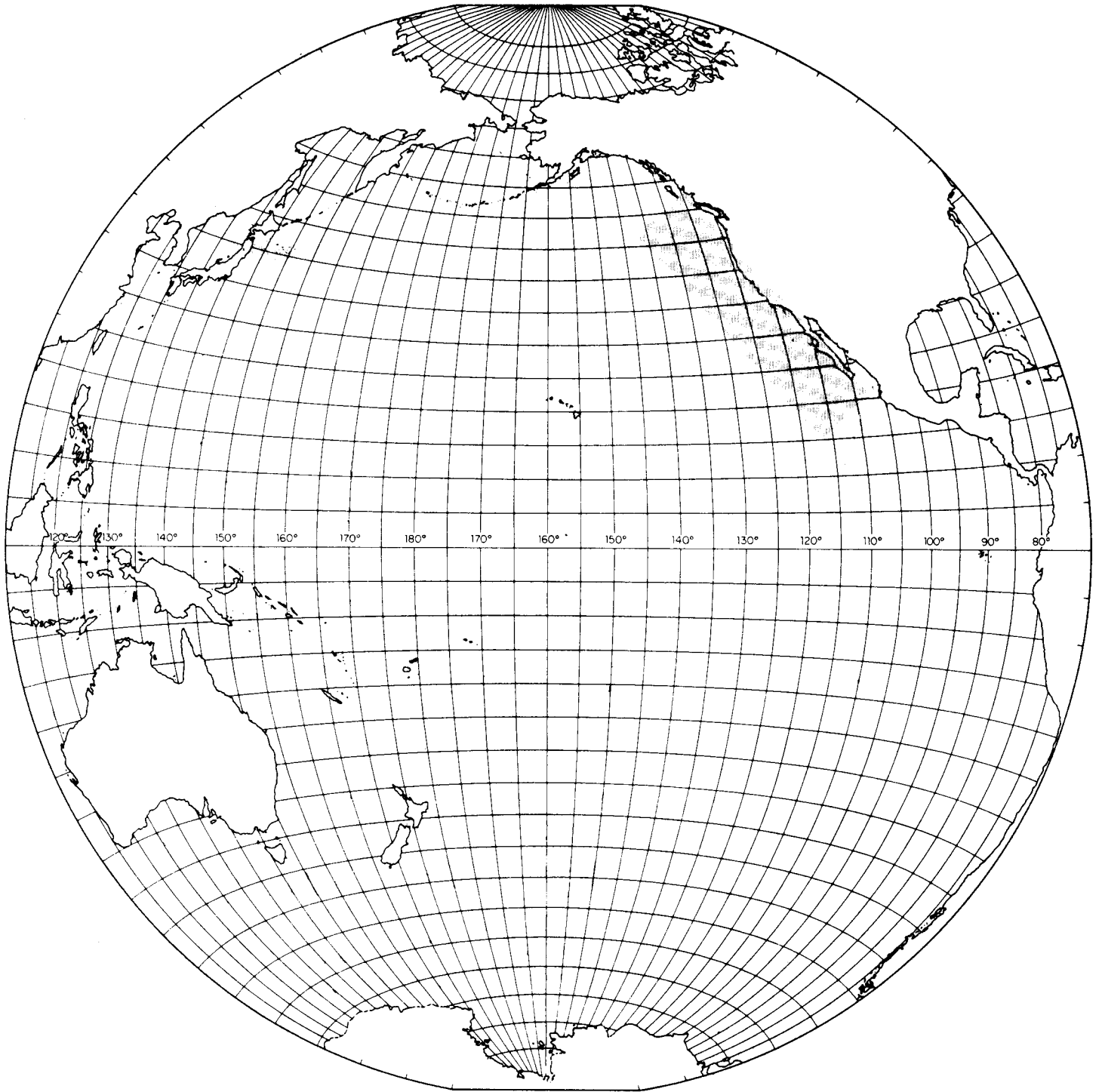
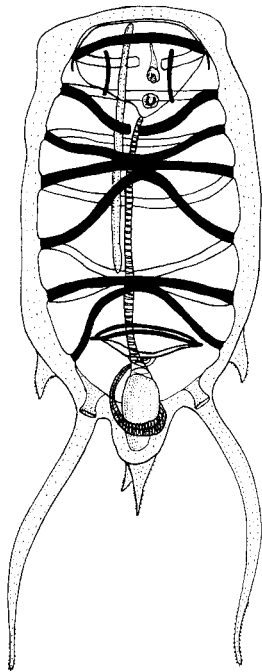


STATE OF CALIFORNIA
MARINE RESEARCH COMMITTEE

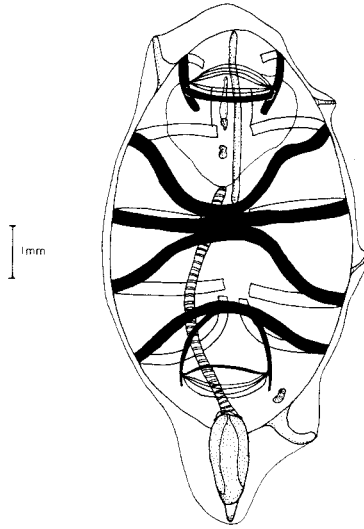


CALIFORNIA COOPERATIVE OCEANIC FISHERIES INVESTIGATIONS

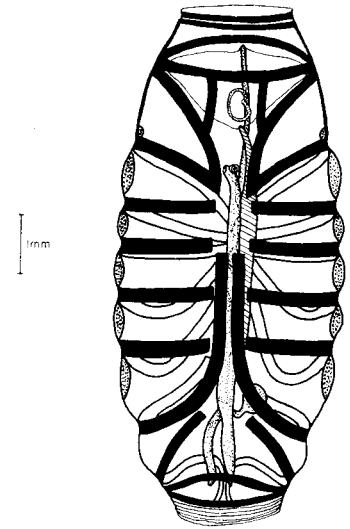
ATLAS No. 8



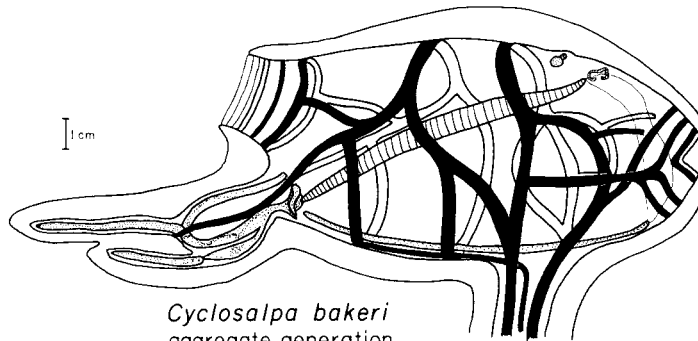
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solitary generation



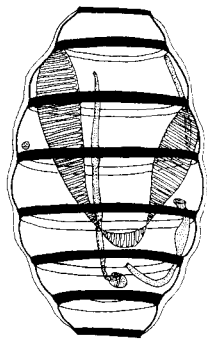
Thalia democratica
aggregate generation



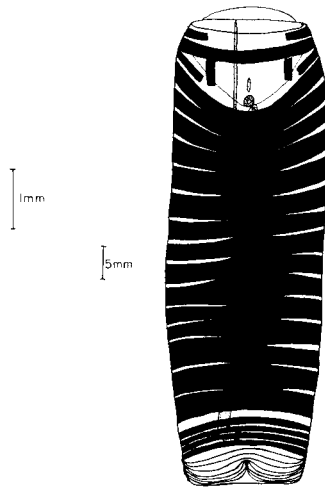
Cyclosalpa bakeri
solitary generation



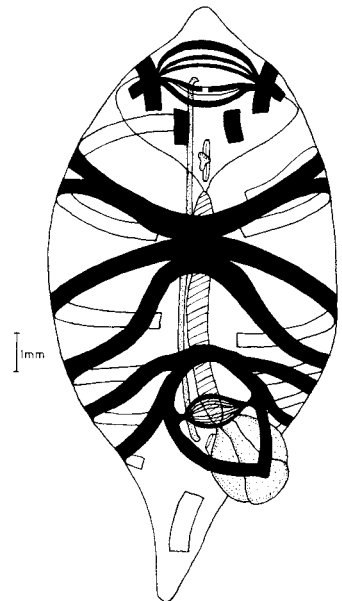
Cyclosalpa bakeri
aggregate generation



Doliolum denticulatum
gonozoid



Ritteriella picteti
solitary generation



Ritteriella picteti
aggregate generation

CALIFORNIA
COOPERATIVE
OCEANIC
FISHERIES
INVESTIGATIONS

Atlas No. 8

STATE OF CALIFORNIA
MARINE RESEARCH COMMITTEE

Cooperating Agencies:

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

June, 1967

THE CALCOFI ATLAS SERIES

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

California Academy of Sciences
California Department of Fish and Game
Stanford University, Hopkins Marine Station
U. S. Fish and Wildlife Service, Bureau of Commercial Fisheries
University of California, Scripps Institution of Oceanography

CalCOFI atlases² are issued as individual units as they become available. They provide processed physical, chemical and biological measurements of the California Current region. Each number may contain one or more contributions. A general description of the CalCOFI Program with its objectives appears in the preface of Atlas No. 2.

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

CalCOFI Atlas Editorial Staff:

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

Atlases in this series, through June 1967, 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
Alvaríño, A. Distributional atlas of Chaetognatha in the California Current region.
- CalCOFI Atlas No. 4
Wyllie, J. G. Geostrophic flow of the California Current at the surface and at 200 meters.
- CalCOFI Atlas No. 5
Brinton, E. Distributional atlas of Euphausiacea (Crustacea) in the California Current region, Part I.
- CalCOFI Atlas No. 6
McGowan, J. A. Distributional atlas of pelagic molluscs in the California Current region.
- CalCOFI Atlas No. 7
Fleminger, A. Distributional atlas of calanoid copepods in the California Current region, Part II.
- CalCOFI Atlas No. 8
Bernier, L. Distributional atlas of Thaliacea in the California Current region.

¹ Usually abbreviated CalCOFI, sometimes CALCOFI or CCOFI.

² For citation this issue in the series should be referred to as CalCOFI Atlas No. 8.

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DISTRIBUTIONAL ATLAS OF THALIACEA
IN THE CALIFORNIA CURRENT REGION¹

Leo D. Berner²

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Introduction

The samples studied in connection with this report were collected on regular CalCOFI cruises during the period 1949-58. Data were obtained from the following 26 cruises: 1949 (4903-4910), 1950 (5002, 5003, 5005, 5006, 5009), 1951 (5103, 5106, 5109-5111), 1952 (5203, 5206, 5209, 5210), 1954 (5403, 5404), 1958 (5804, 5806). Hydrographic data are not presented in this volume because they appear elsewhere in this series or will become available in the near future.

Only representatives of the orders Salpida and Doliolida are shown. Representatives of the Larvacea were not adequately sampled by the nets used and often were not adequately preserved for identification.

Members of the order Pyrosomida were rare in the samples examined. Large populations of Pyrosoma appeared in the CalCOFI region during 1955 and persisted through 1956, when they again became rare. It appears that Pyrosoma atlanticum with its associated subspecies is the most common species in the region. Pyrosomida represents a group which shows a remarkable amount of intergradation. Several of the subspecies and perhaps some of the species are apparently questionable. The large collections made by CalCOFI in the years 1955 and 1956 offer a unique opportunity to study this problem.

¹ This research was carried out under the Scripps Institution's Marine Life Research Program.

² Present address: Texas A. and M. University, Department of Oceanography, College of Geosciences, College Station, Texas 77843.

Methods of Collecting

The plankton nets used in the CalCOFI Program have been adequately described in a number of publications (Ahlstrom 1948; King and Demond, 1953; Fleminger, 1964). Fleminger also describes, in general, the method used in making "standard tows" between the surface and 140 meters, the practice since Cruise 5010. Before Cruise 5010, nets were towed to a "standard depth" of 70 meters. With the change in depth of tow, the distribution of some species, Doliolletta gegenbauri in particular, showed rather abrupt changes. It is not known whether the differences represent actual changes in the distribution of the species or whether the deeper tows revealed a population not previously sampled. The latter is believed the more likely explanation.

Counts

Counts of specimens were usually made with the use of an aliquot. Exceedingly large individuals were removed before an aliquot was taken. While the size of the aliquots was varied, depending on the amount of material in the sample, the aliquots usually ranged between 20 and 50%.

Aliquots were taken by adjusting the sample volume to a multiple of a milliliter in a graduated beaker. The adjusted volume usually ranged from 200 to 500 milliliters. After stirring by rapid pouring between two beakers an aliquot of 100 ml was poured off. If a particular species was very abundant, subsamples of aliquots were employed. Such subsamples were taken by treating the aliquot as a complete sample and following the procedure outlined above. The original aliquot was examined for other species.

Counts were made under a low-power microscope, generally at a magnification of 9 λ , but higher magnifications were used when necessary.

After counting, the remaining sample was scanned for rarer species which might have been absent from the aliquot. This sometimes added a few Salpida to the list. Because of their small size, however, additional Doliolida were seldom detected by this method.

Counts were adjusted to the number of individuals in the sample by simple multiplication. That number was then adjusted to 1000 m³ of water filtered by the formula $N = 1000 n/V$, where N = number of specimens/1000 m³, n = number of specimens in the sample and V = the number of m³ of water filtered by the net.

Sampling Limitations

It should be pointed out that members of Salpida and Doliolida tend to show contagious distributions which may be masked on charts by large contour intervals.

In some cases, dense patches were not adequately sampled at sea so that reliable estimates of abundance could not be made. Sometimes notes were found on net-tow log sheets, referring to salps, such as "Not full to ring."

Remarks

Since these counts were made, the species Salpa fusiformis has been subdivided into four species by Foxton (1961). Specimens from the CalCOFI region probably include S. fusiformis and S. aspera although there are specimens which do not appear to agree with any of the four species discussed by Foxton. Assuming S. aspera is a valid species, it is apparently the more common of the two in the region.

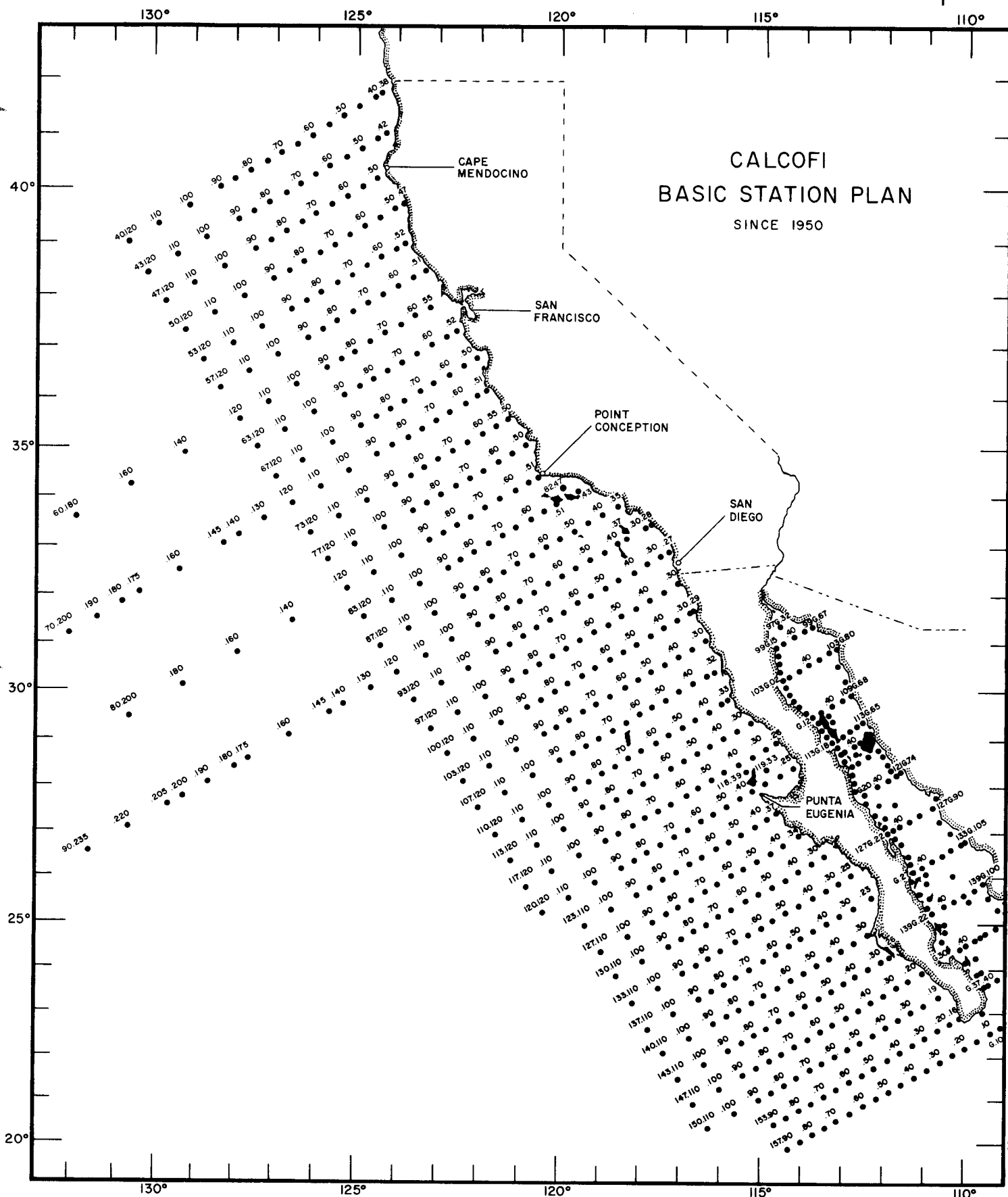
Identifications are based on the comparison of specimens with published descriptions. Four papers are particularly useful: Thompson (1945), Ritter (1906), Garstang (1933), and Yount (1954). Berner (1955) and Tokioka and Berner (1958a and b) provide descriptions of specimens not found elsewhere in the literature.

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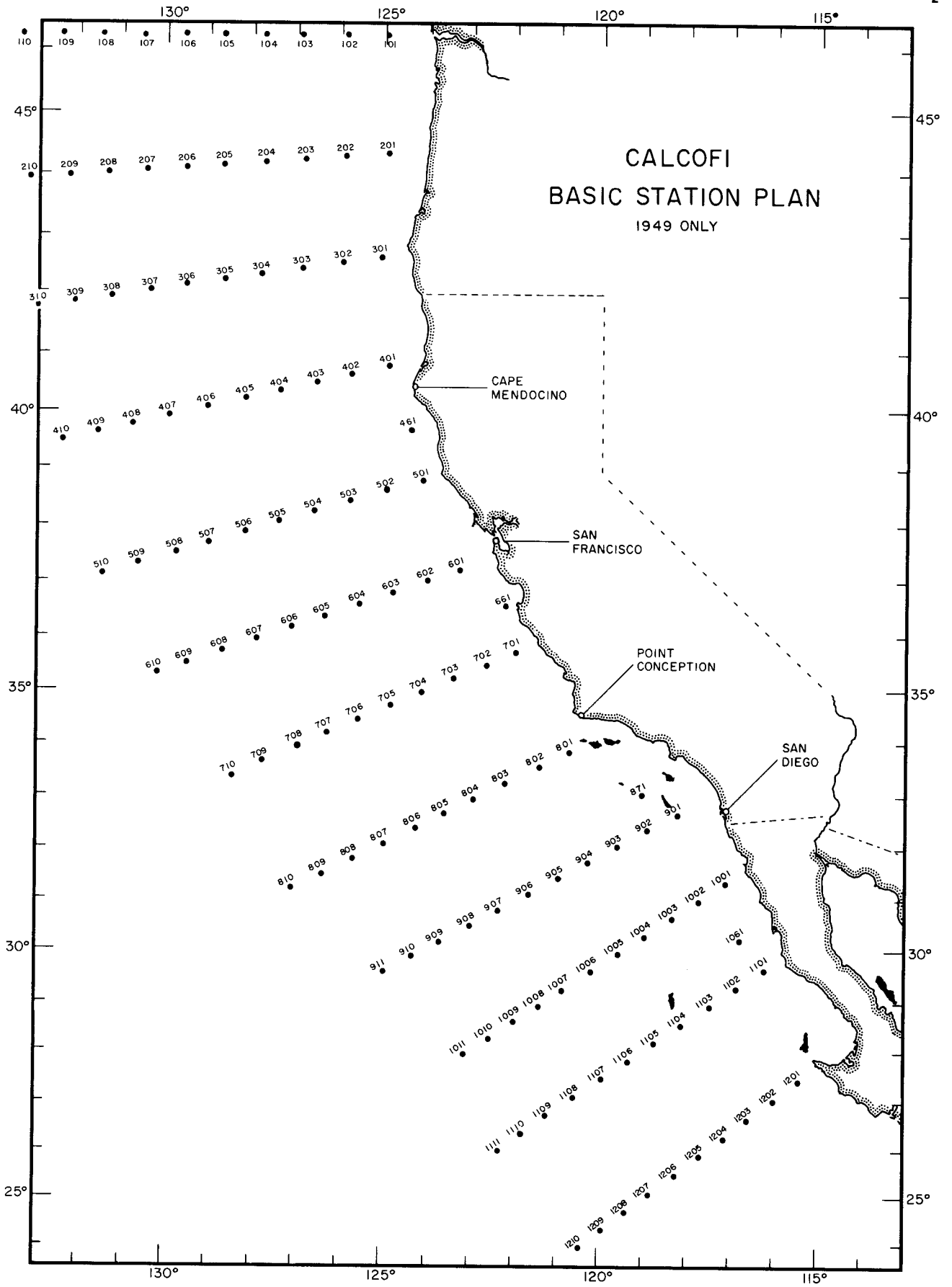
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CALCOFI

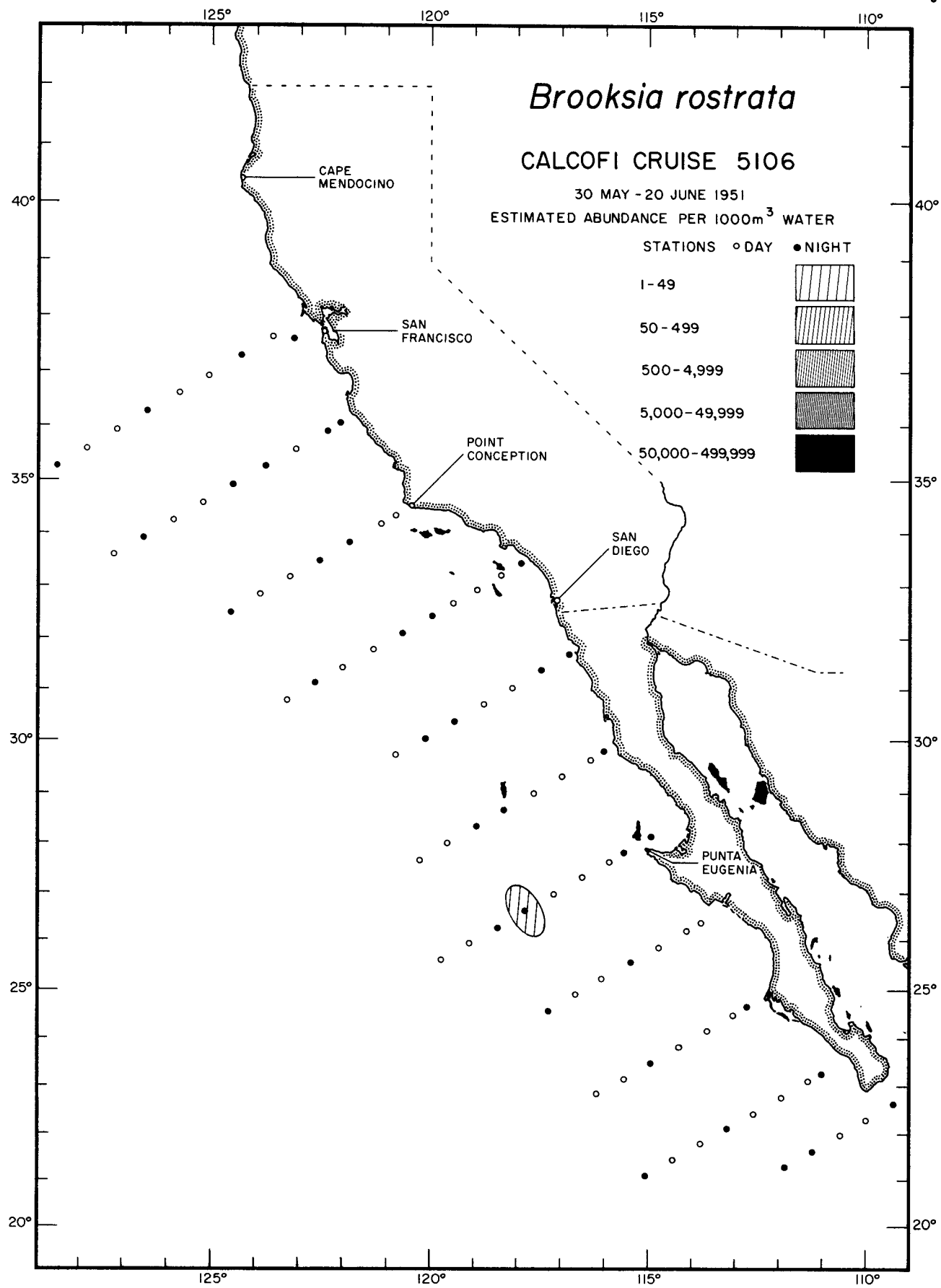
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SINCE 1950



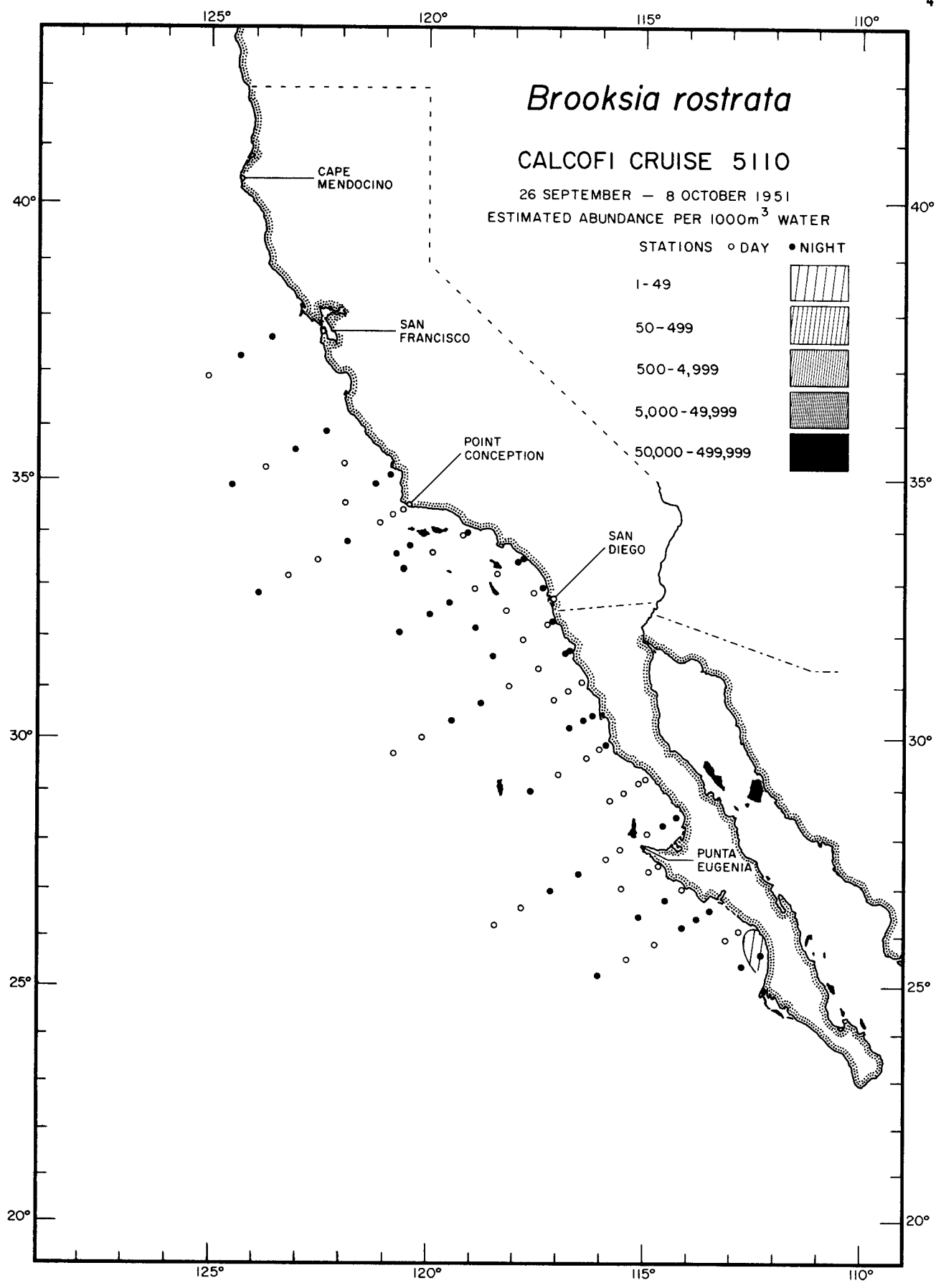
CALCOFI

BASIC STATION PLAN

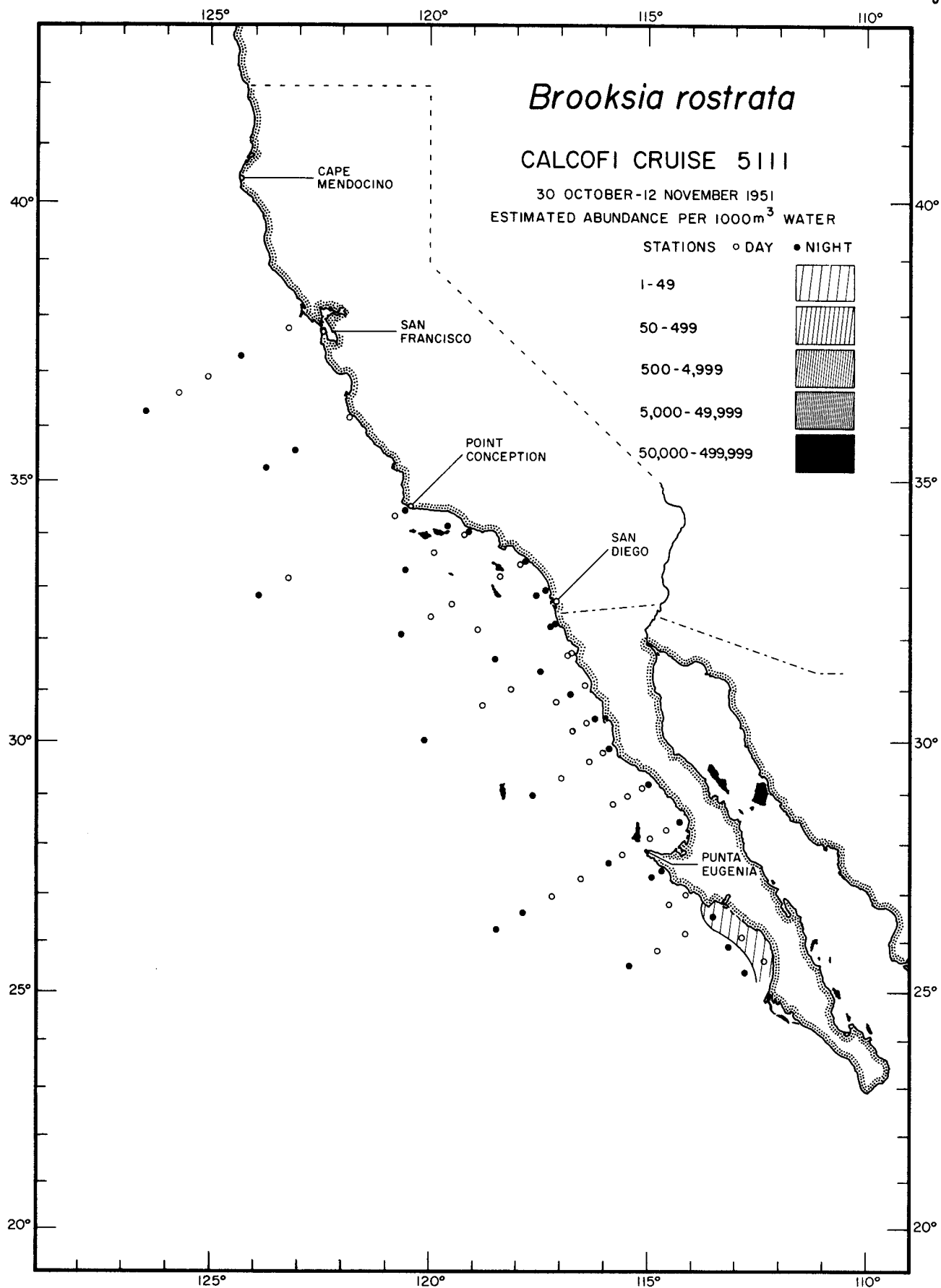
1949 ONLY



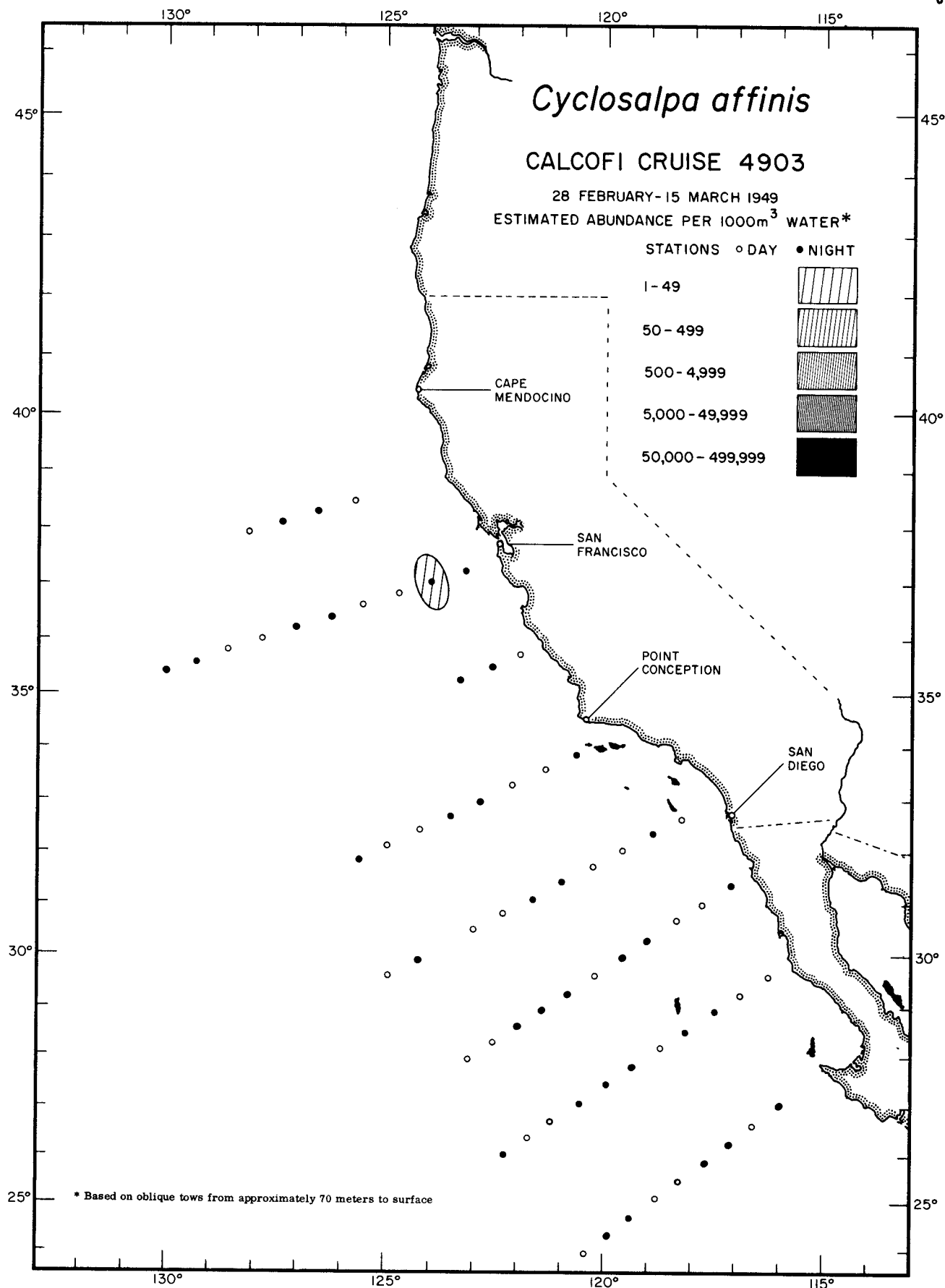
Thaliacea
Brooksia rostrata
5106



Thaliacea
Brooksia rostrata
5110

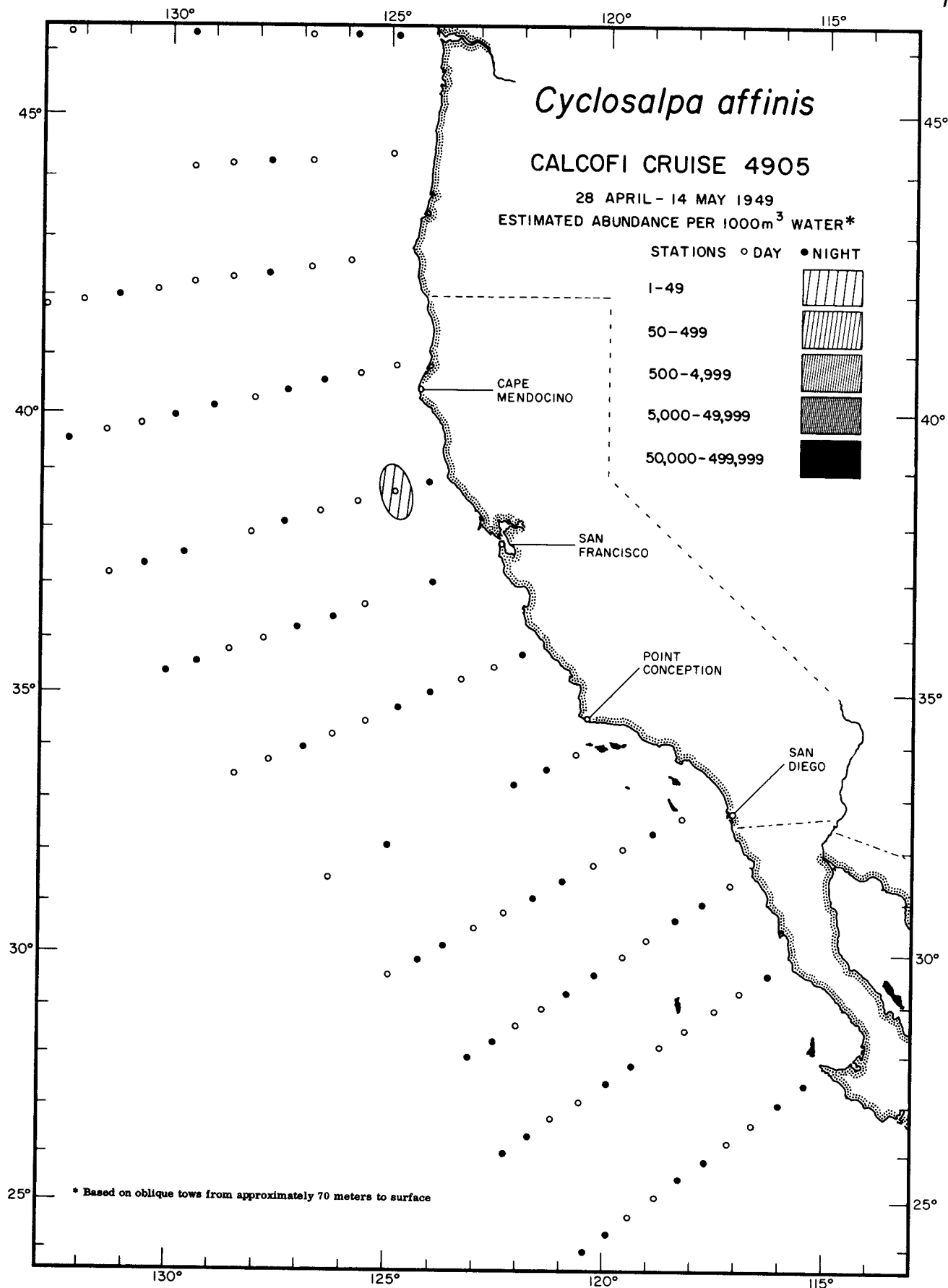


Thaliacea
Brooksia rostrata
5111

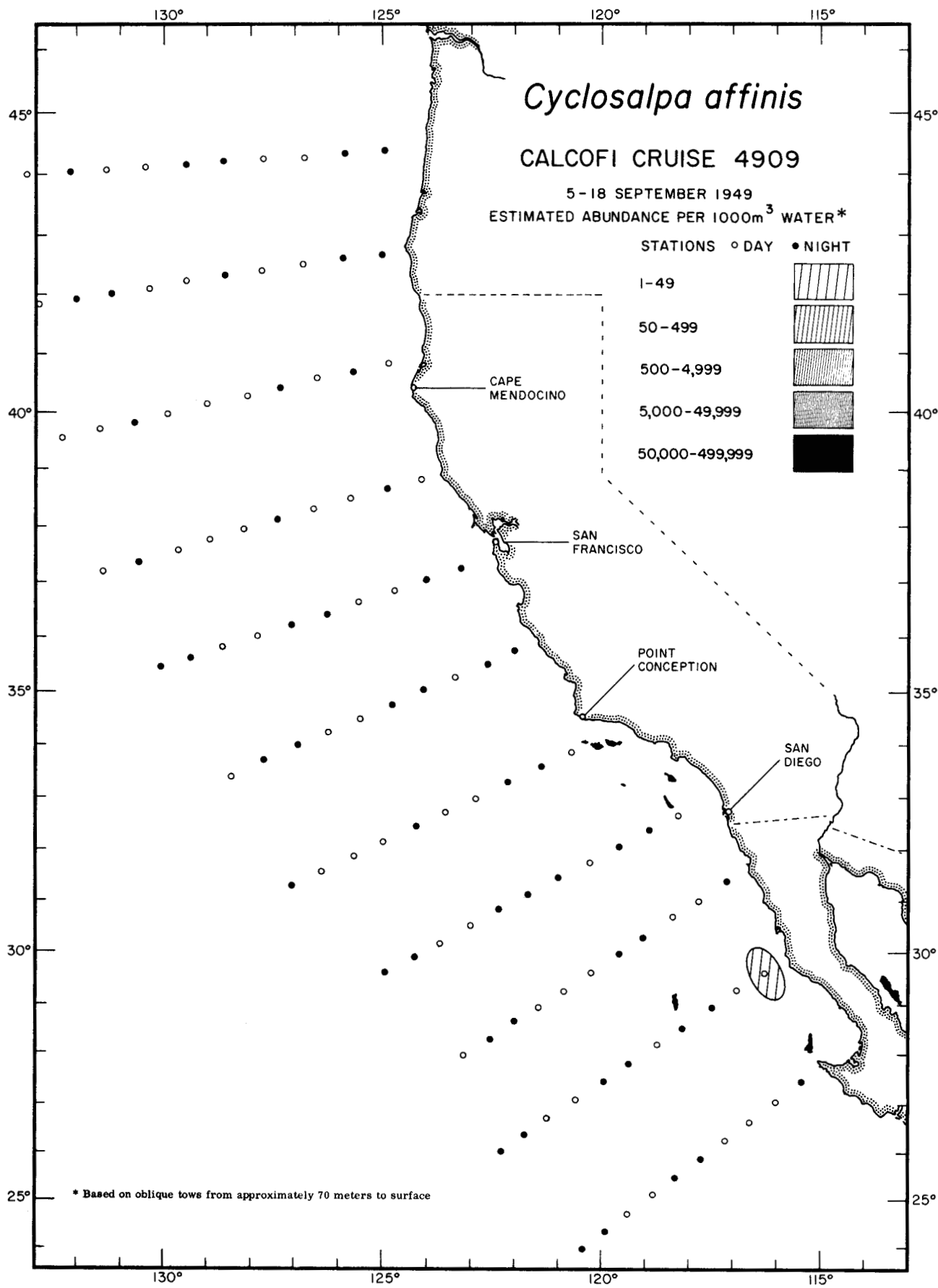


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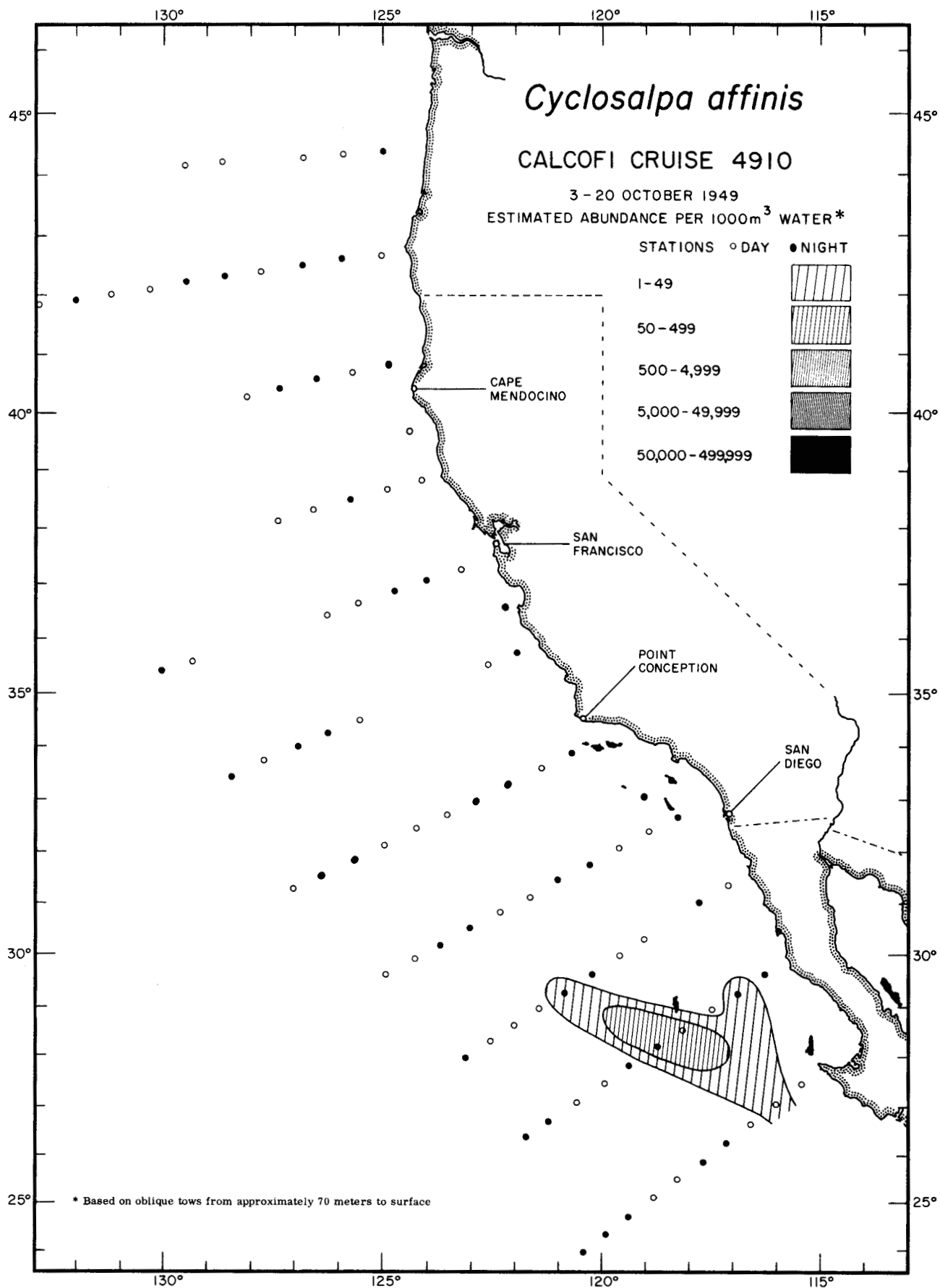
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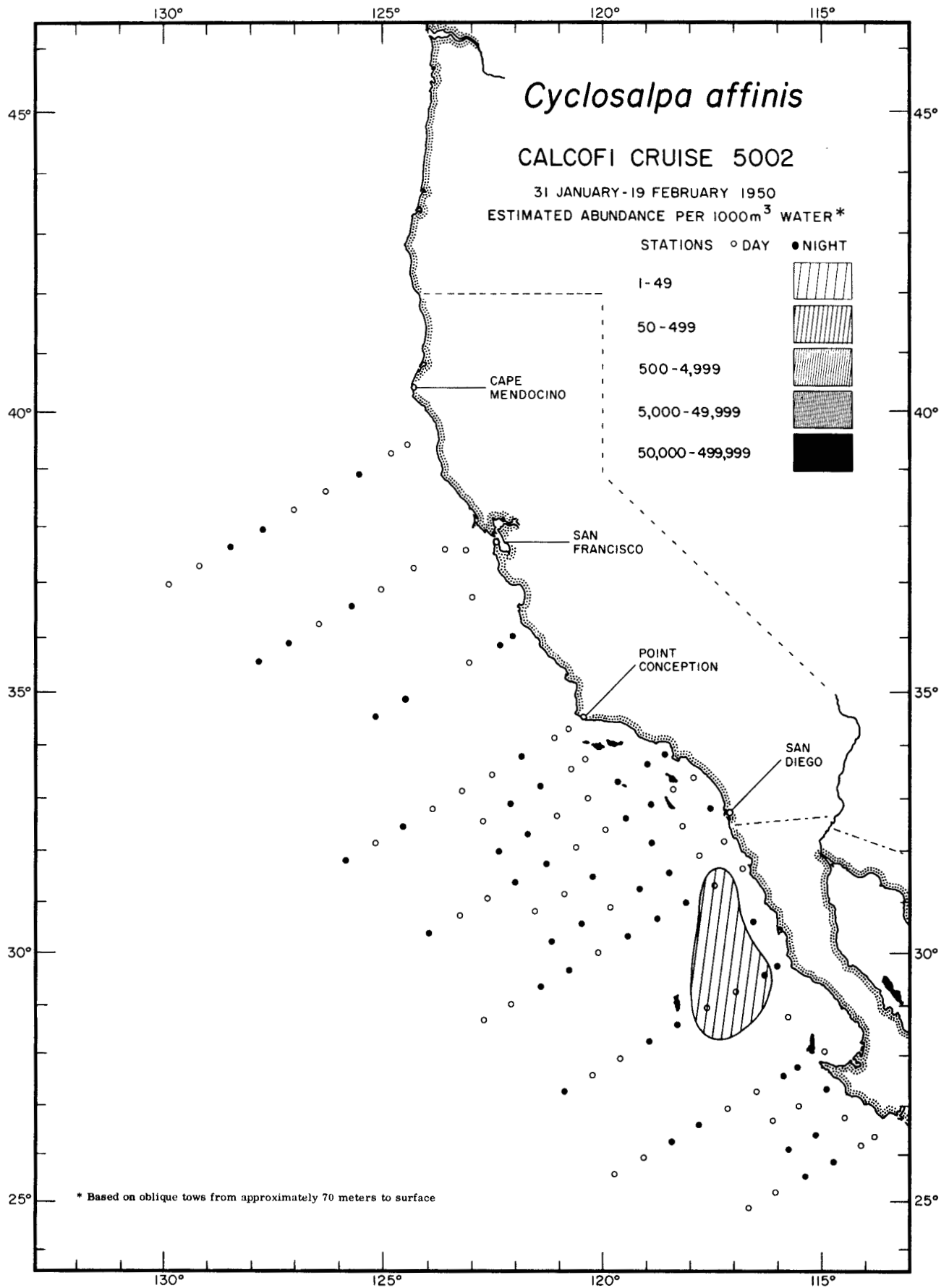


