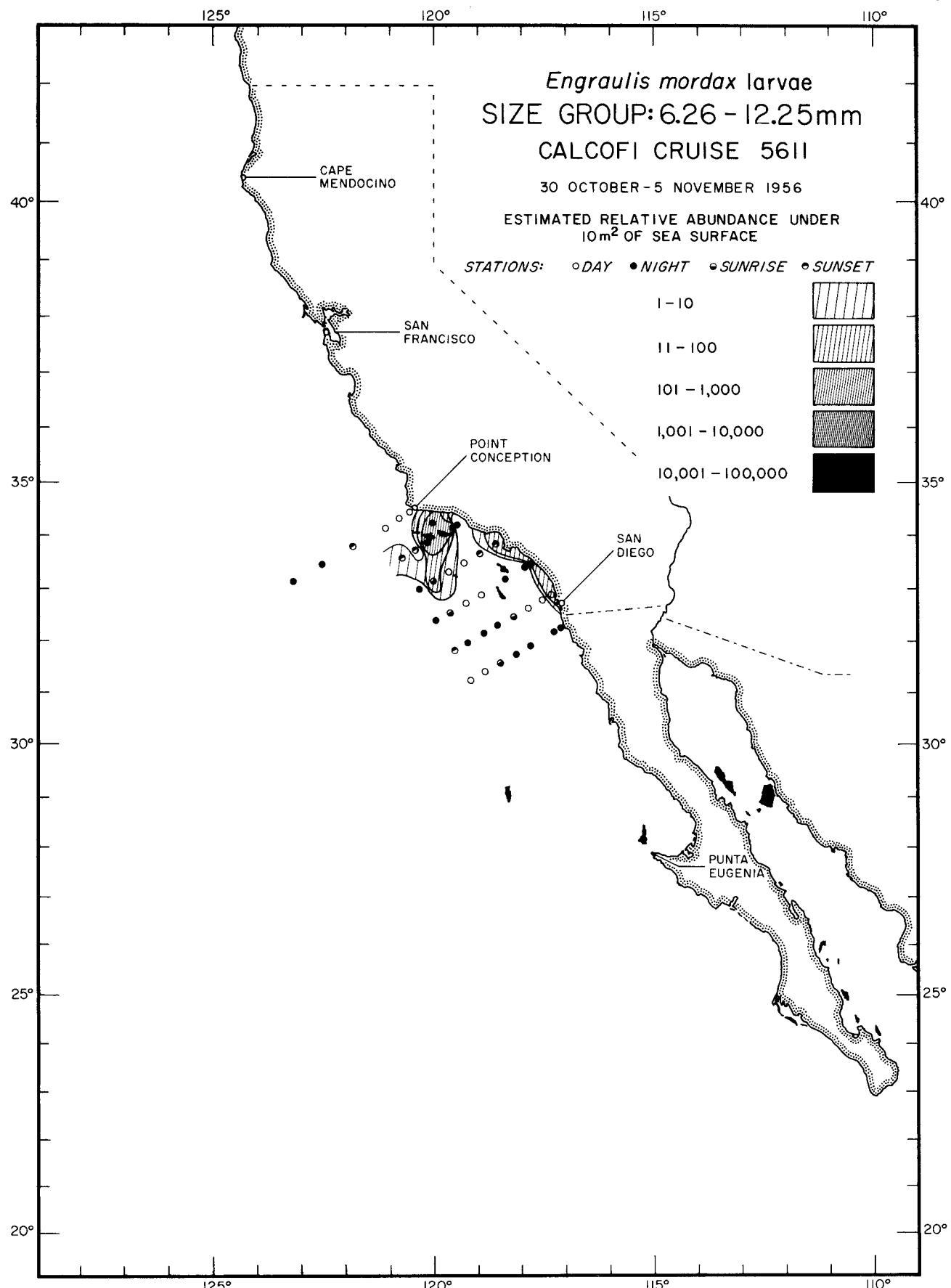
5609



Engraulis mordax larvae
Size Group: 6.26-12.25mm
5610

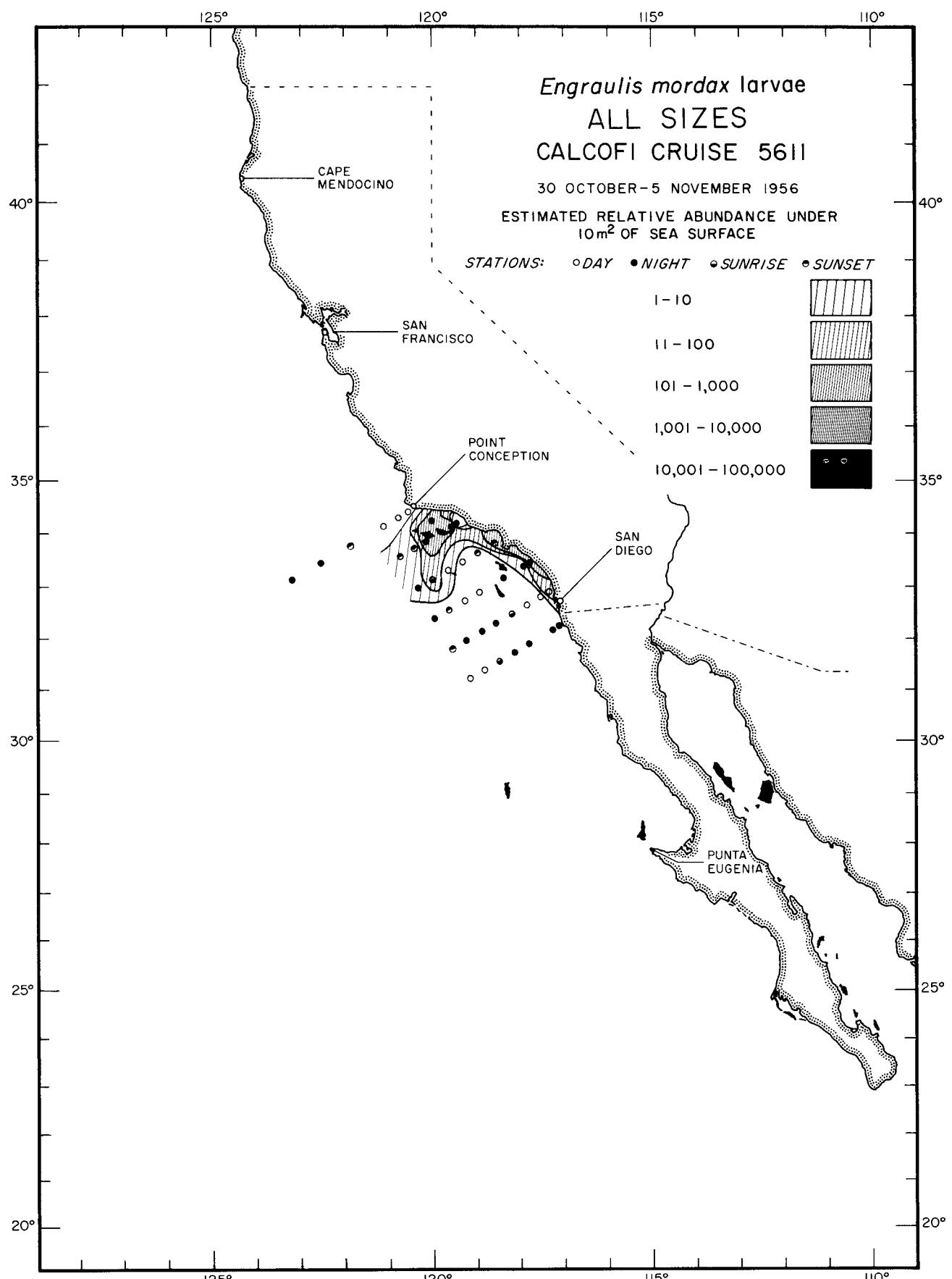


Engraulis mordax larvae
All Sizes
5610

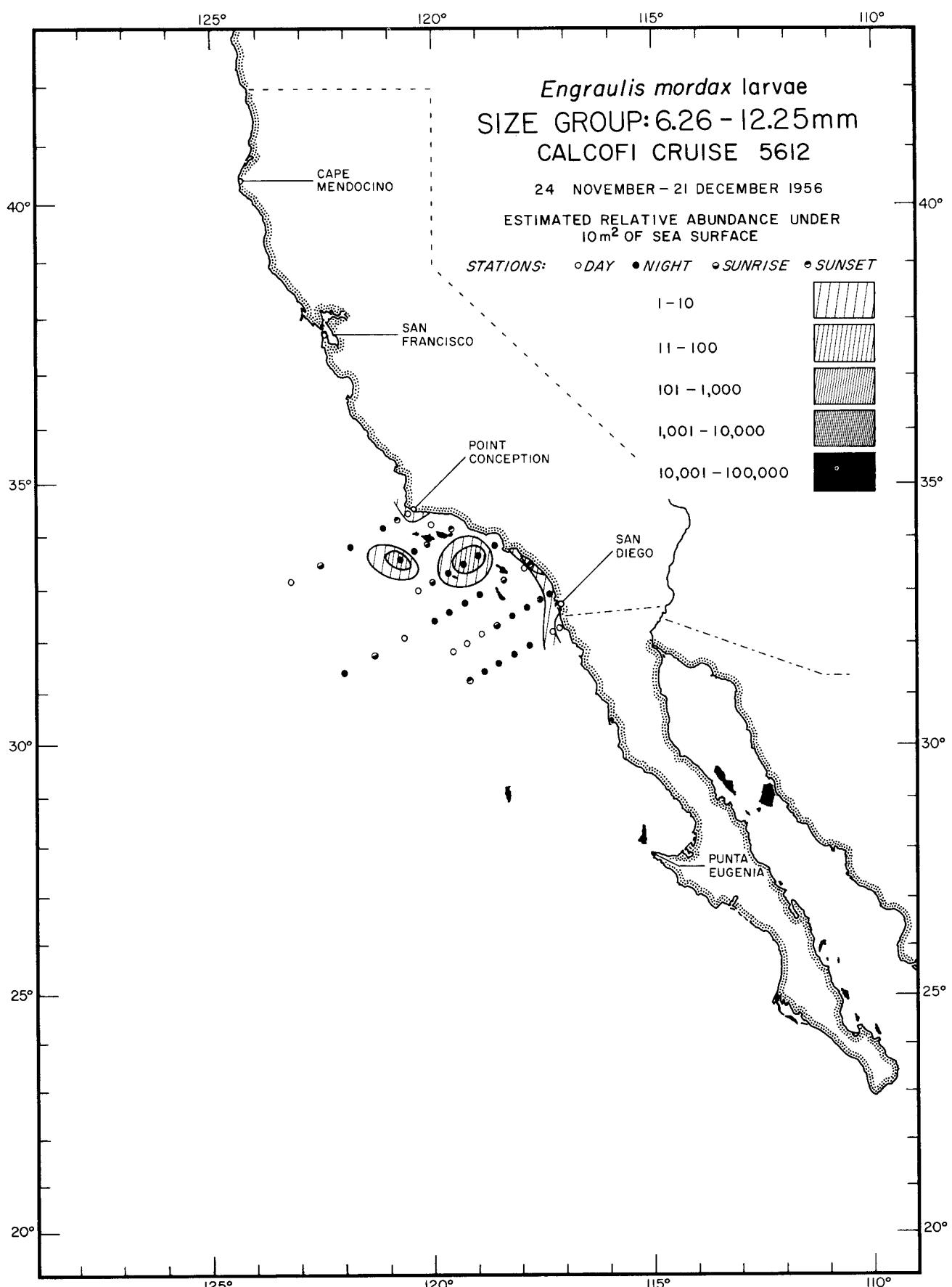
*Engraulis mordax* larvae

Size Group: 6.26-12.25mm

5611

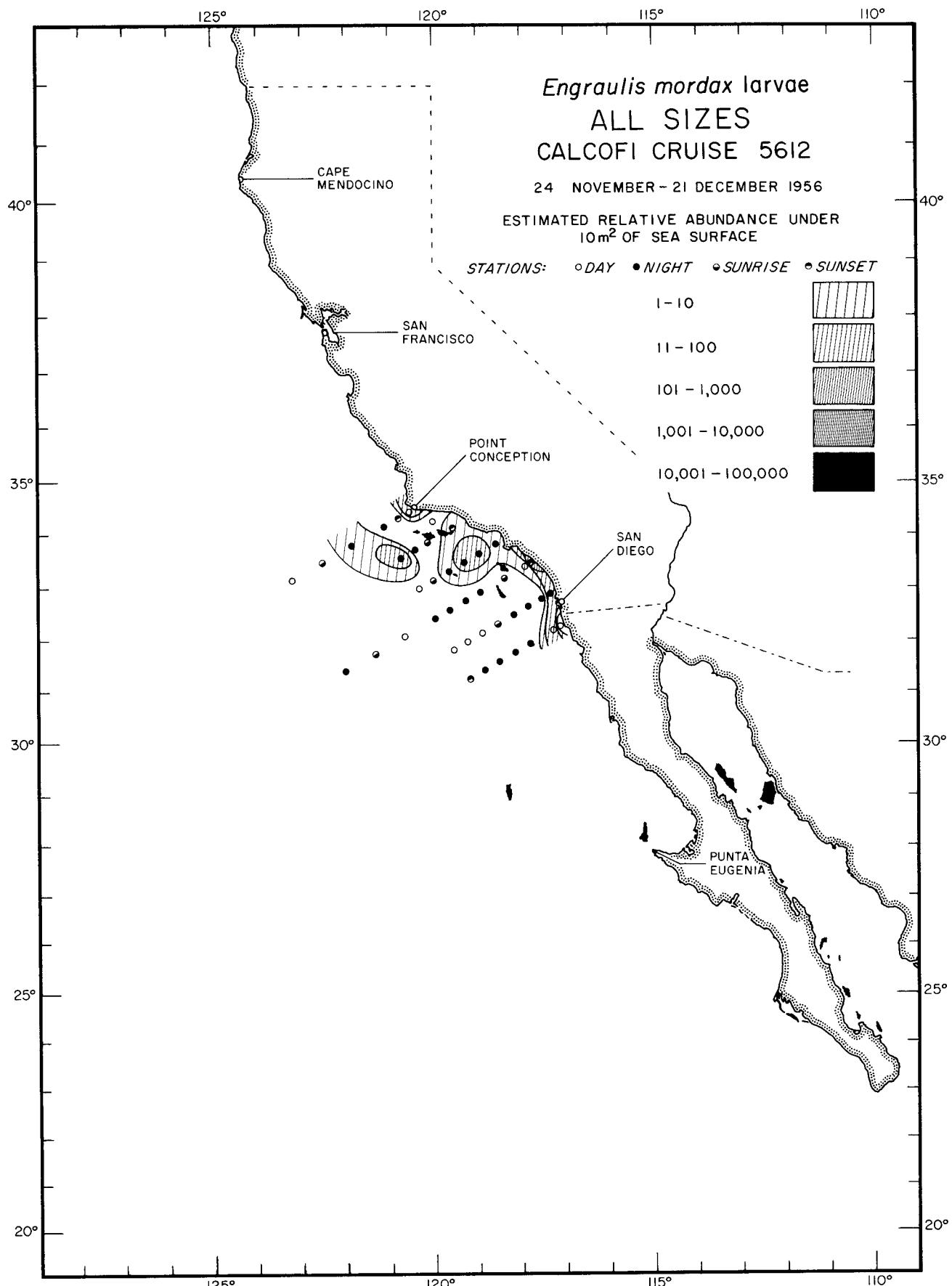


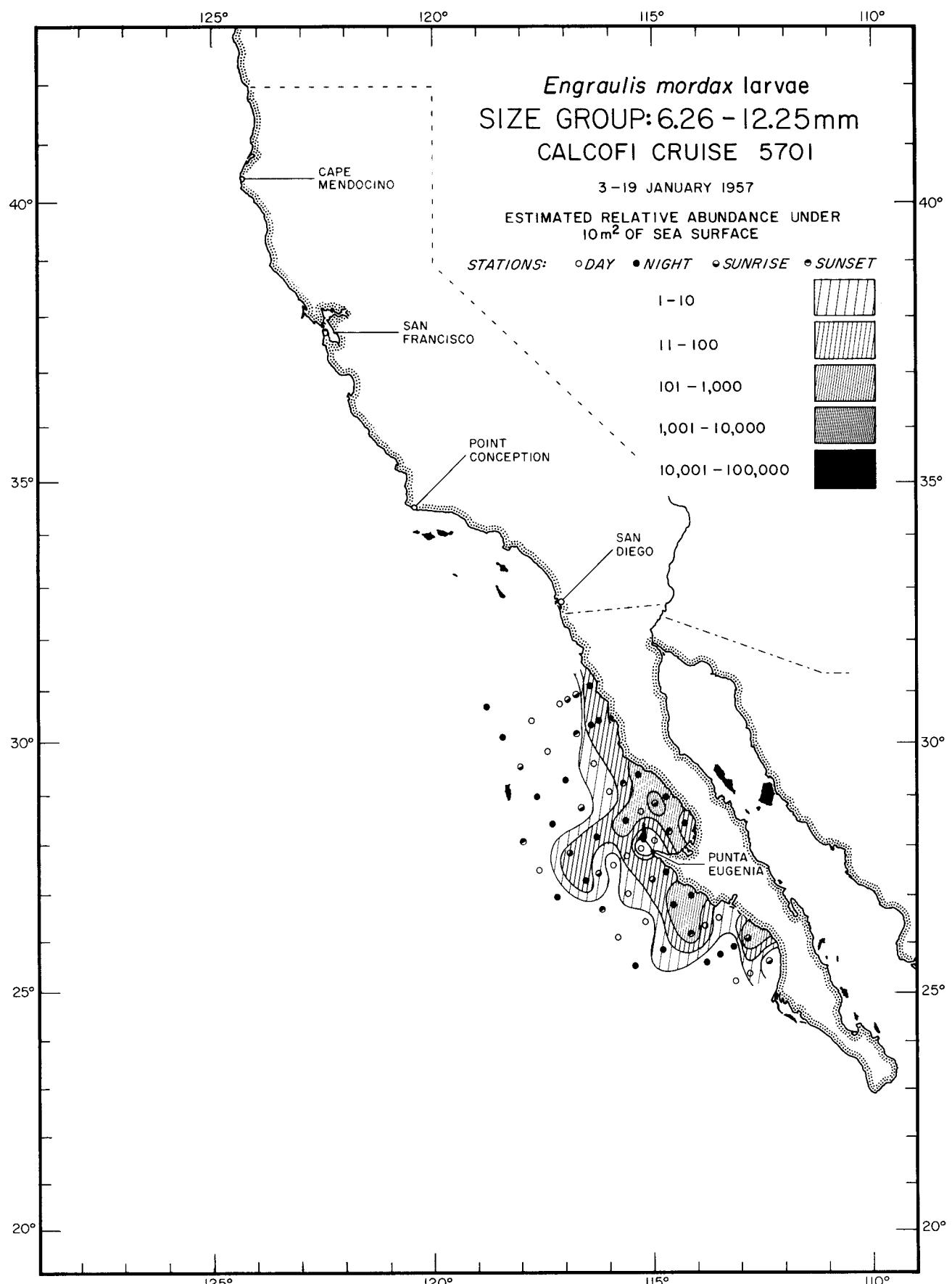
Engraulis mordax larvae
All Sizes
56II

*Engraulis mordax* larvae

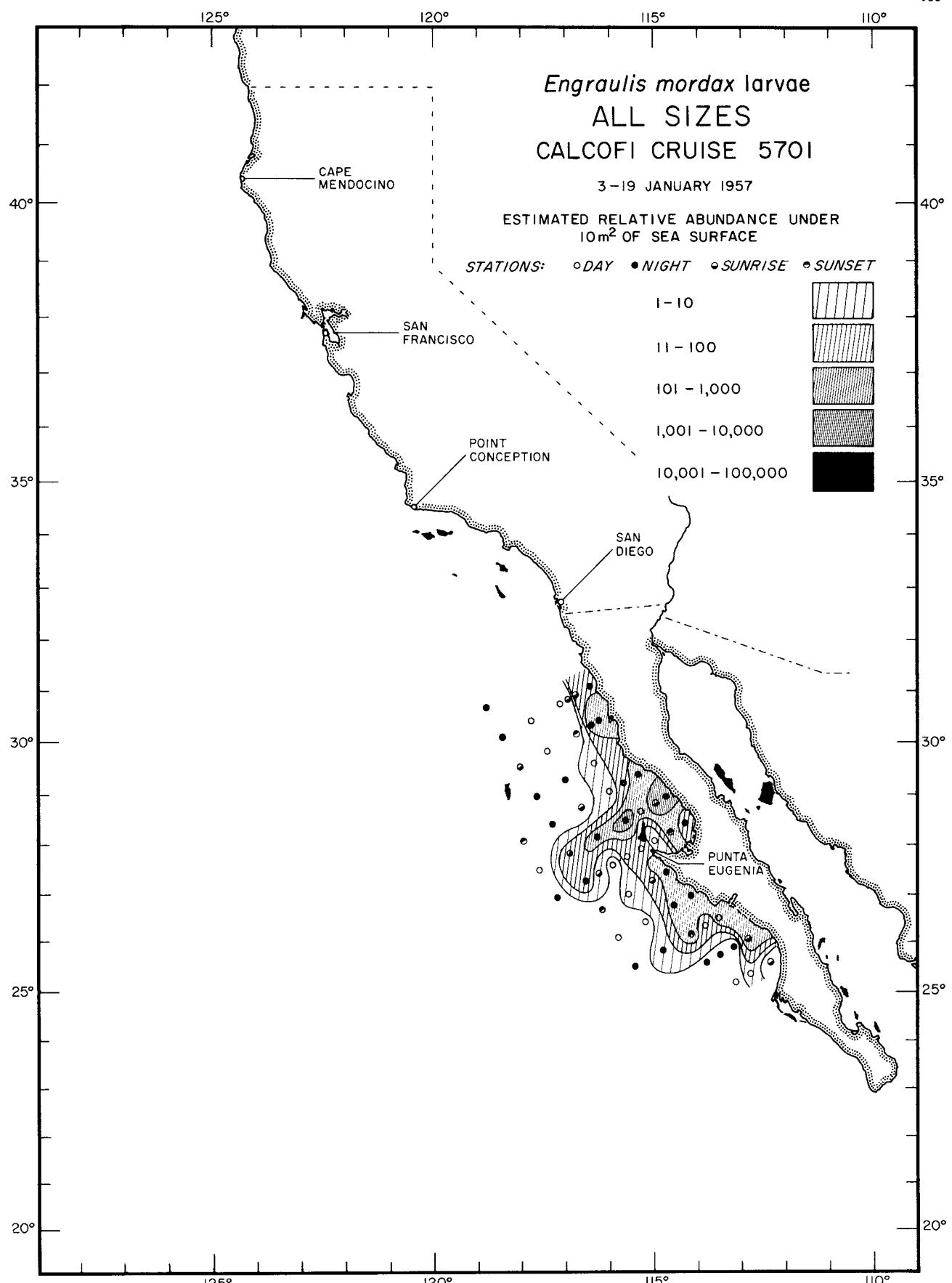
Size Group: 6.26-12.25mm

5612

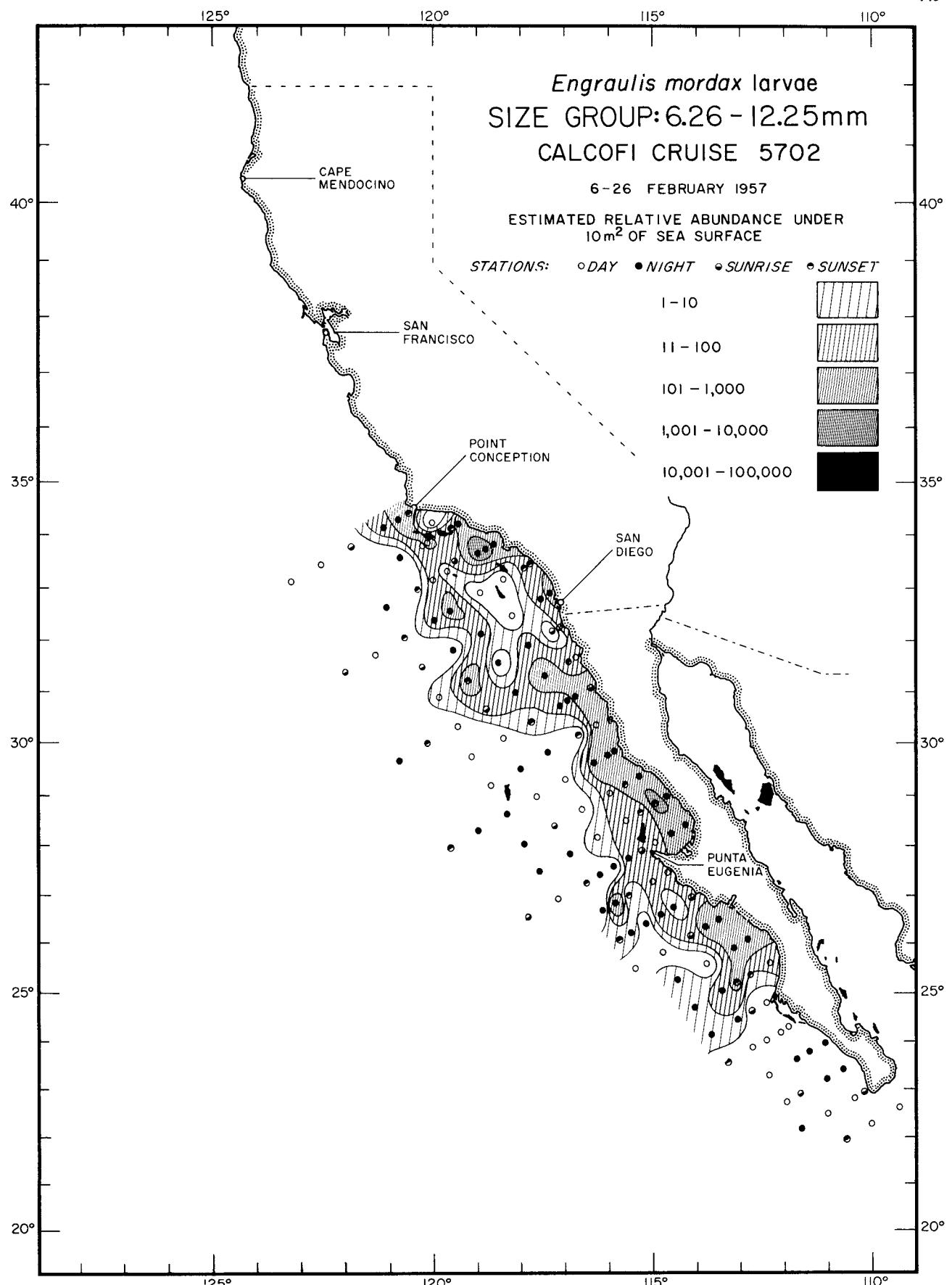
*Engraulis mordax* larvaeAll Sizes
5612



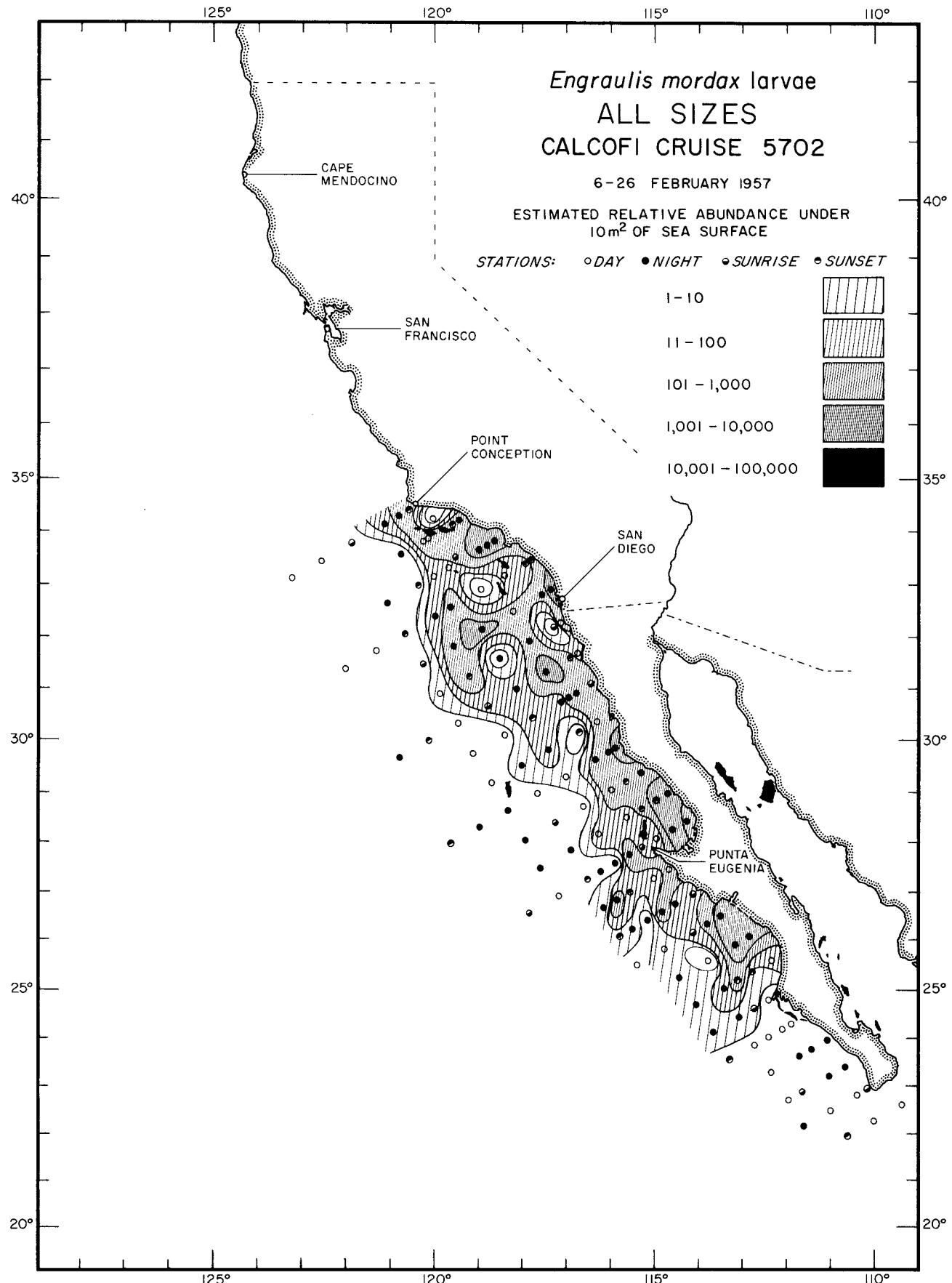
Engraulis mordax larvae
Size Group: 6.26-12.25mm
5701



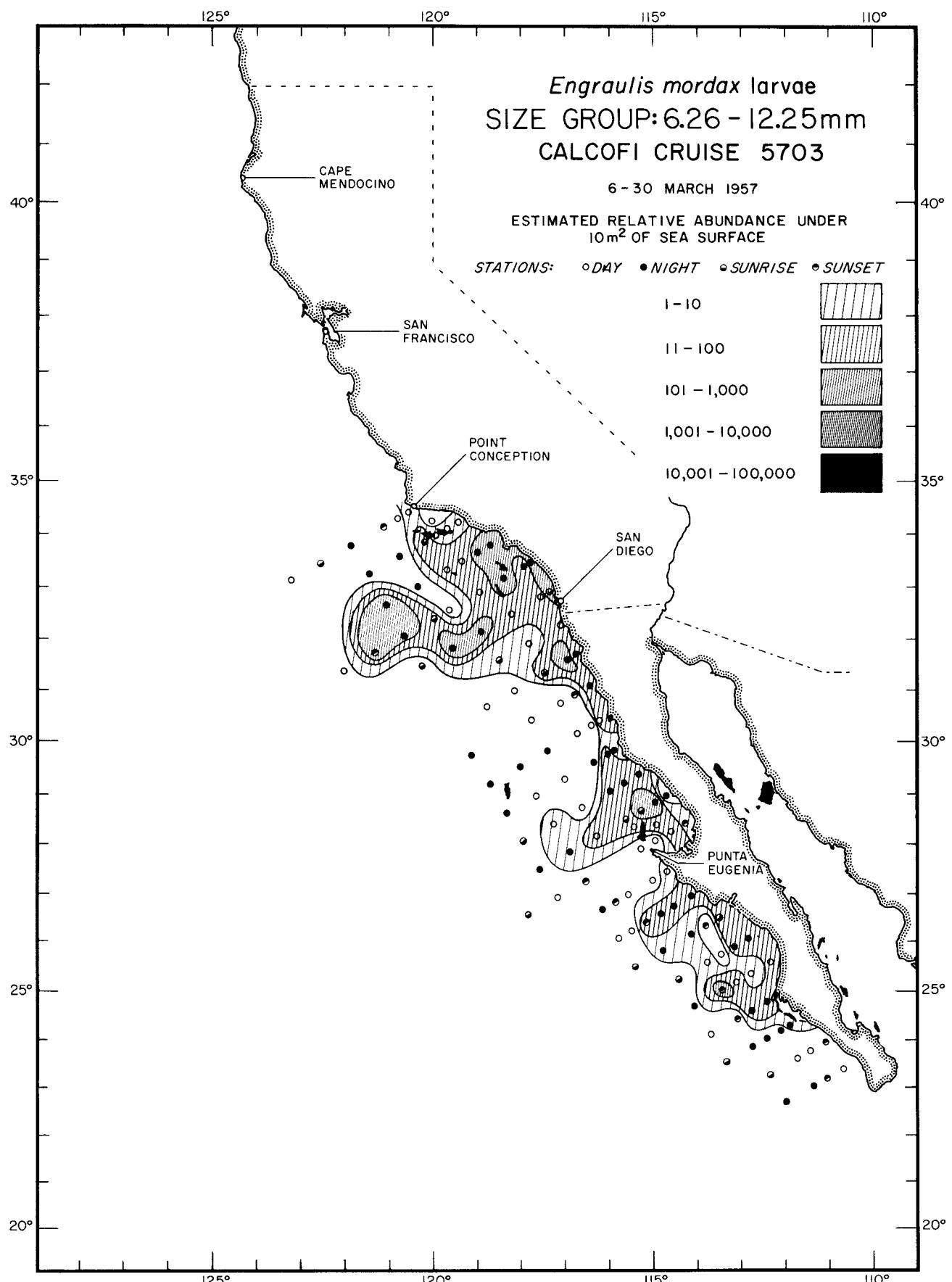
Engraulis mordax larvae
All Sizes
5701



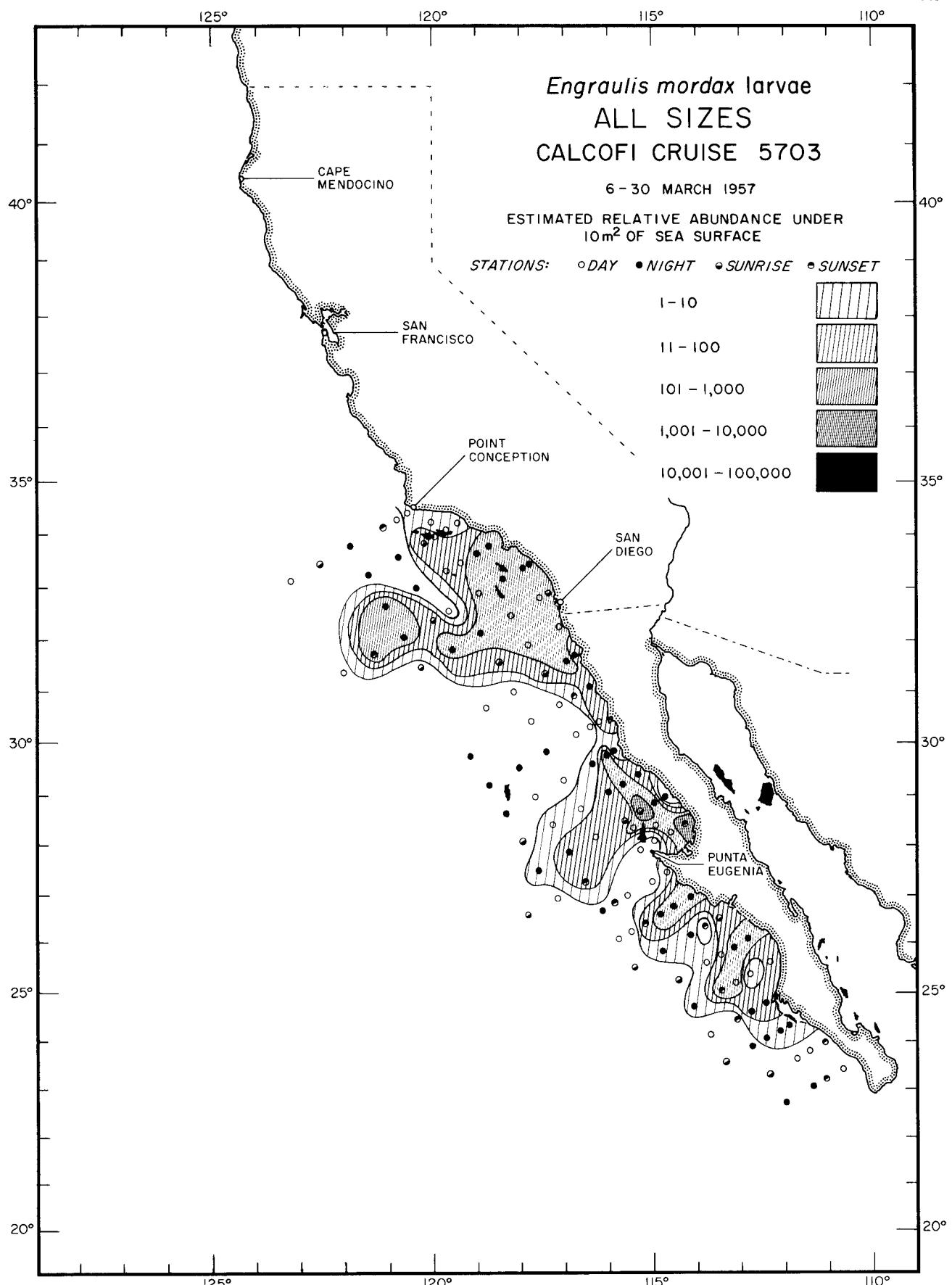
Engraulis mordax larvae
Size Group: 6.26-12.25mm
5702

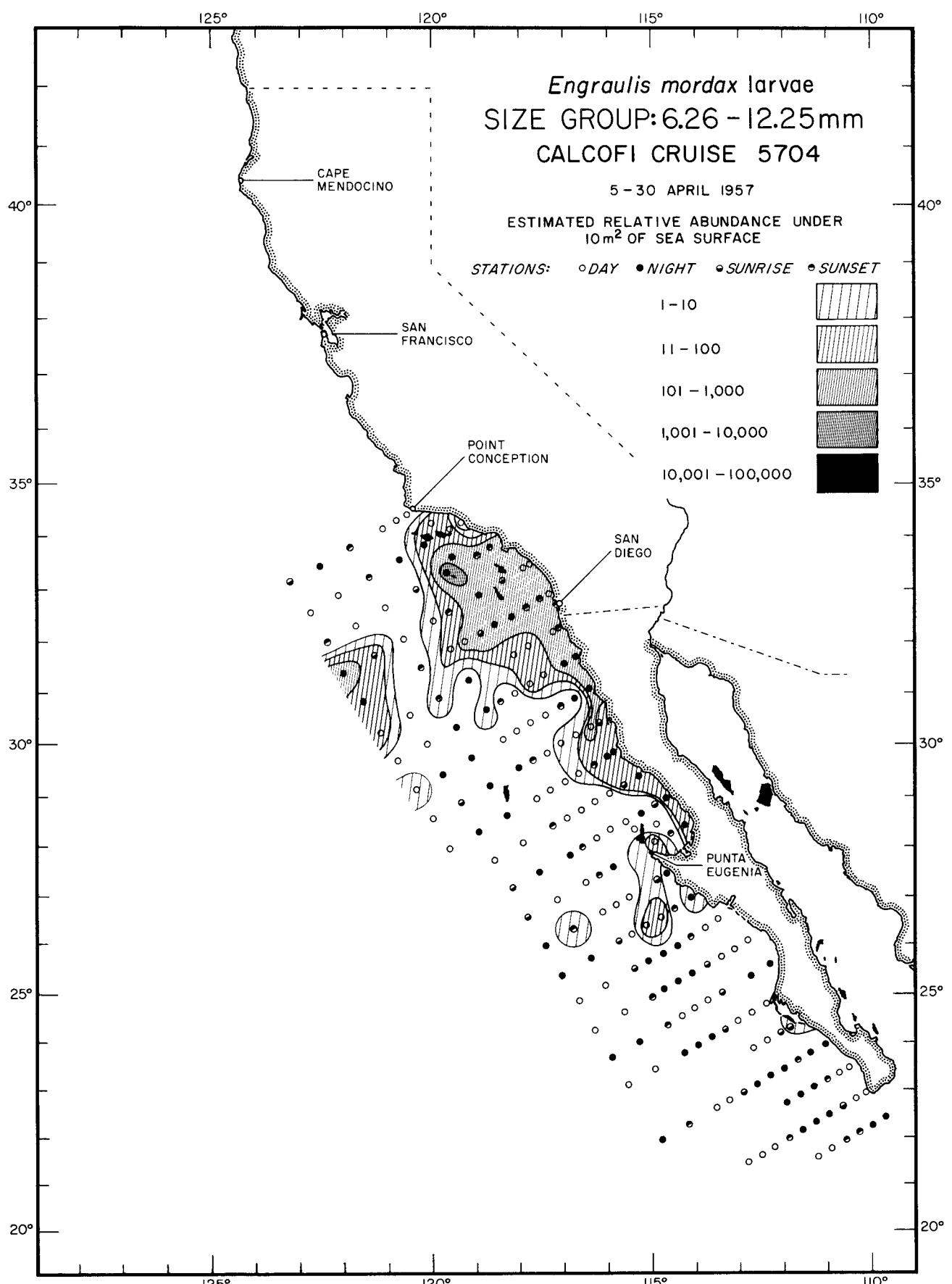


Engraulis mordax larvae
All Sizes
5702



Engraulis mordax larvae
Size Group: 6.26-12.25mm
5703

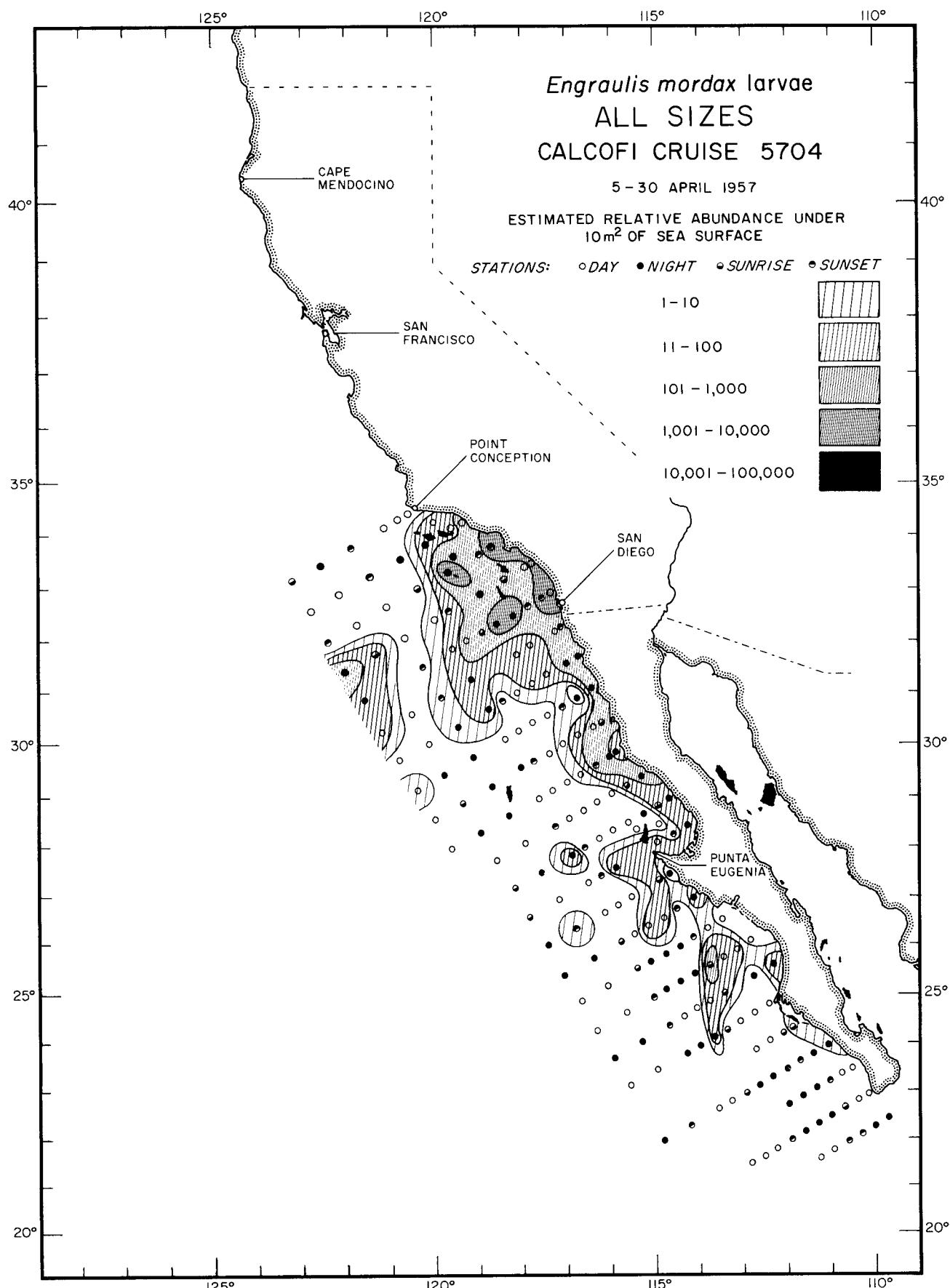
*Engraulis mordax* larvaeAll Sizes
5703



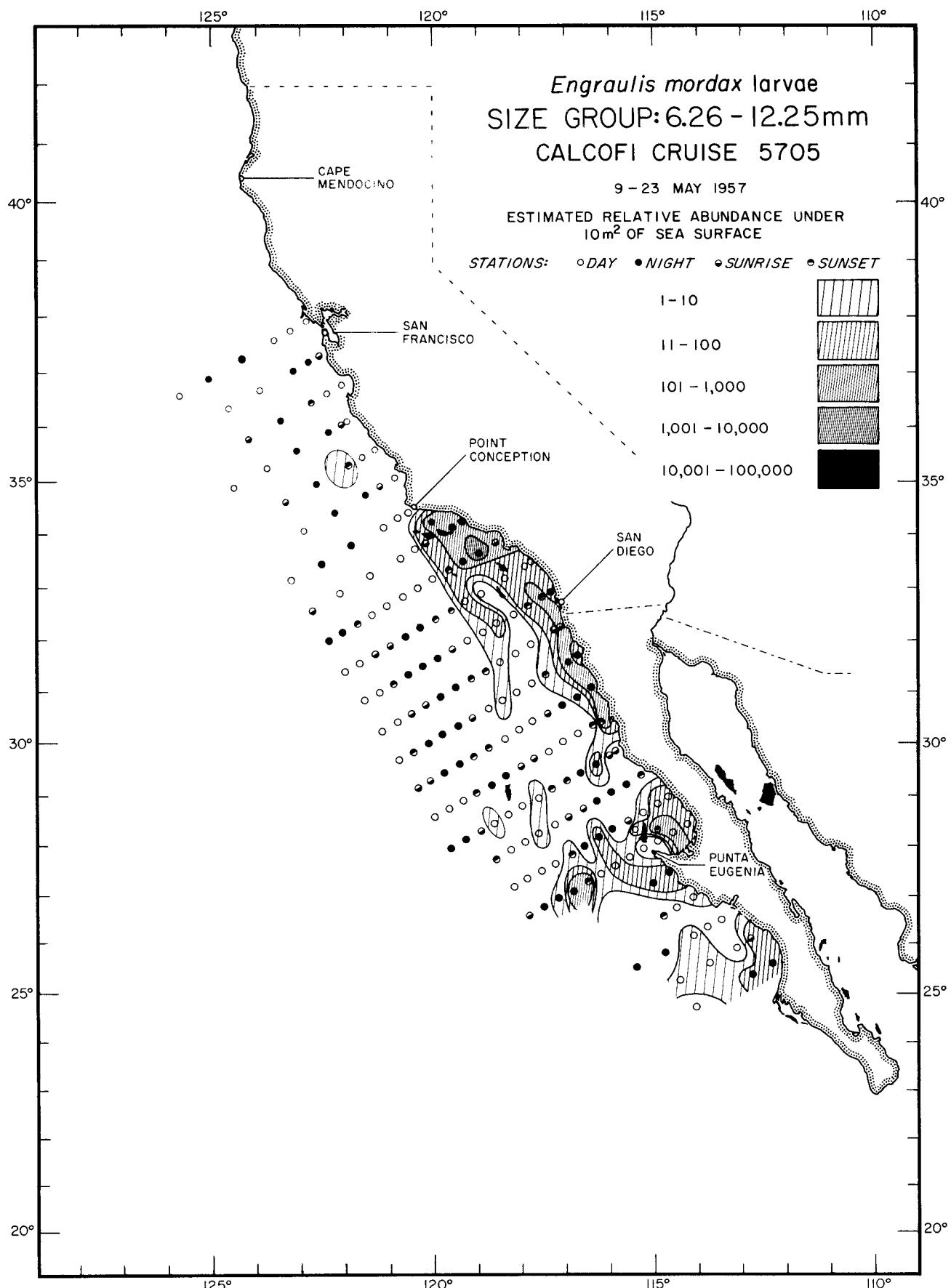
Engraulis mordax larvae

Size Group: 6.26 - 12.25mm

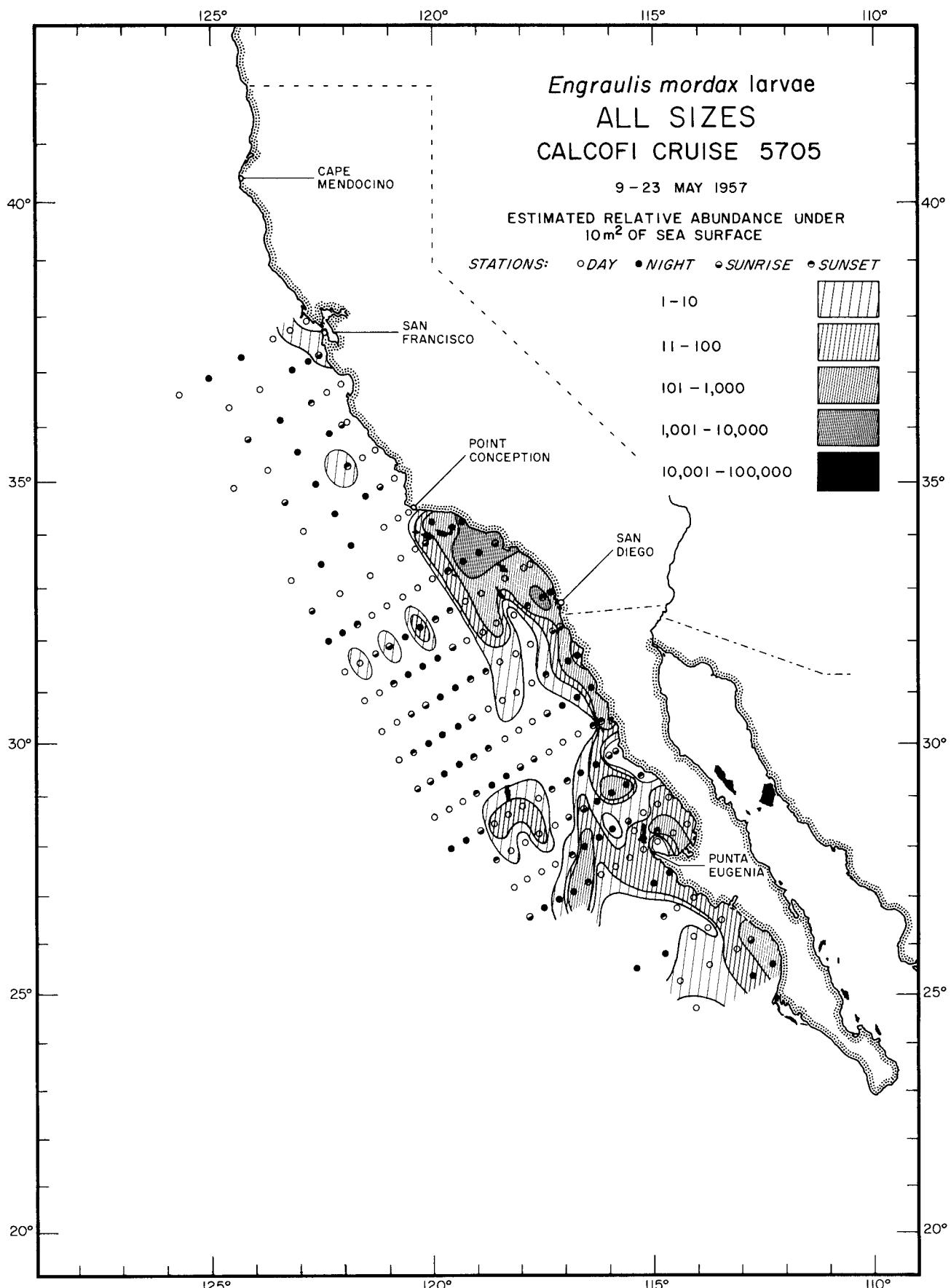
5704



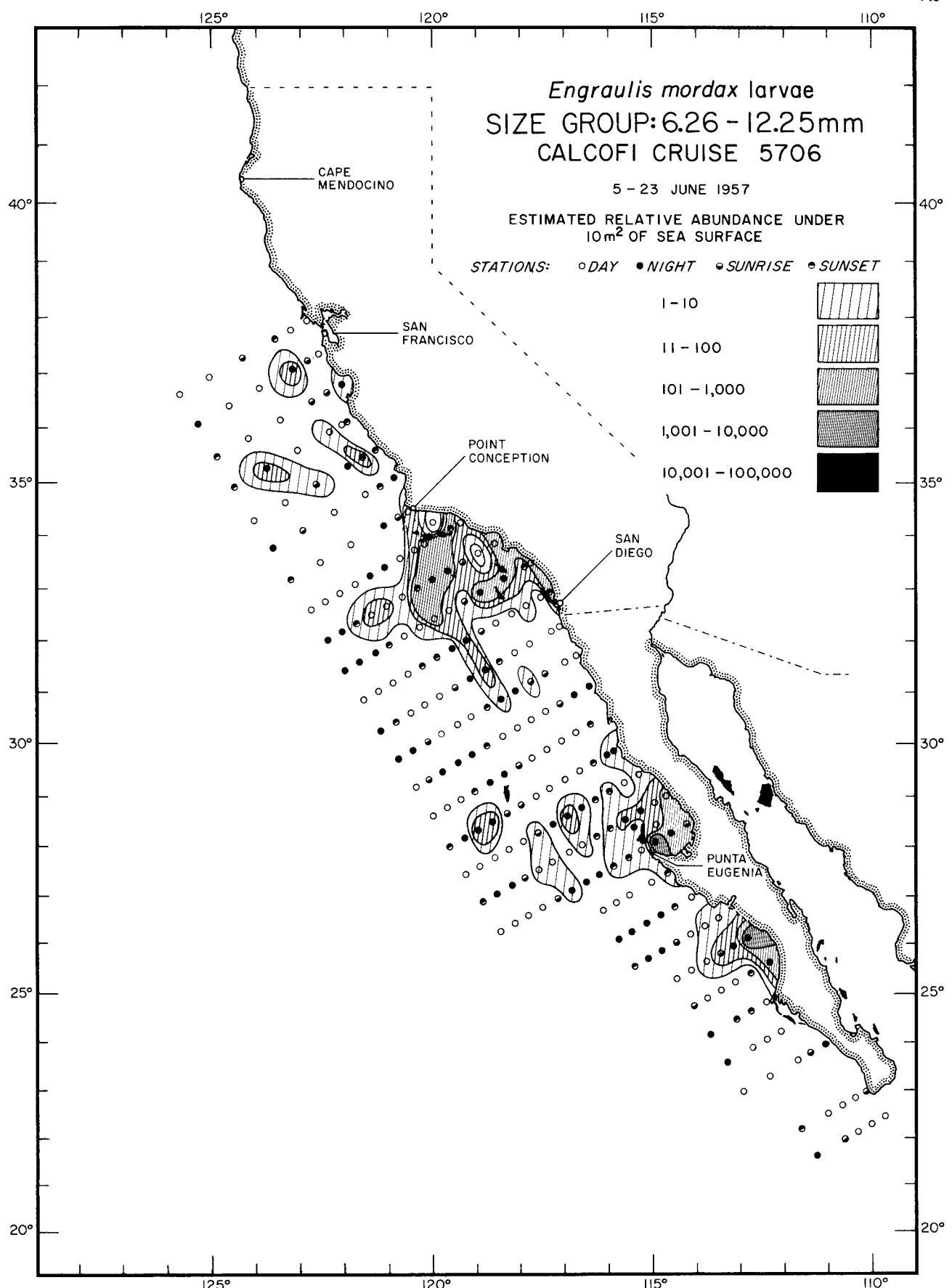
Engraulis mordax larvae
All Sizes
5704



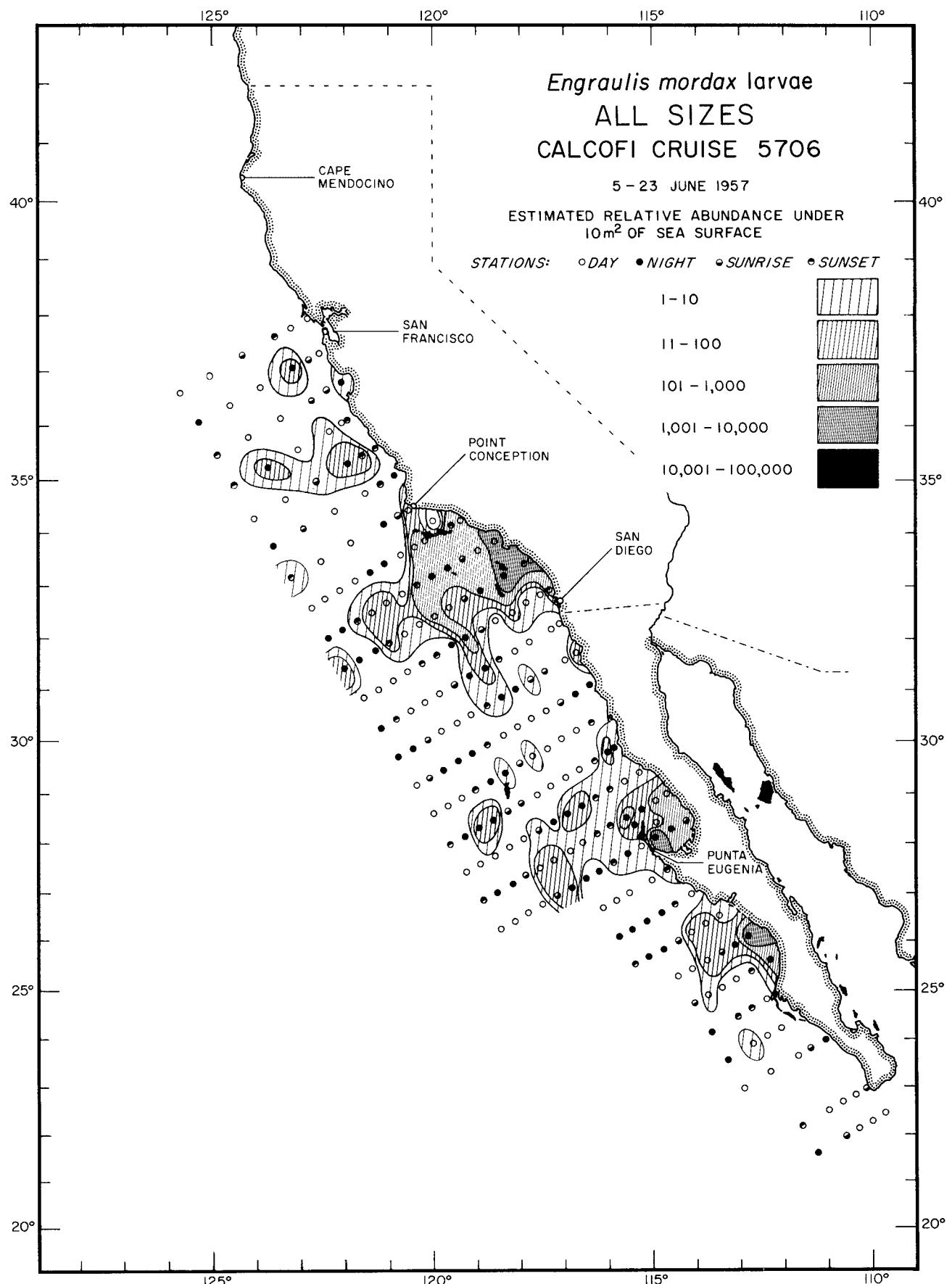
Engraulis mordax larvae
Size Group: 6.26-12.25mm
5705