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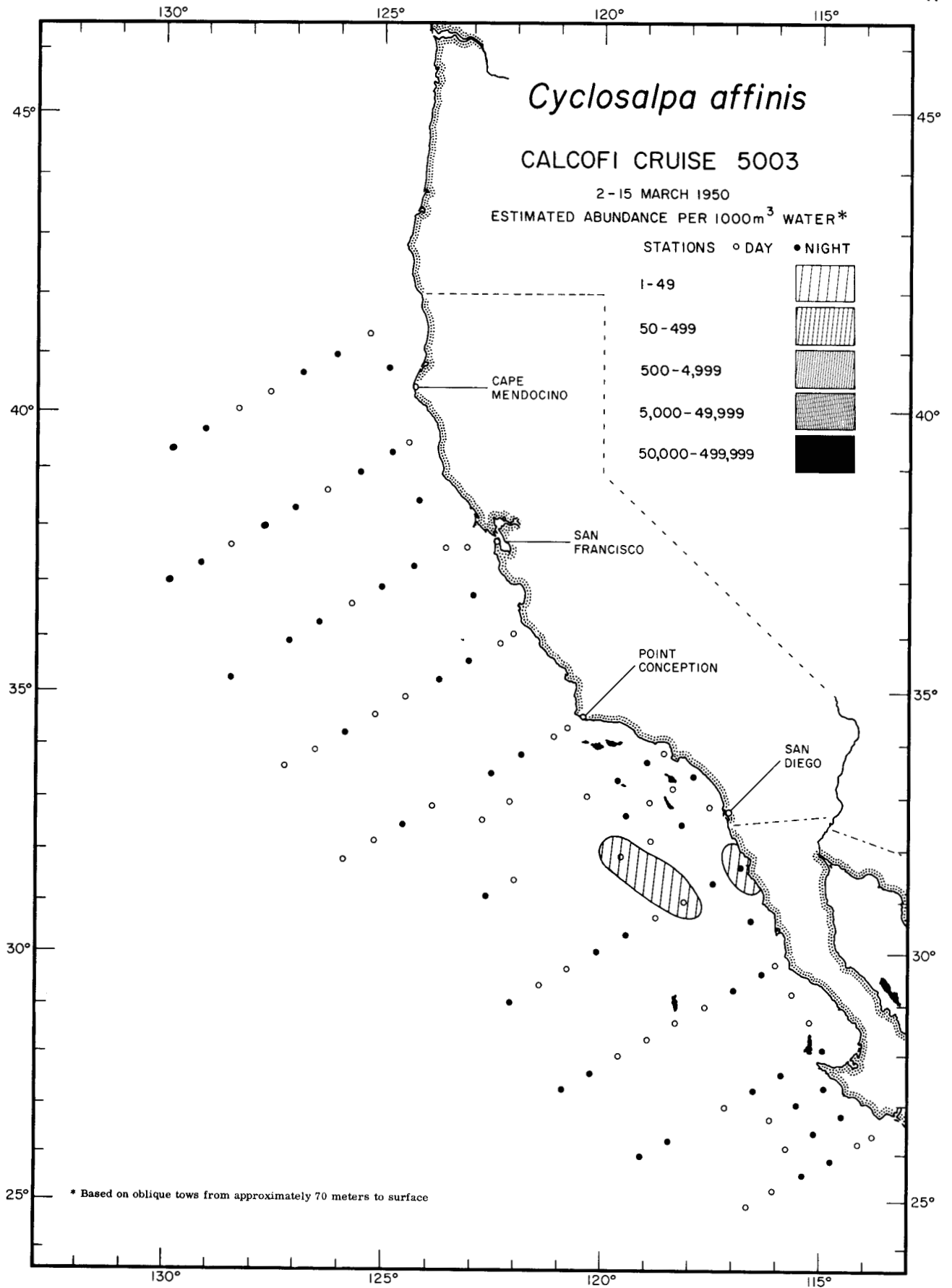


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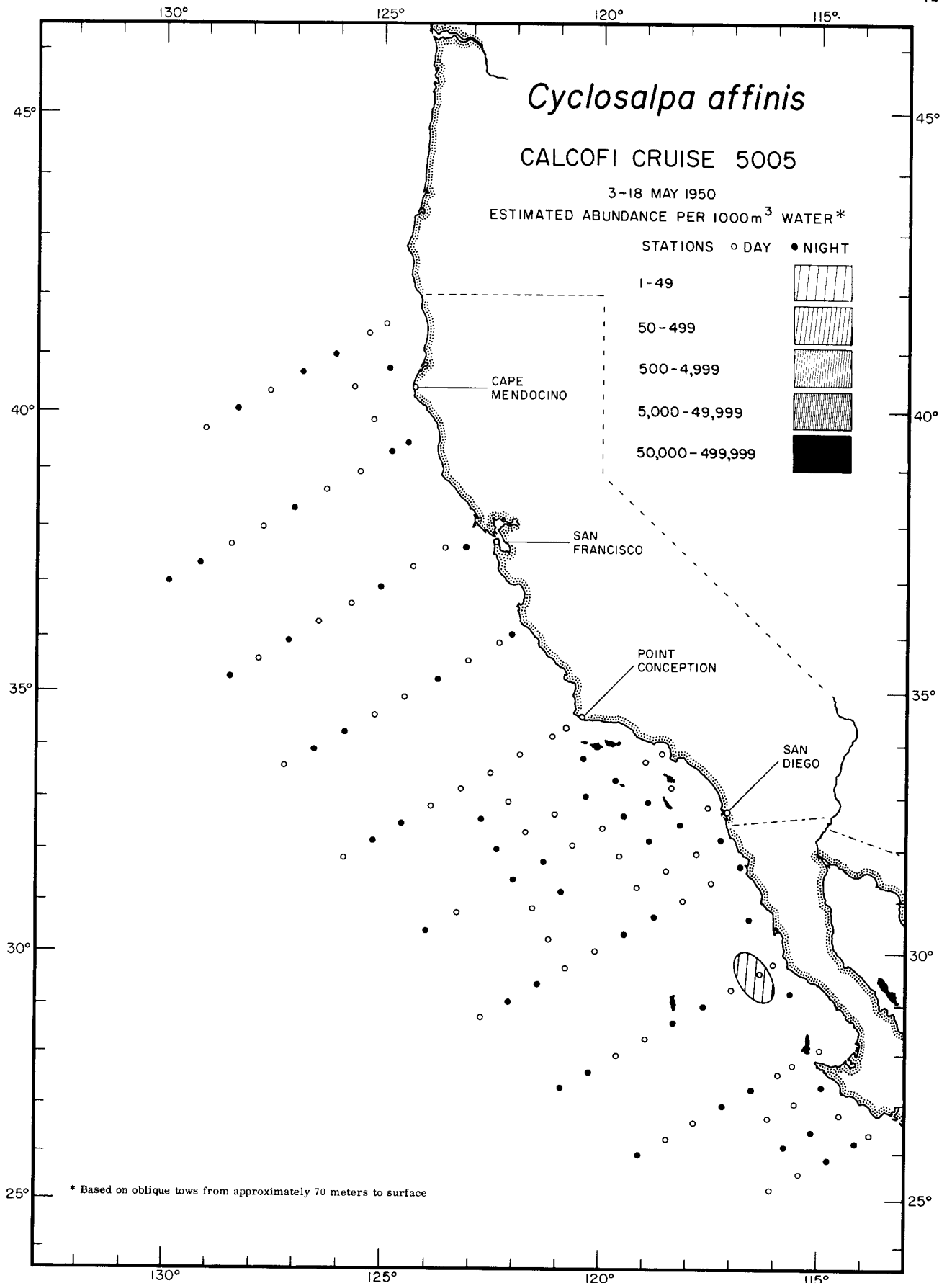
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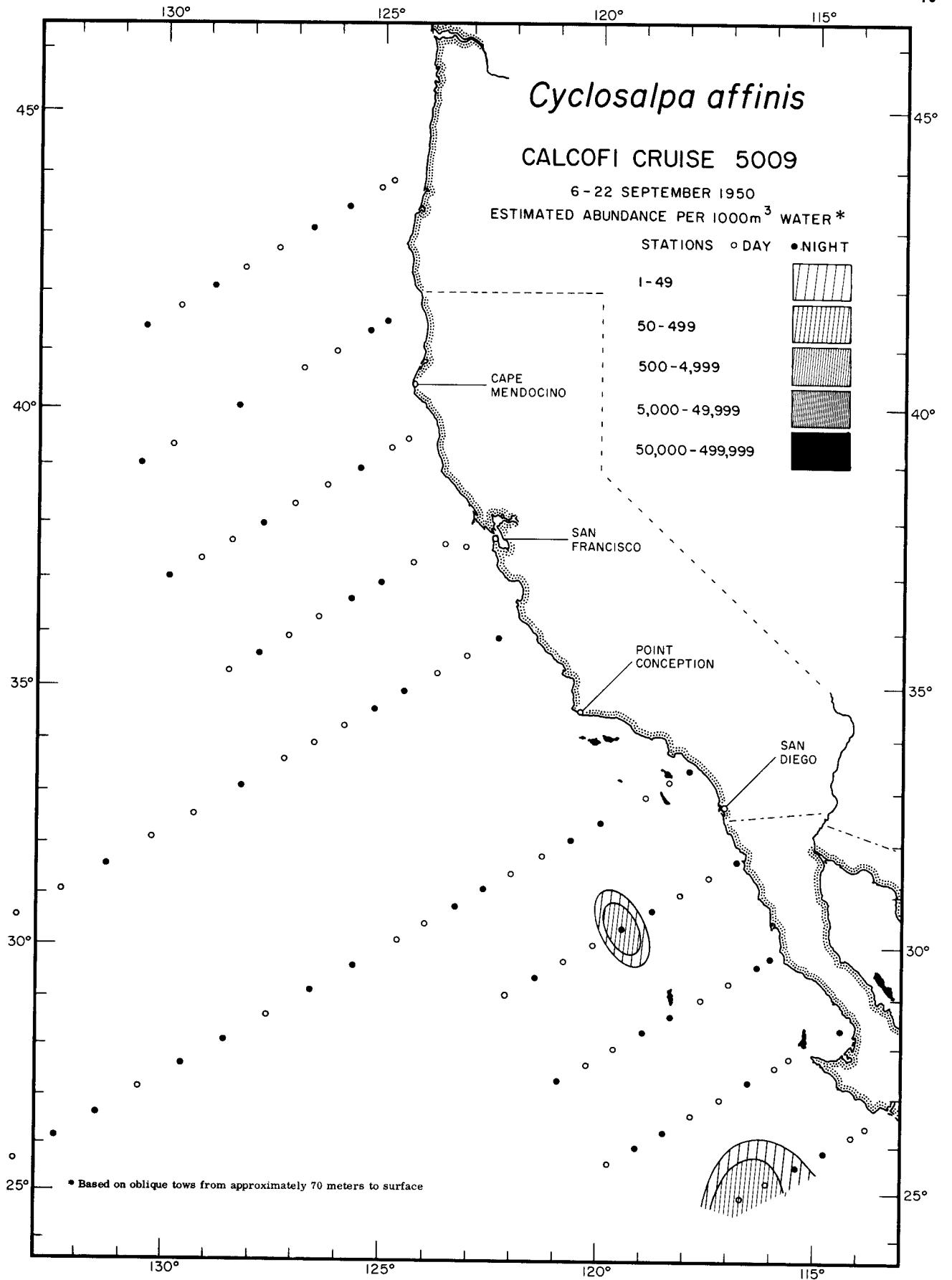
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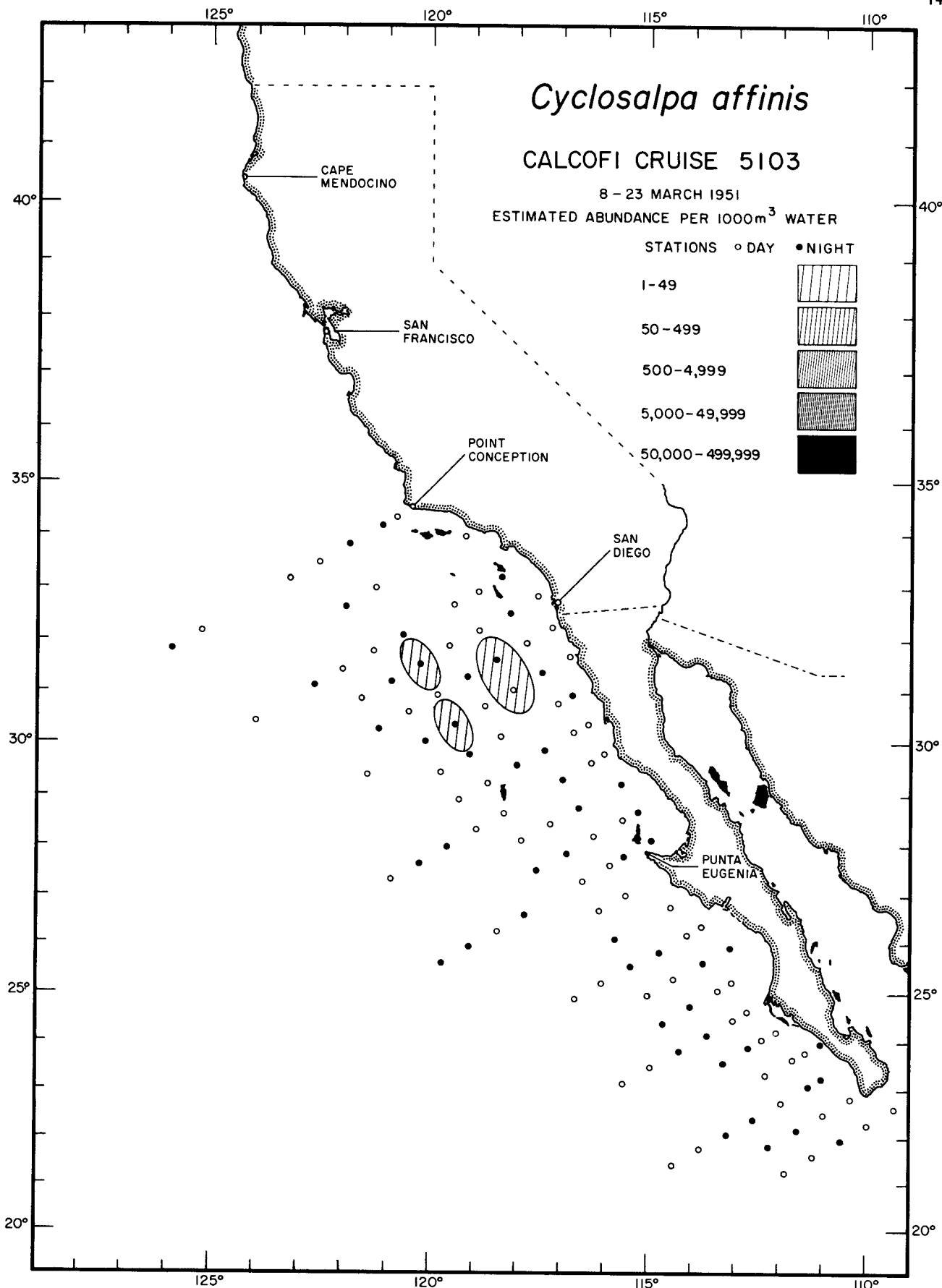
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Thaliacea
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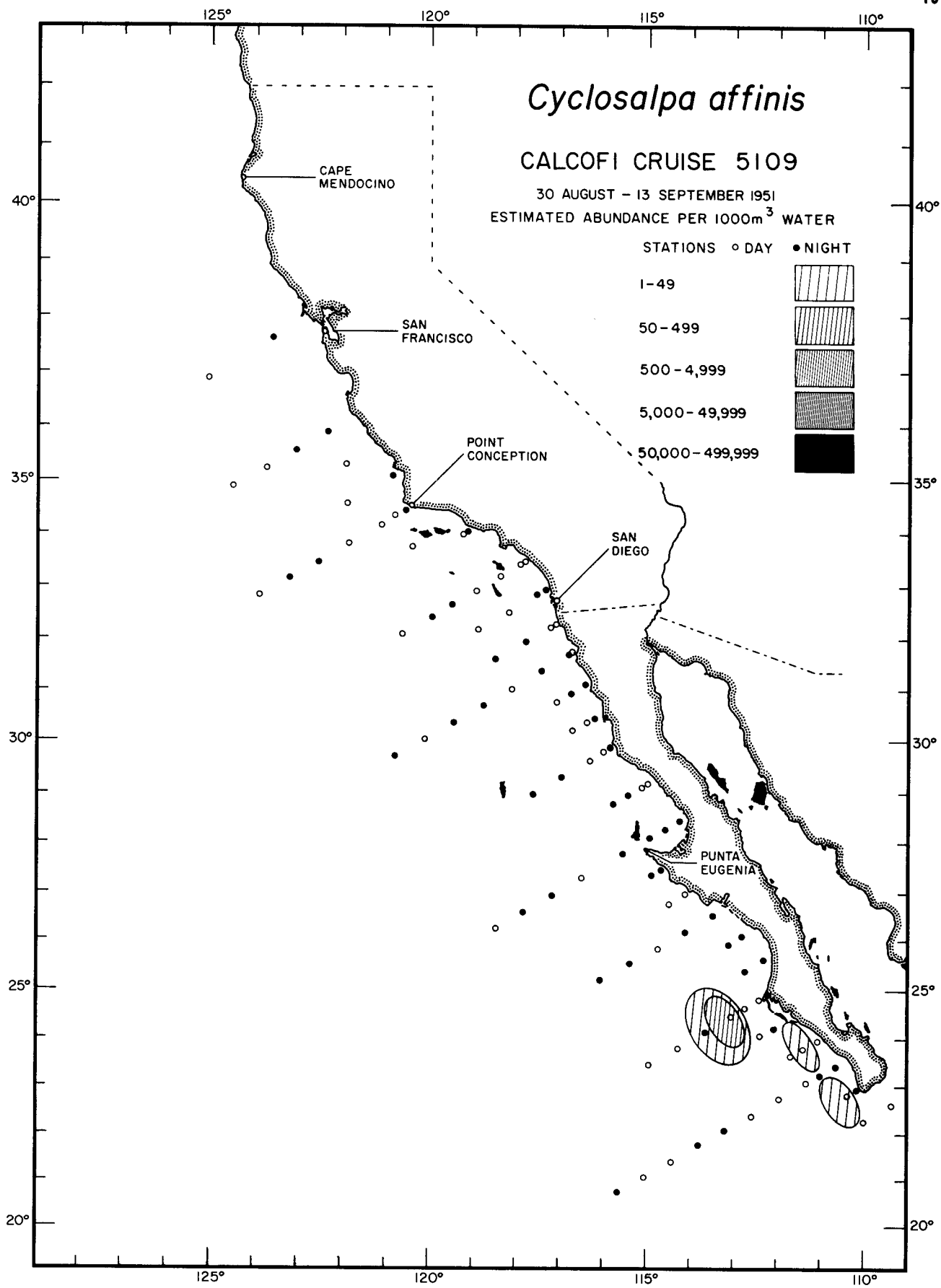


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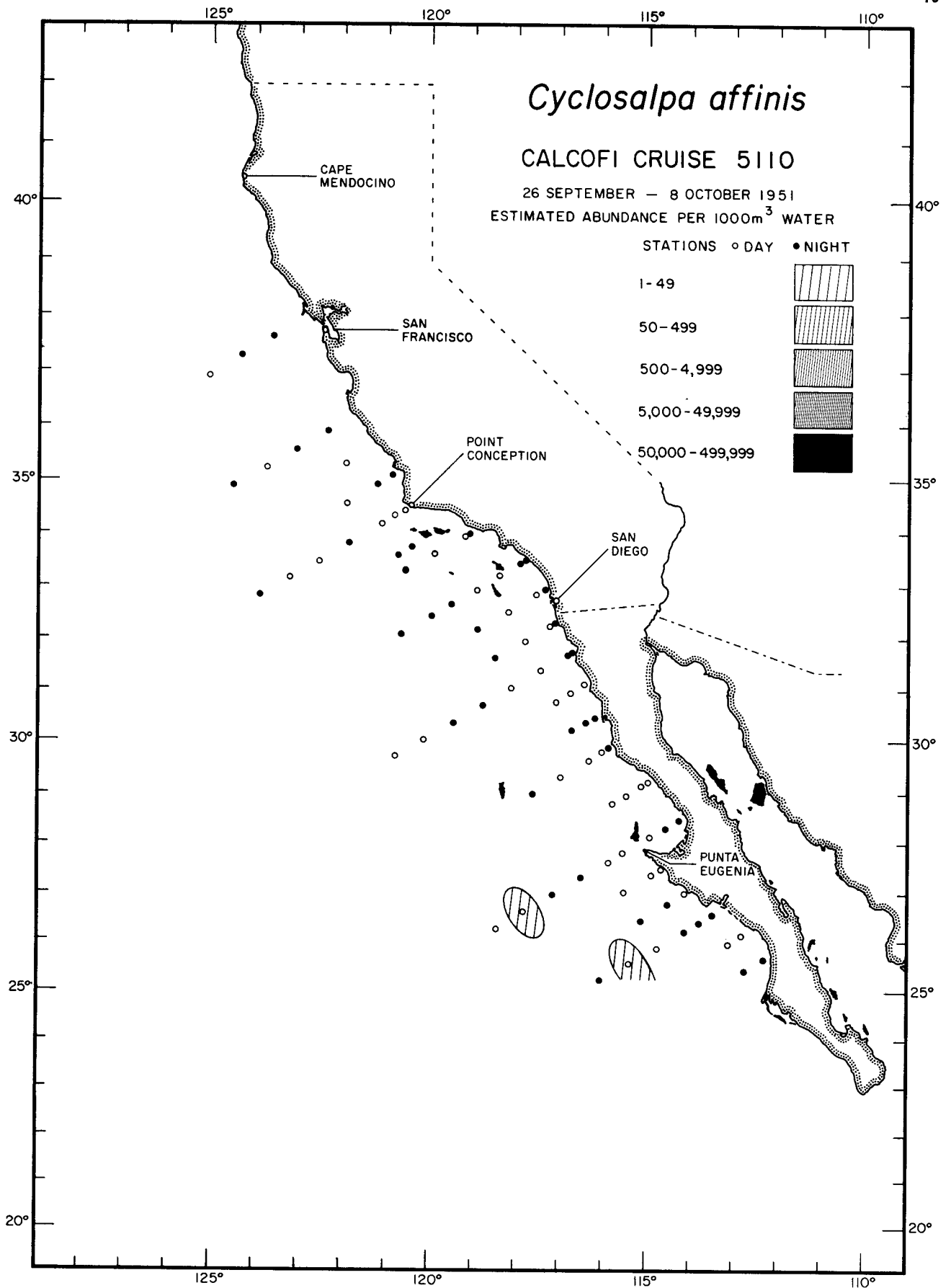


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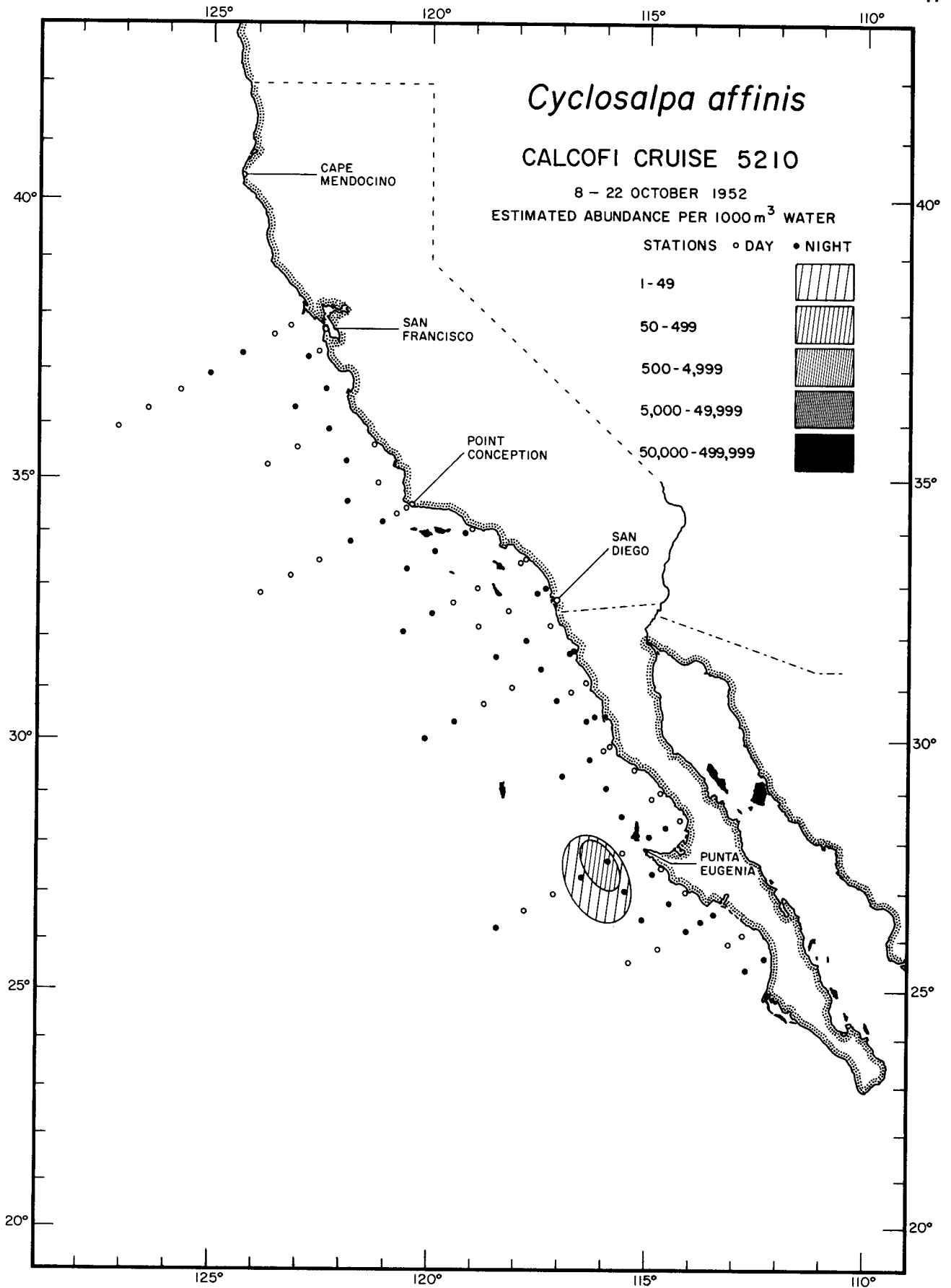


Thaliacea
Cyclosalpa affinis
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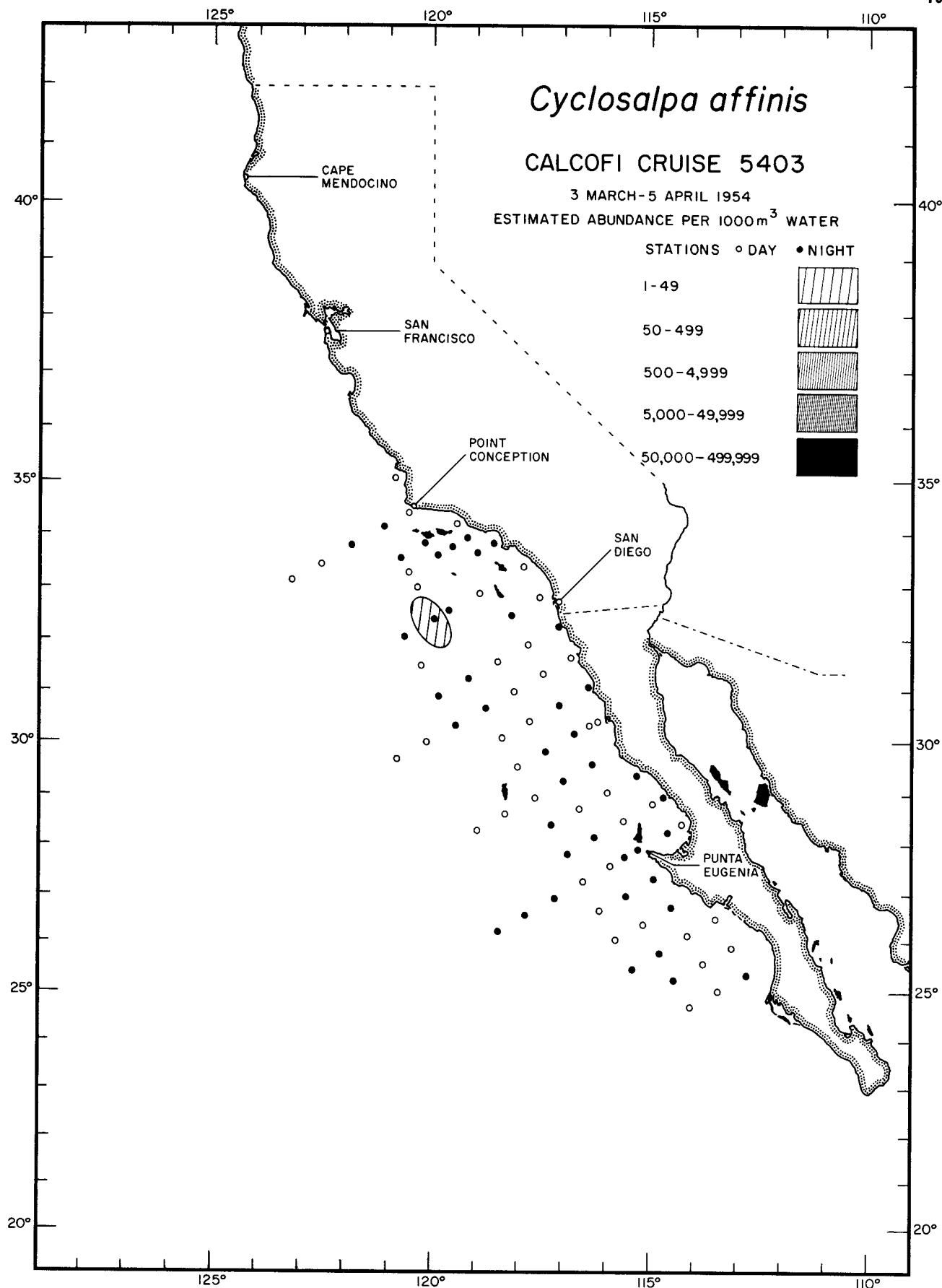


Thaliacea
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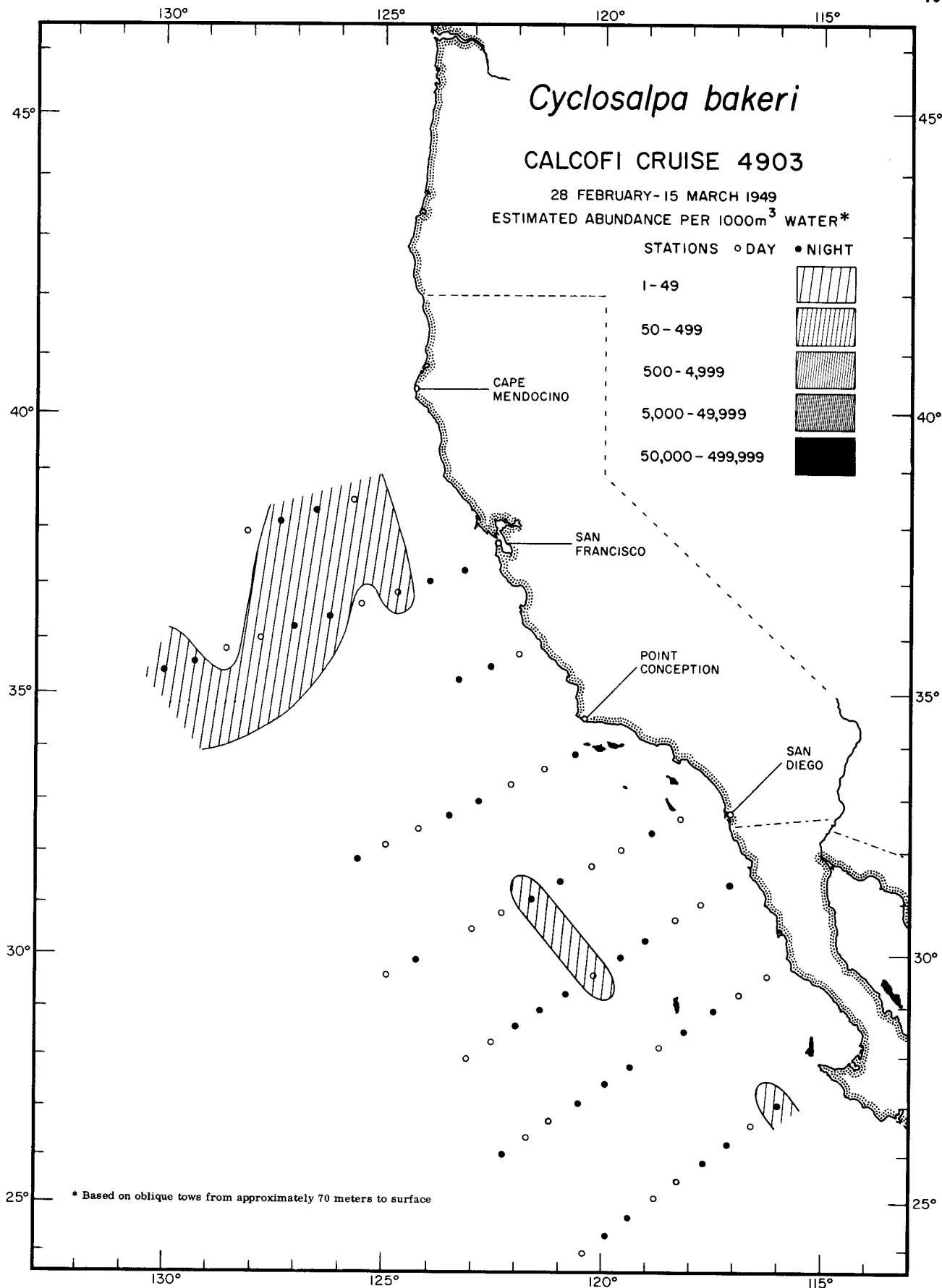


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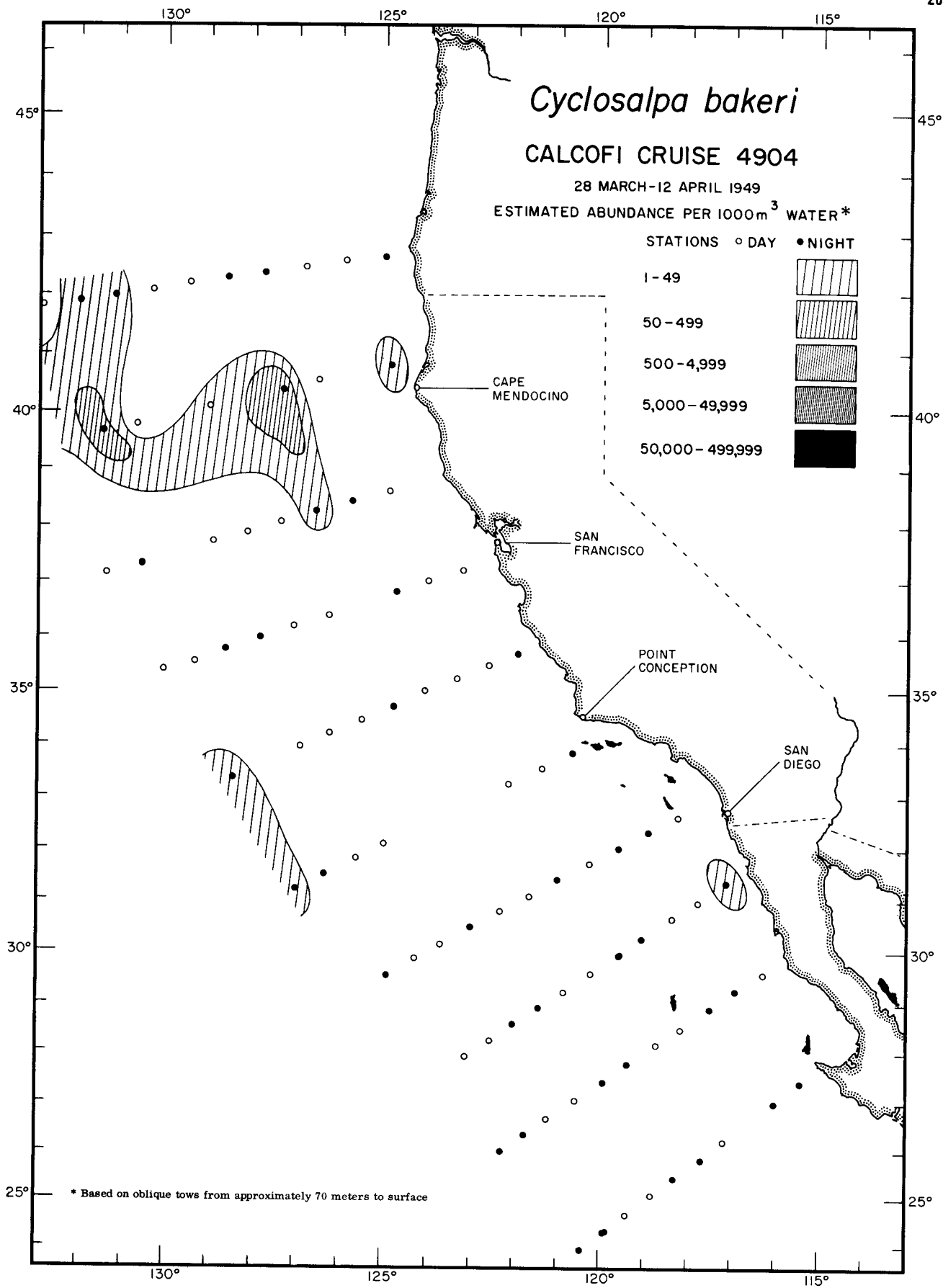