Engraulis mordax larvae
All Sizes
5705

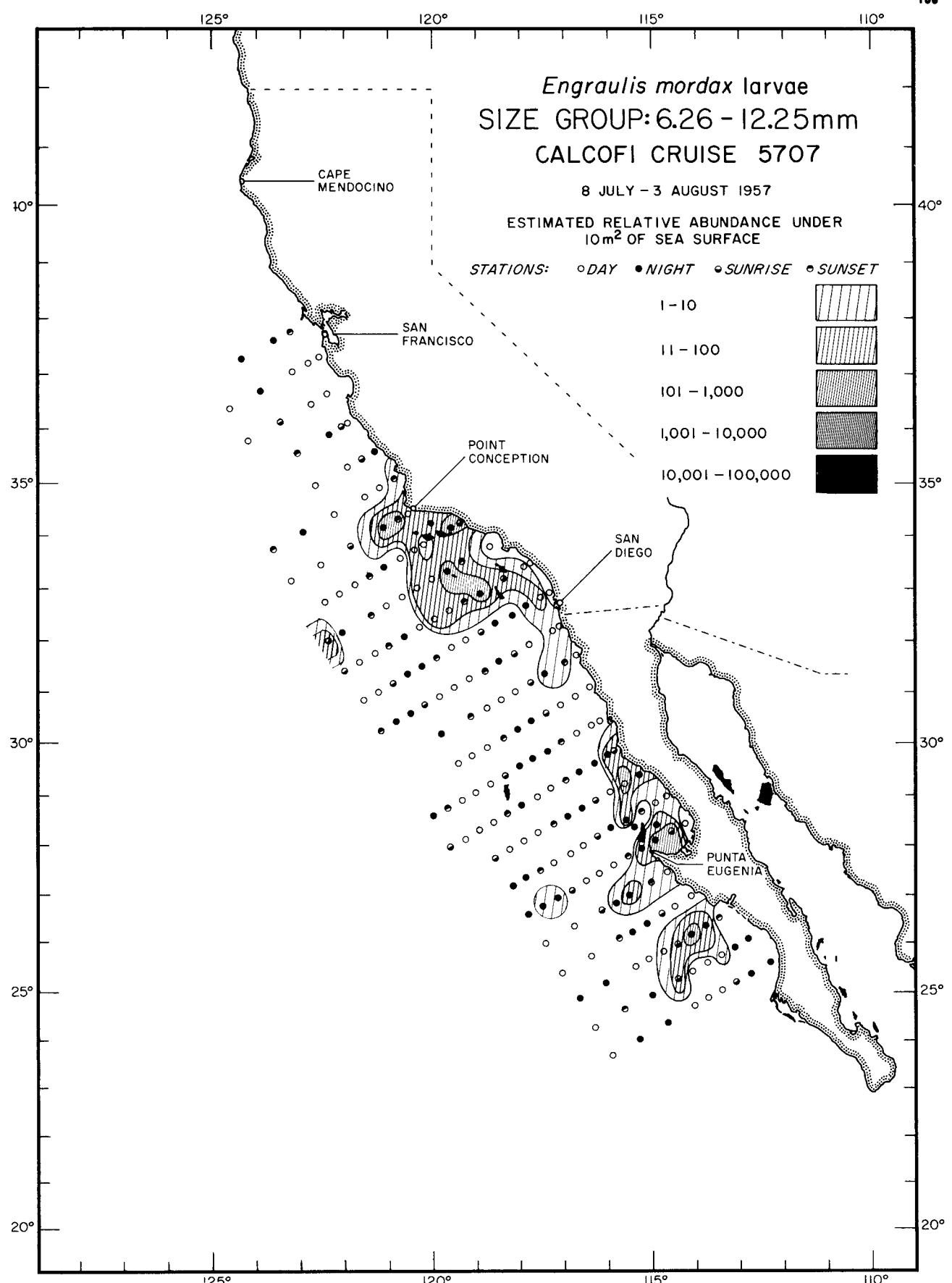


Engraulis mordax larvae
Size Group: 6.26-12.25mm
5706

*Engraulis mordax* larvae

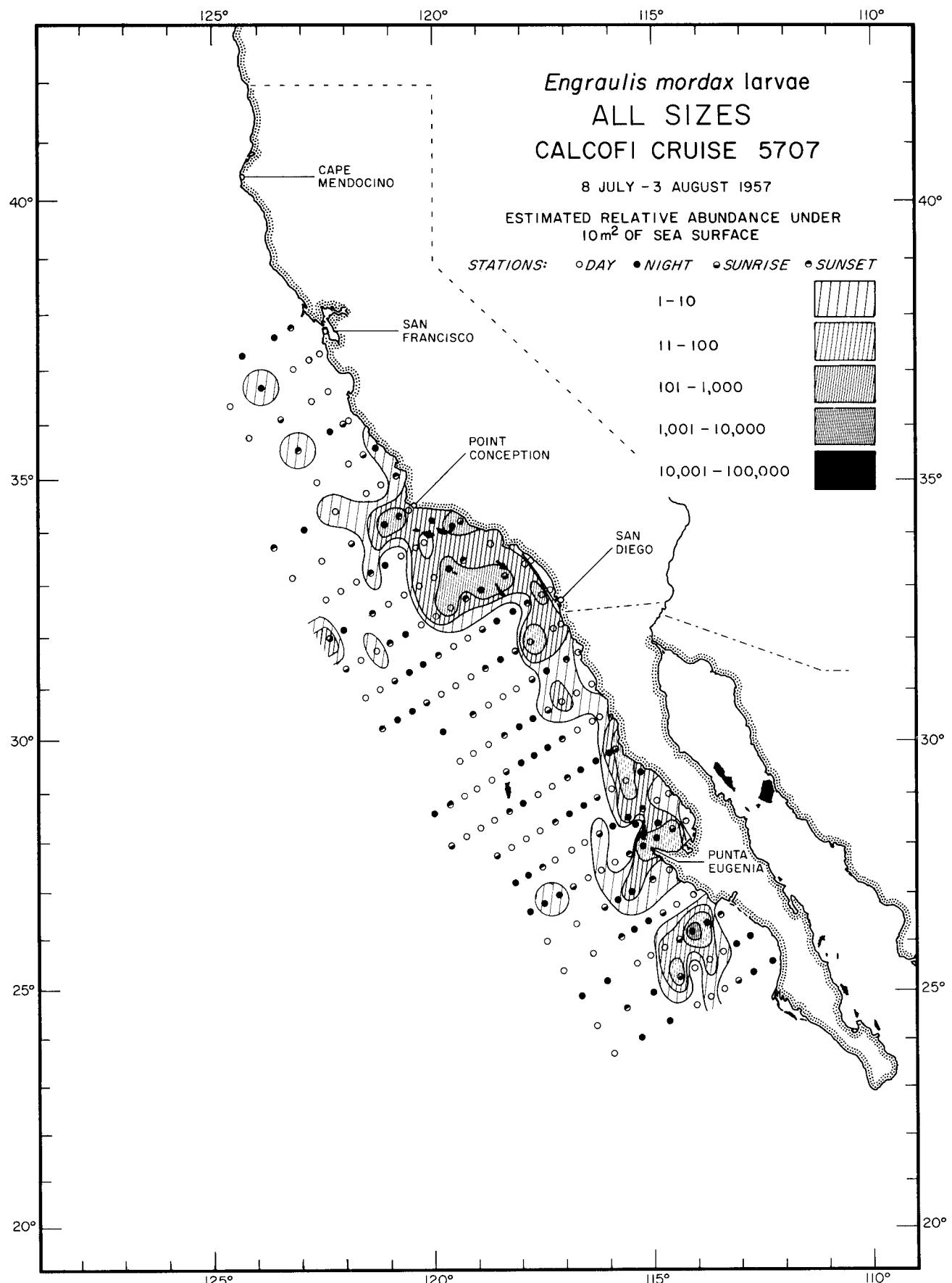
All Sizes

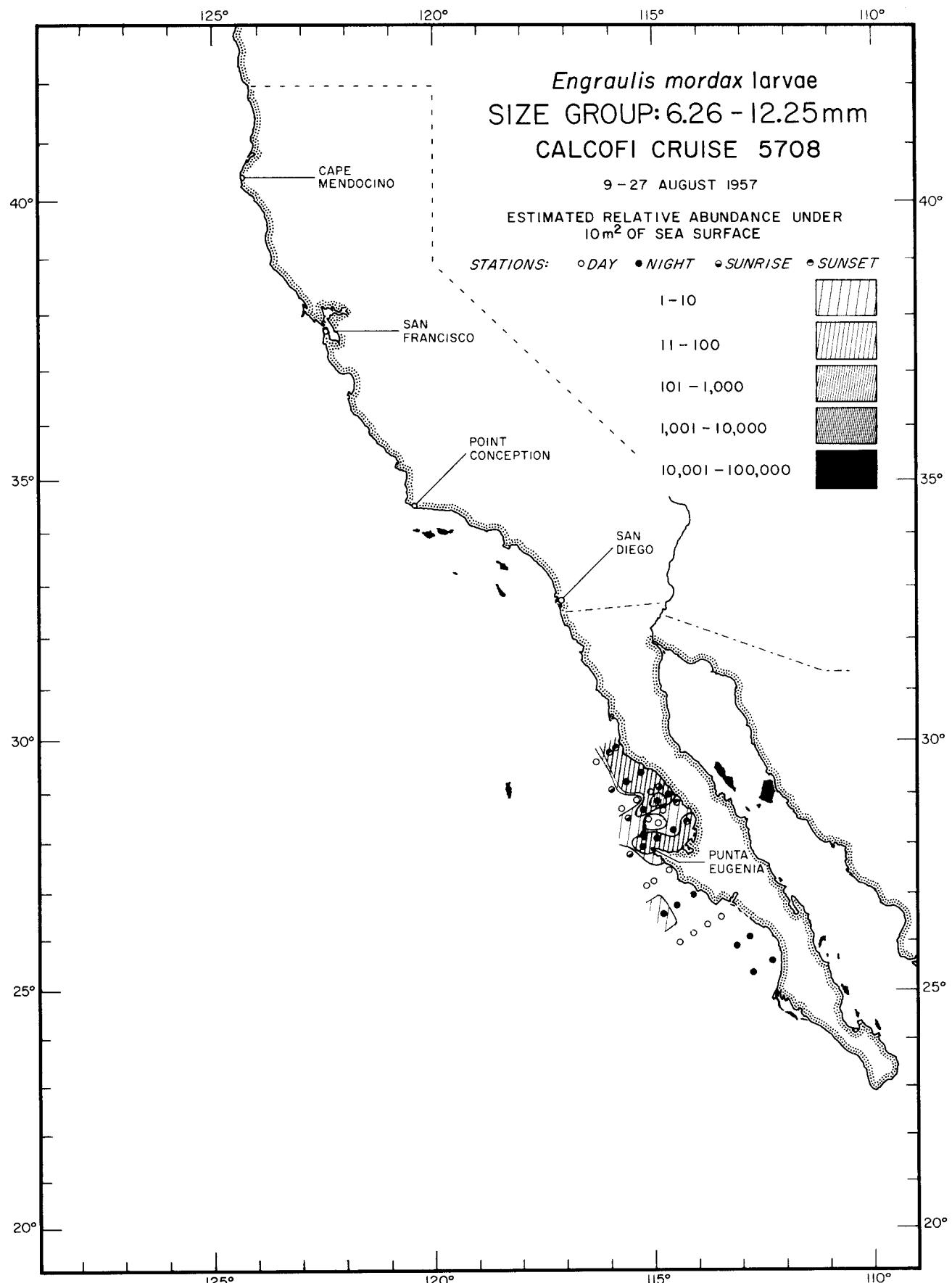
5706

*Engraulis mordax* larvae

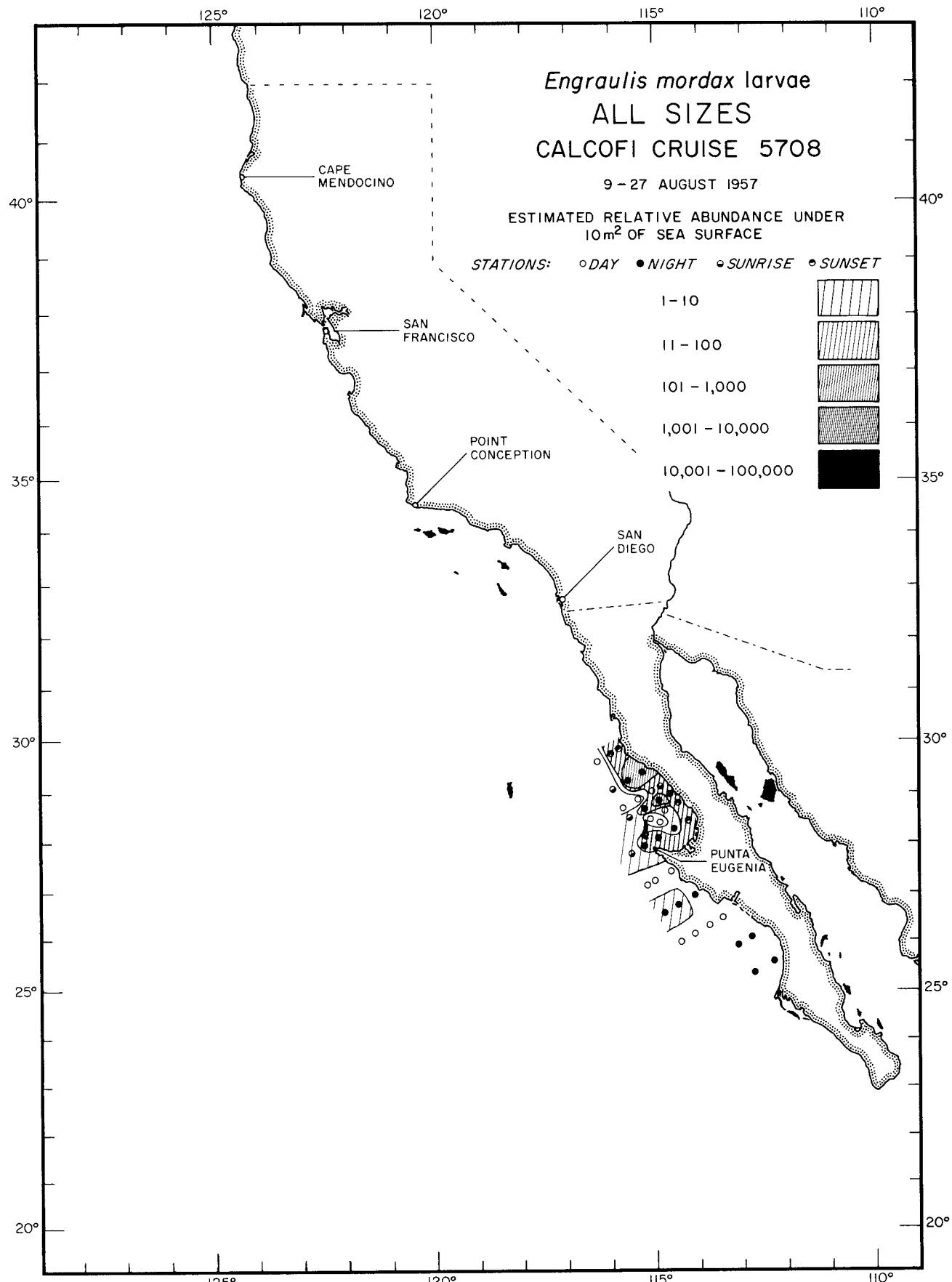
Size Group: 6.26-12.25mm

5707

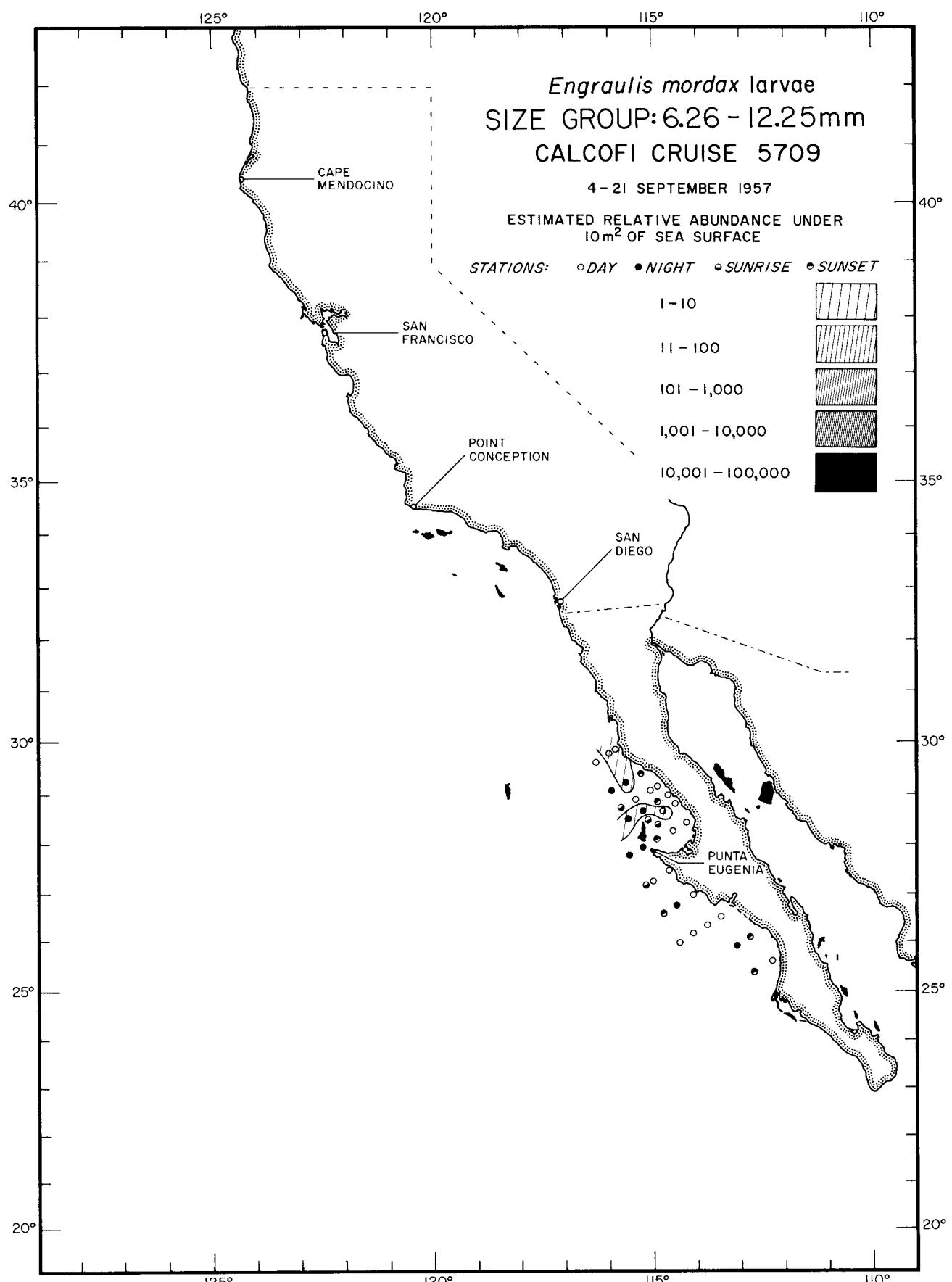
*Engraulis mordax* larvaeAll Sizes
5707



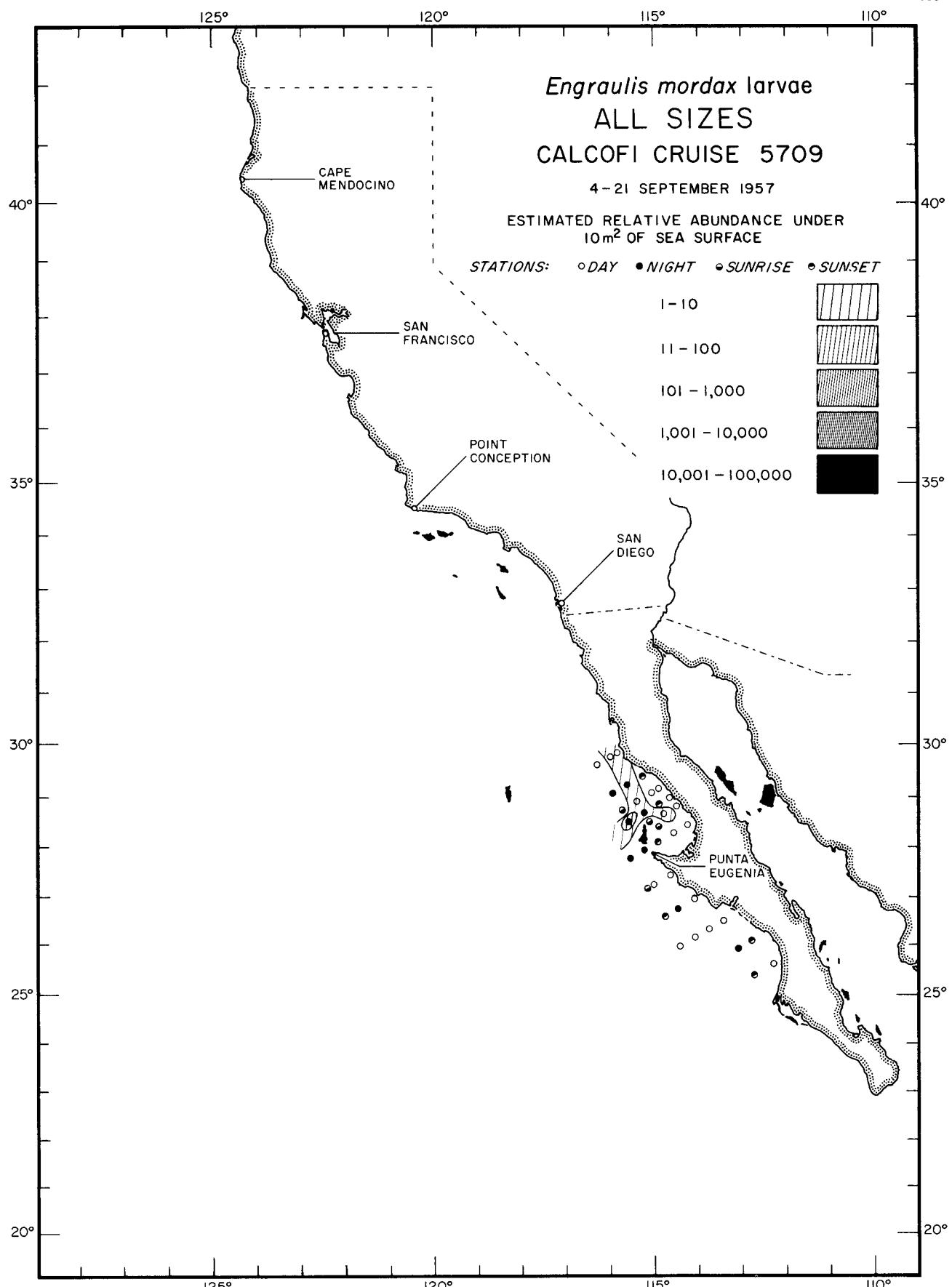
Engraulis mordax larvae
Size Group: 6.26-12.25mm
5708

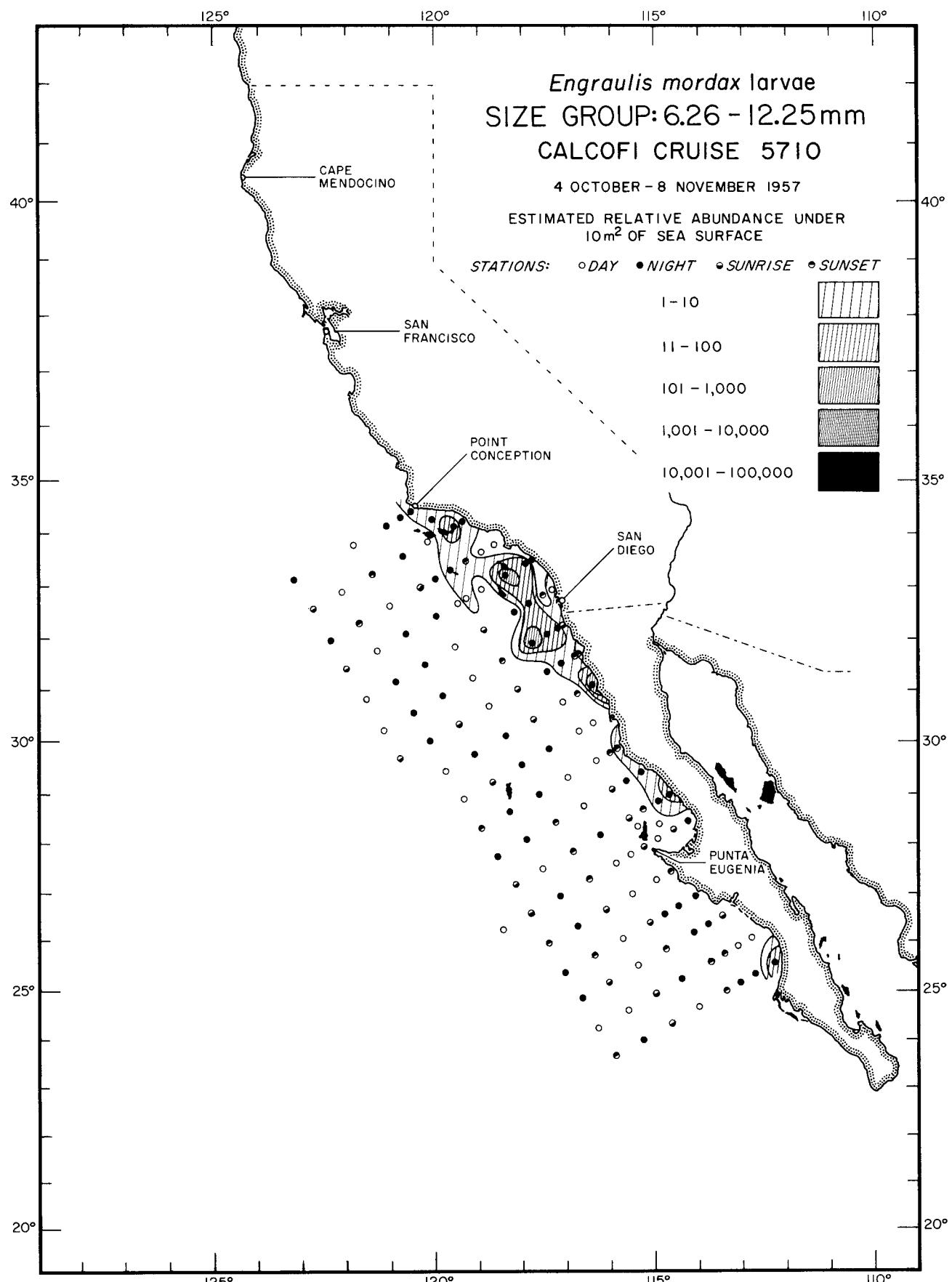


Engraulis mordax larvae
All Sizes
5708

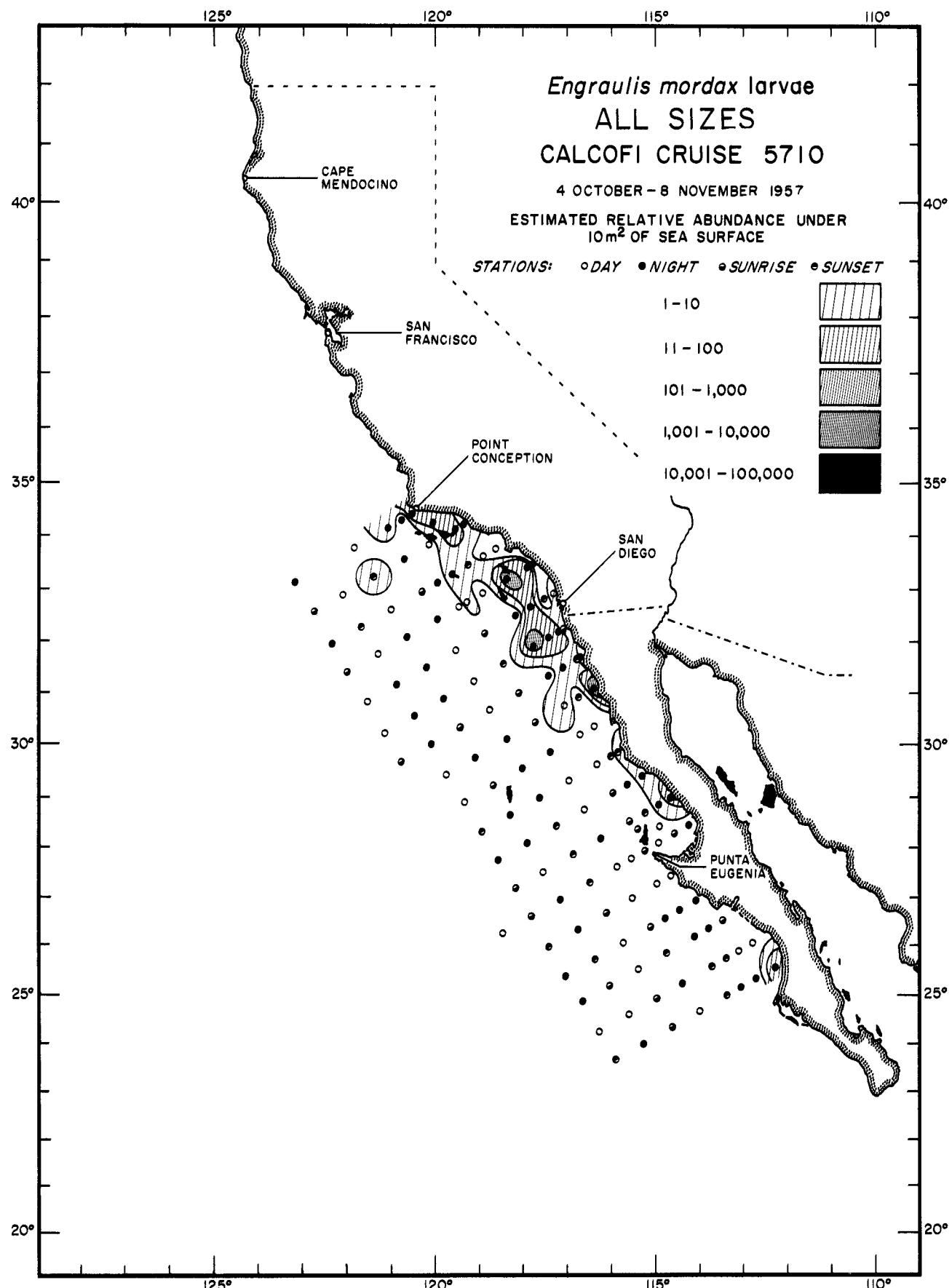


Engraulis mordax larvae
Size Group: 6.26-12.25mm
5709

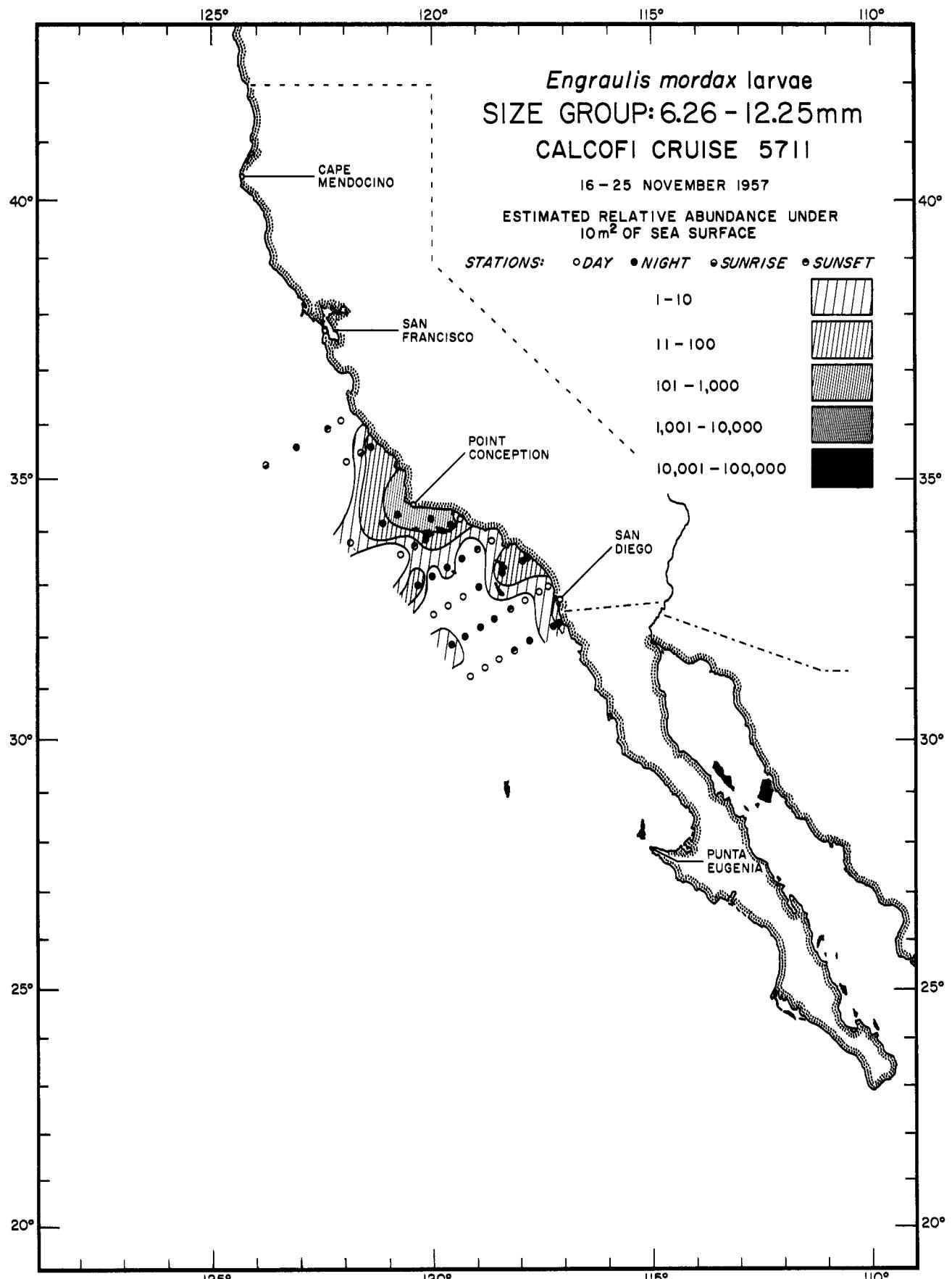
*Engraulis mordax* larvaeAll Sizes
5709



Engraulis mordax larvae
Size Group: 6.26-12.25mm
5710

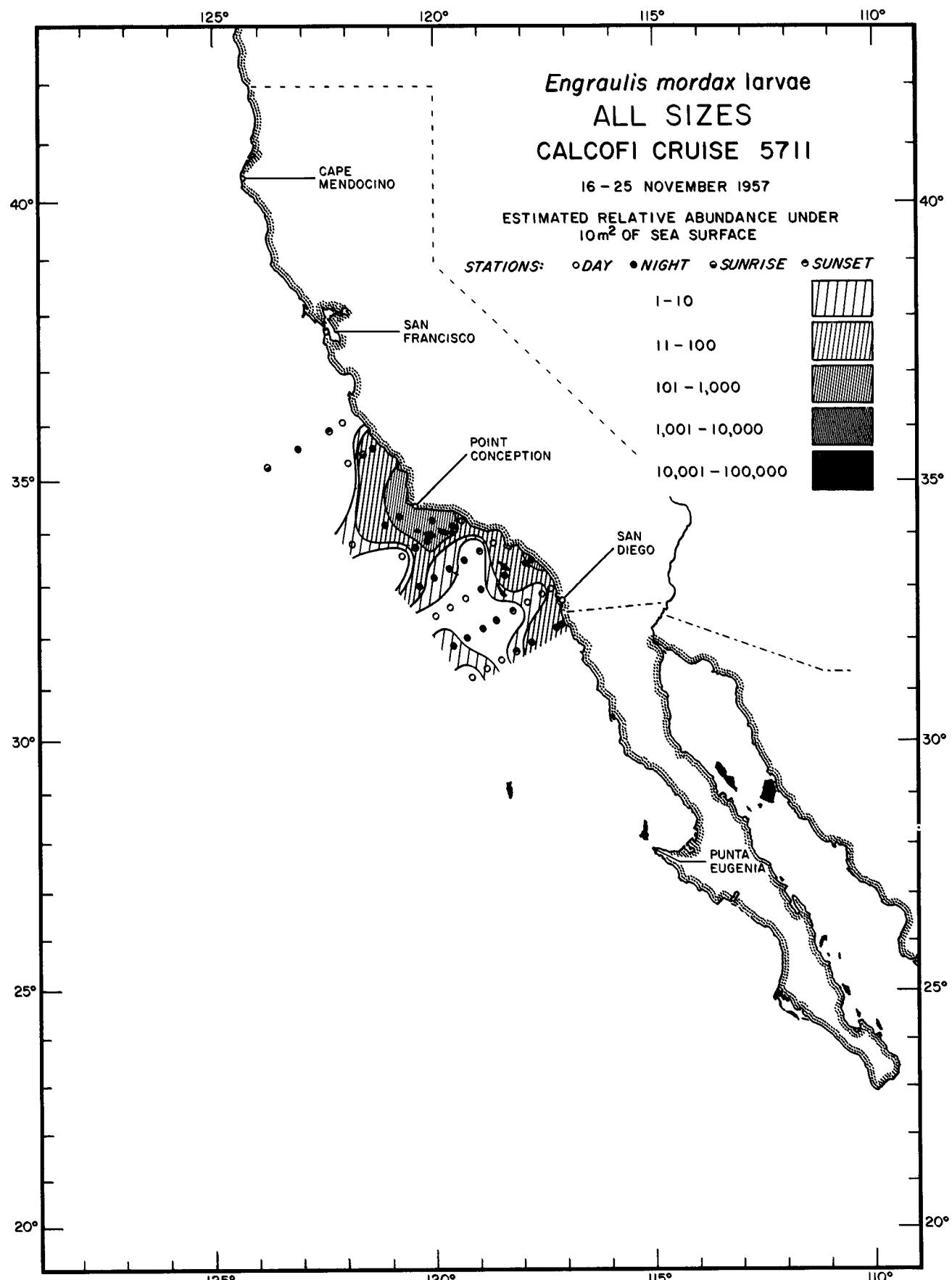


Engraulis mordax larvae
All Sizes
5710

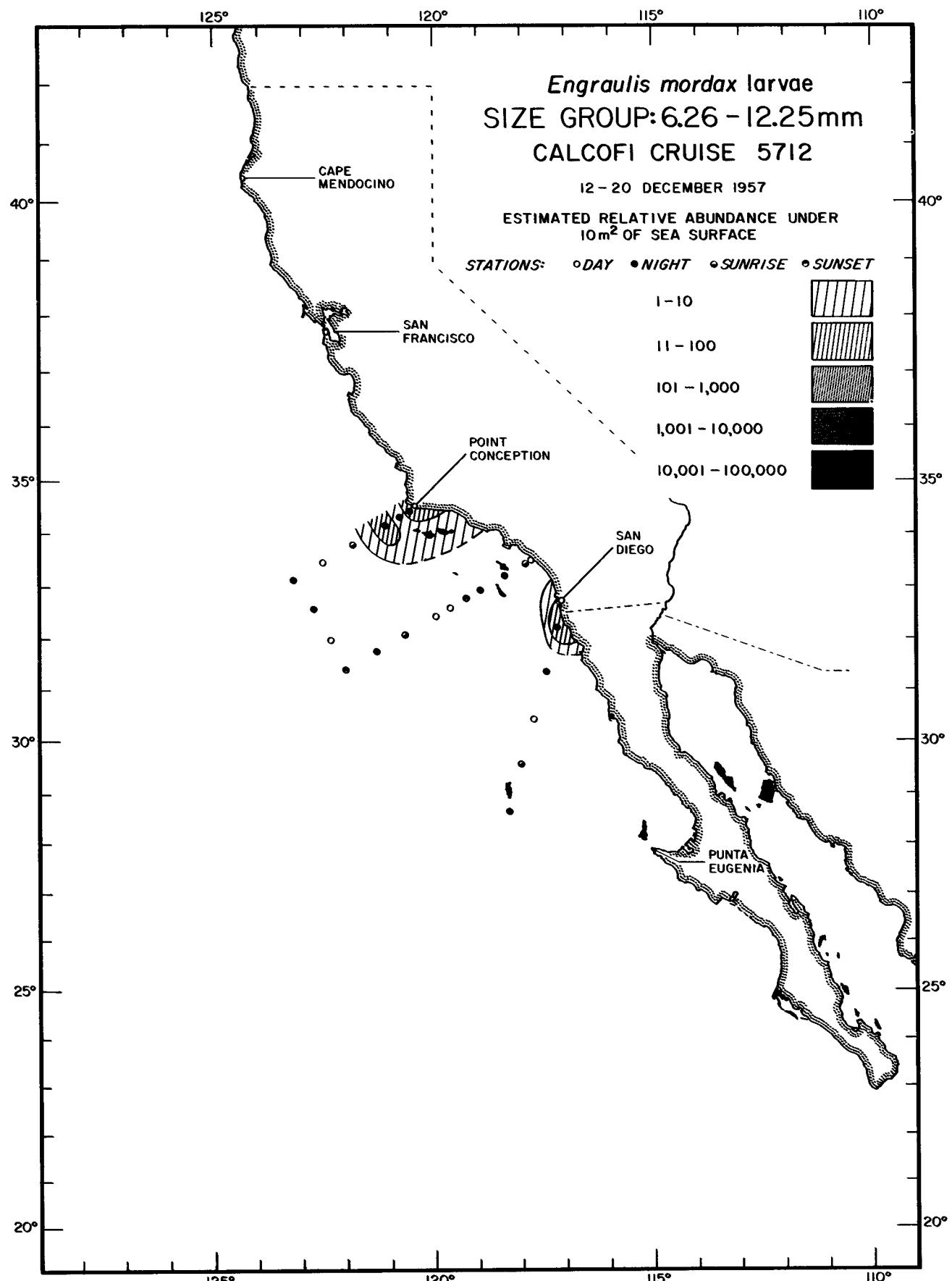
*Engraulis mordax* larvae

Size Group: 6.26-12.25mm

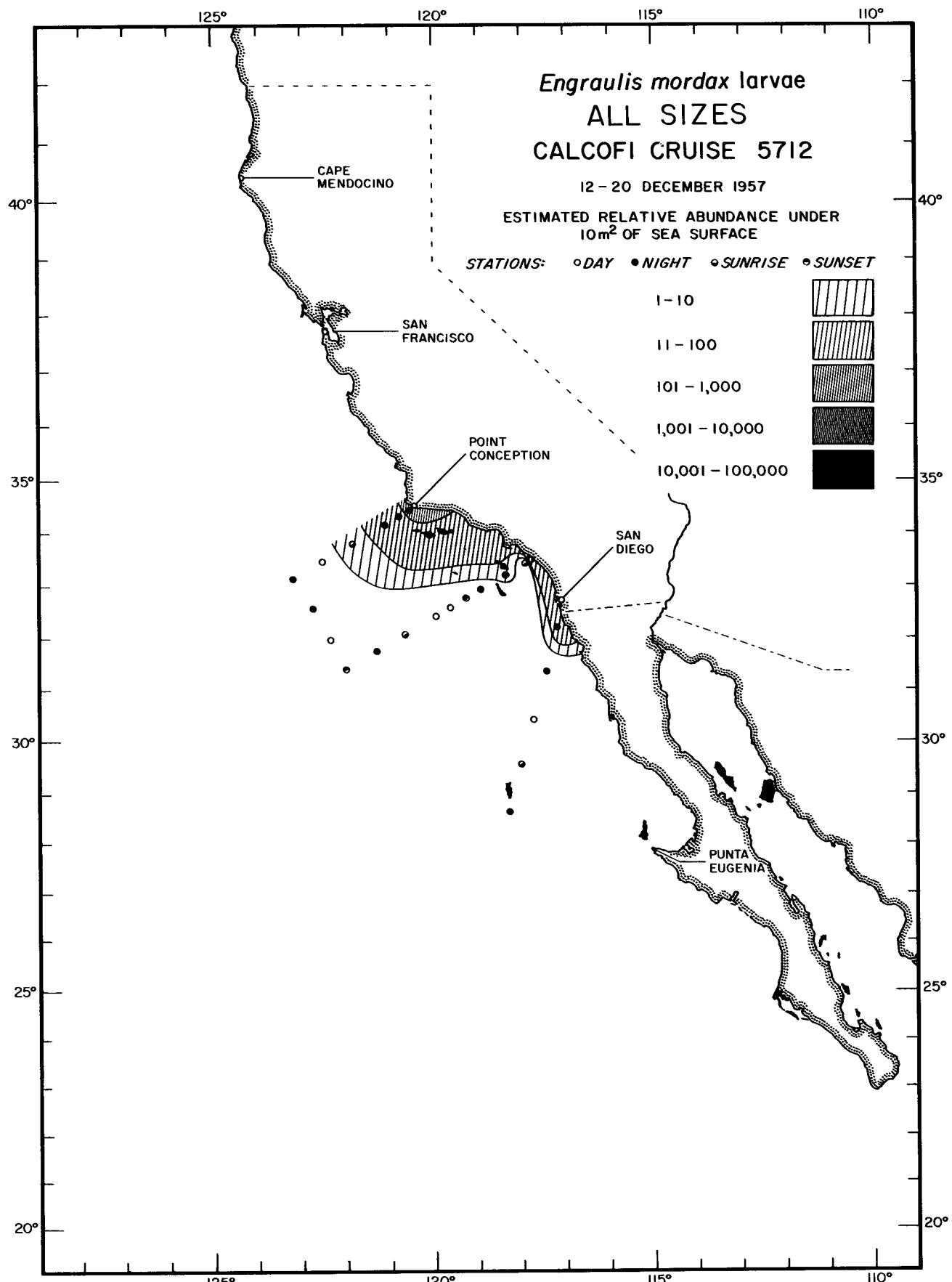
5711



Engraulis mordax larvae
All Sizes
5711

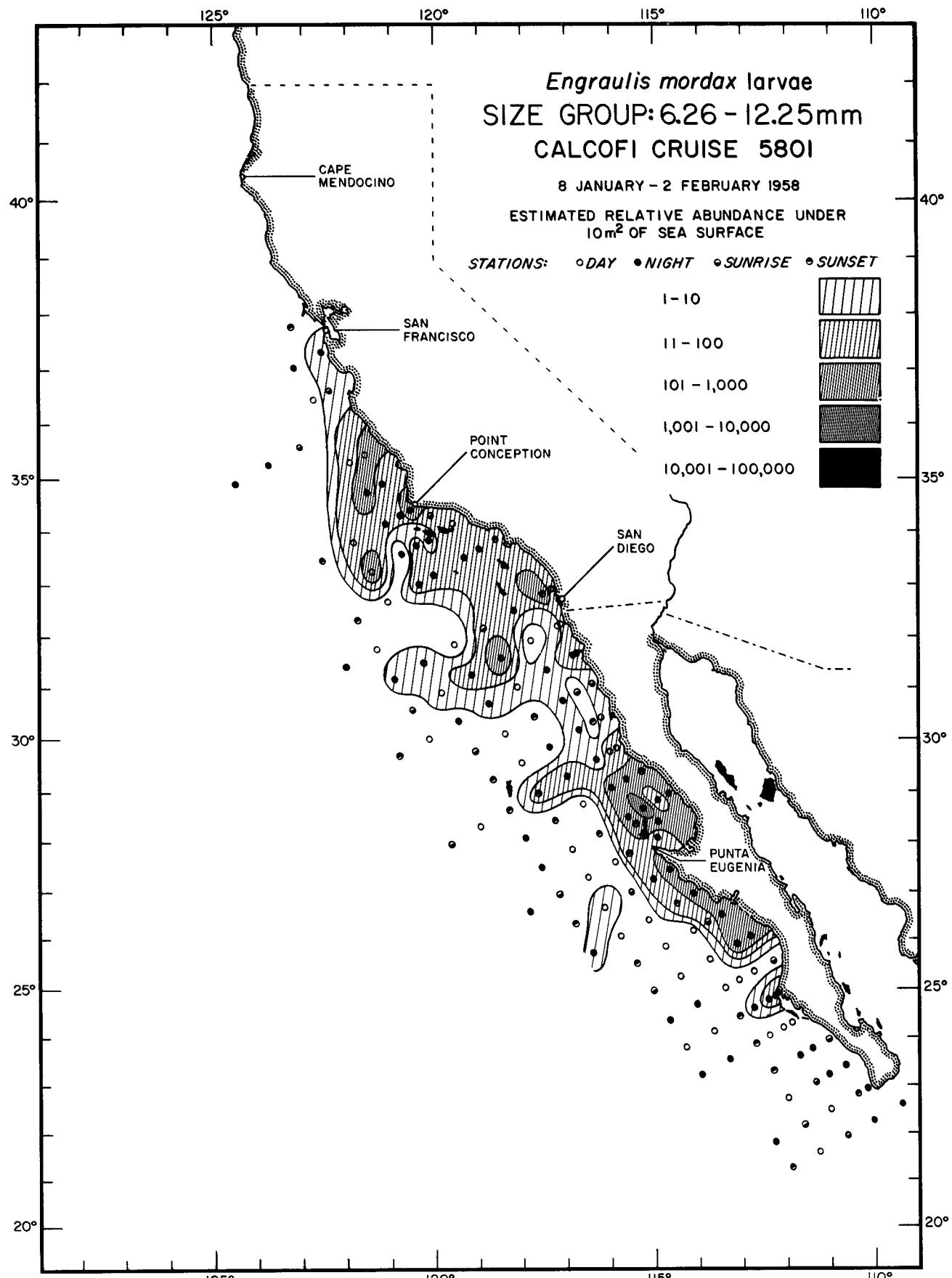


Engraulis mordax larvae
Size Group: 6.26-12.25mm
5712

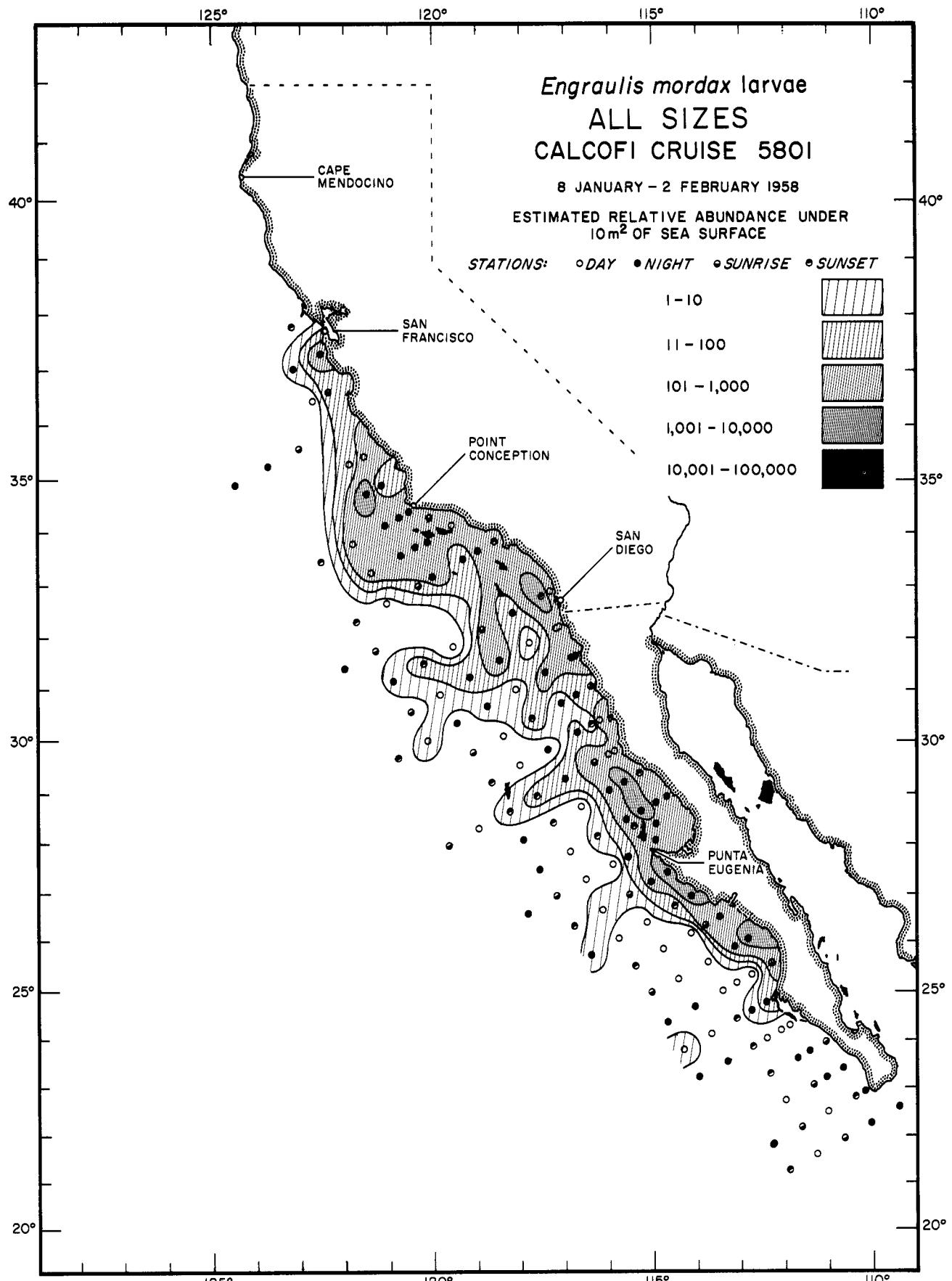
*Engraulis mordax* larvae

All Sizes

5712

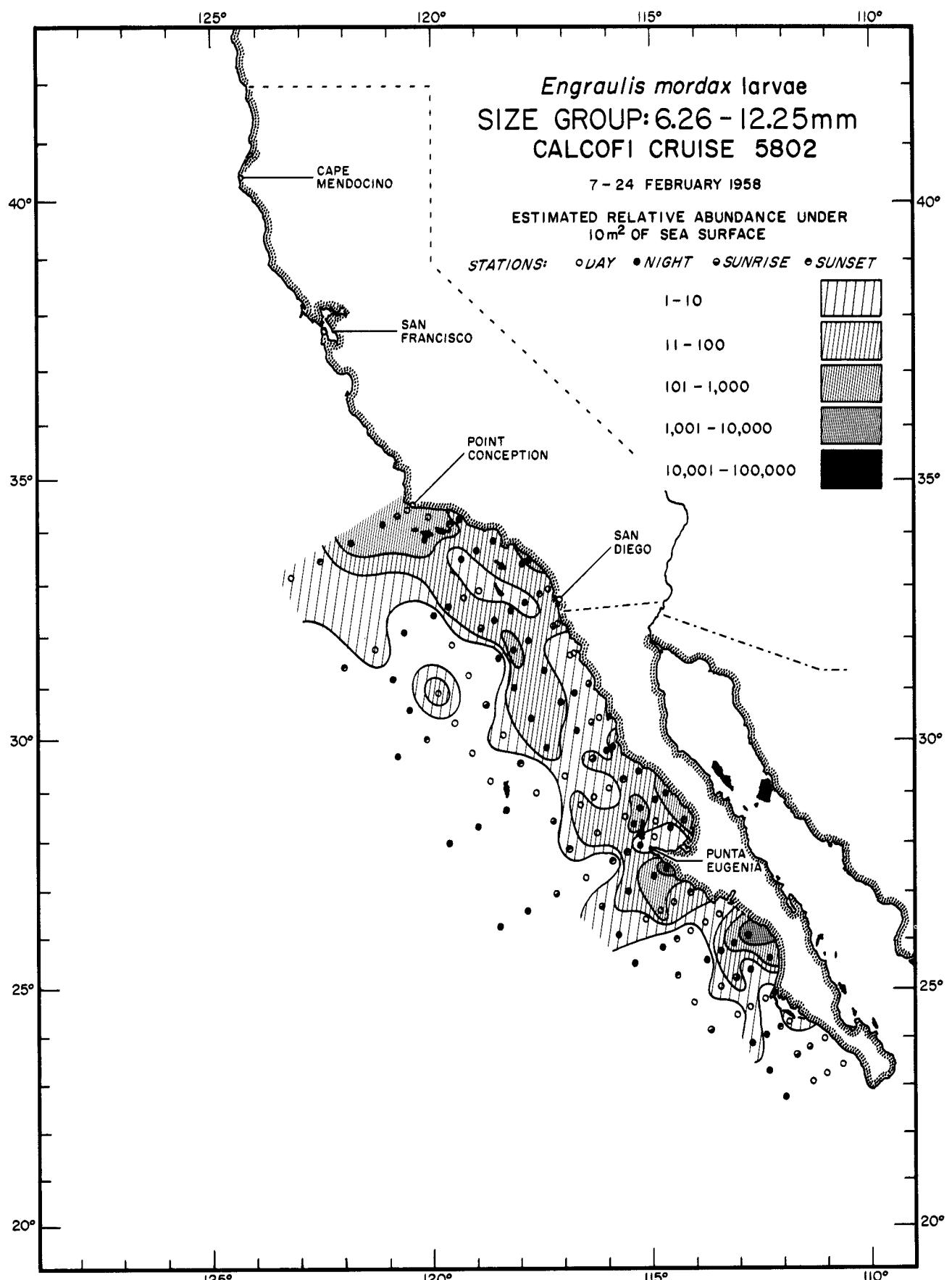


Engraulis mordax larvae
Size Group: 6.26-12.25mm
5801

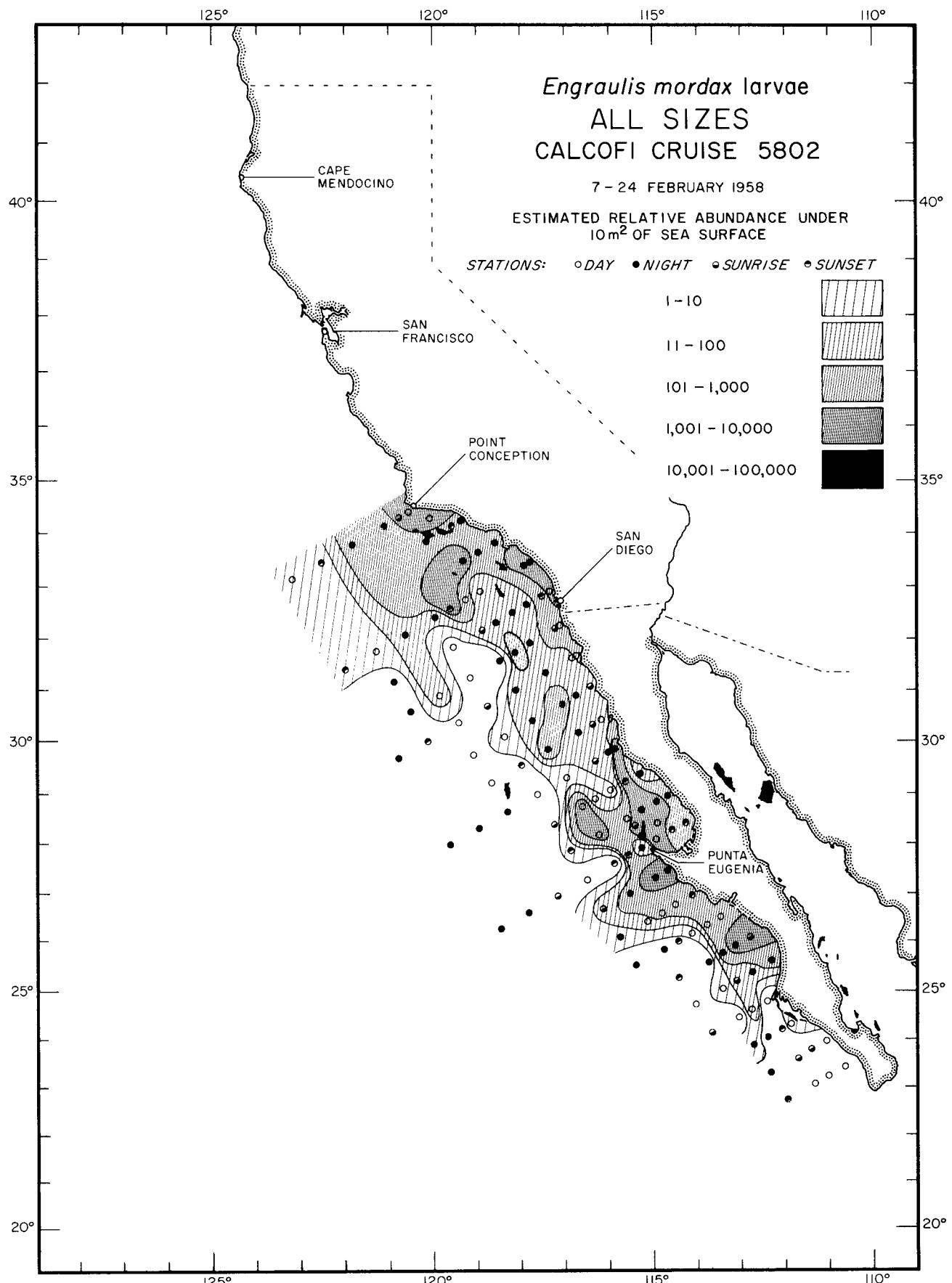
*Engraulis mordax* larvae

All Sizes

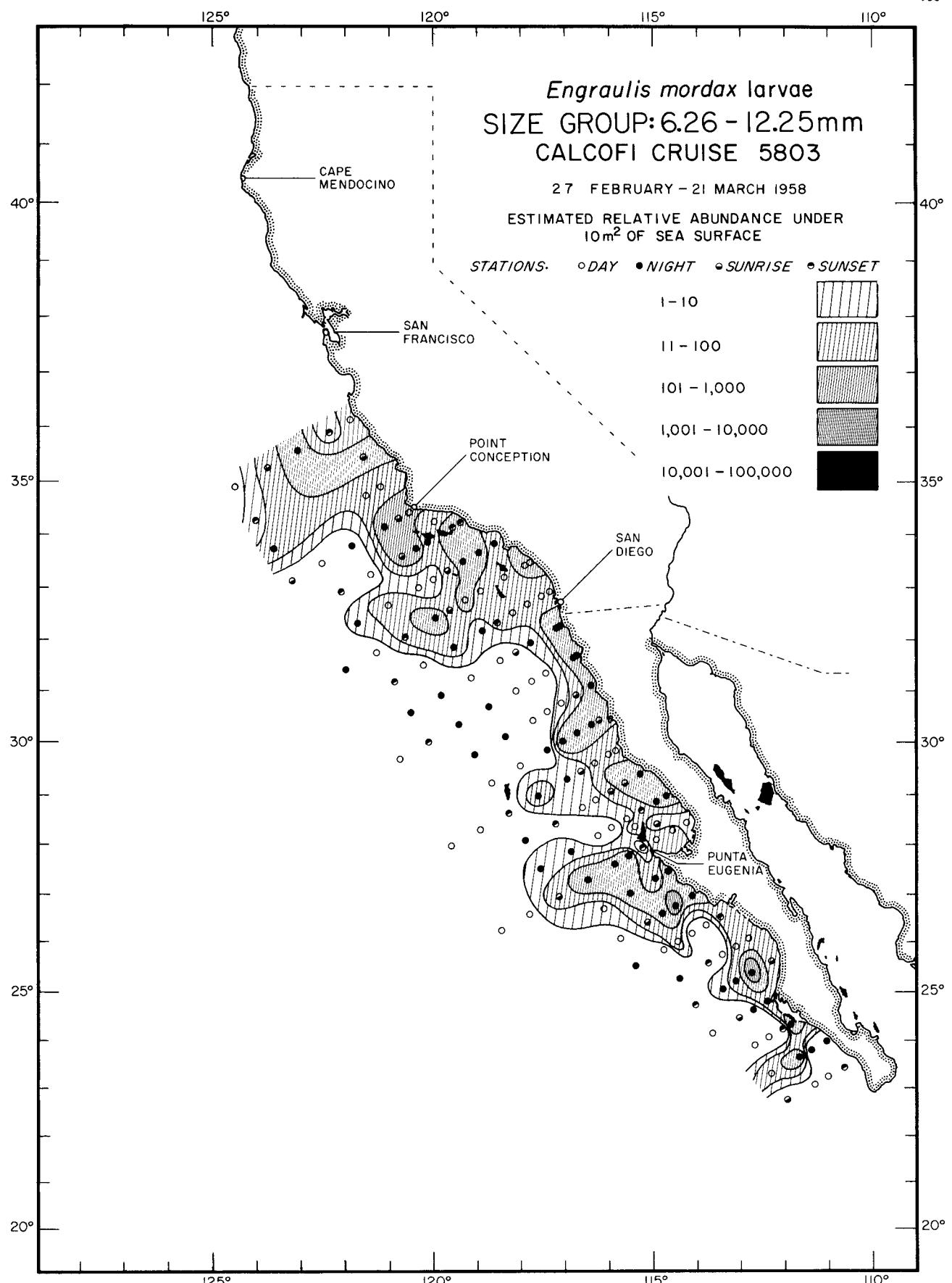
5801



Engraulis mordax larvae
Size Group: 6.26-12.25mm
5802

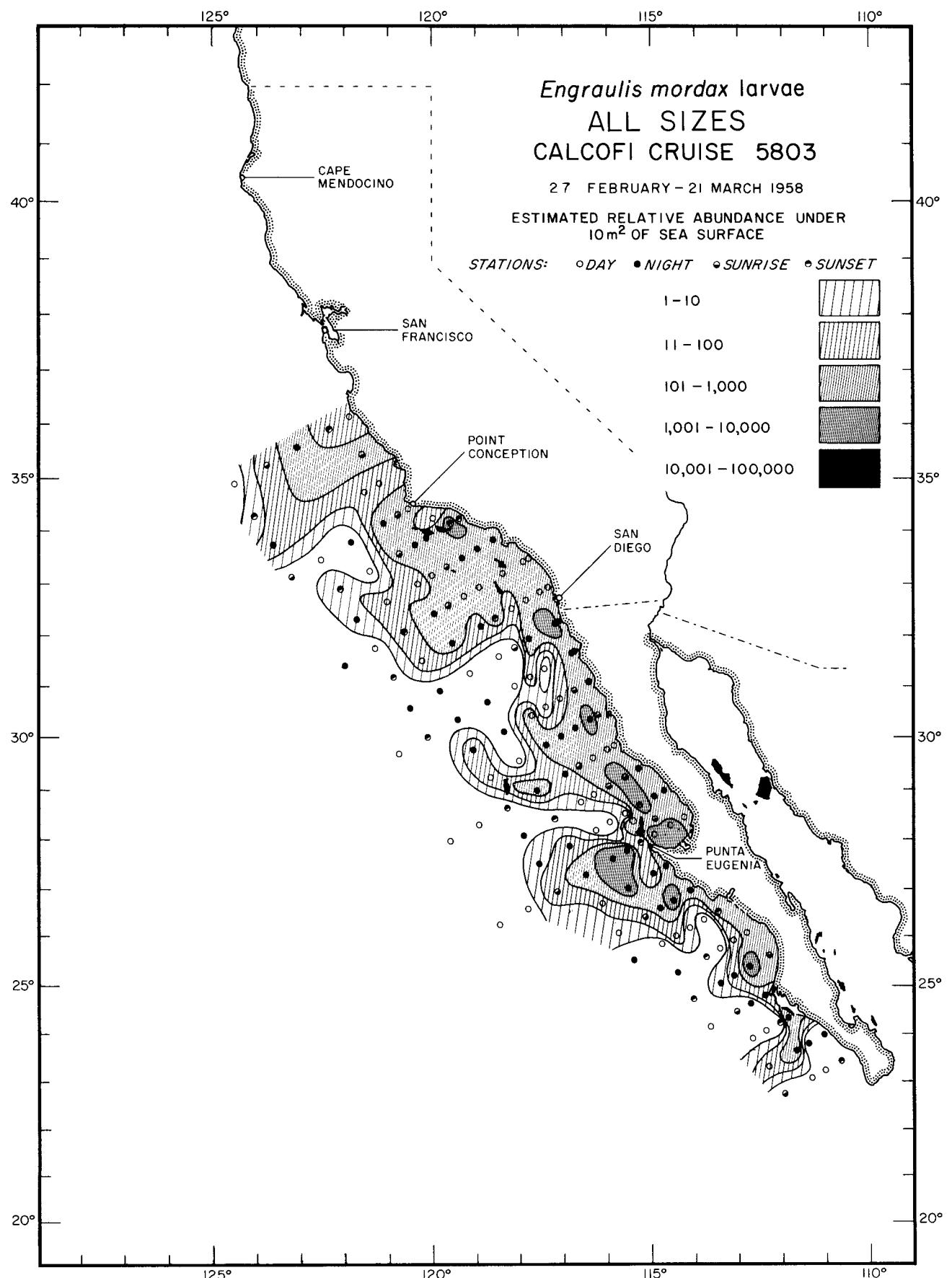


Engraulis mordax larvae
All Sizes
5802

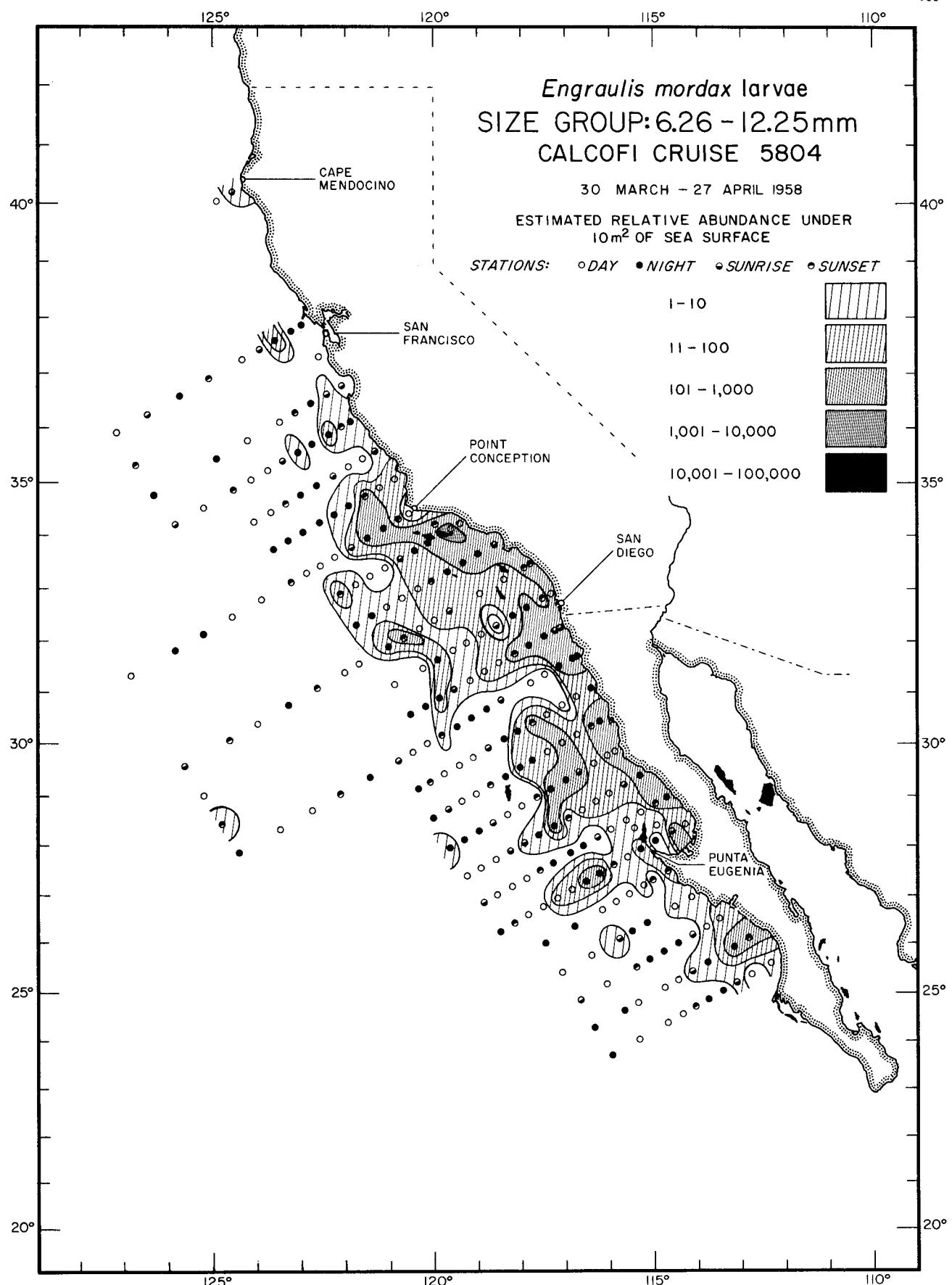
*Engraulis mordax* larvae

Size Group: 6.26-12.25mm

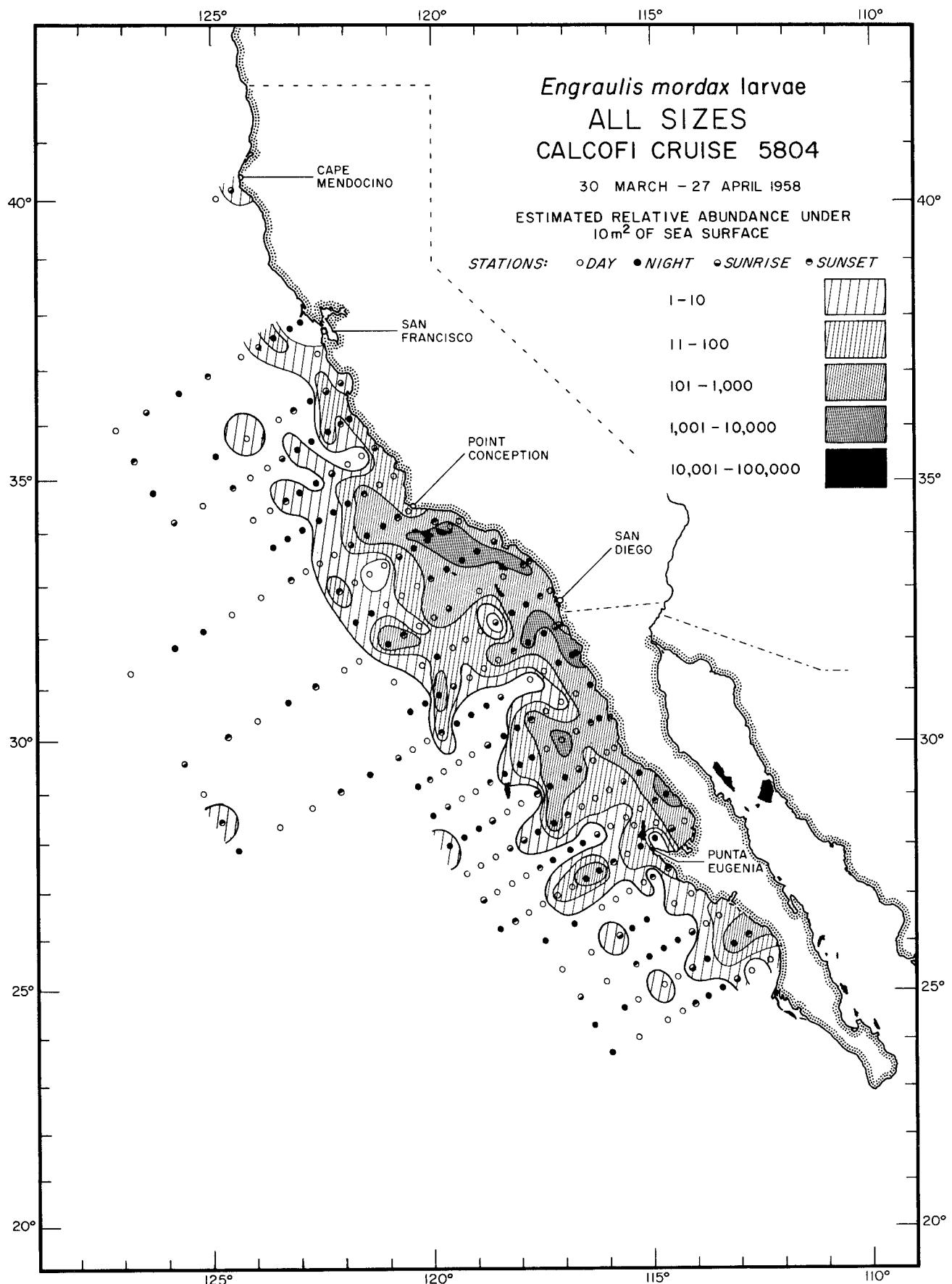
5803



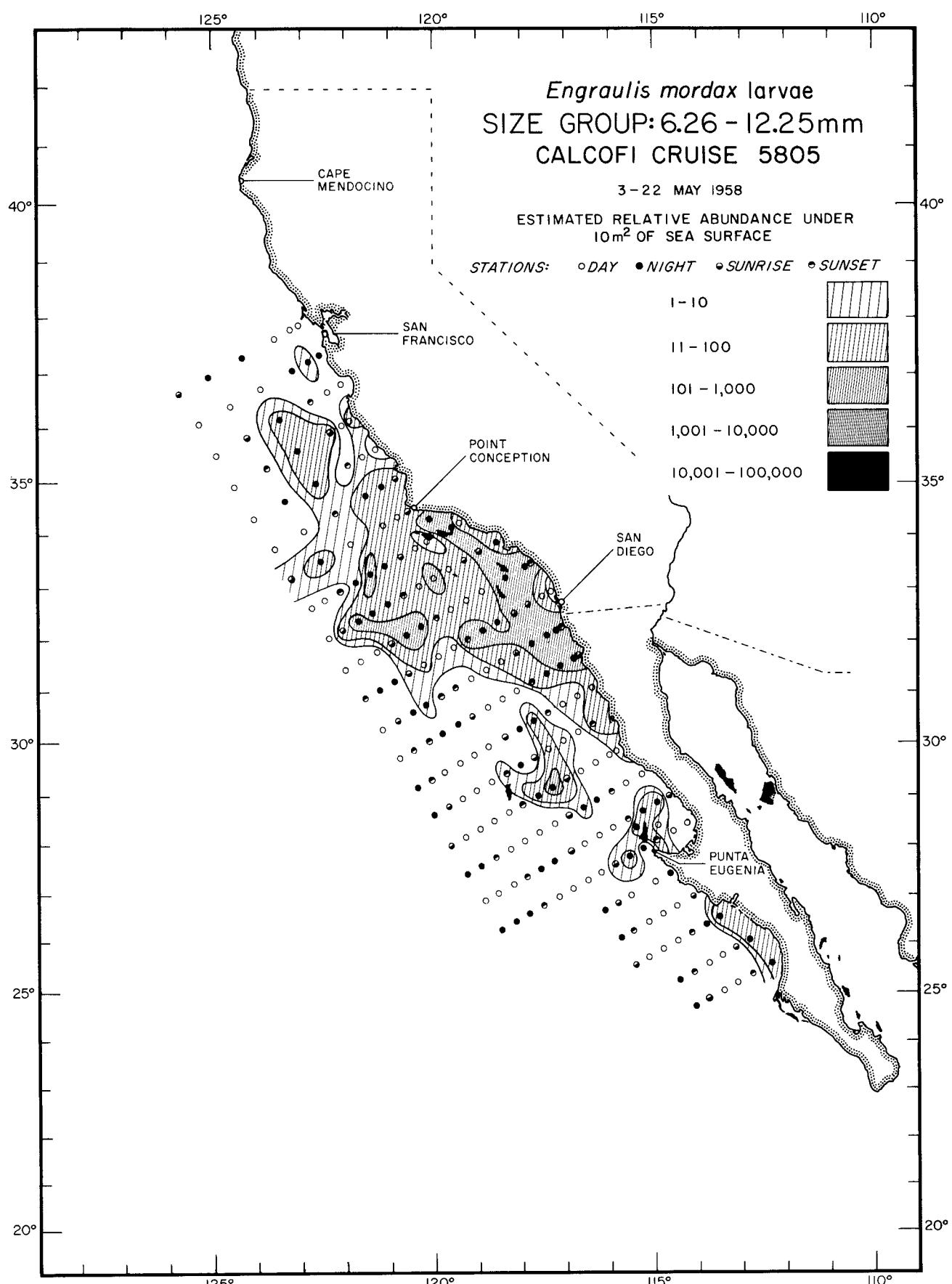
Engraulis mordax larvae
All Sizes
5803



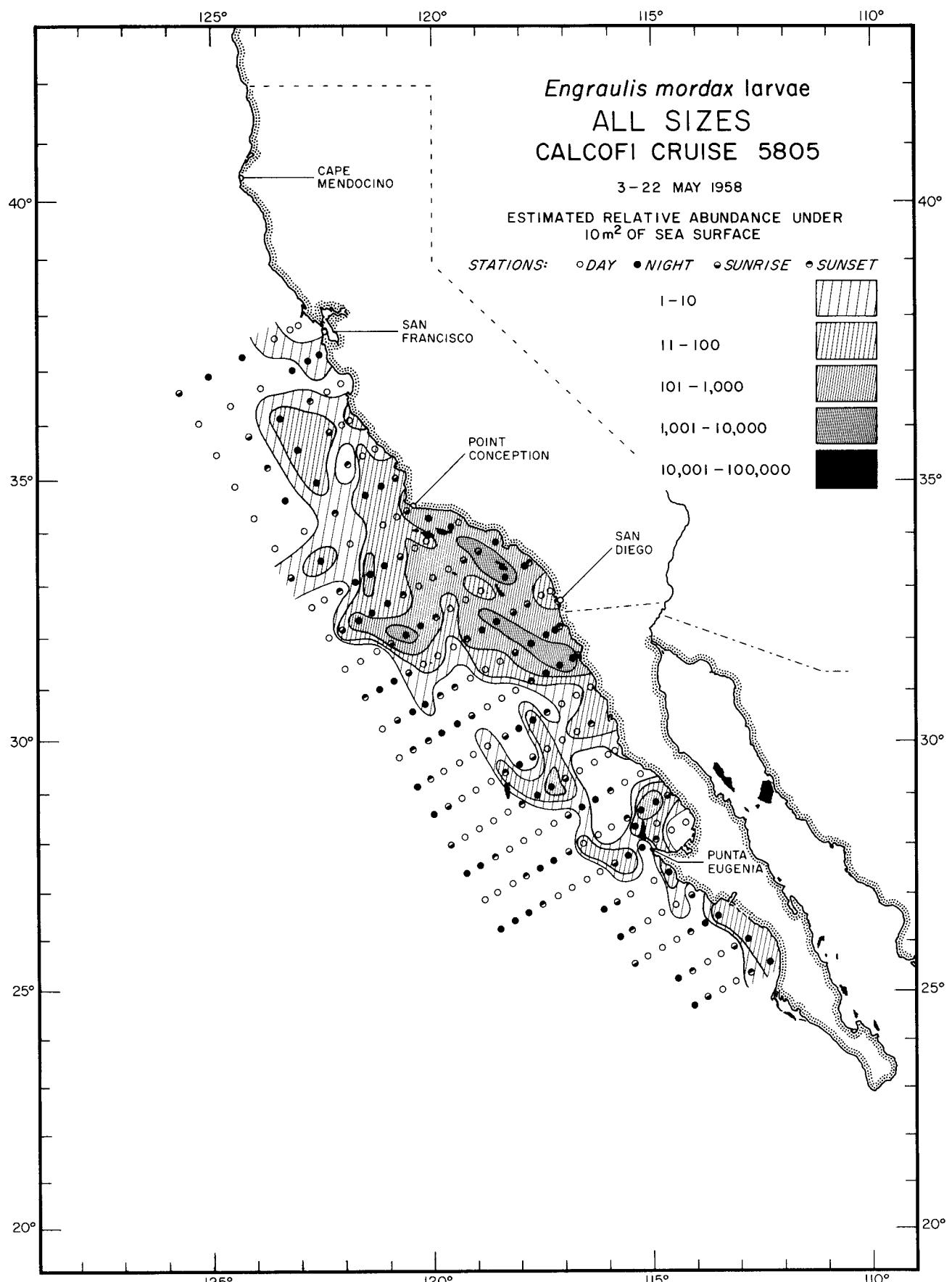
Engraulis mordax larvae
Size Group: 6.26-12.25mm
5804



Engraulis mordax larvae
All Sizes
5804

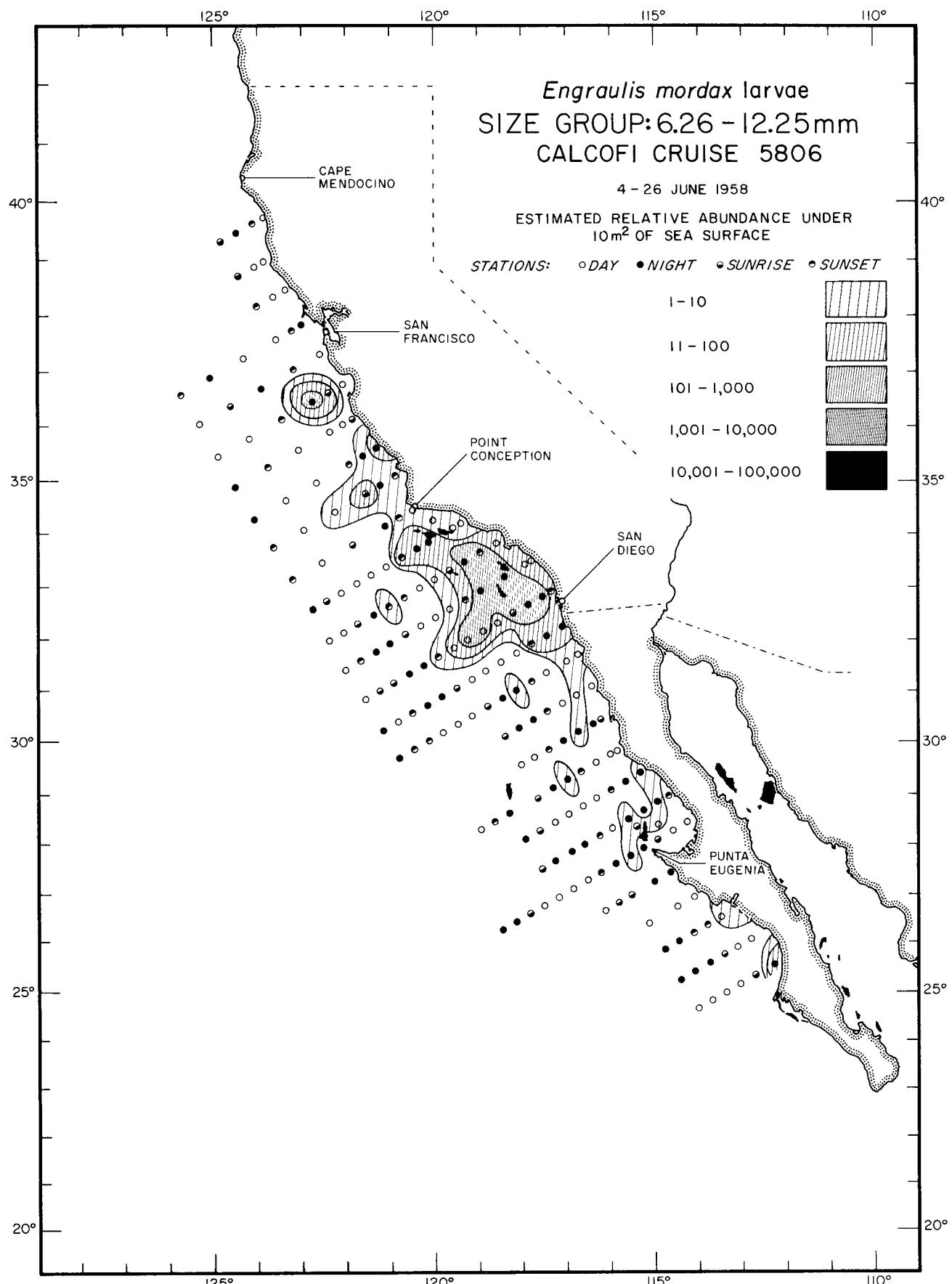


Engraulis mordax larvae
Size Group: 6.26-12.25mm
5805

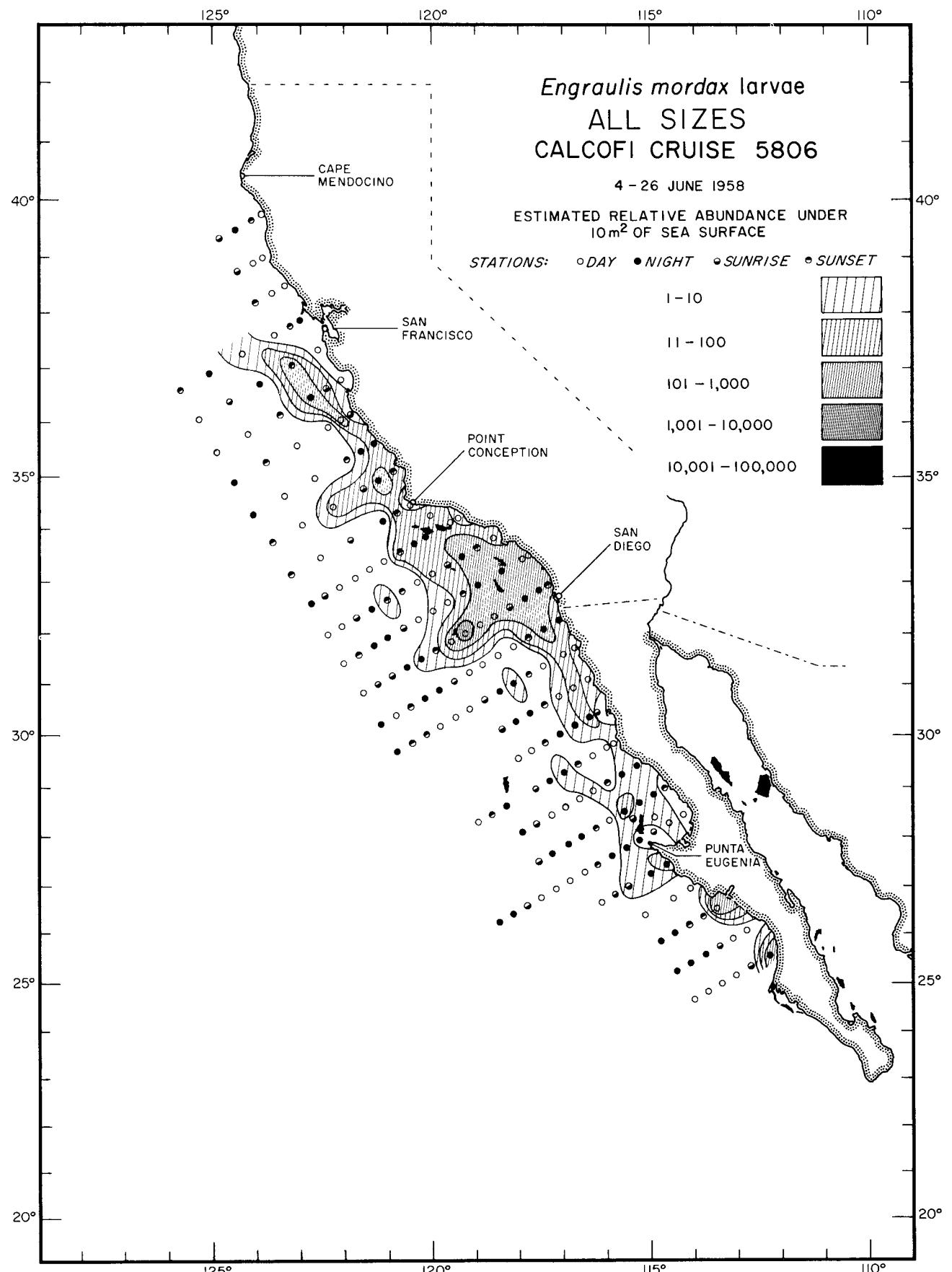
*Engraulis mordax* larvae

All Sizes

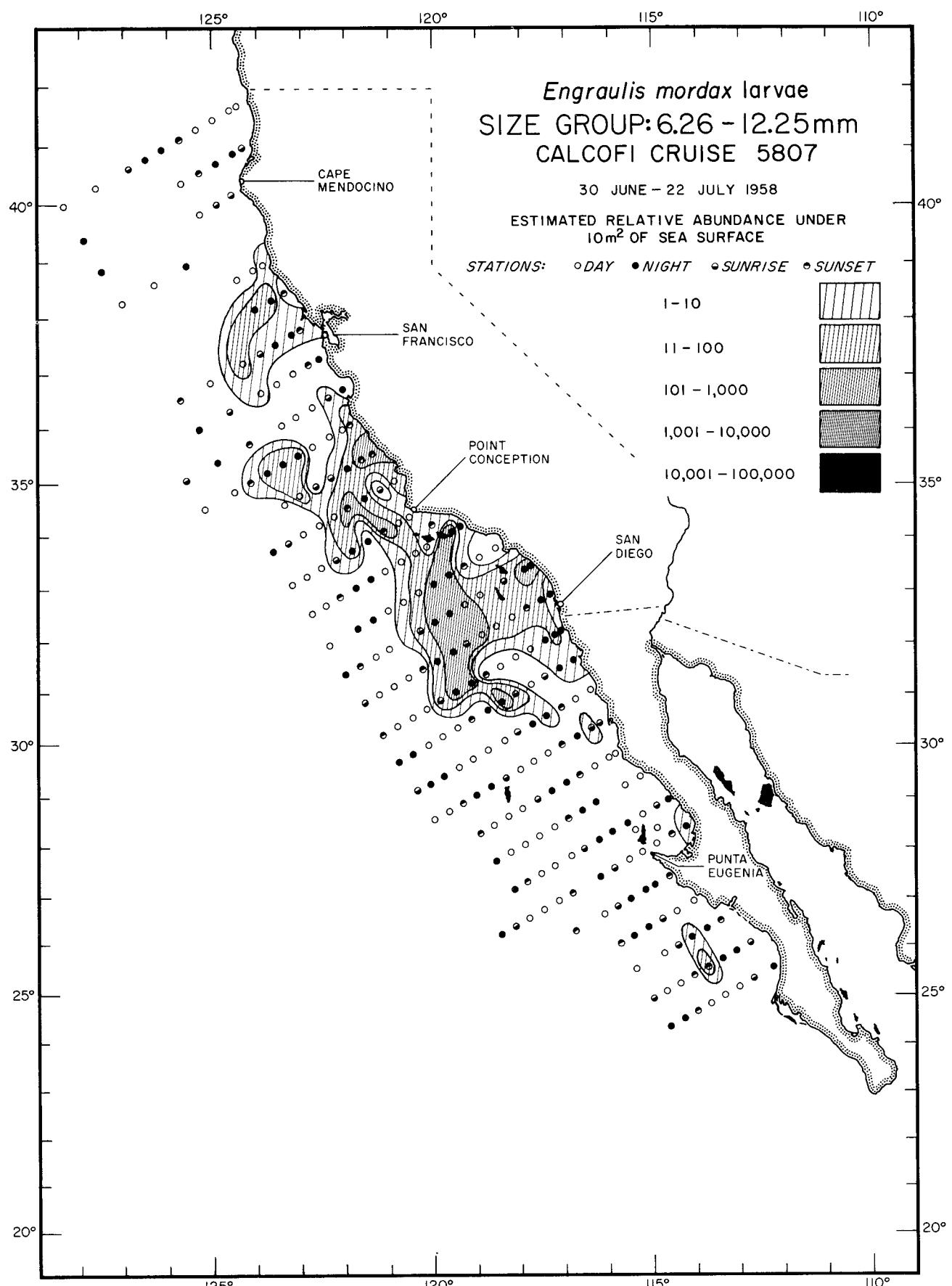
5805



Engraulis mordax larvae
Size Group: 6.26-12.25mm
5806



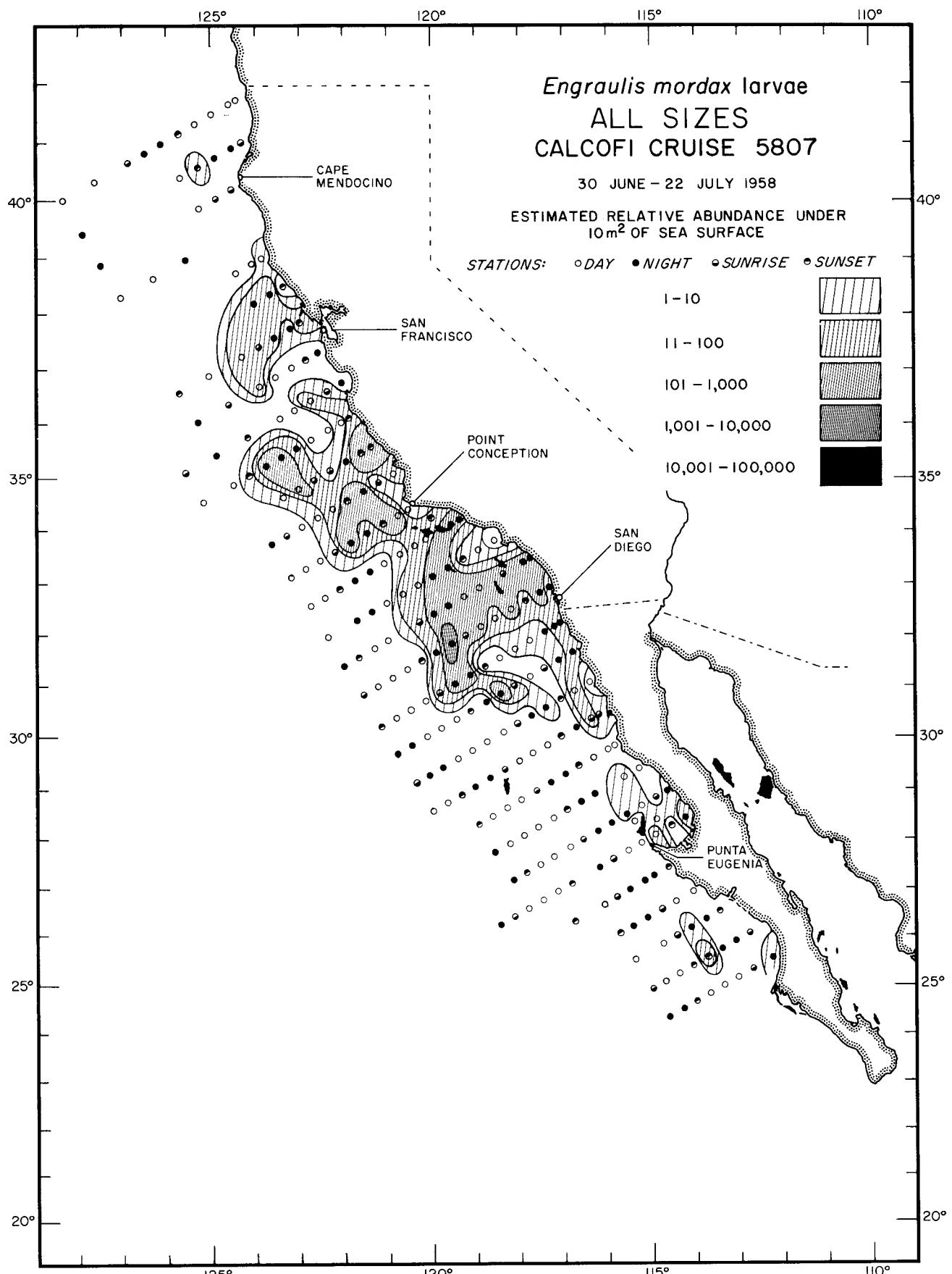
Engraulis mordax larvae
All Sizes
5806



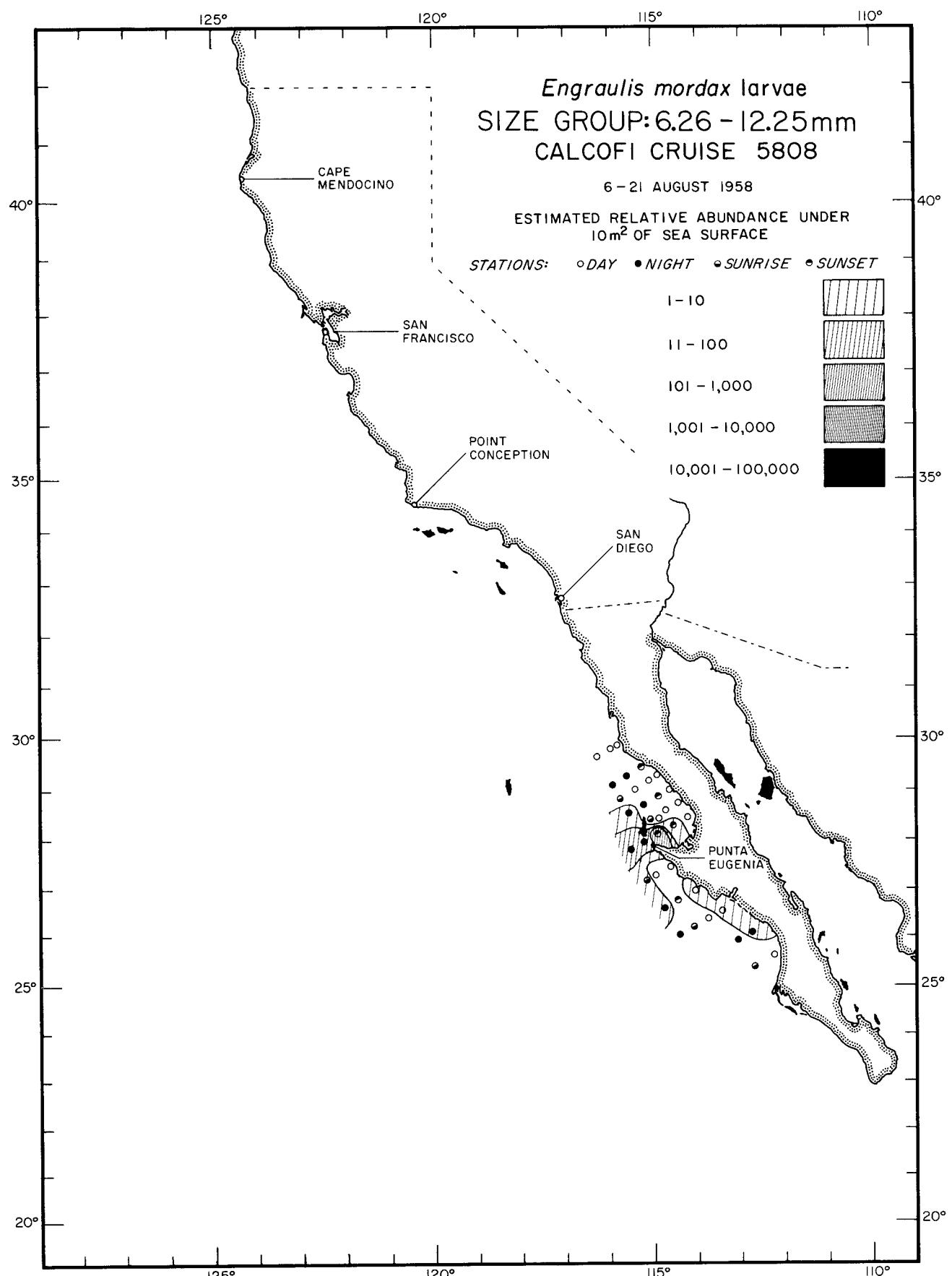
Engraulis mordax larvae

Size Group: 6.26-12.25mm

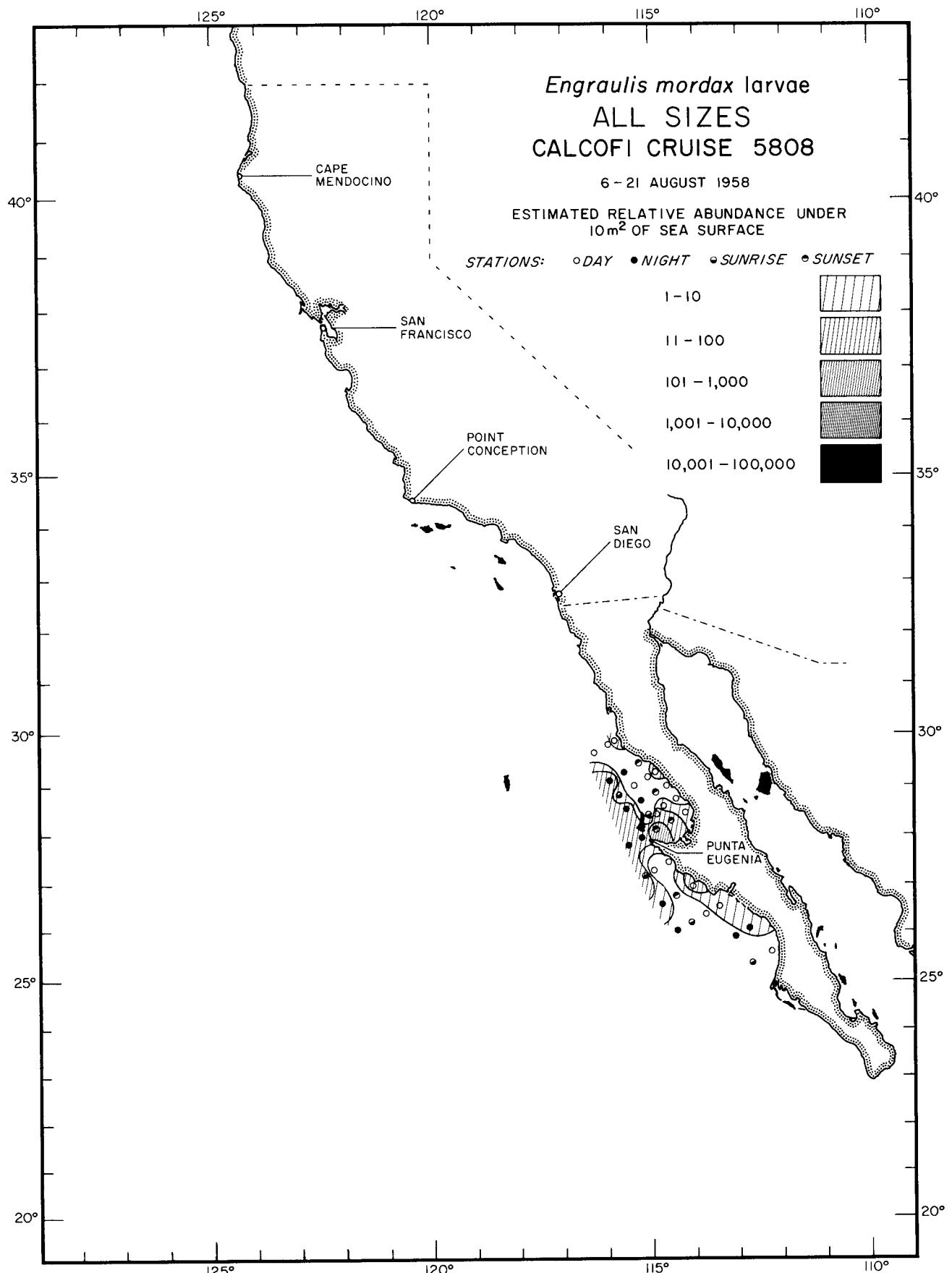
5807



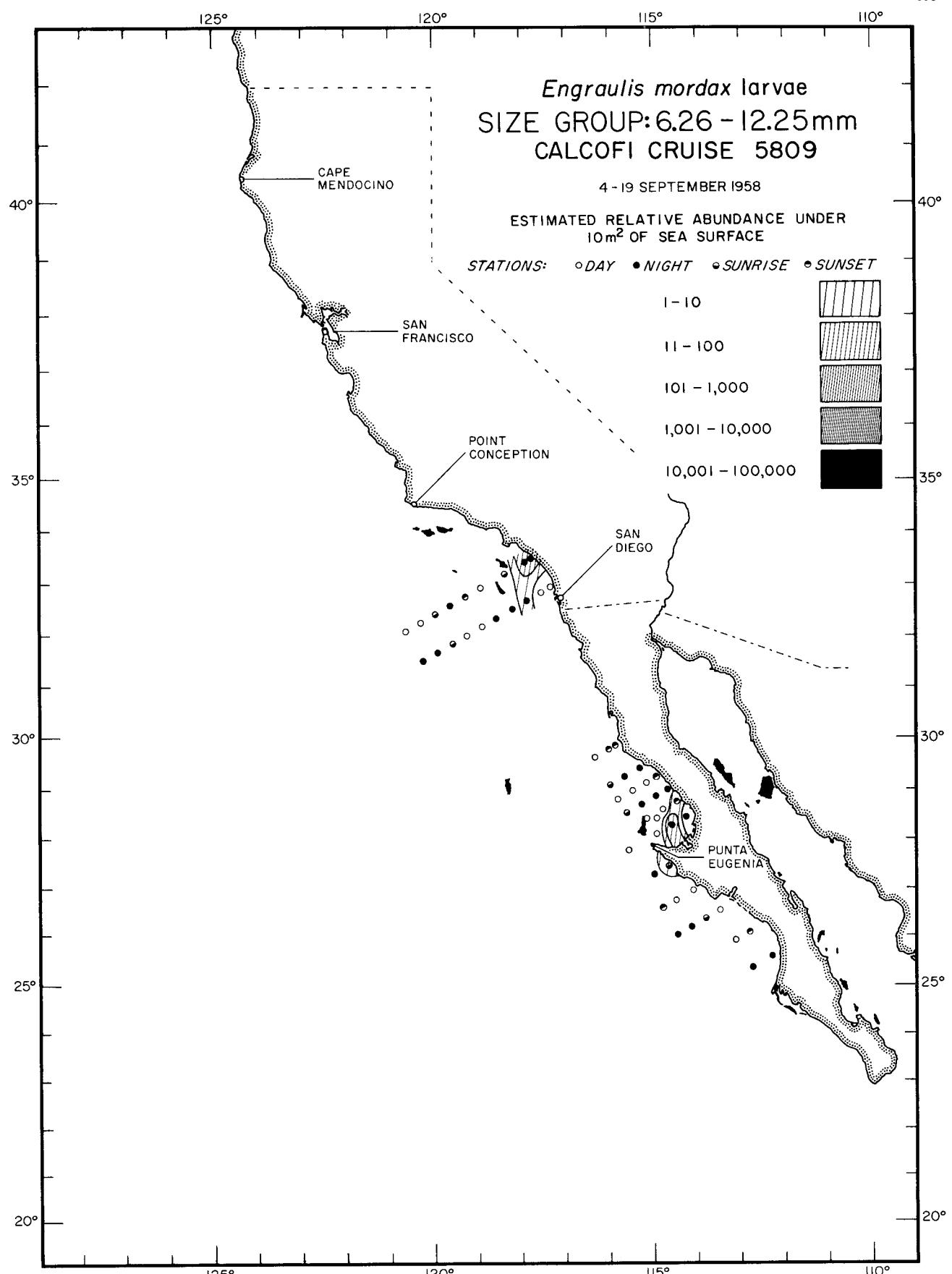
Engraulis mordax larvae
All Sizes
5807



Engraulis mordax larvae
Size Group: 6.26 - 12.25mm
5808



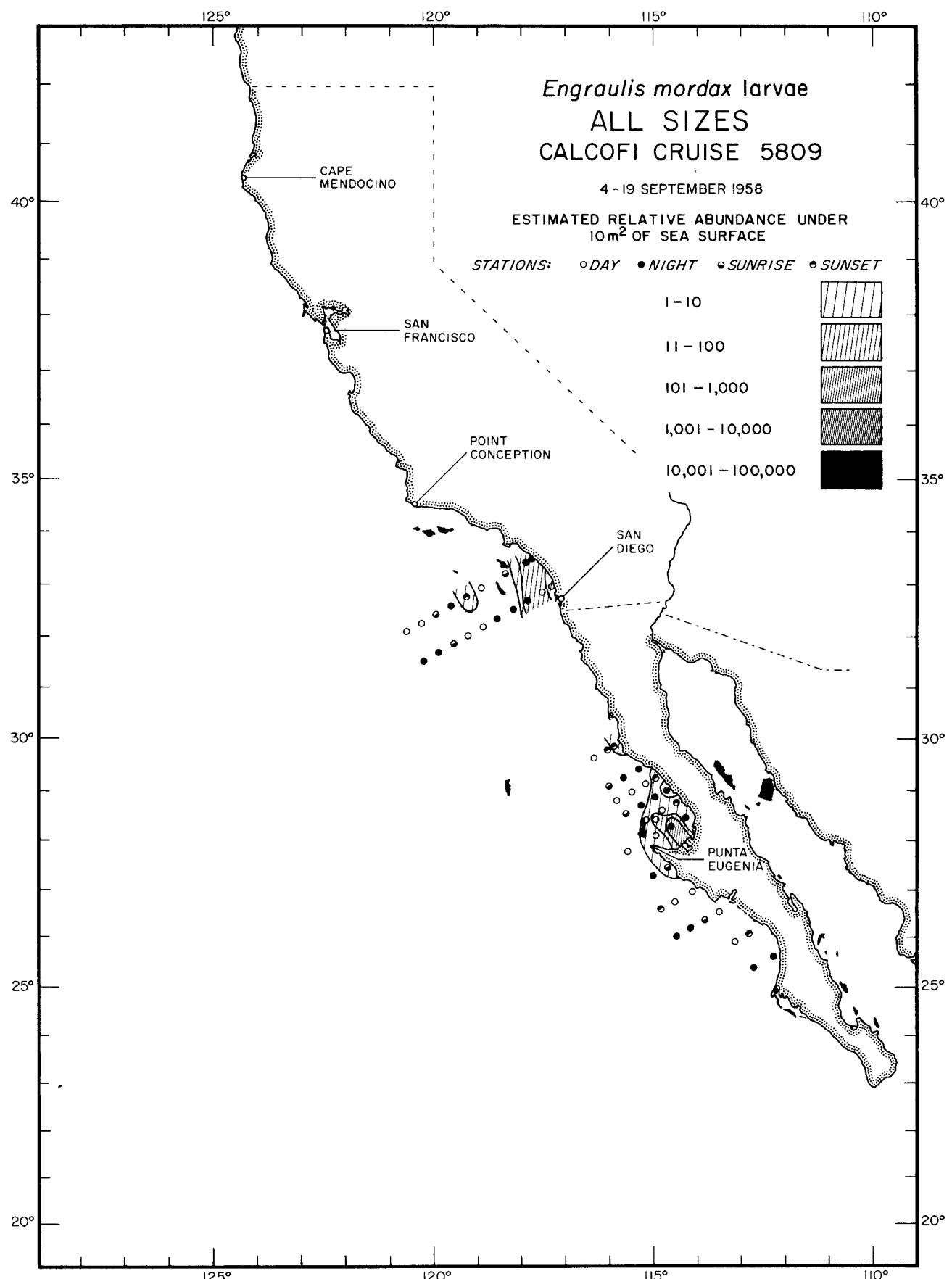
Engraulis mordax larvae
All Sizes
5808

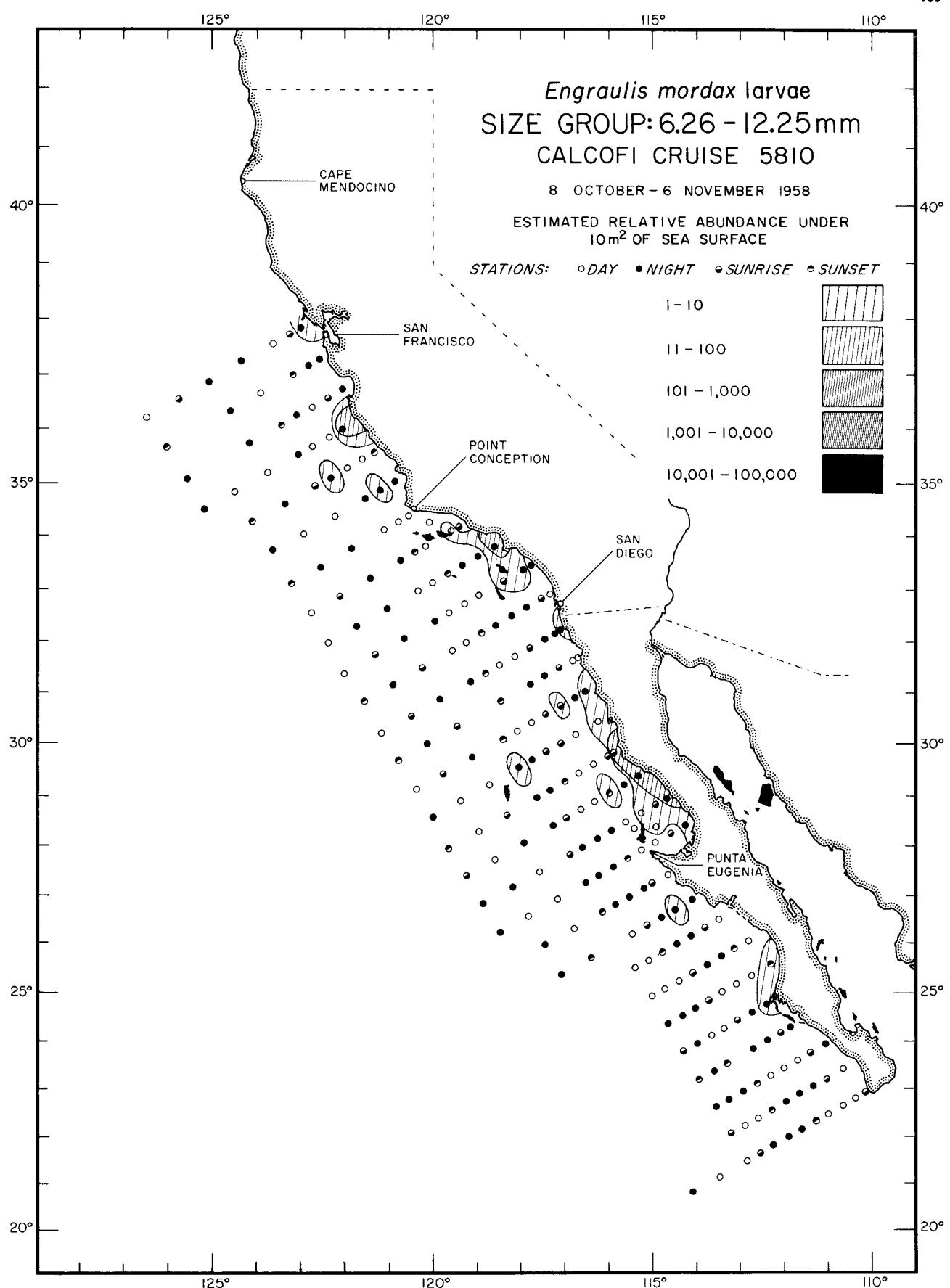


Engraulis mordax larvae

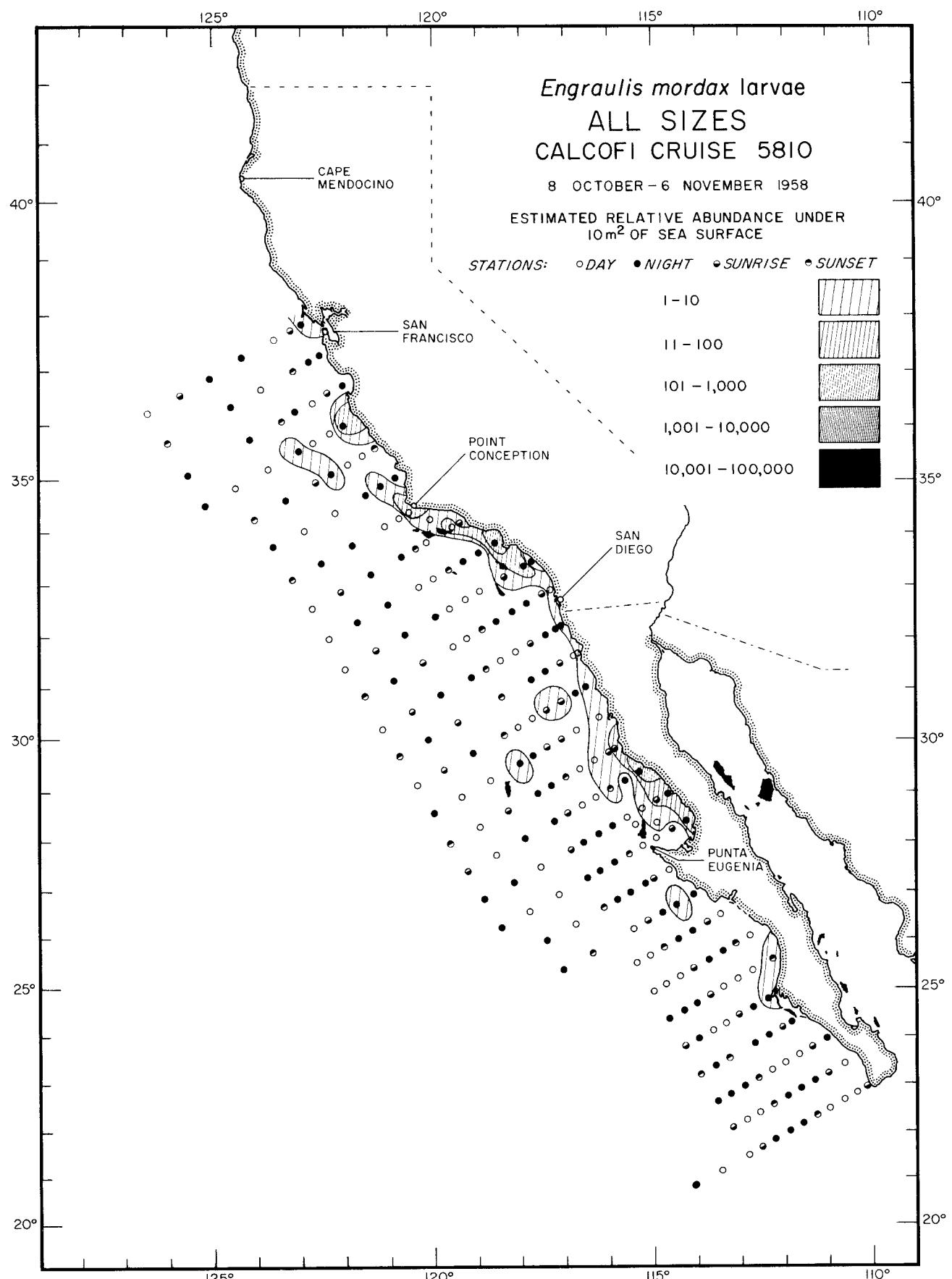
Size Group: 6.26-12.25mm

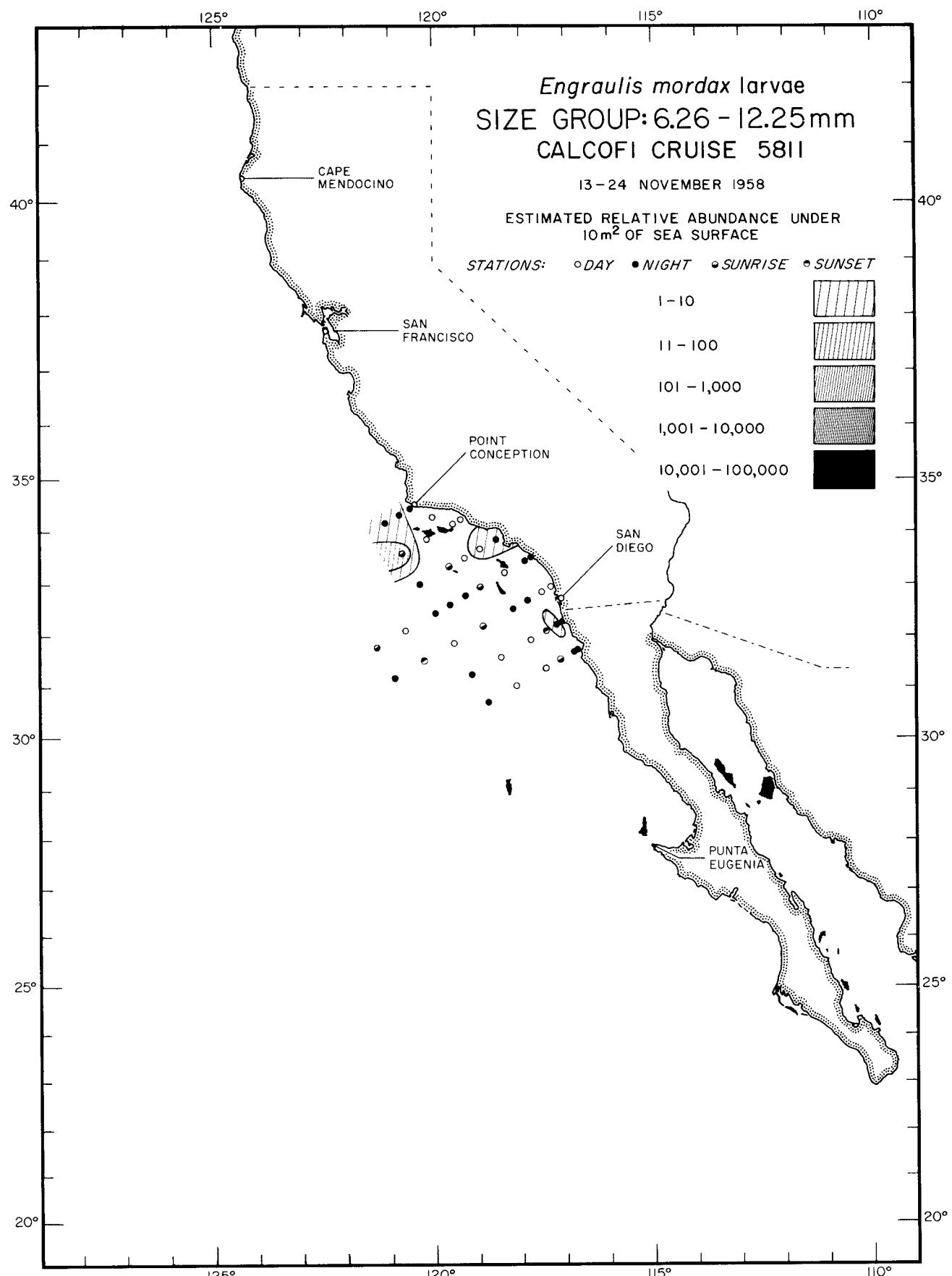
5809

*Engraulis mordax* larvaeAll Sizes
5809



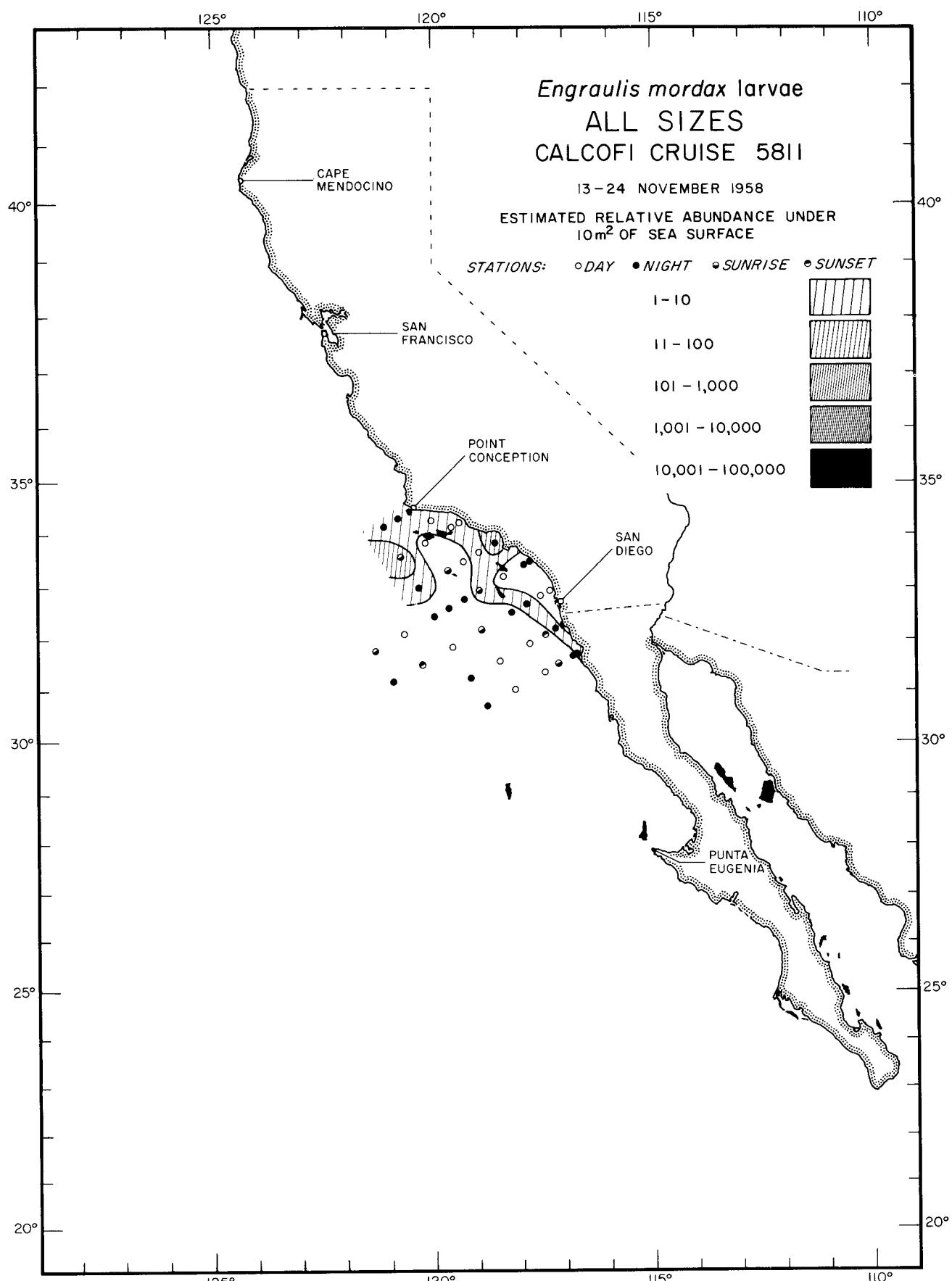
Engraulis mordax larvae
Size Group: 6.26-12.25mm
5810