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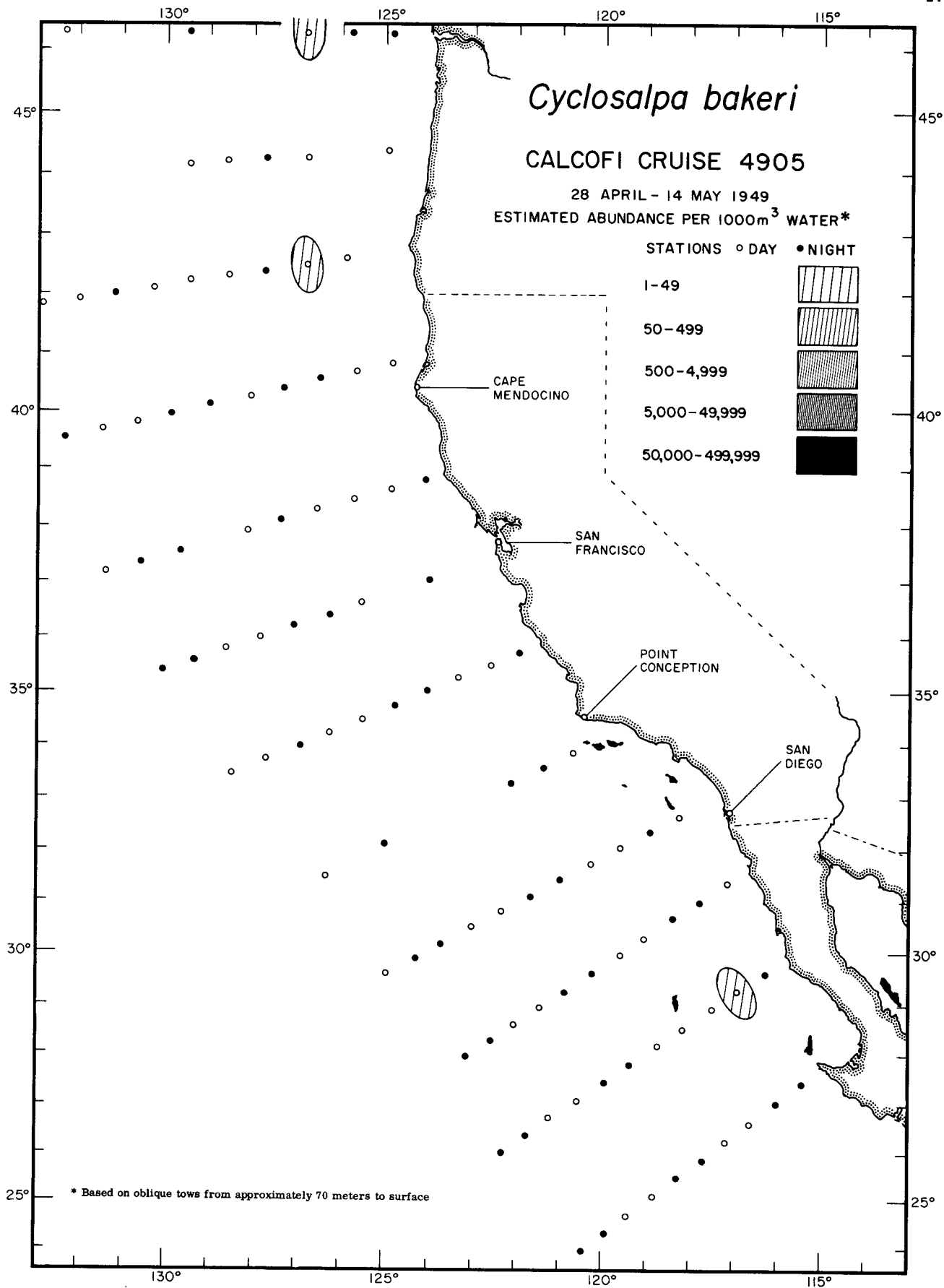
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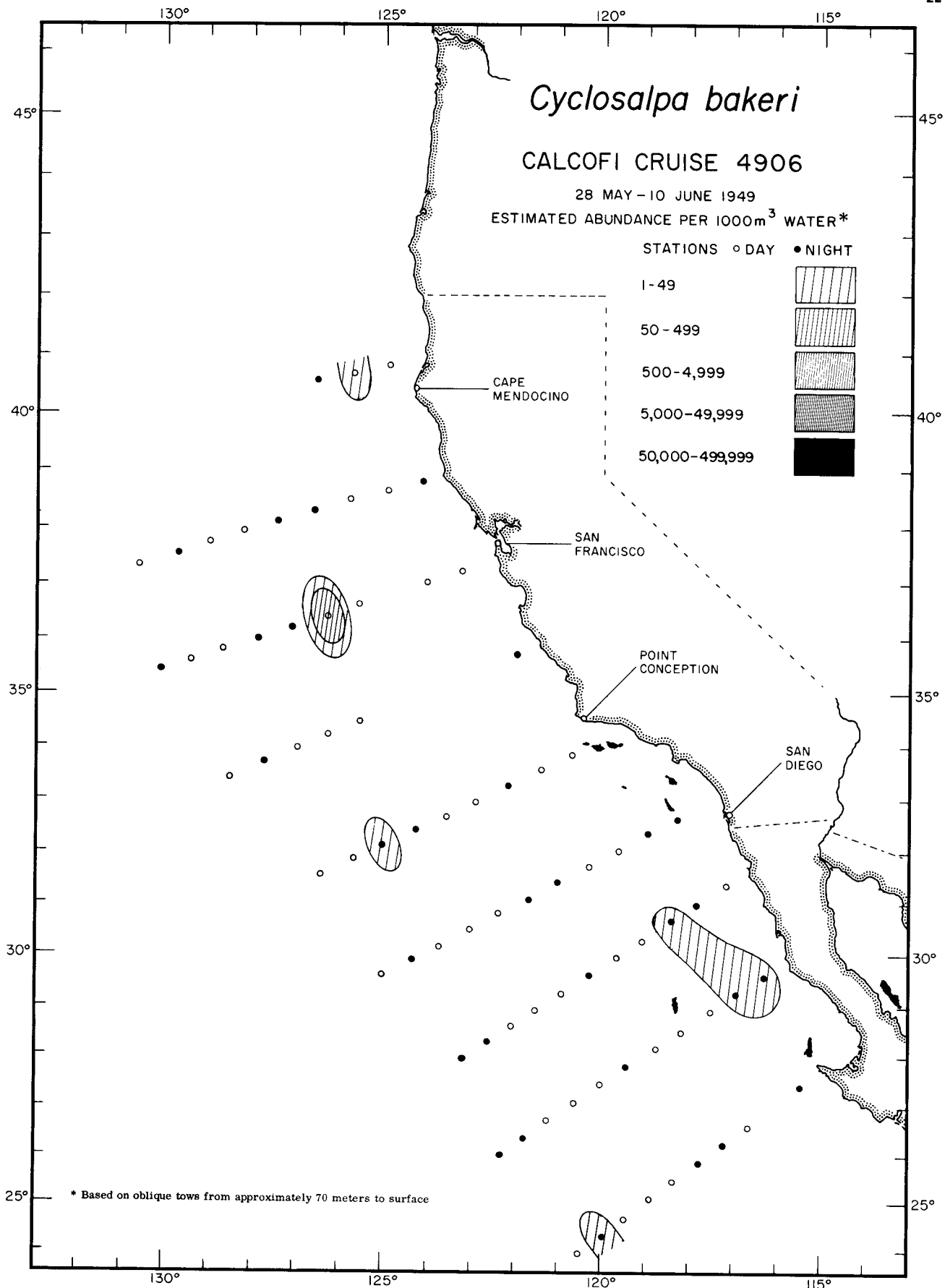
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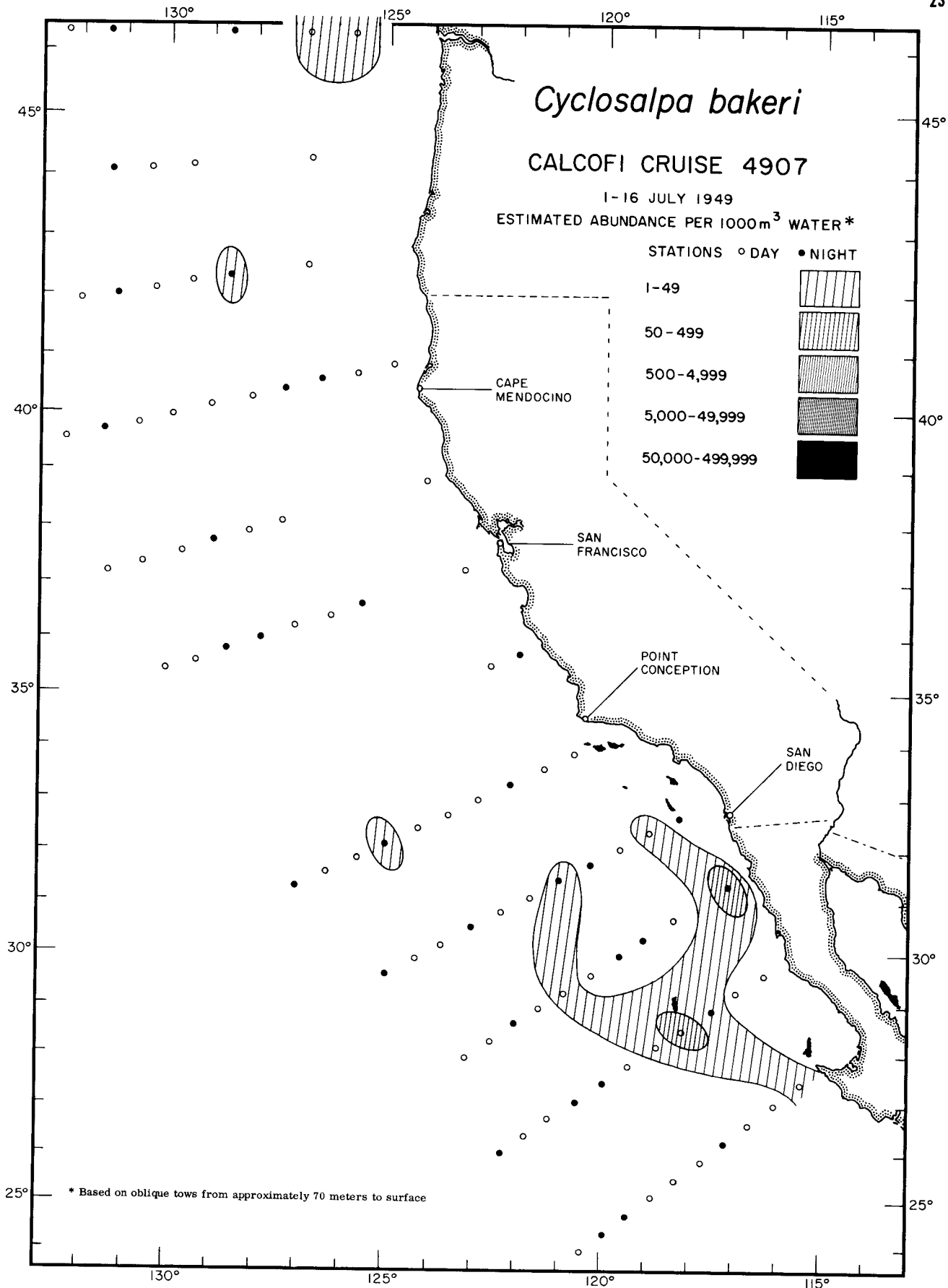
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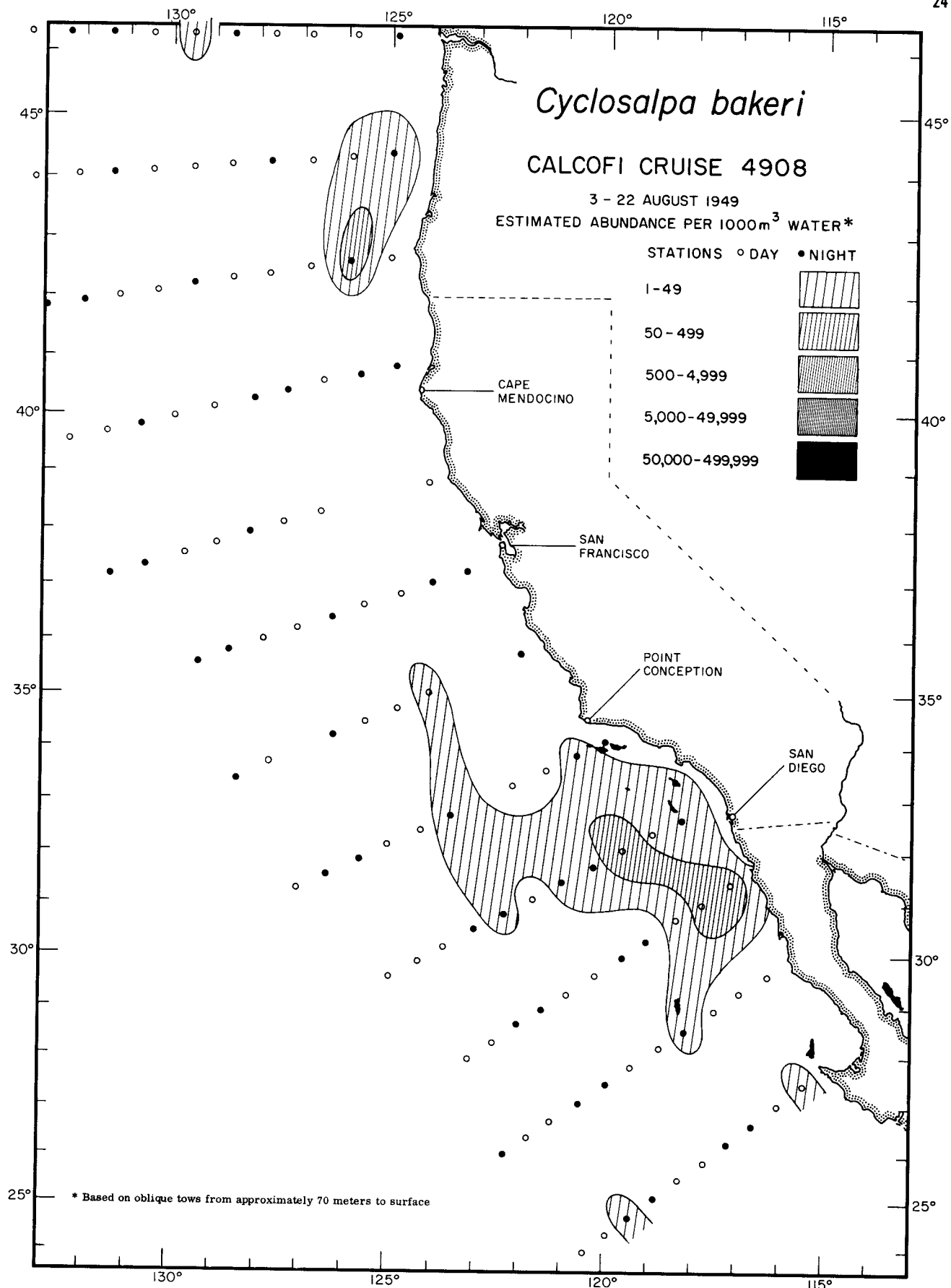
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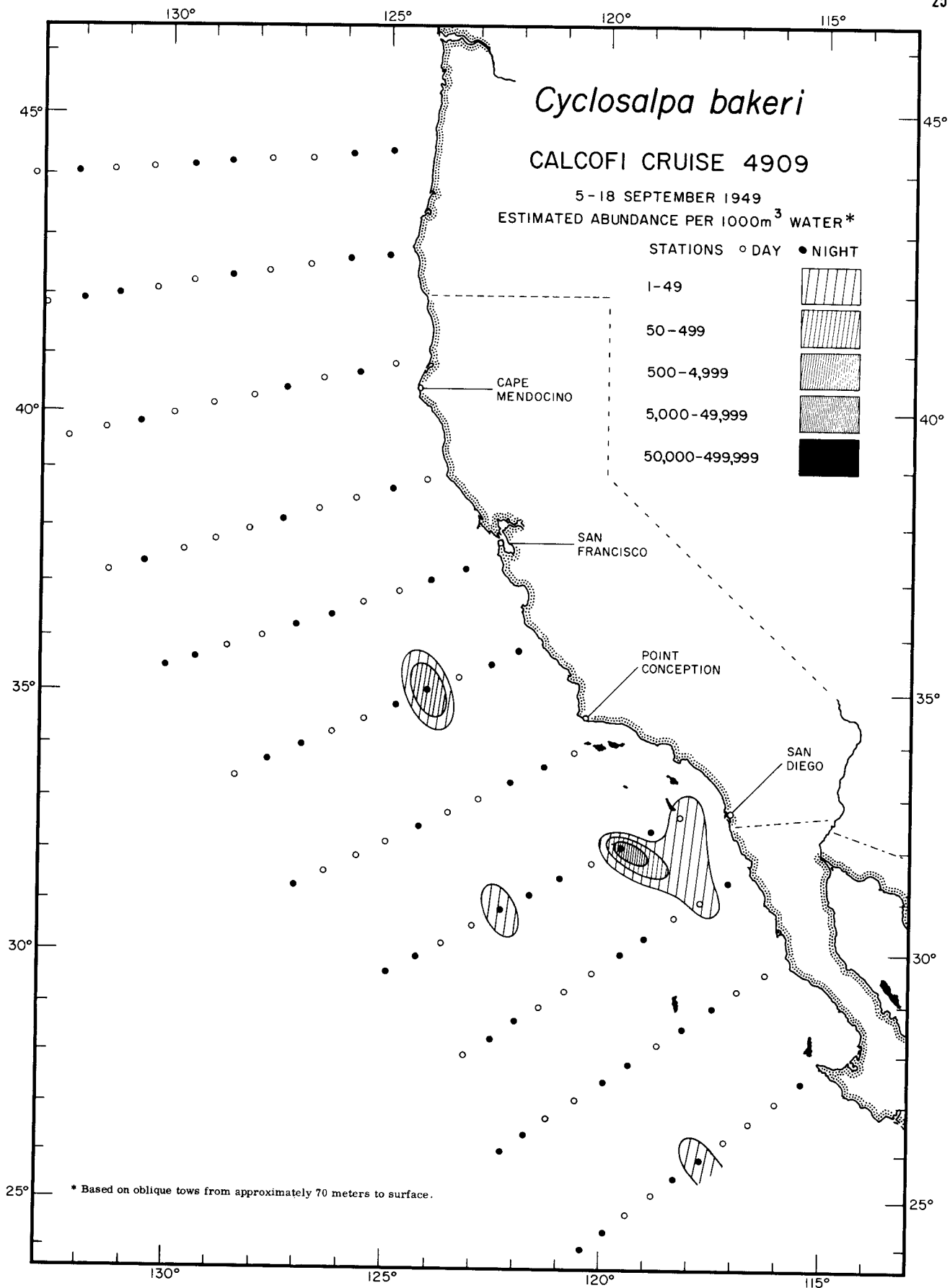
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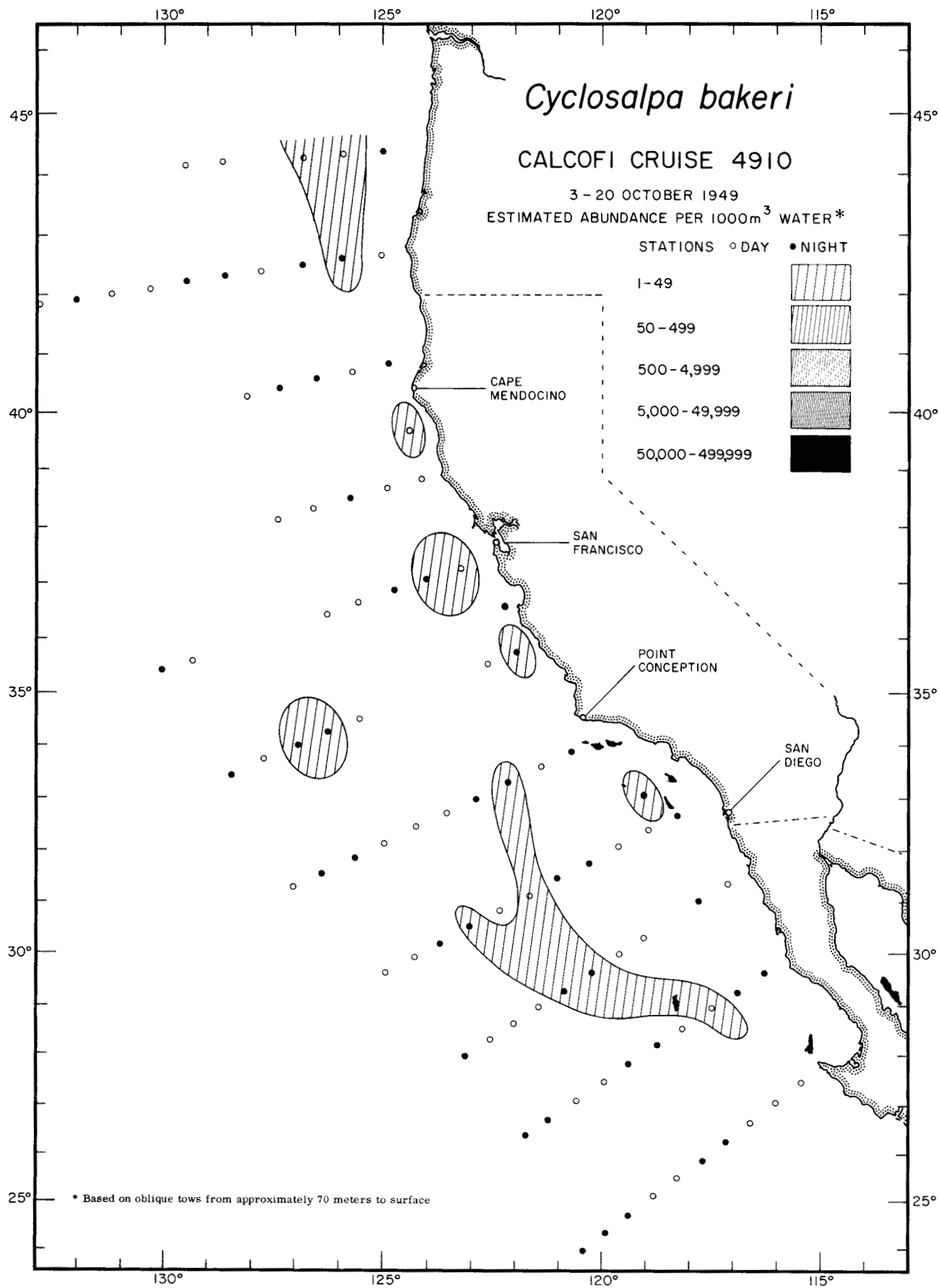
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Thaliacea
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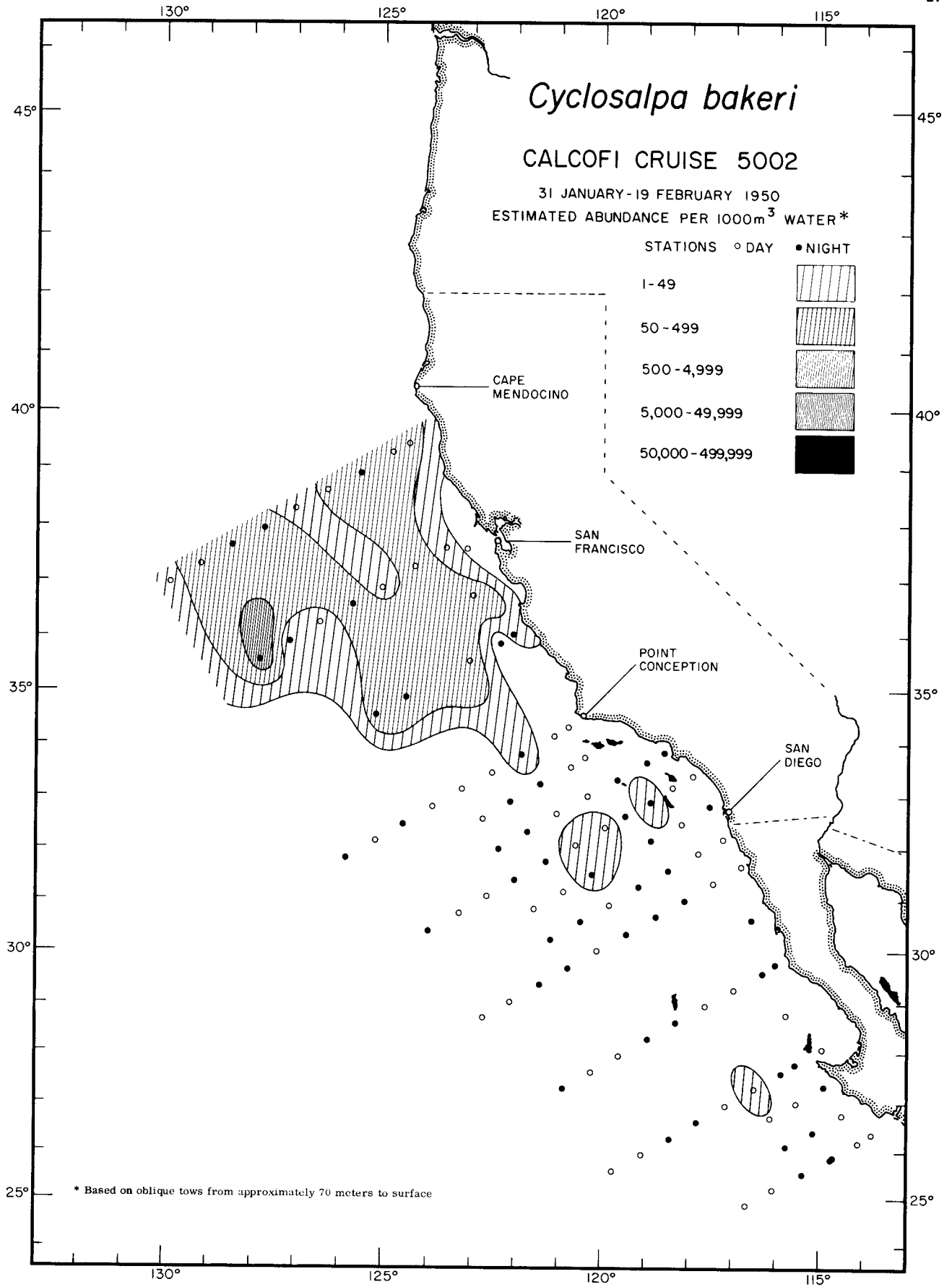


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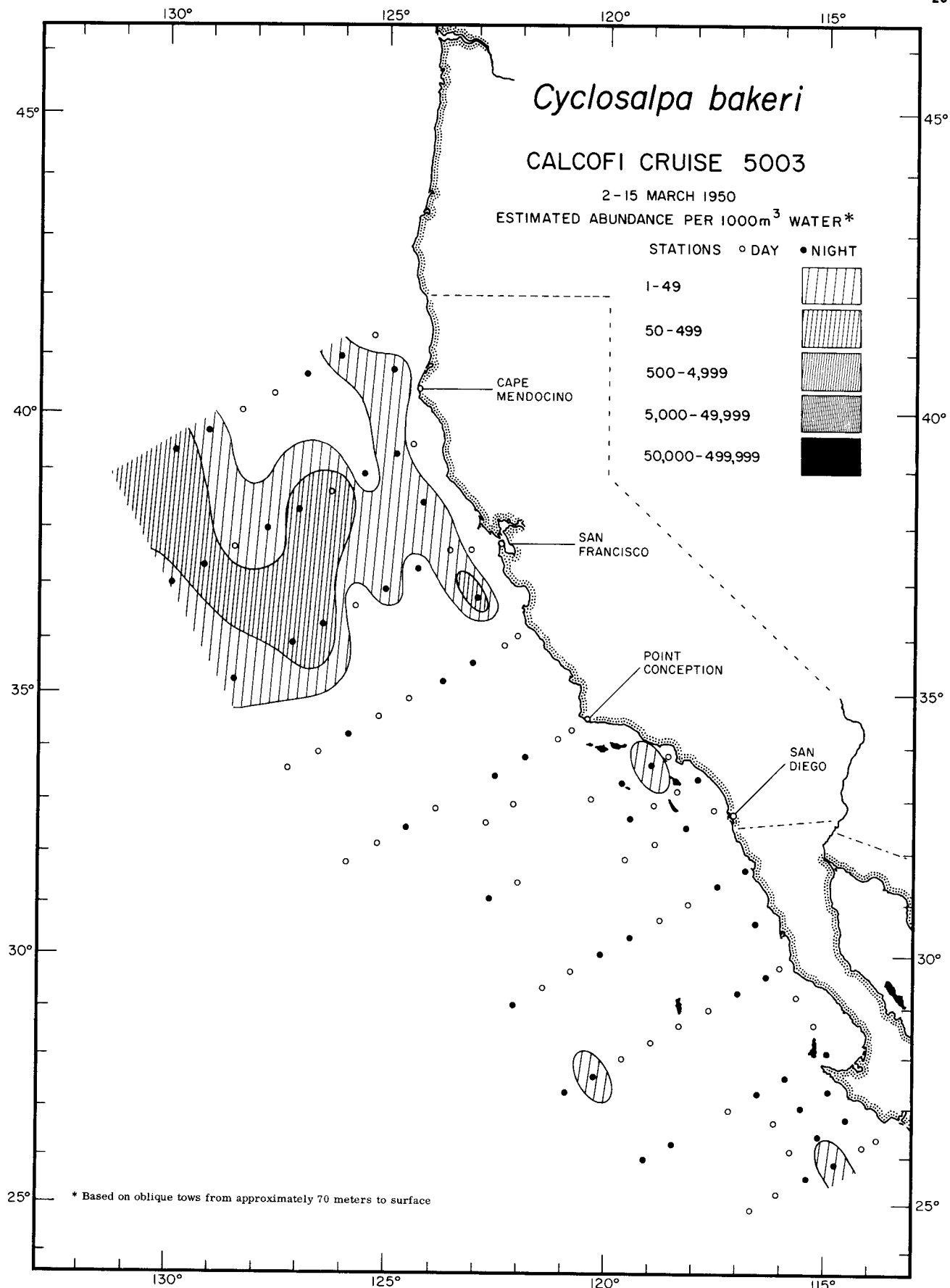


Thaliacea
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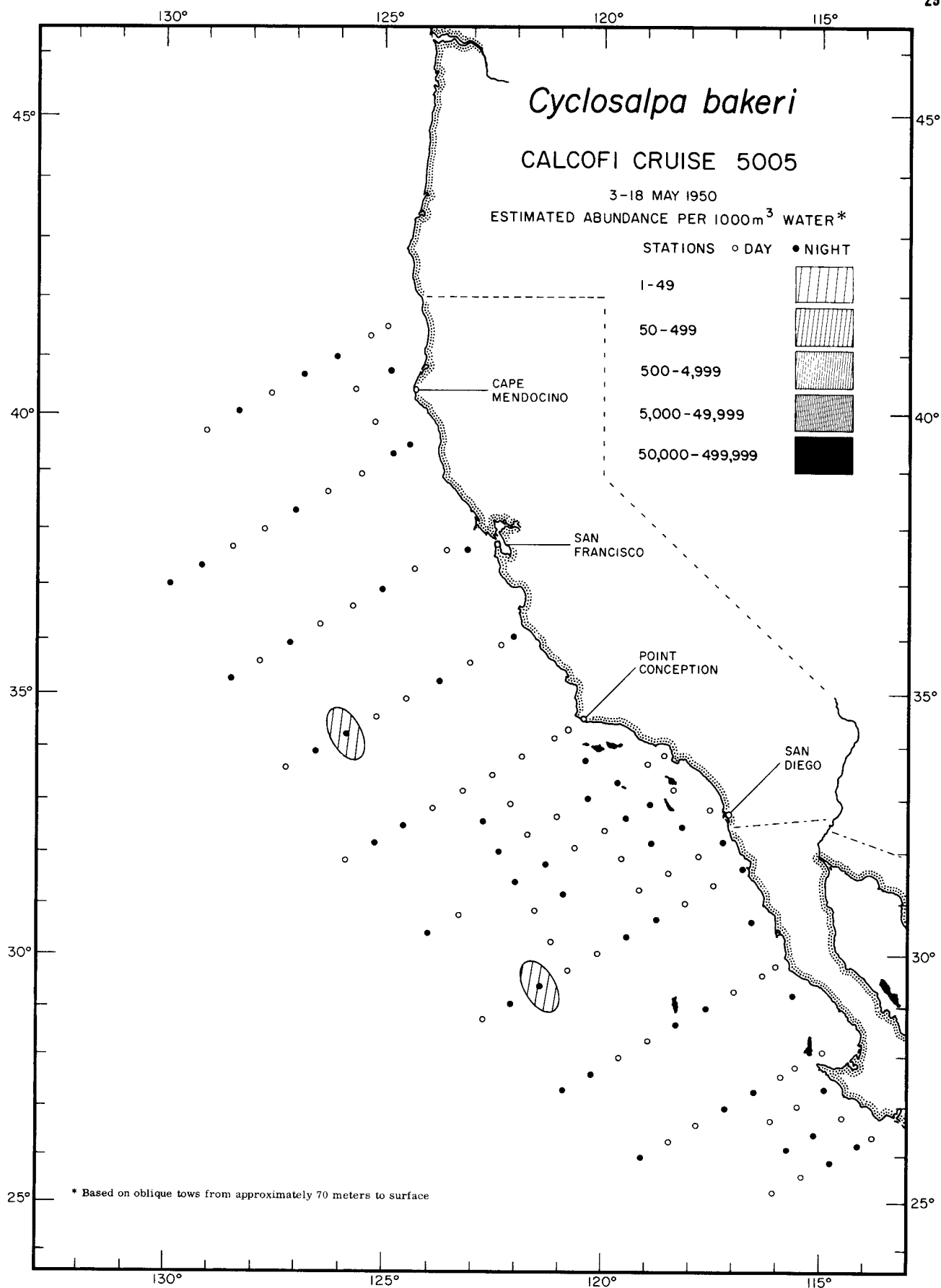


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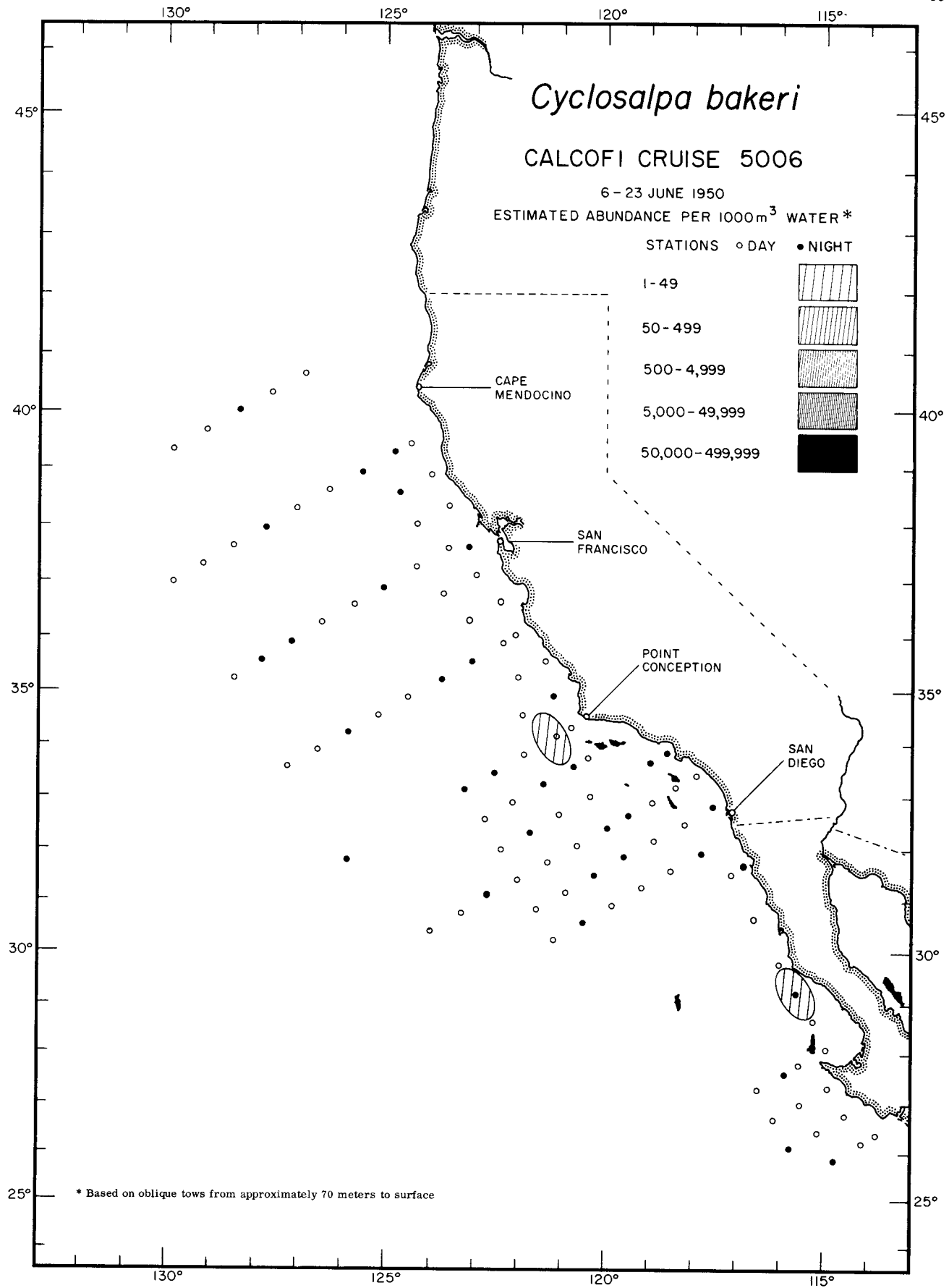
Thaliacea
Cyclosalpa bakeri

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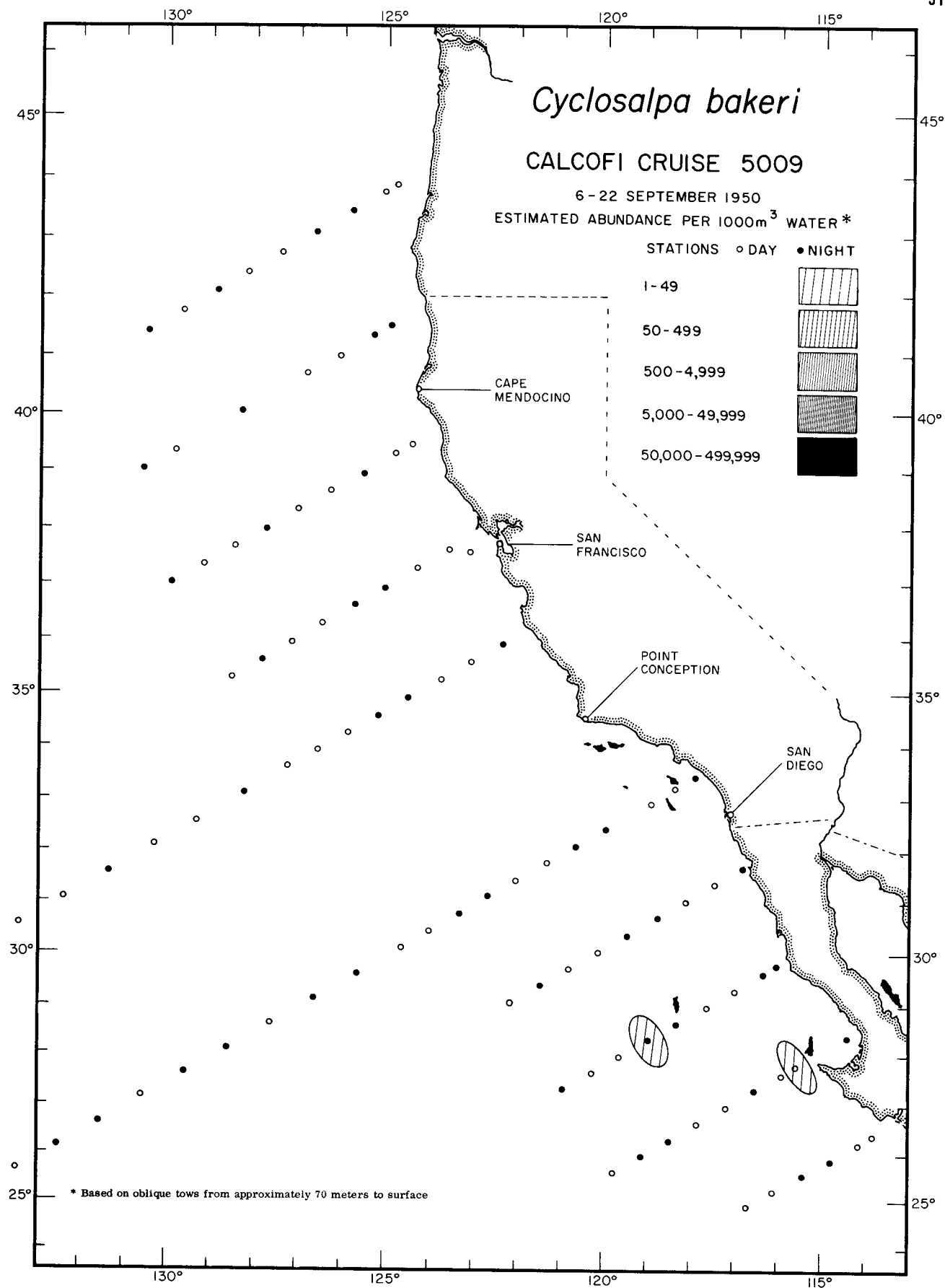


Thaliacea
Cyclosalpa bakeri

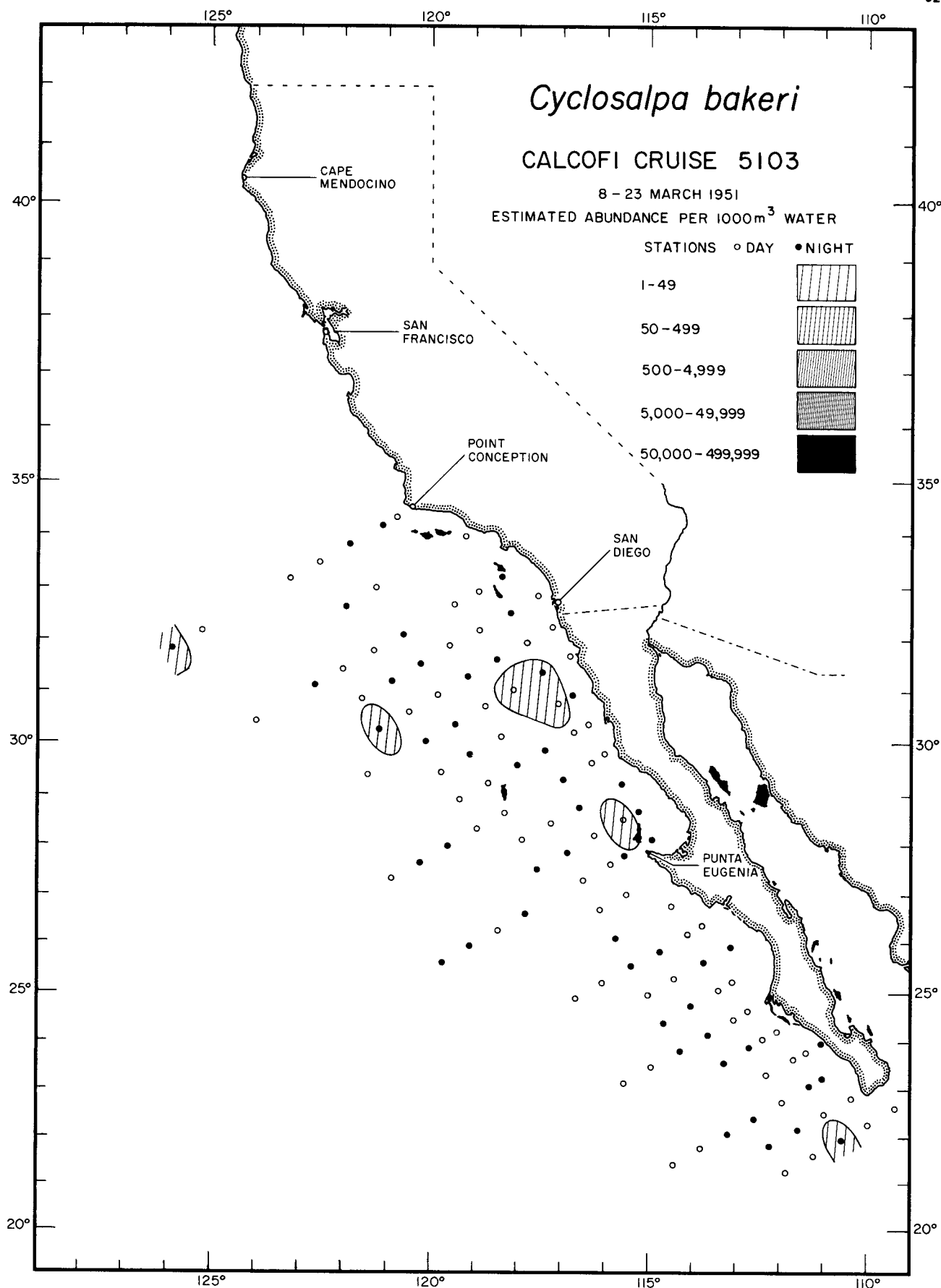
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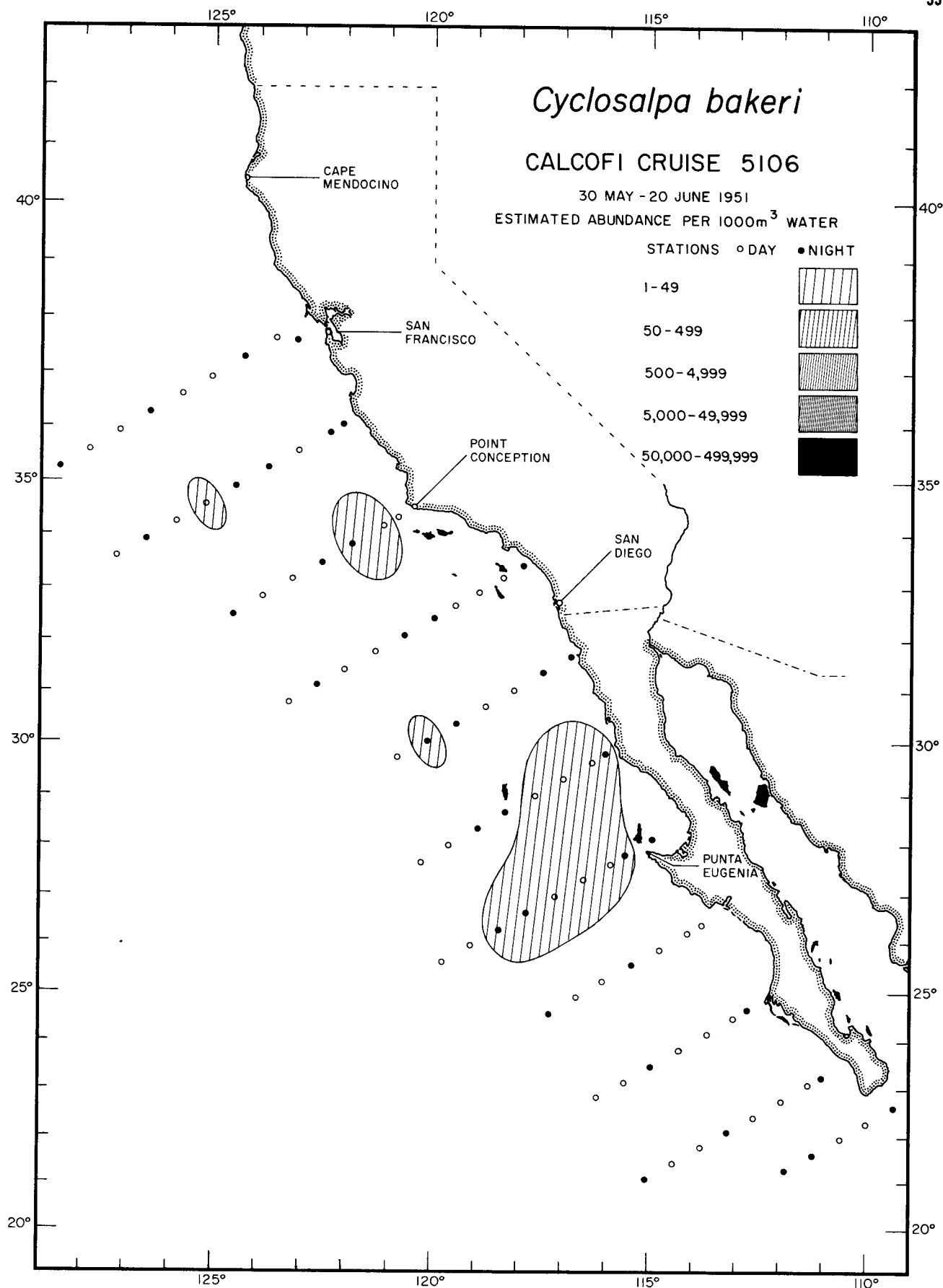
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Thaliacea
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5009

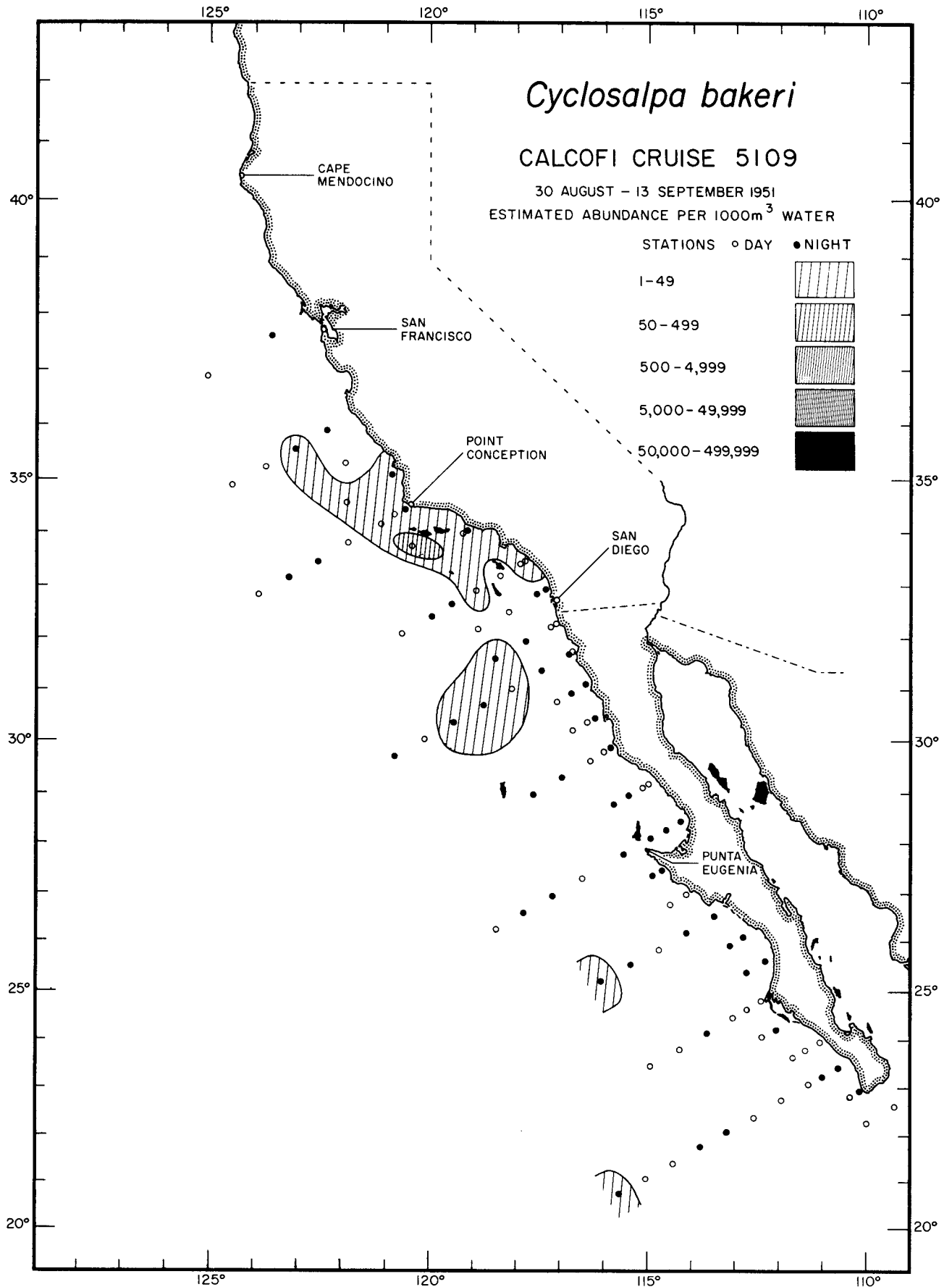


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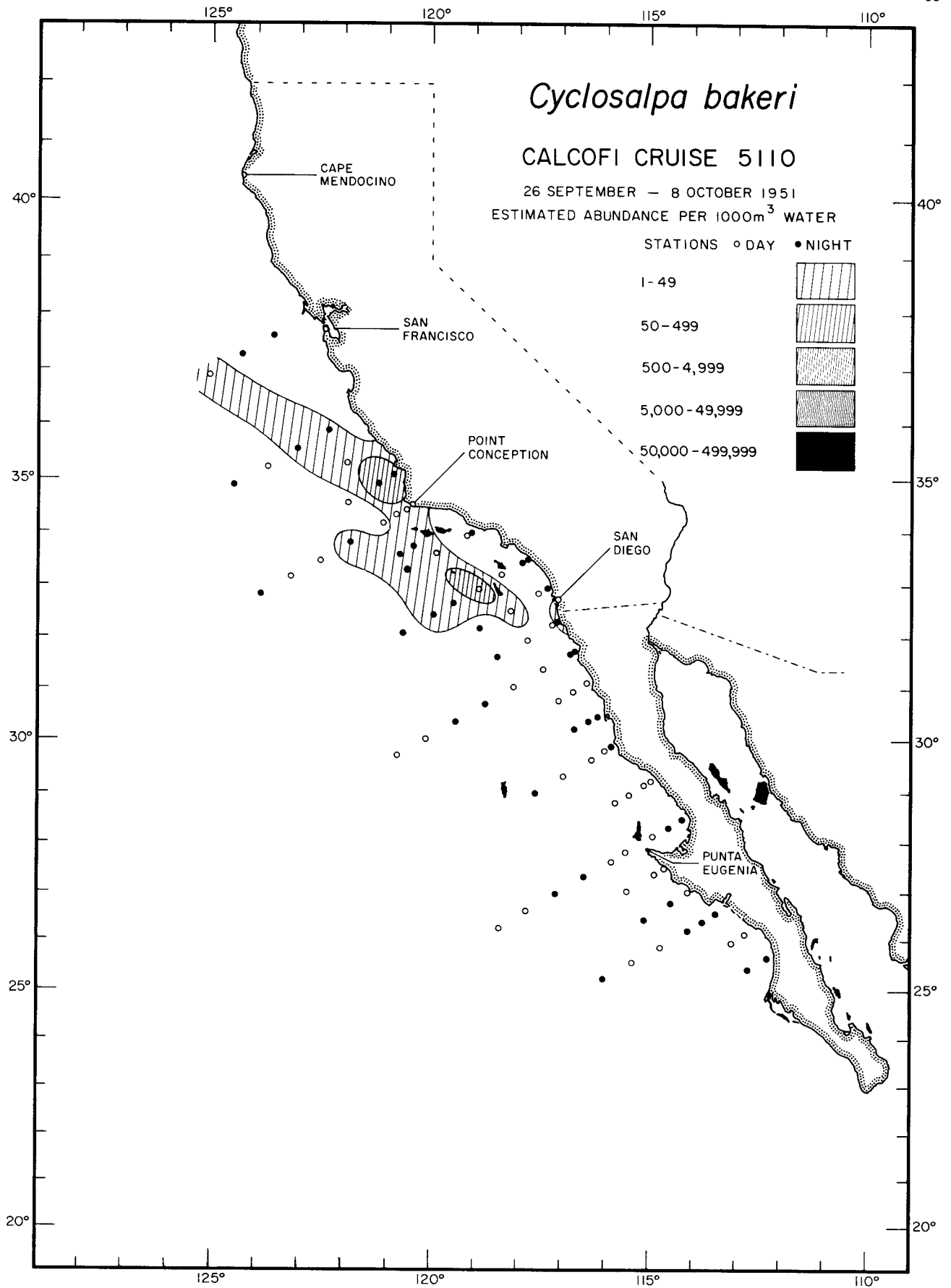
Thaliacea
Cyclosalpa bakeri