*Engraulis mordax* larvaeAll Sizes
5810

*Engraulis mordax* larvae

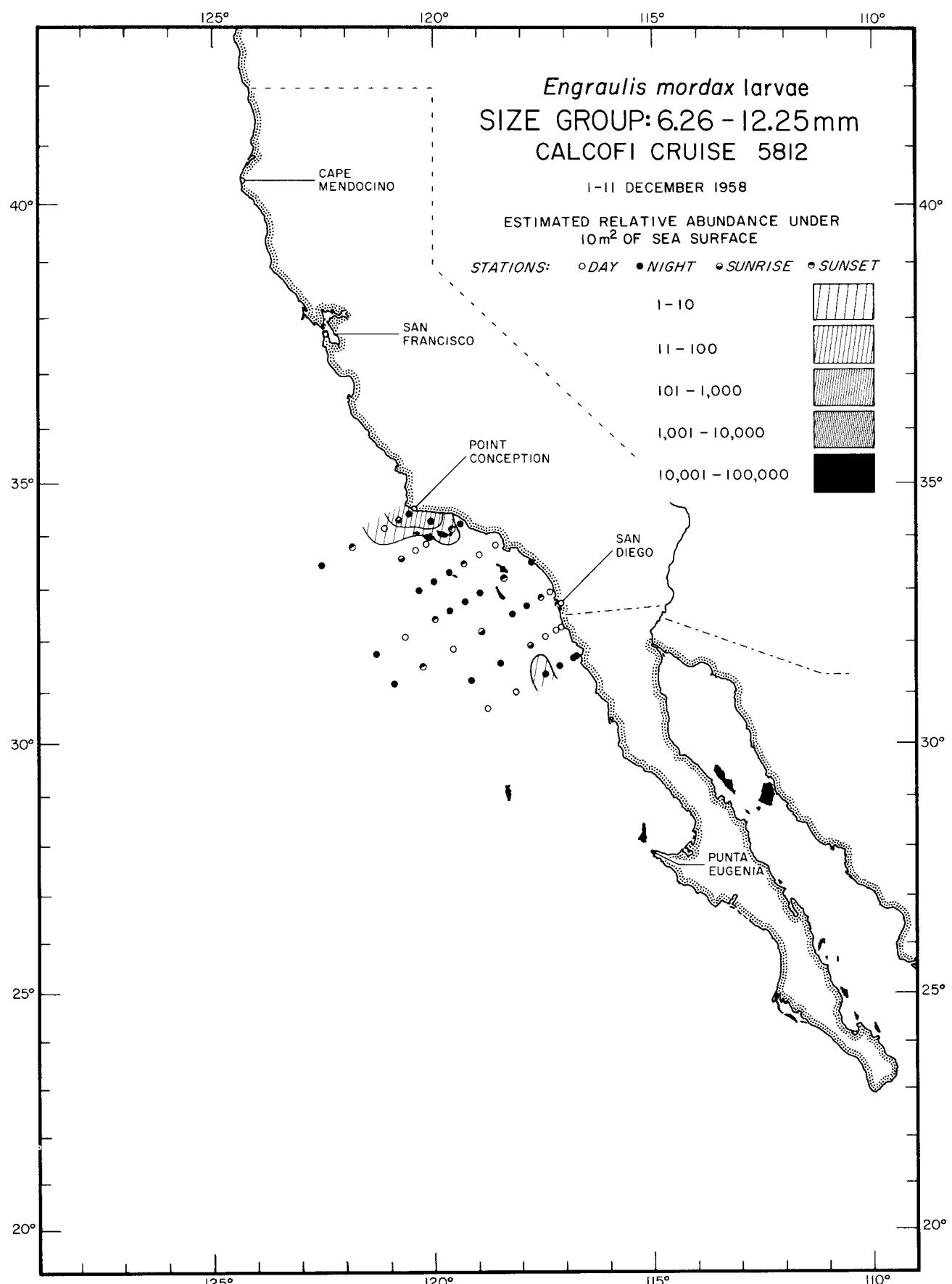
Size Group: 6.26-12.25mm

58II

*Engraulis mordax* larvae

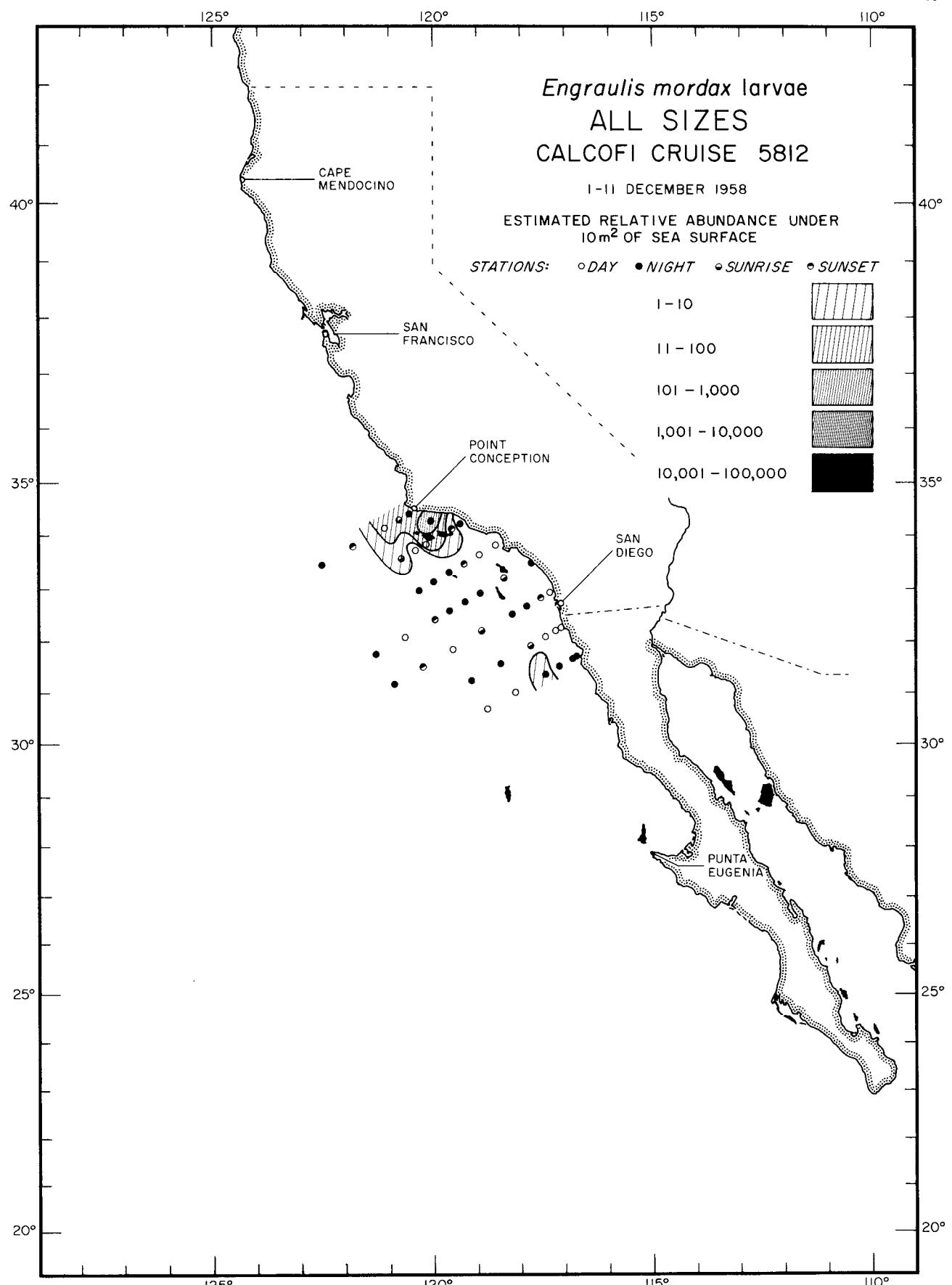
All Sizes

58II

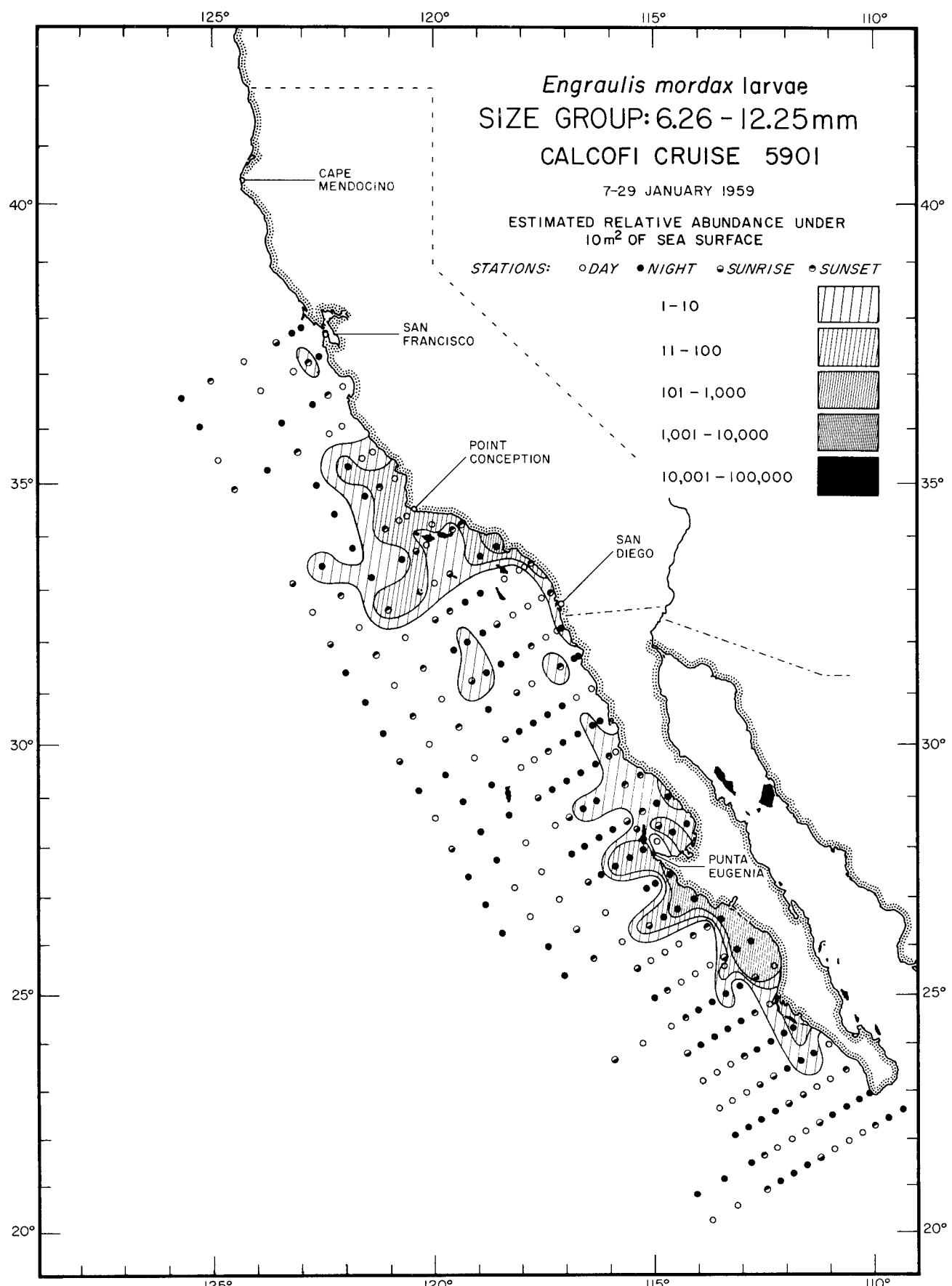
*Engraulis mordax* larvae

Size Group: 6.26-12.25mm

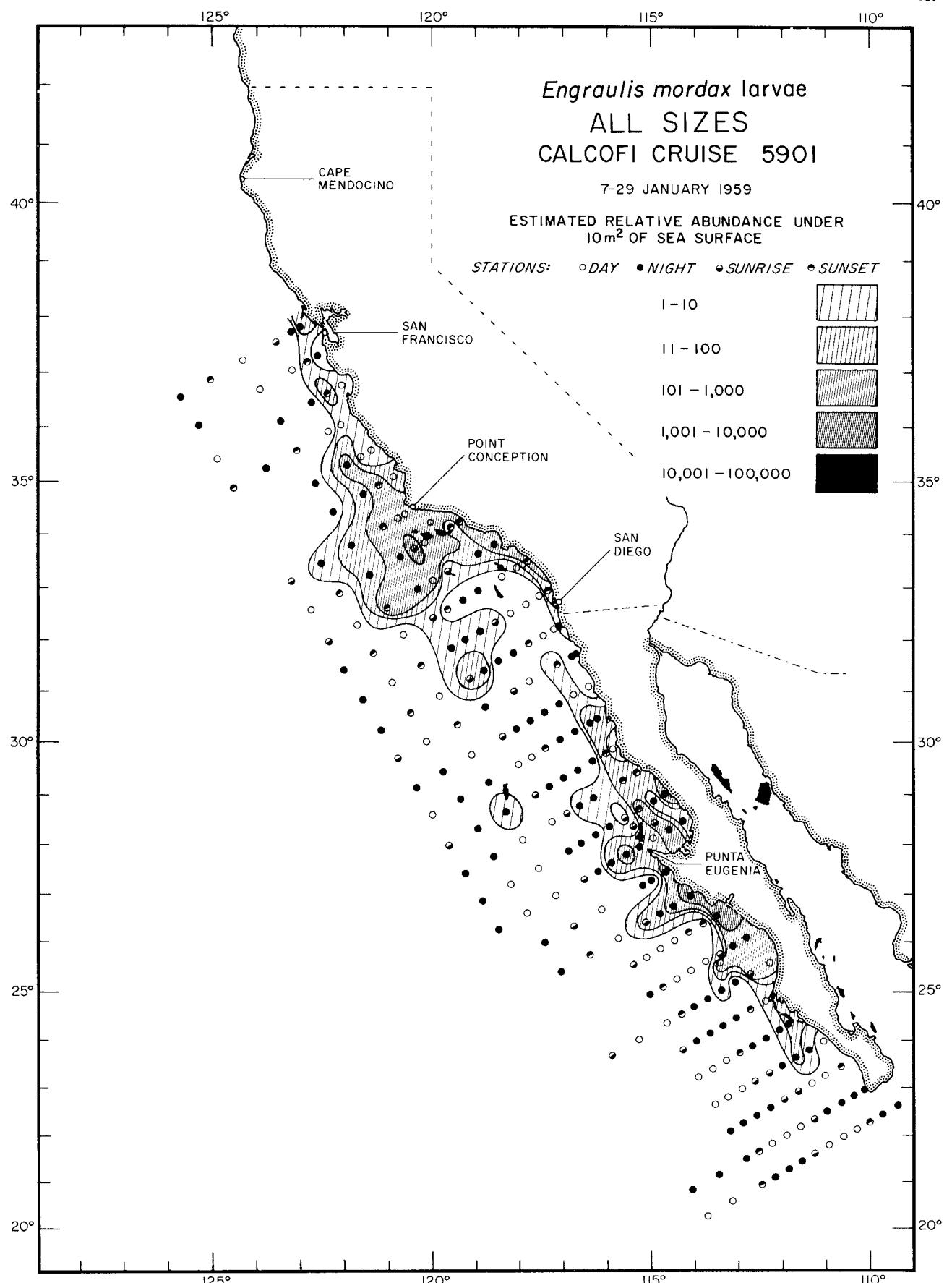
5812



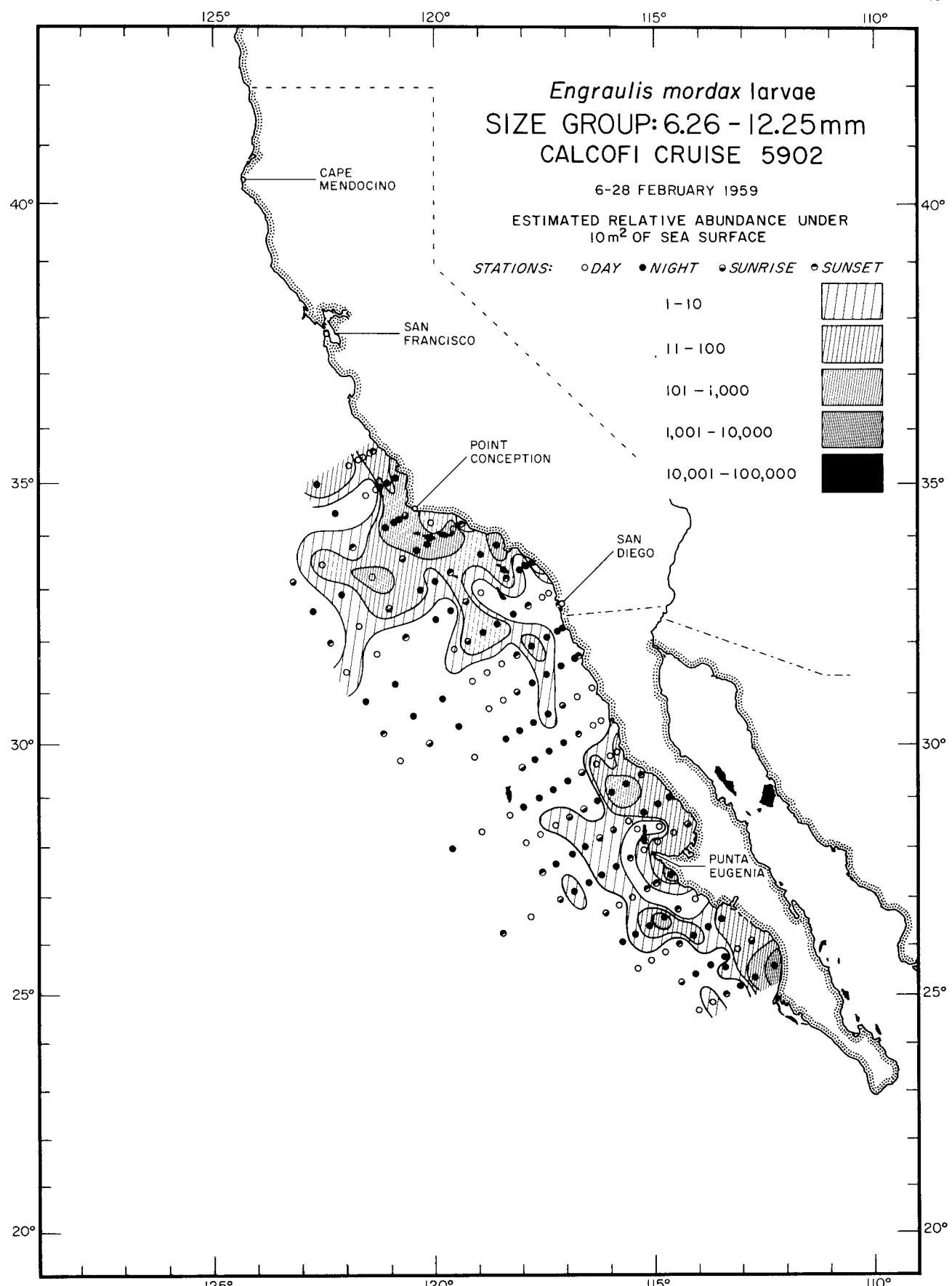
Engraulis mordax larvae
All Sizes
5812



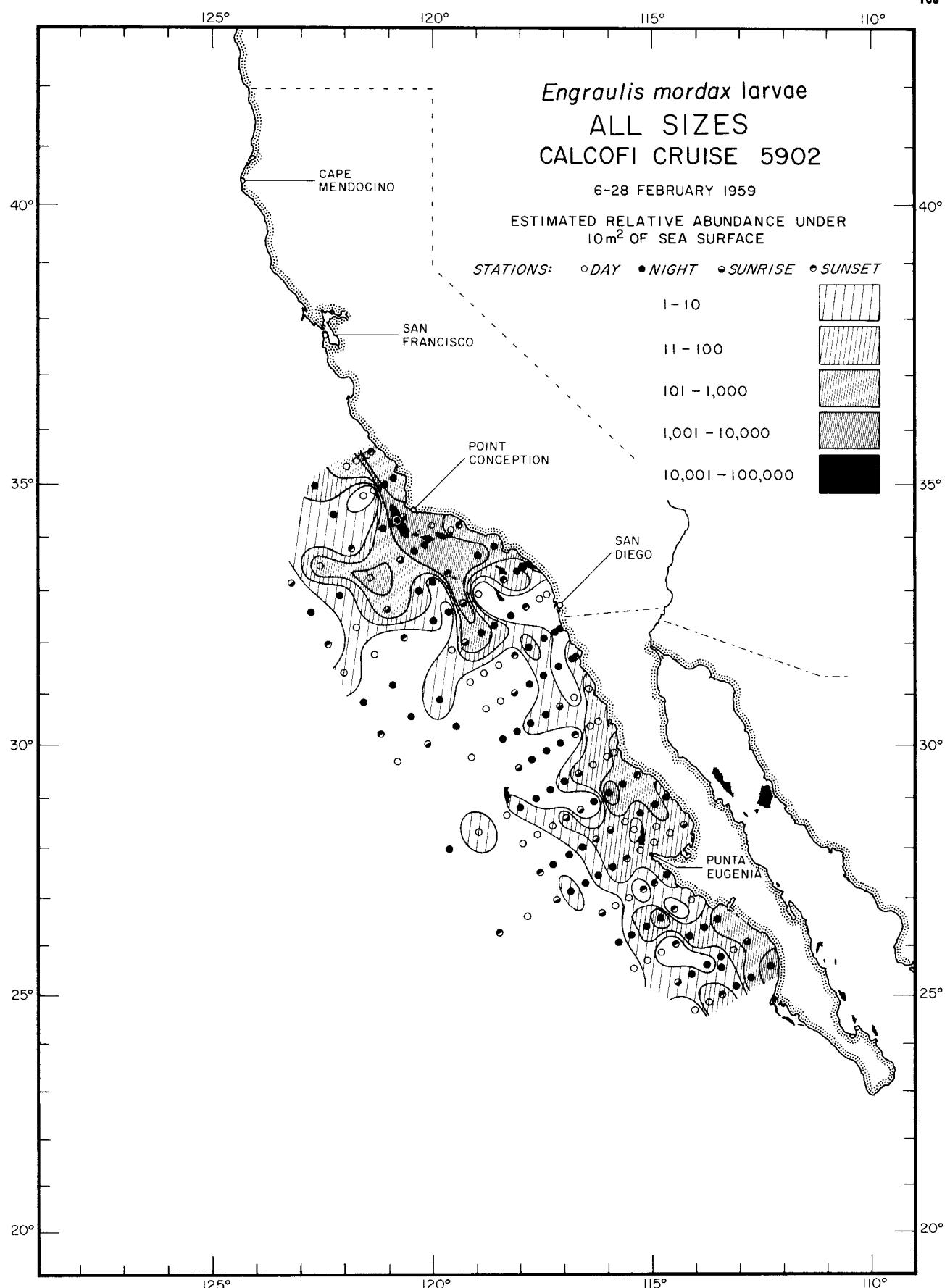
Engraulis mordax larvae
Size Group: 6.26-12.25mm
5901



Engraulis mordax larvae
All Sizes
5901

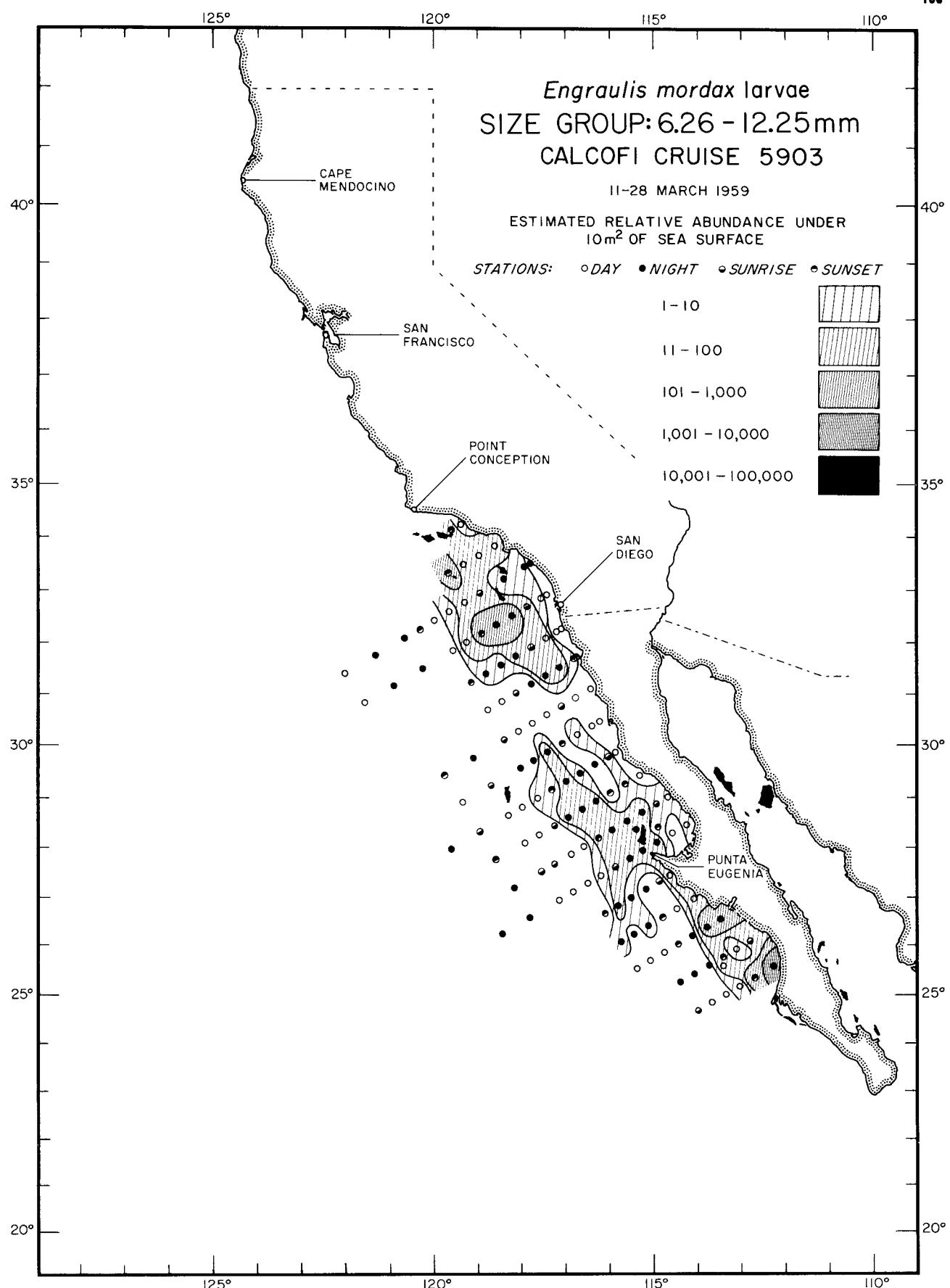


Engraulis mordax larvae
Size Group: 6.26-12.25mm
5902

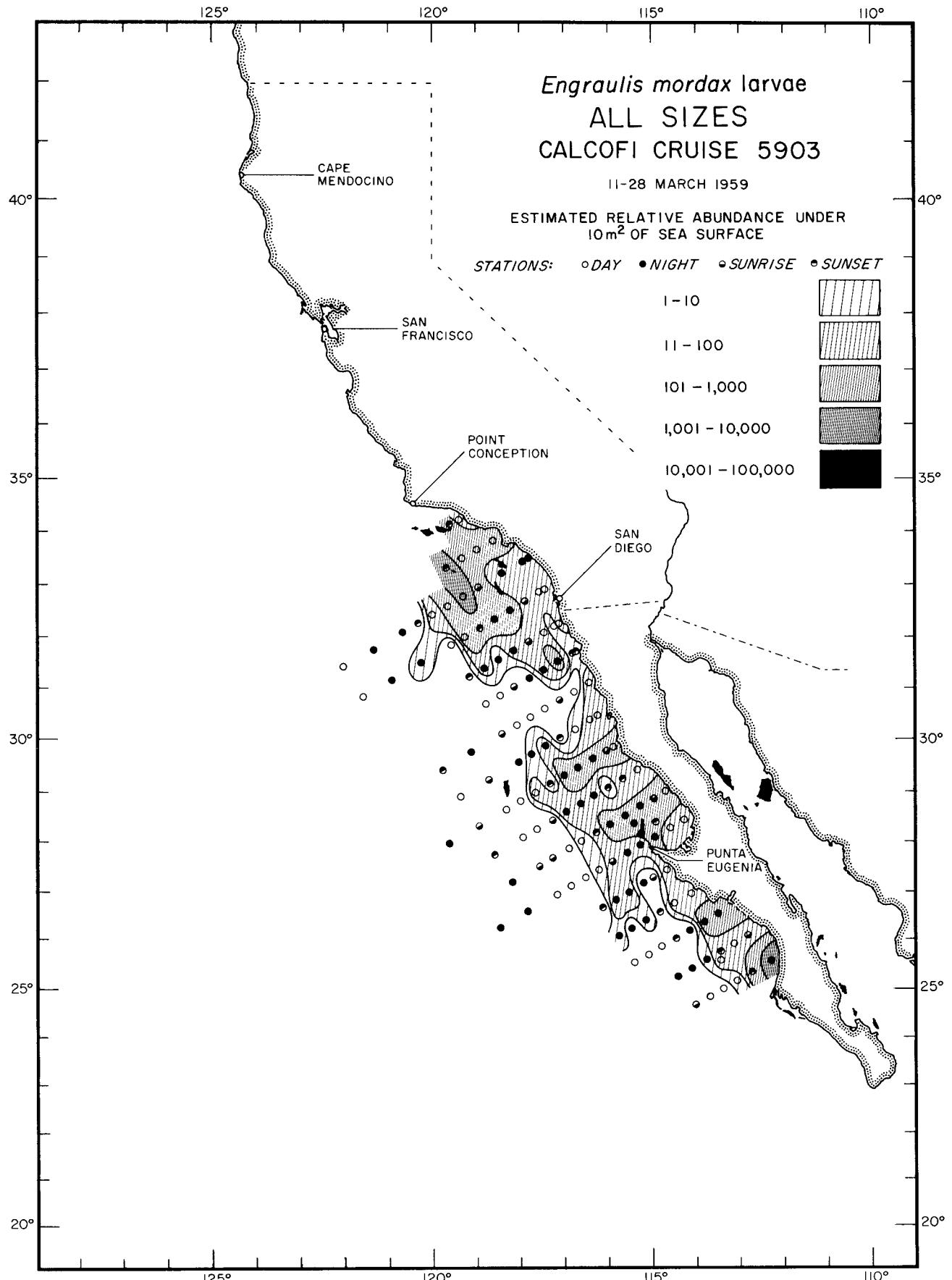
*Engraulis mordax* larvae

All Sizes

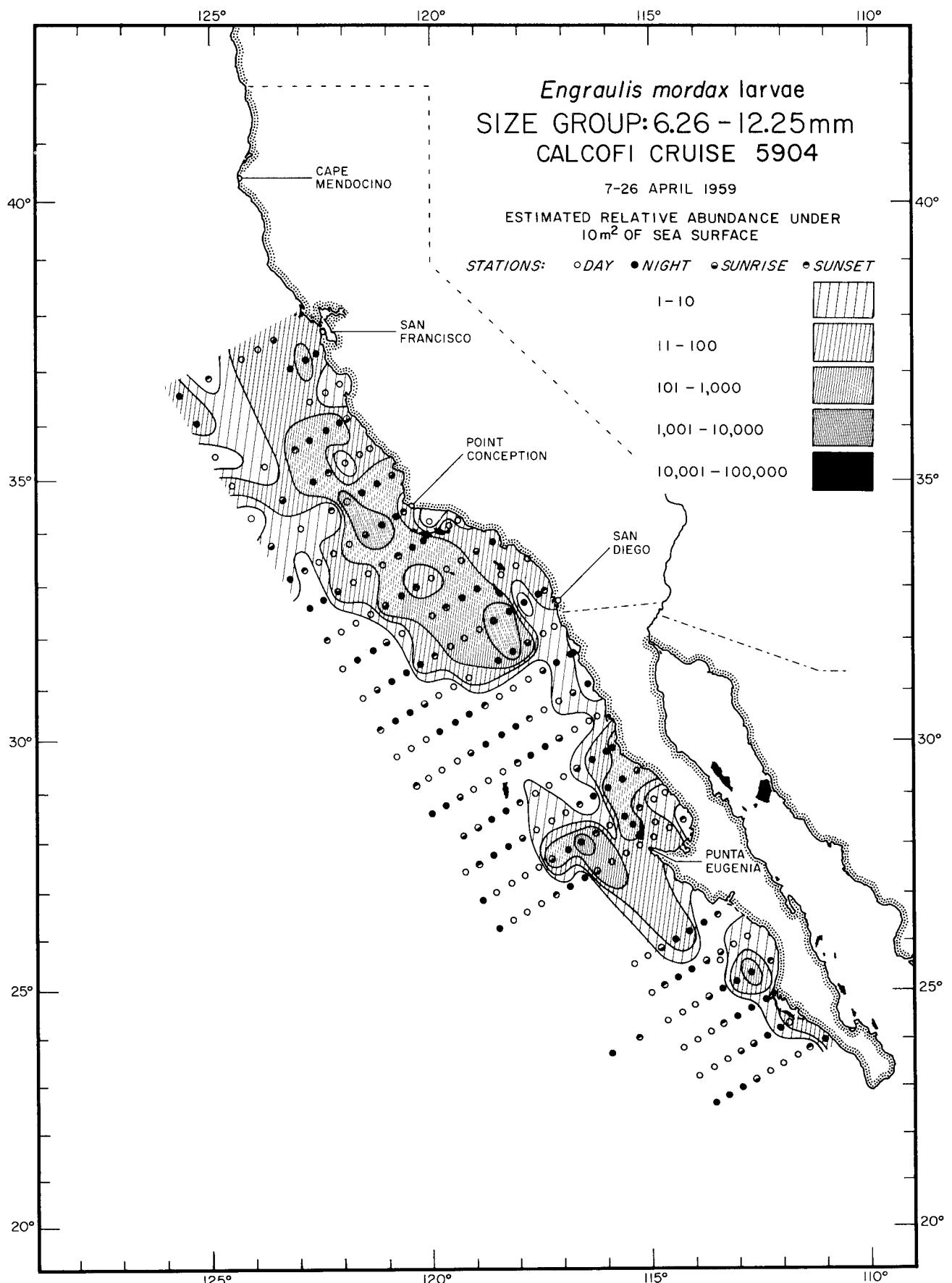
5902



Engraulis mordax larvae
Size Group: 6.26-12.25mm
5903



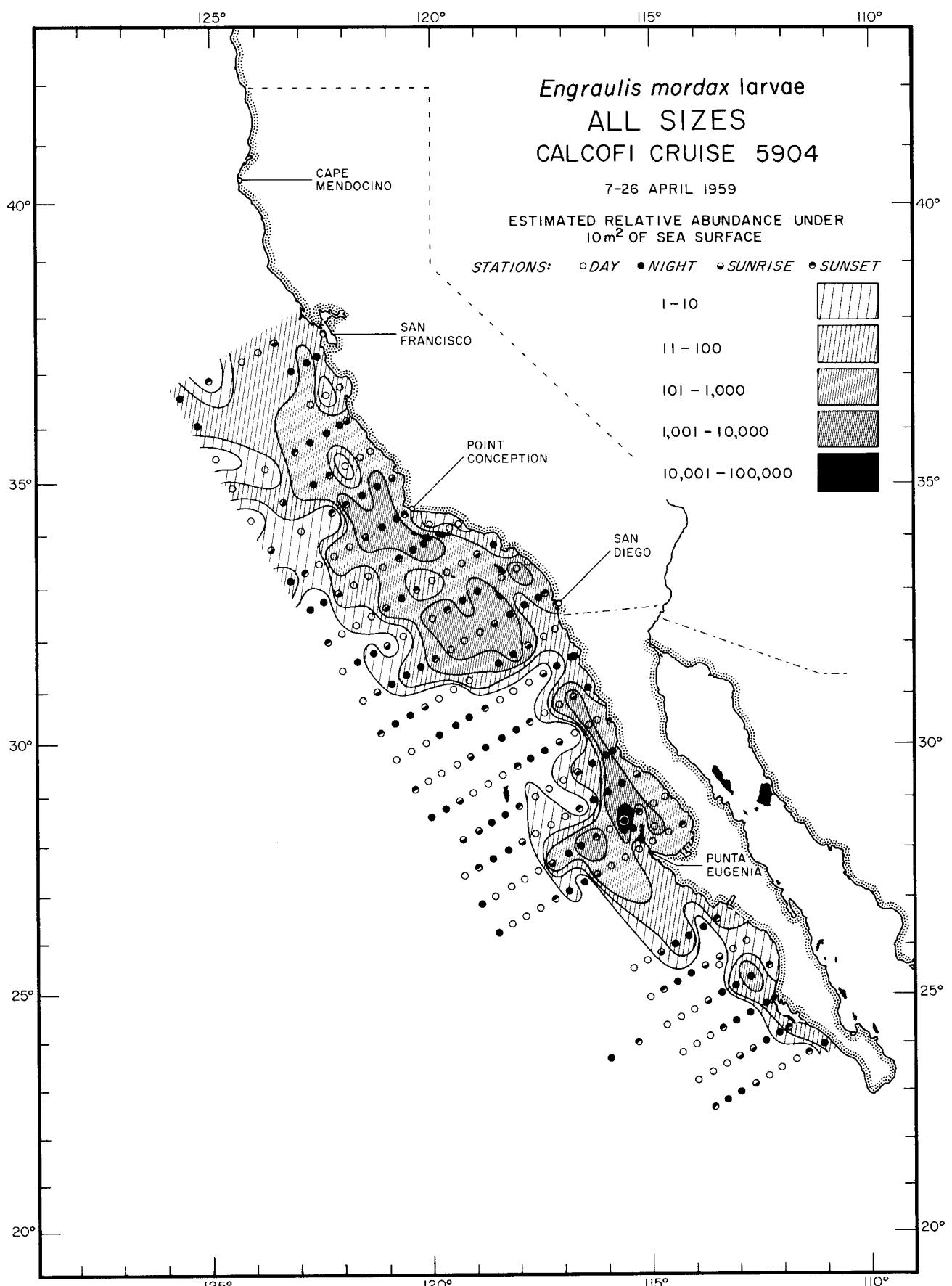
Engraulis mordax larvae
All Sizes
5903



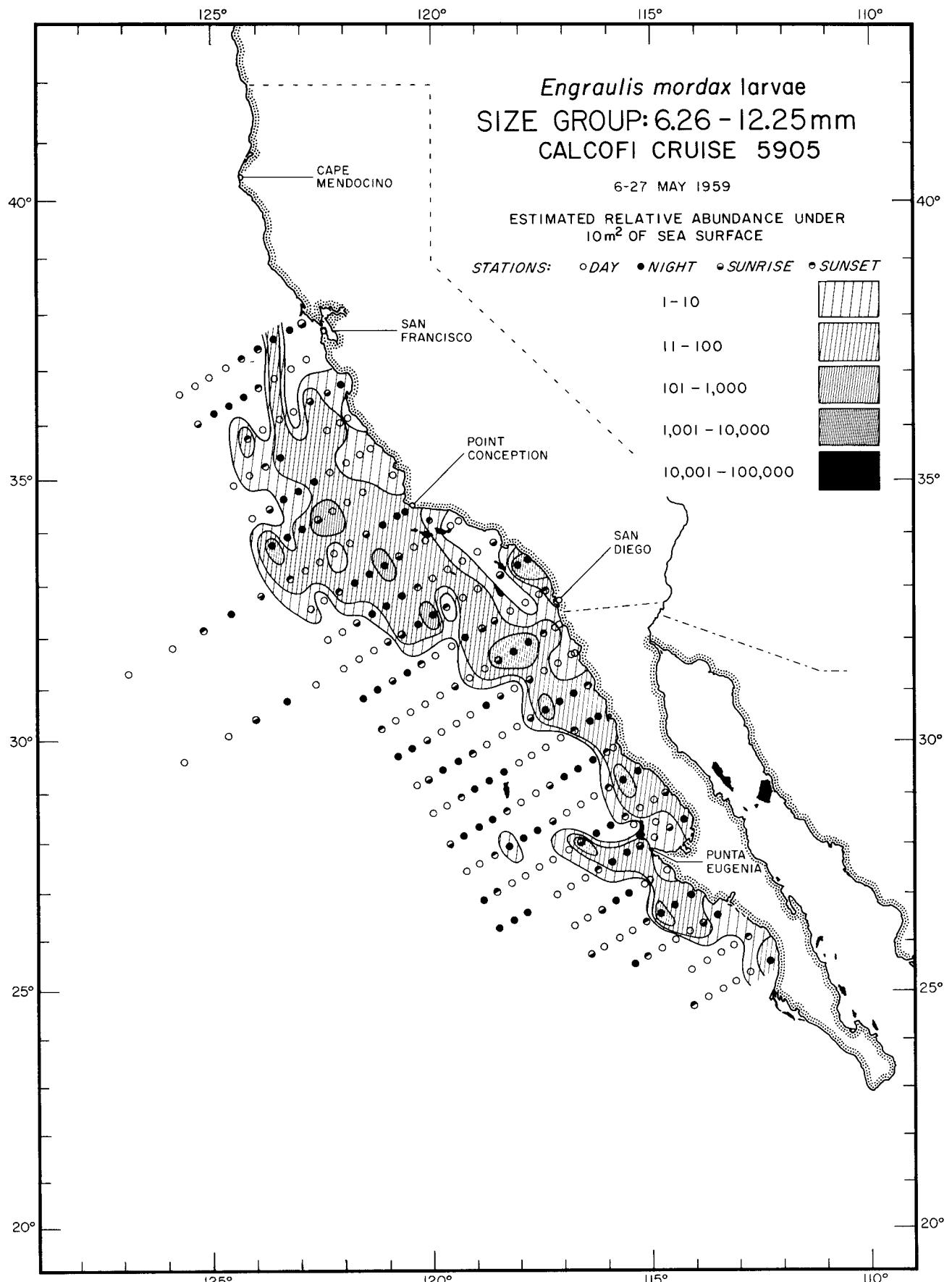
Engraulis mordax larvae

Size Group: 6.26-12.25mm

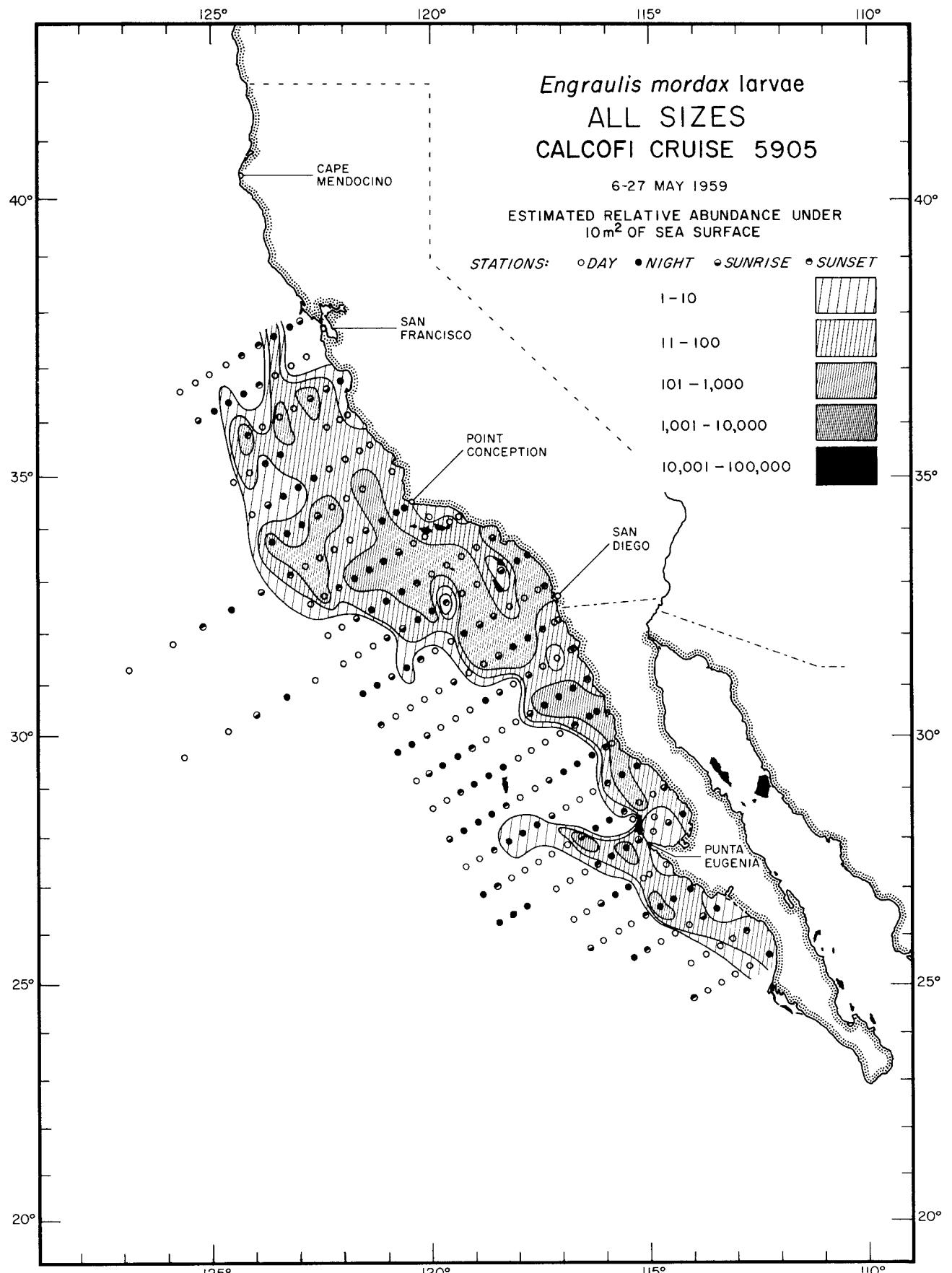
5904



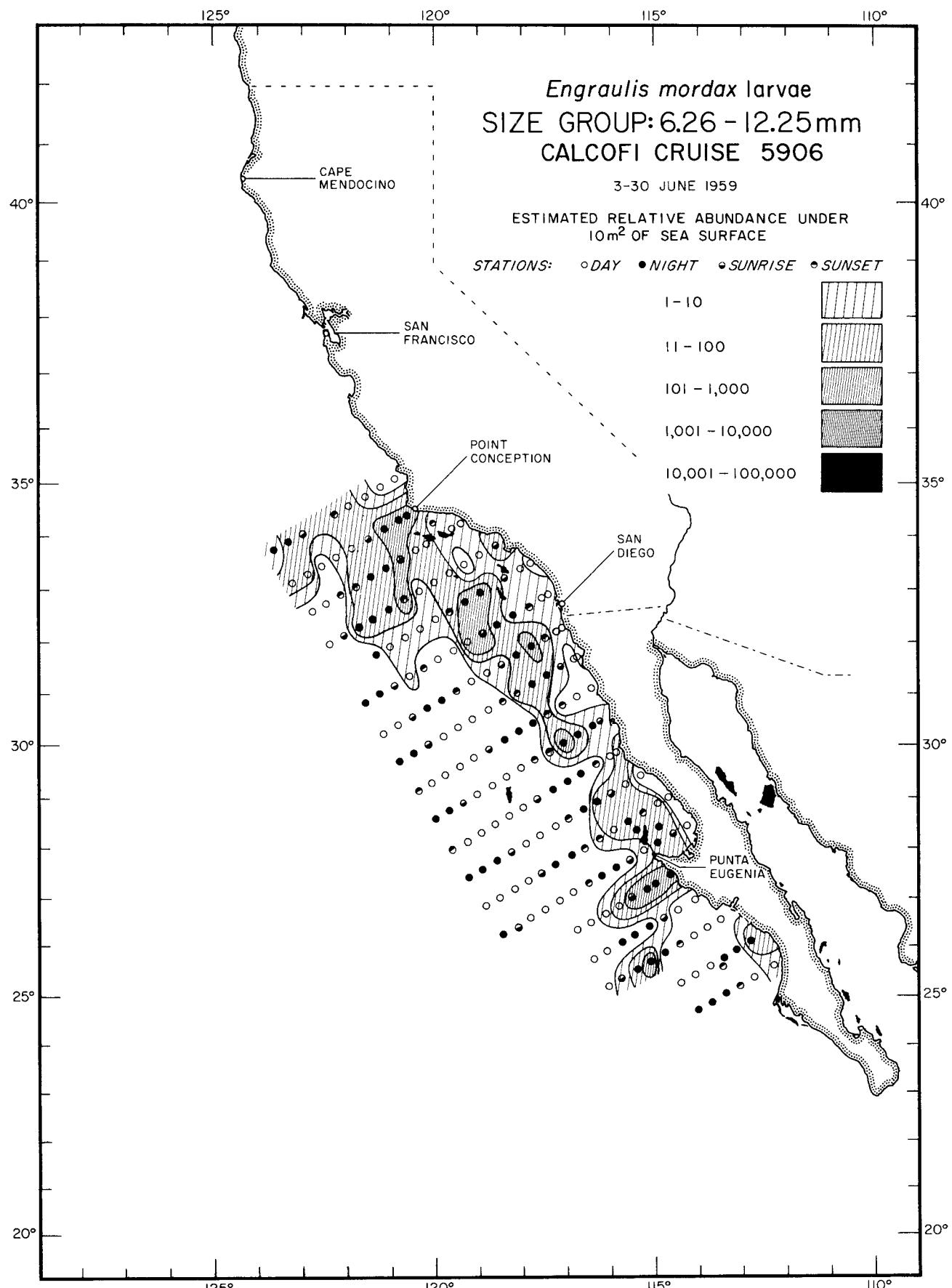
Engraulis mordax larvae
All Sizes
5904



Engraulis mordax larvae
Size Group: 6.26-12.25mm
5905

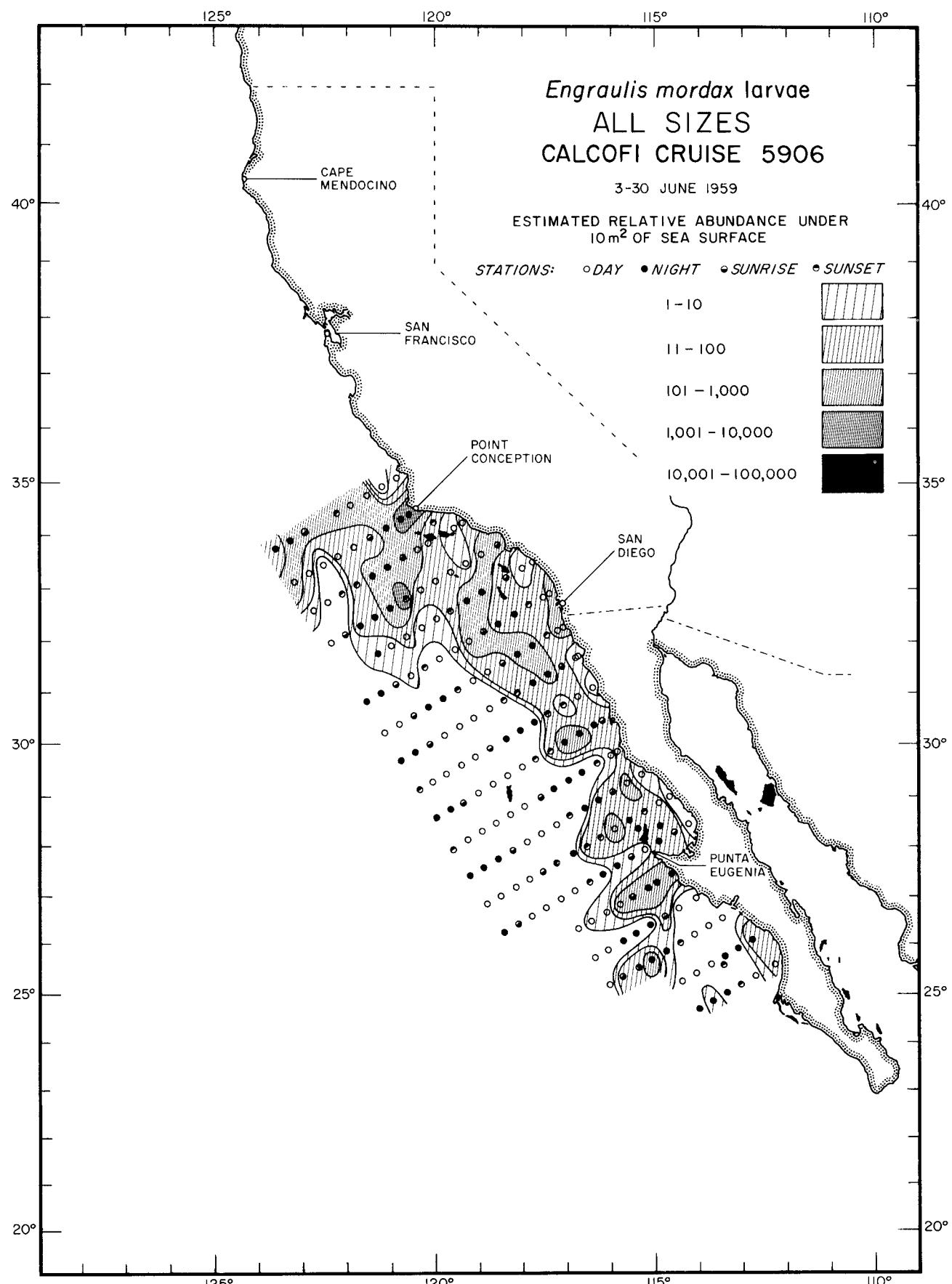


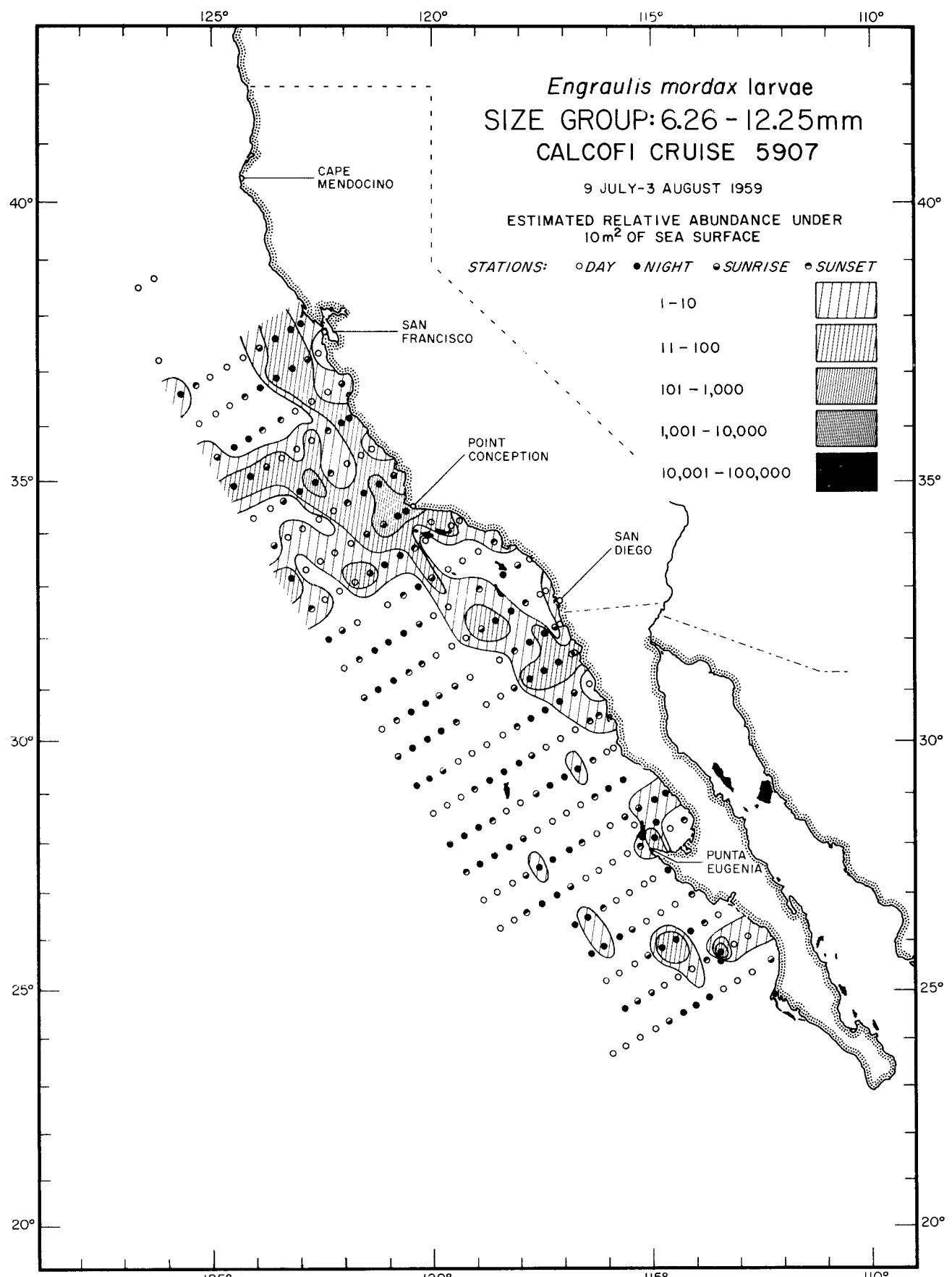
Engraulis mordax larvae
All Sizes
5905

*Engraulis mordax* larvae

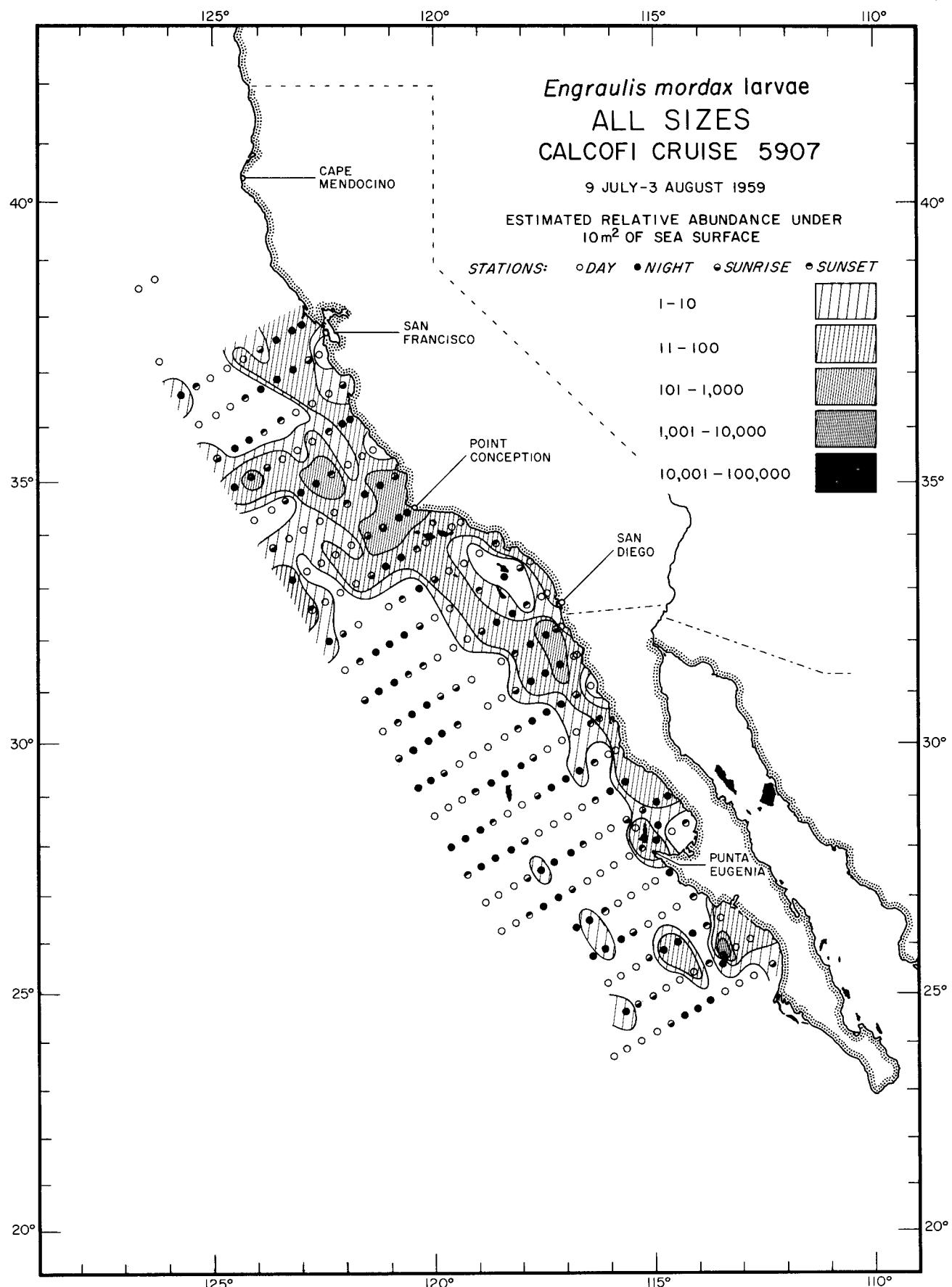
Size Group: 6.26-12.25mm

5906

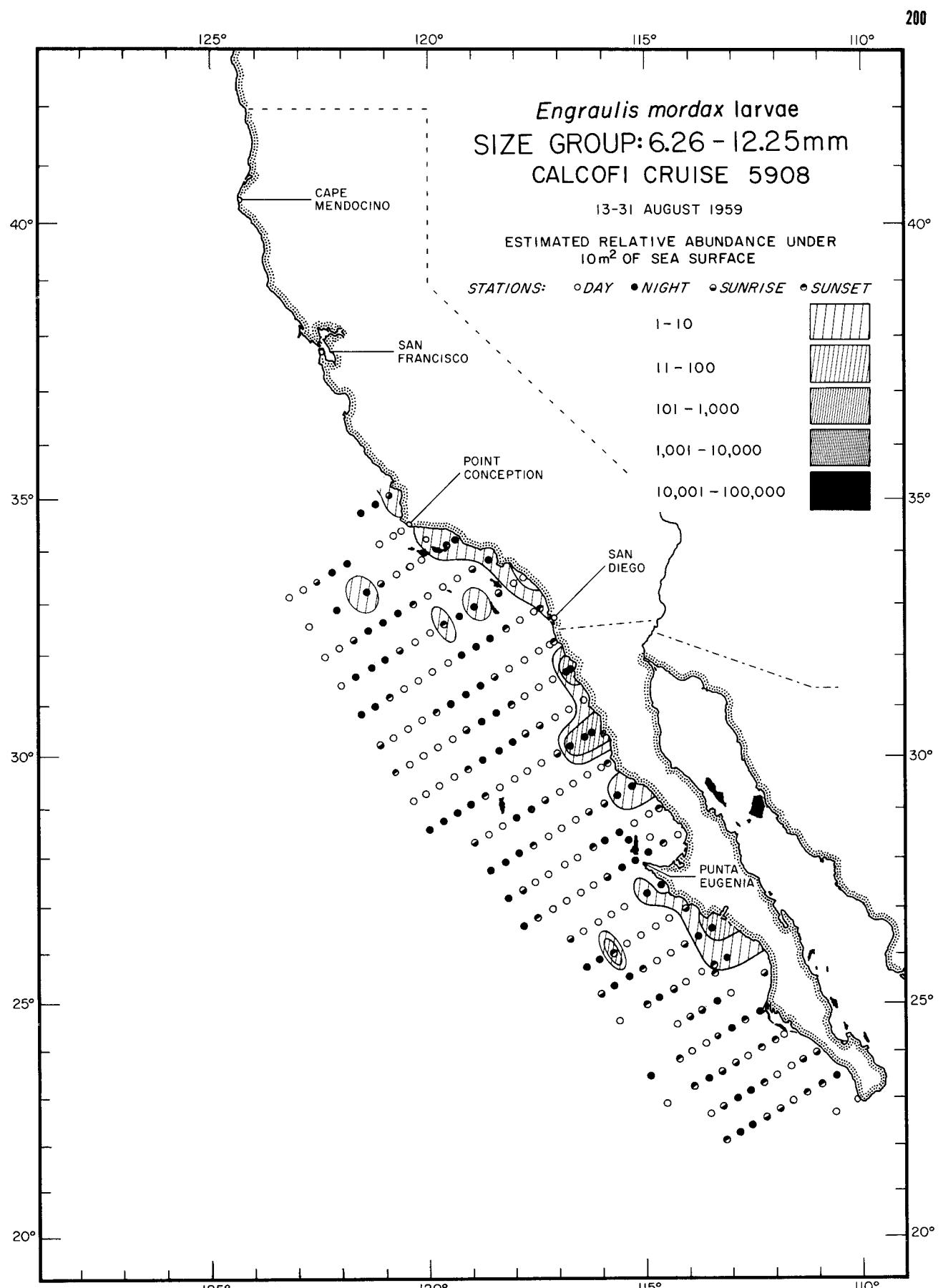
*Engraulis mordax* larvaeAll Sizes
5906



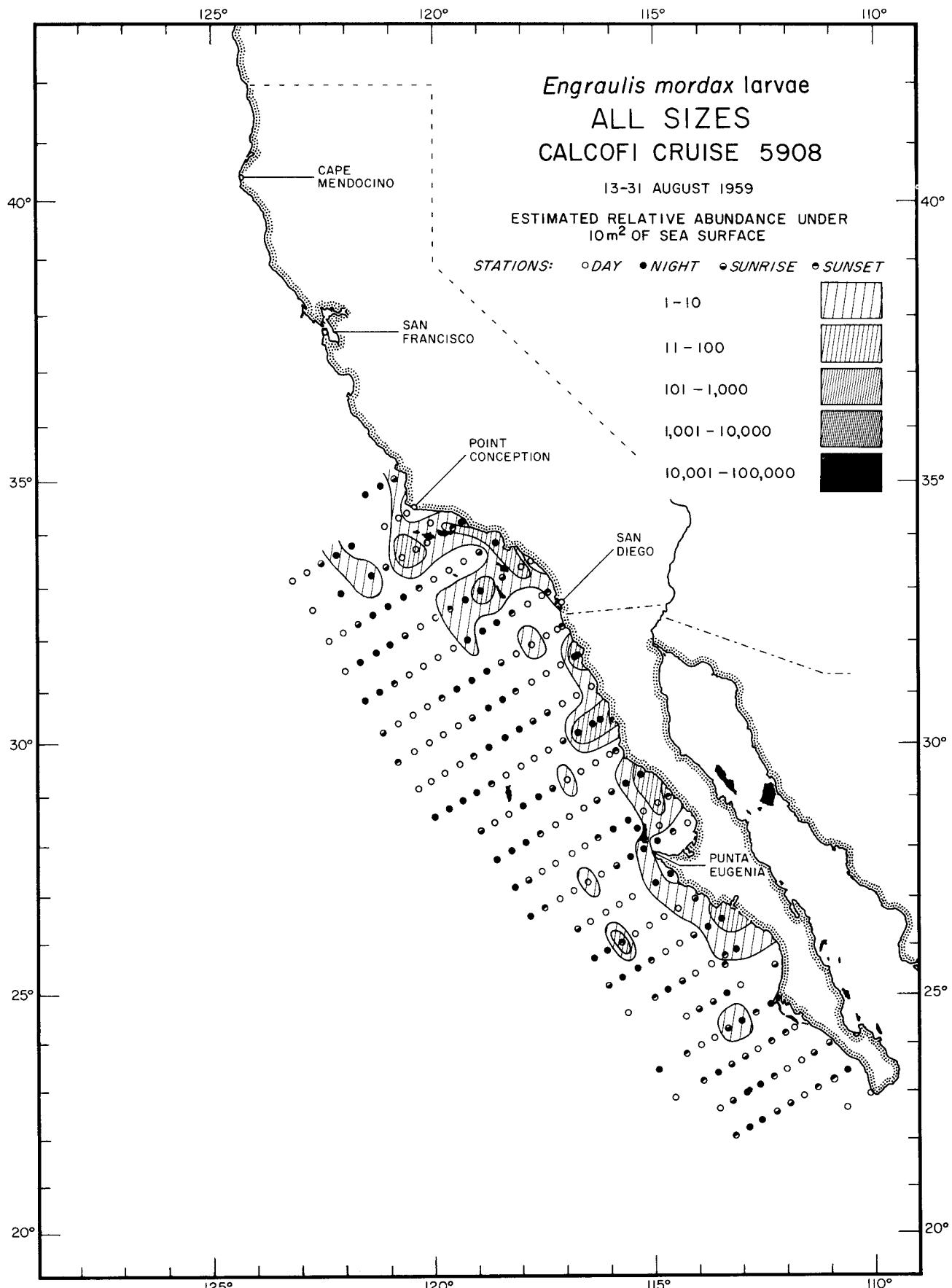
Engraulis mordax larvae
Size Group: 6.26-12.25mm
5907

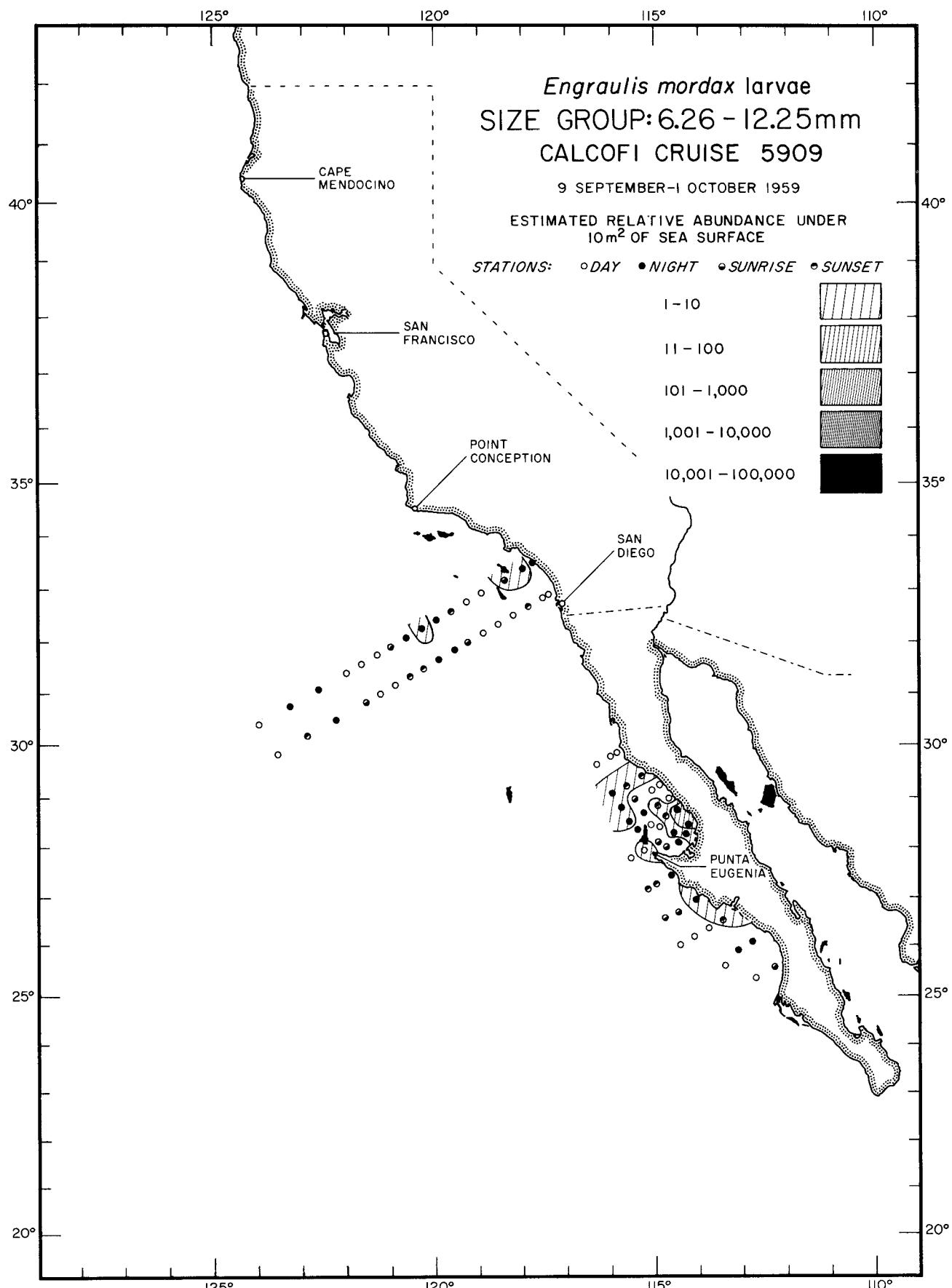


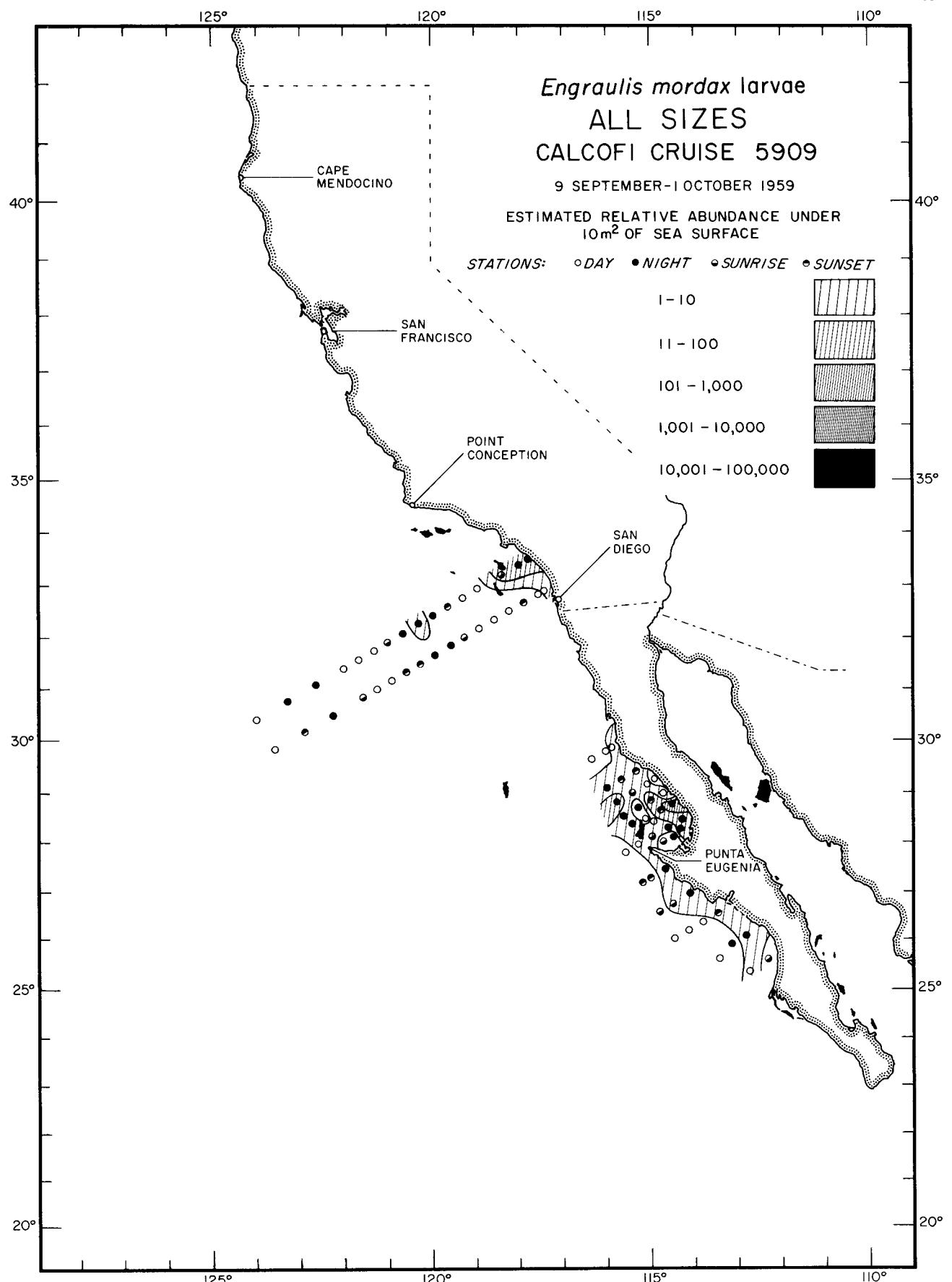
Engraulis mordax larvae
All Sizes
5907



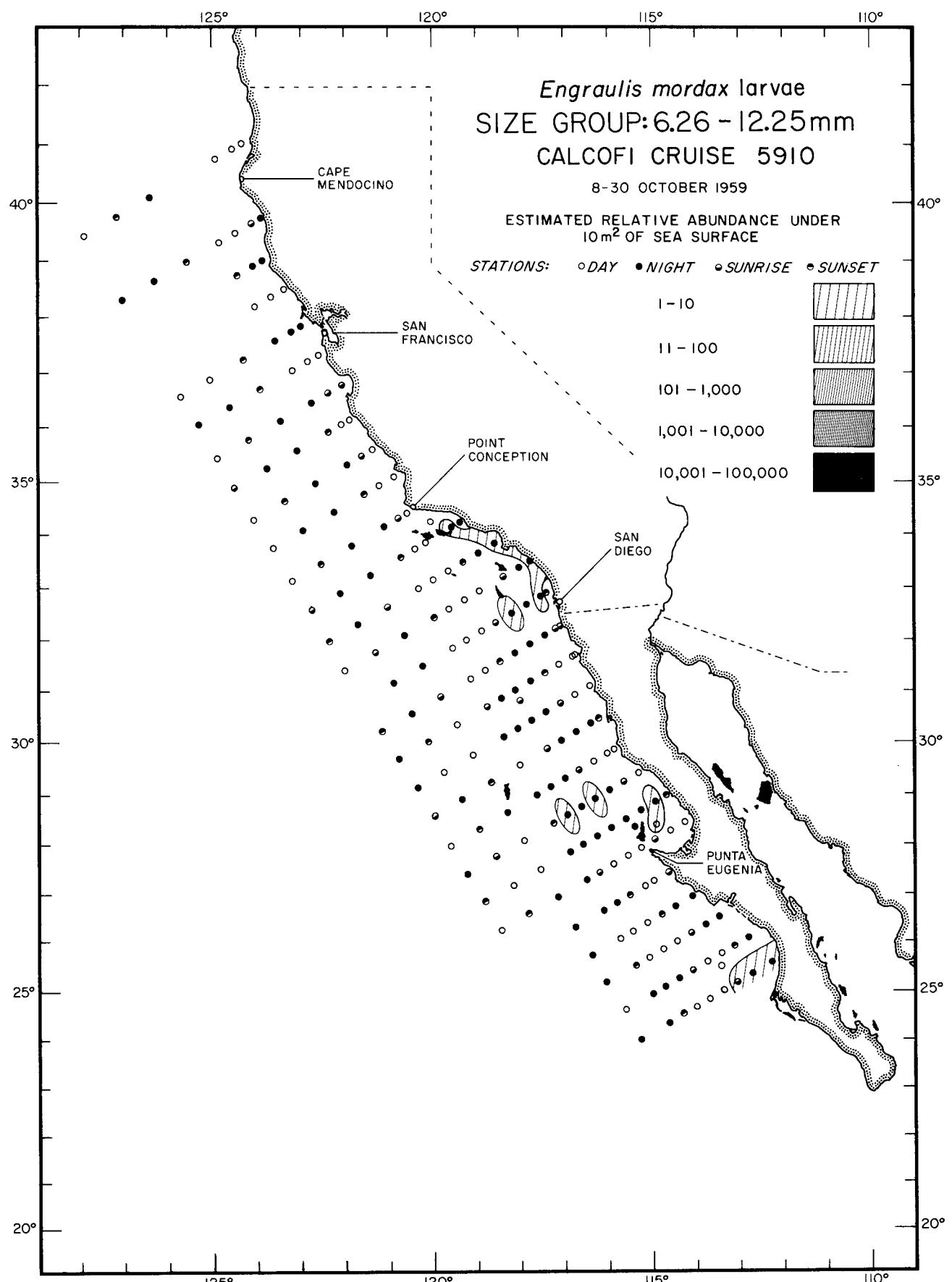
Engraulis mordax larvae
Size Group: 6.26-12.25mm
5908

*Engraulis mordax* larvaeAll Sizes
5908

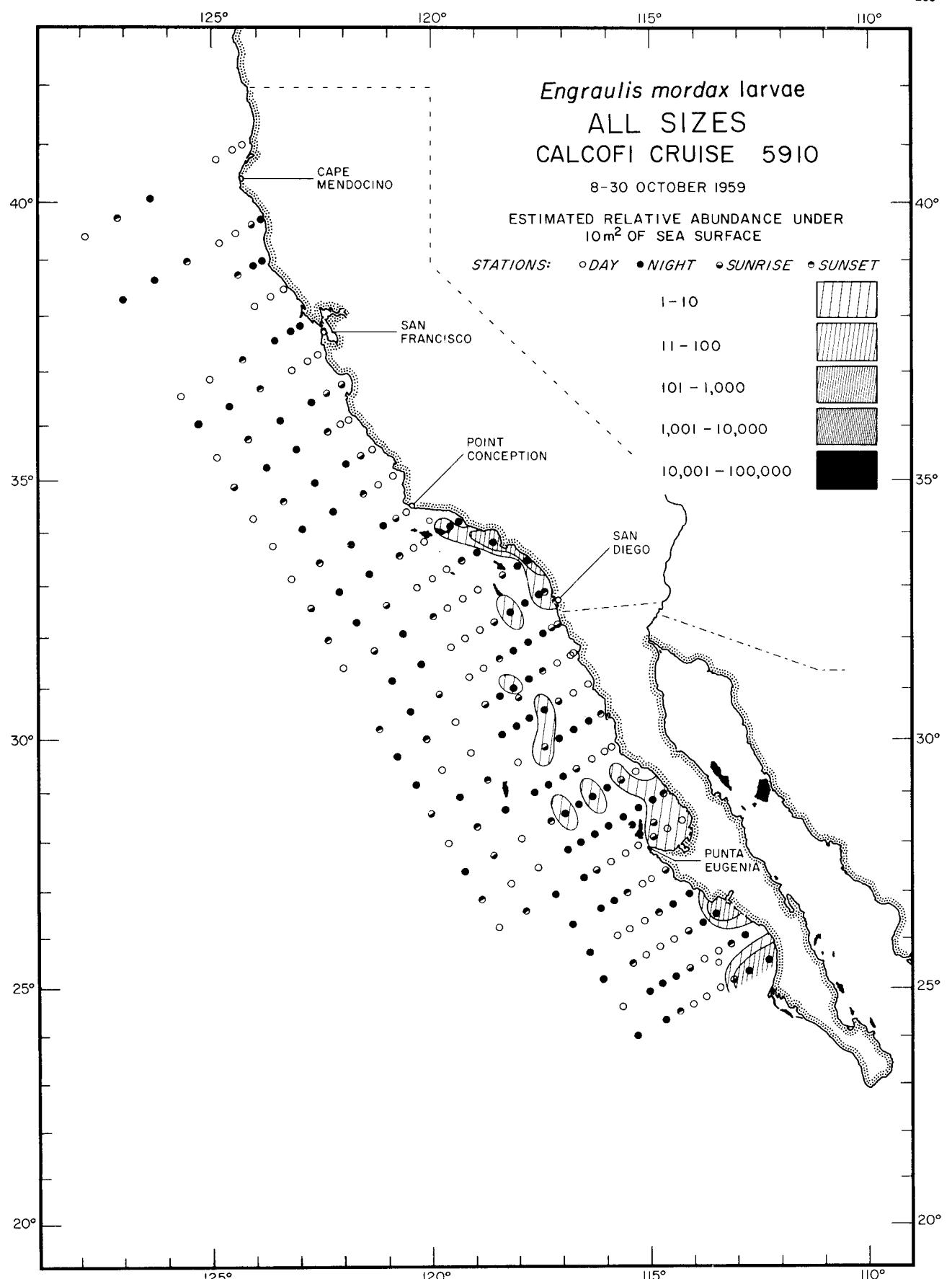
*Engraulis mordax* larvaeSize Group: 6.26-12.25mm
5909



Engraulis mordax larvae
All Sizes
5909

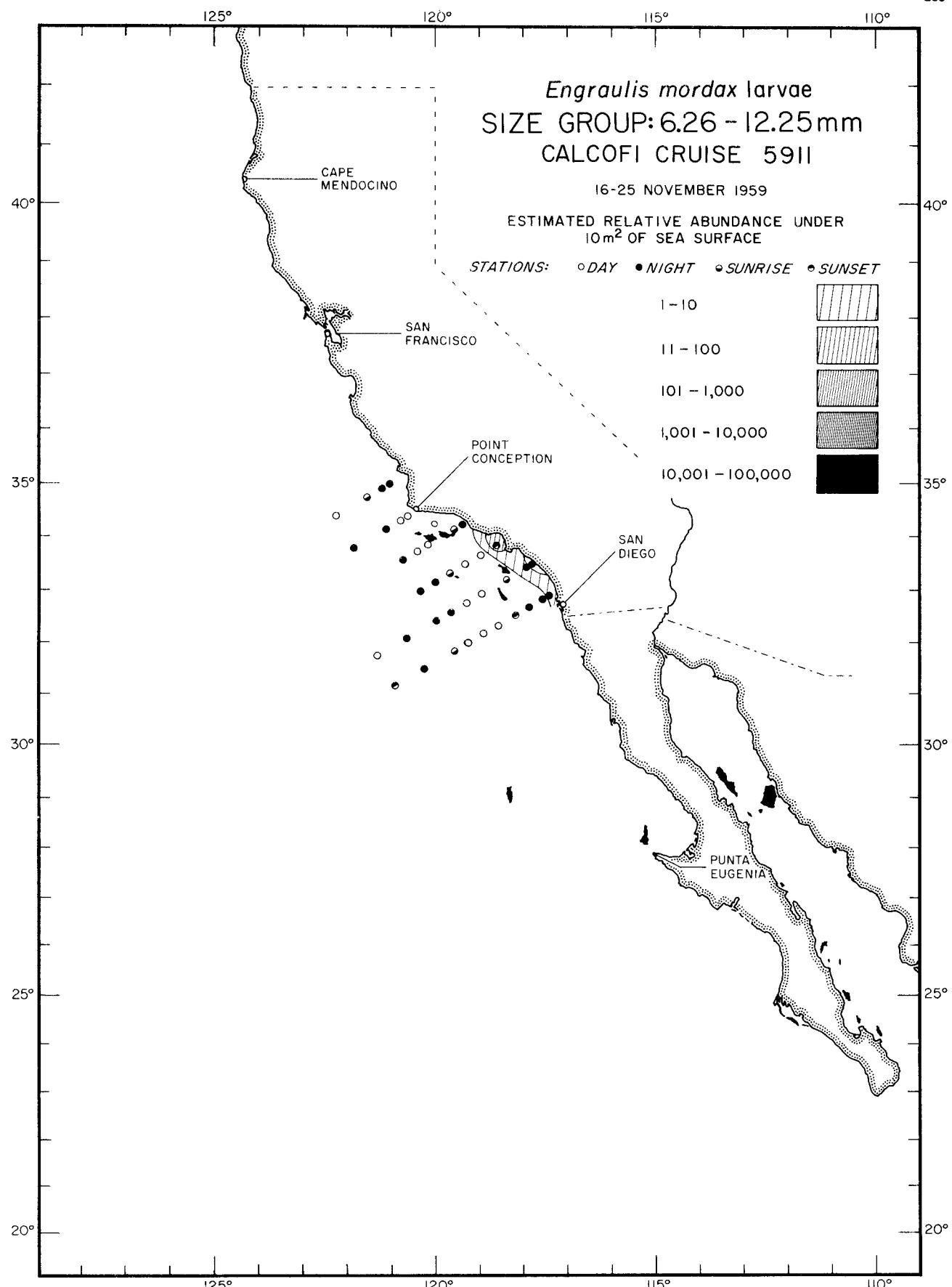


Engraulis mordax larvae
Size Group: 6.26-12.25mm
5910

*Engraulis mordax* larvae

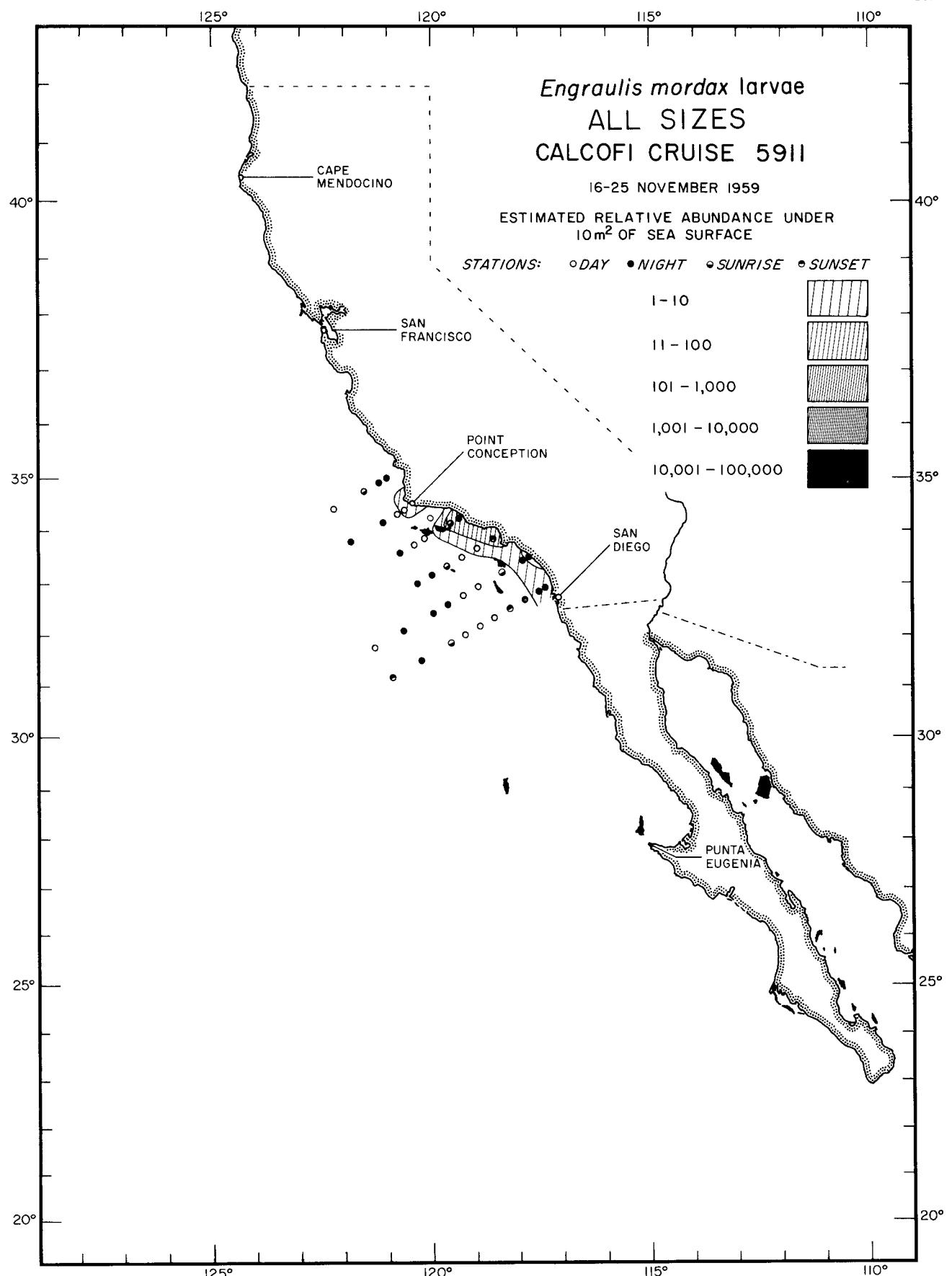
All Sizes

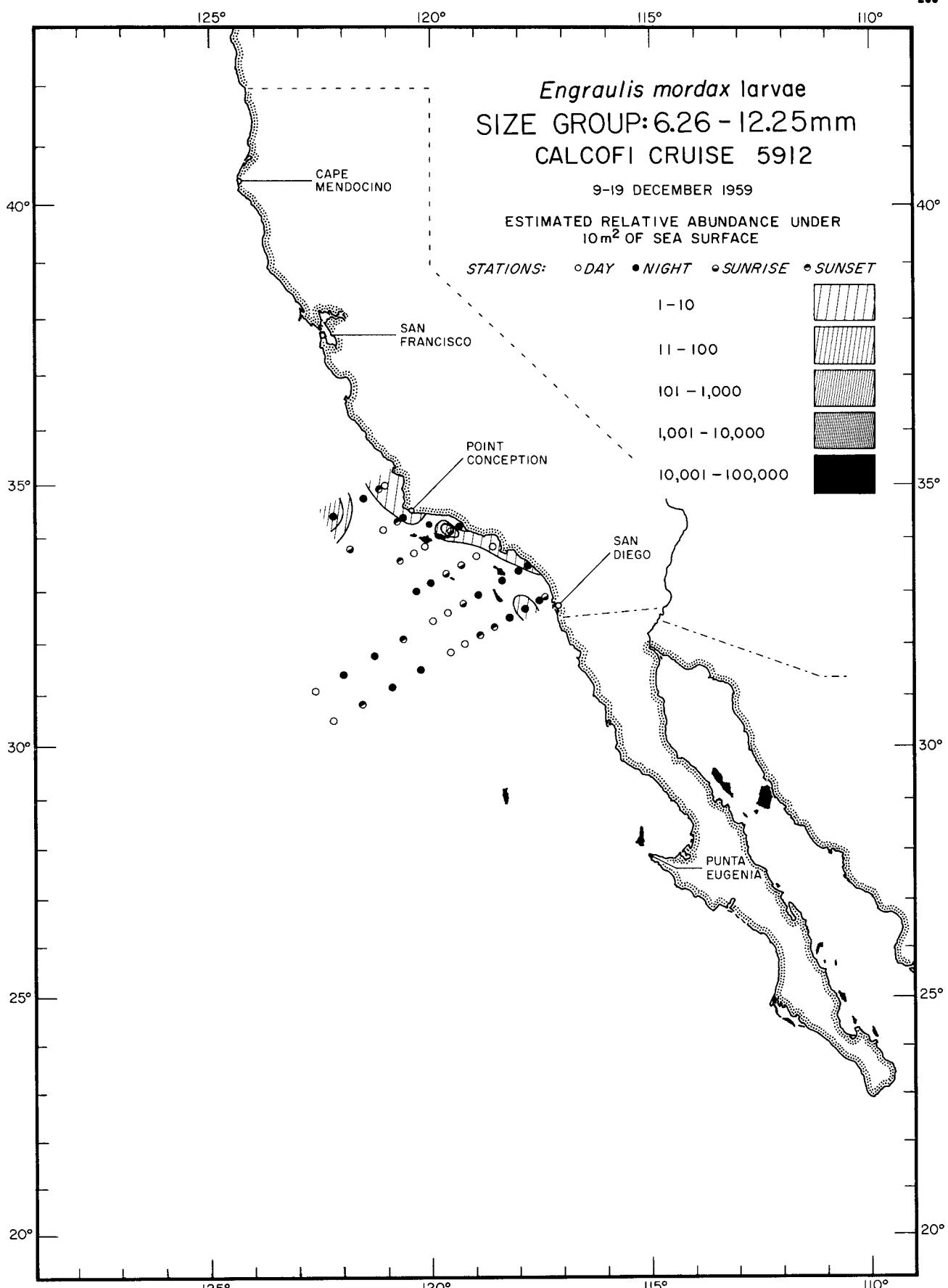
5910

*Engraulis mordax* larvae

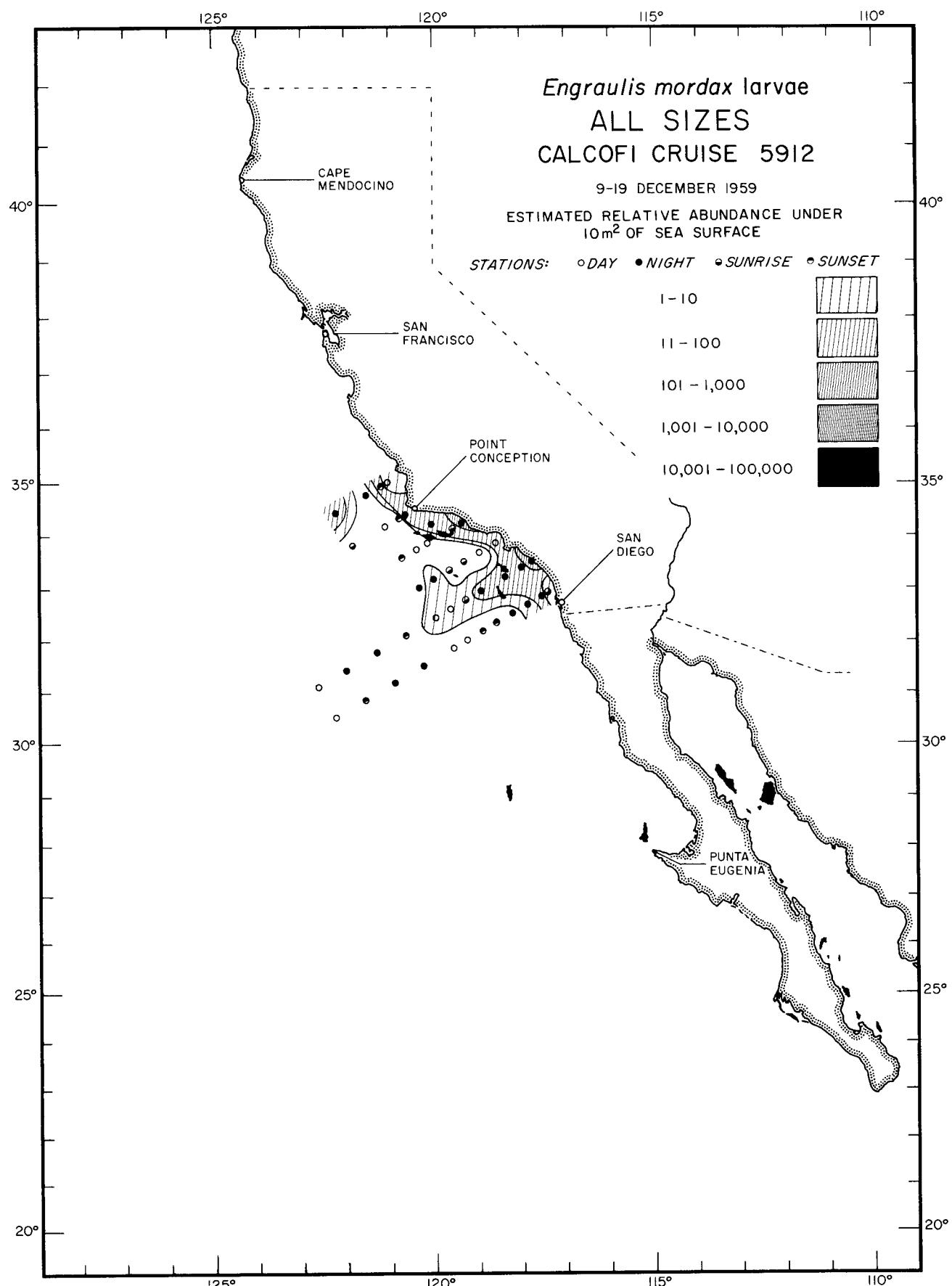
Size Group: 6.26-12.25mm

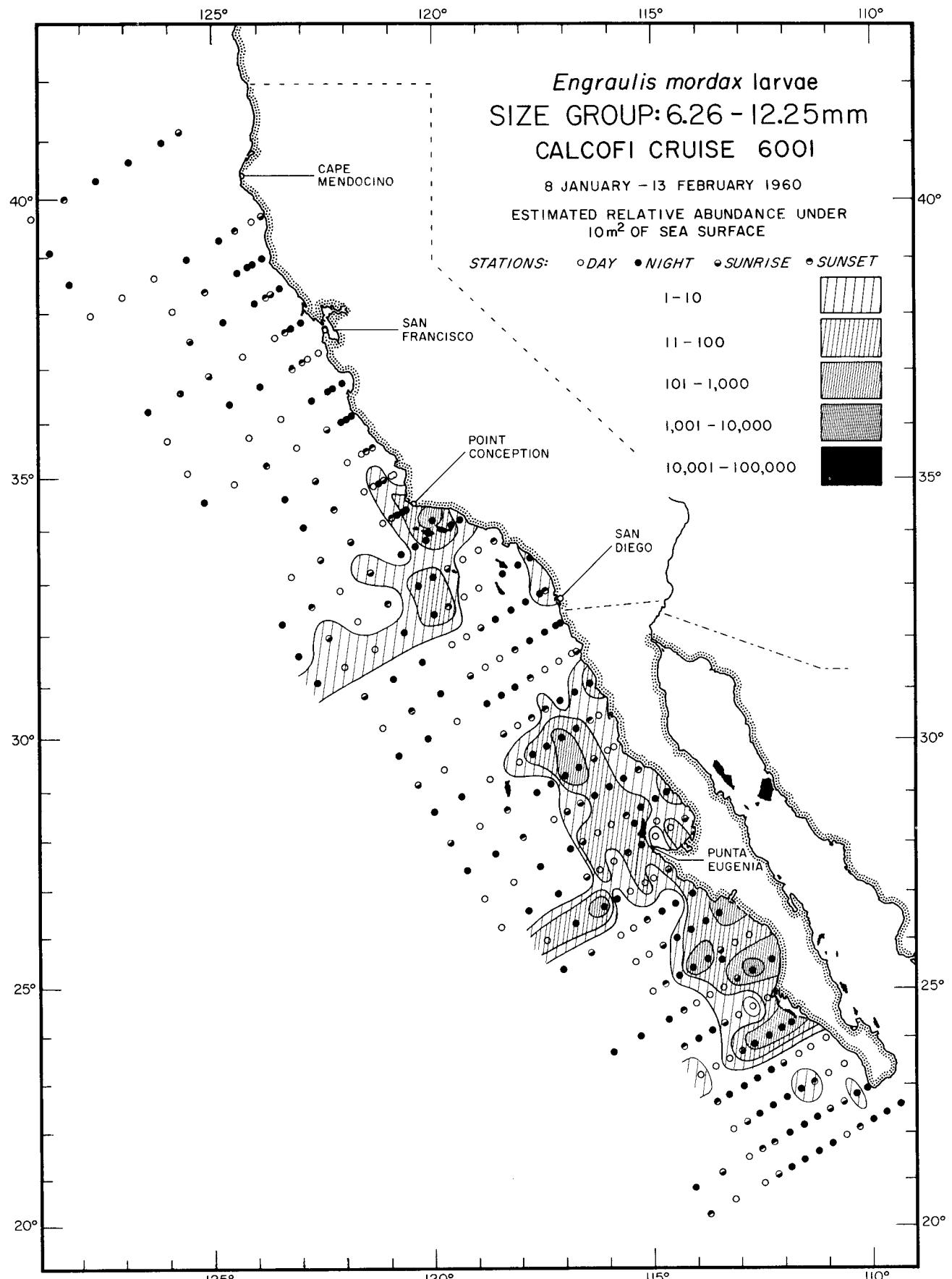
59II

*Engraulis mordax* larvaeAll Sizes
59II

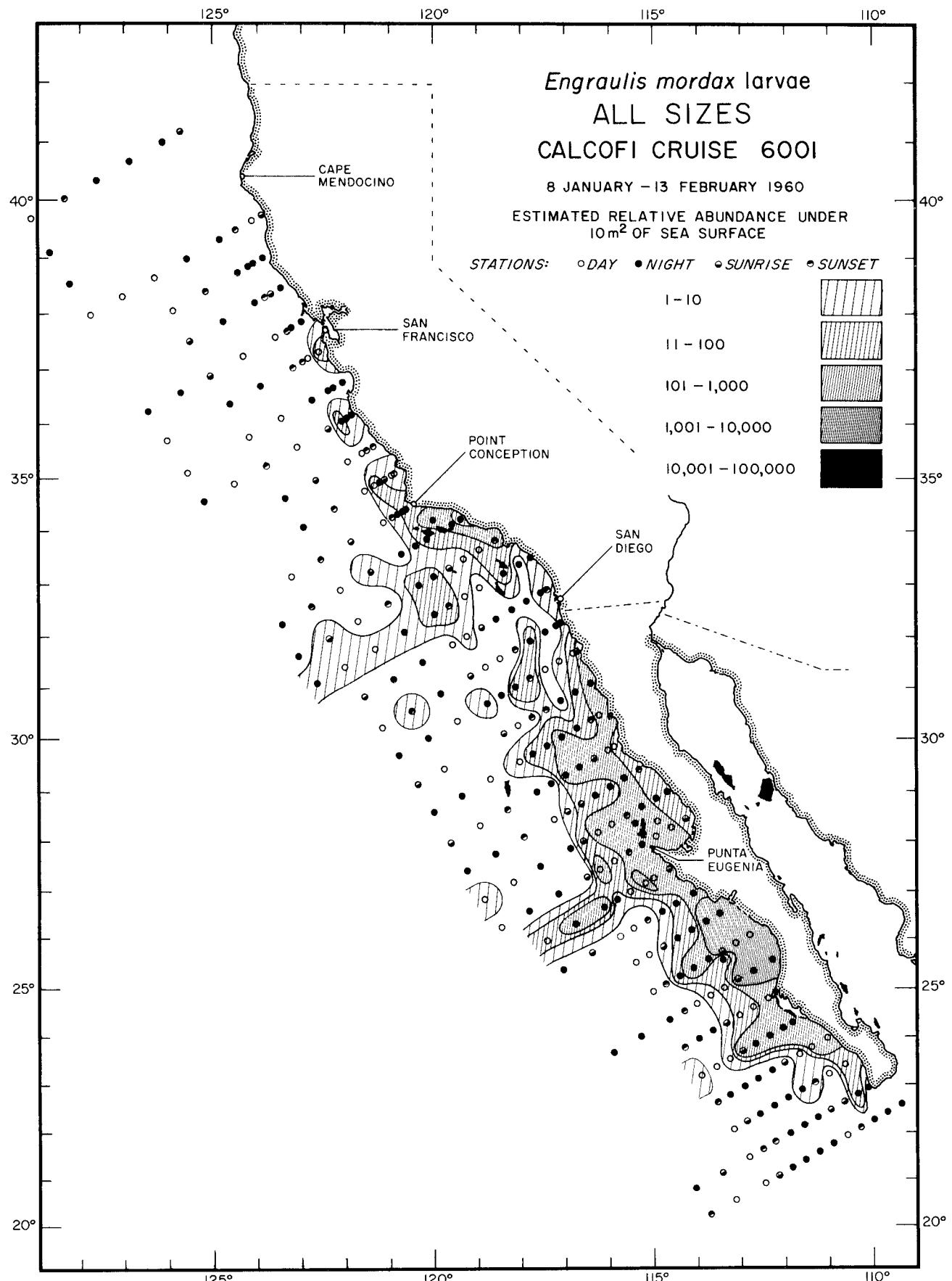


Engraulis mordax larvae
Size Group: 6.26-12.25mm
5912

*Engraulis mordax* larvaeAll Sizes
5912

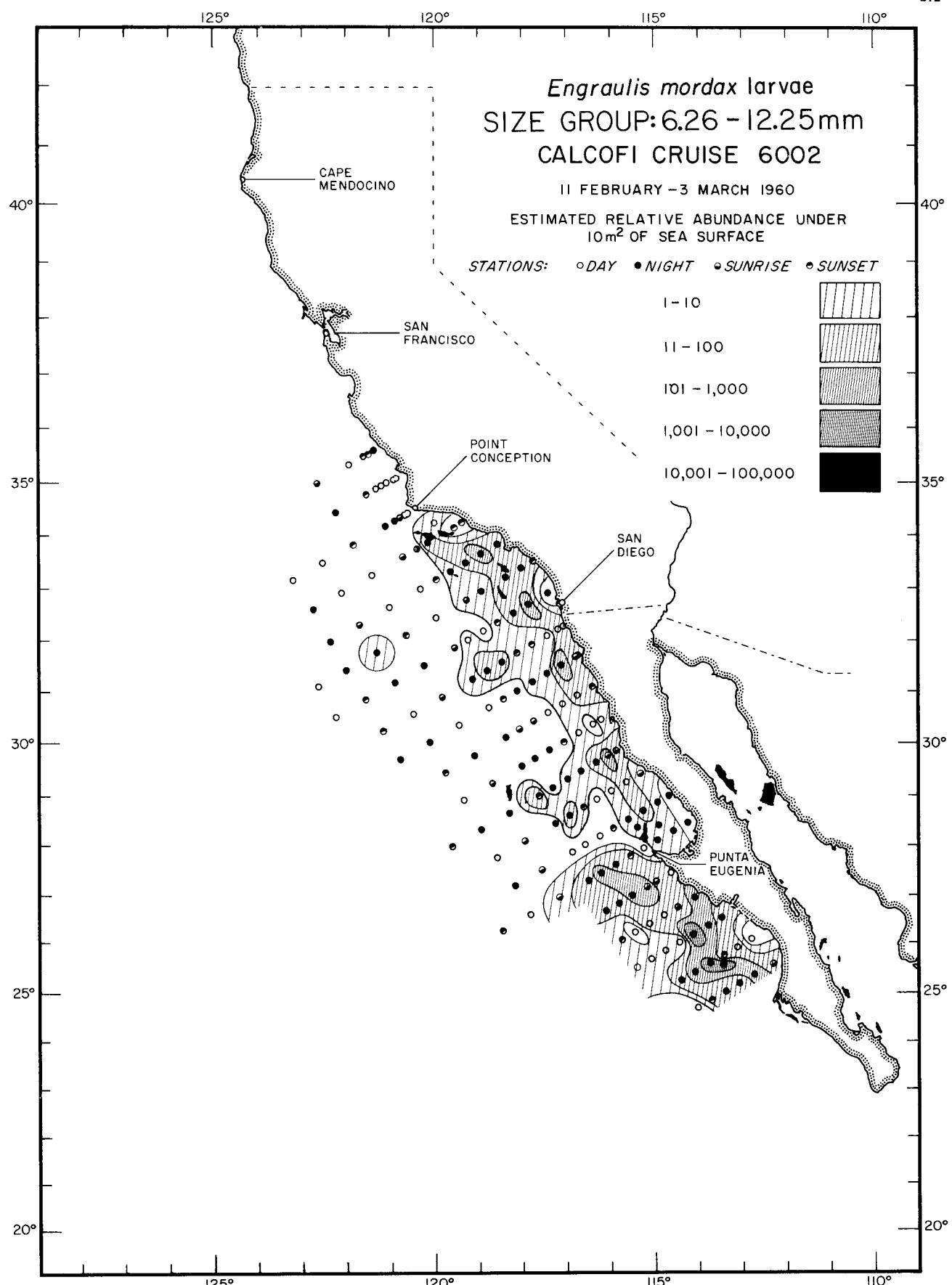


Engraulis mordax larvae
Size Group: 6.26-12.25mm
6001

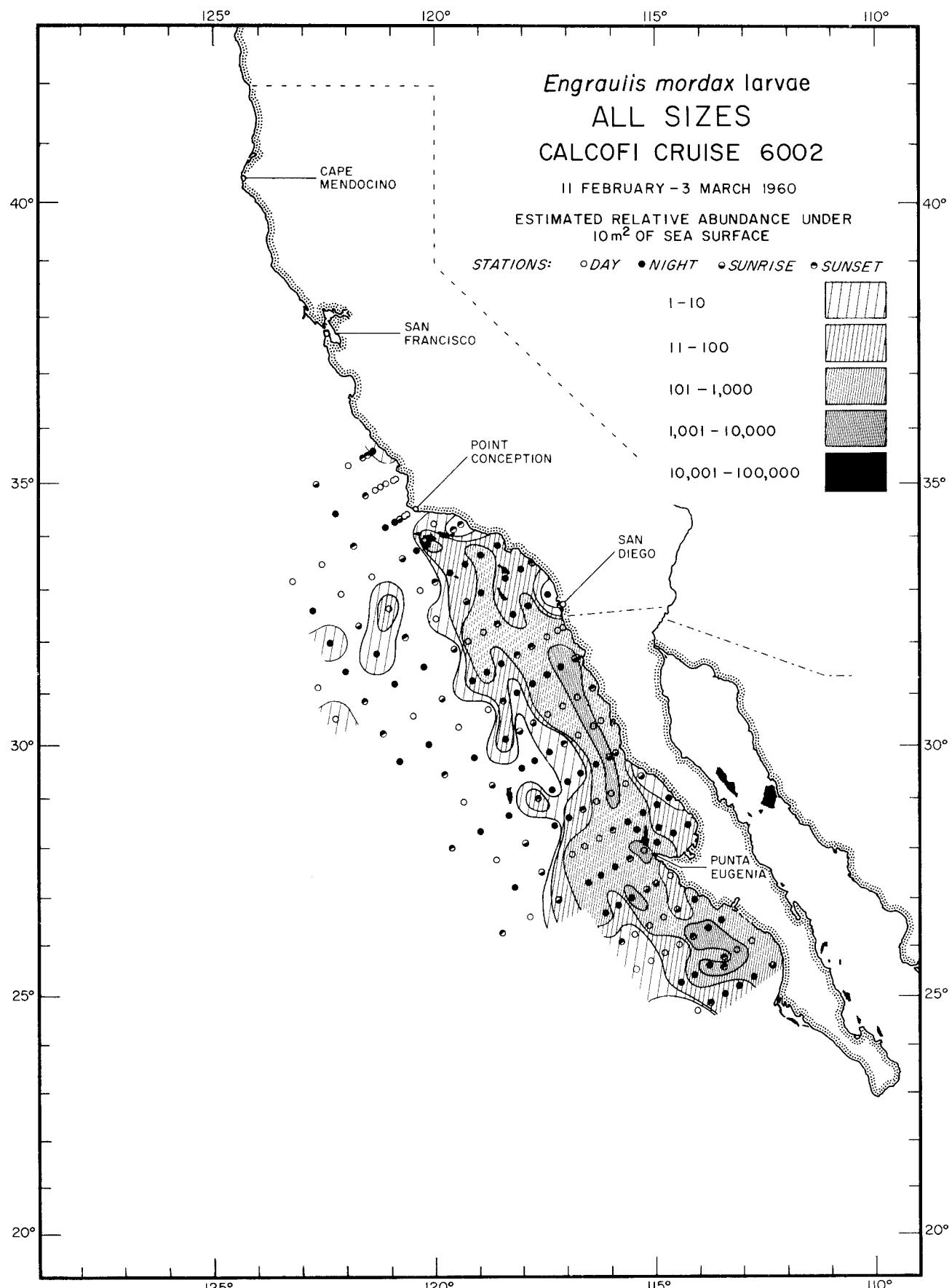
*Engraulis mordax* larvae

All Sizes

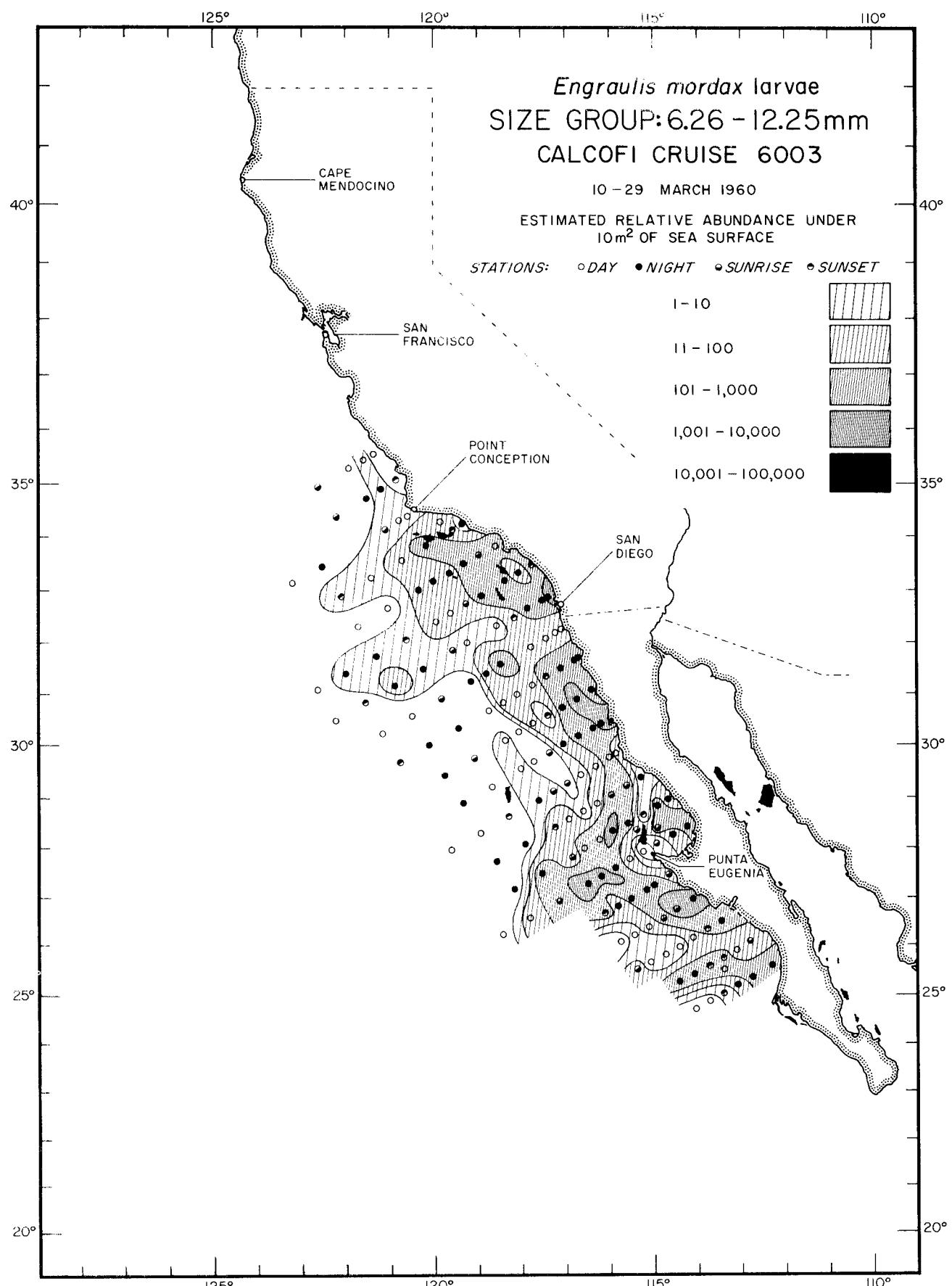
6001



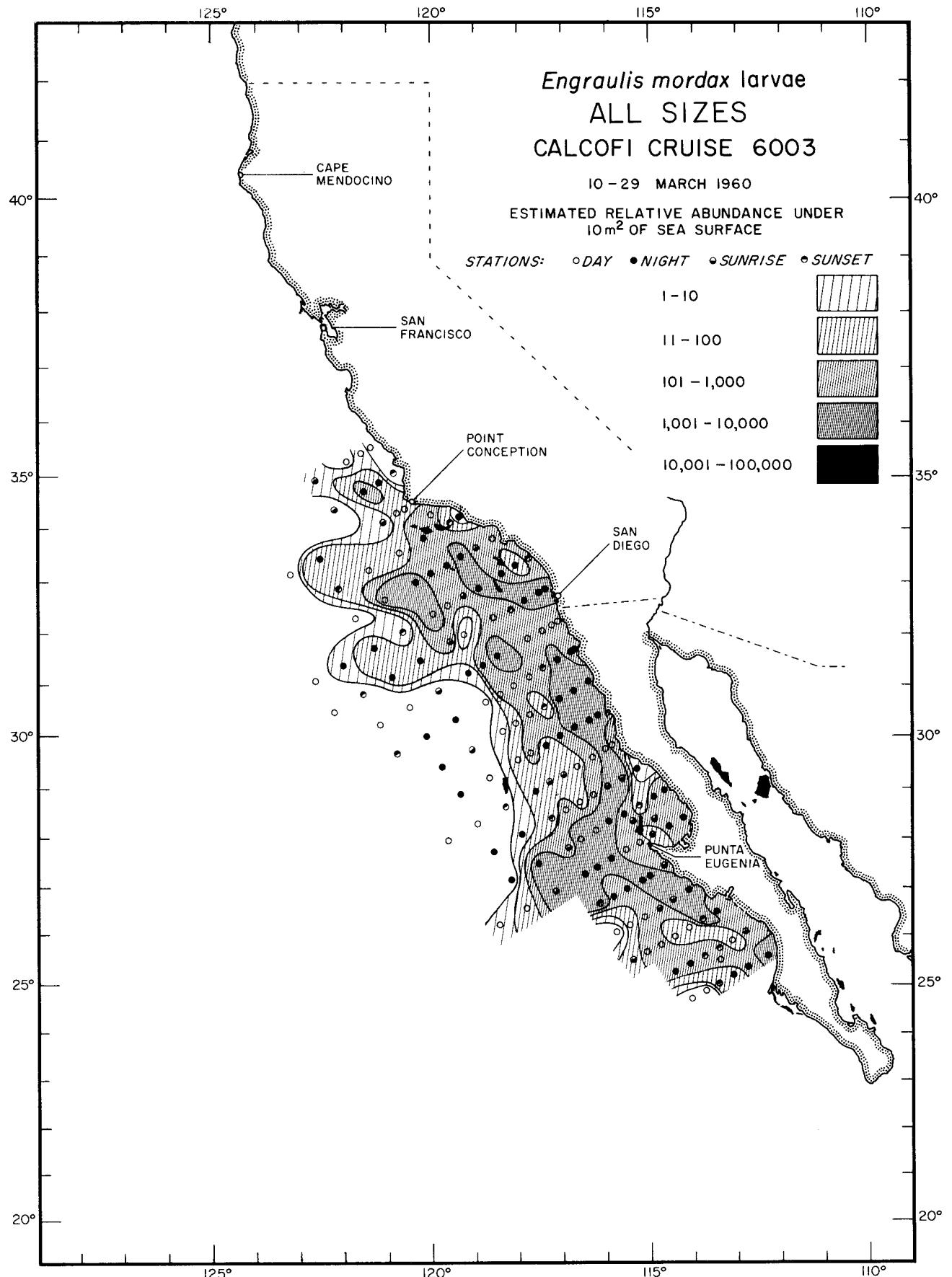
Engraulis mordax larvae
Size Group: 6.26-12.25mm
6002



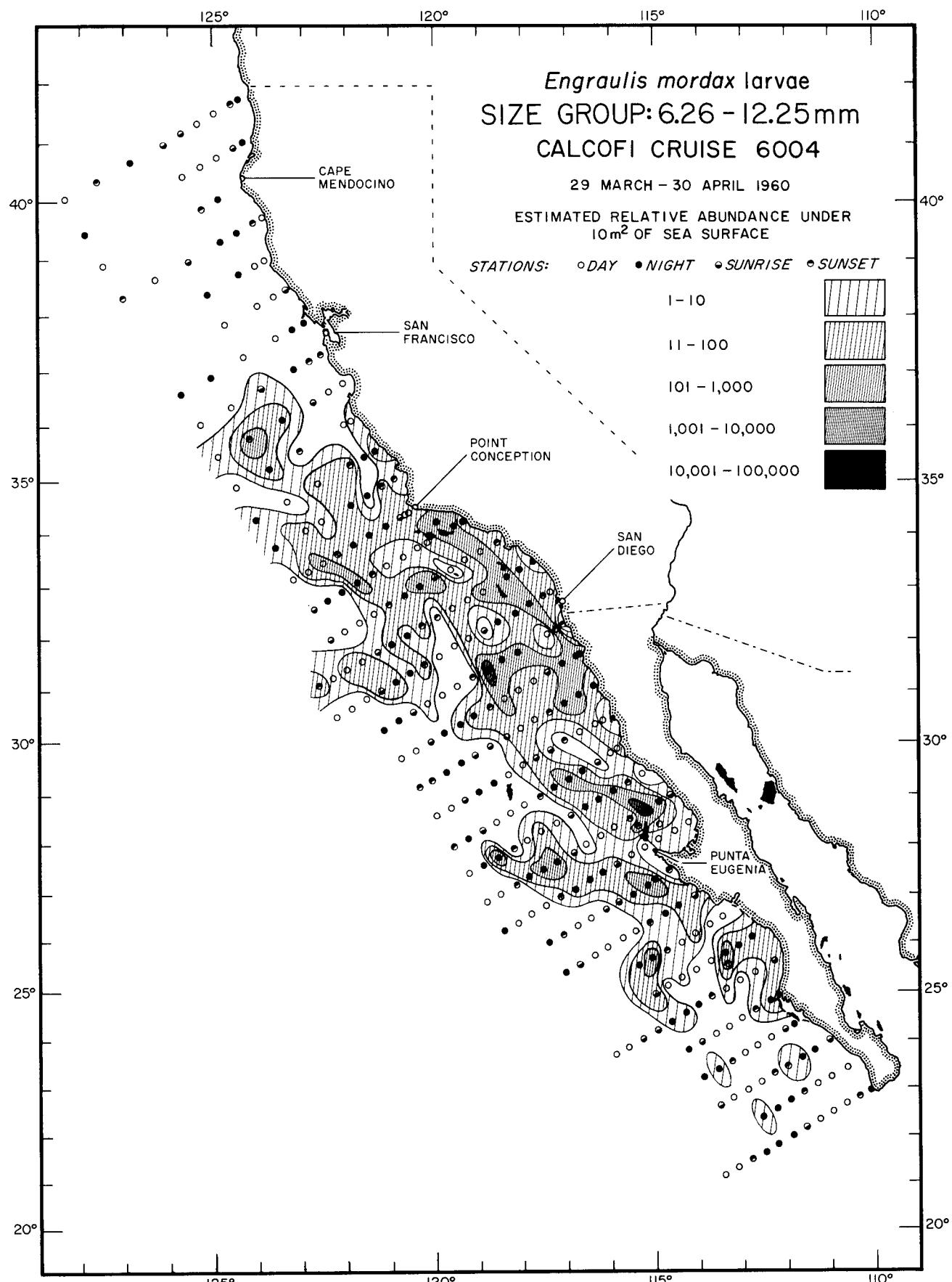
Engraulis mordax larvae
All Sizes
6002



Engraulis mordax larvae
Size Group: 6.26-12.25mm
6003



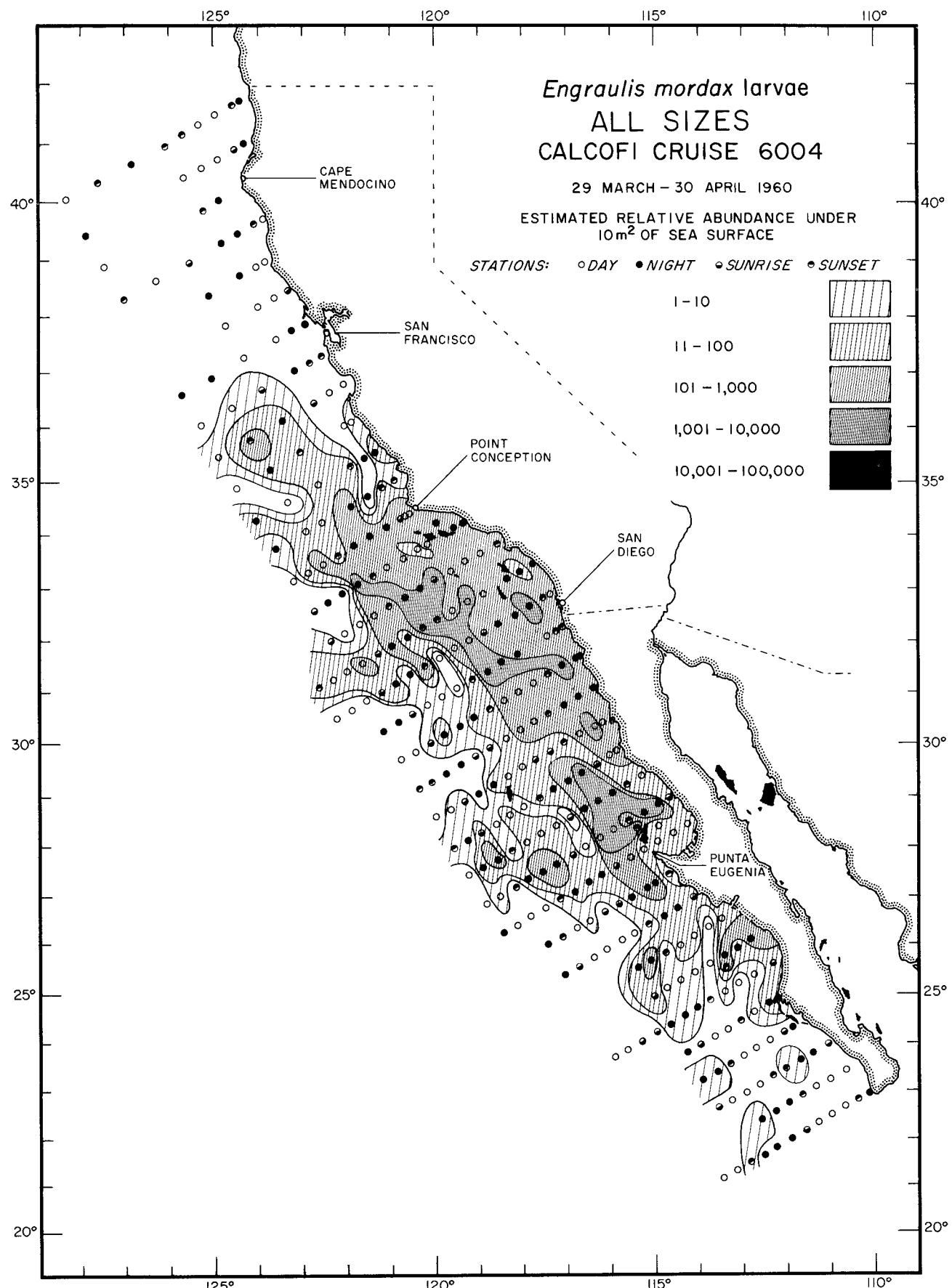
Engraulis mordax larvae
All Sizes
6003



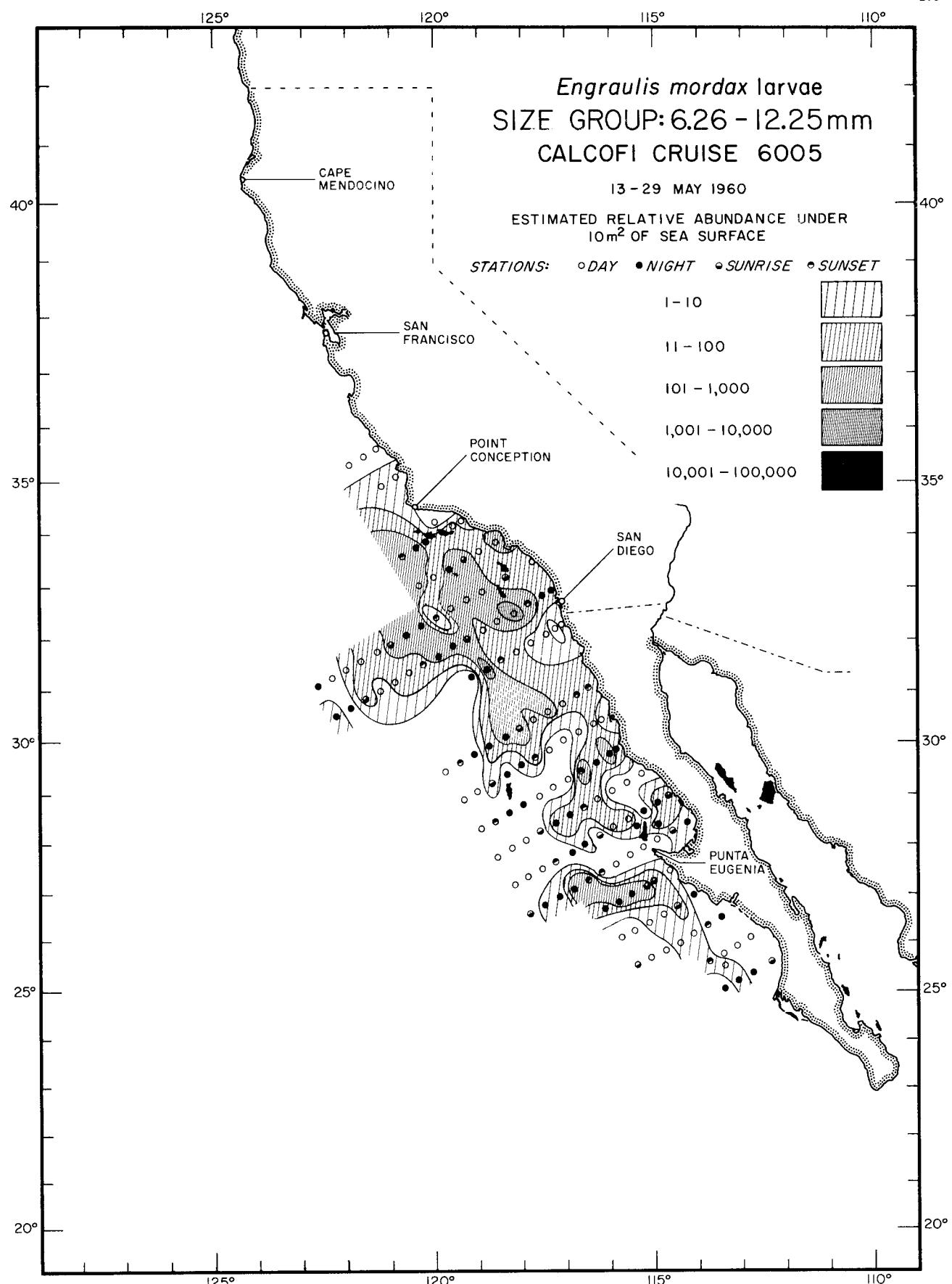
Engraulis mordax larvae

Size Group: 6.26-12.25mm

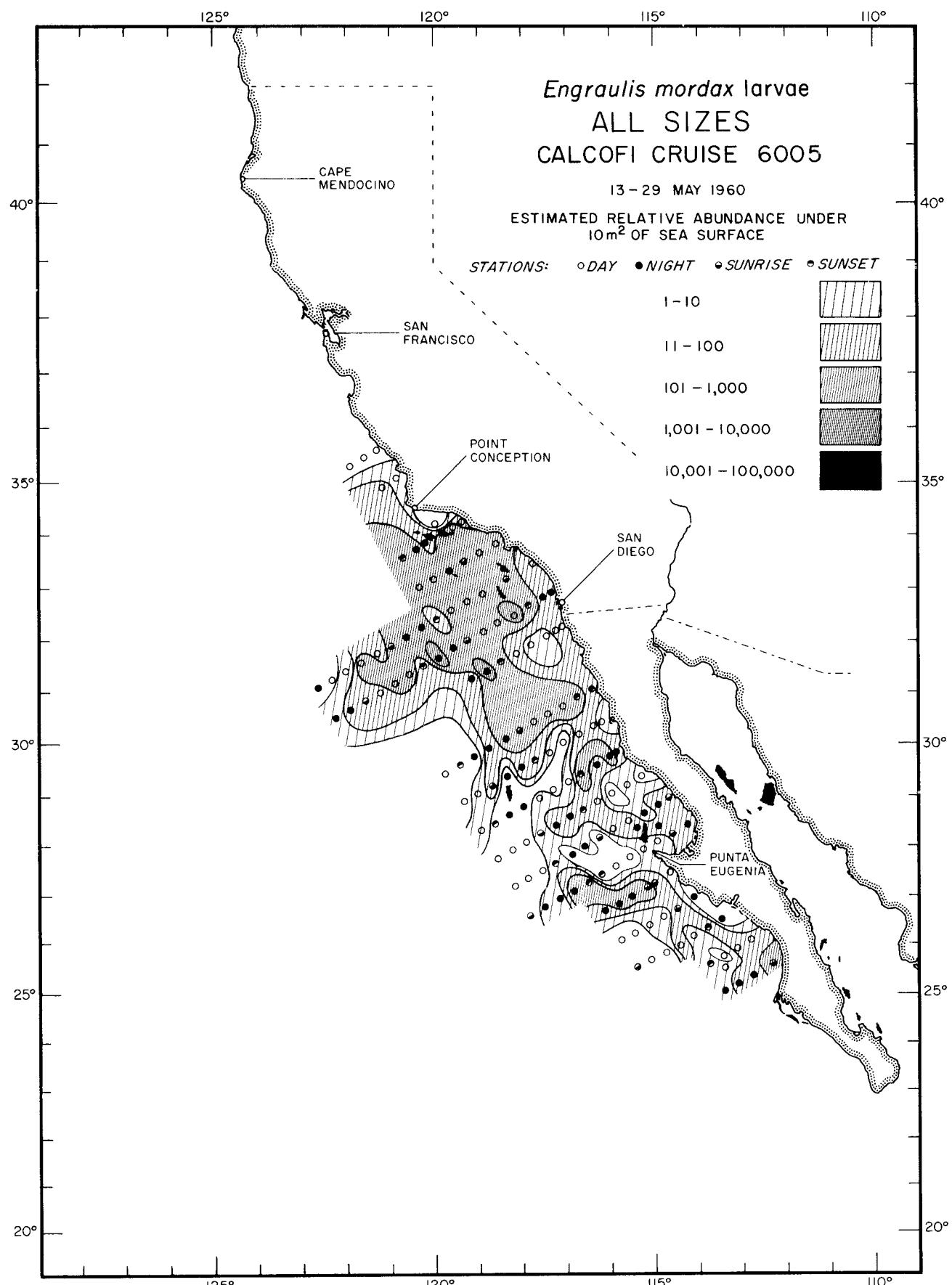
6004



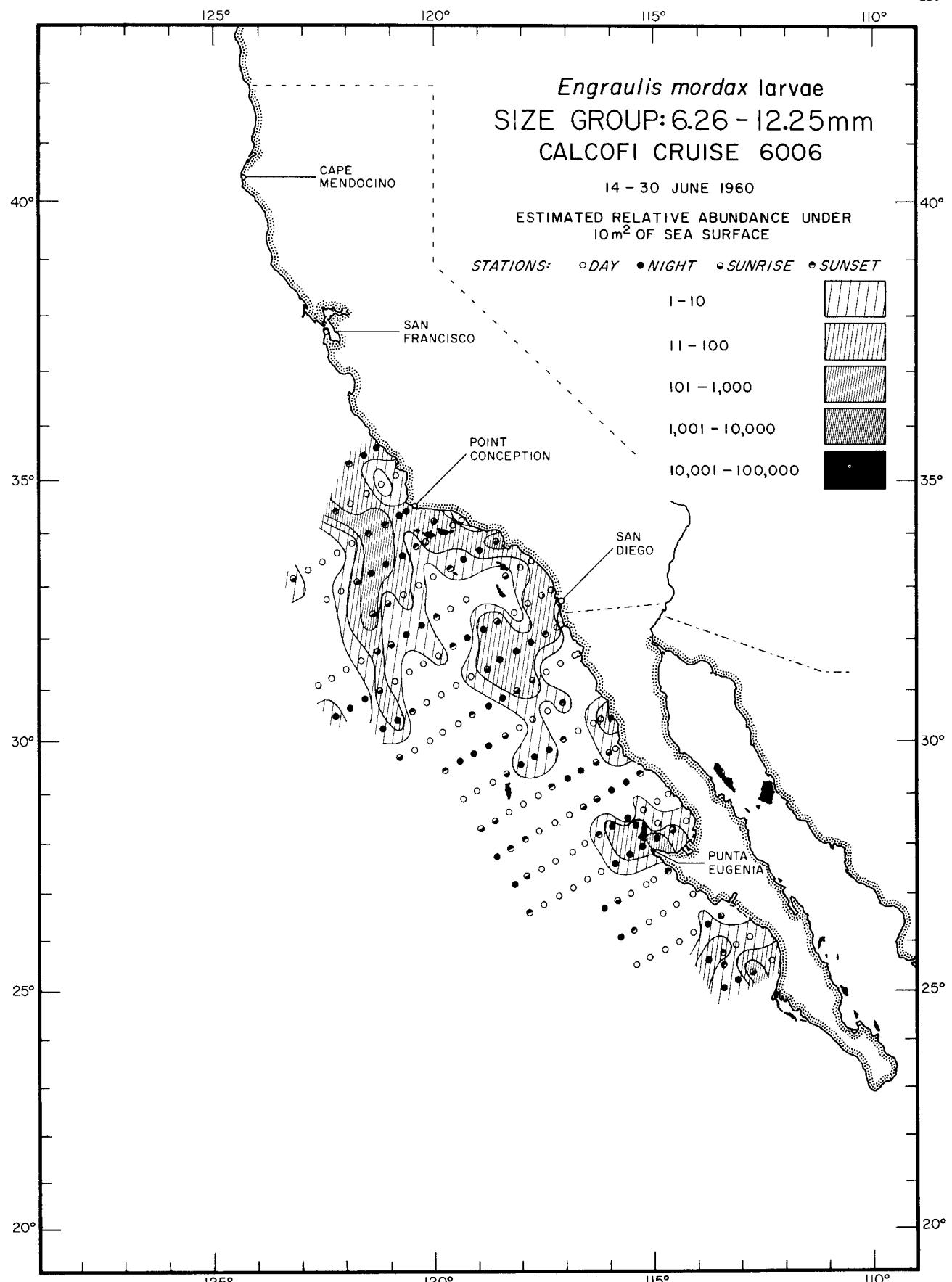
Engraulis mordax larvae
All Sizes
6004



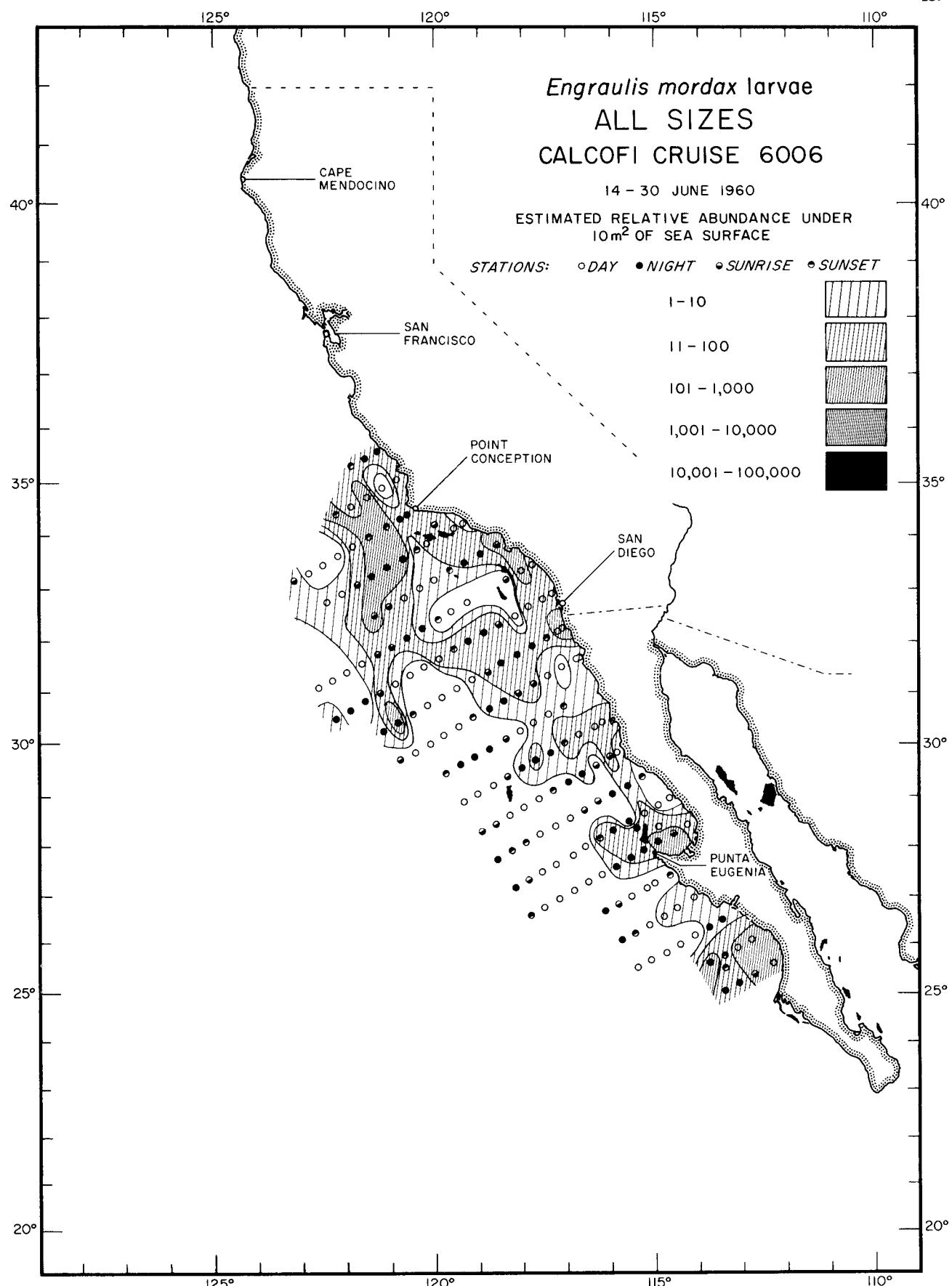
Engraulis mordax larvae
Size Group: 6.26-12.25mm
6005