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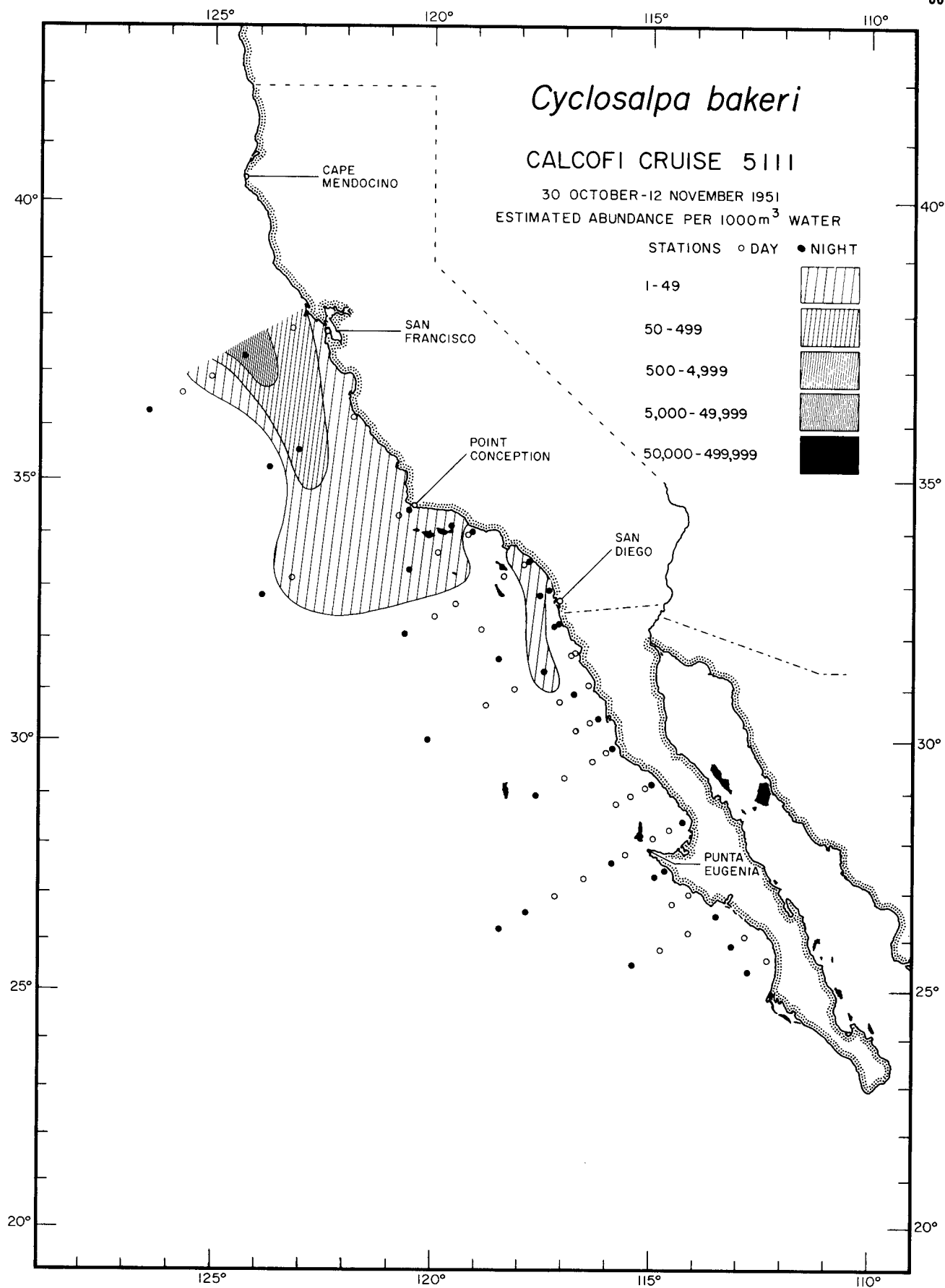


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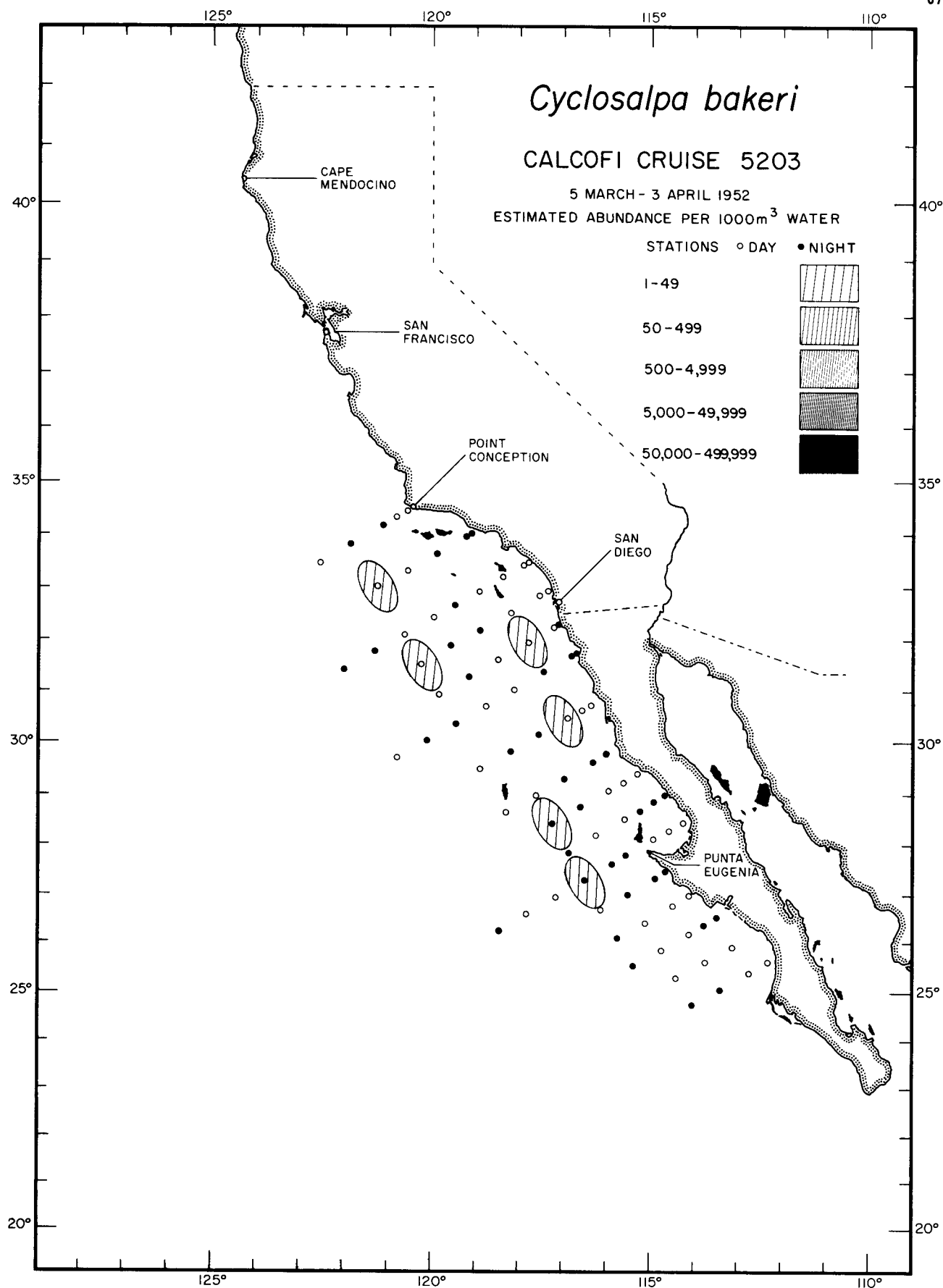


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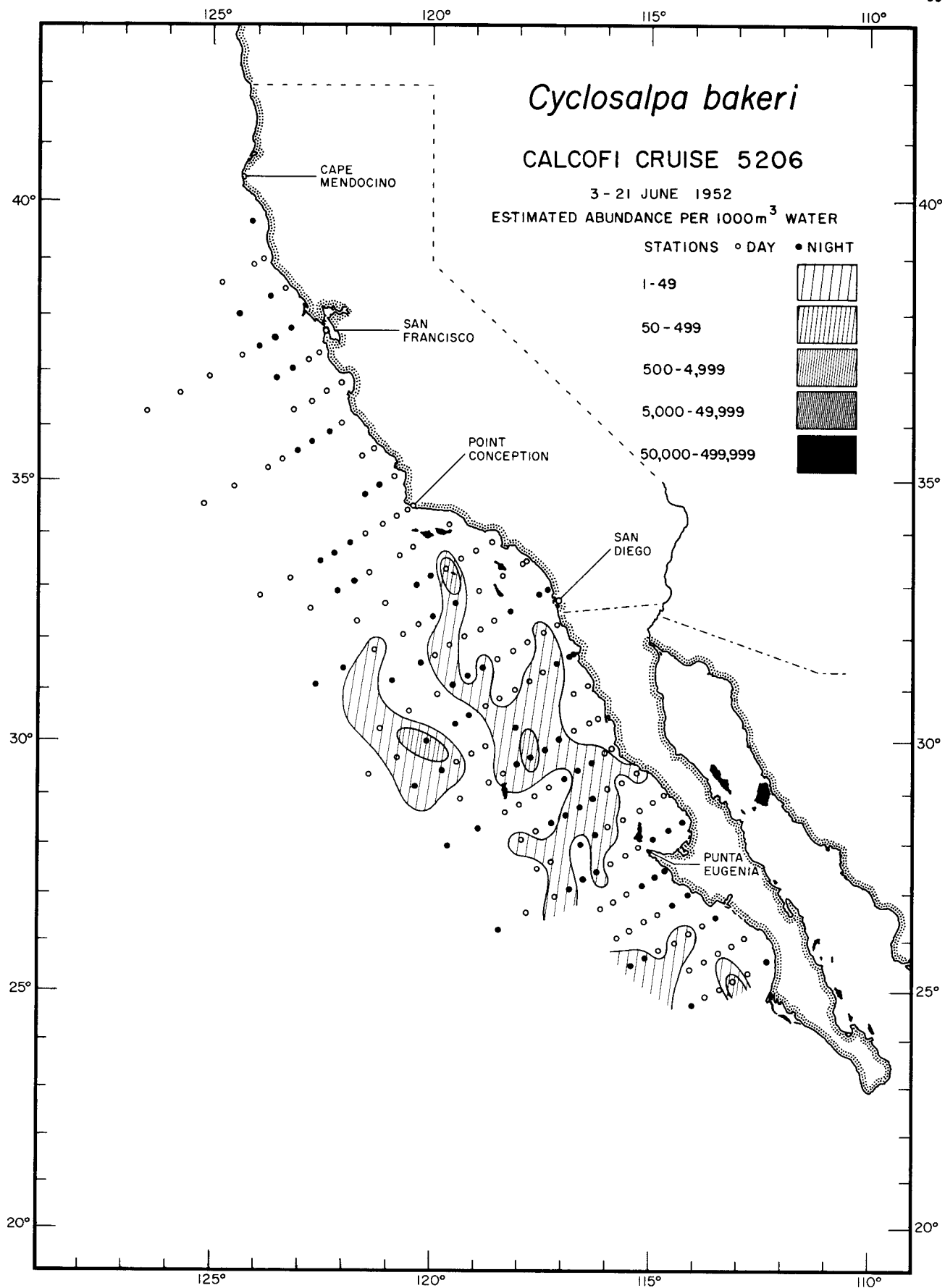
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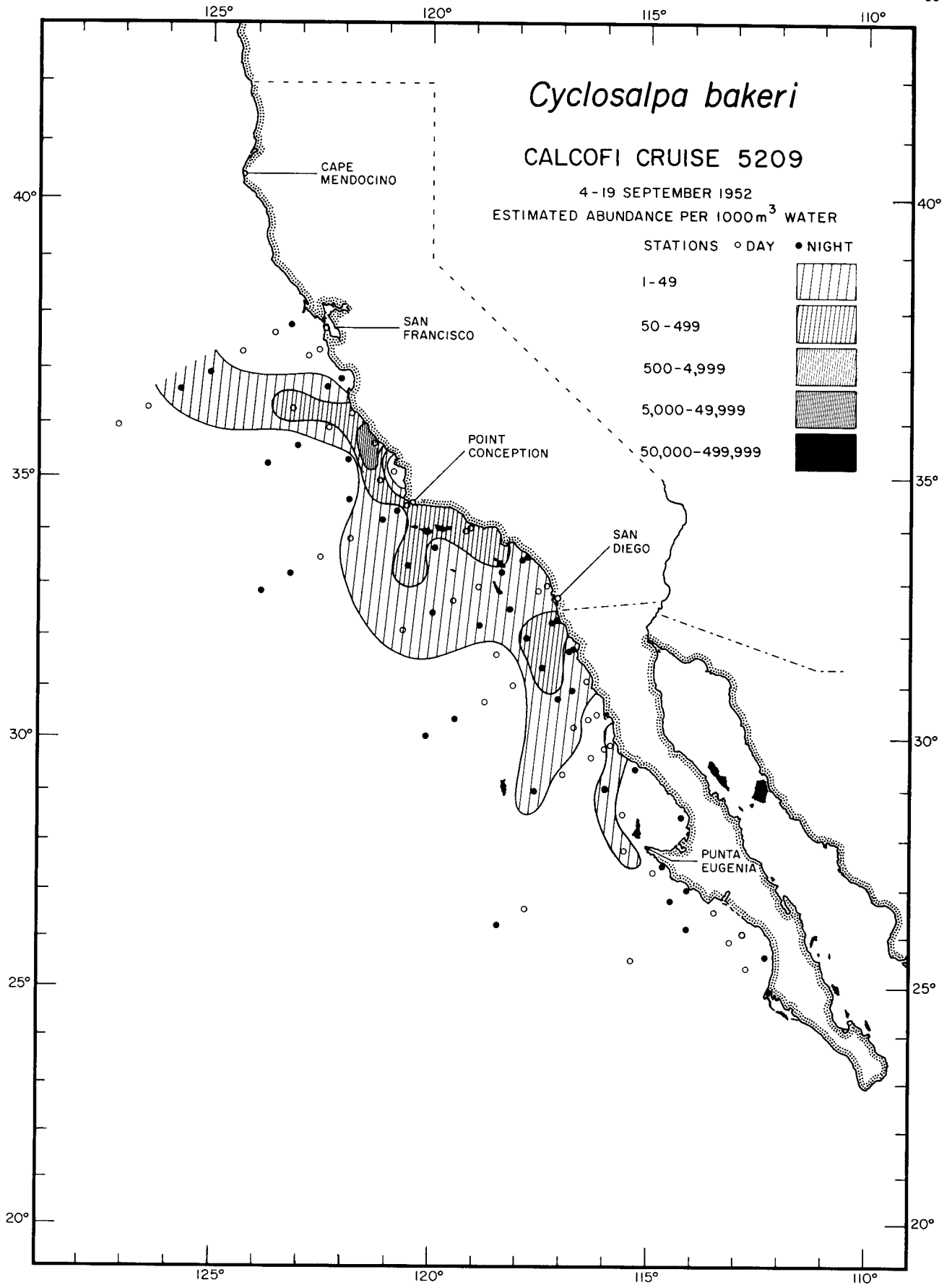
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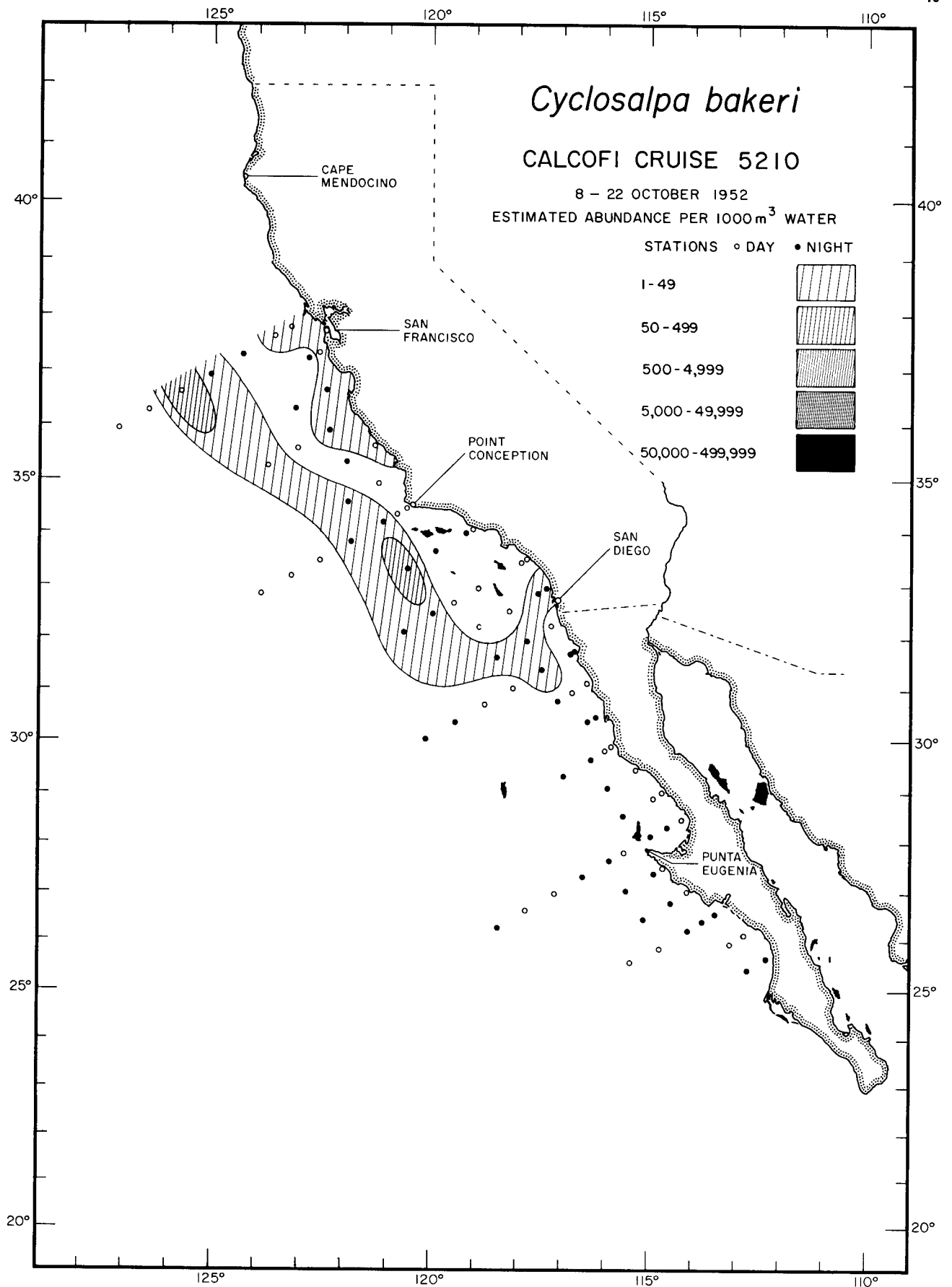
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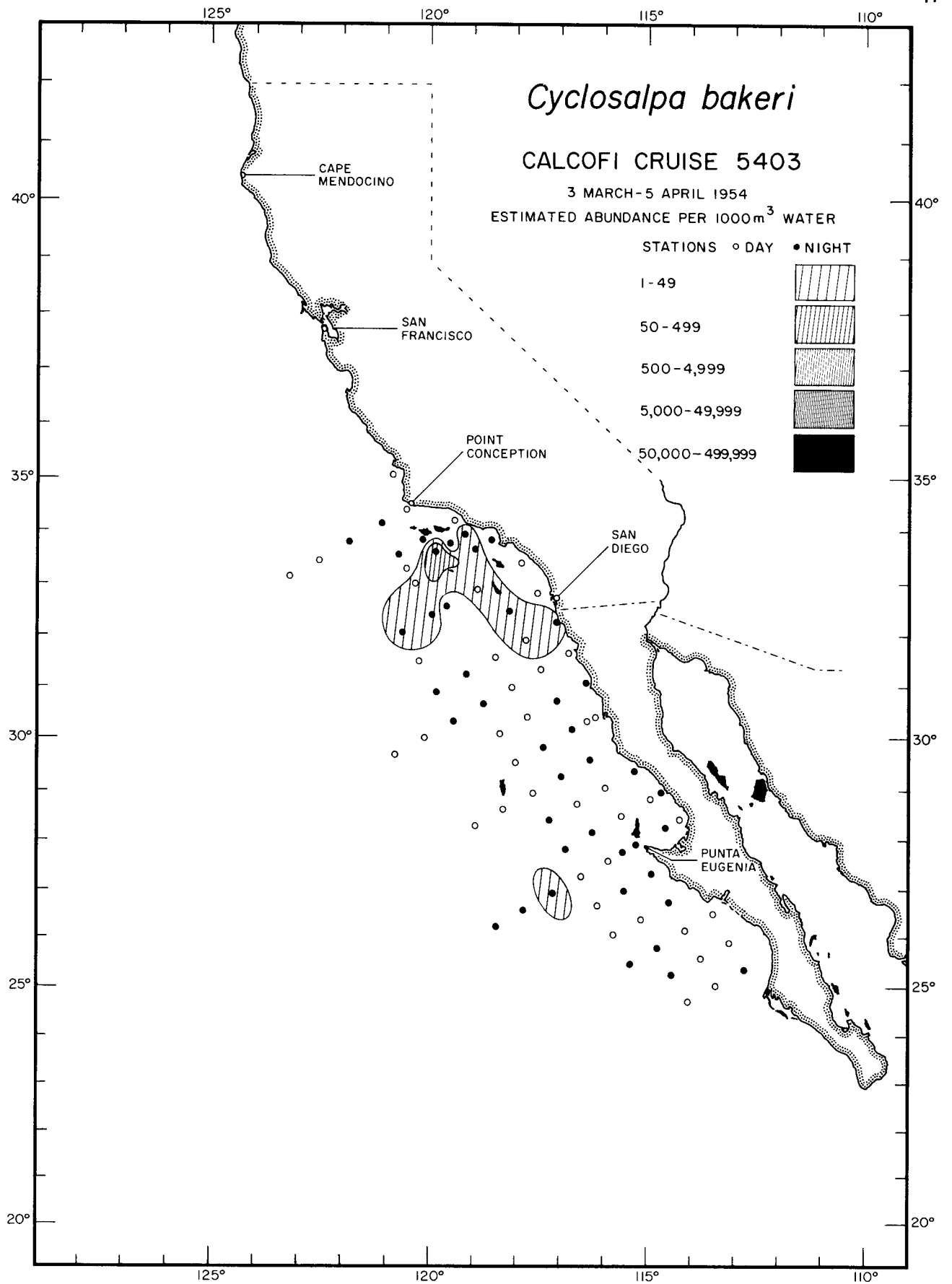
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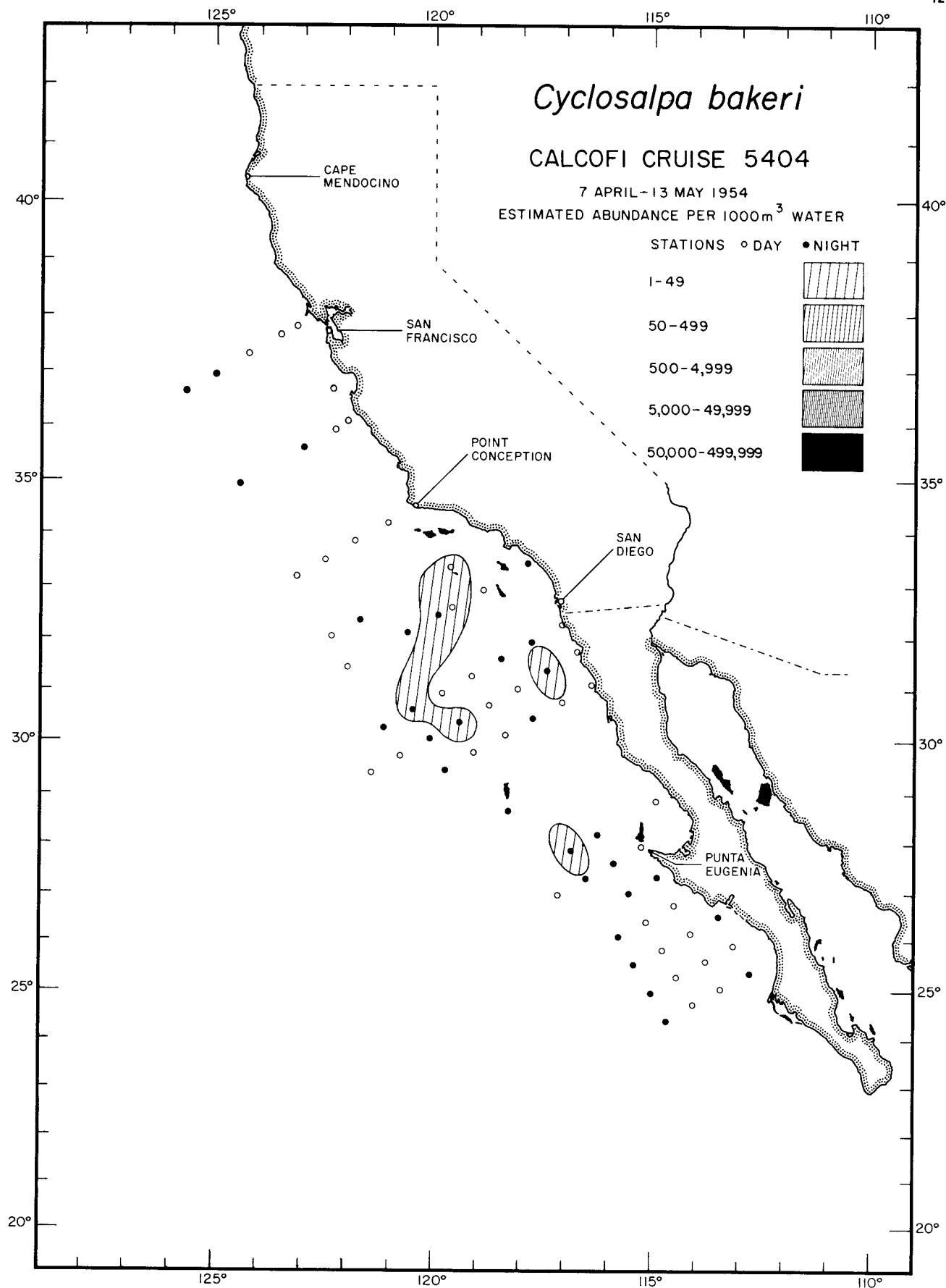
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5210

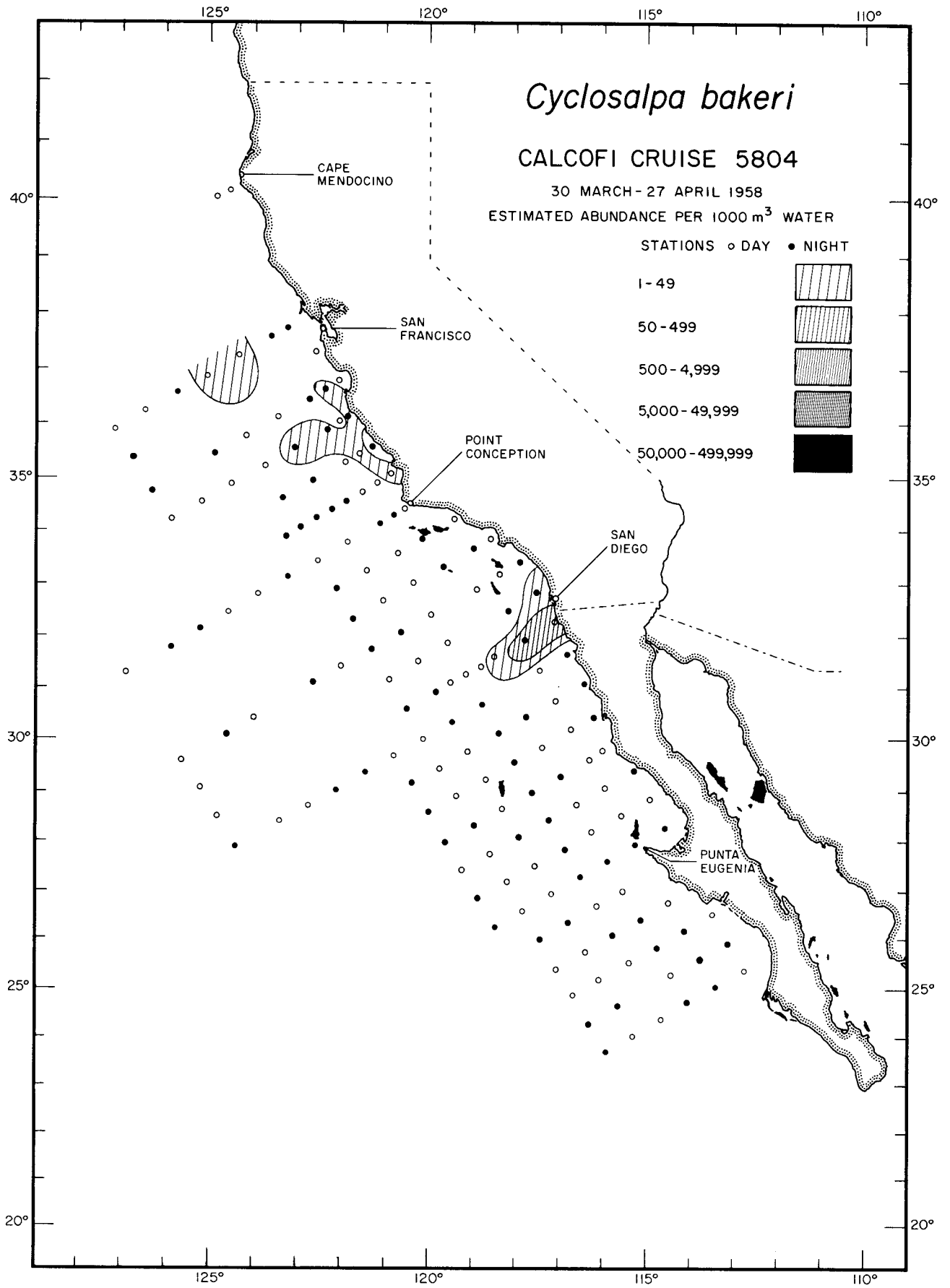


Thaliacea
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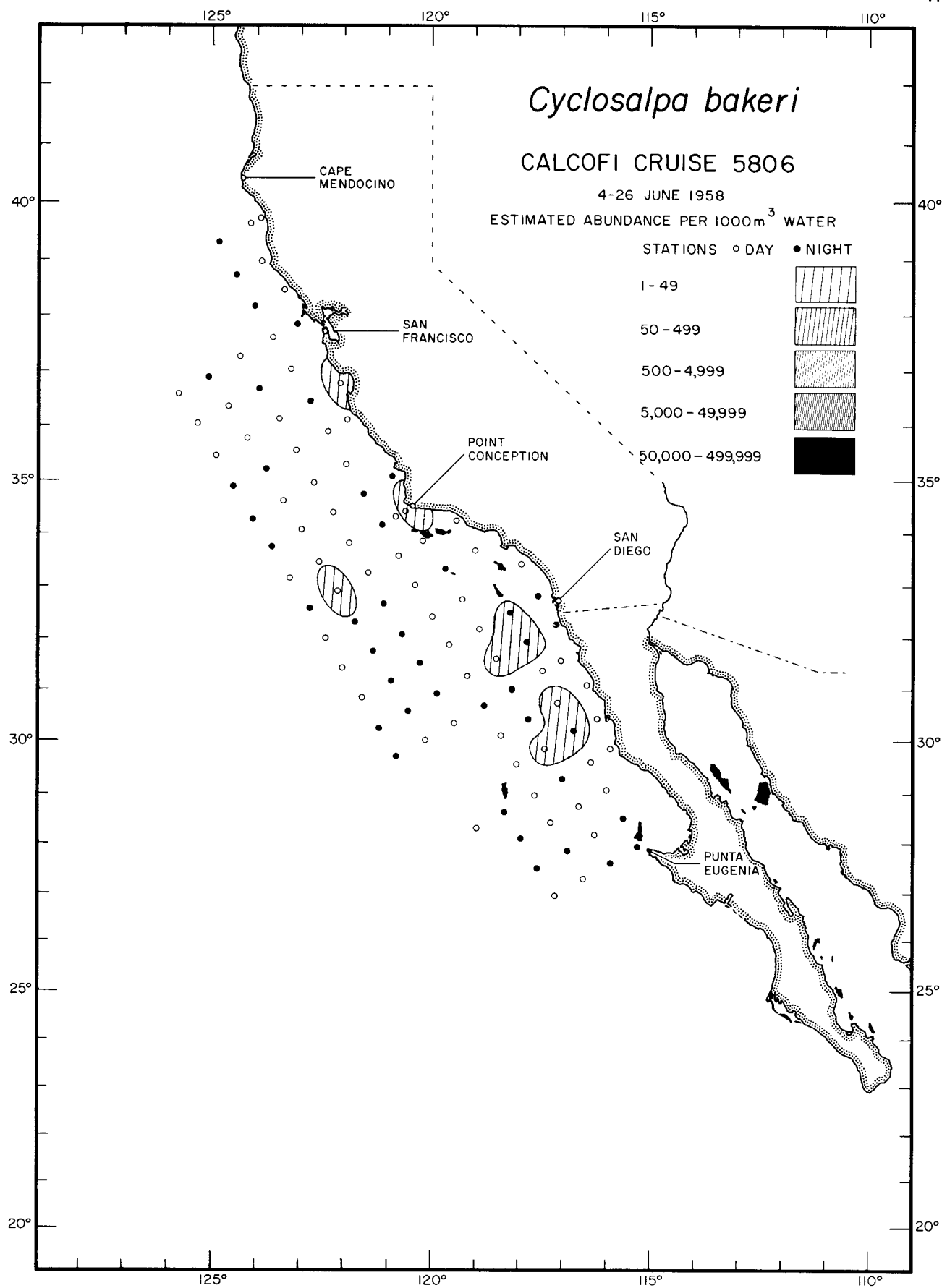
5403



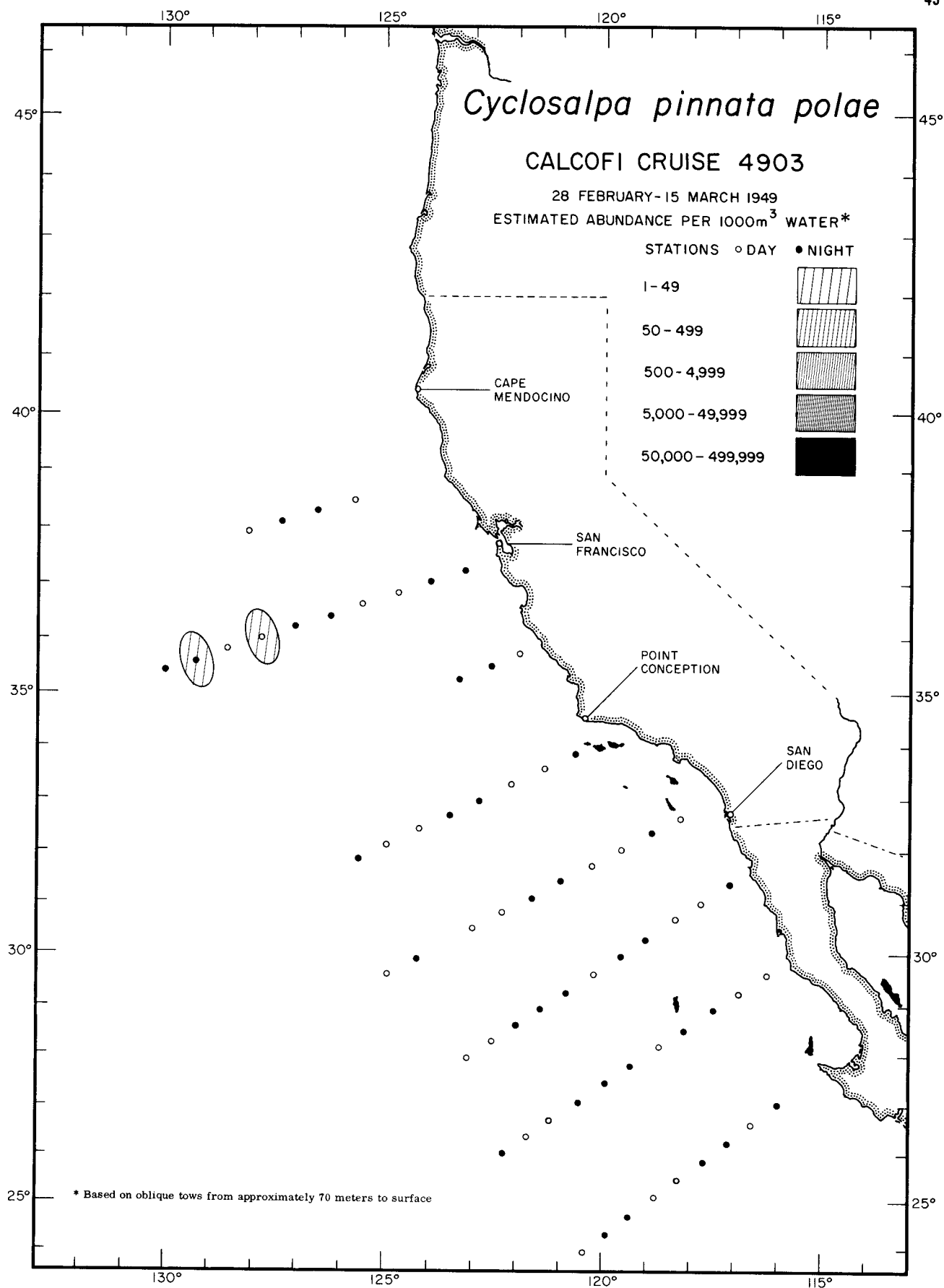
Thaliacea
Cyclosalpa bakeri
5404



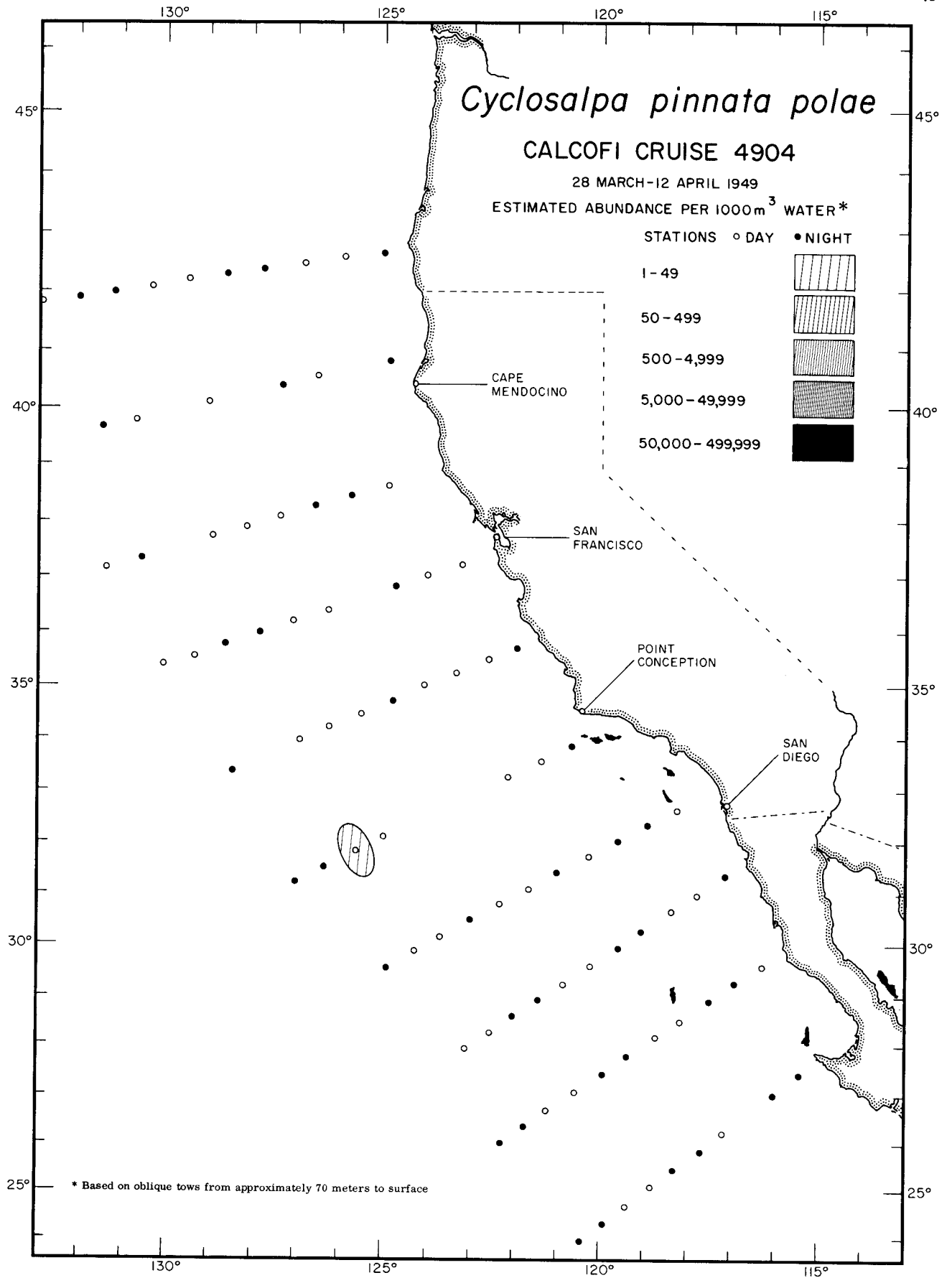
Thaliacea
Cyclosalpa bakeri
5804



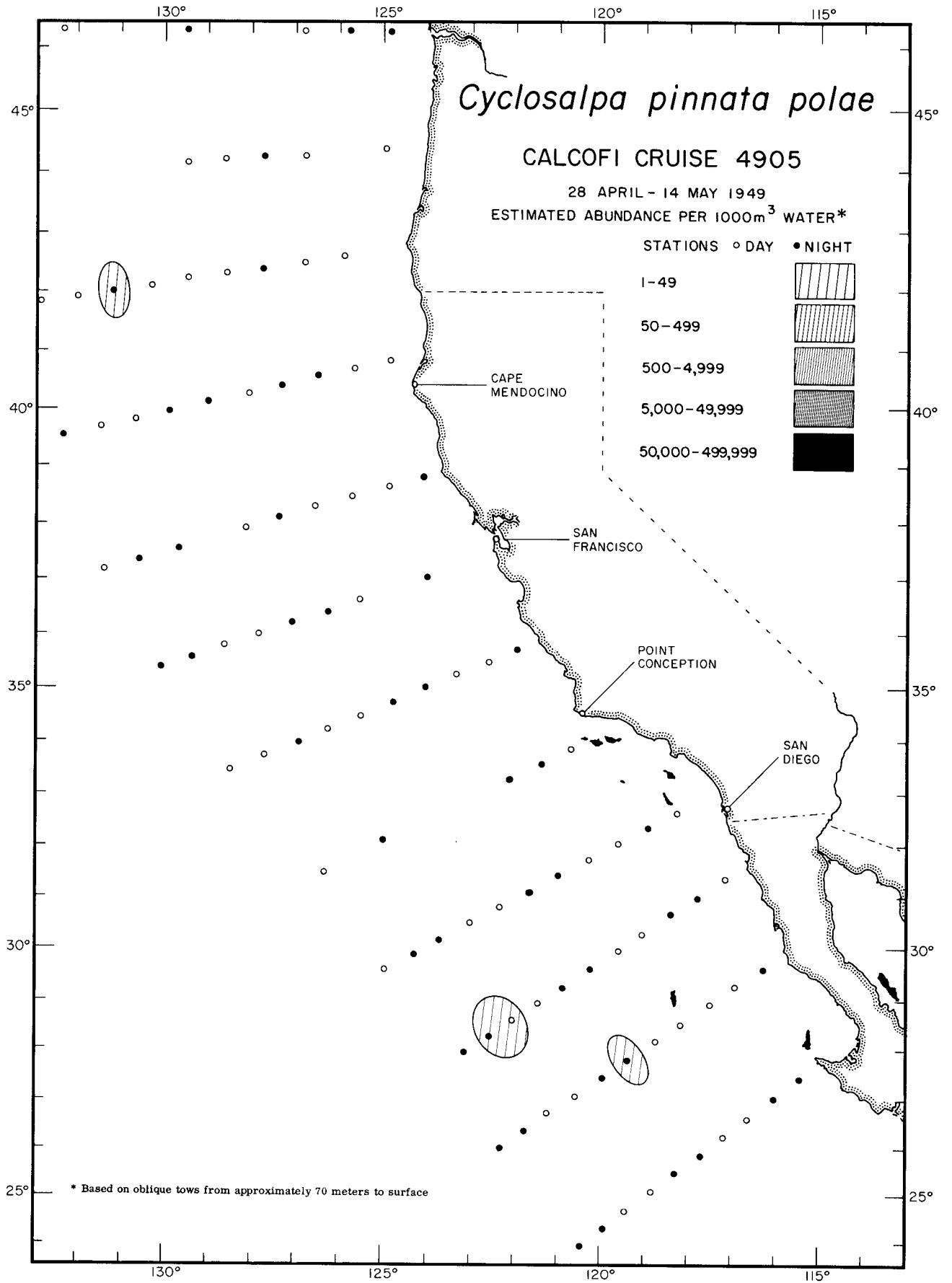
Thaliacea
Cyclosalpa bakeri
 5806



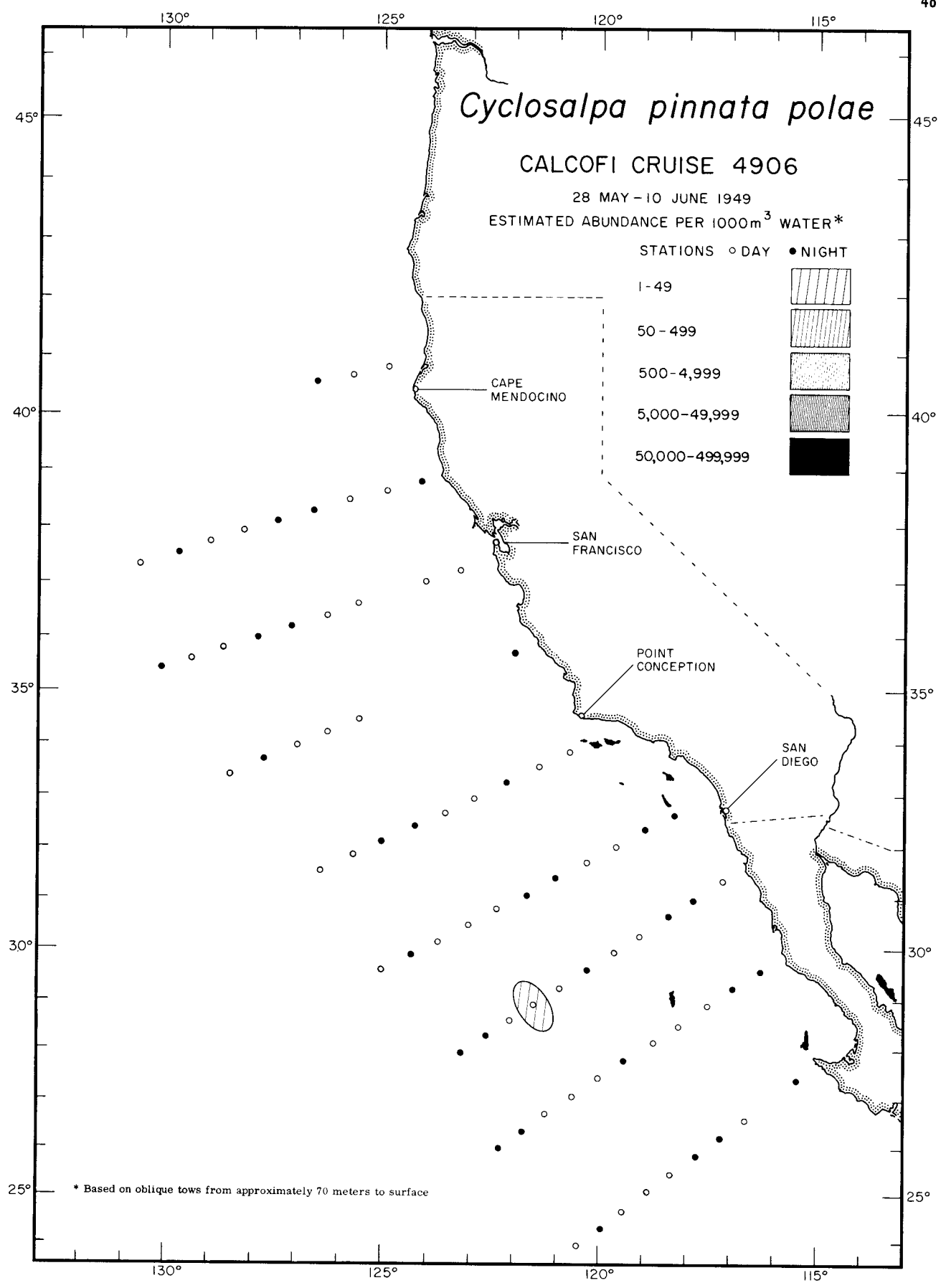
Thaliacea
Cyclosalpa pinnata polae
4903



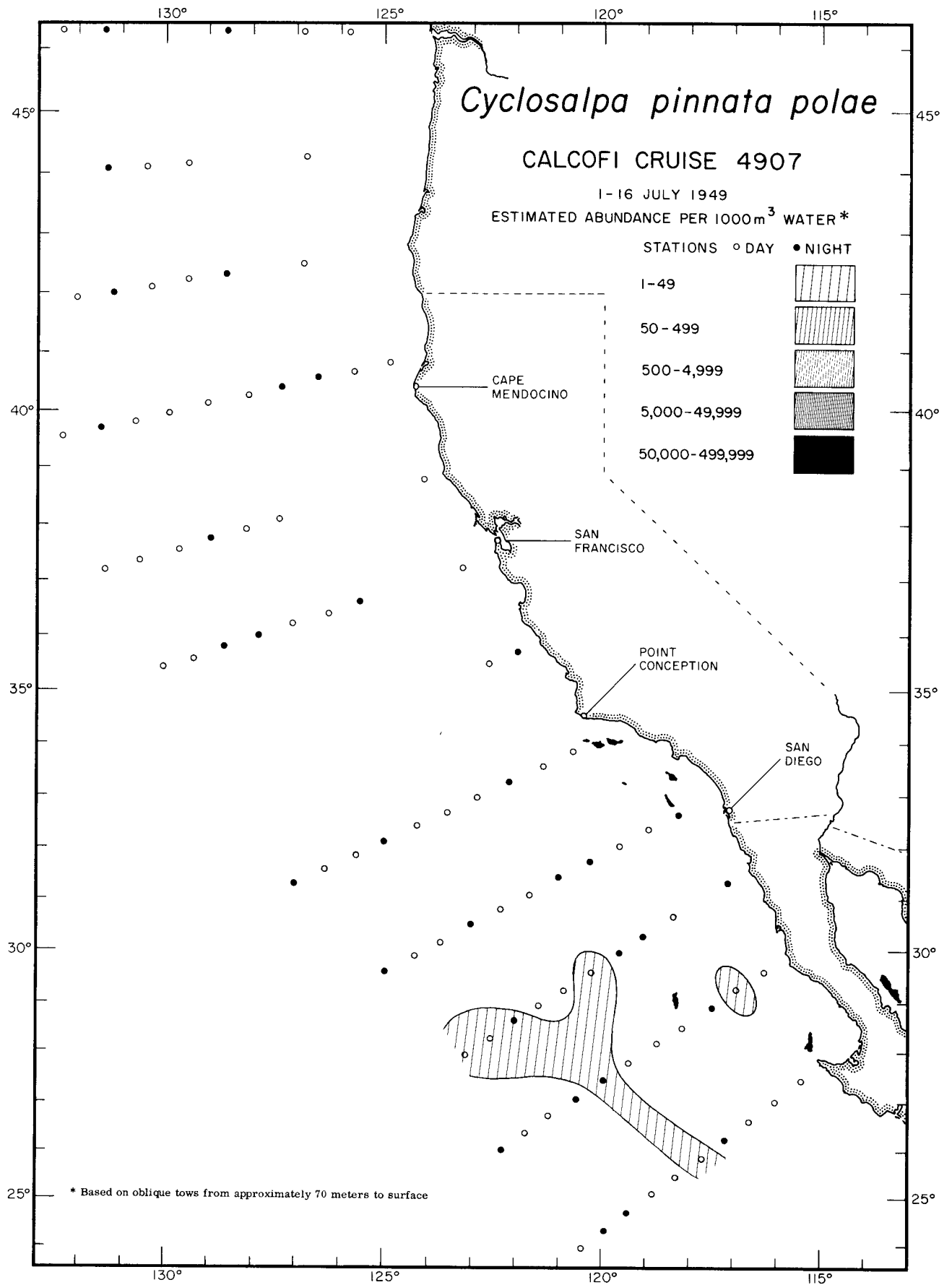
Thaliacea
Cyclosalpa pinnata polae
4904



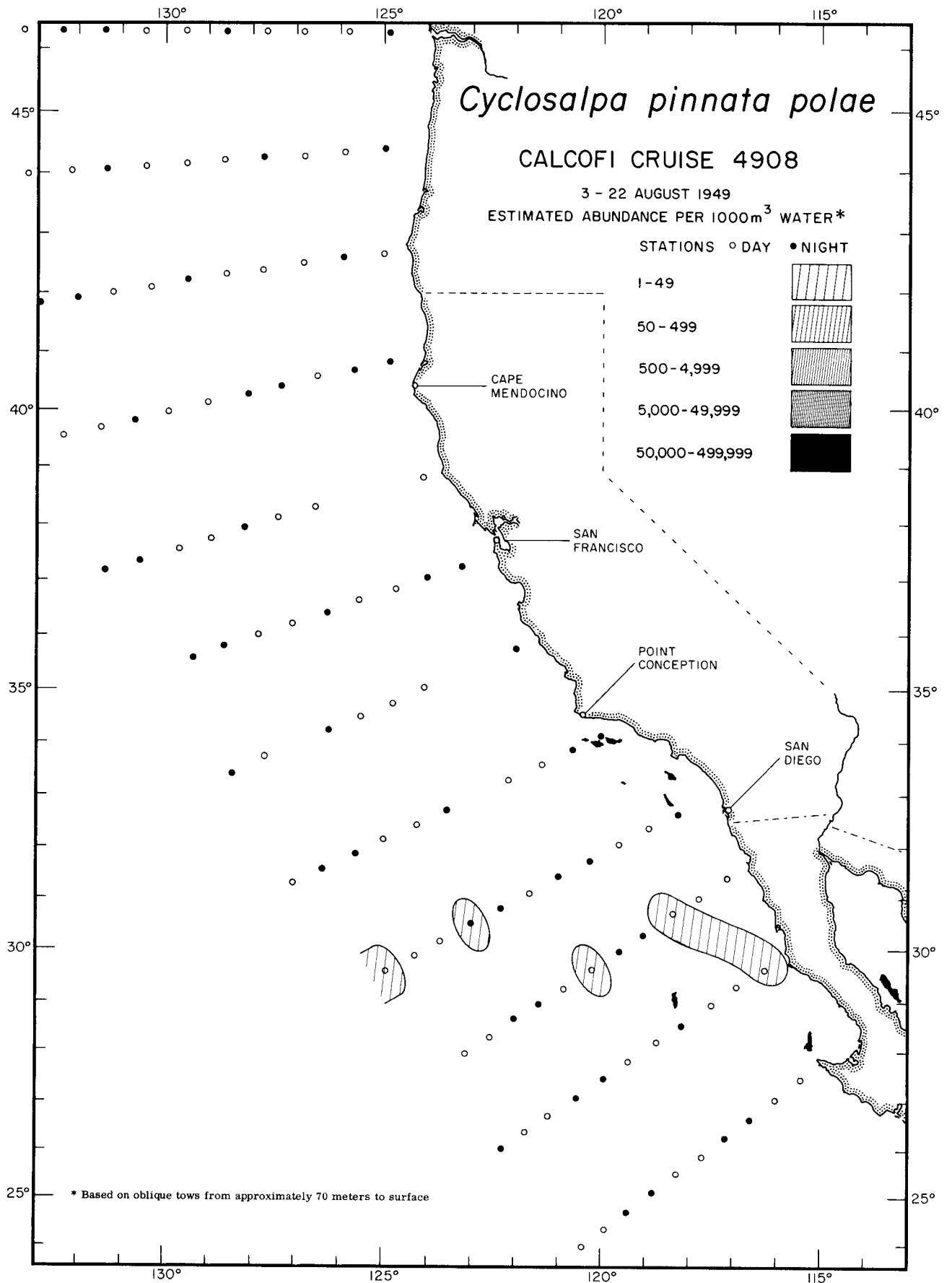
Thaliacea
Cyclosalpa pinnata polae
4905



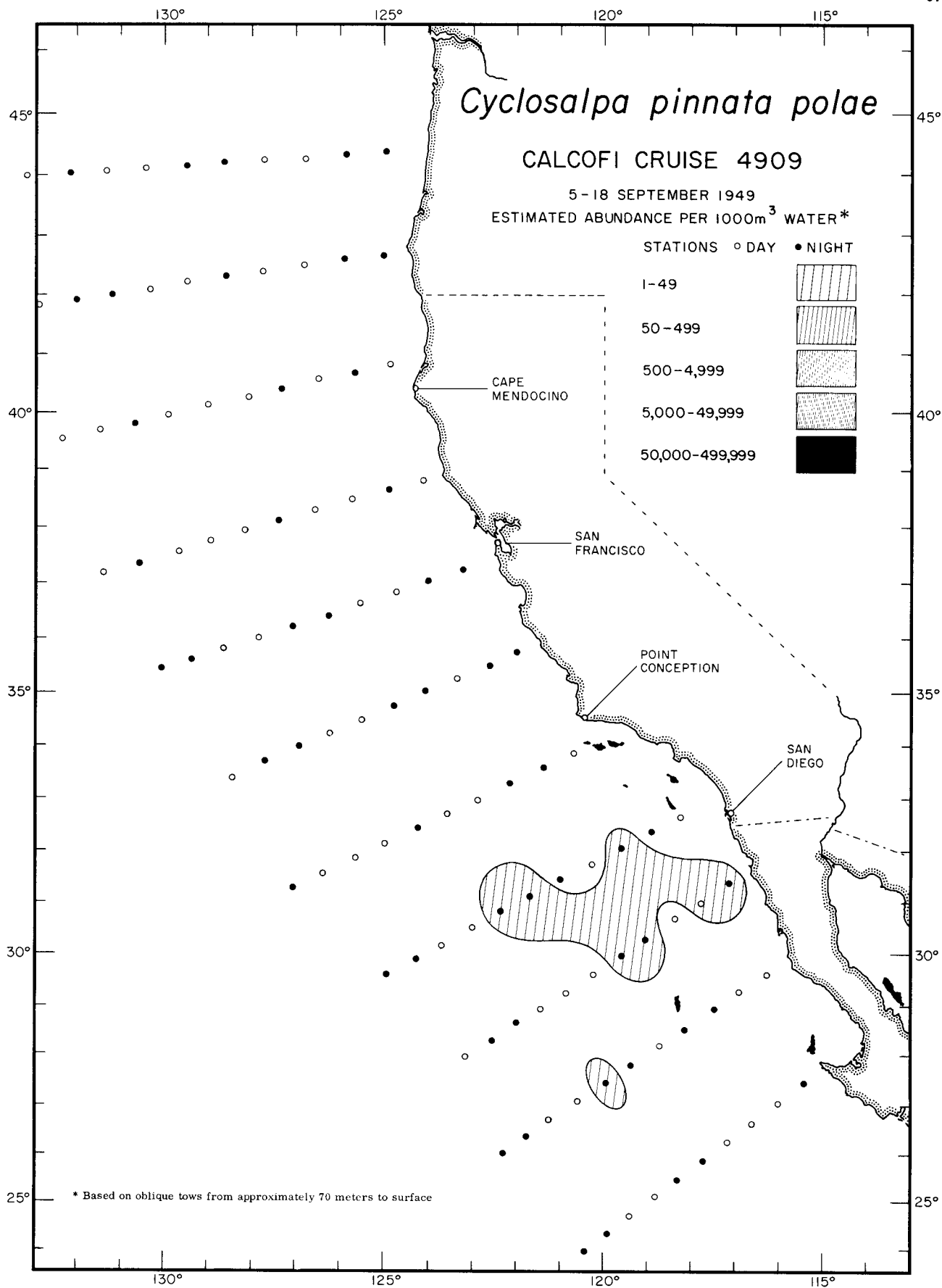
Thaliacea
Cyclosalpa pinnata polae
4906



Thaliacea
Cyclosalpa pinnata polae
4907

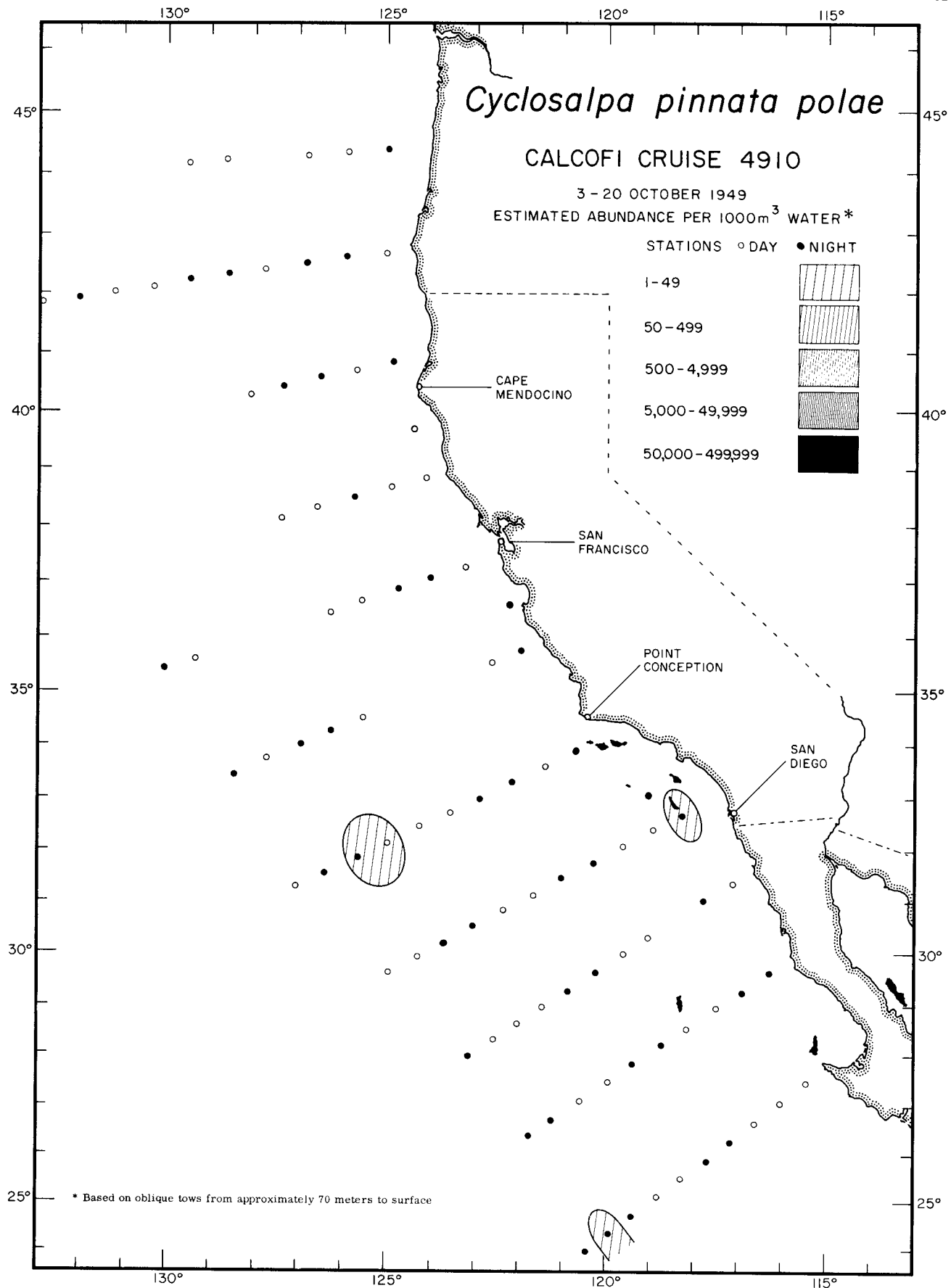


Thaliacea
Cyclosalpa pinnata polae
 4908

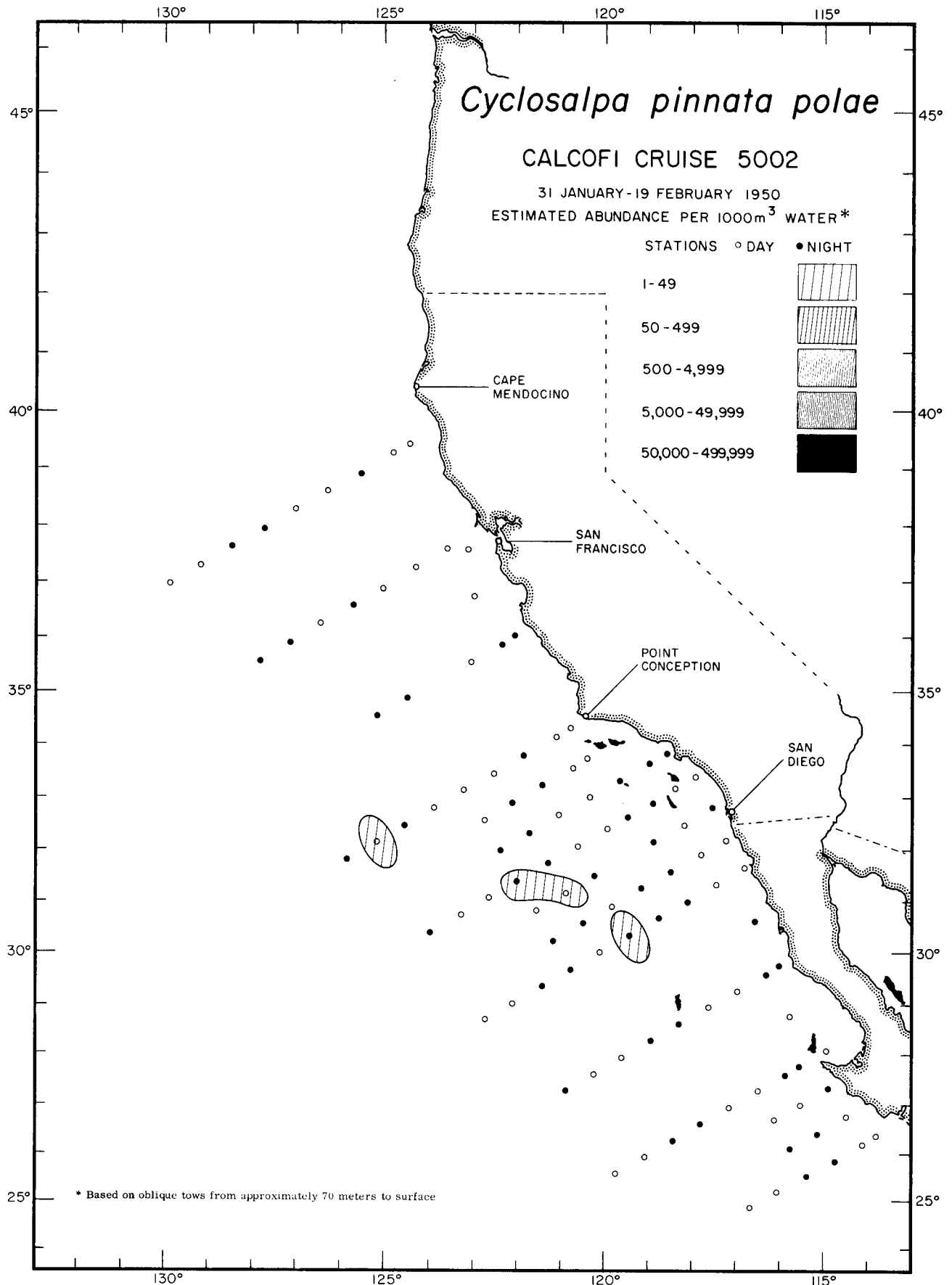


Thaliacea

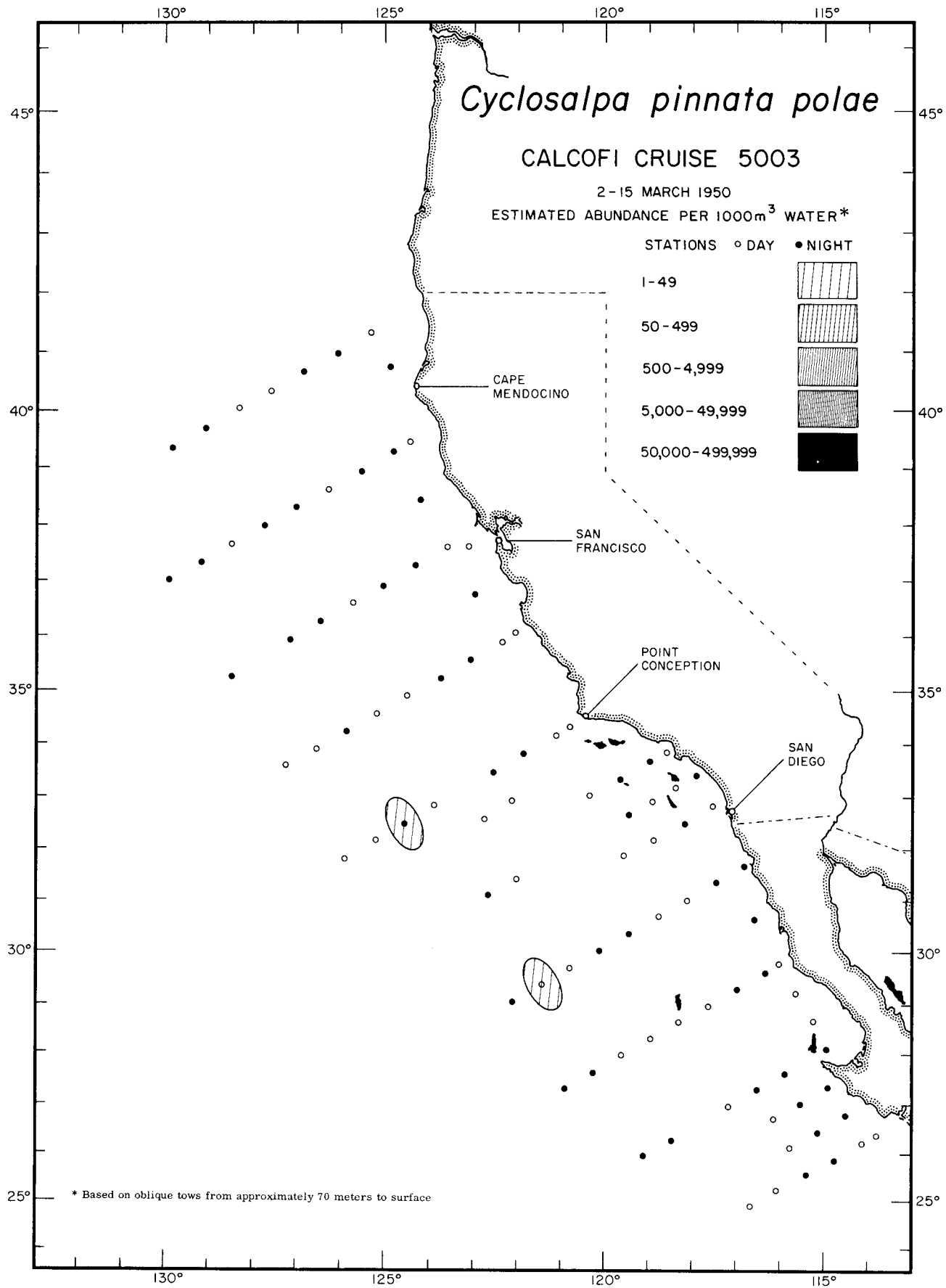
Cyclosalpa pinnata polae
4909



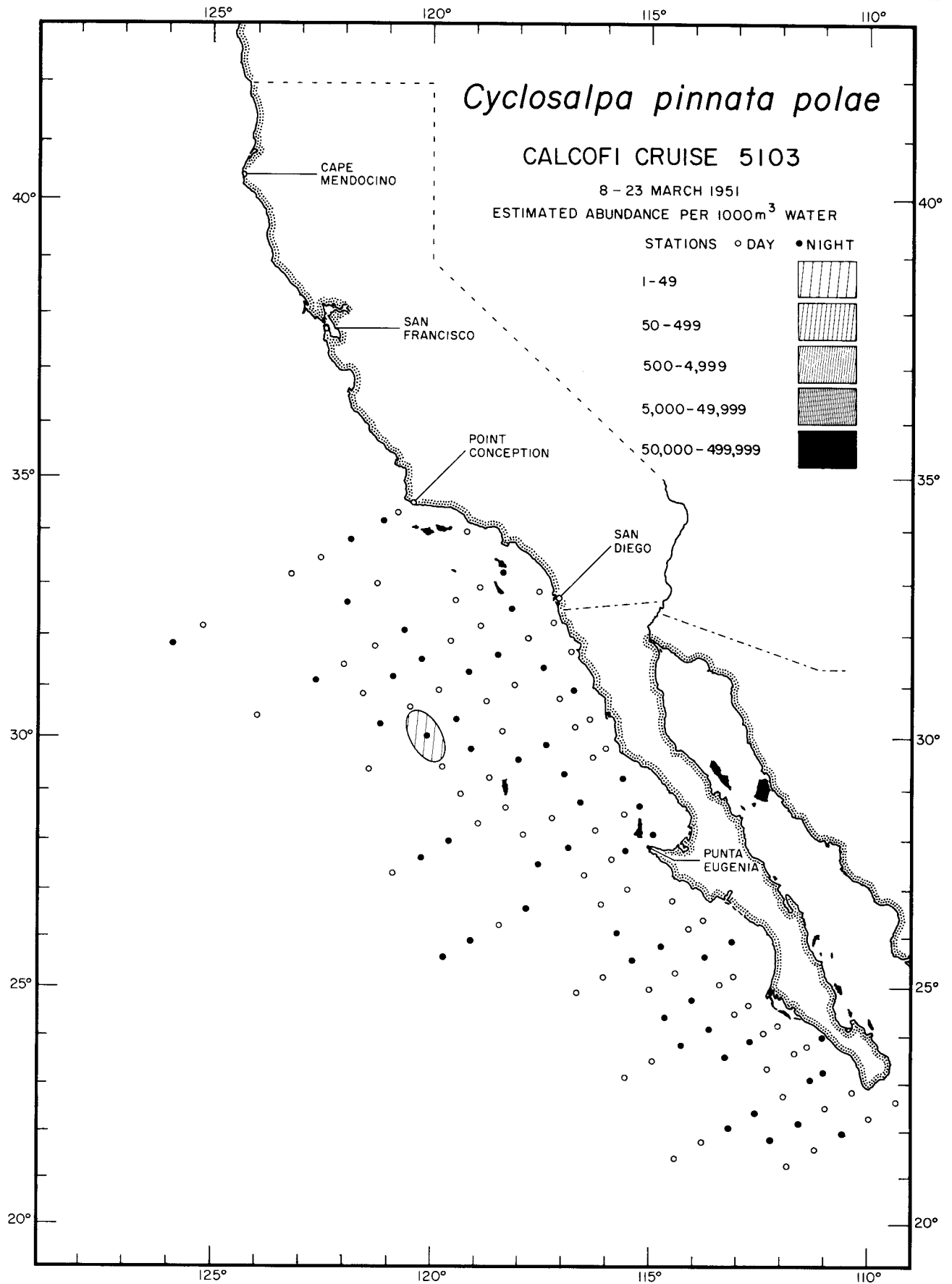
Thaliacea
Cyclosalpa pinnata polae
 4910



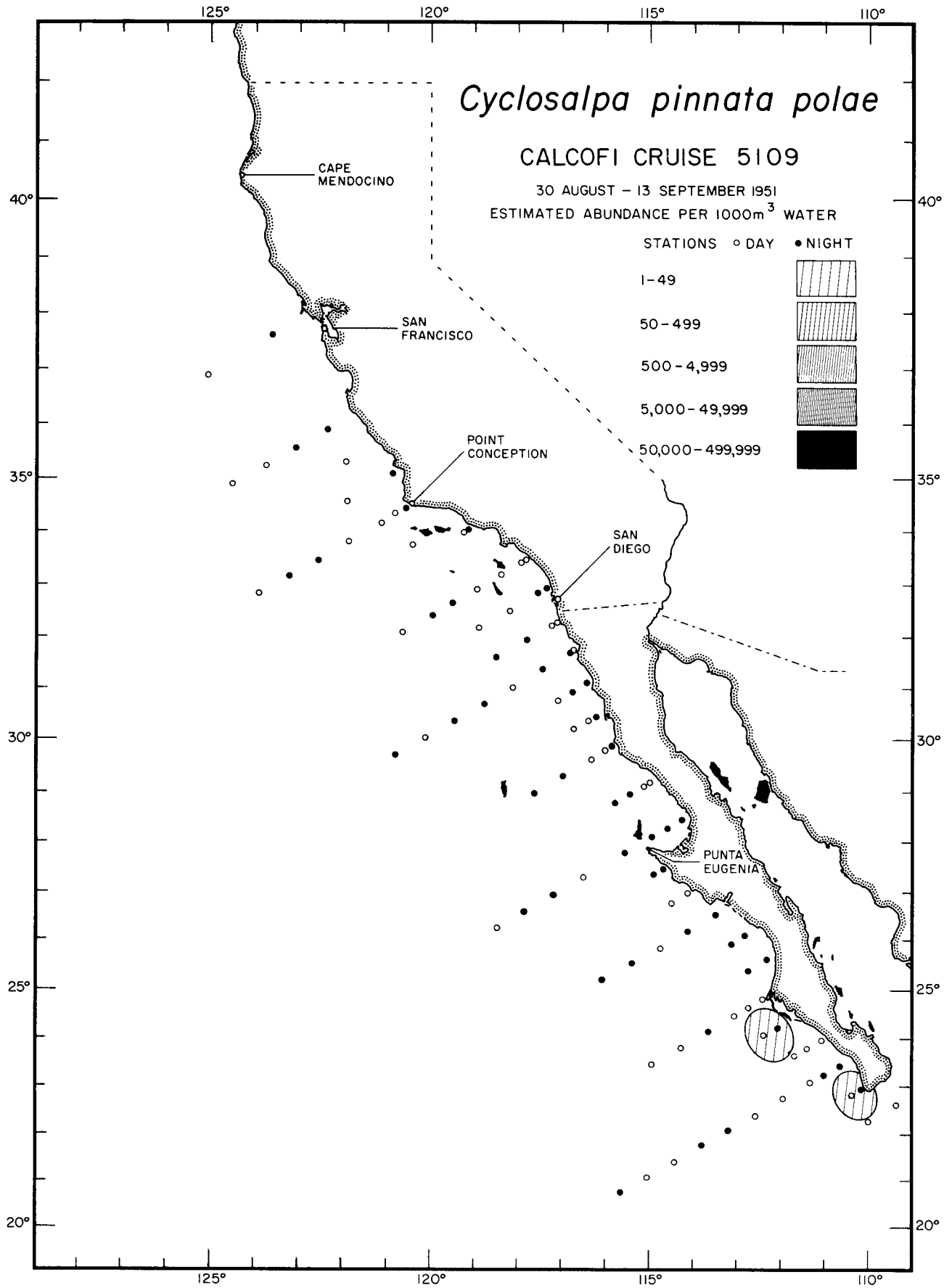
Thaliacea
Cyclosalpa pinnata polae
 5002