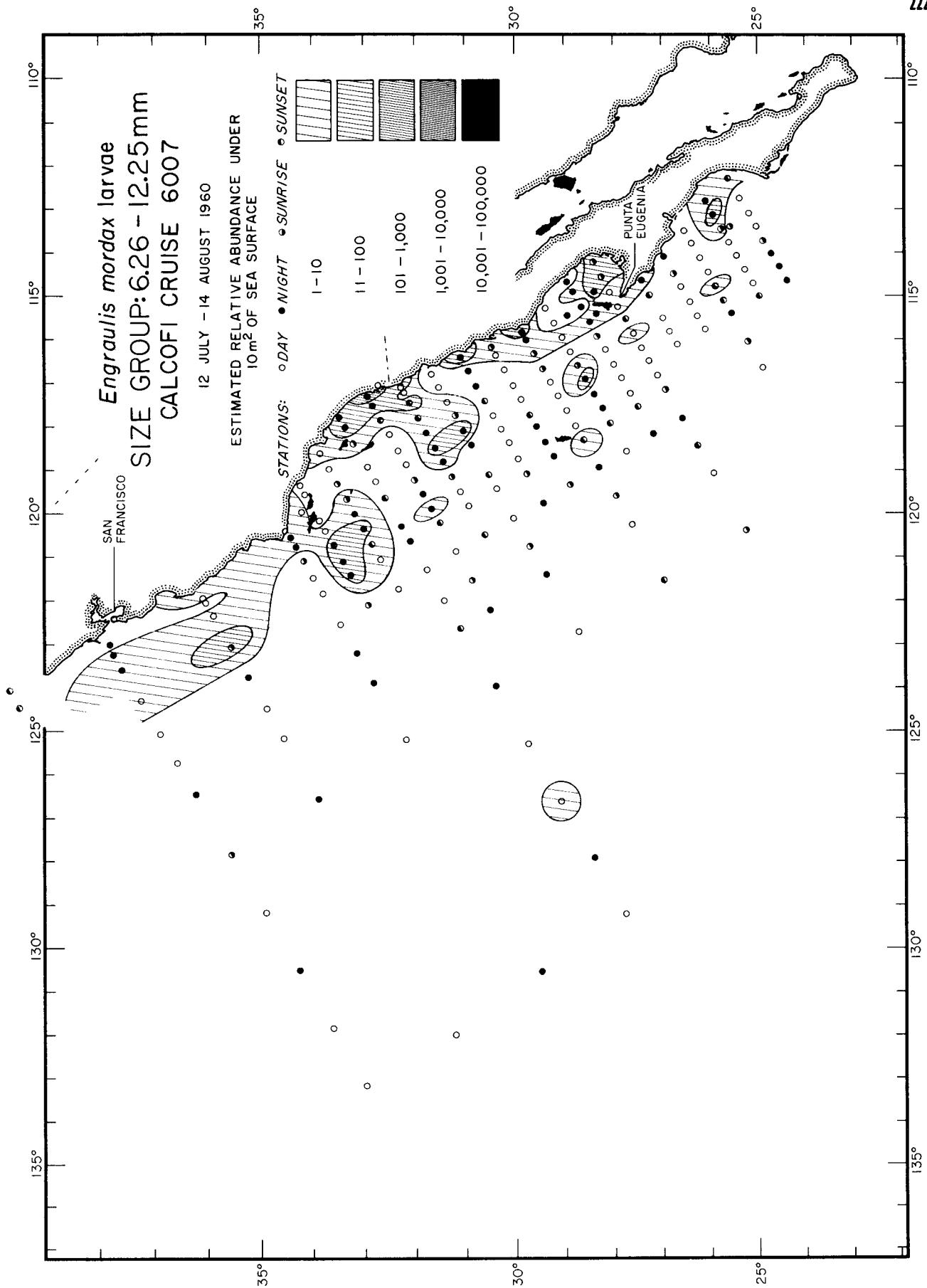
Engraulis mordax larvae
All Sizes
6005



Engraulis mordax larvae
Size Group: 6.26-12.25mm
6006

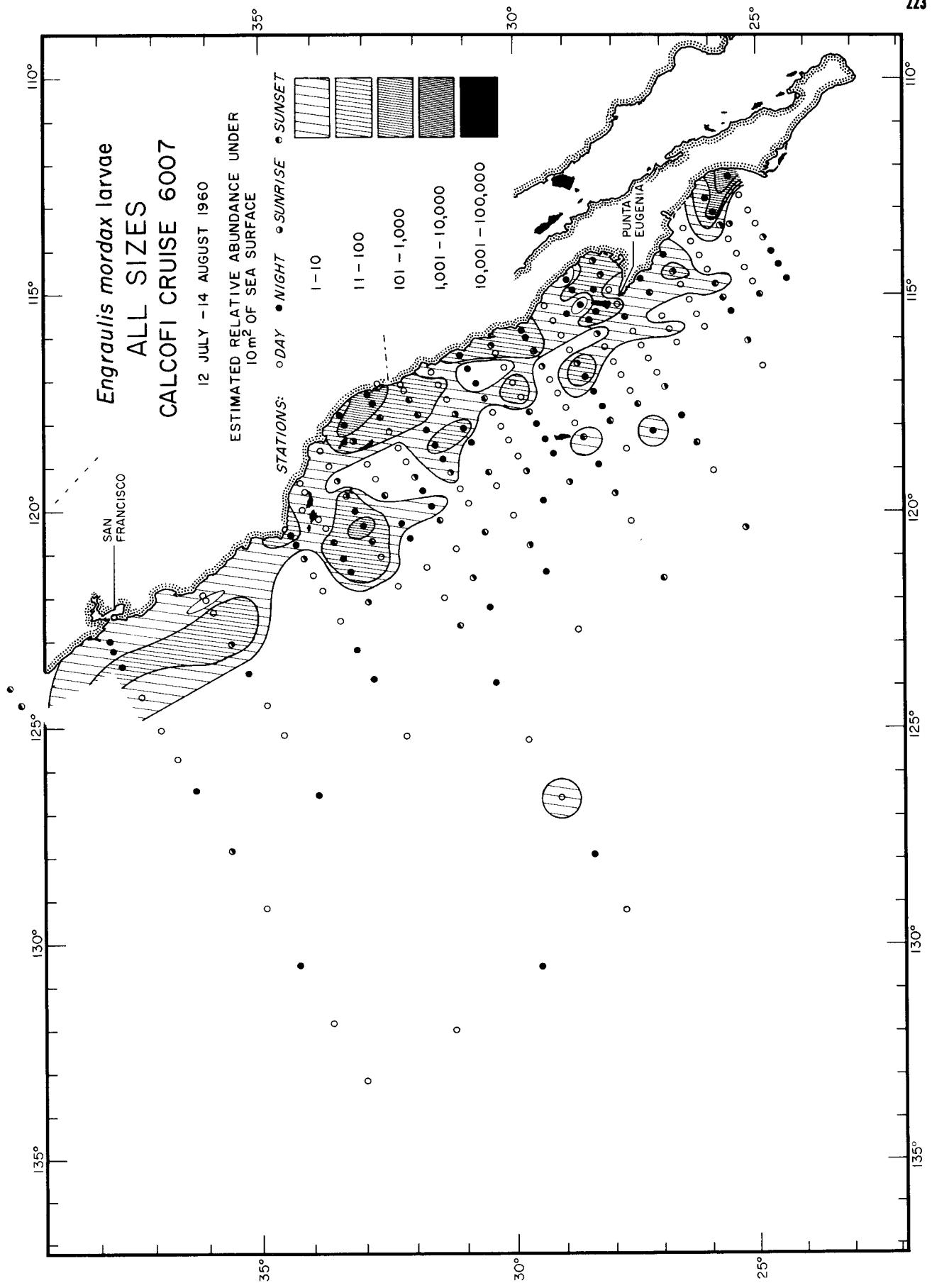


Engraulis mordax larvae
All Sizes
6006

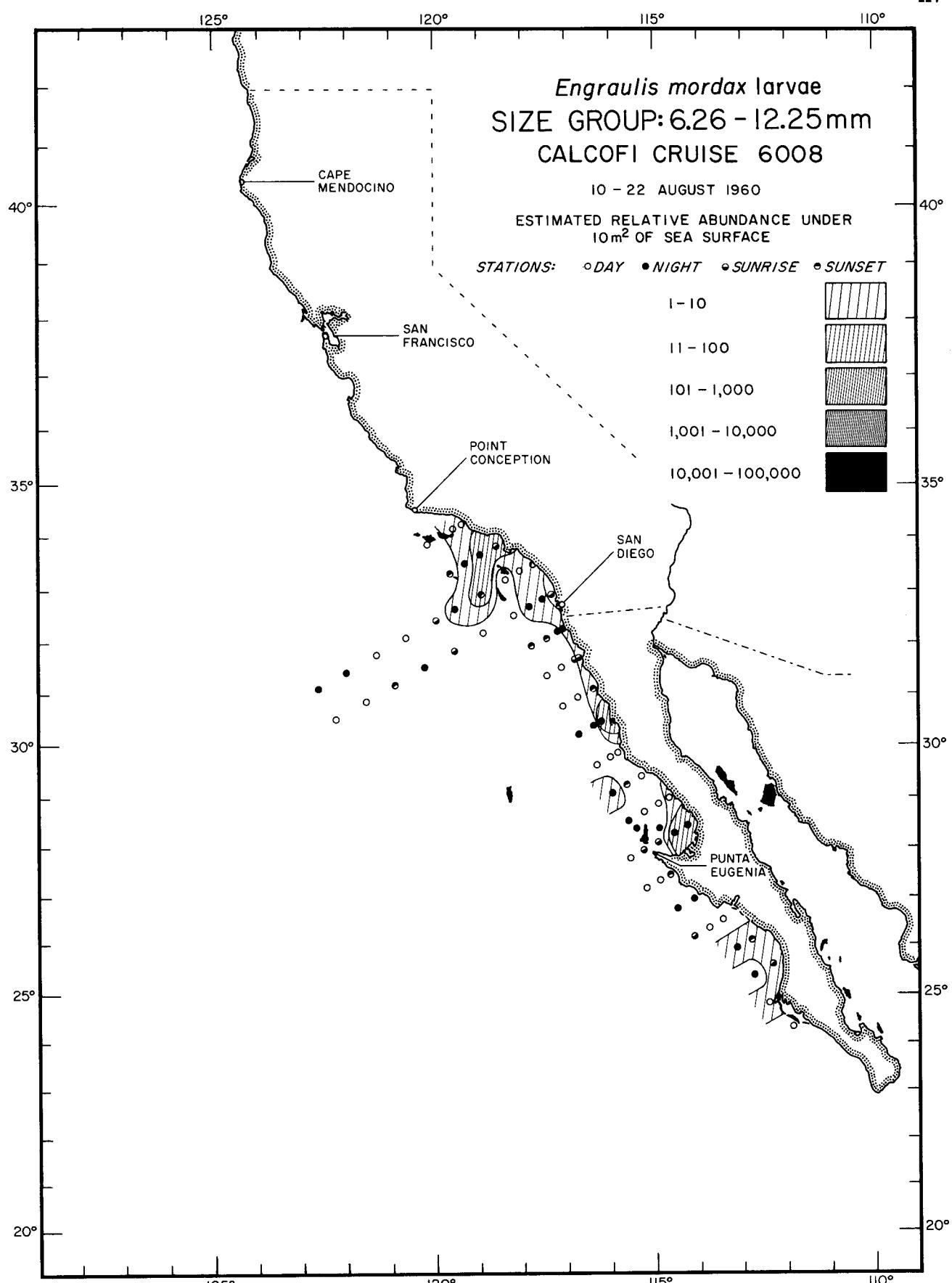
*Engraulis mordax* larvae

Size Group: 6.26-12.25mm

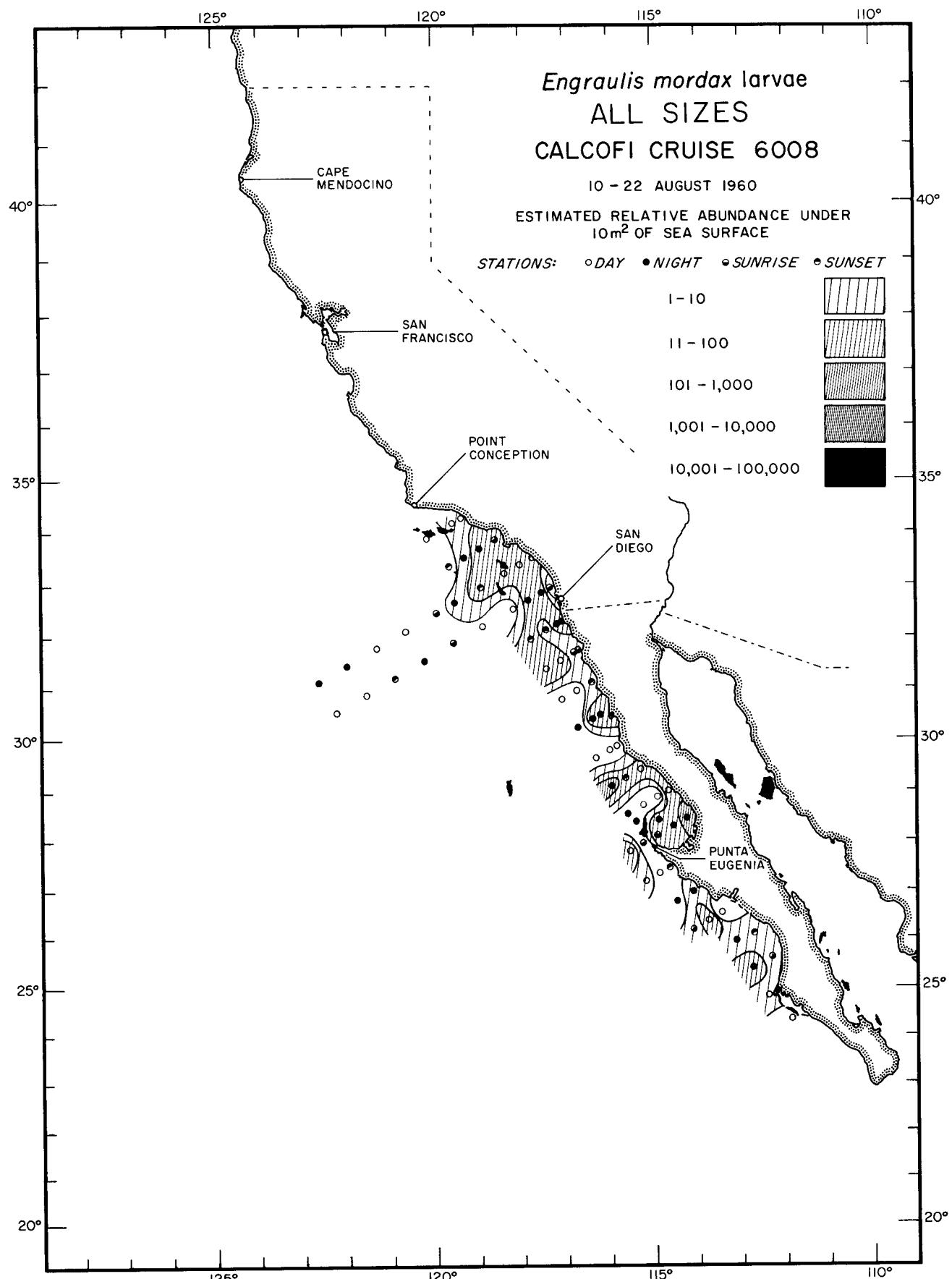
6007



Engraulis mordax larvae
All Sizes
6007

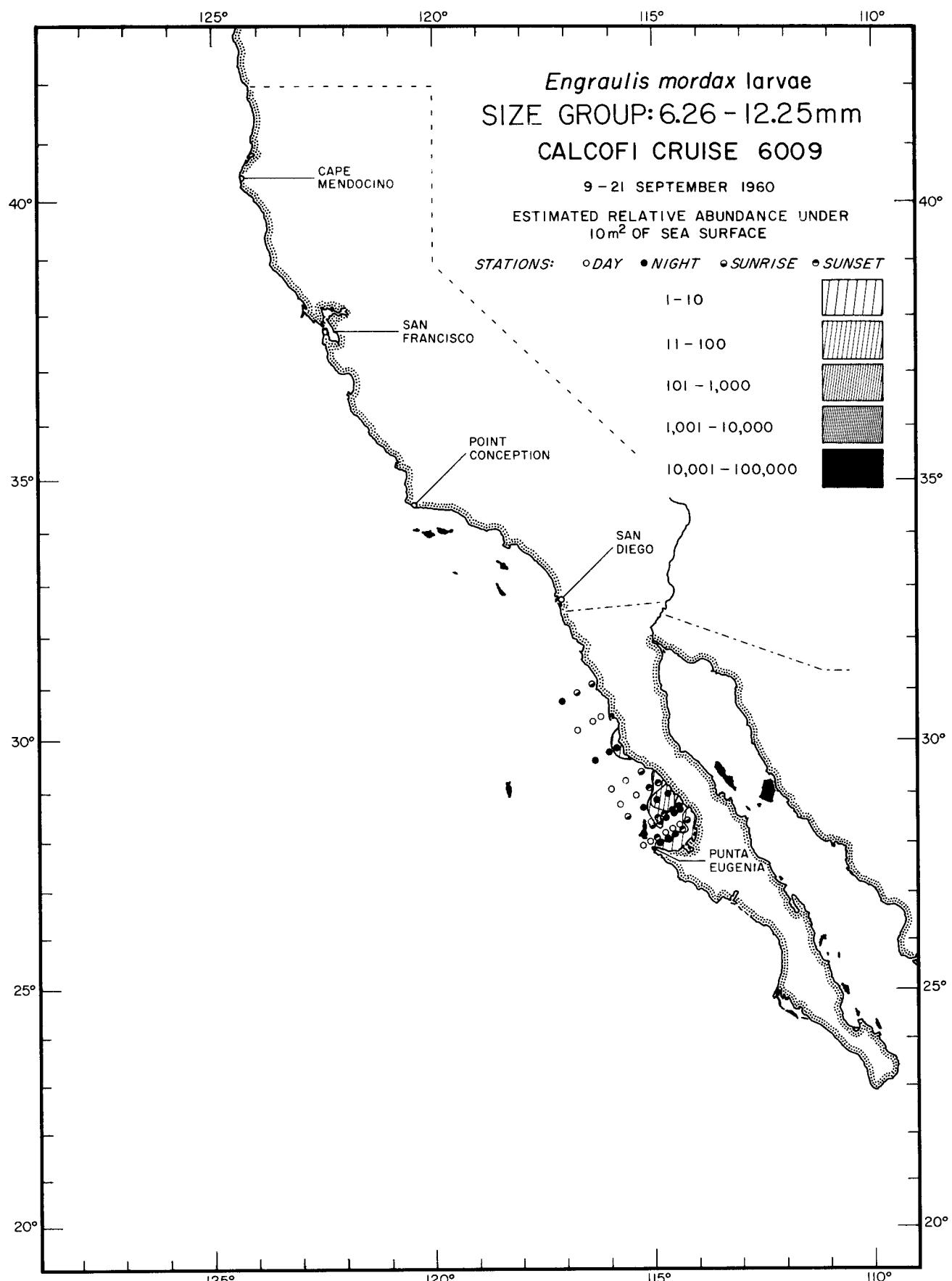


Engraulis mordax larvae
Size Group: 6.26 - 12.25mm
6008

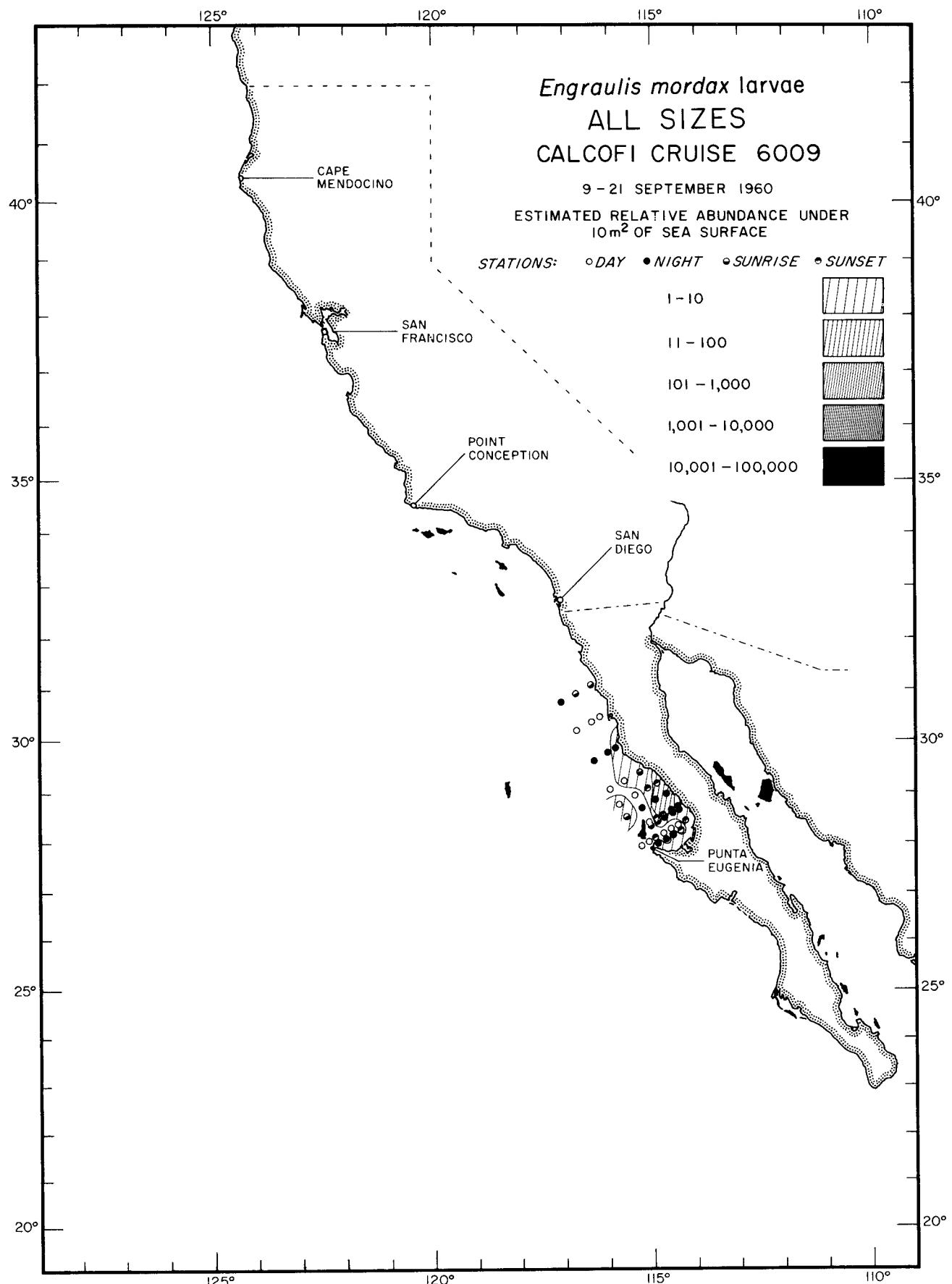


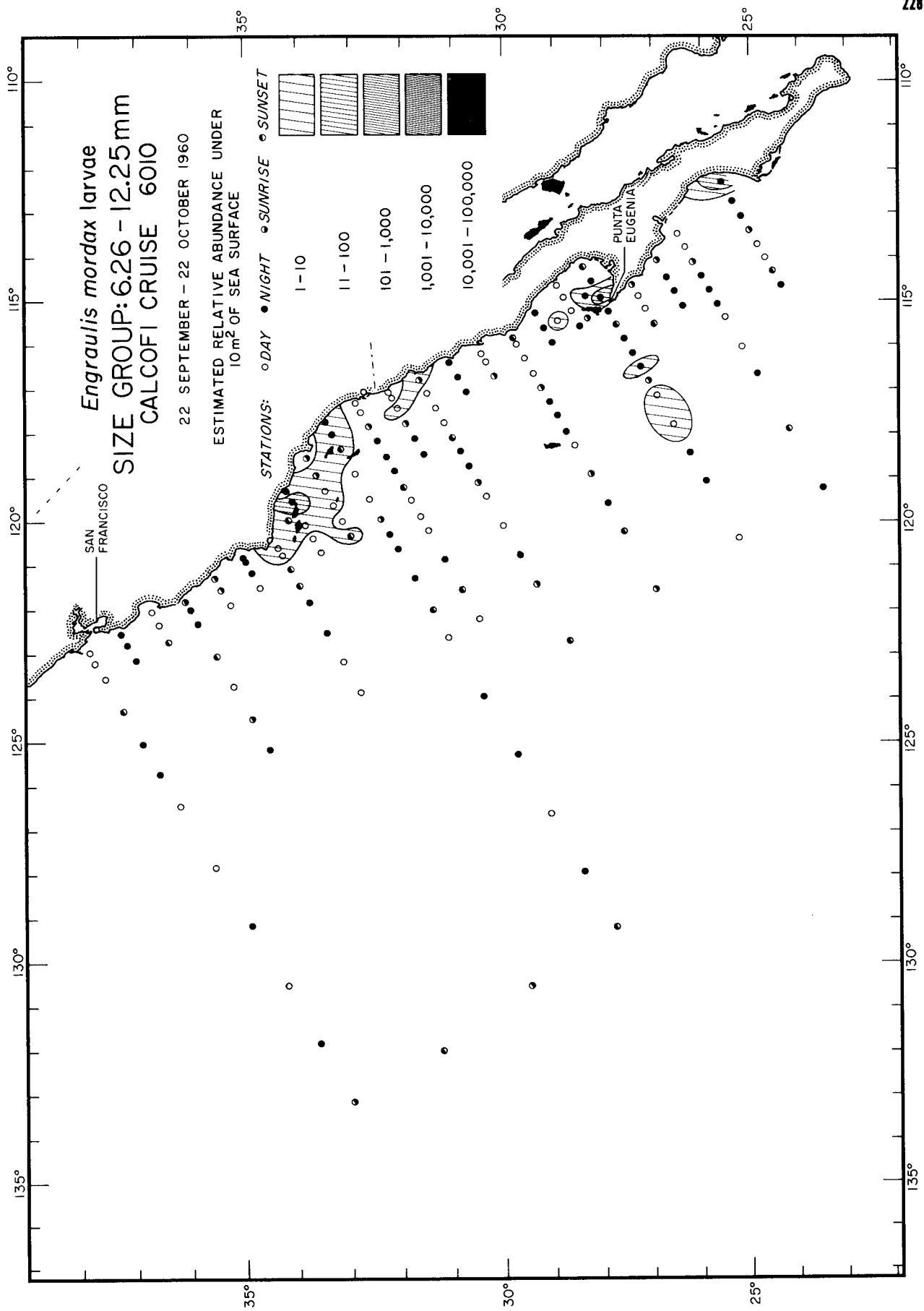
Engraulis mordax larvae

All Sizes
6008

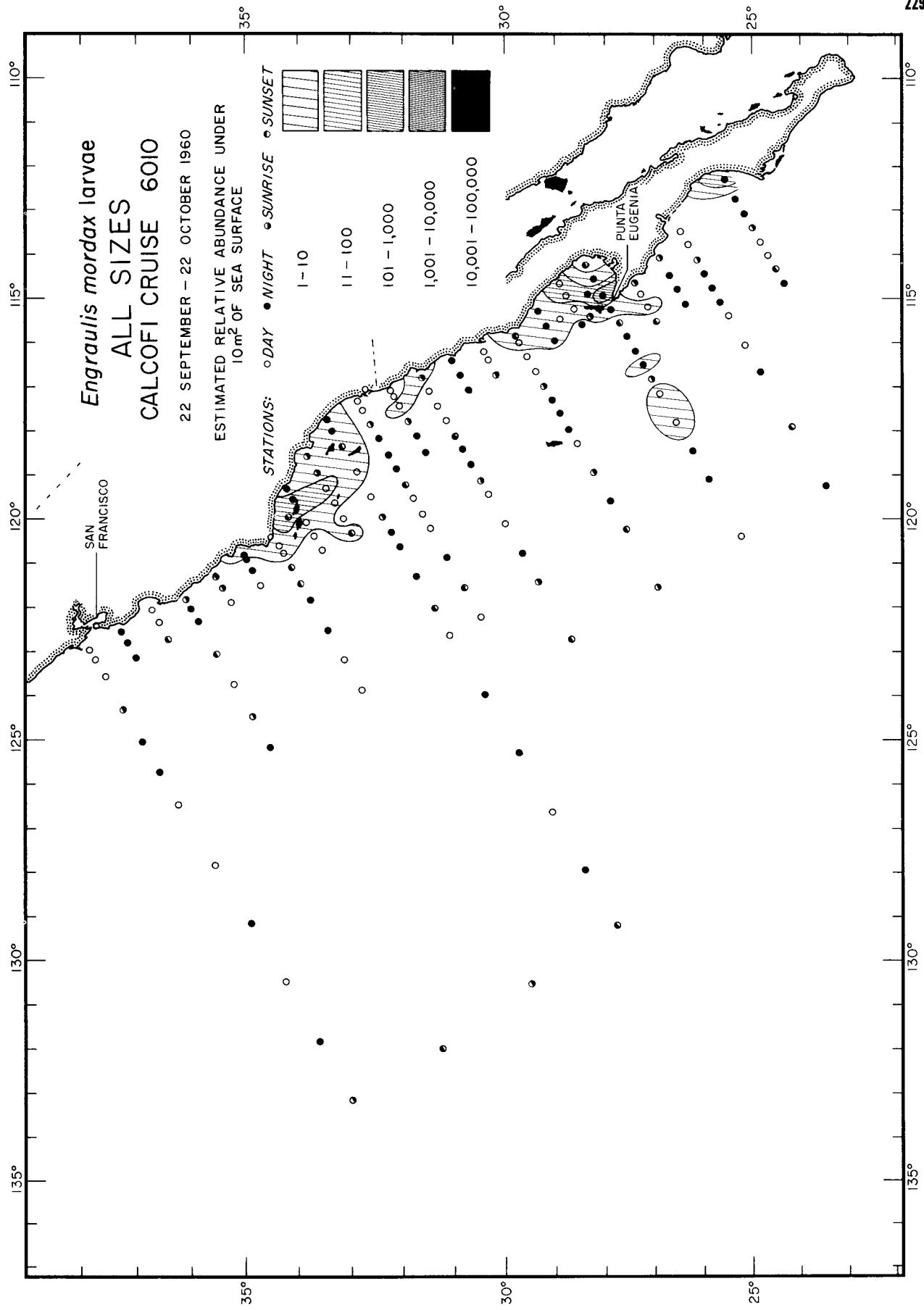


Engraulis mordax larvae
Size Group: 6.26-12.25mm
6009

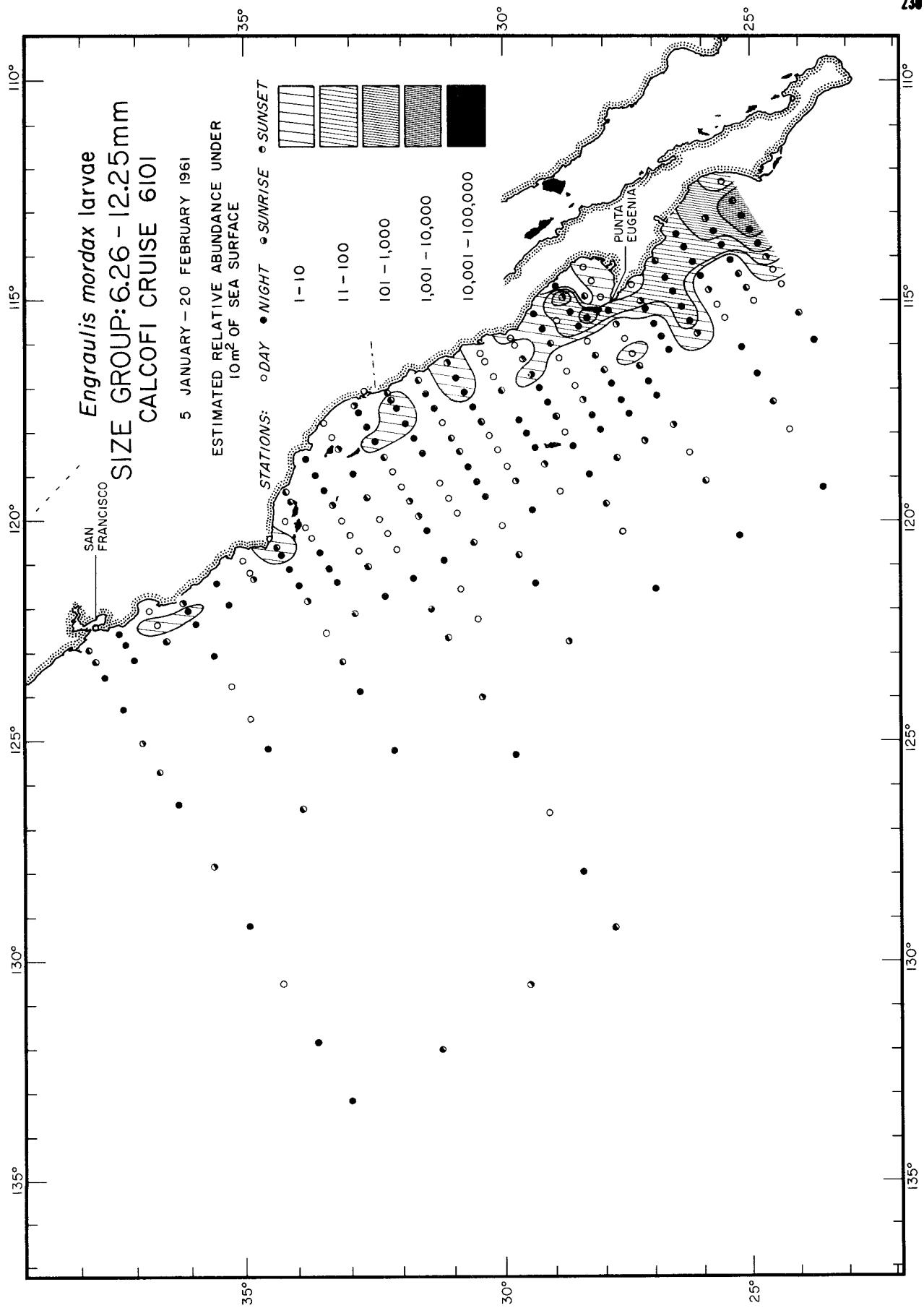
*Engraulis mordax* larvaeAll Sizes
6009



Engraulis mordax larvae
 Size Group: 6.26-12.25mm
 6010



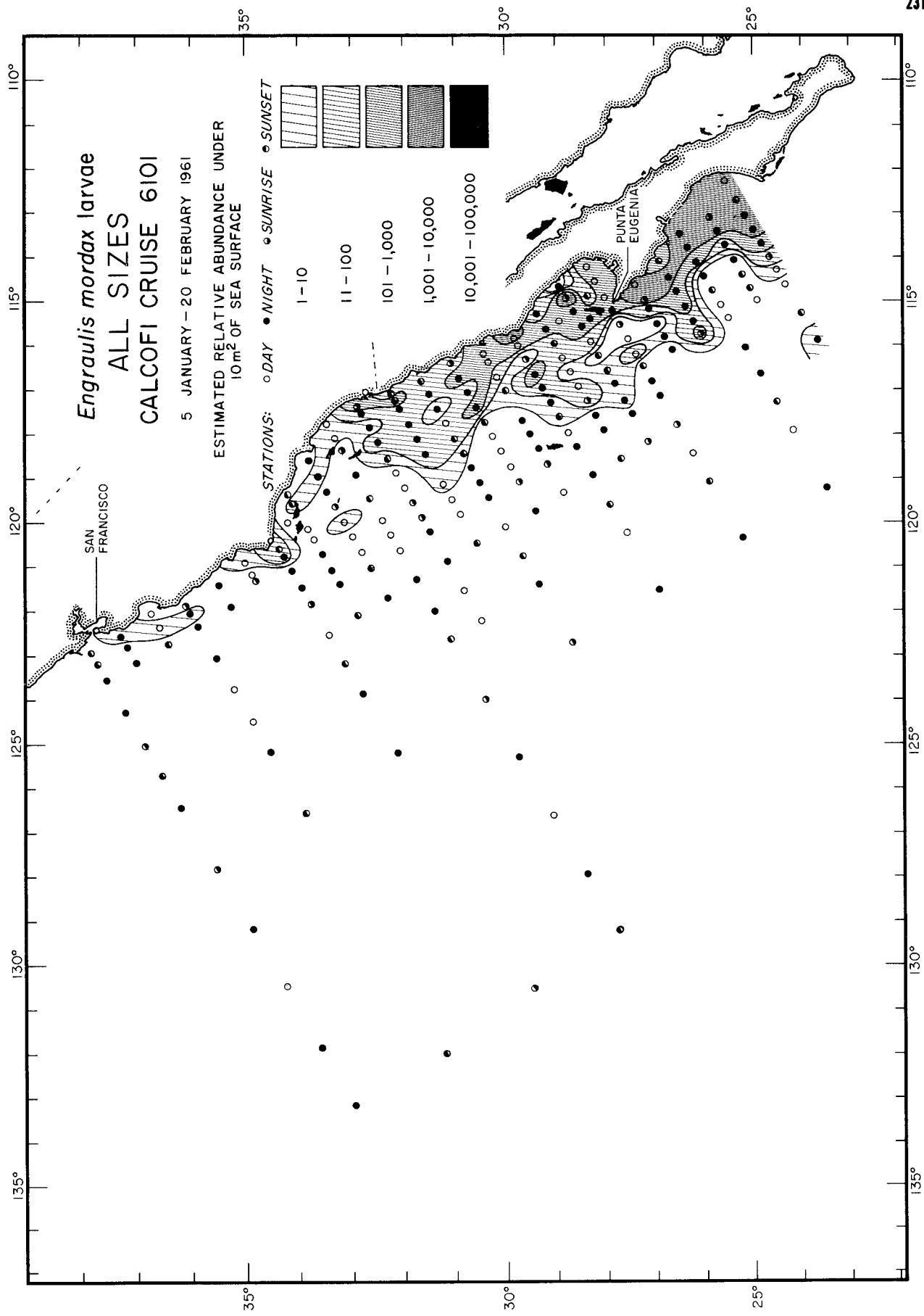
Engraulis mordax larvae
All Sizes
6010



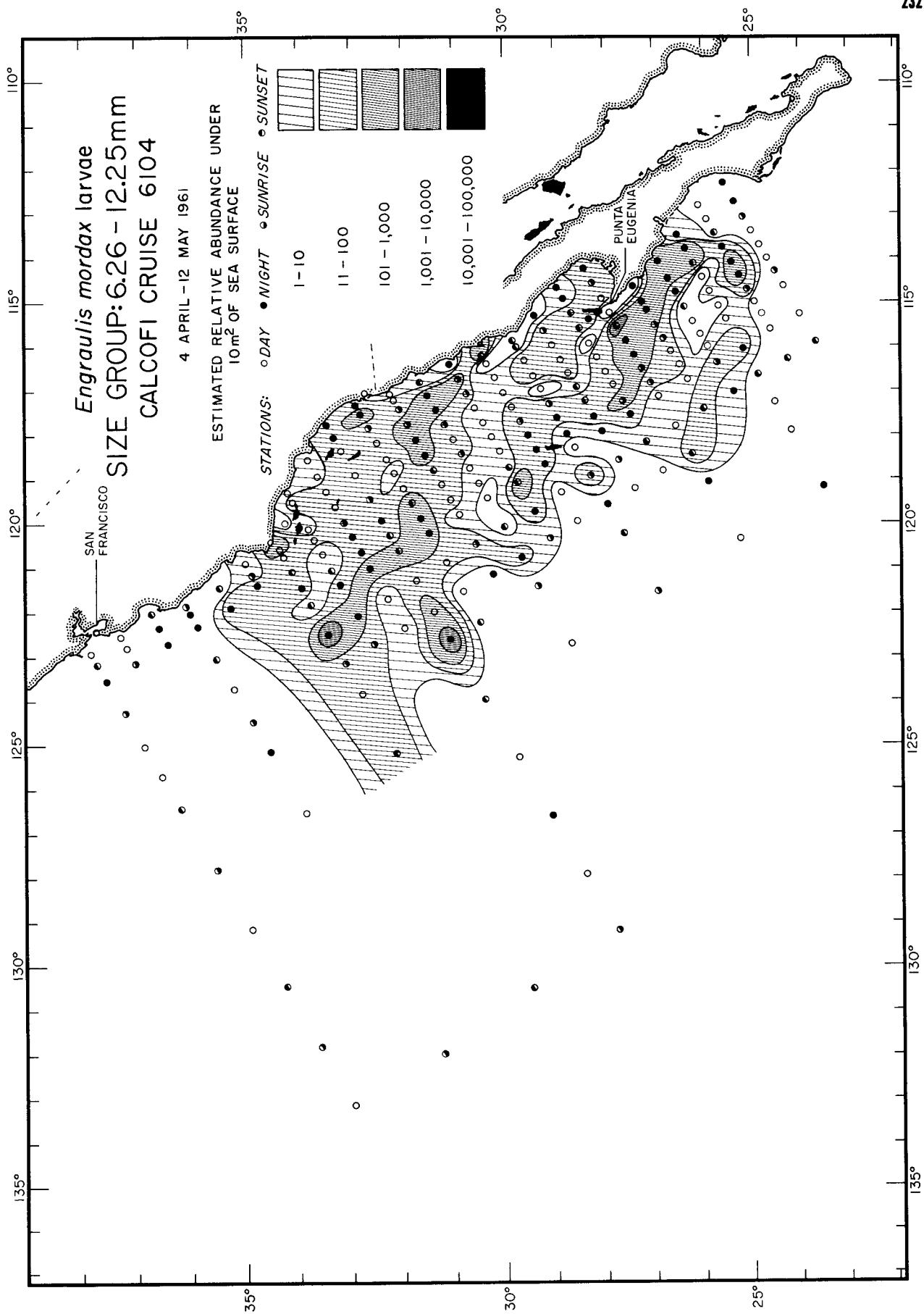
Engraulis mordax larvae

Size Group: 6.26-12.25mm

6101

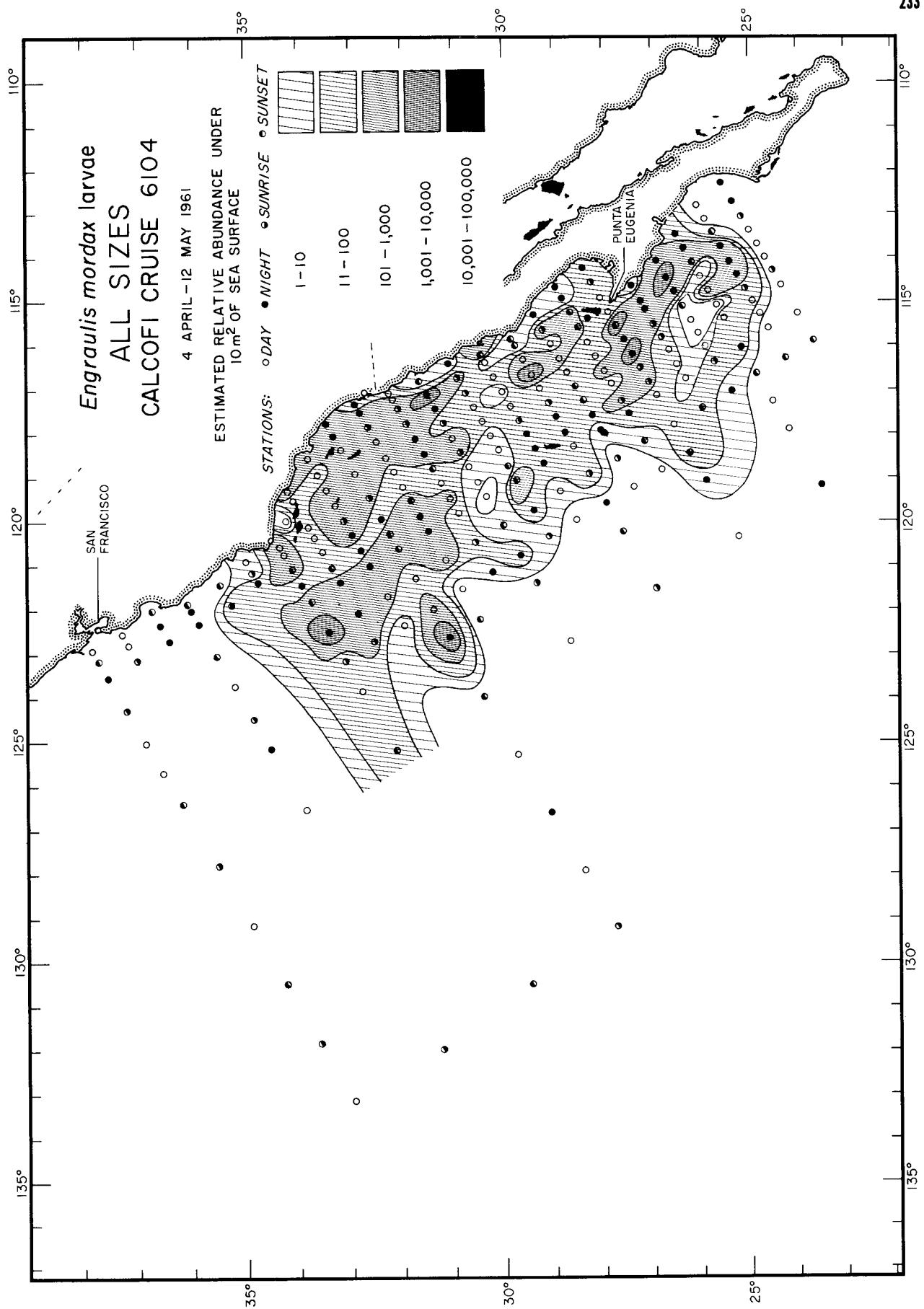


Engraulis mordax larvae
All Sizes
6101

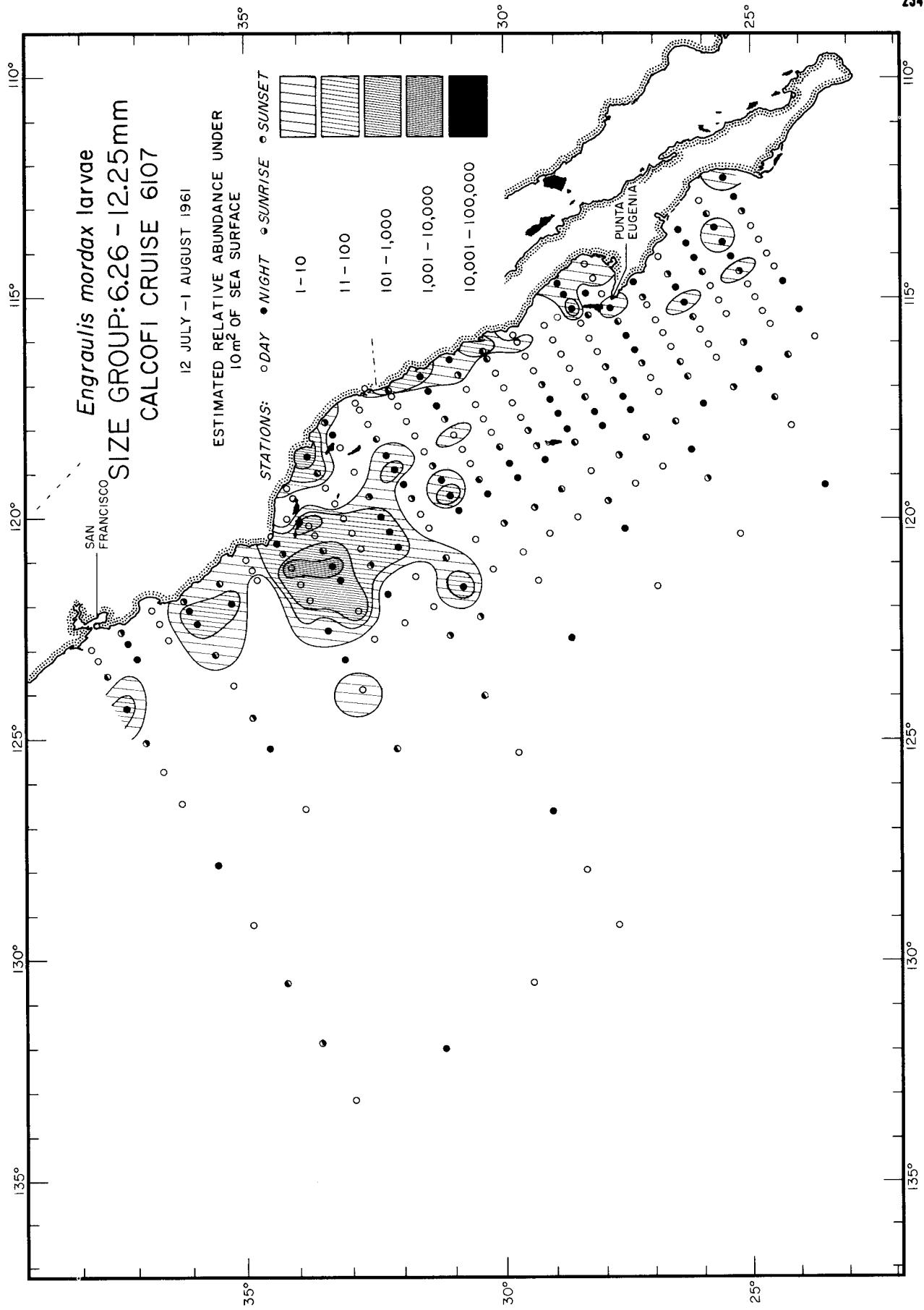


Engraulis mordax larvae

Size Group: 6.26-12.25mm
6104



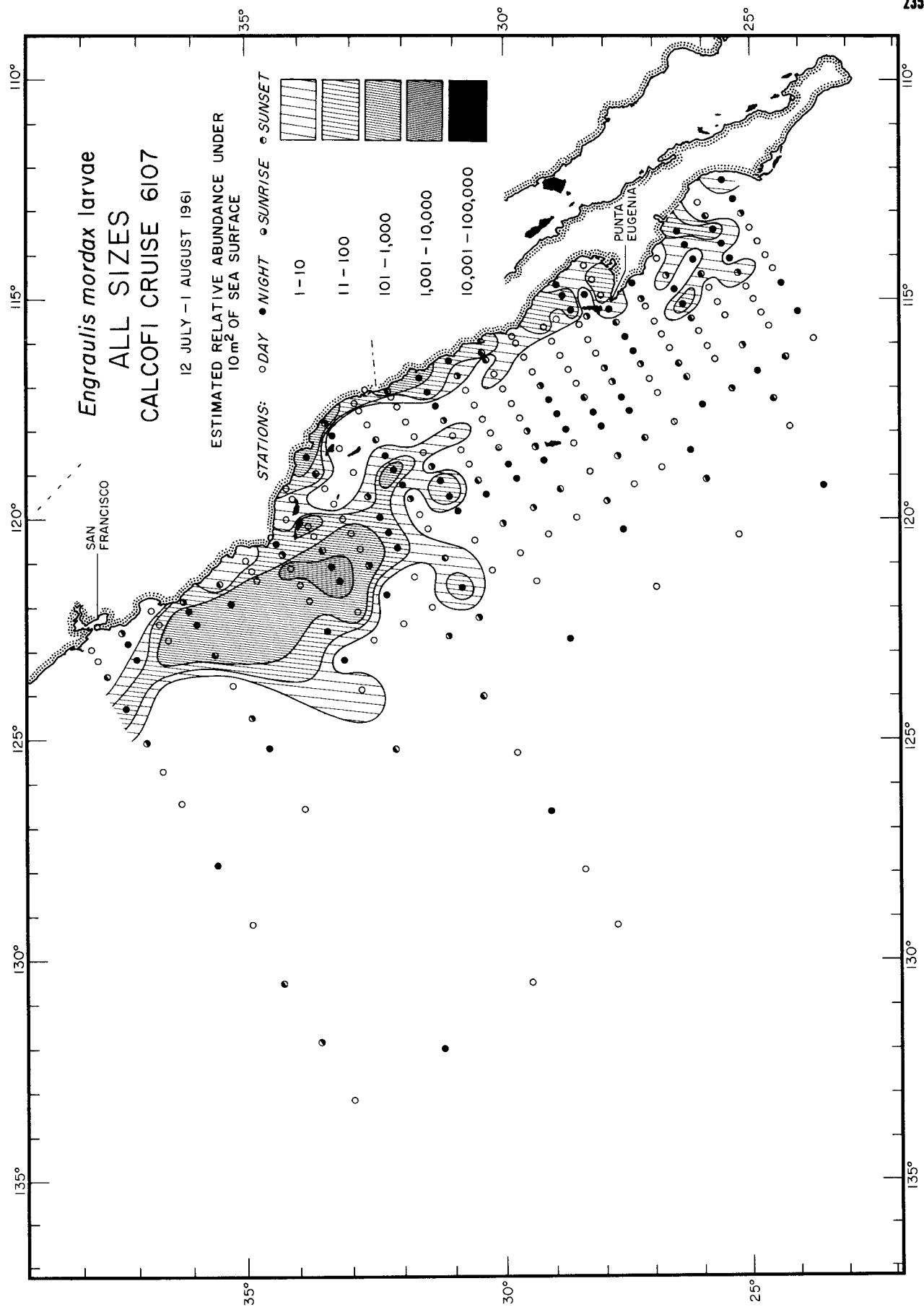
Engraulis mordax larvae
All Sizes
6104



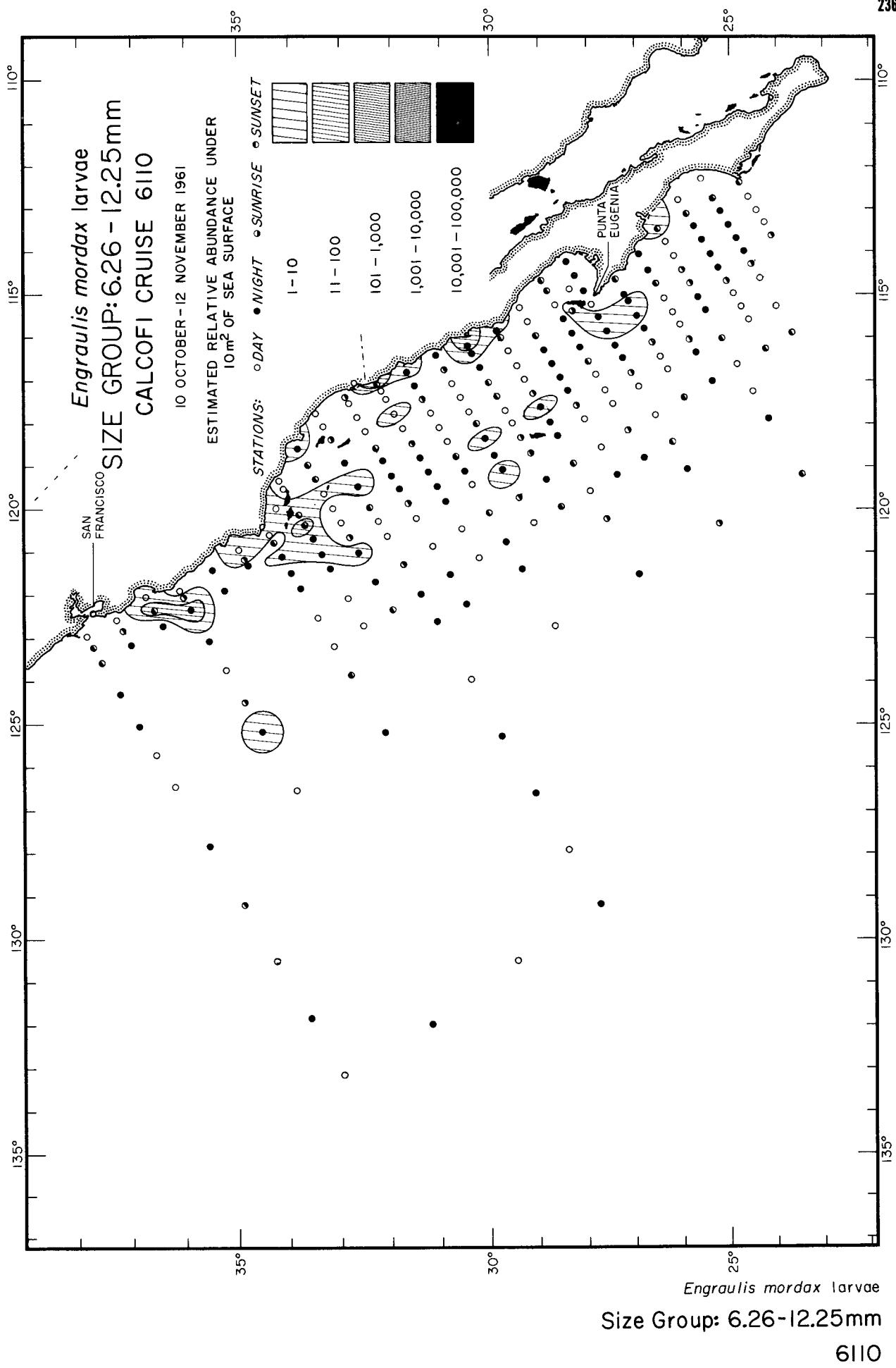
Engraulis mordax larvae

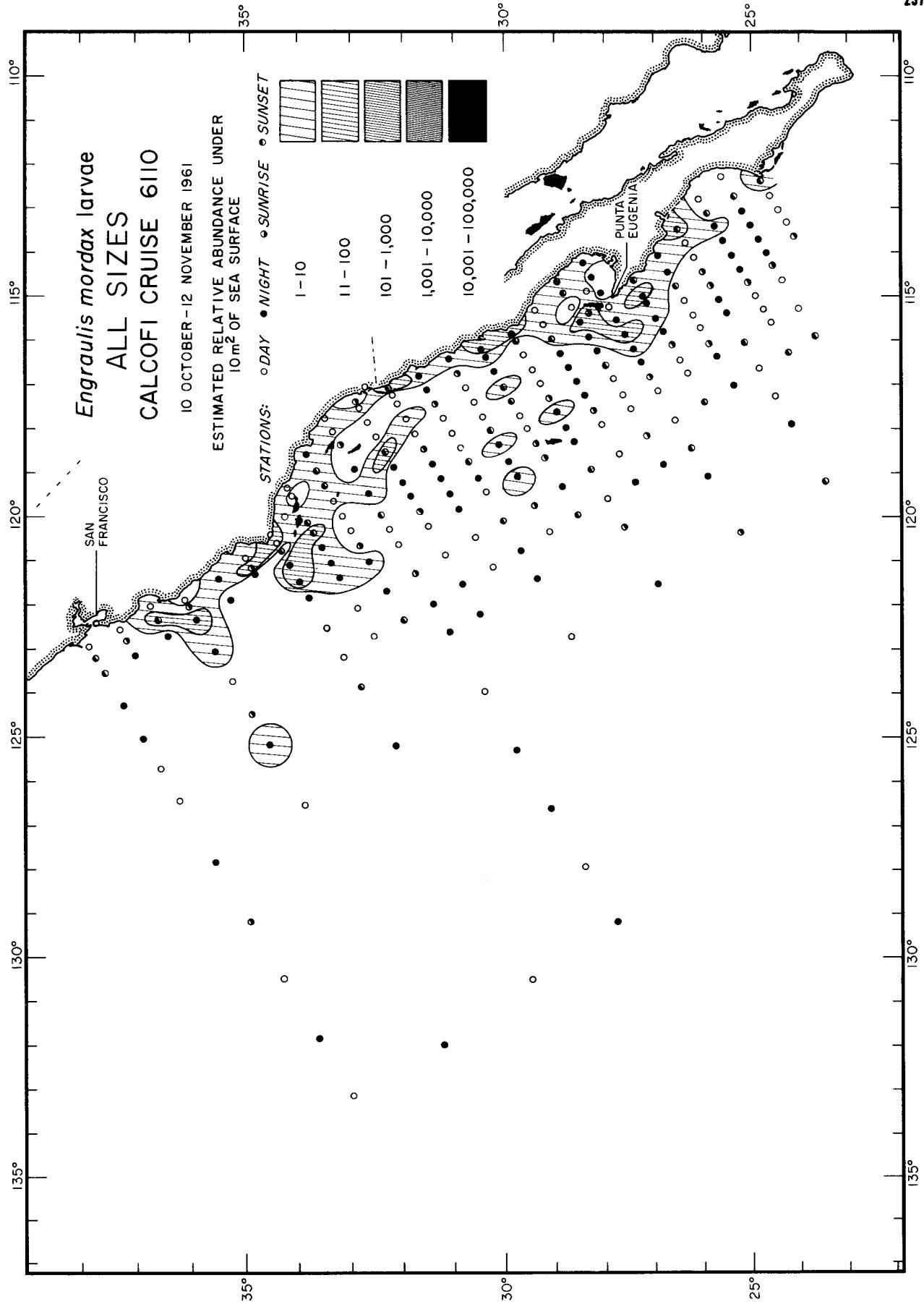