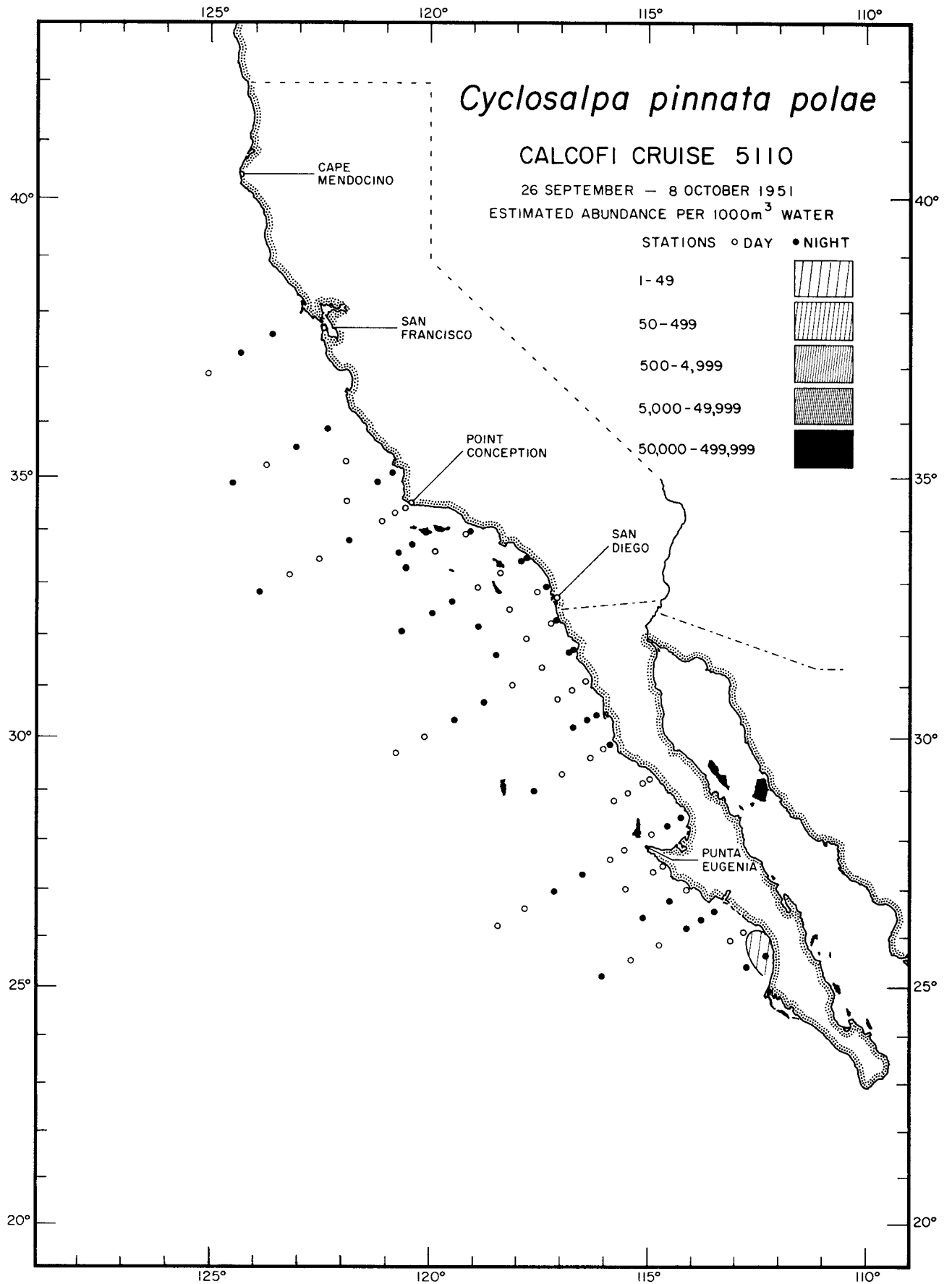
Thaliacea
Cyclosalpa pinnata polae
5003



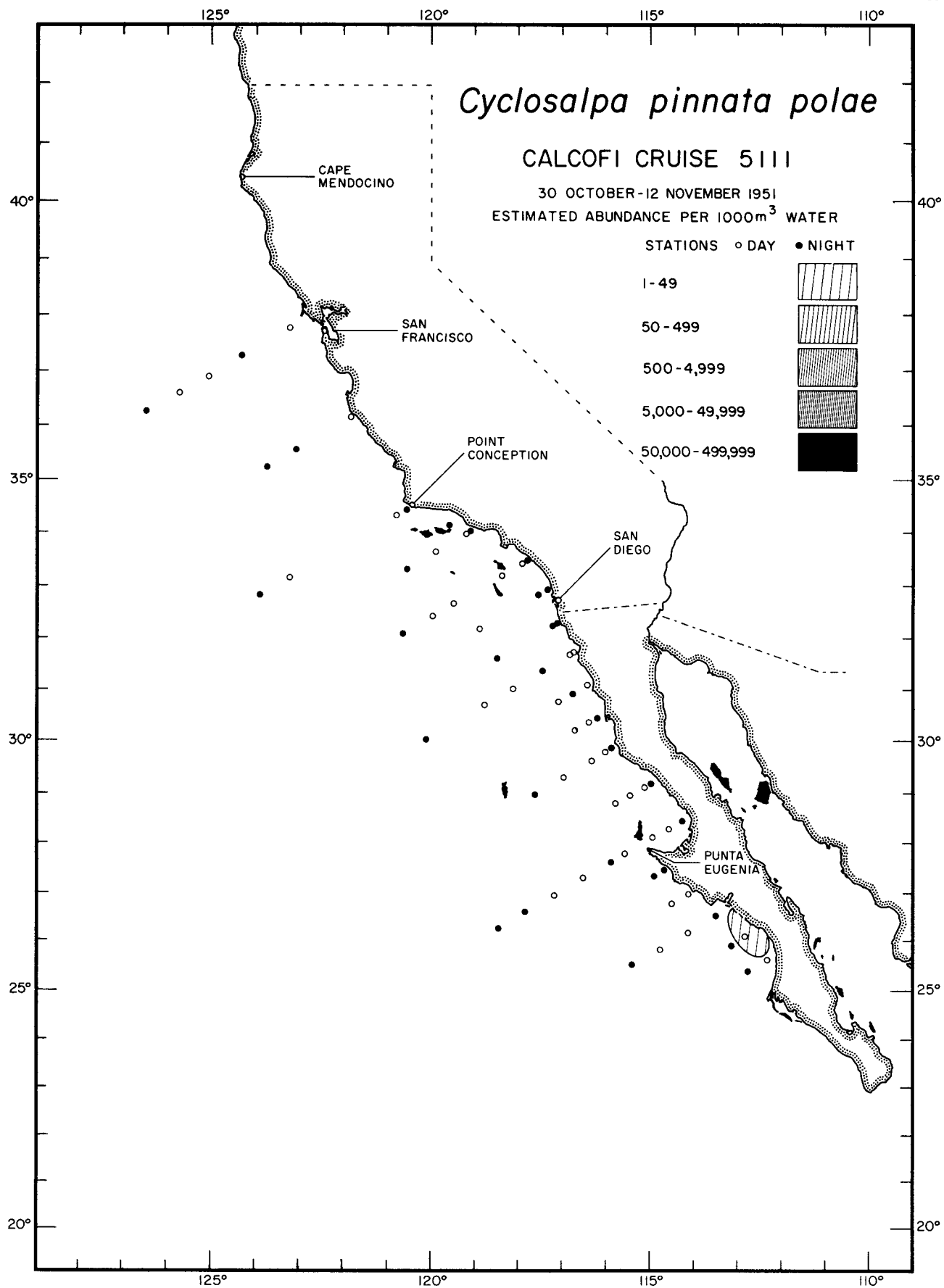
Thaliacea
Cyclosalpa pinnata polae
5103



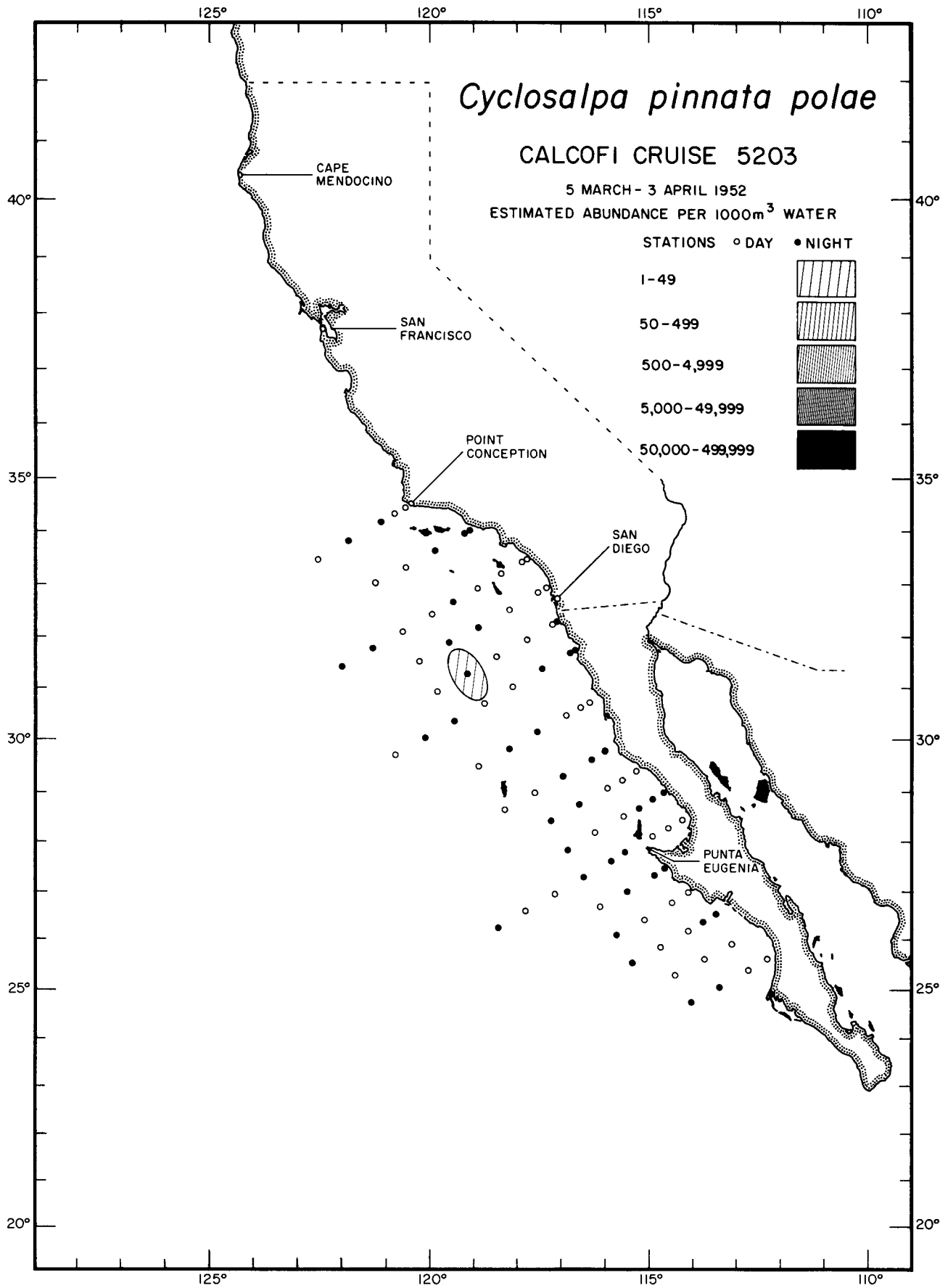
Thaliacea
Cyclosalpa pinnata polae
5109



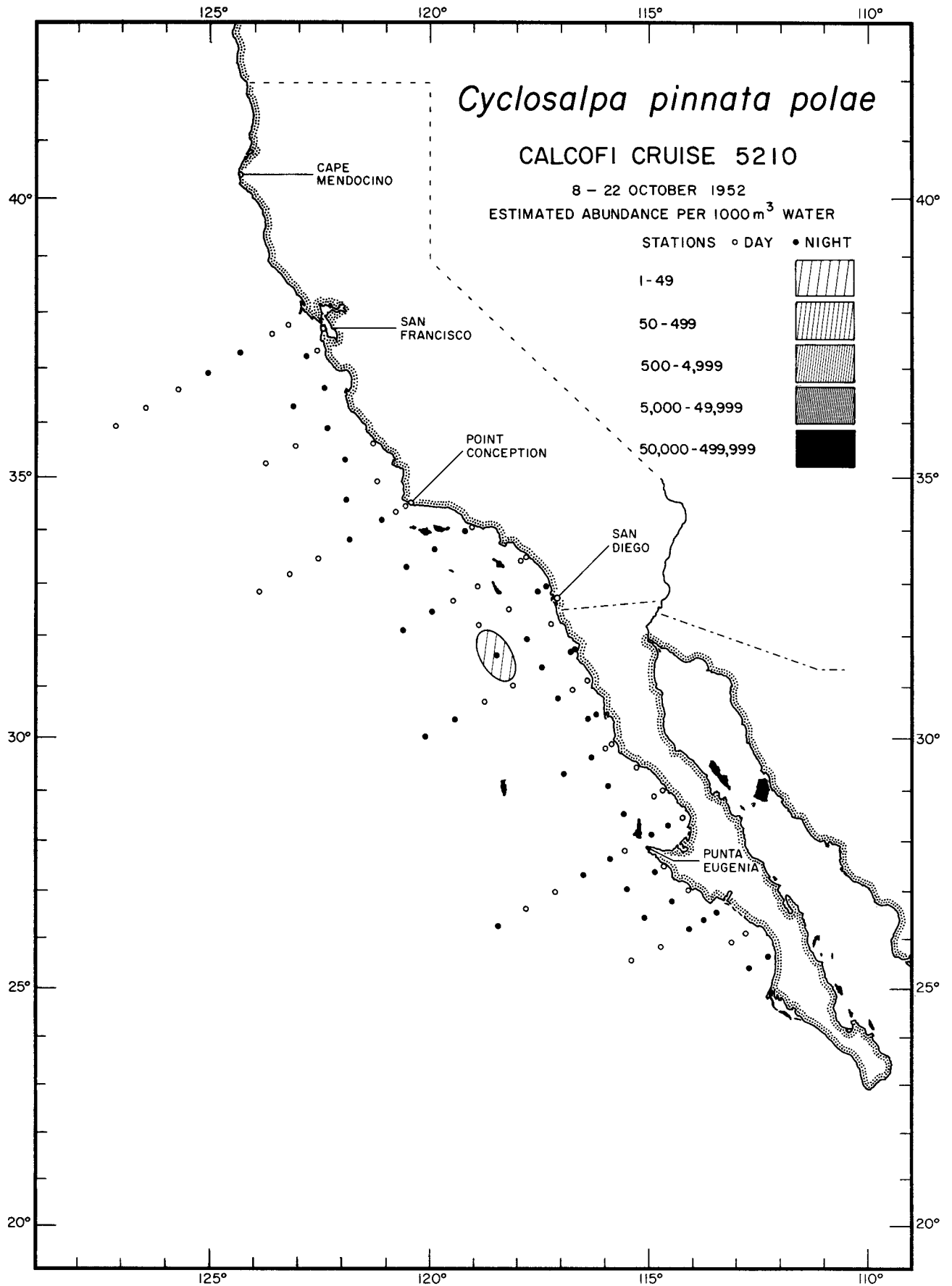
Thaliacea
Cyclosalpa pinnata polae
5110



Thaliacea
Cyclosalpa pinnata polae
5111



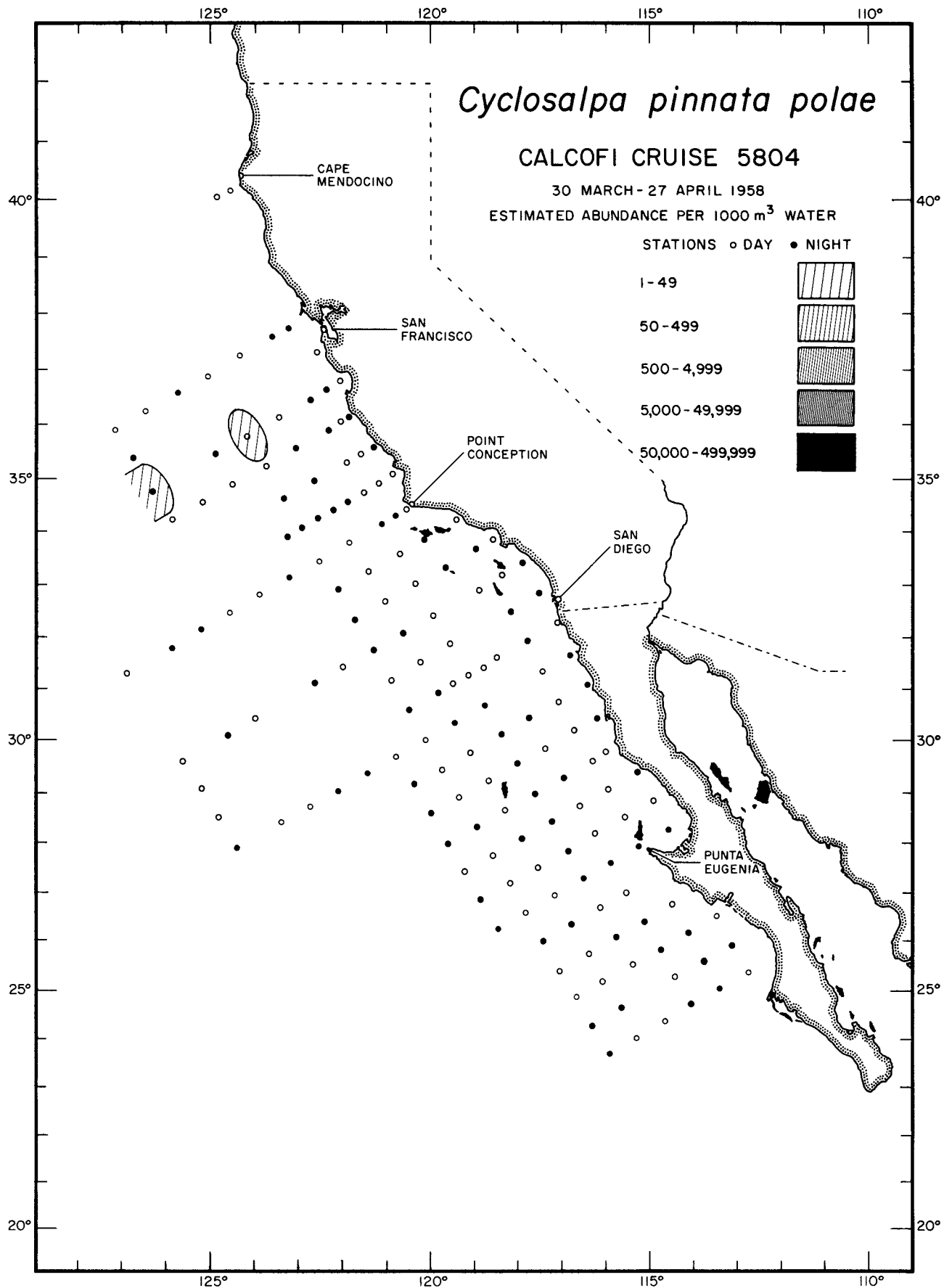
Thaliacea
Cyclosalpa pinnata polae
5203



Thaliacea

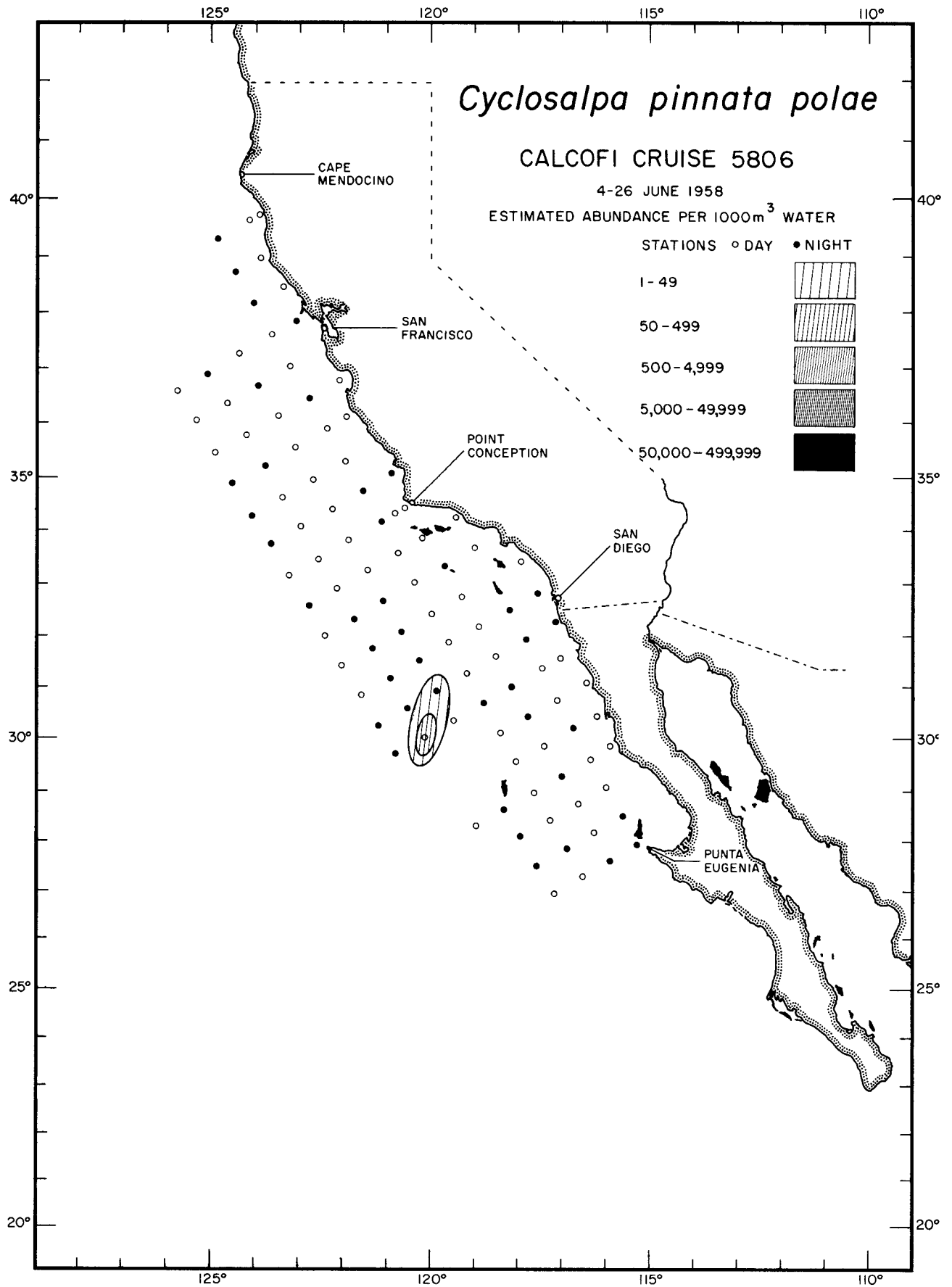
Cyclosalpa pinnata polae

5210

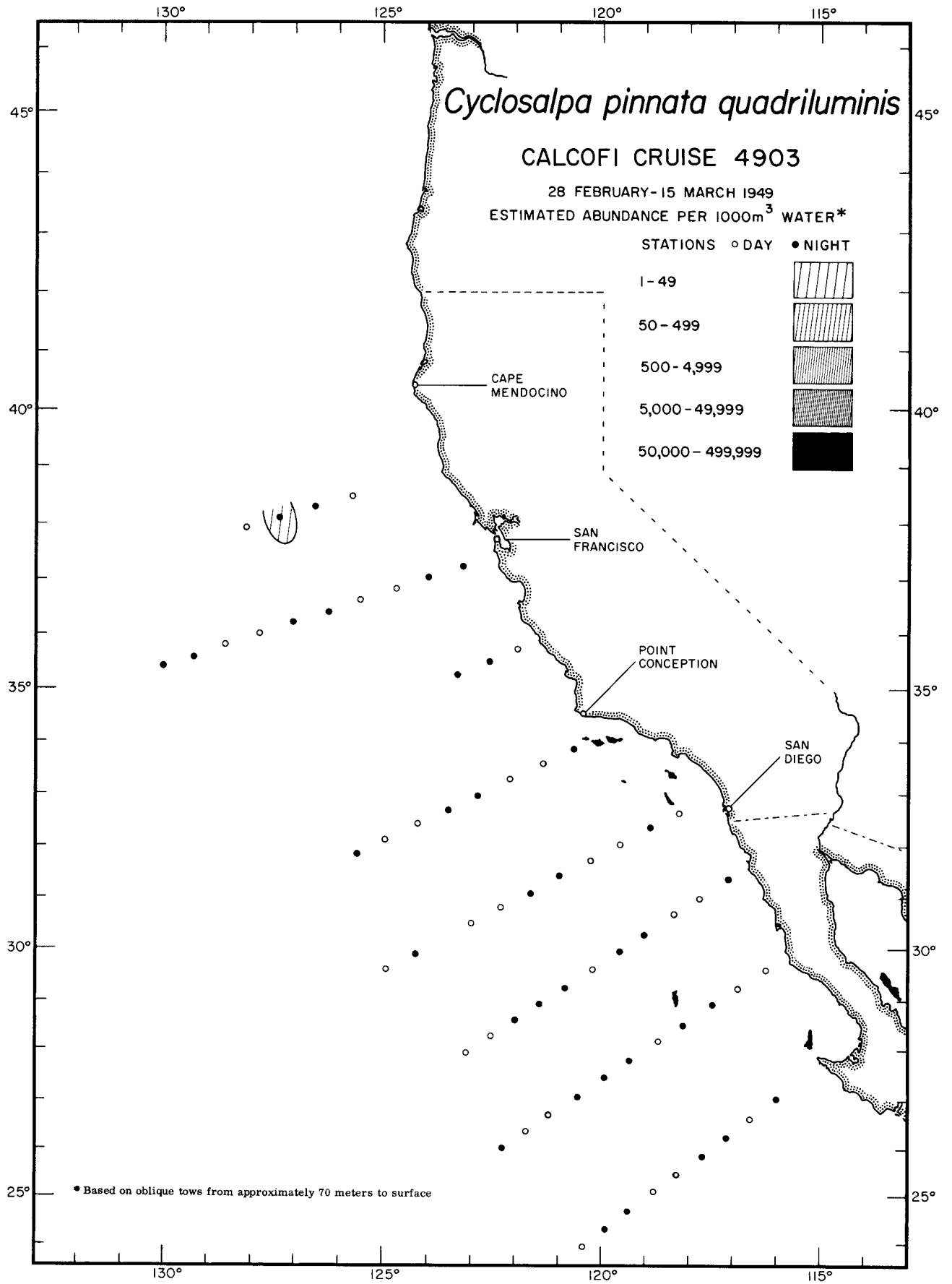


Thaliacea

Cyclosalpa pinnata polae
5804



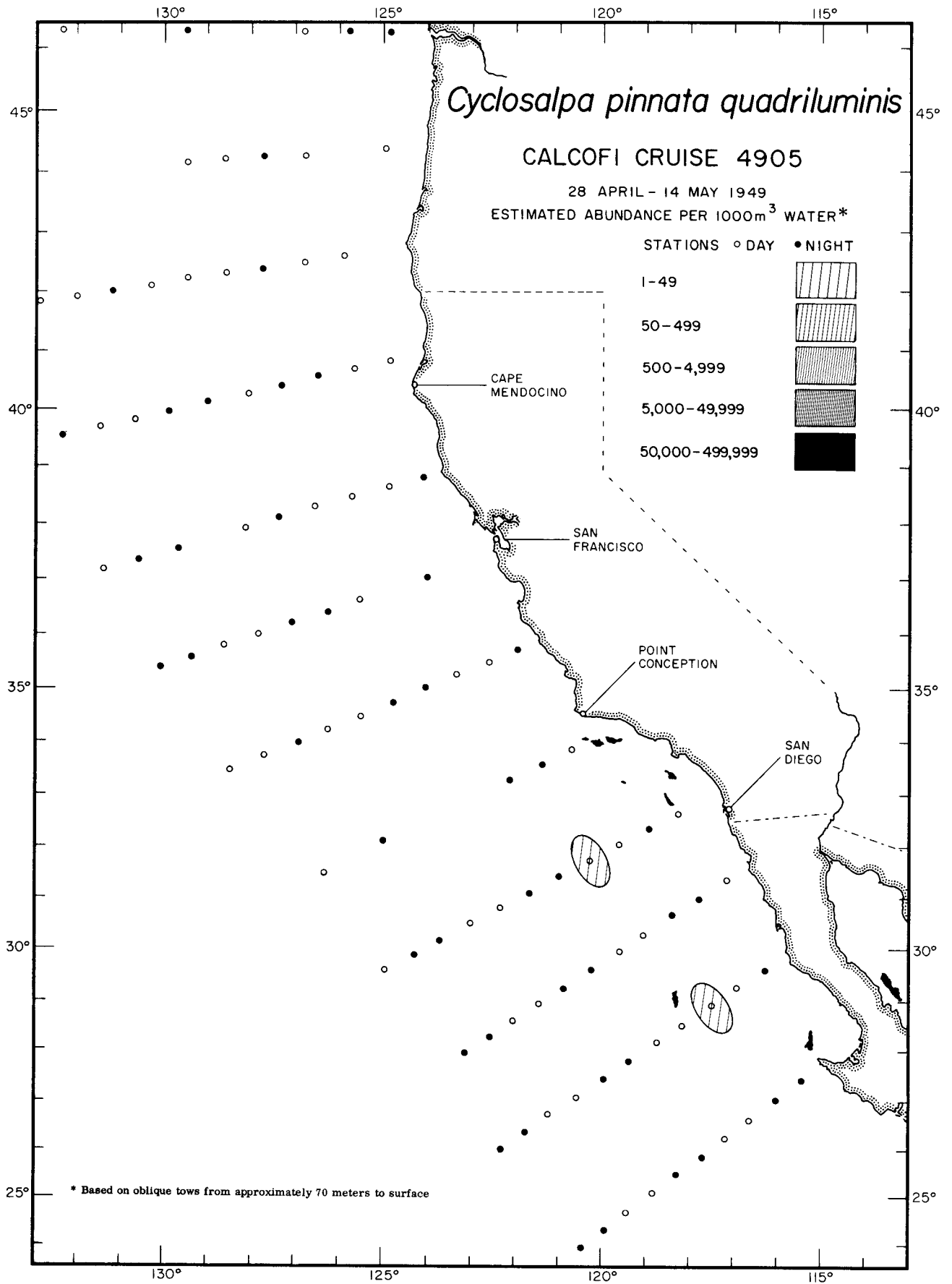
Thaliacea
Cyclosalpa pinnata polae
5806



Thaliacea

Cyclosalpa pinnata quadriluminis

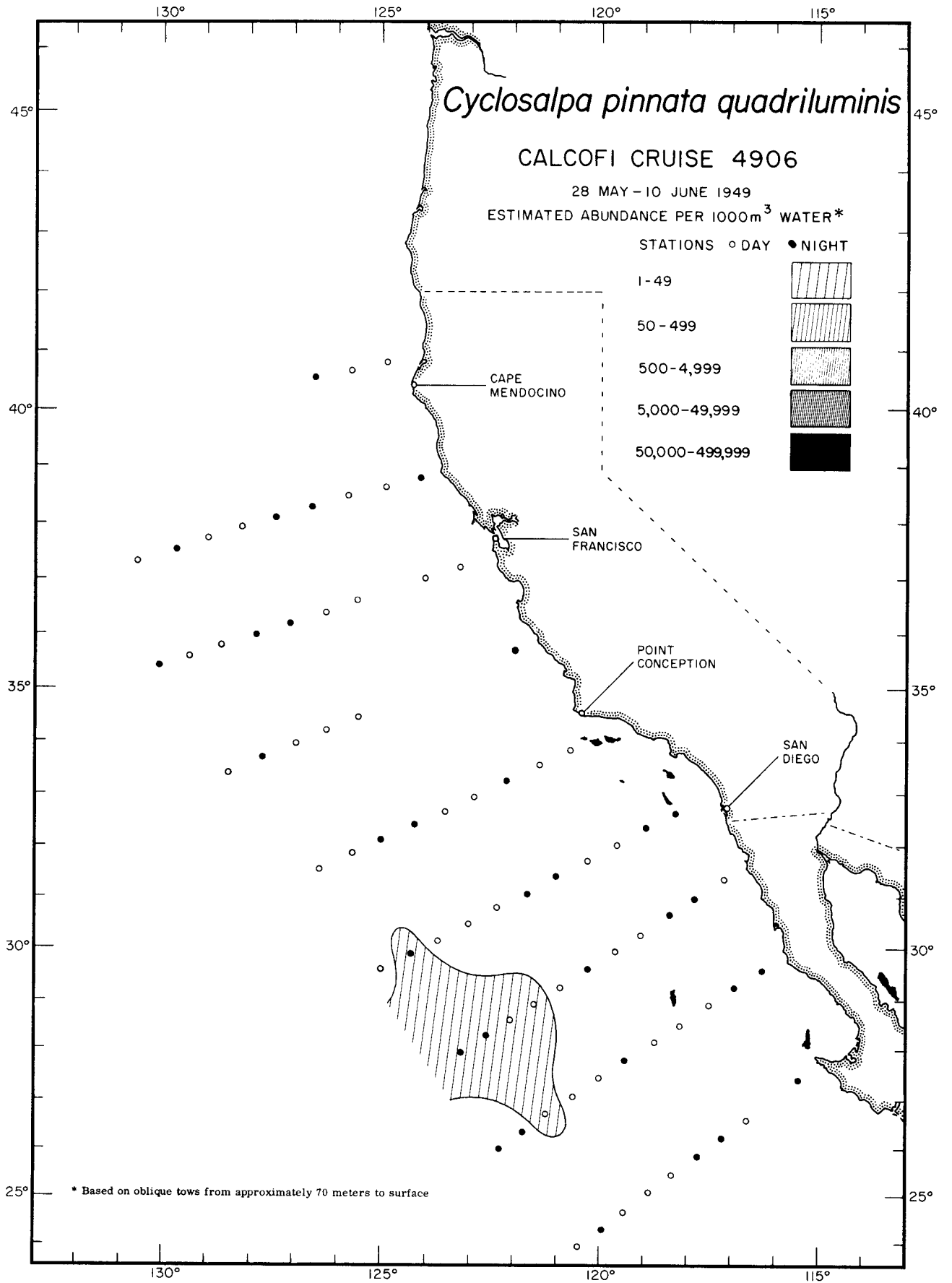
4903



Thaliacea

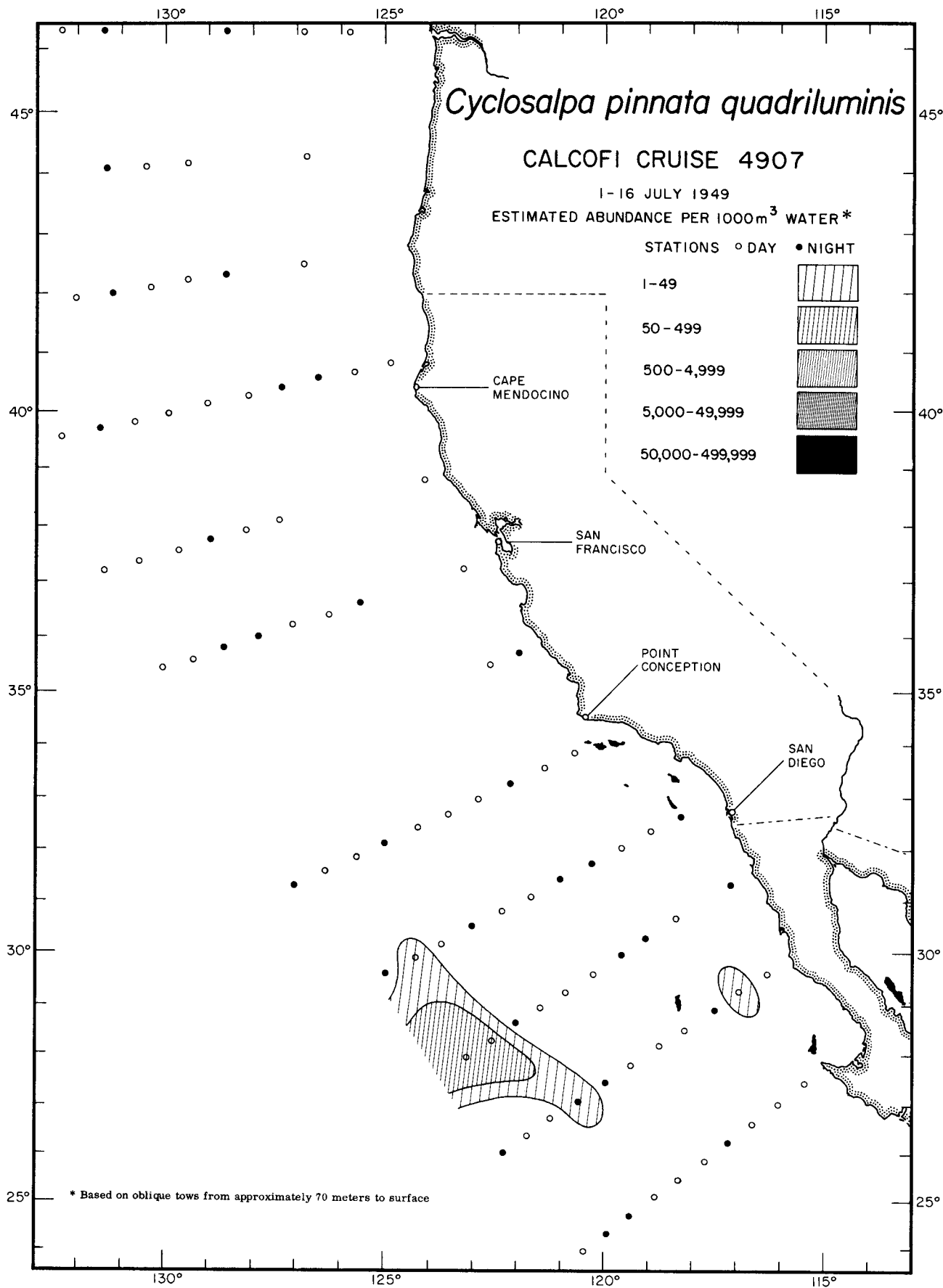
Cyclosalpa pinnata quadriluminis

4905



Thaliacea

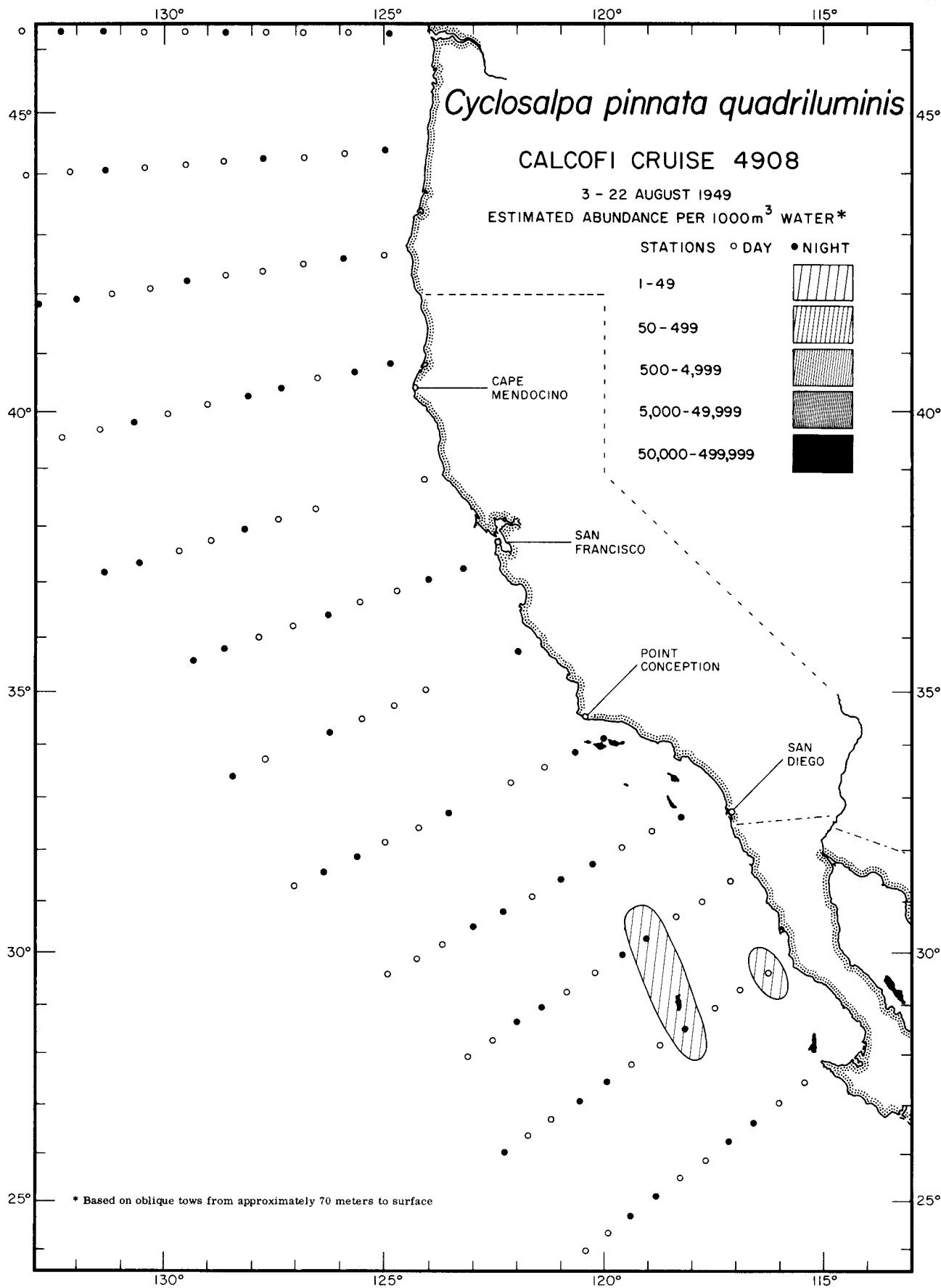
Cyclosalpa pinnata quadriluminis
4906



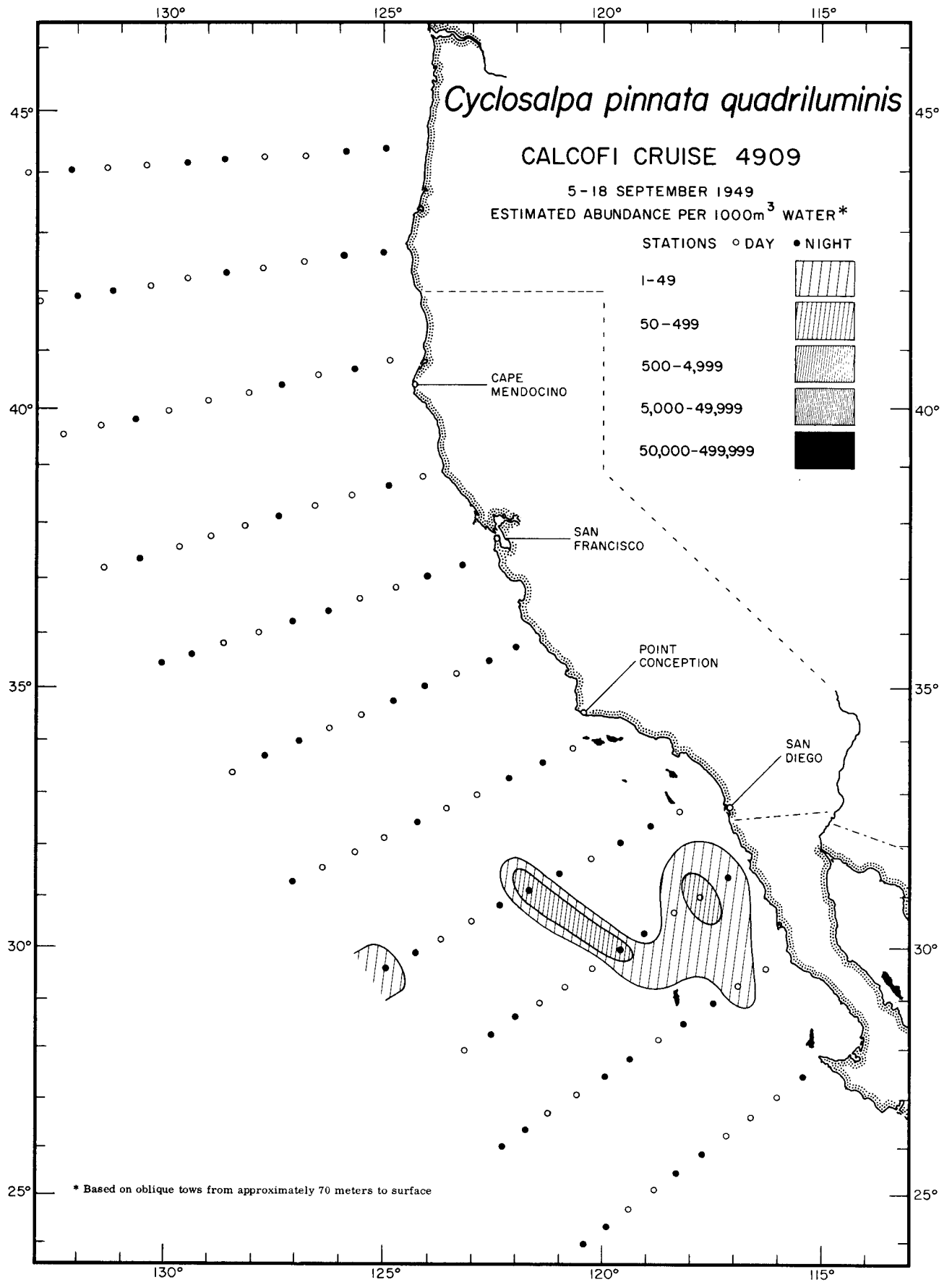
Thaliacea

Cyclosalpa pinnata quadriluminis

4907

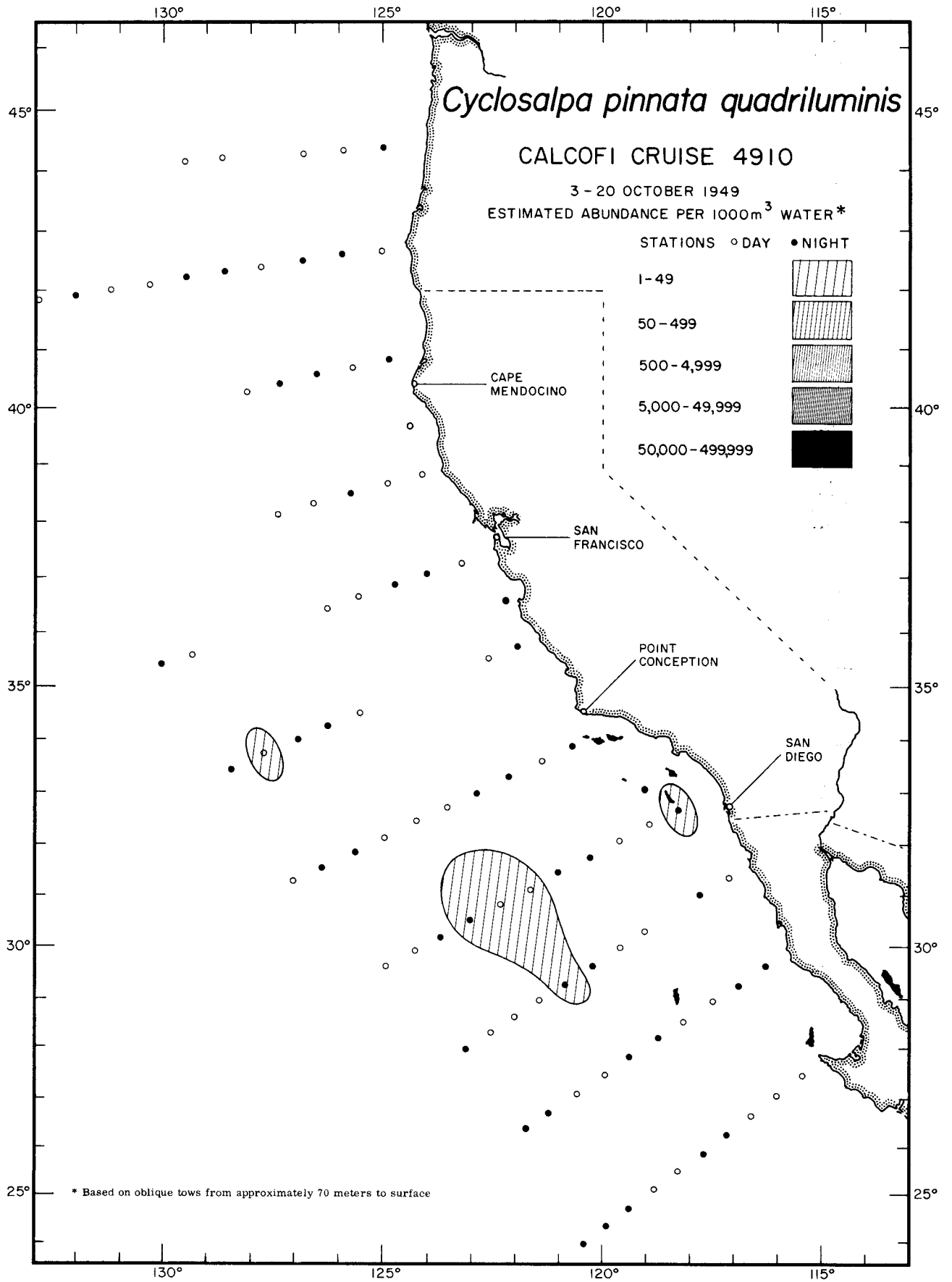


Thaliacea
Cyclosalpa pinnata quadriluminis
 4908



Thaliacea

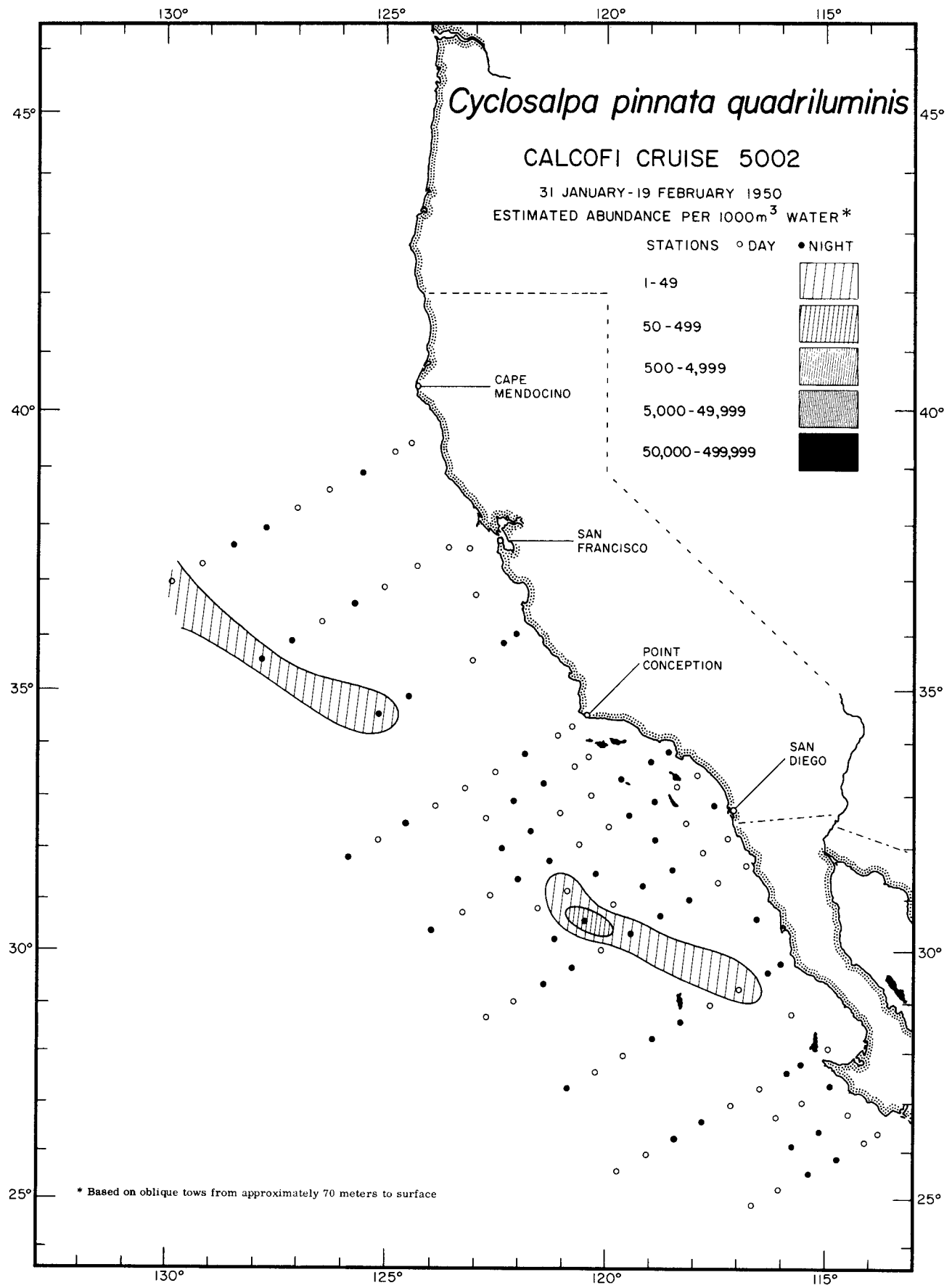
Cyclosalpa pinnata quadriluminis
4909



Thaliacea

Cyclosalpa pinnata quadriluminis

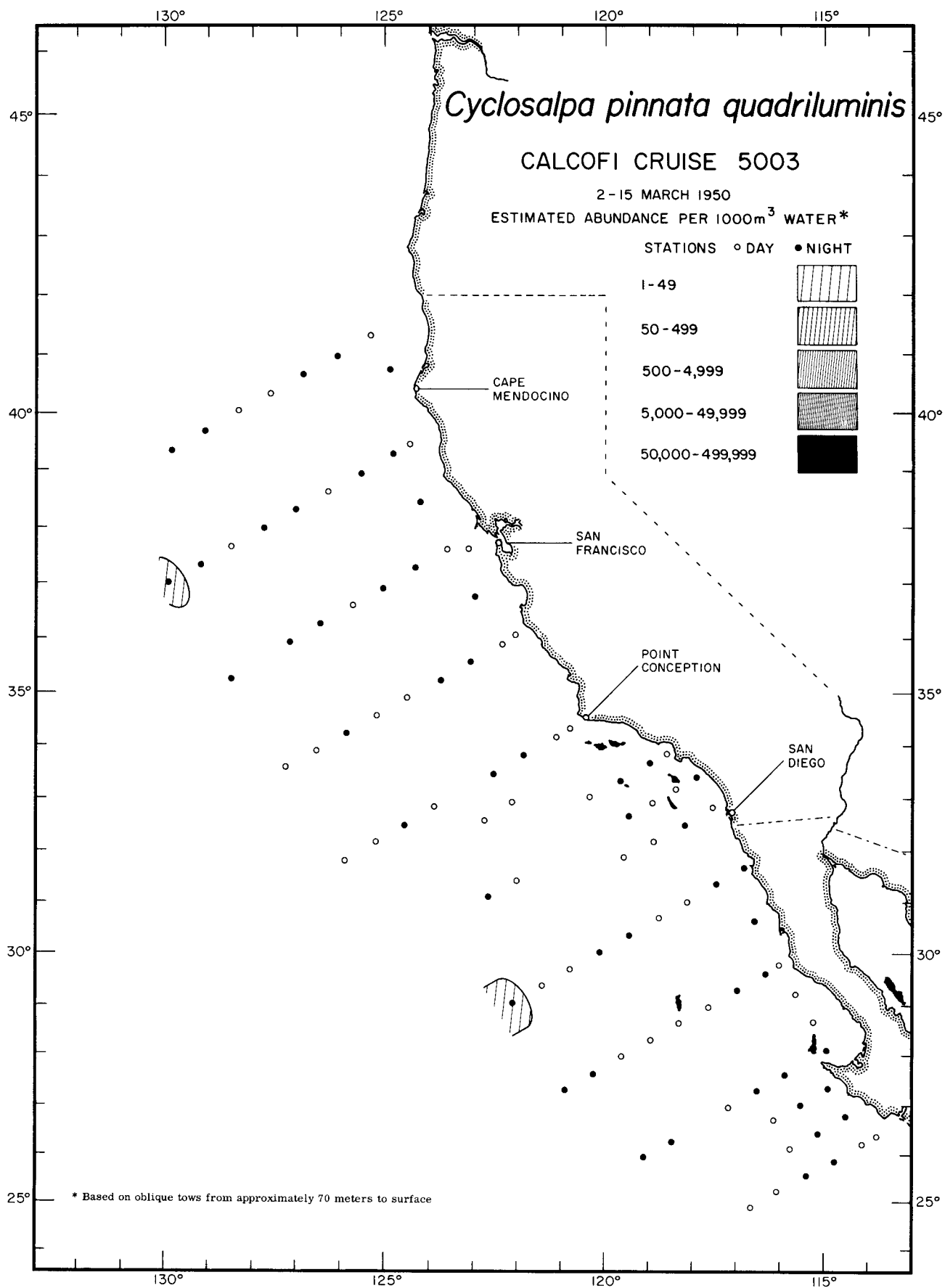
4910



Thaliacea

Cyclosalpa pinnata quadriluminis

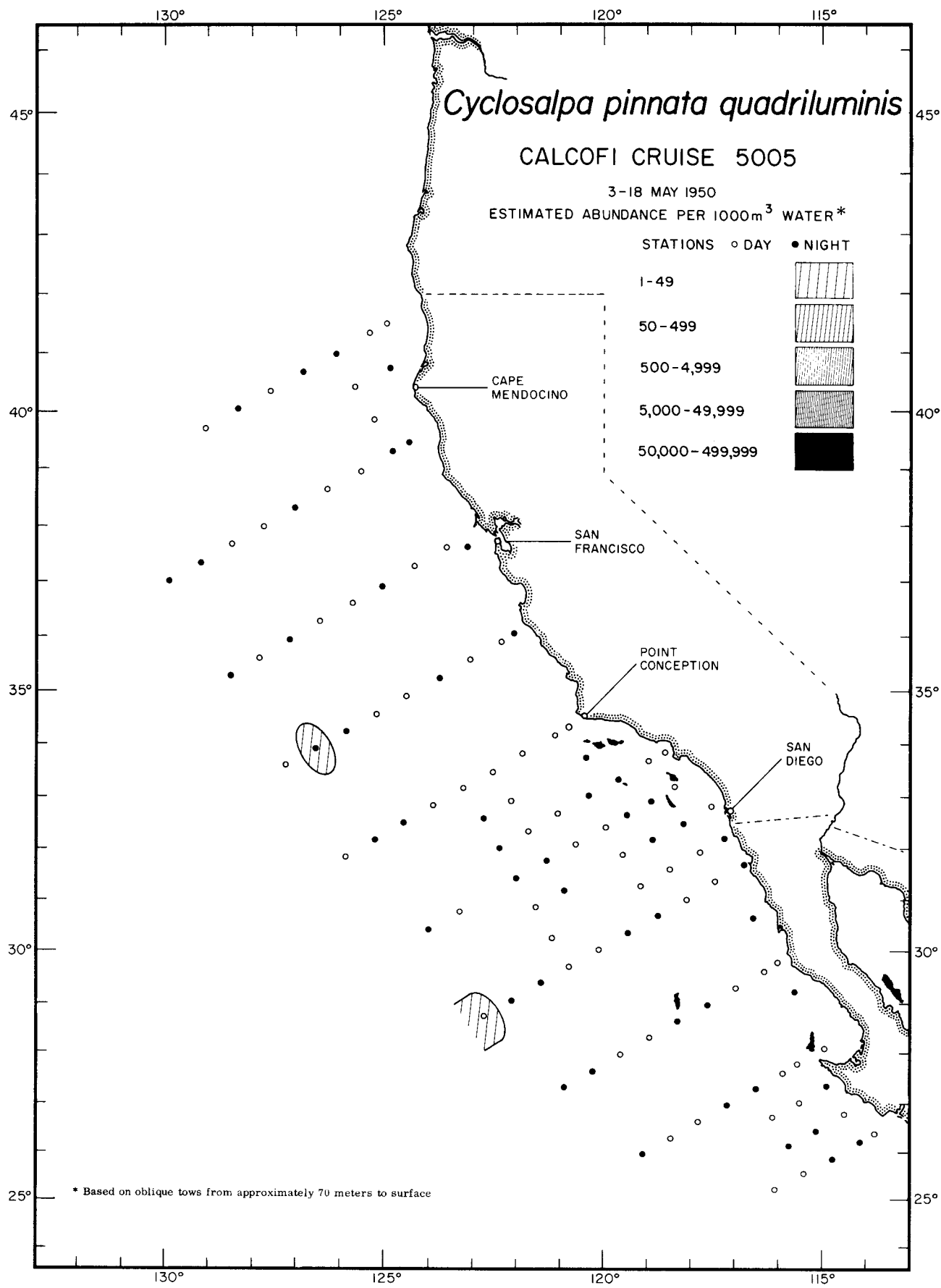
5002



Thaliacea

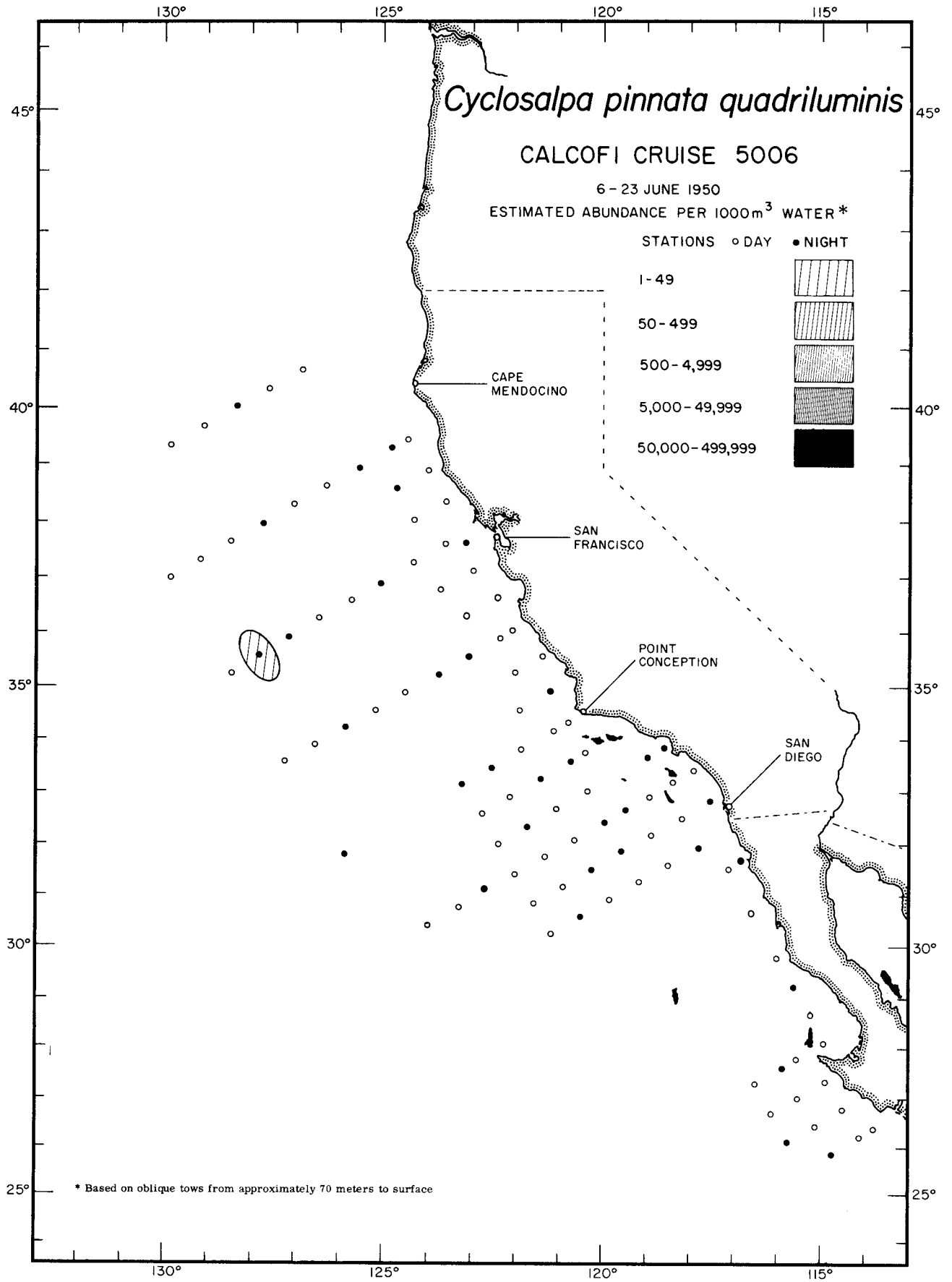
Cyclosalpa pinnata quadriluminis

5003



Thaliacea

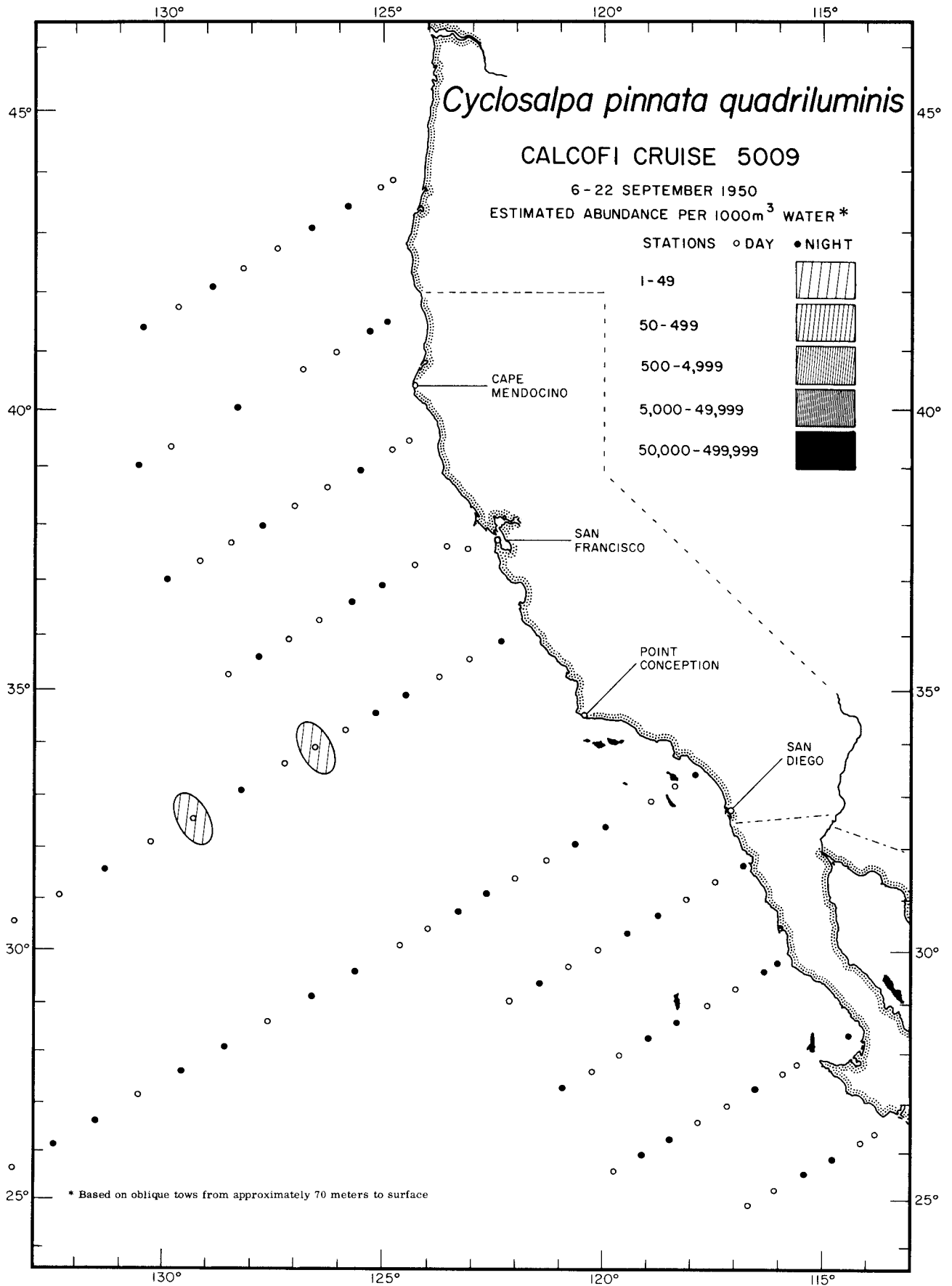
Cyclosalpa pinnata quadriluminis
5005



Thaliacea

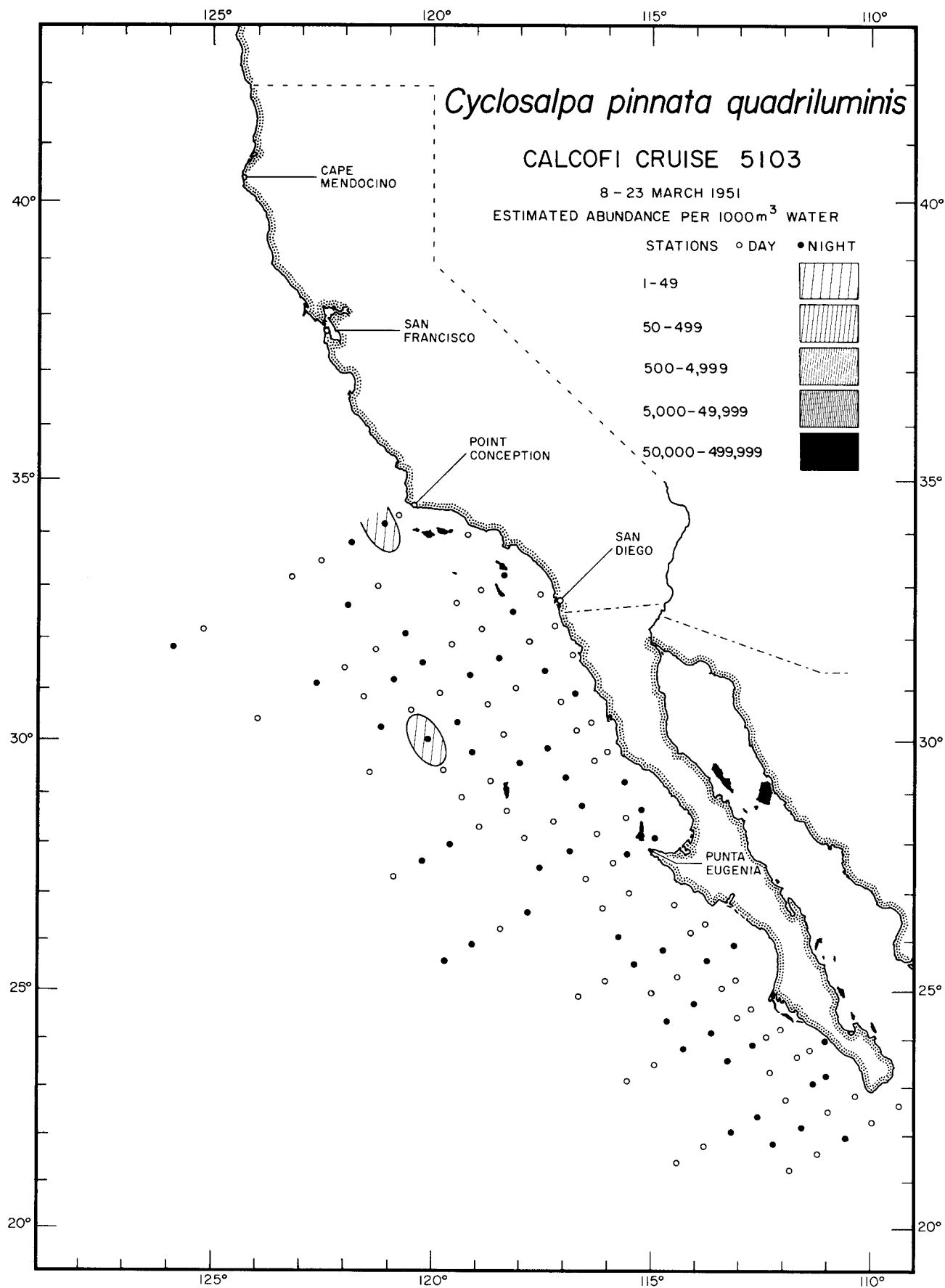
Cyclosalpa pinnata quadriluminis

5006



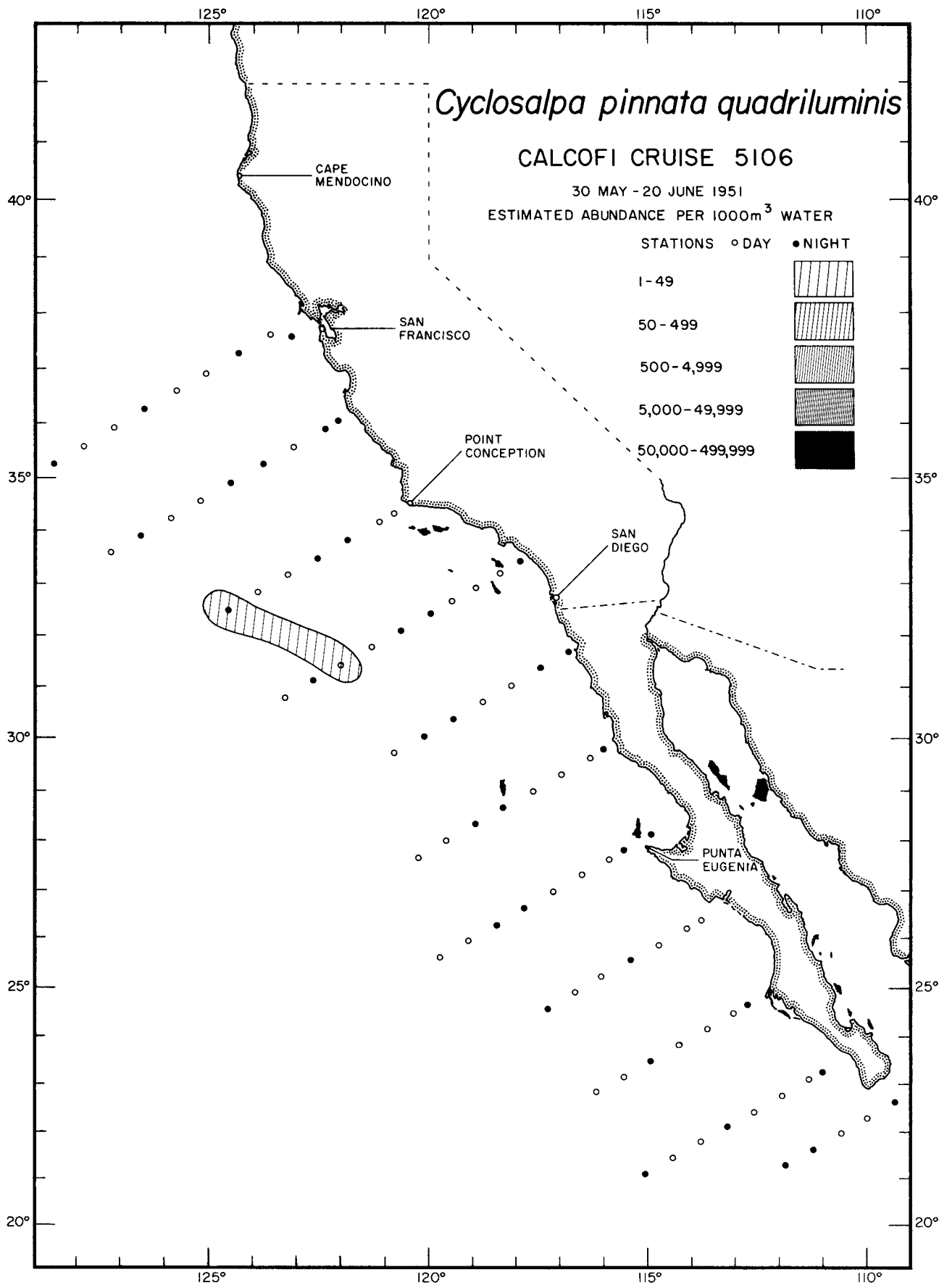
Thaliacea

Cyclosalpa pinnata quadriluminis
5009



Thaliacea
Cyclosalpa pinnata quadriluminis

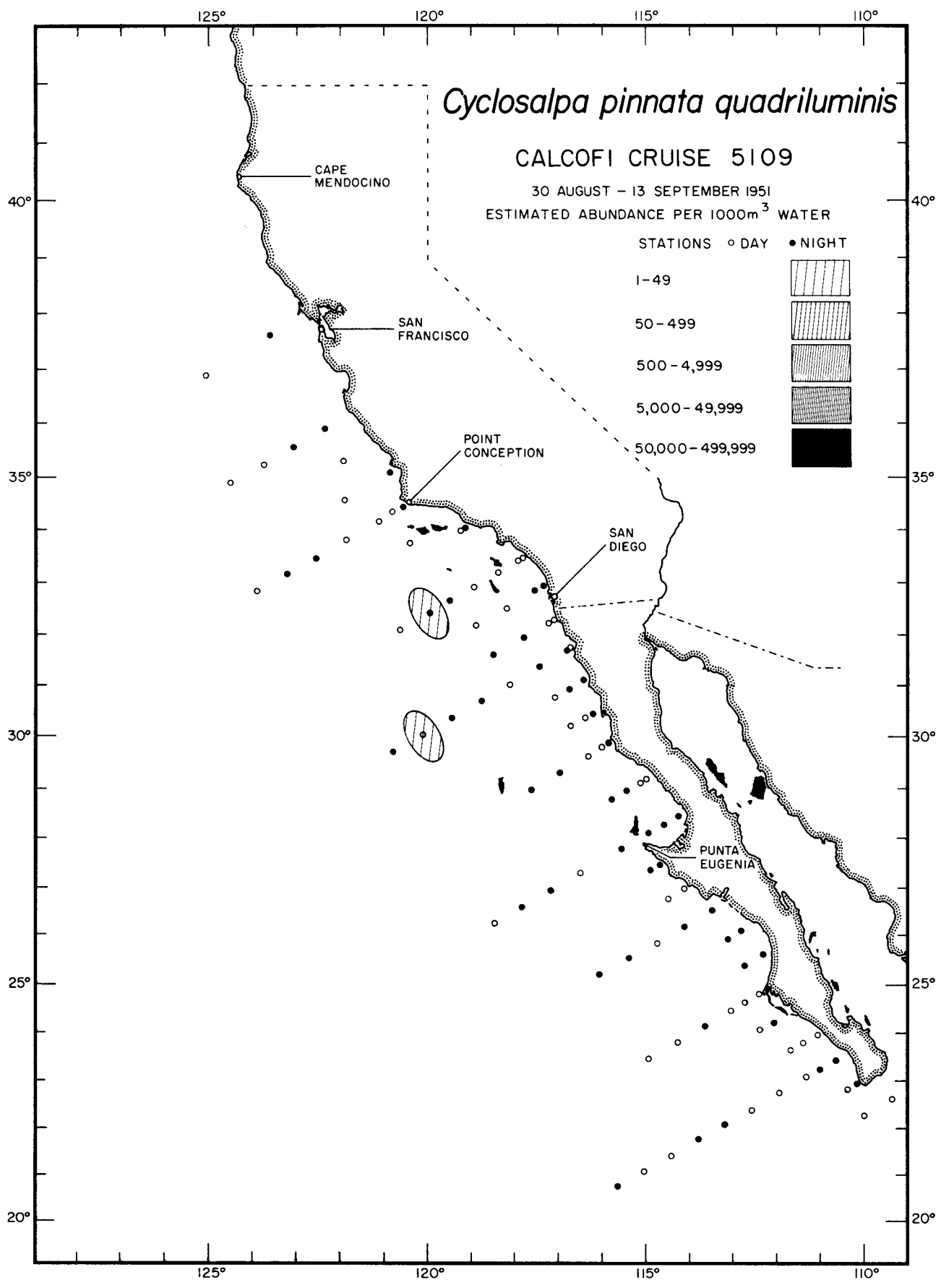
5103



Thaliacea

Cyclosalpa pinnata quadriluminis

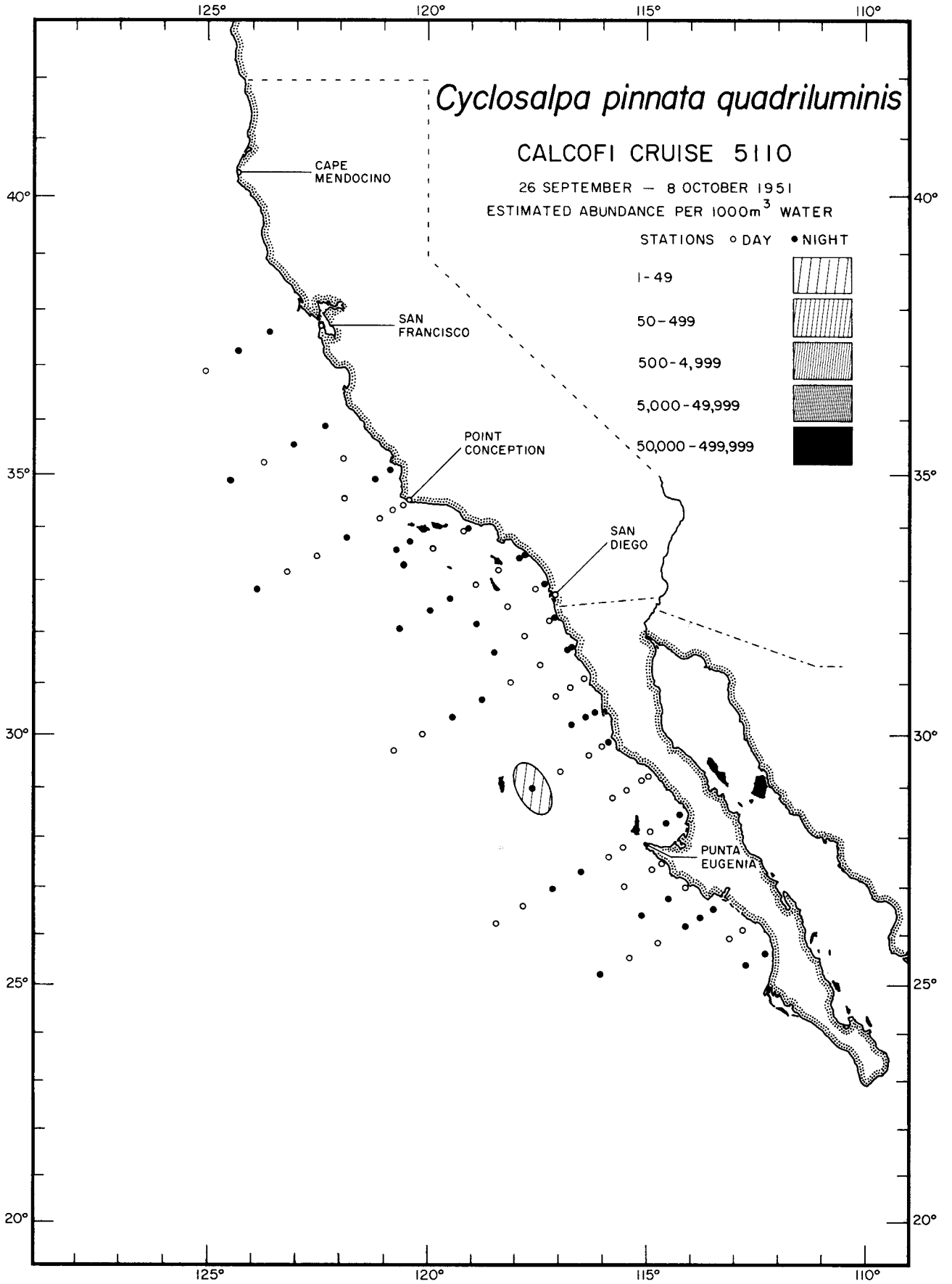
5106



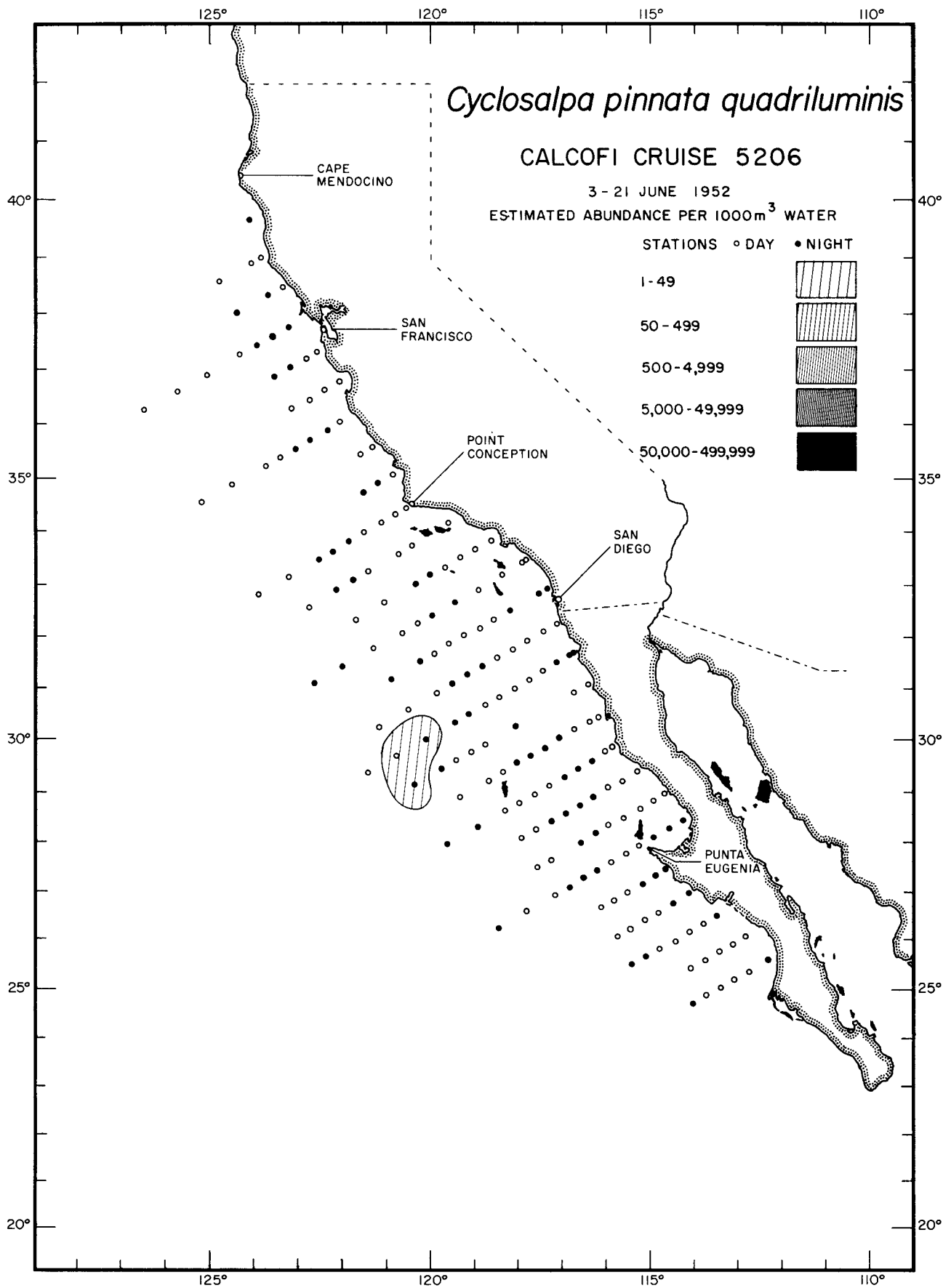
Thaliacea

Cyclosalpa pinnata quadriluminis

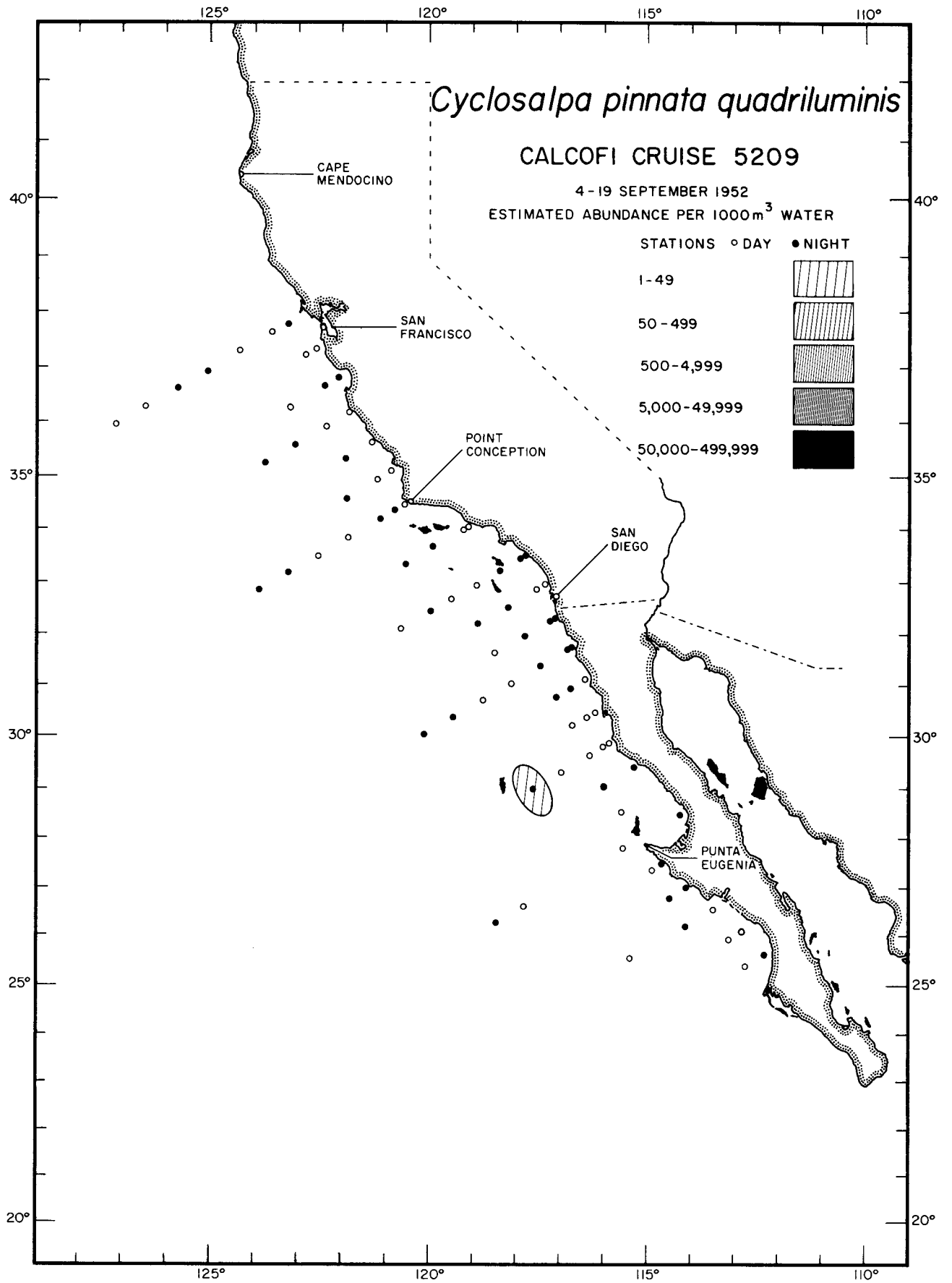
5109



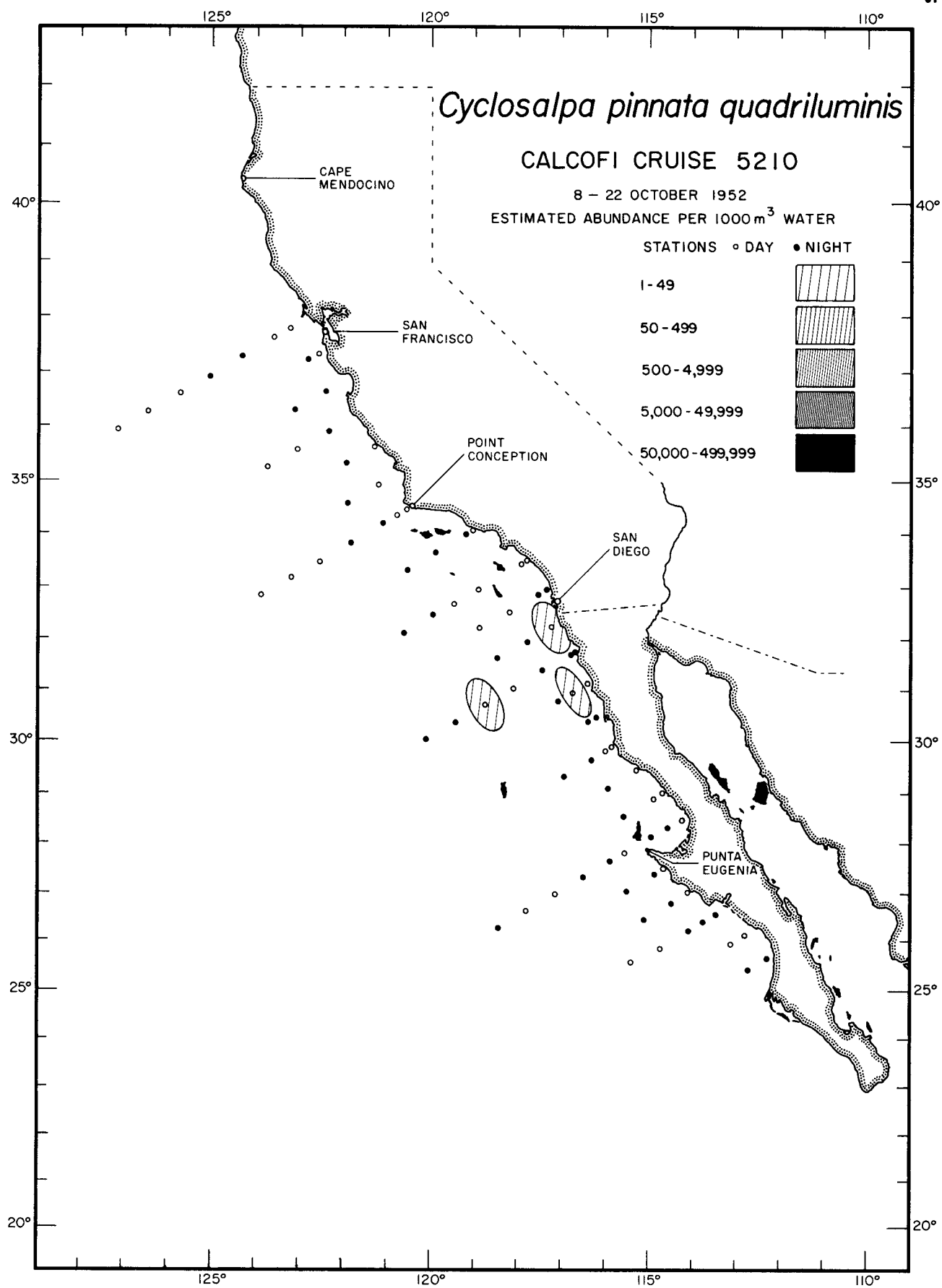
Thaliacea
Cyclosalpa pinnata quadriluminis
 5110



Thaliacea
Cyclosalpa pinnata quadriluminis
5206



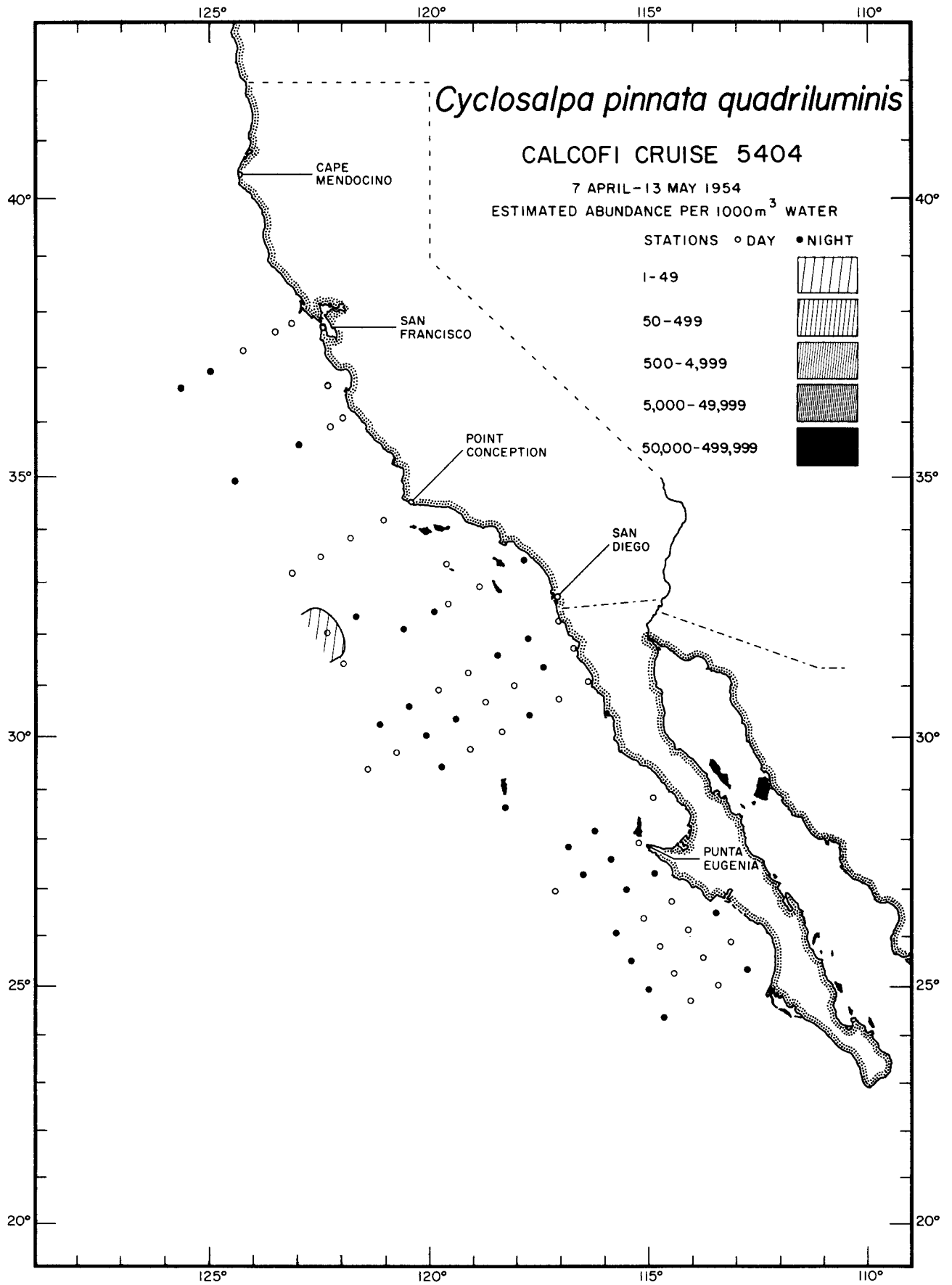
Thaliacea
Cyclosalpa pinnata quadriluminis
 5209



Thaliacea

Cyclosalpa pinnata quadriluminis

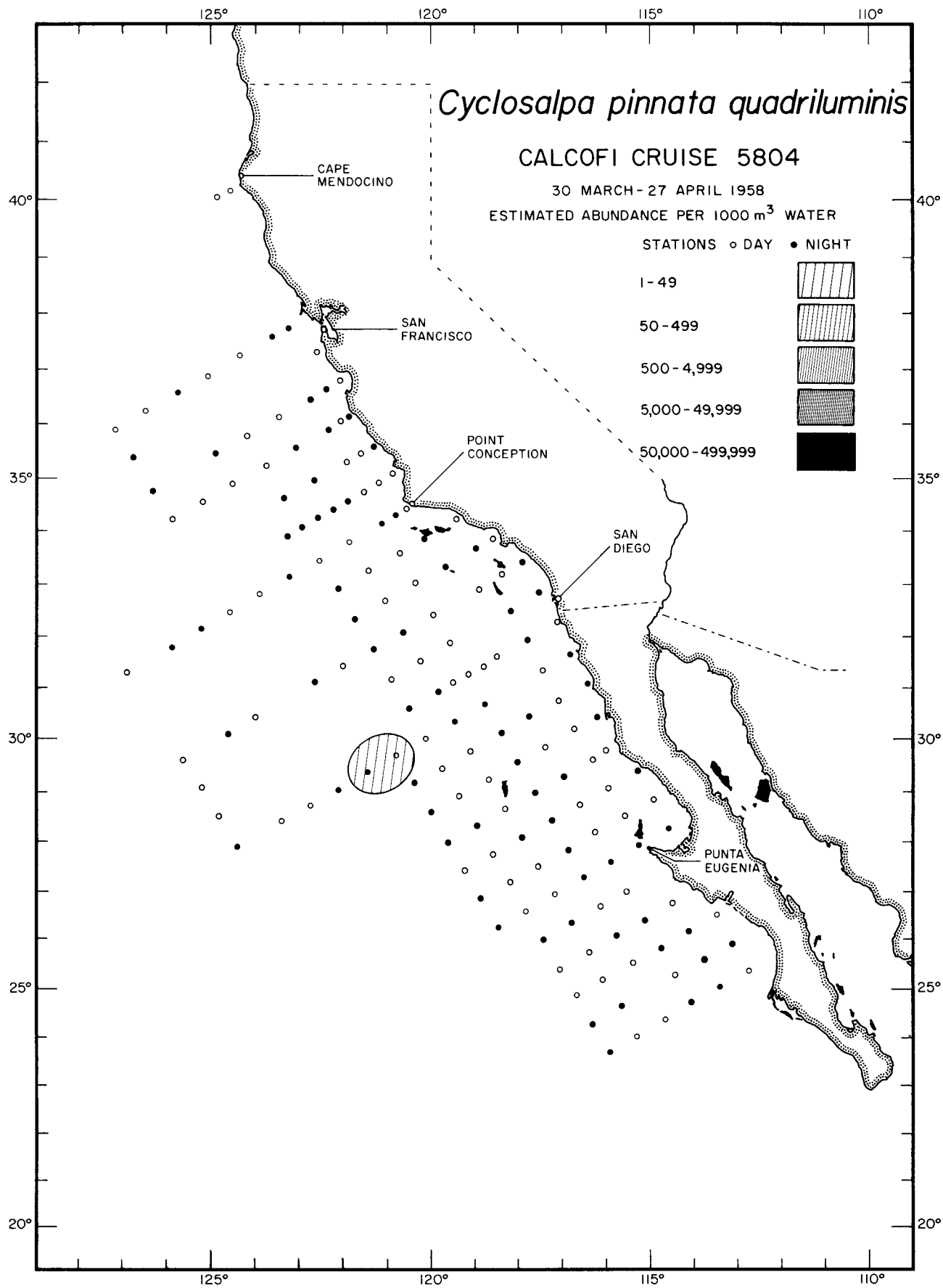
5210



Thaliacea

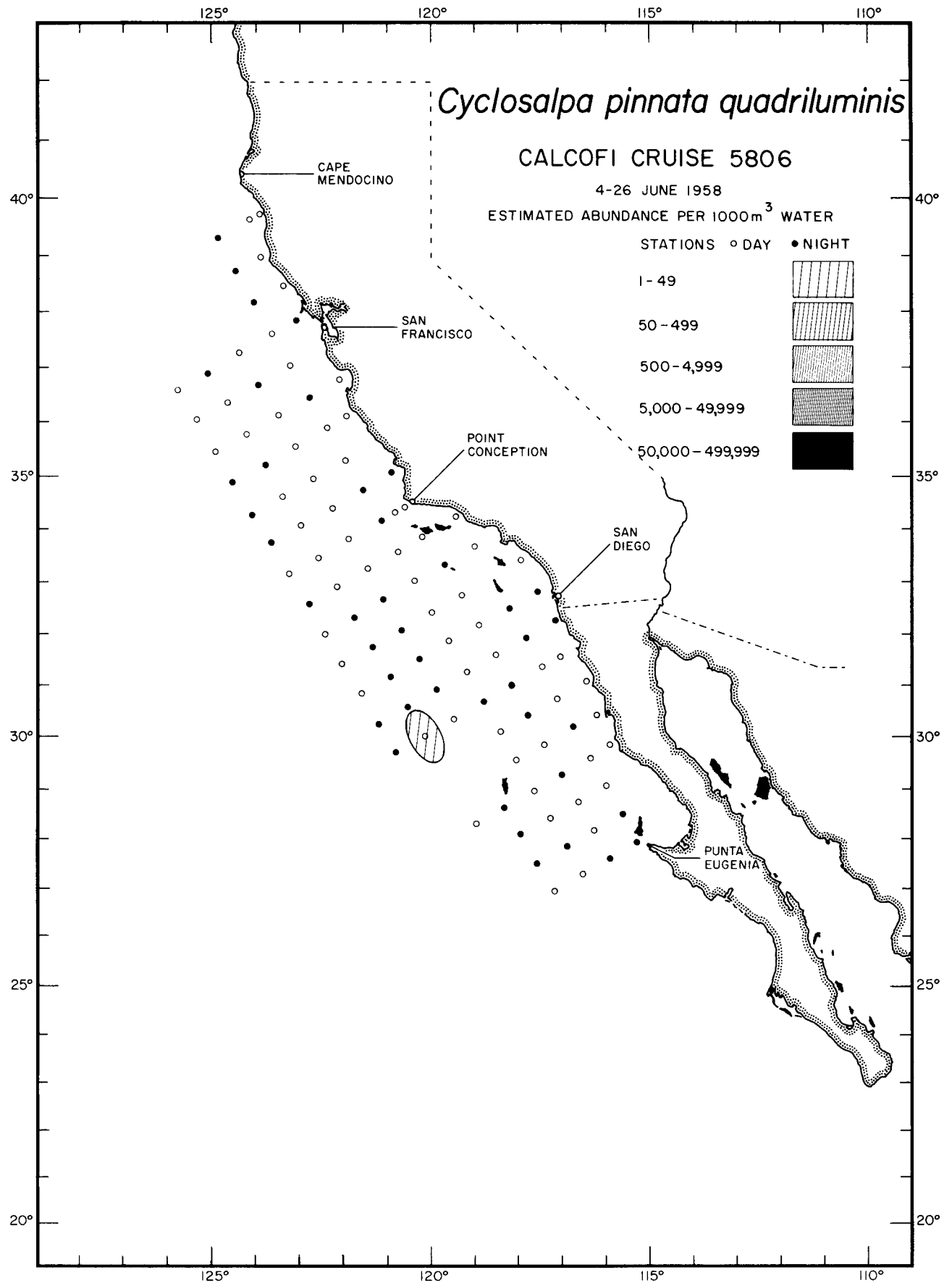
Cyclosalpa pinnata quadriluminis

5404

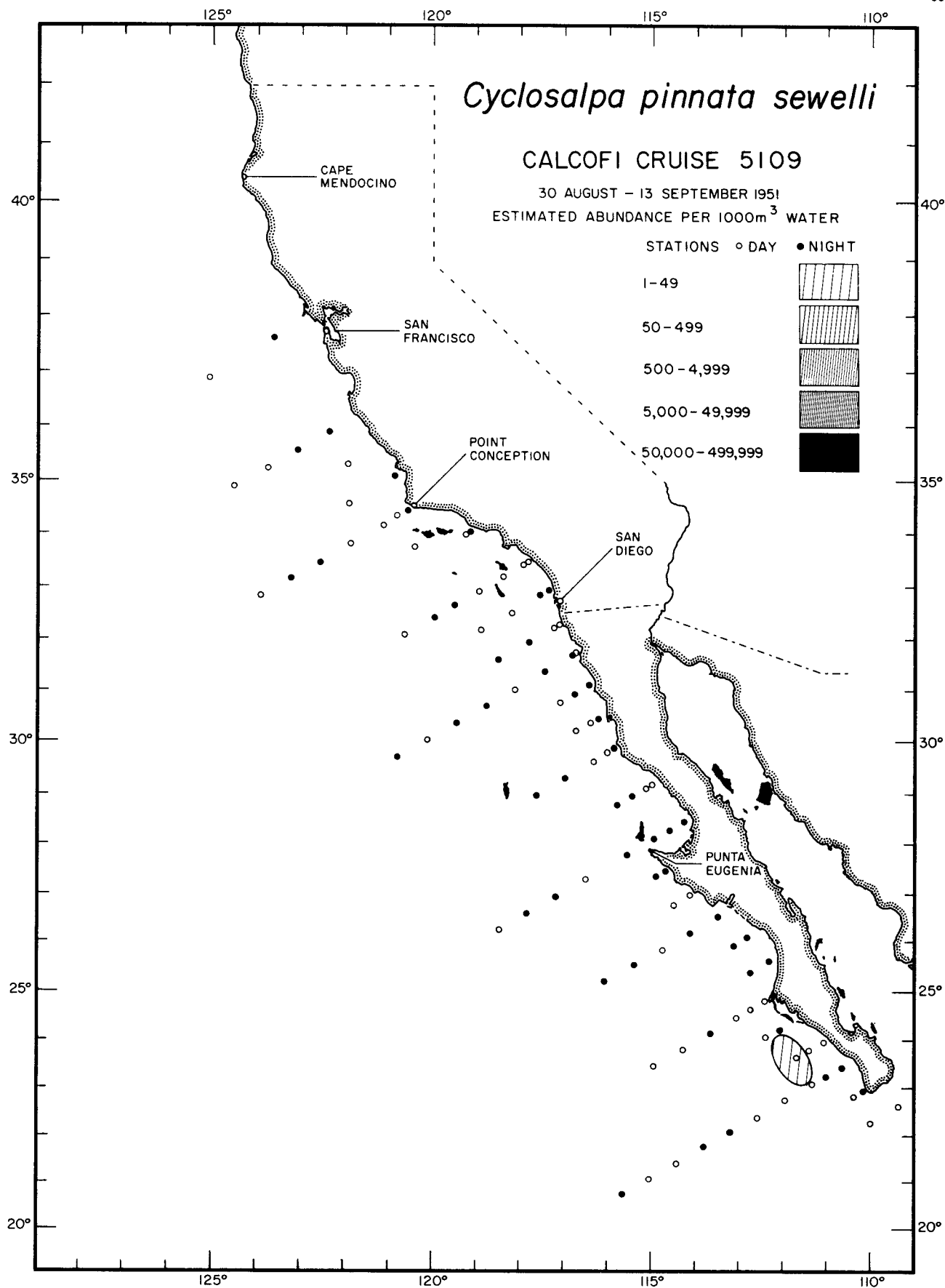


Thaliacea

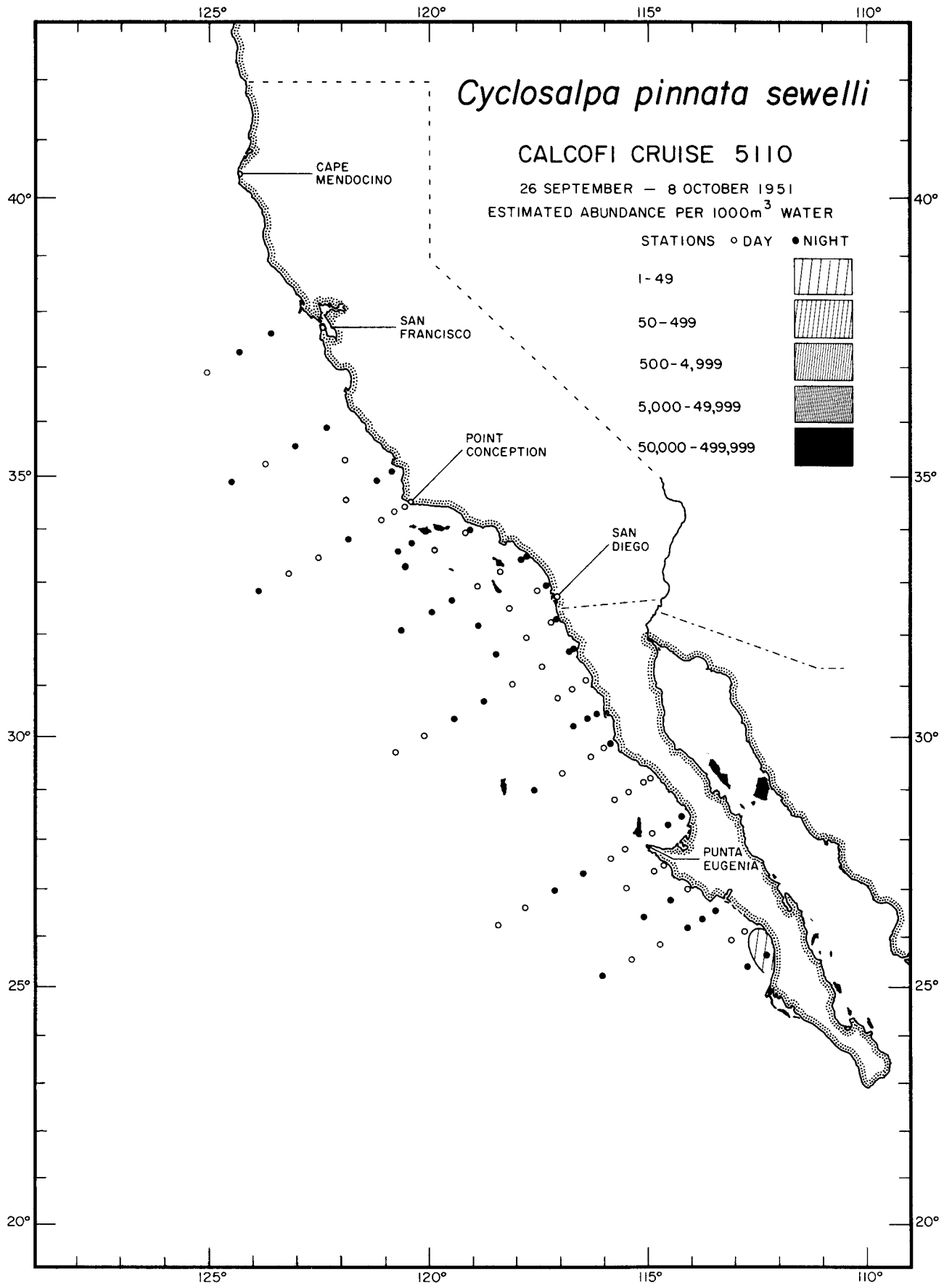
Cyclosalpa pinnata quadriluminis
5804



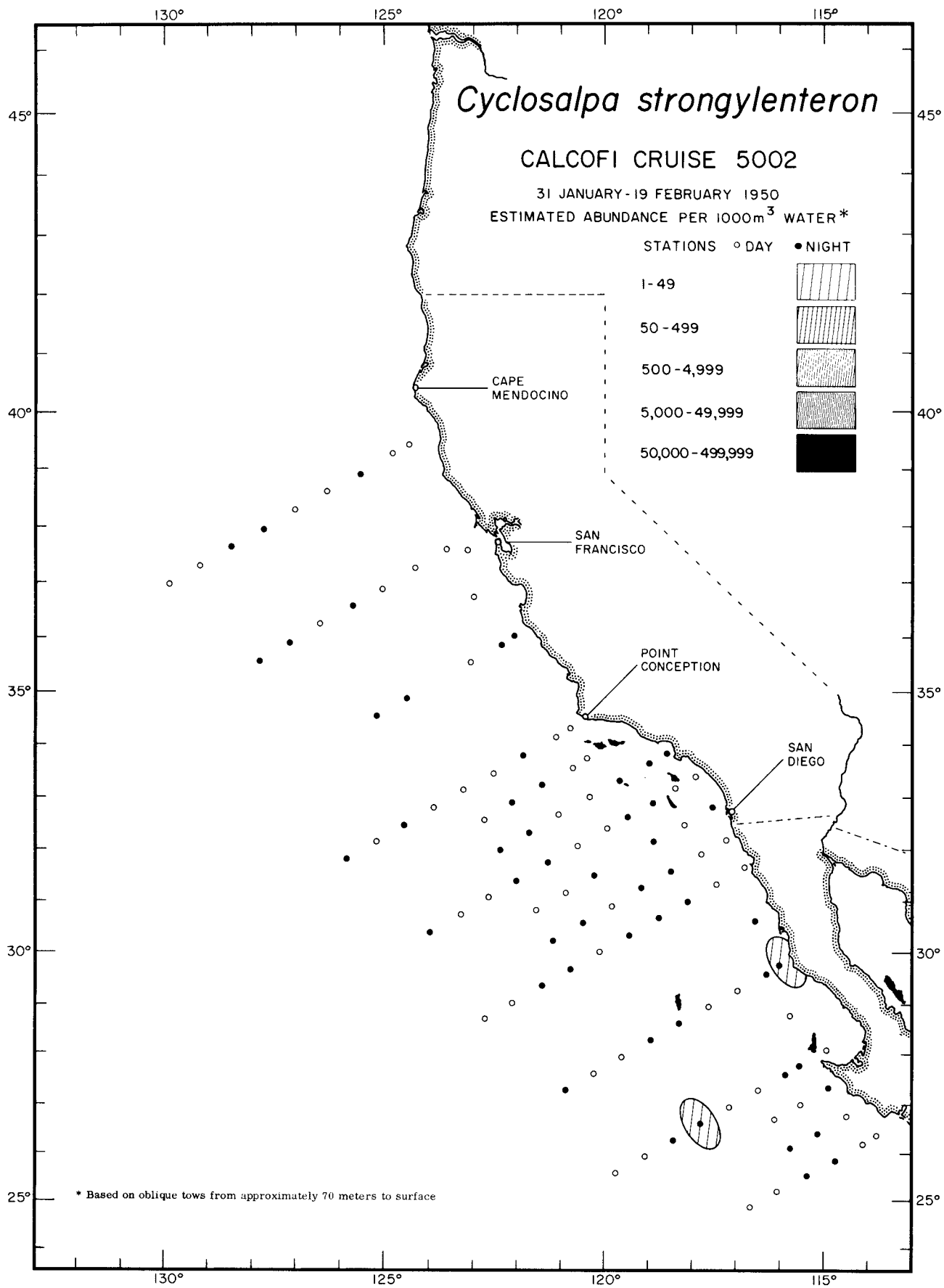
Thaliacea
Cyclosalpa pinnata quadriluminis
 5806