Size Group: 6.26-12.25mm

6107



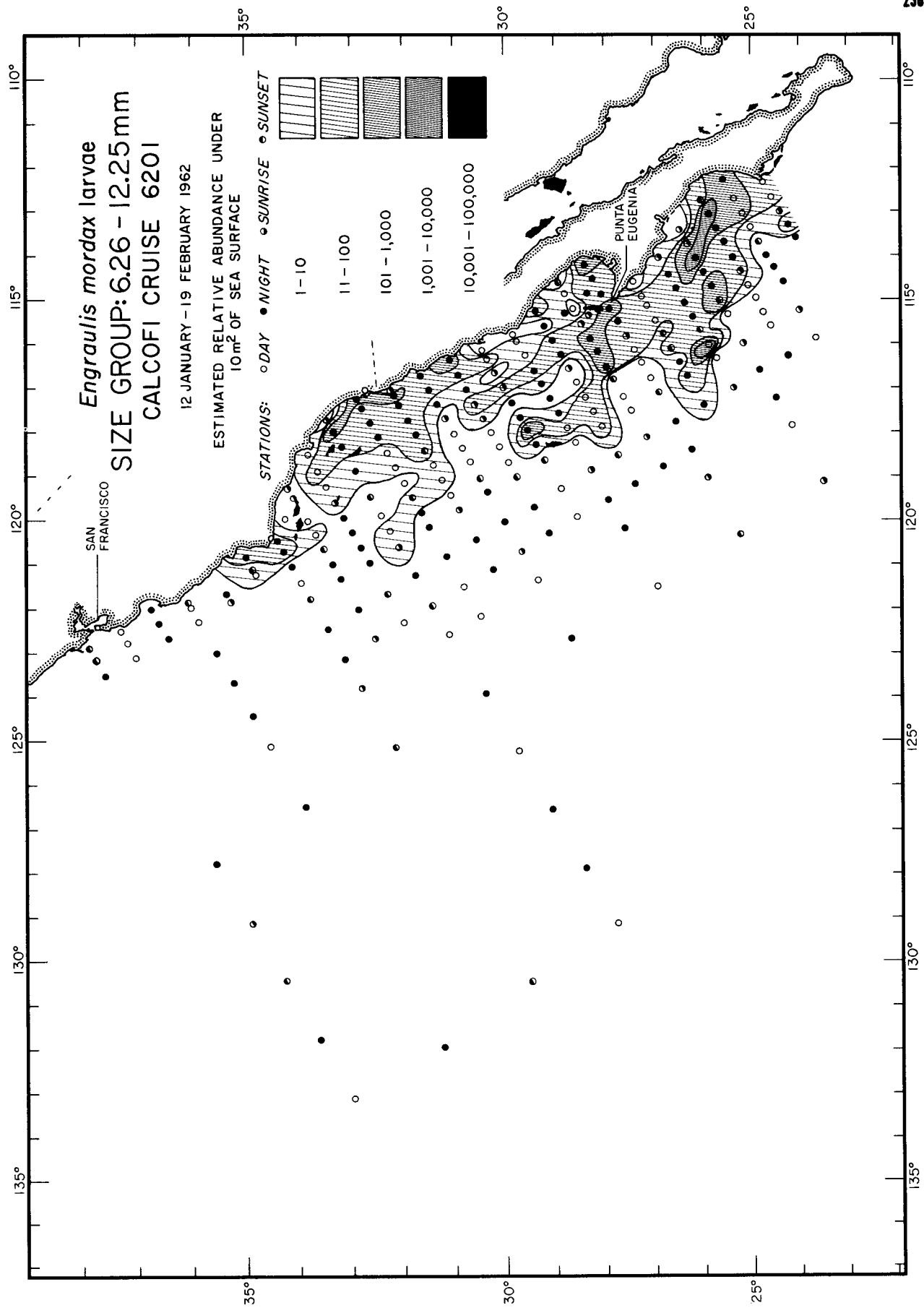
Engraulis mordax larvae
All Sizes
6107



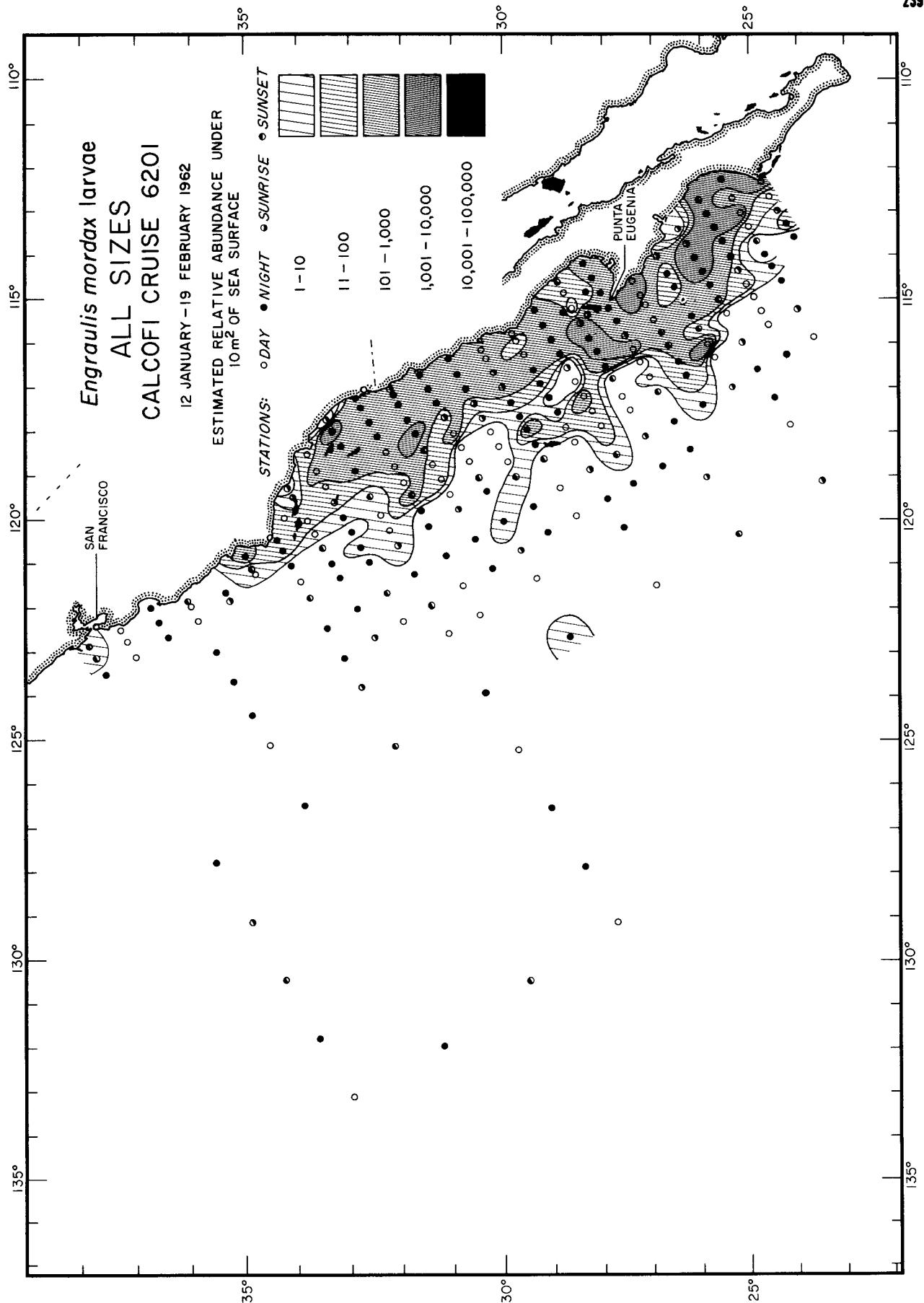
*Engraulis mordax* larvae

All Sizes

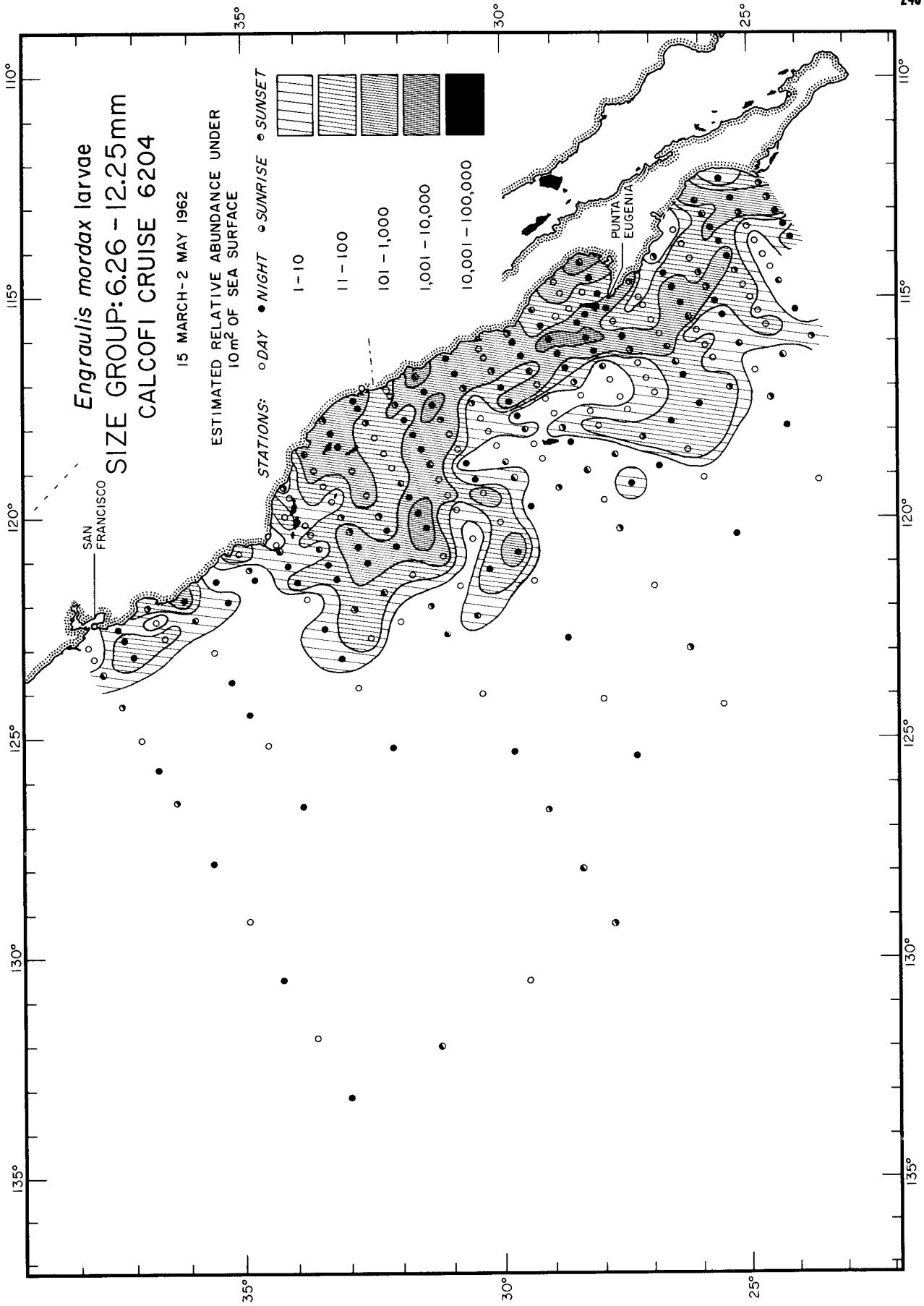
6110



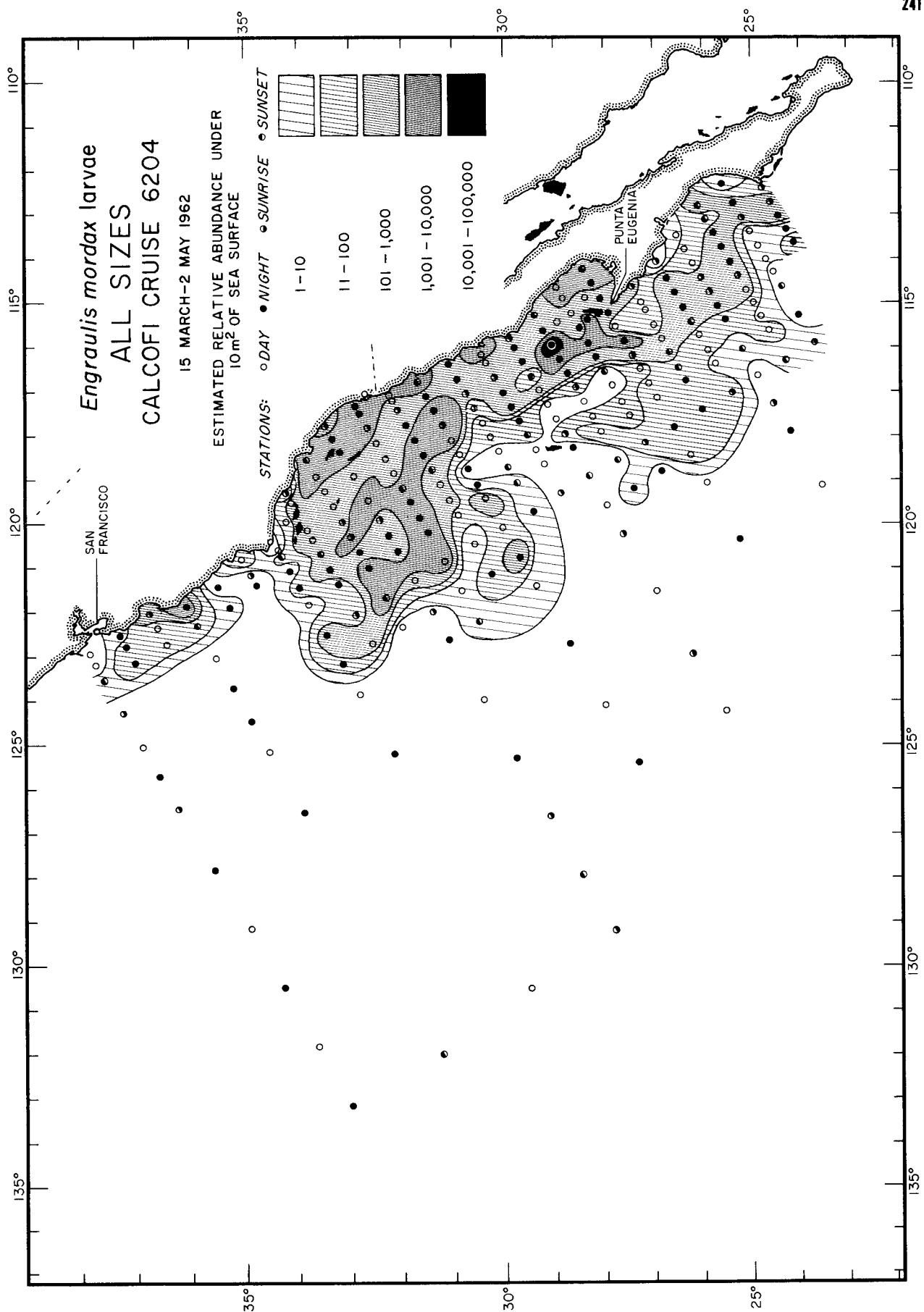
Engraulis mordax larvae
 Size Group: 6.26-12.25mm
 6201

*Engraulis mordax* larvae

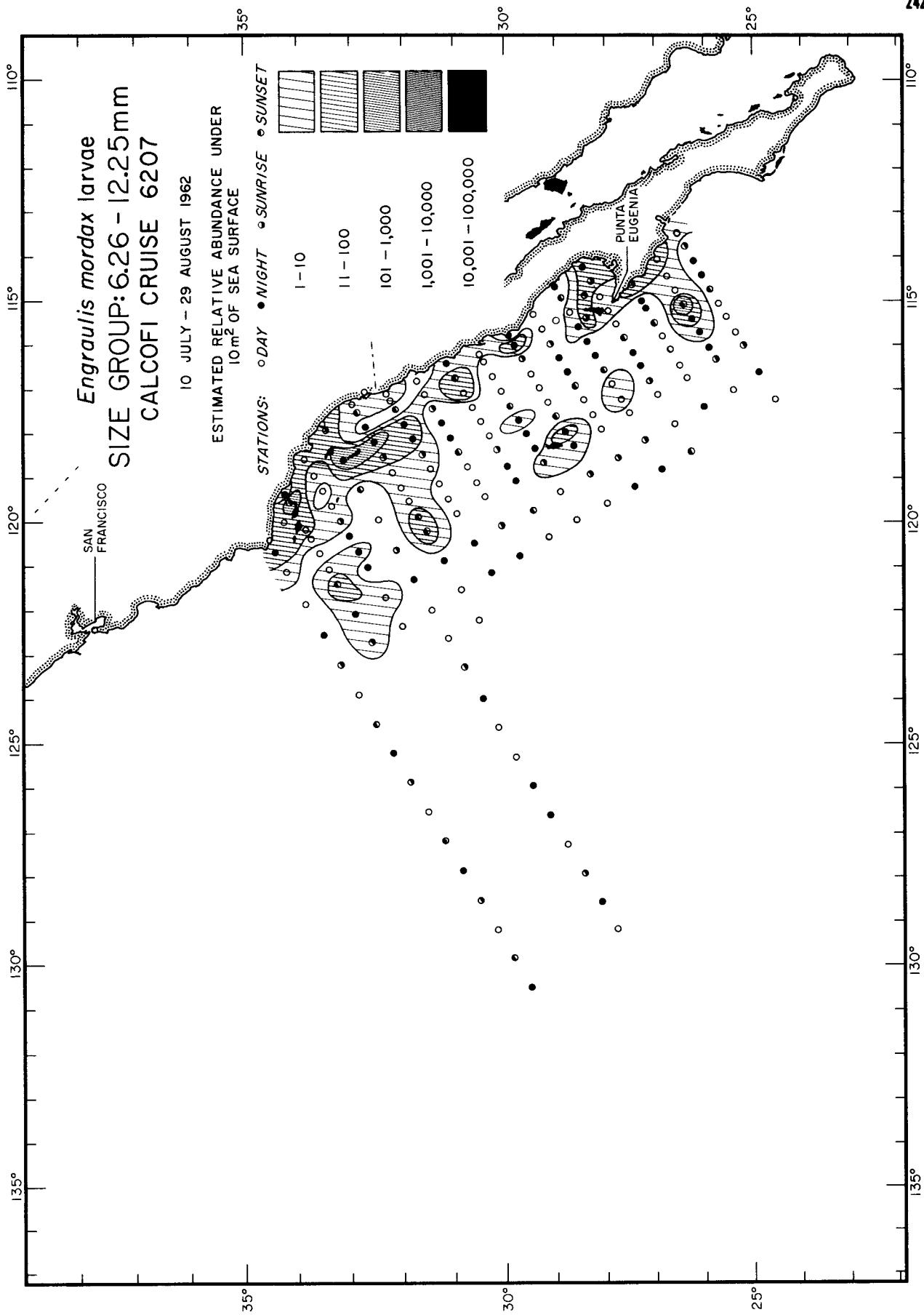
All Sizes
6201



Engraulis mordax larvae
Size Group: 6.26 - 12.25mm
6204



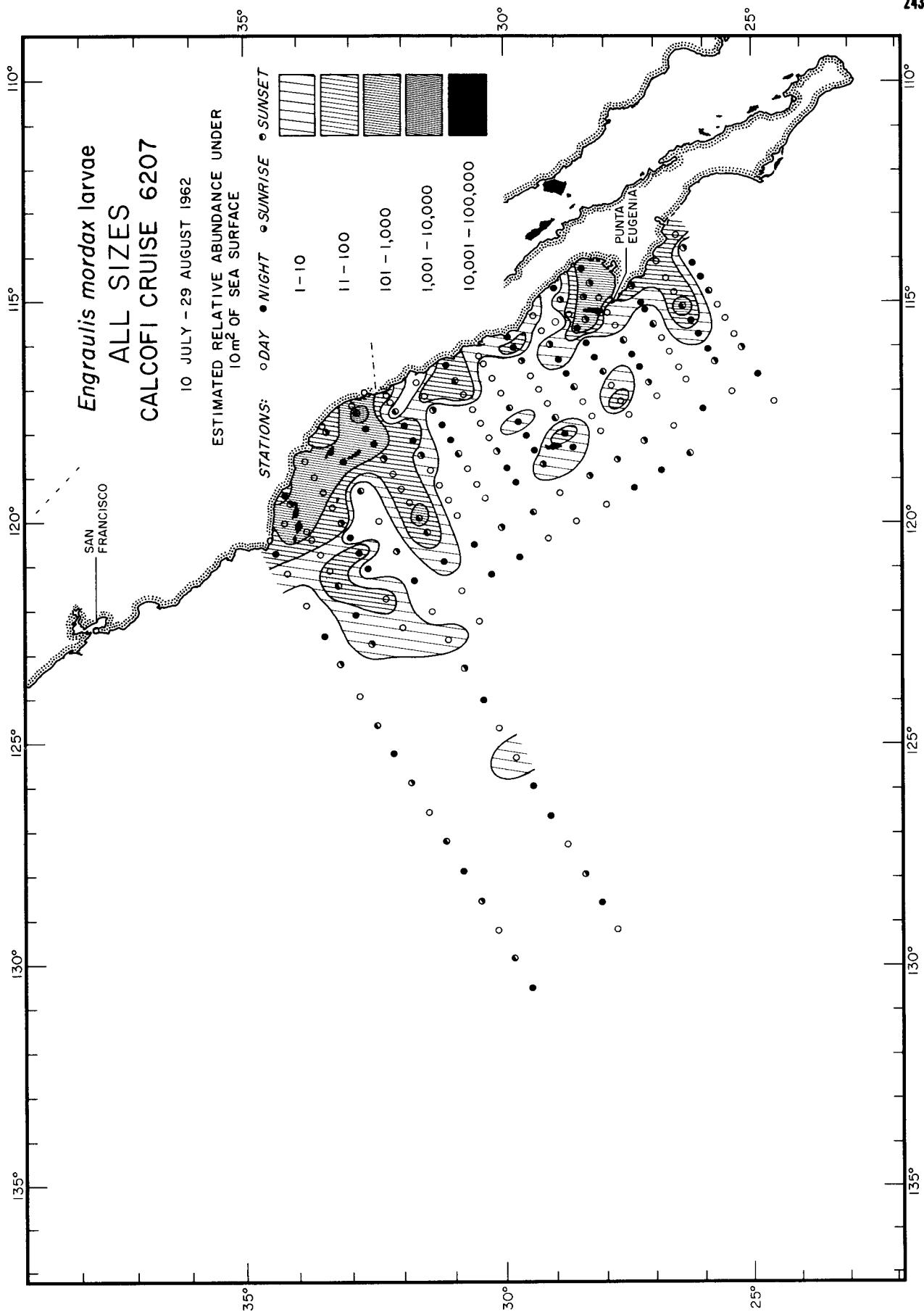
Engraulis mordax larvae
 All Sizes
 6204



Engraulis mordax larvae

Size Group: 6.26-12.25mm

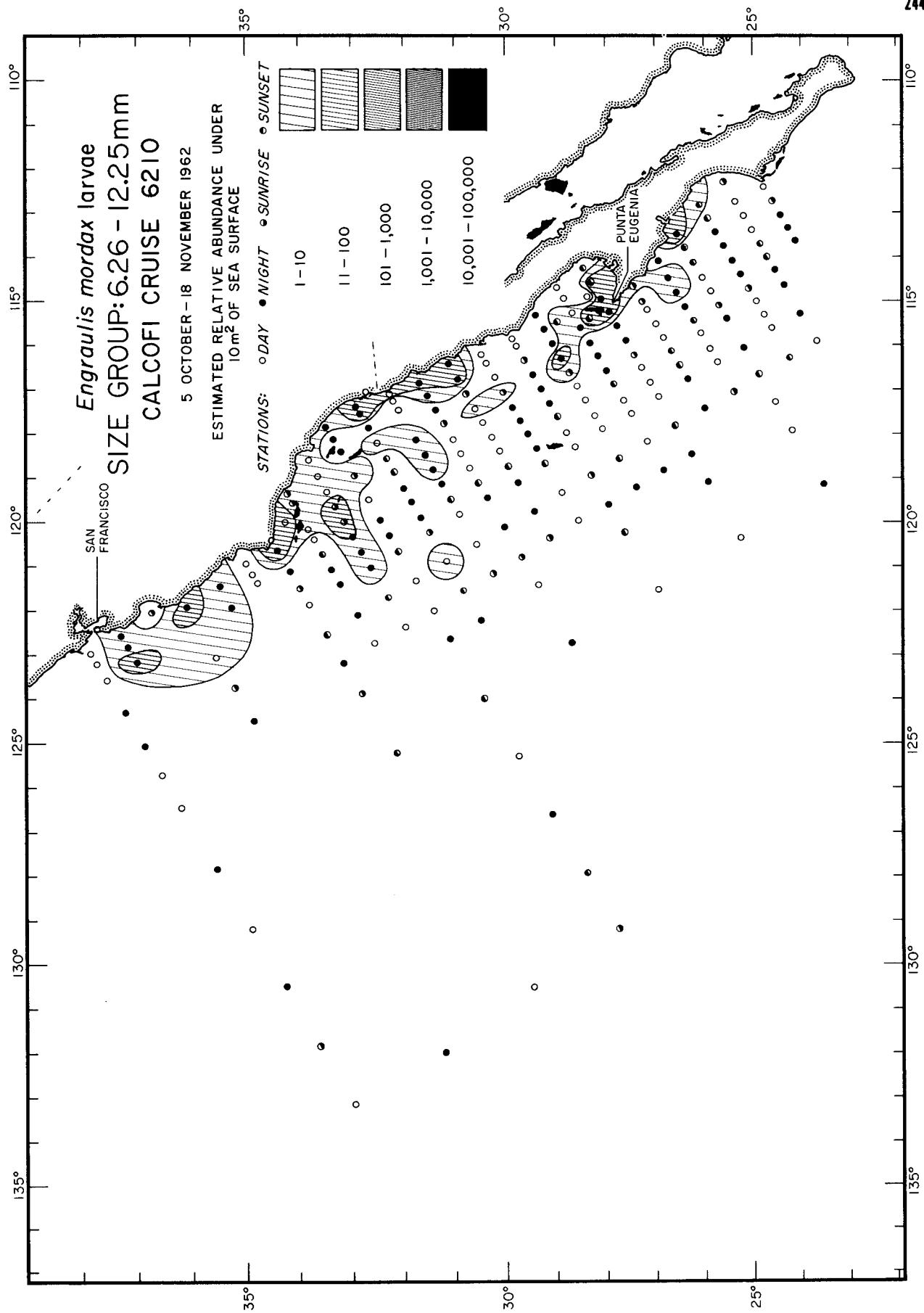
6207



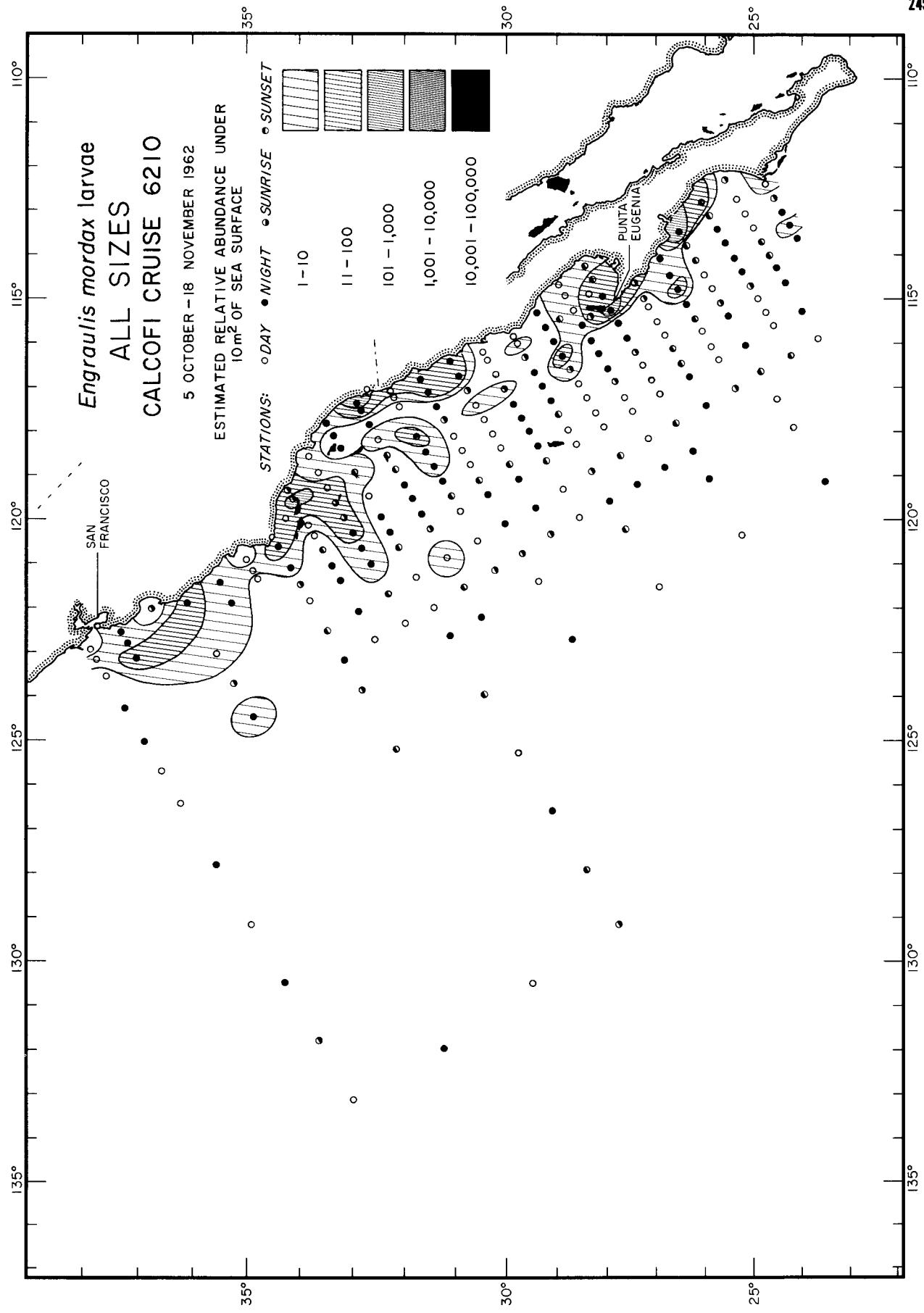
Engraulis mordax larvae

All Sizes

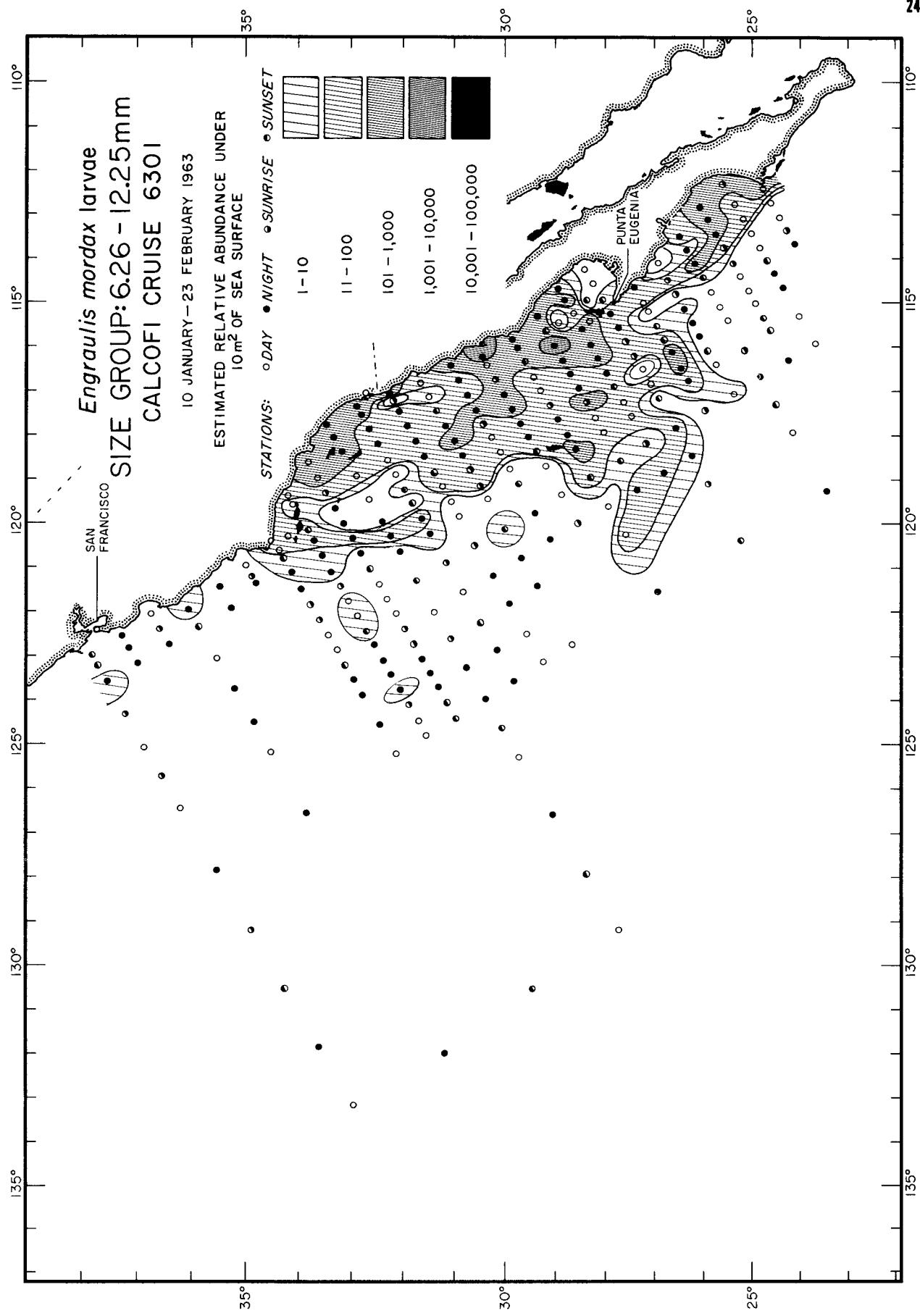
6207



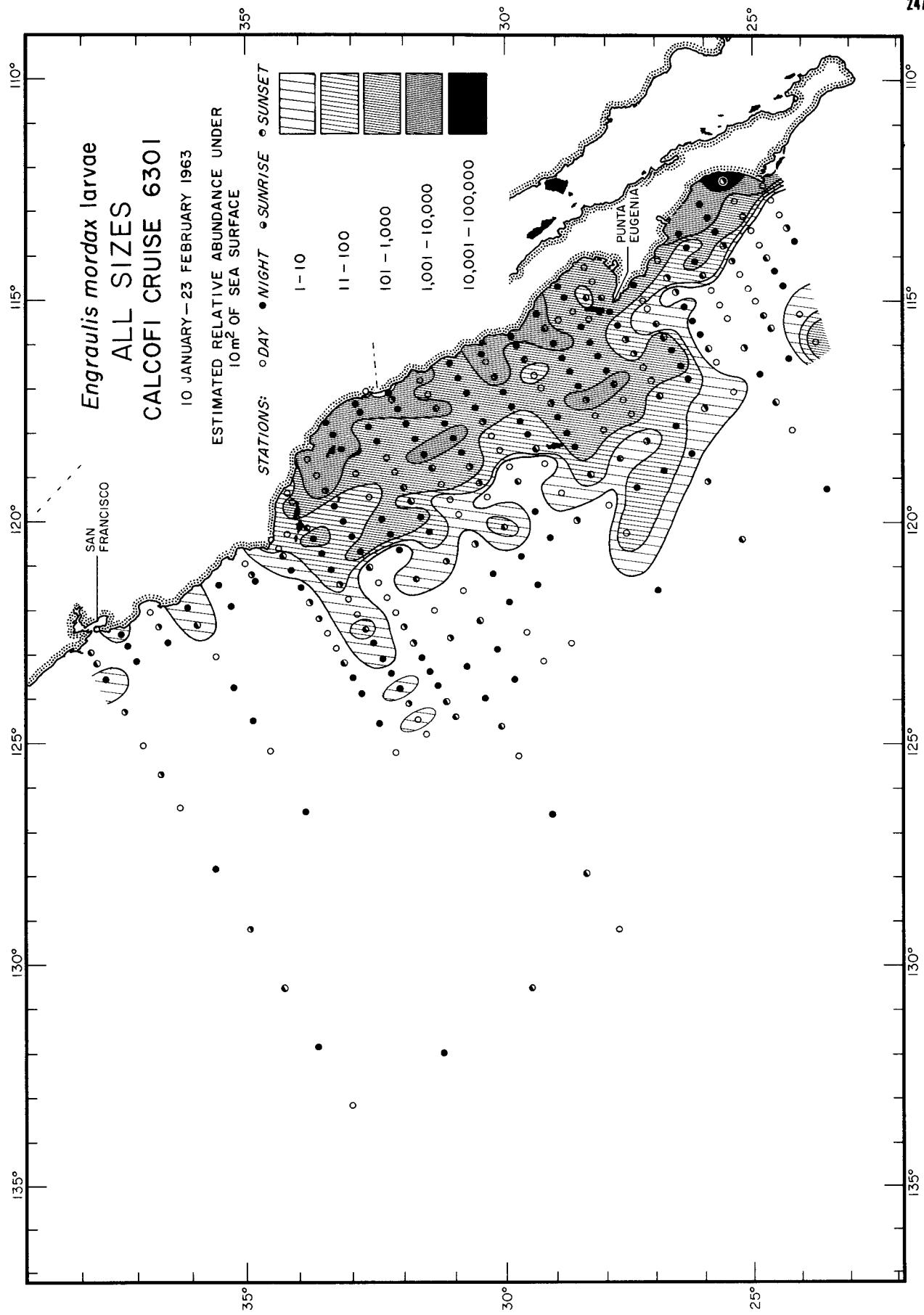
Engraulis mordax larvae
 Size Group: 6.26-12.25mm
 6210



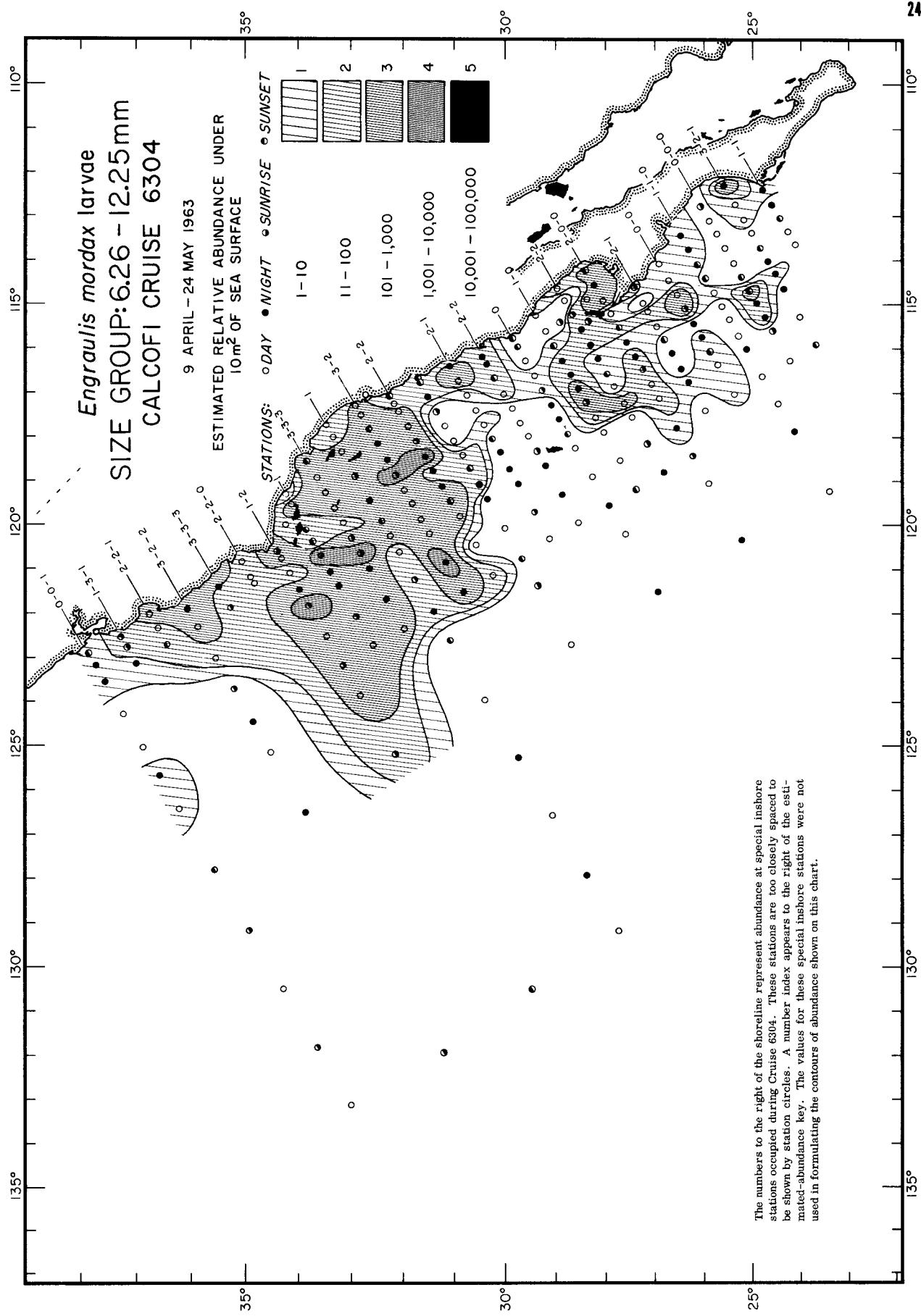
Engraulis mordax larvae
All Sizes
6210



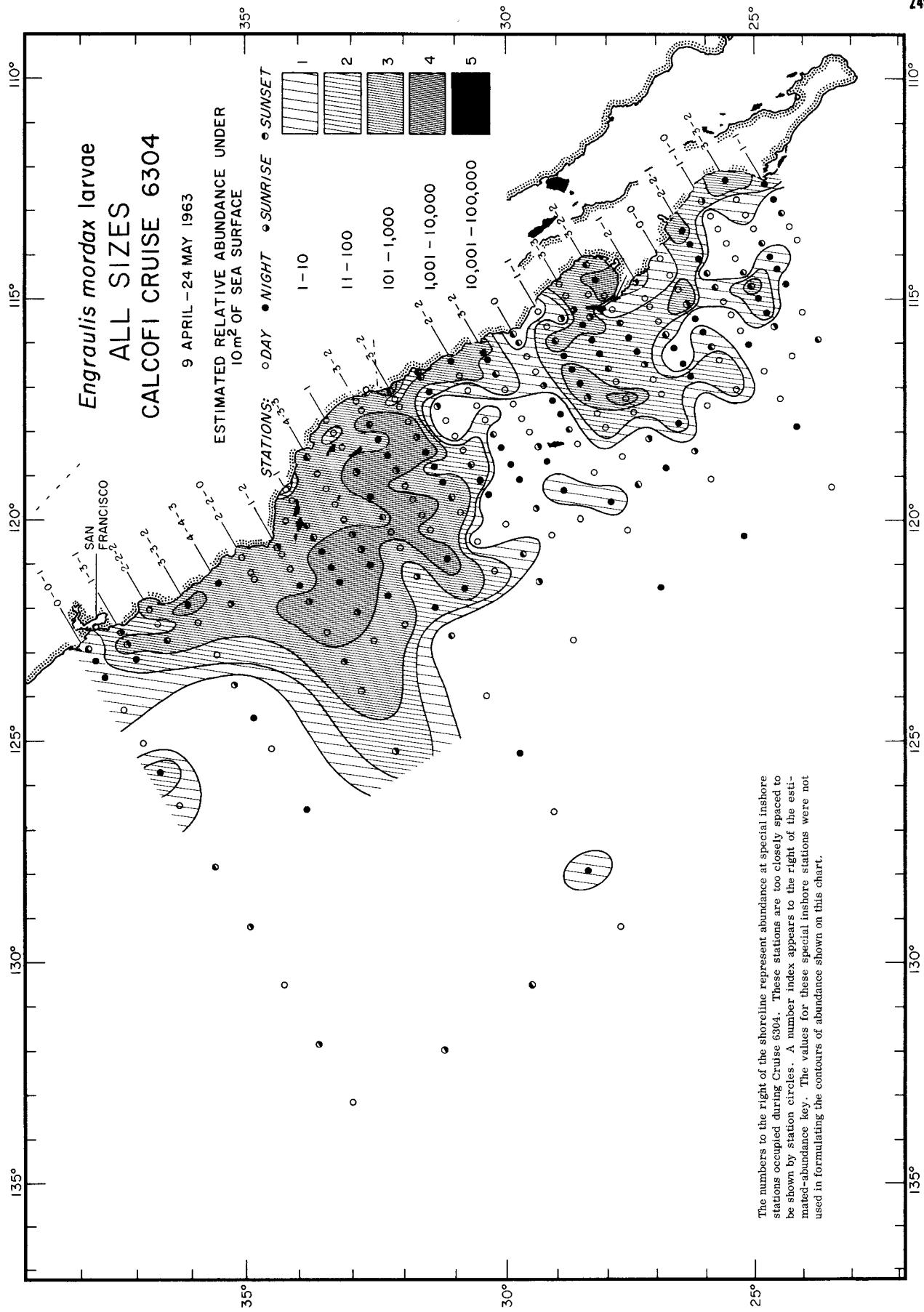
Engraulis mordax larvae
 Size Group: 6.26-12.25mm
 6301



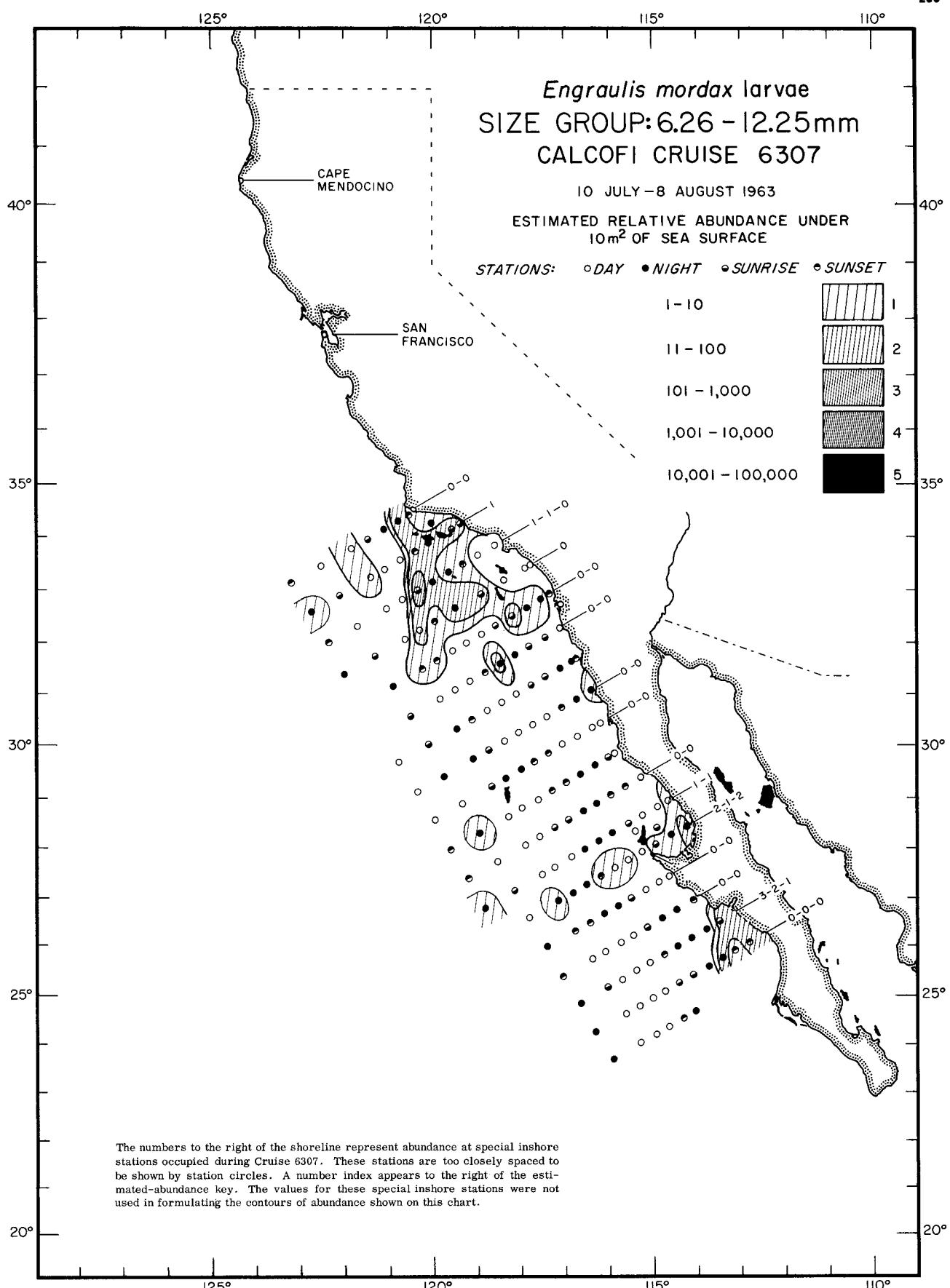
Engraulis mordax larvae
 All Sizes
 6301



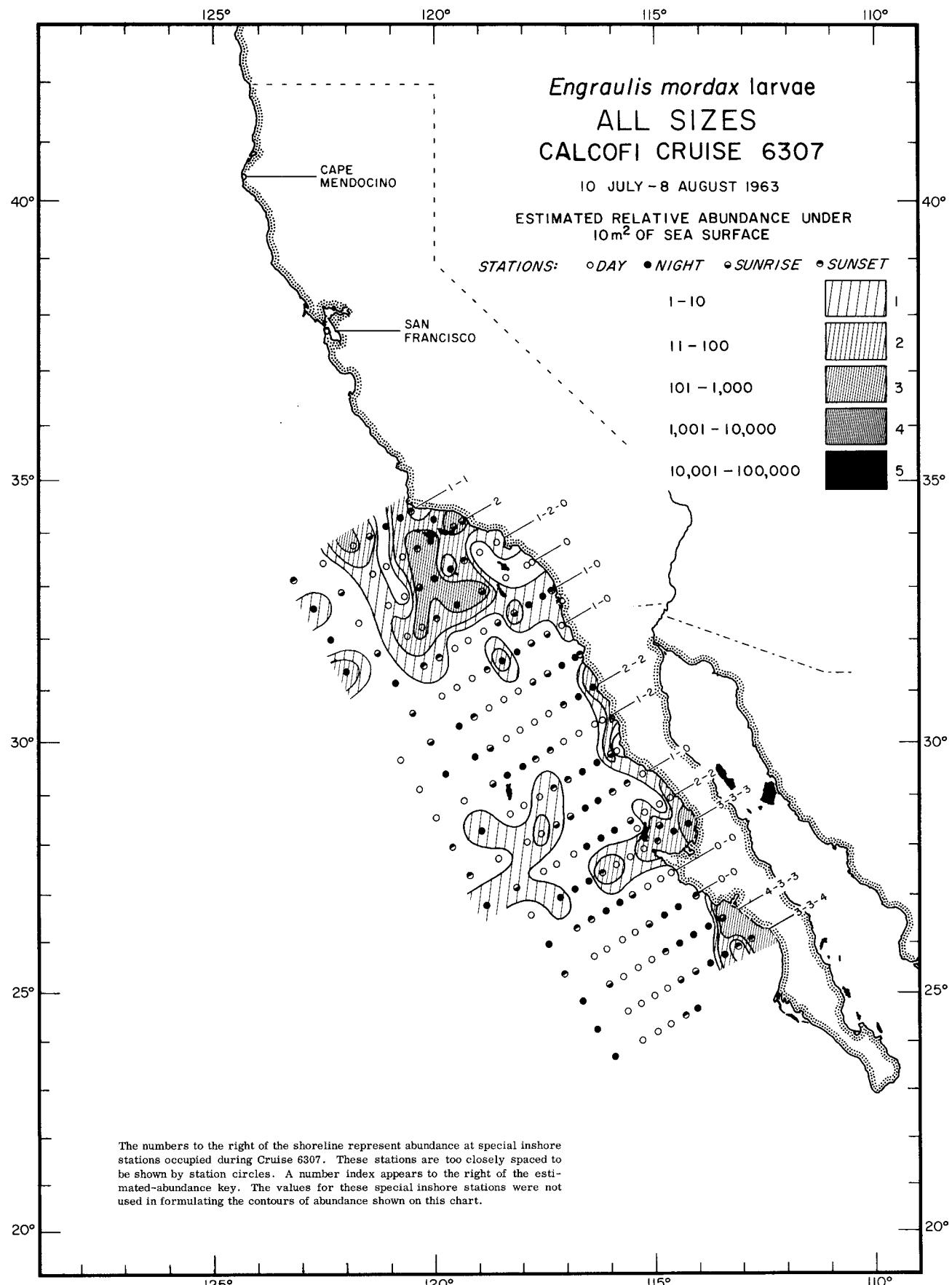
Engraulis mordax larvae
Size Group: 6.26-12.25mm
6304



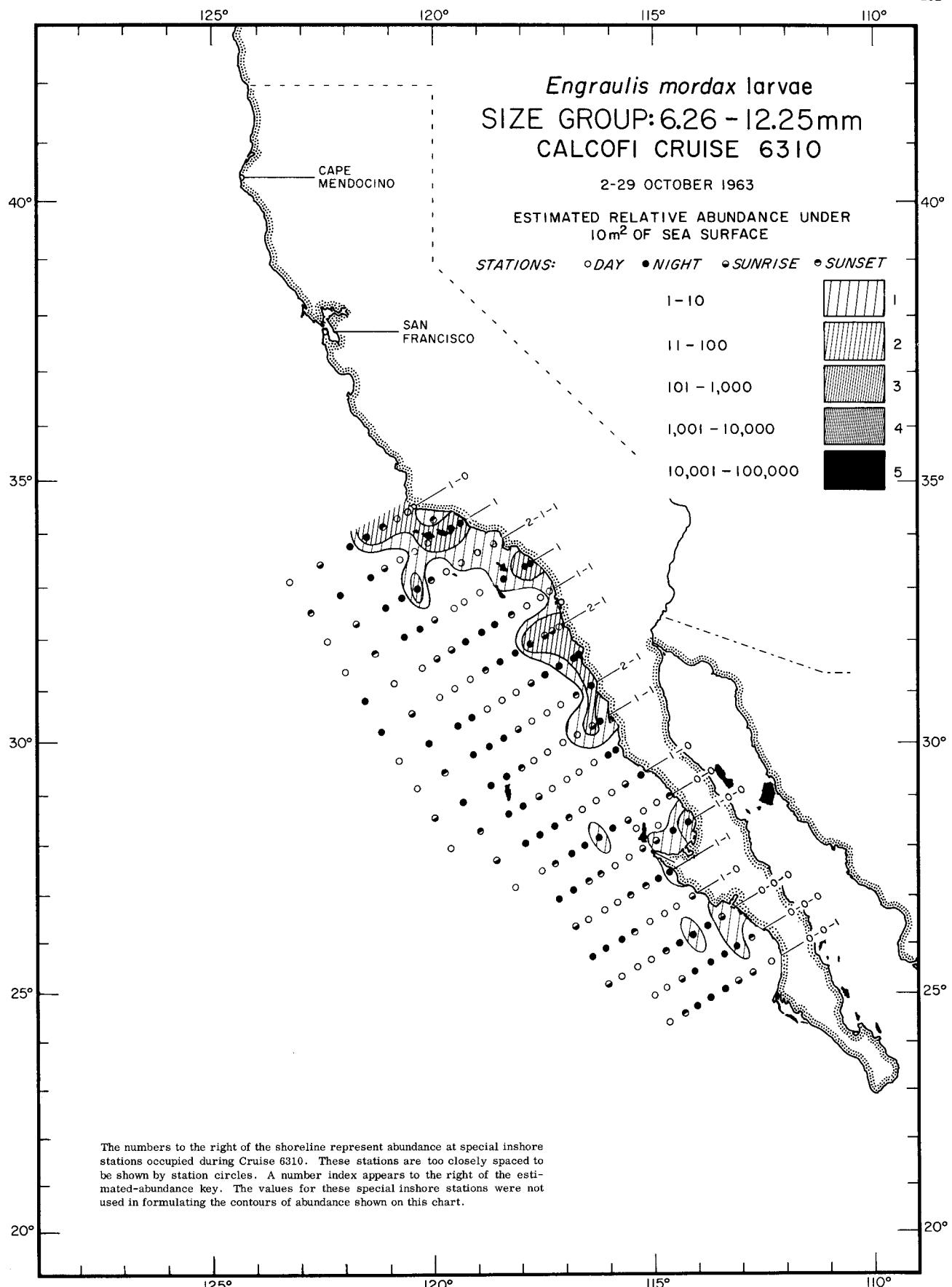
Engraulis mordax larvae
 All Sizes
 6304



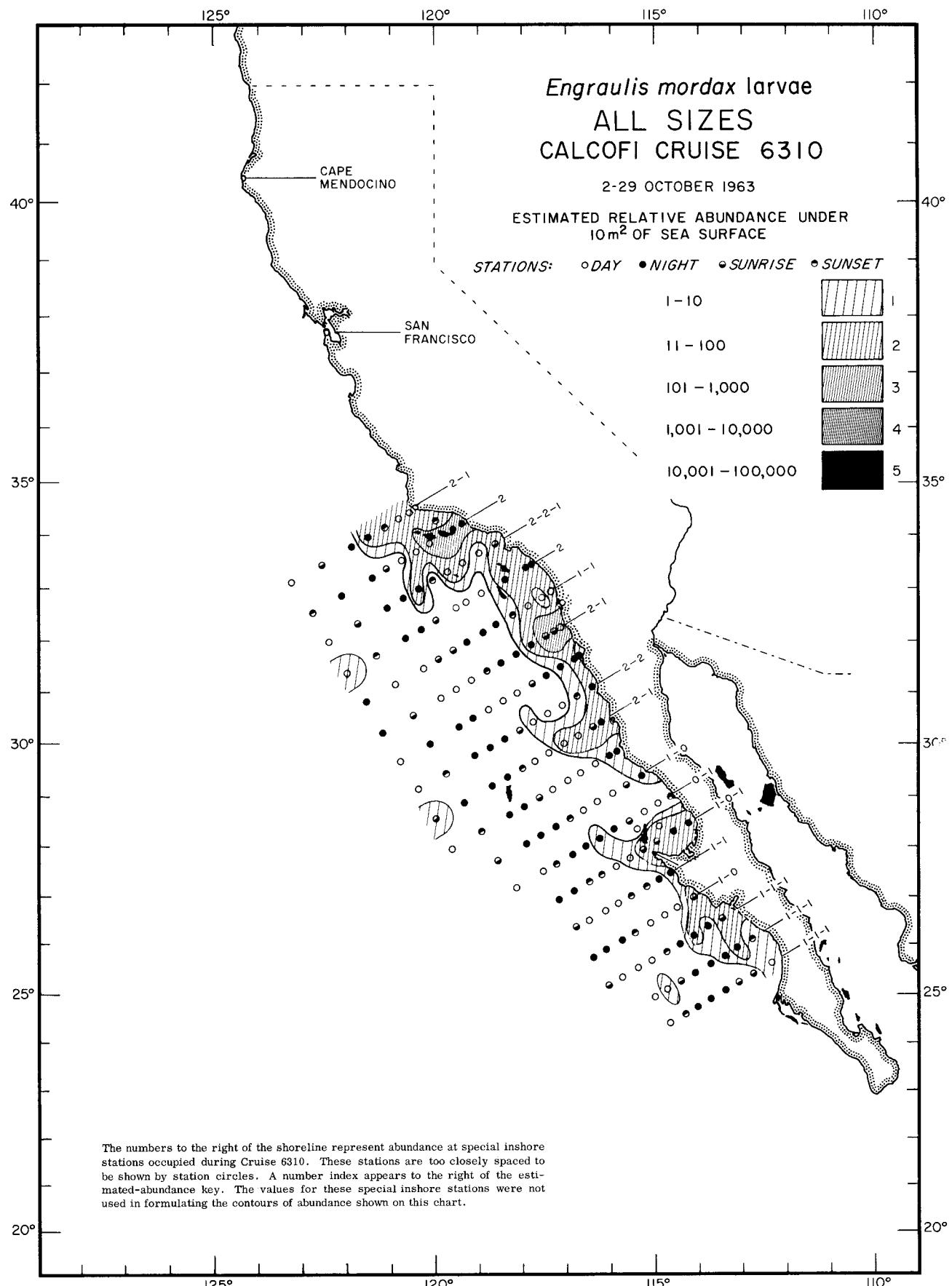
Engraulis mordax larvae
Size Group: 6.26-12.25mm
6307



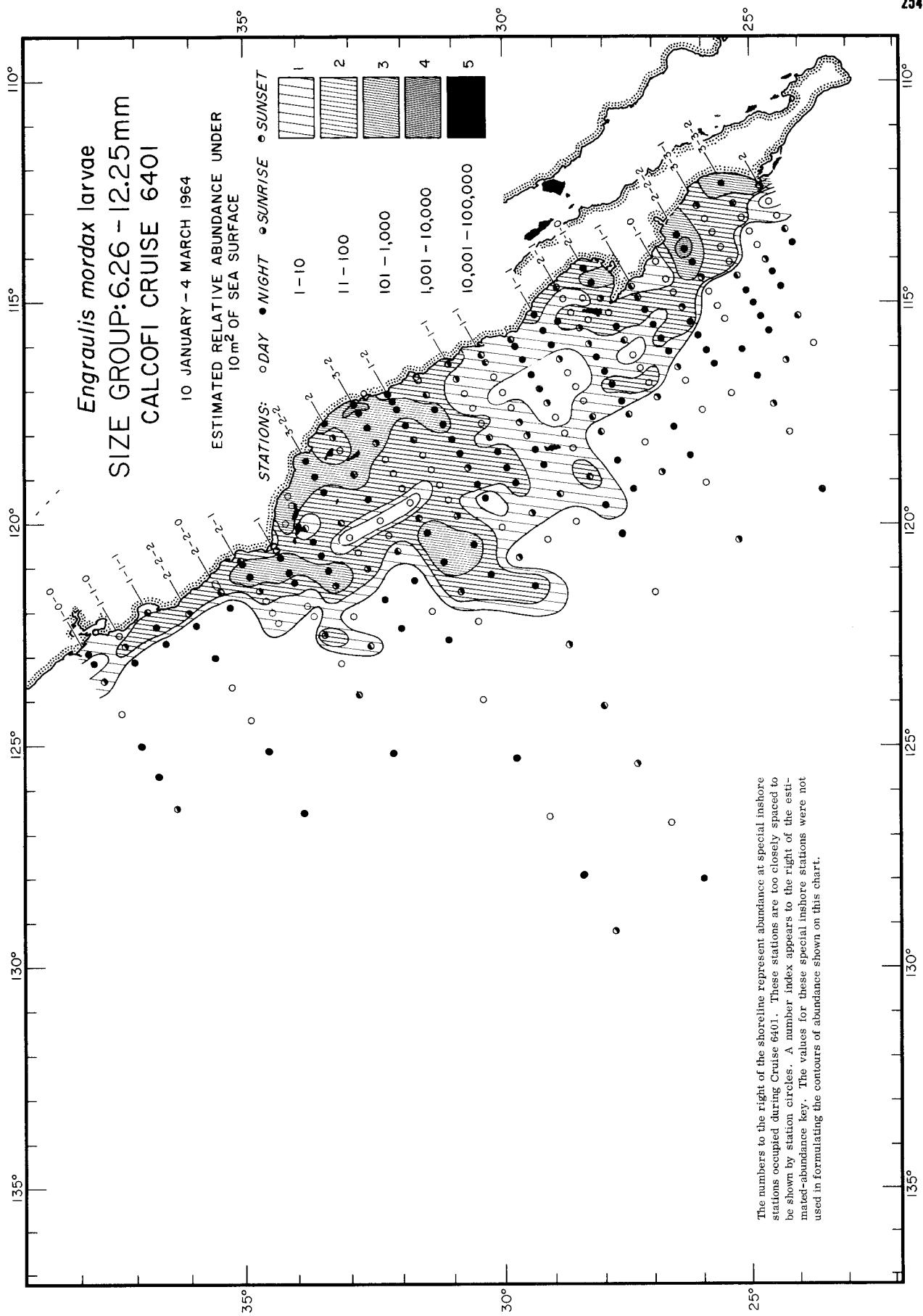
Engraulis mordax larvae
All Sizes
6307



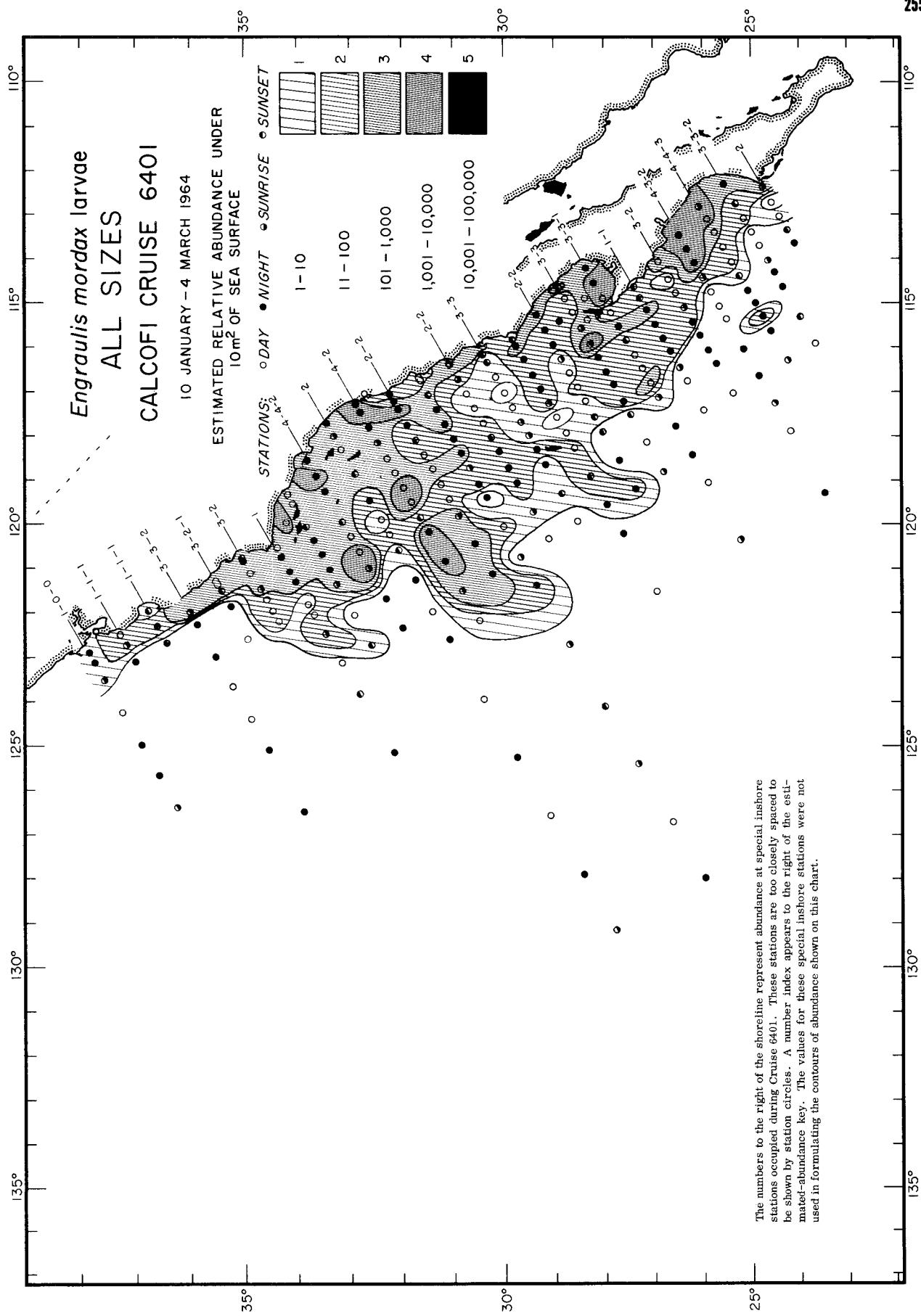
Engraulis mordax larvae
Size Group: 6.26-12.25mm
6310



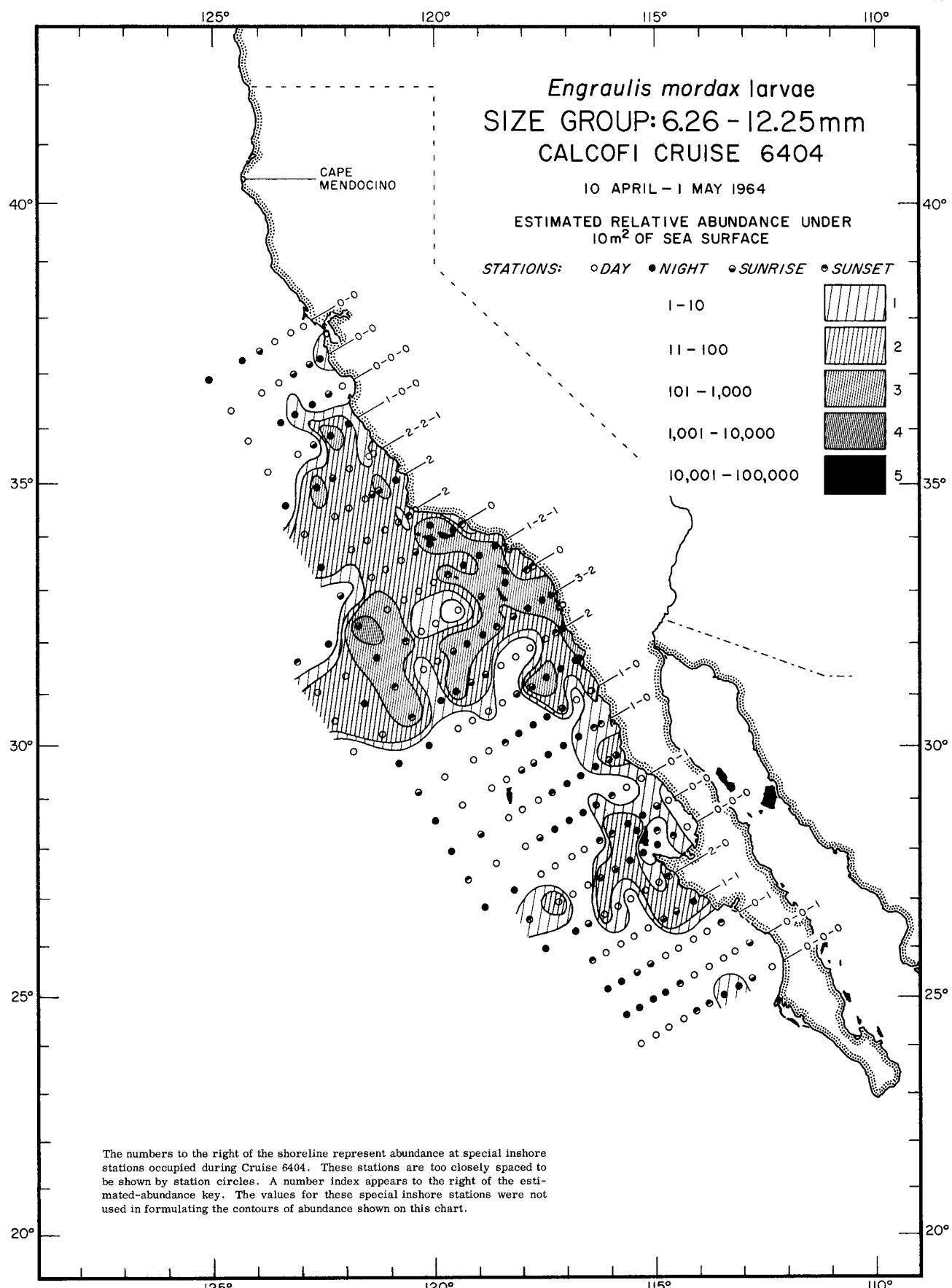
Engraulis mordax larvae
All Sizes
6310



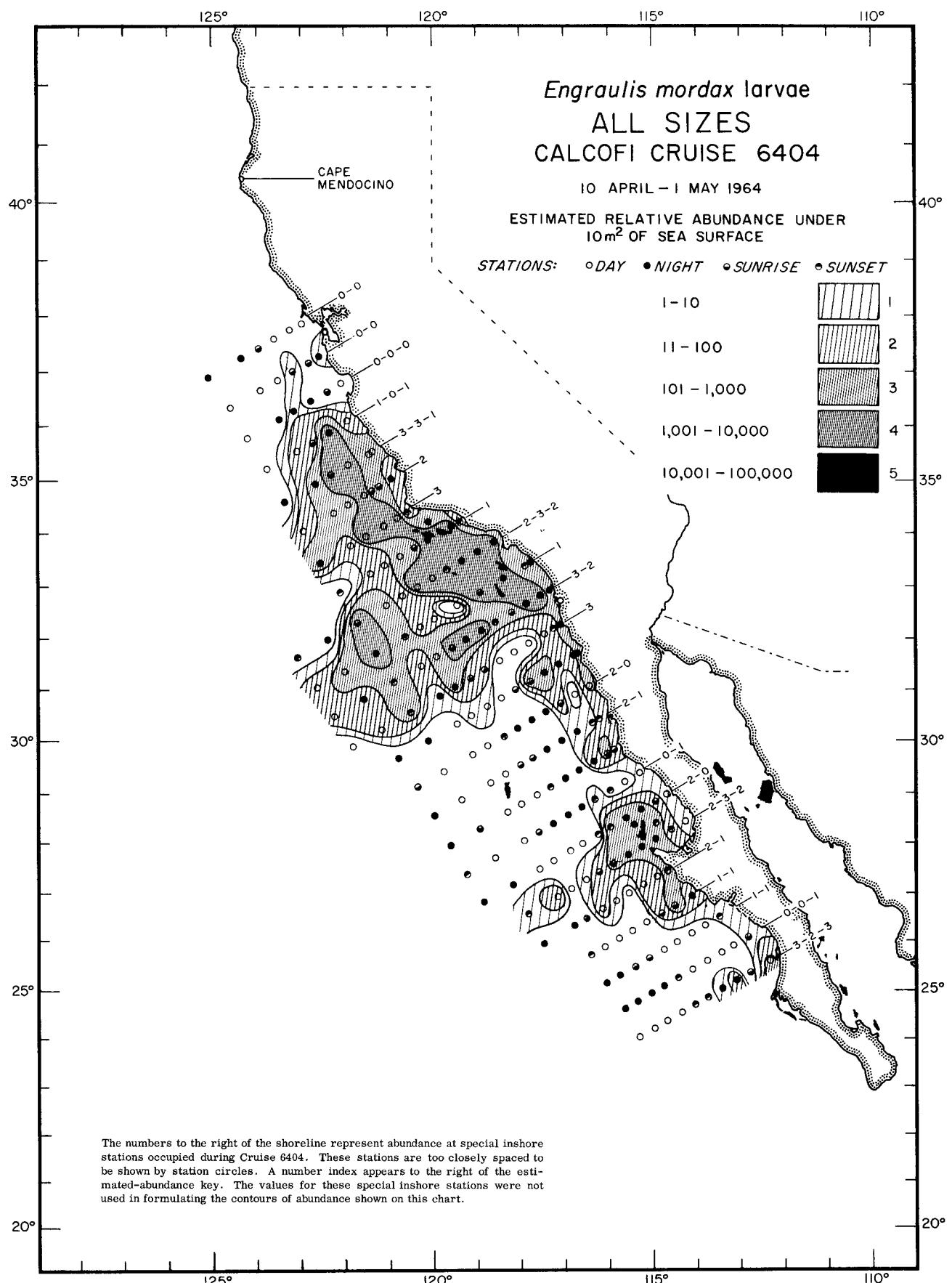
Engraulis mordax larvae
Size Group: 6.26 - 12.25mm
6401



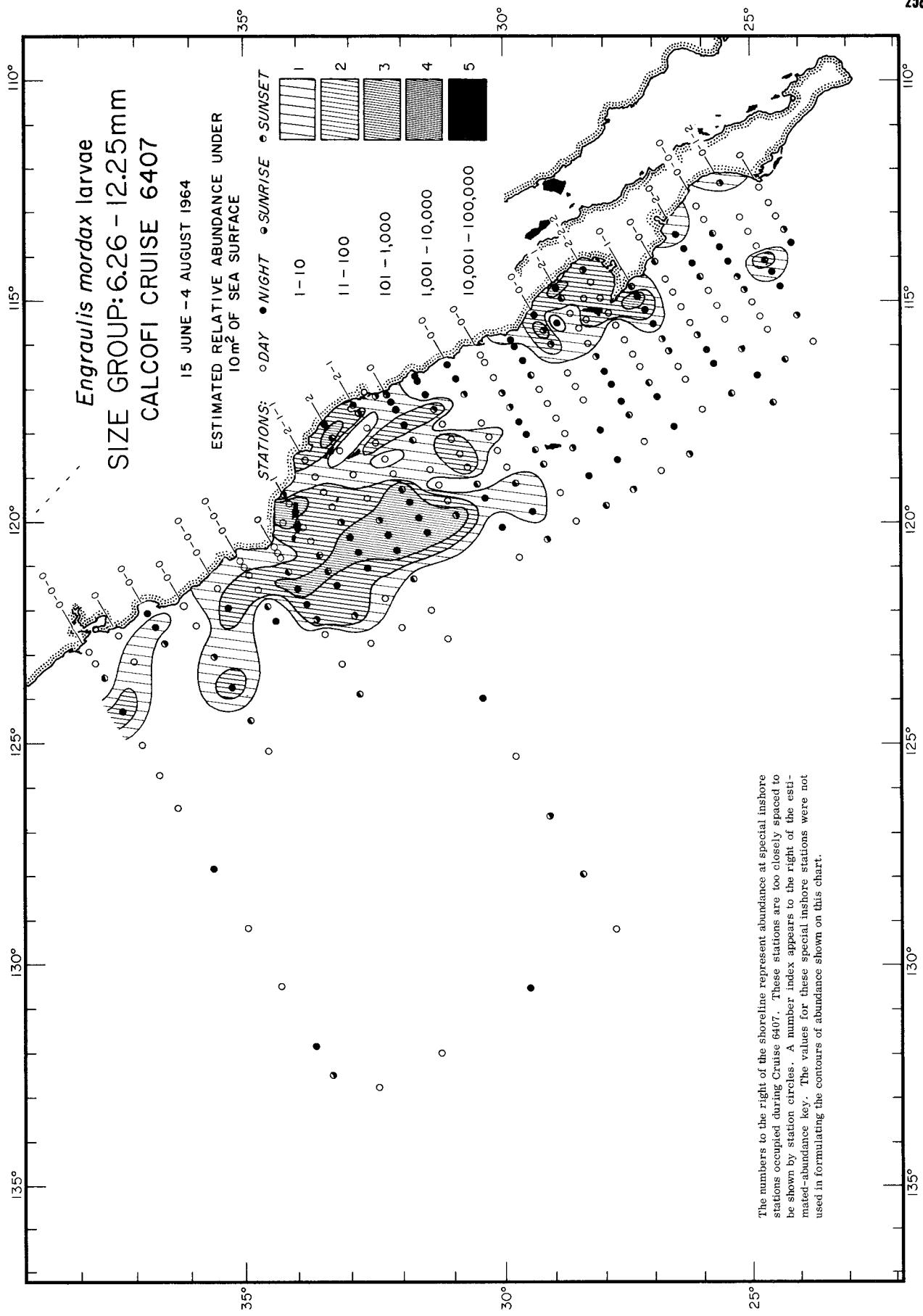
Engraulis mordax larvae
All Sizes
6401



Engraulis mordax larvae
Size Group: 6.26-12.25mm
6404

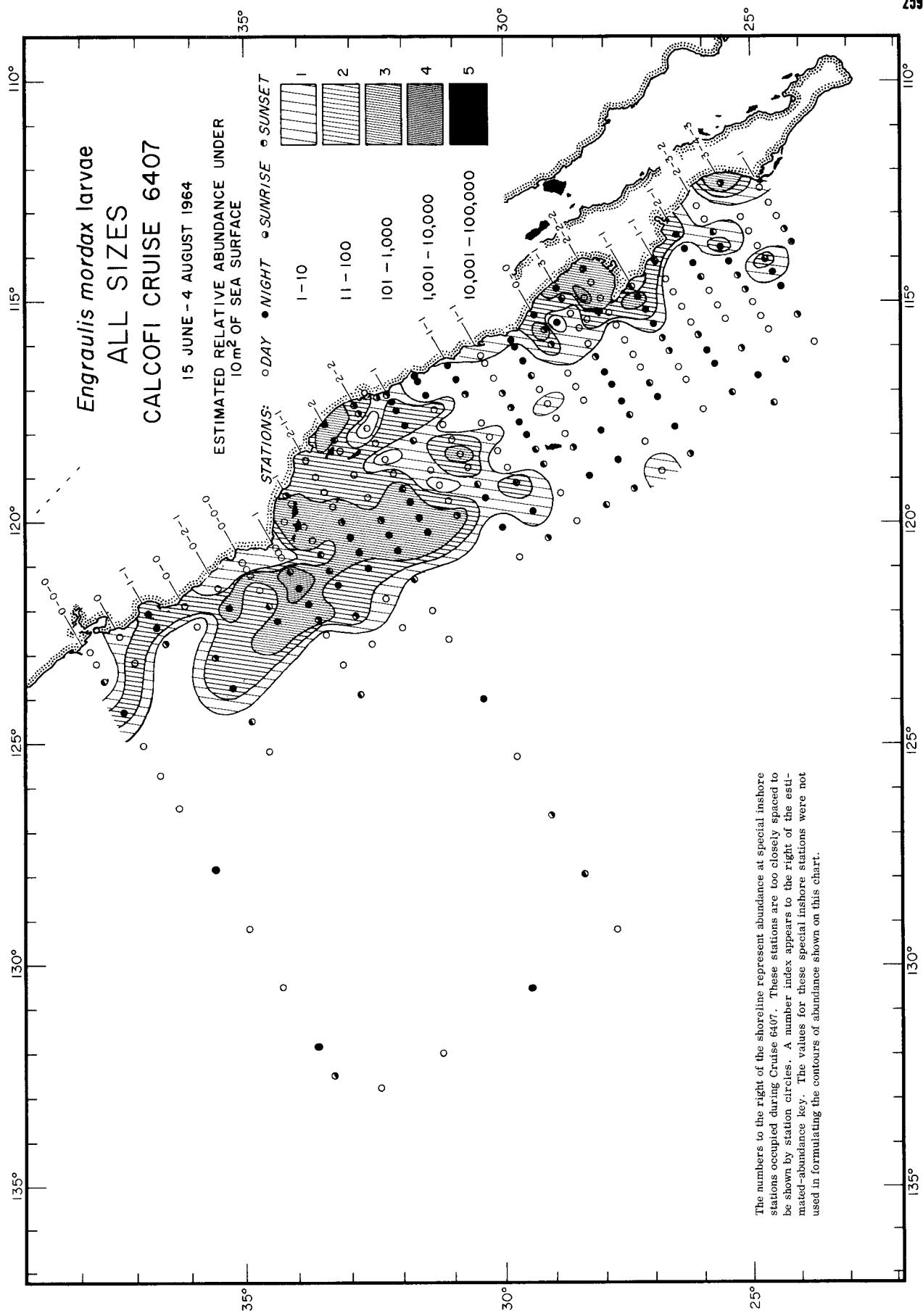


Engraulis mordax larvae
All Sizes
6404

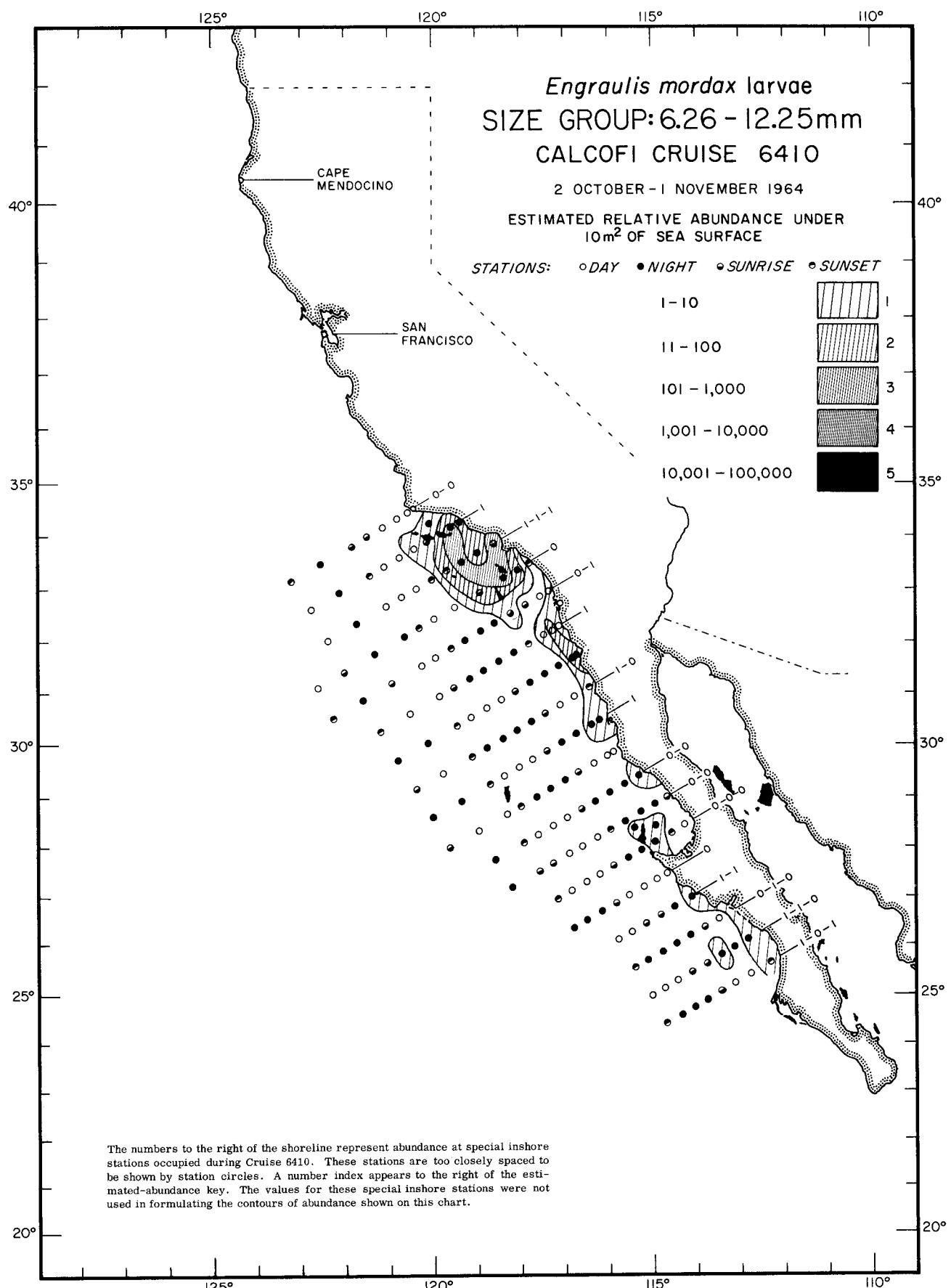


The numbers to the right of the shoreline represent abundance at special inshore stations occupied during Cruise 6407. These stations are too closely spaced to be shown by station circles. A number index appears to the right of the estimated-abundance key. The values for these special inshore stations were not used in formulating the contours of abundance shown on this chart.

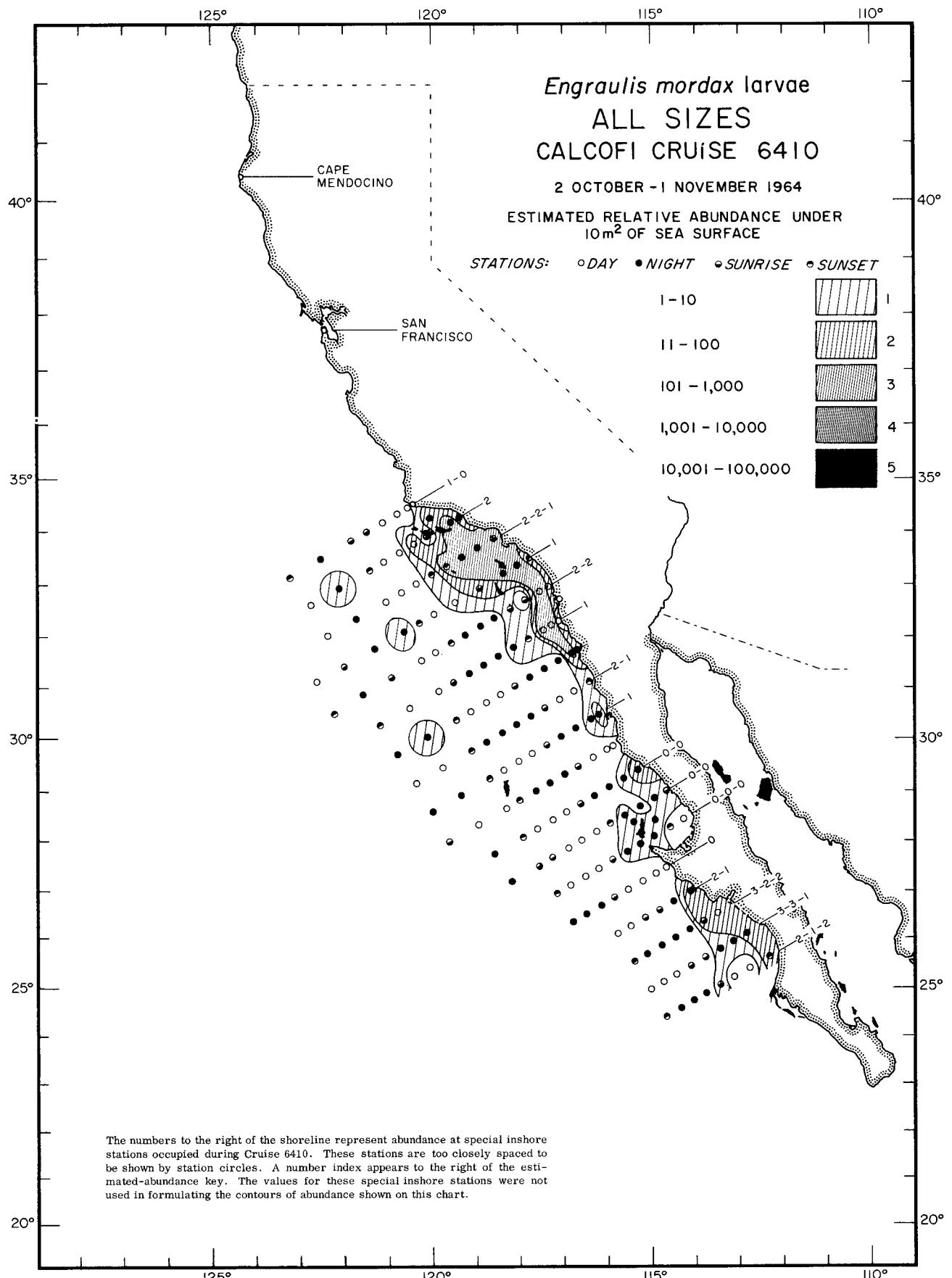
Engraulis mordax larvae
Size Group: 6.26 - 12.25mm
6407



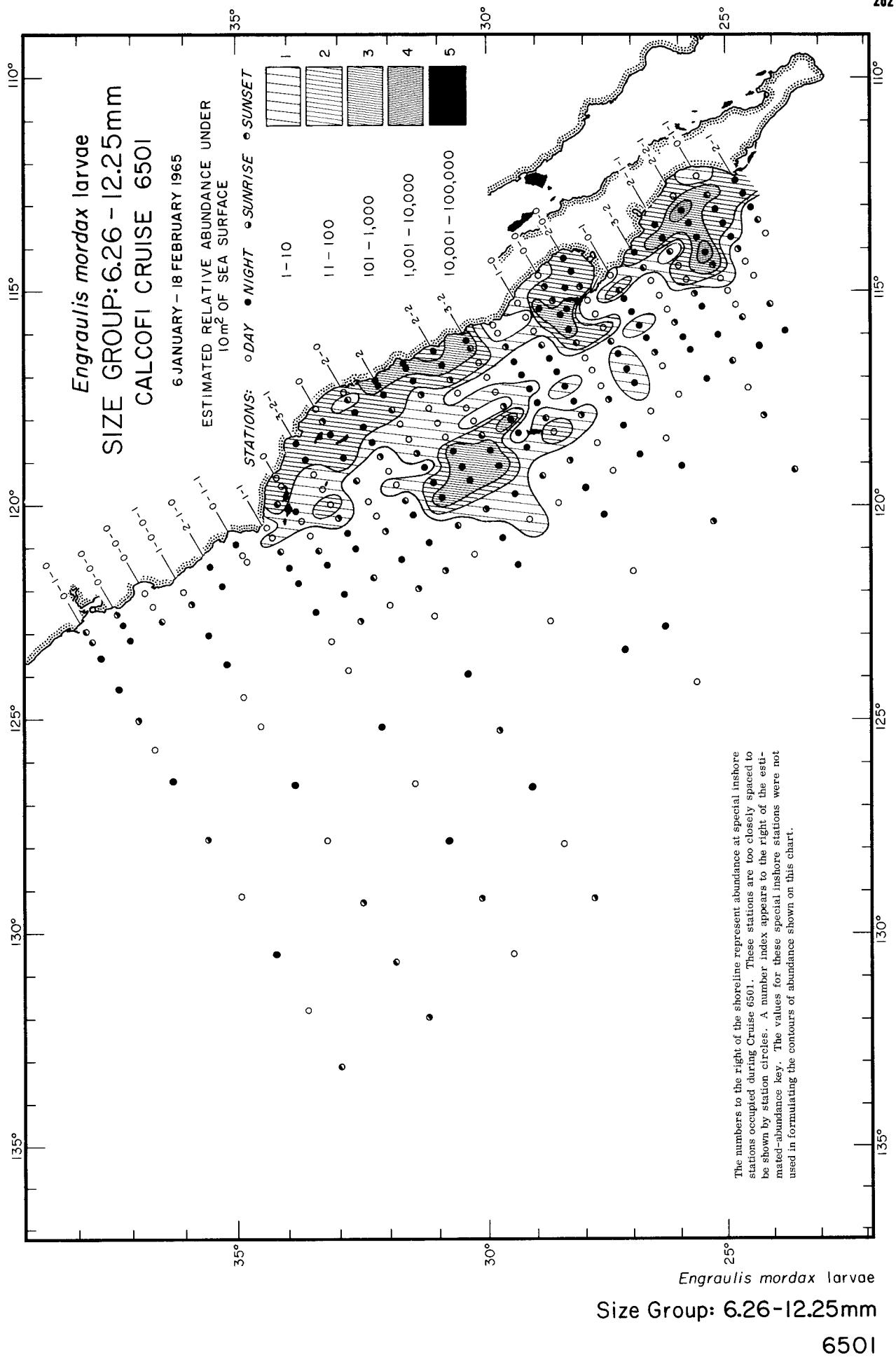
Engraulis mordax larvae
All Sizes
6407

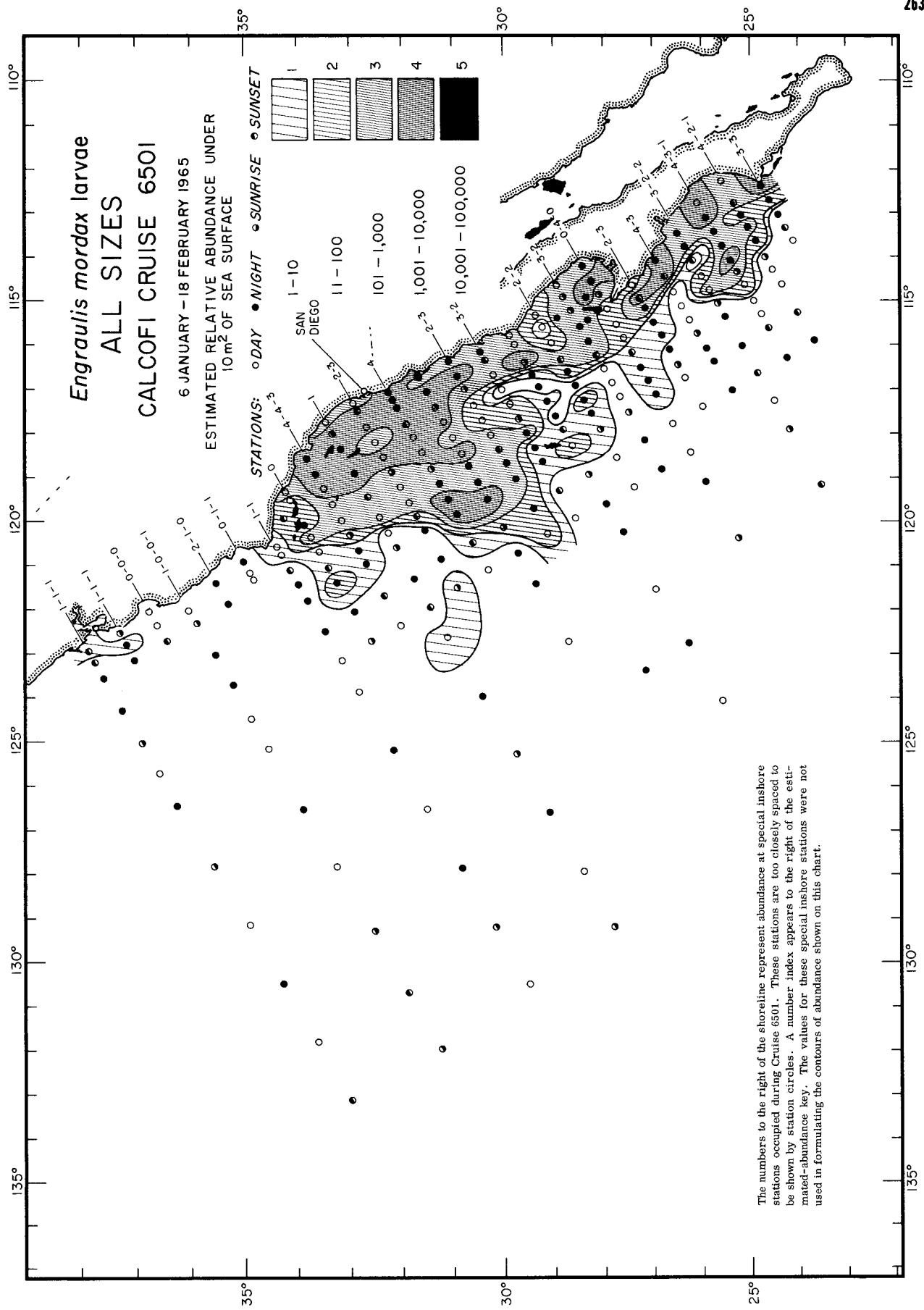


Engraulis mordax larvae
Size Group: 6.26-12.25mm
6410



Engraulis mordax larvae
All Sizes
6410

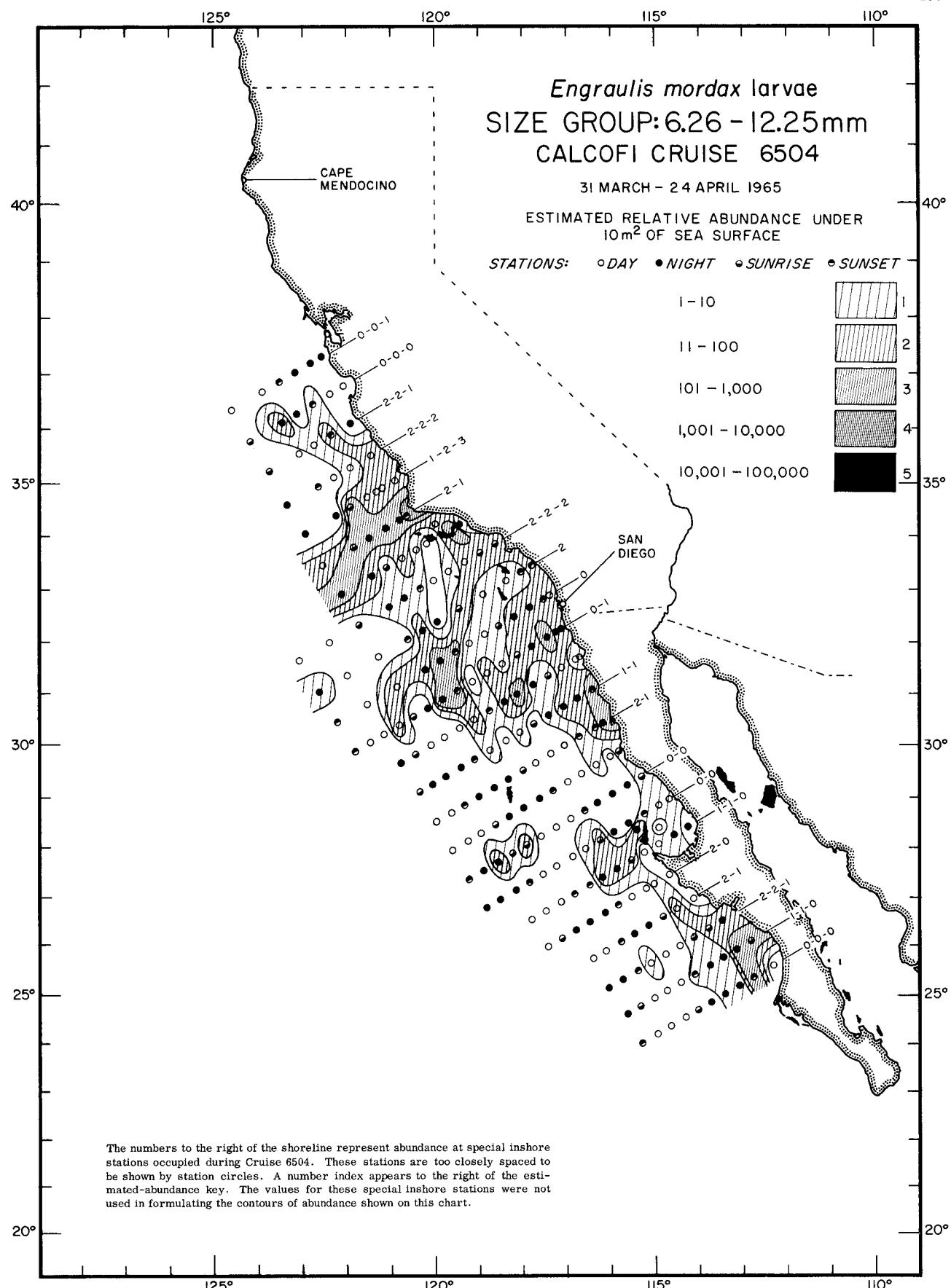




The numbers to the right of the shoreline represent abundance at special inshore stations occupied during Cruise 6501. These stations are too closely spaced to be shown by station circles. A number index appears to the right of the estimated-abundance key. The values for these special inshore stations were not used in formulating the contours of abundance shown on this chart.

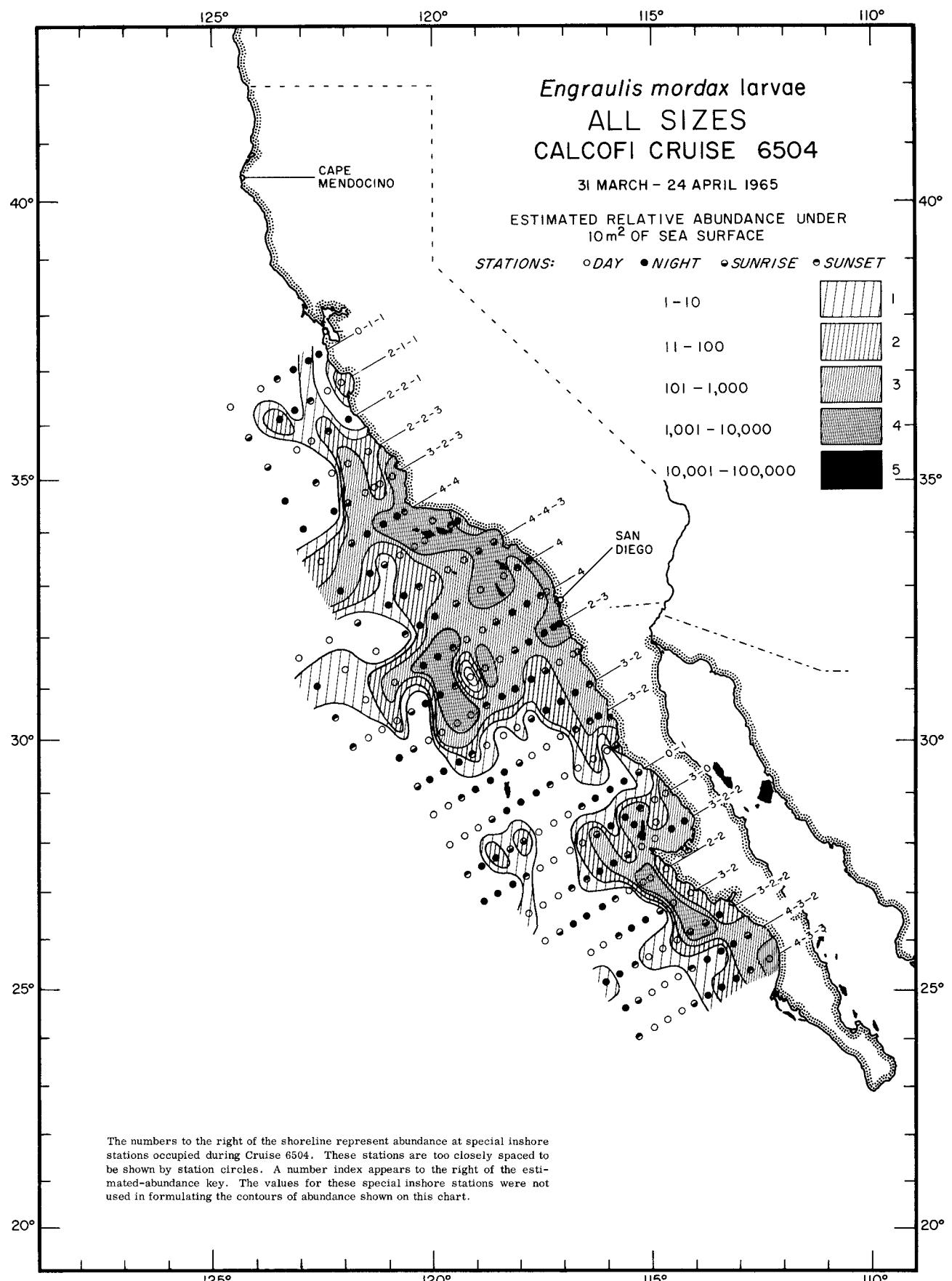
Engraulis mordax larvae

All Sizes
6501

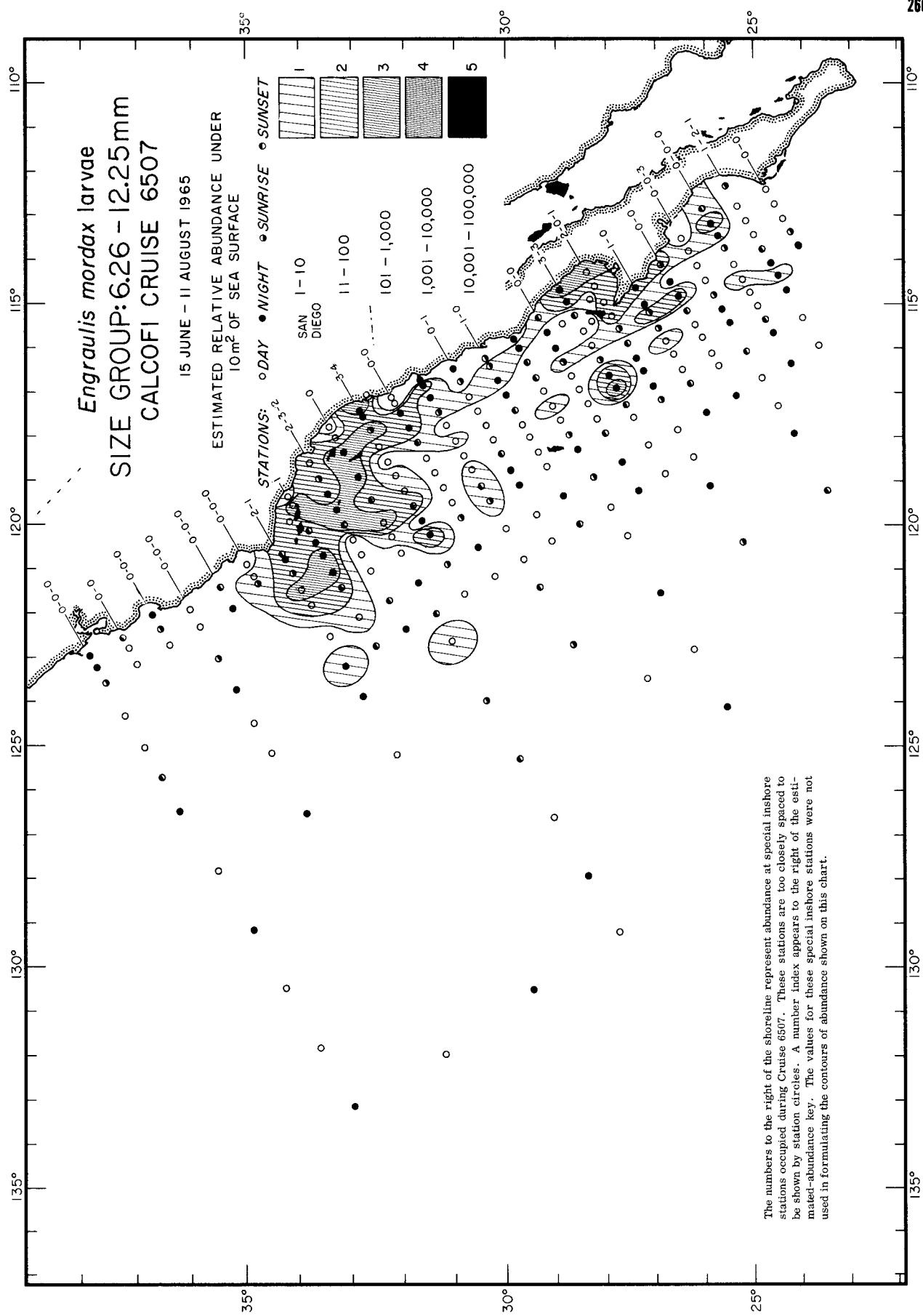
*Engraulis mordax* larvae

Size Group: 6.26-12.25mm

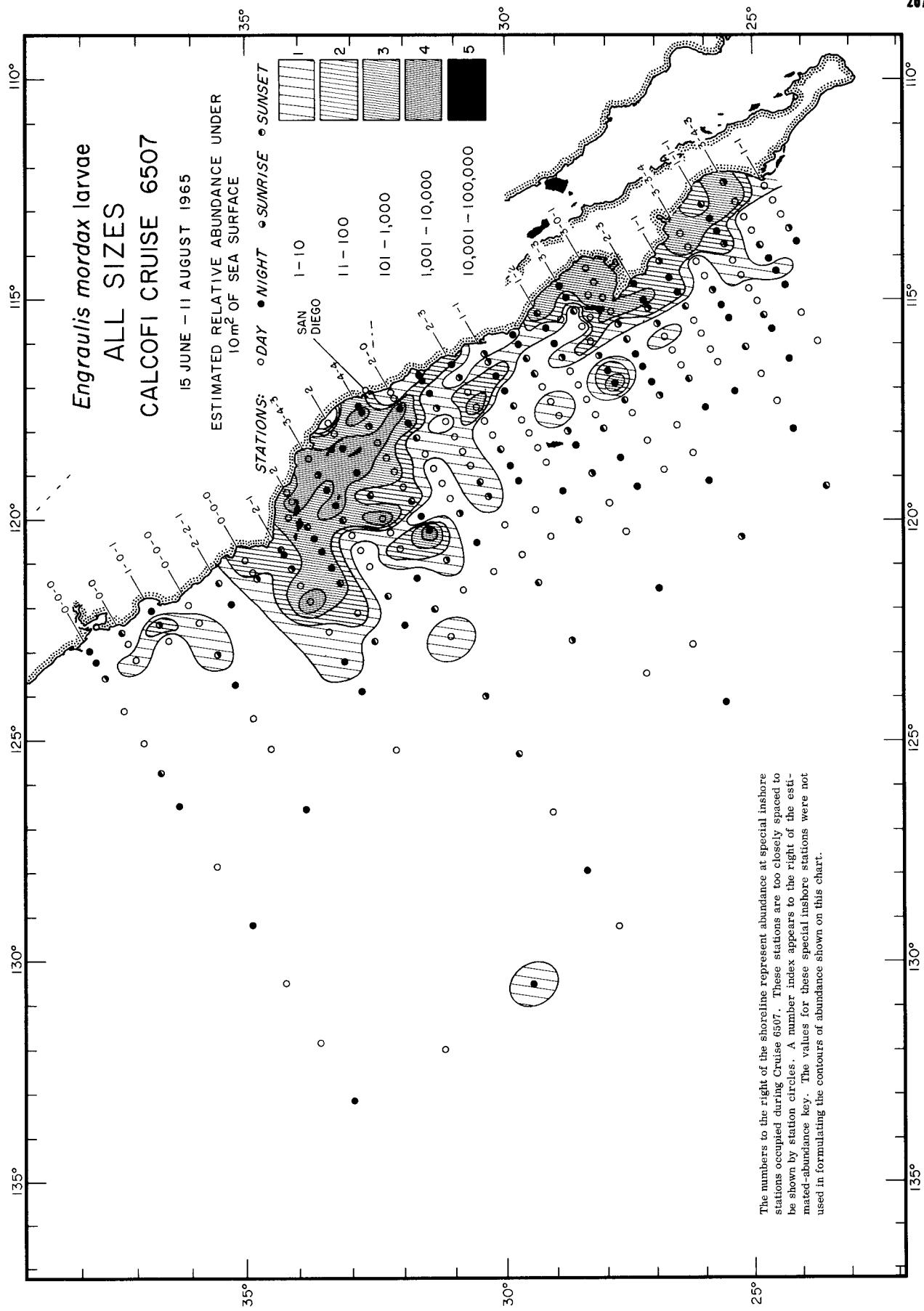
6504



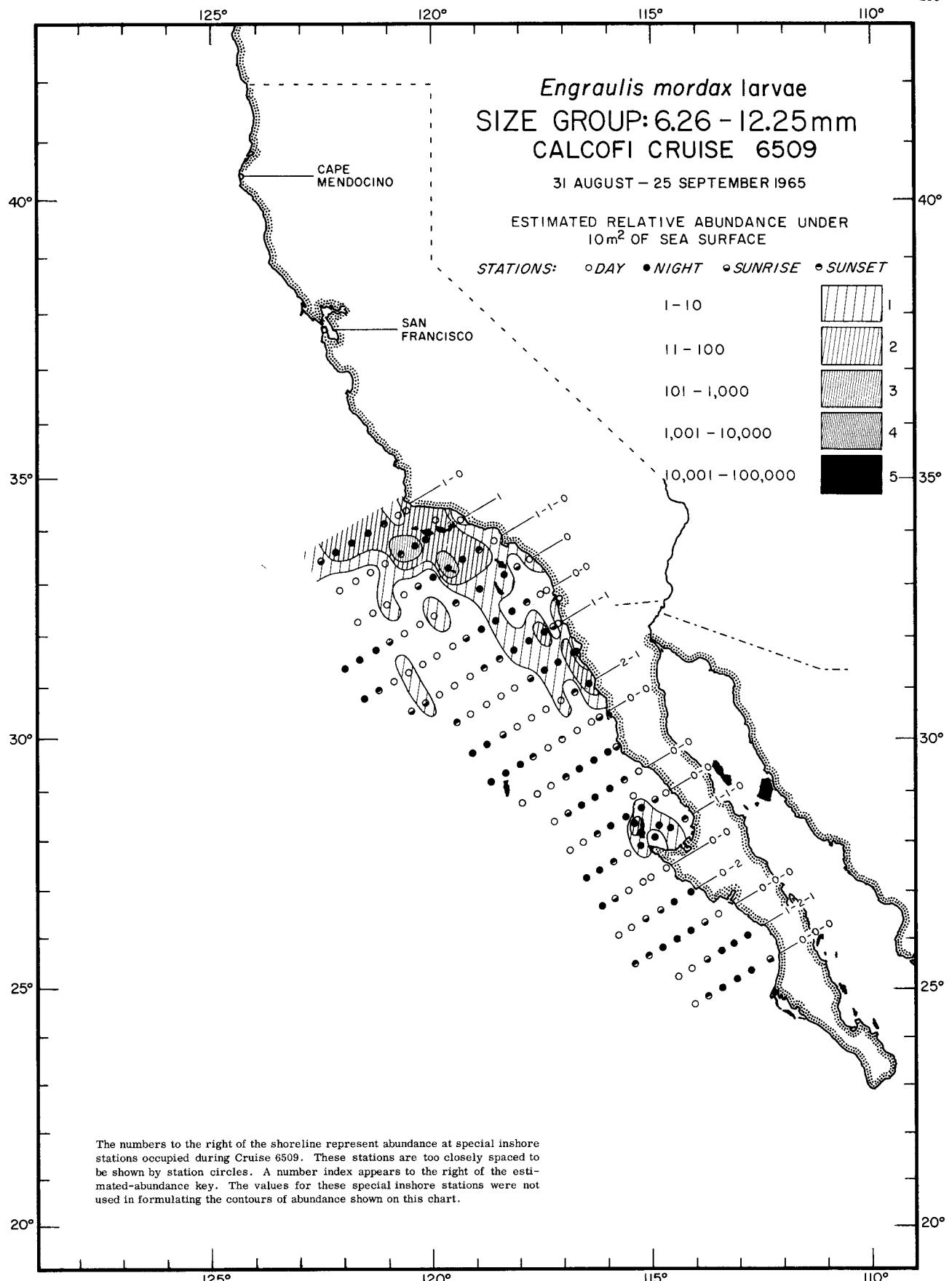
Engraulis mordax larvae
All Sizes
6504



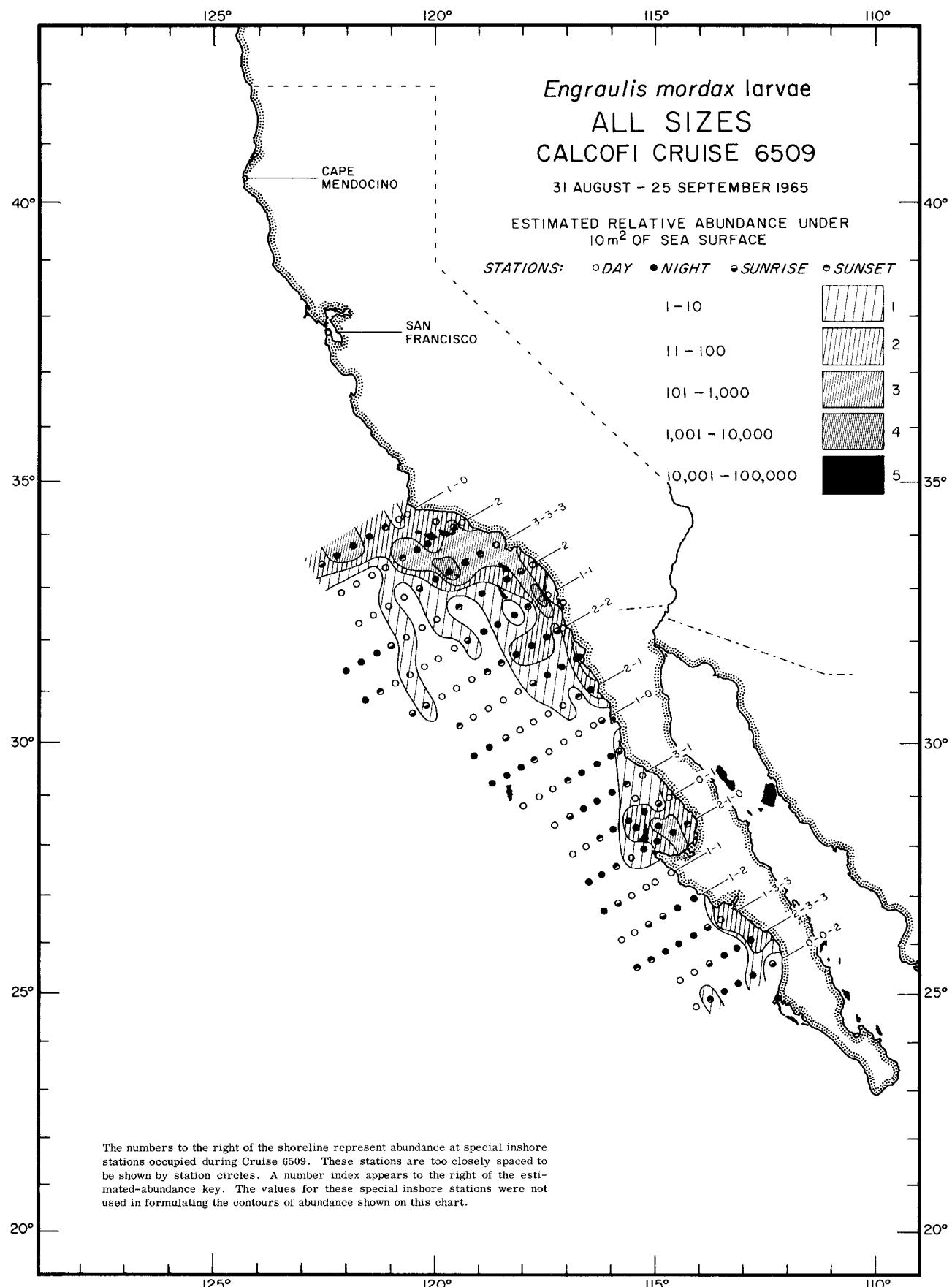
Engraulis mordax larvae
Size Group: 6.26-12.25mm
6507



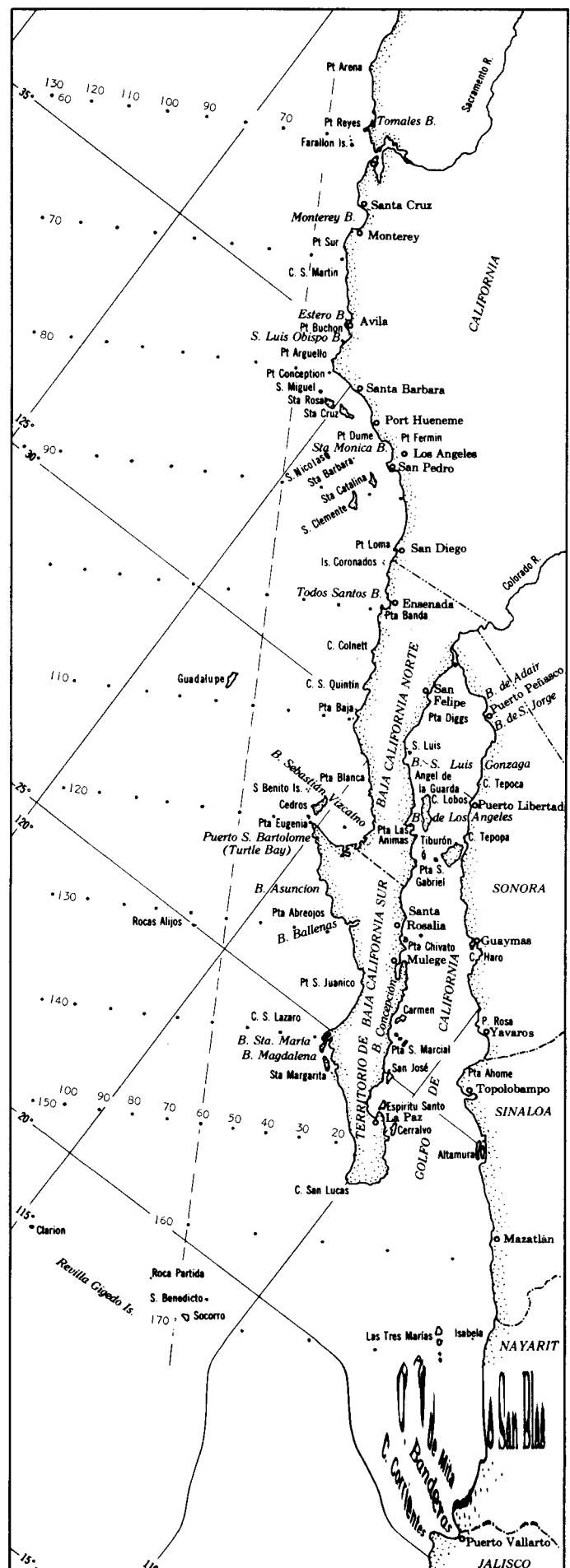
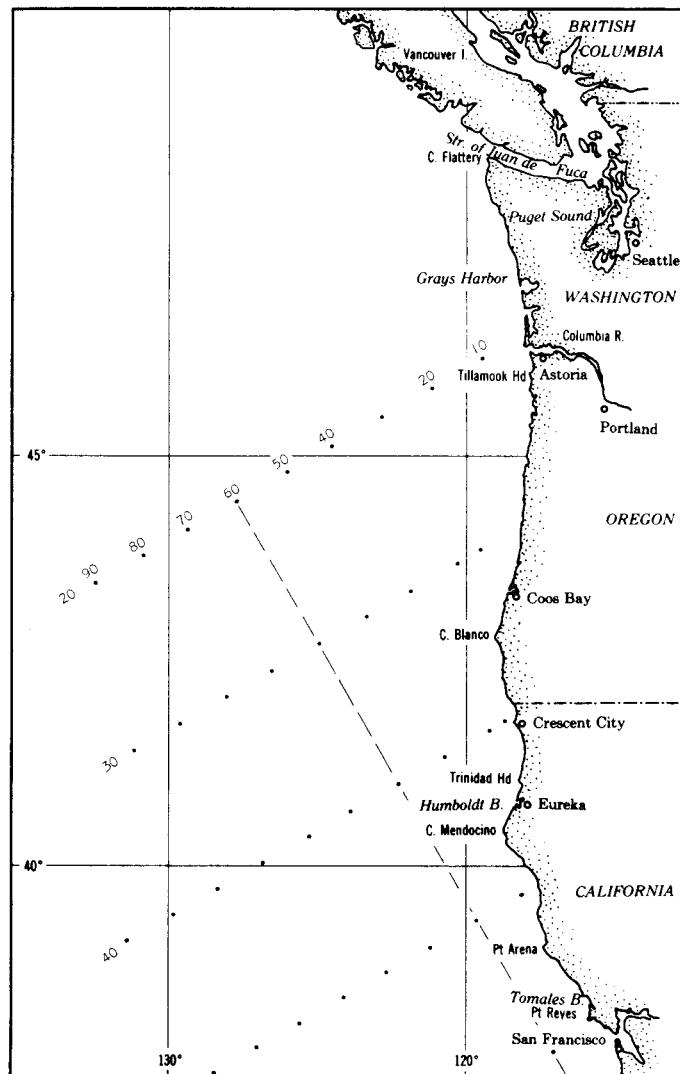
Engraulis mordax larvae
All Sizes
6507



Engraulis mordax larvae
Size Group: 6.26-12.25mm
6509



Engraulis mordax larvae
All Sizes
6509



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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