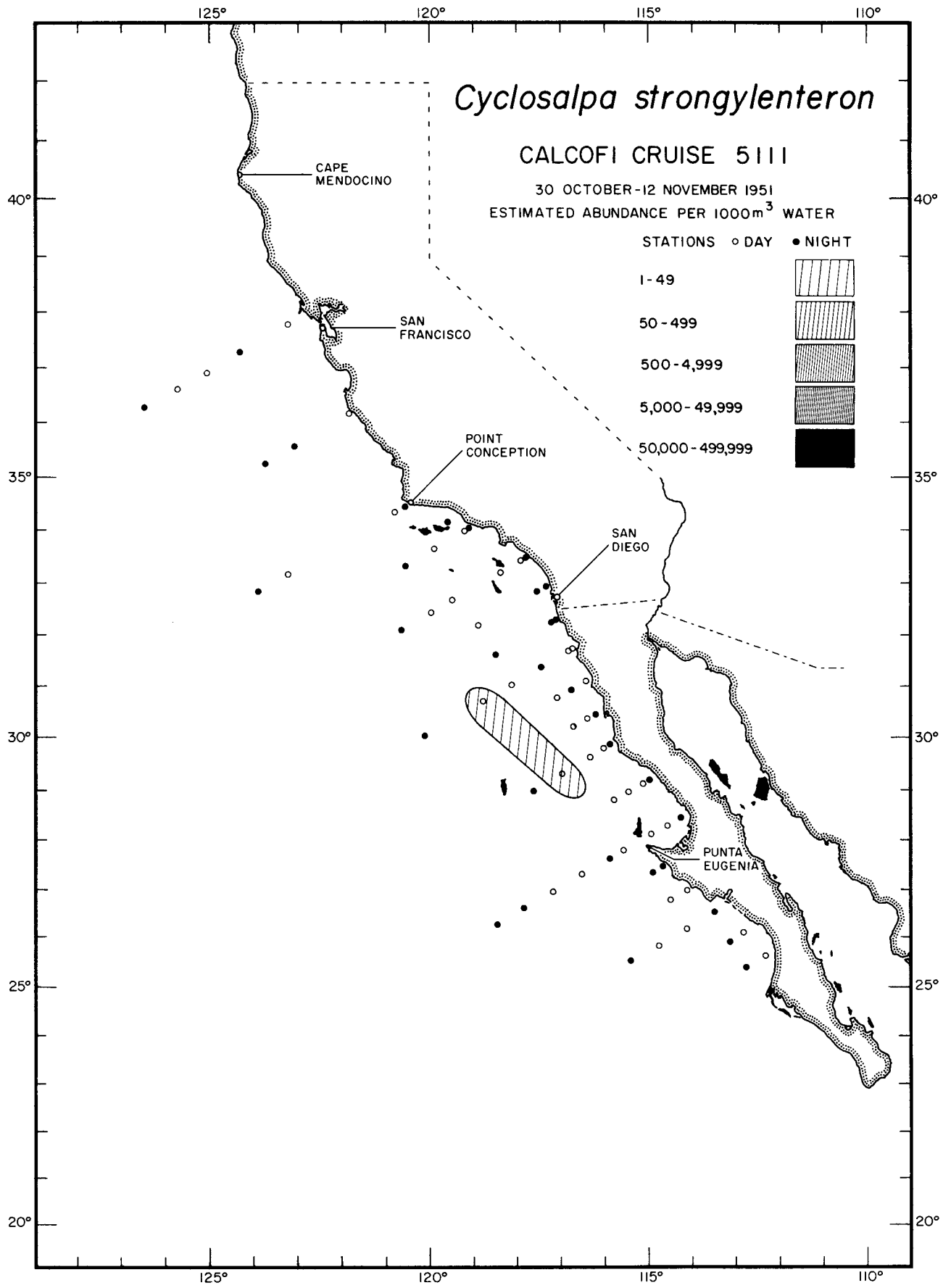
Thaliacea
Cyclosalpa pinnata sewelli
5109



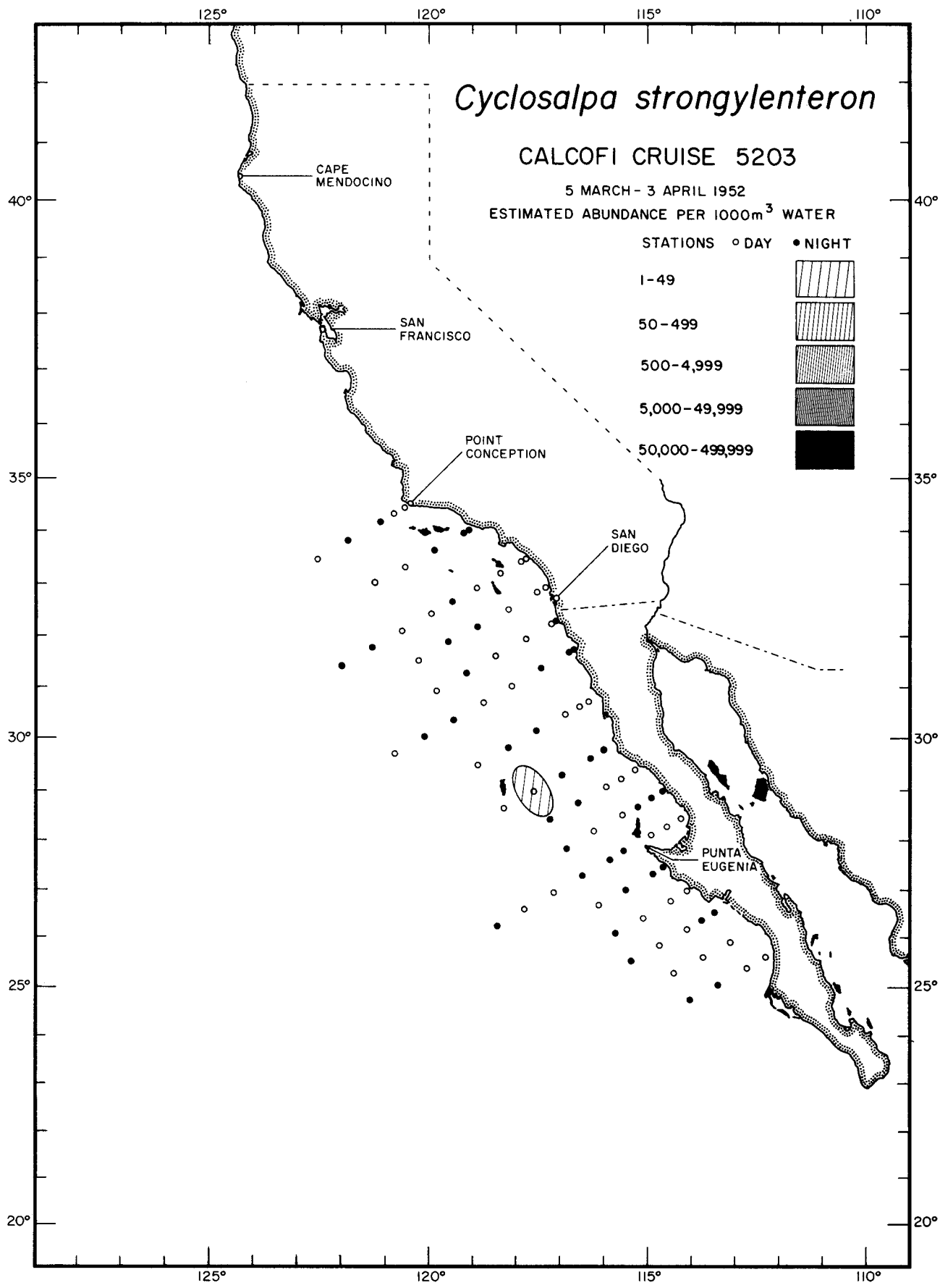
Thaliacea
Cyclosalpa pinnata sewelli
5110



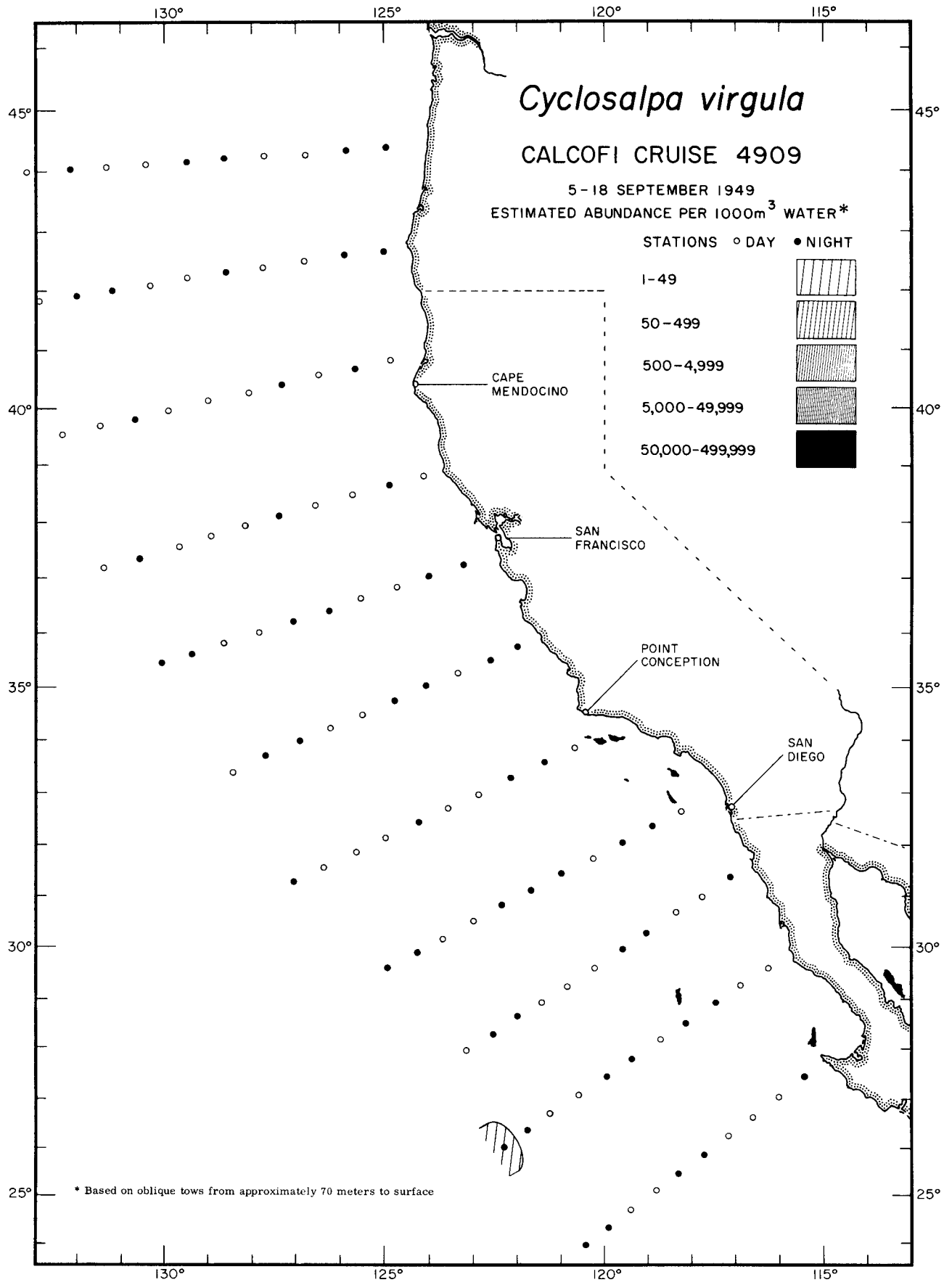
Thaliacea
Cyclosalpa strongylenteron
5002



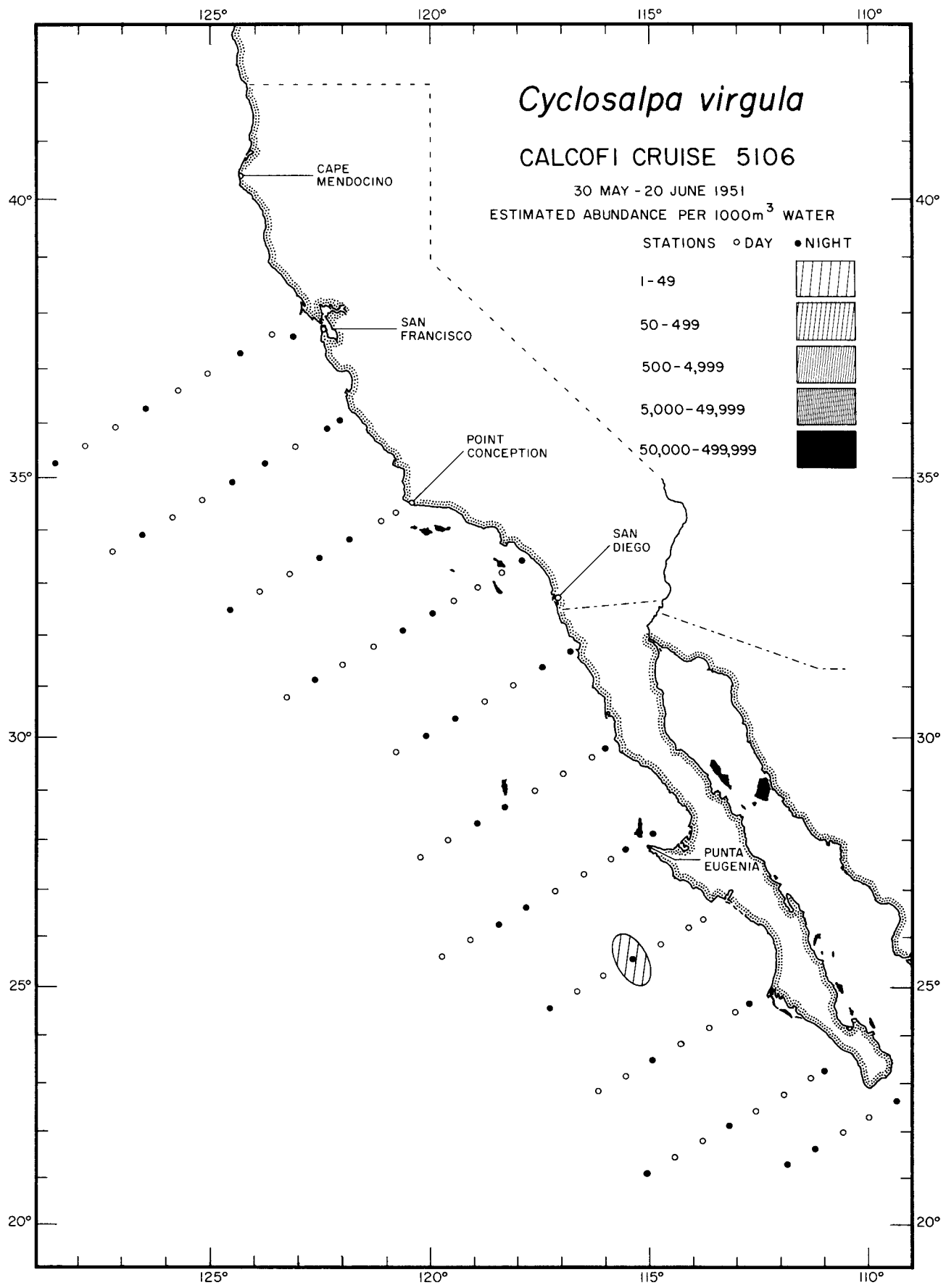
Thaliacea
Cyclosalpa strongylenteron
5111



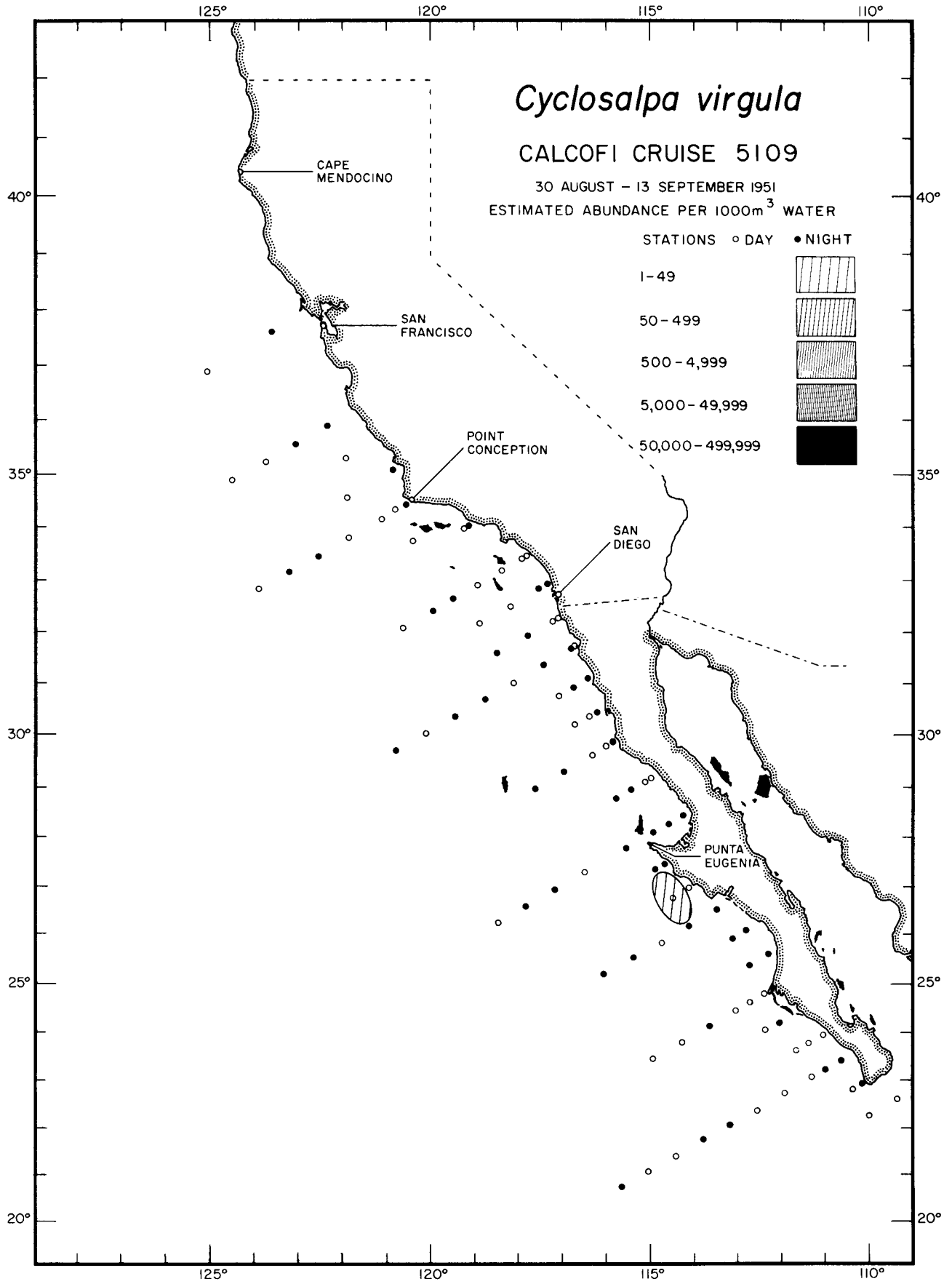
Thaliacea
Cyclosalpa strongylenteron
5203



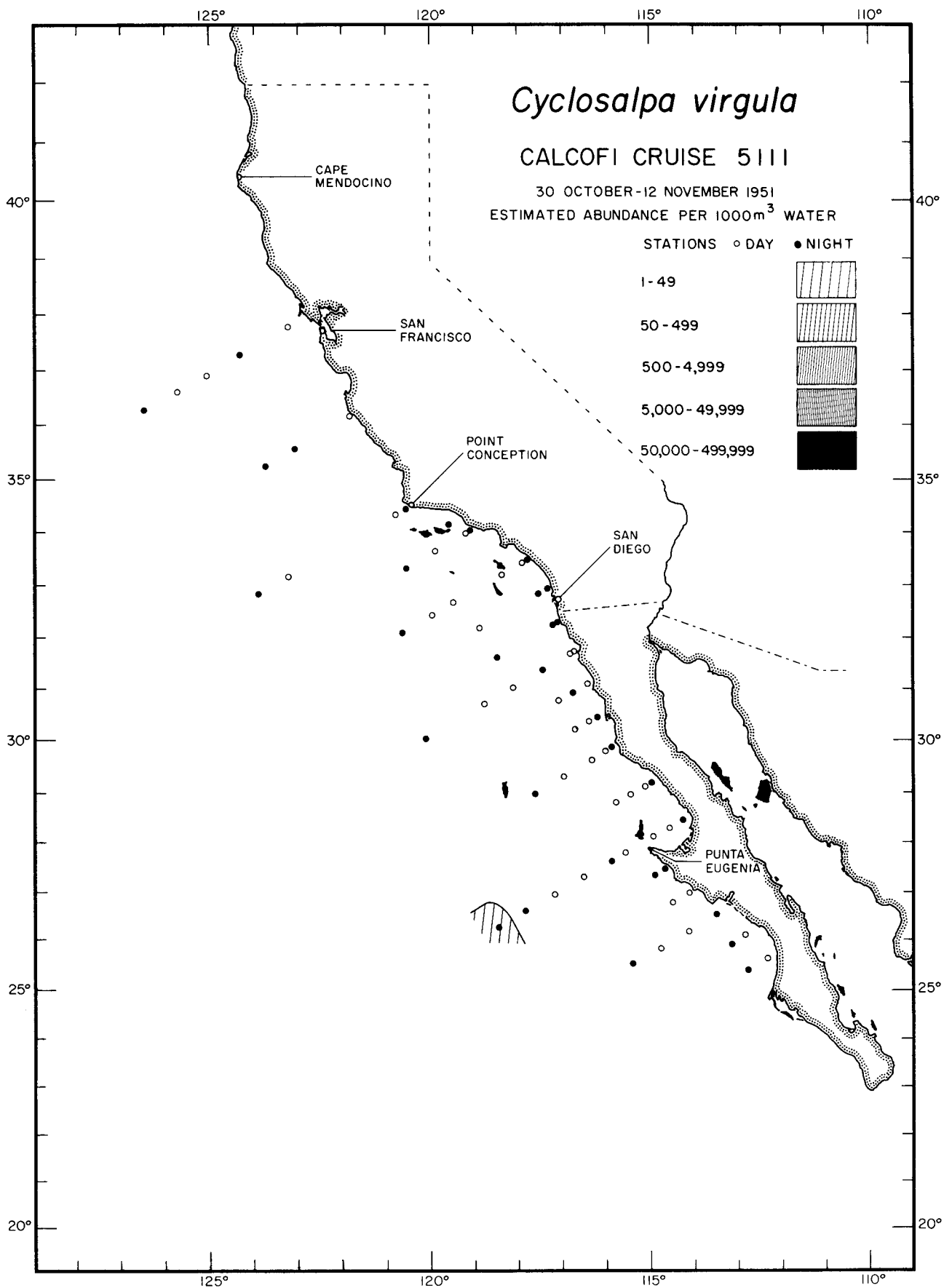
Thaliacea
Cyclosalpa virgula
 4909



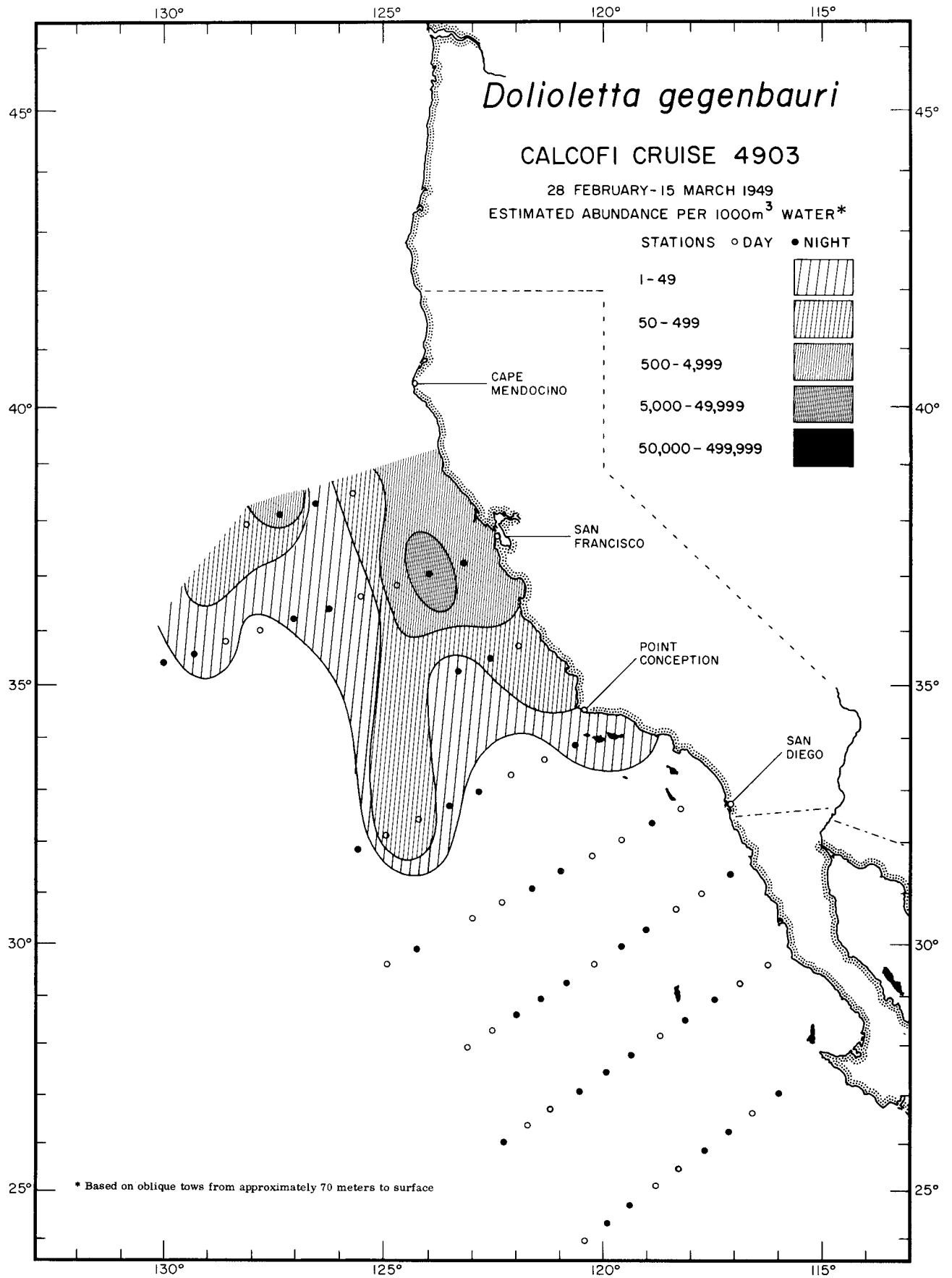
Thaliacea
Cyclosalpa virgula
 5106



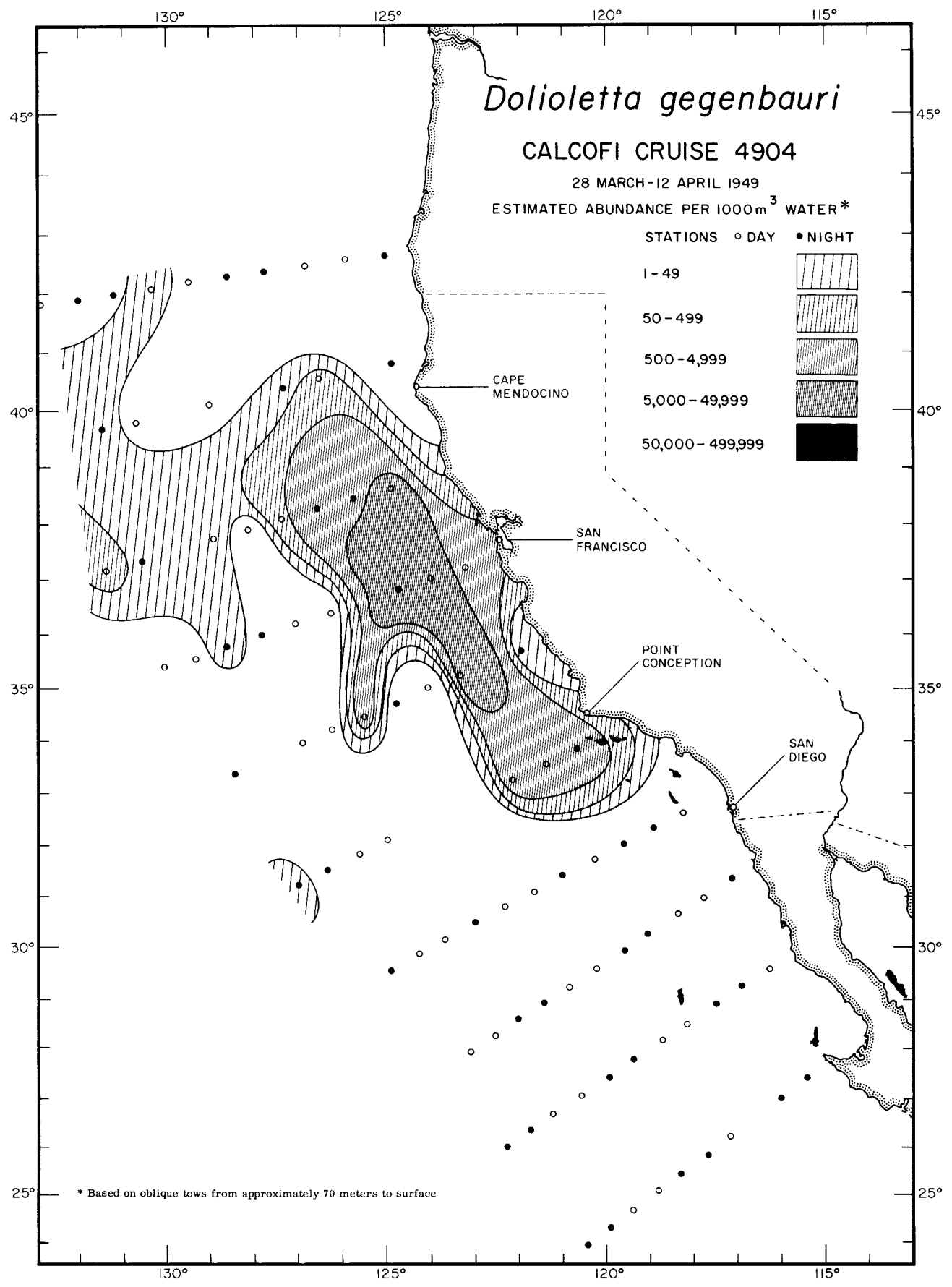
Thaliacea
Cyclosalpa virgula
5109



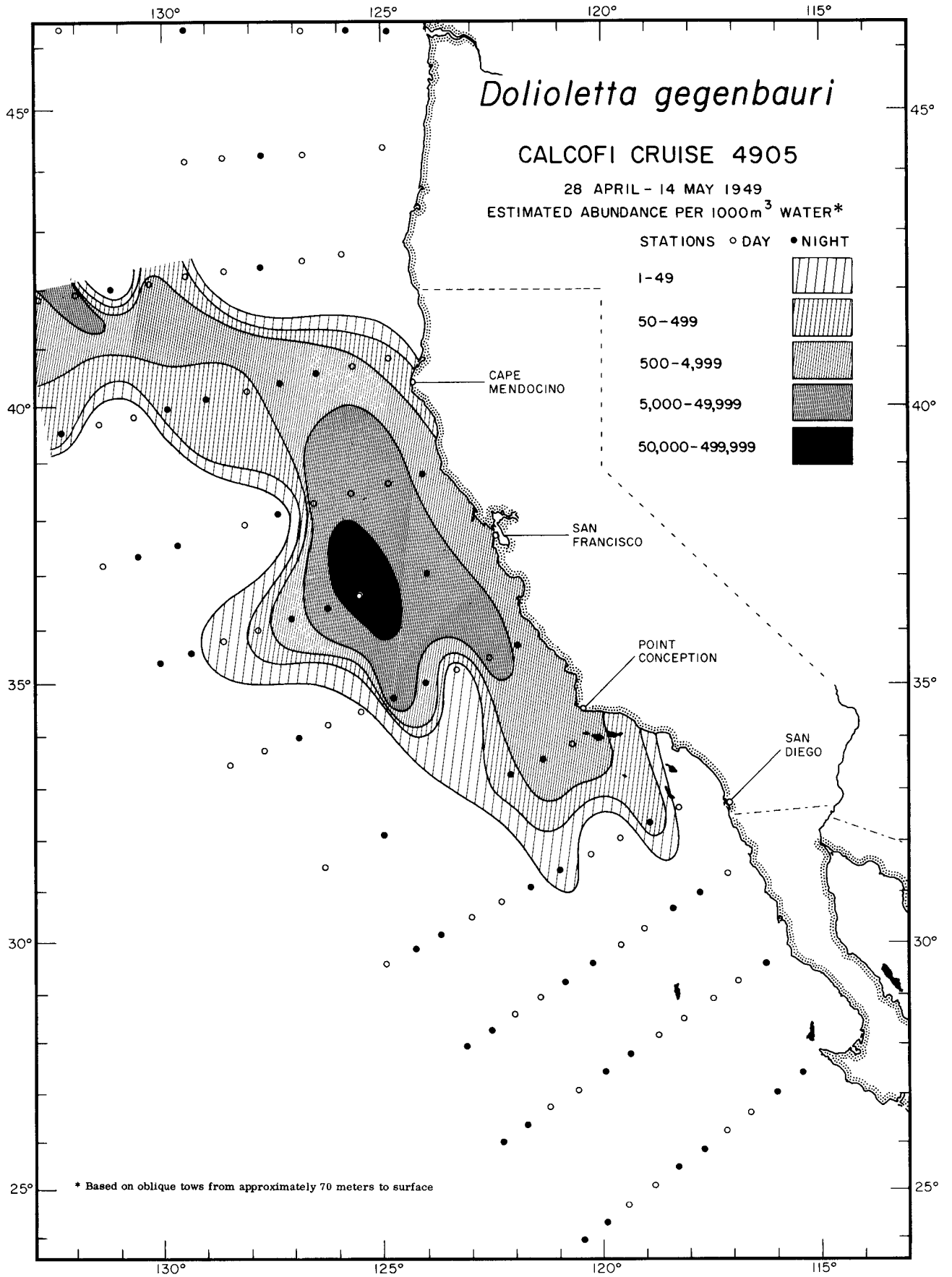
Thaliacea
Cyclosalpa virgula
5111



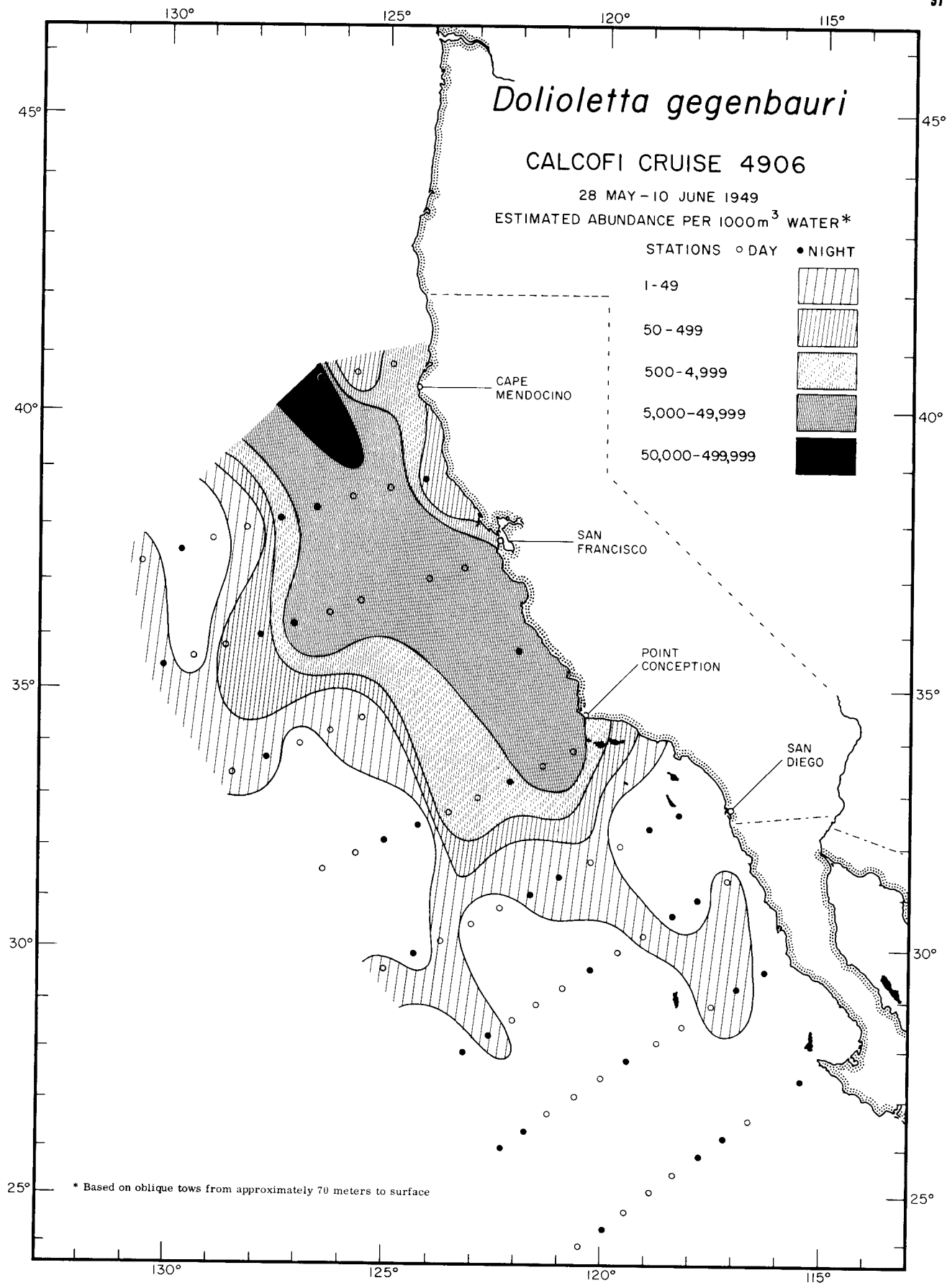
Thaliacea
Doliioletta gegenbauri
4903



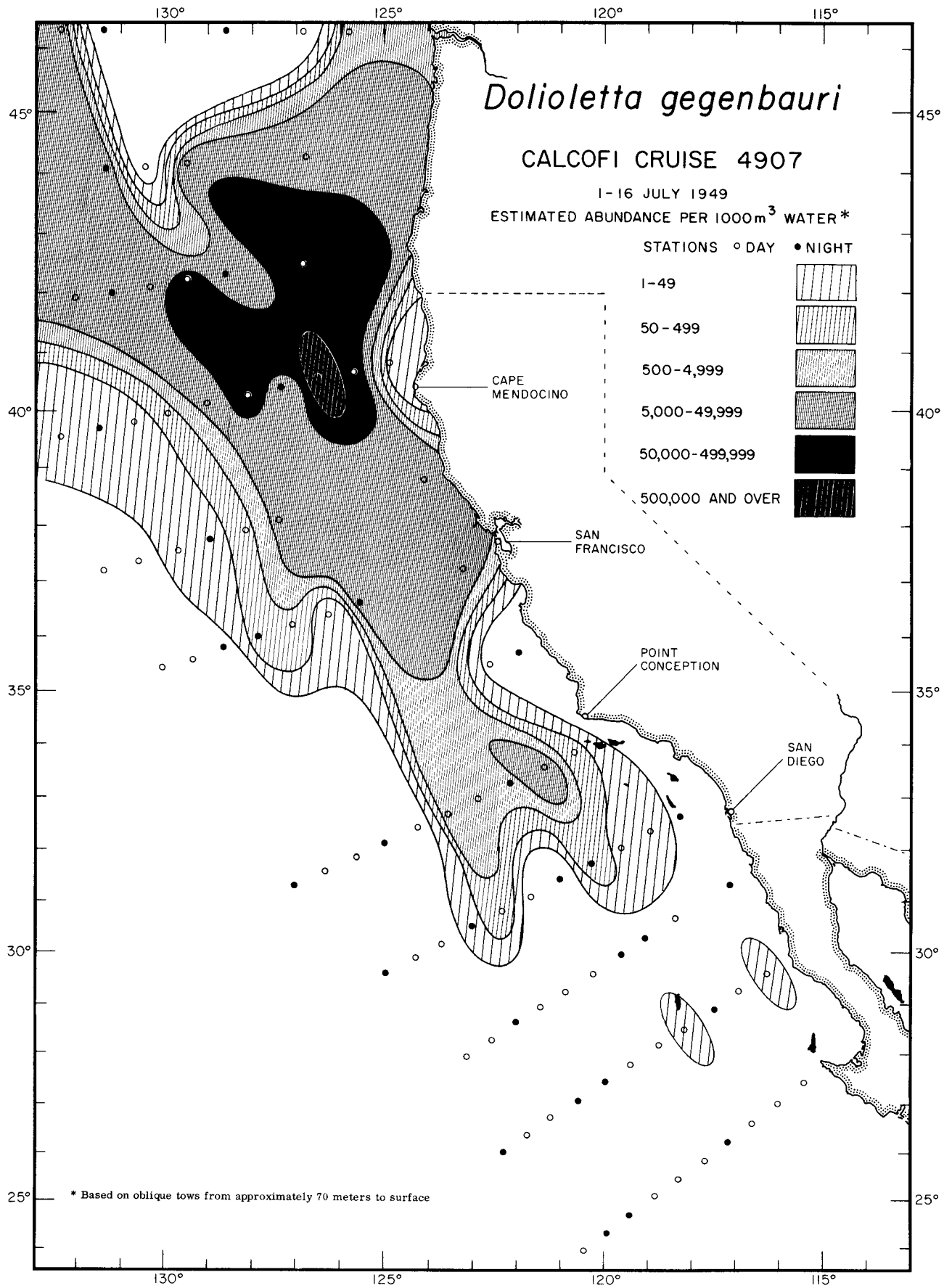
Thaliacea
Doliioletta gegenbauri
4904



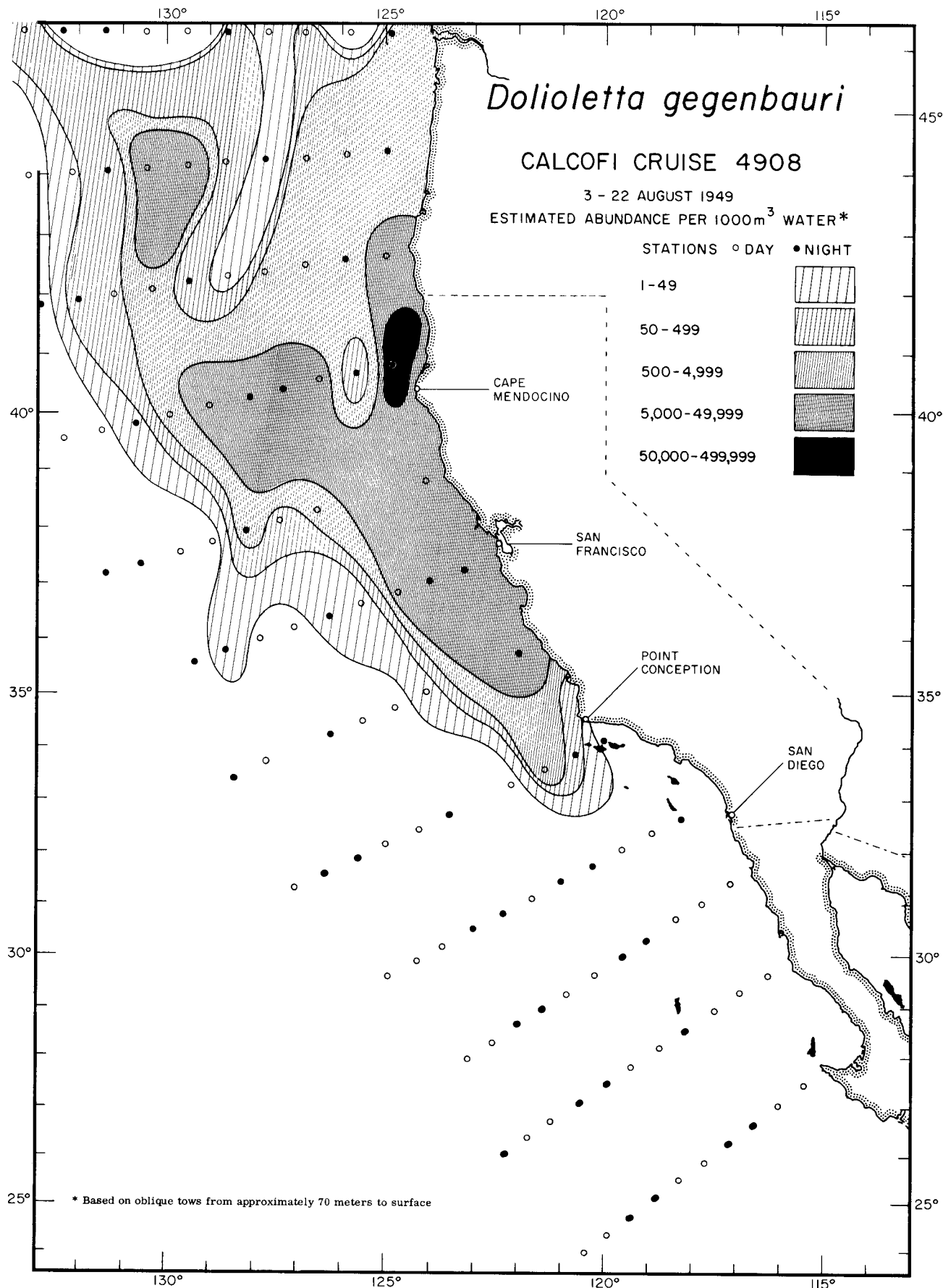
Thaliacea
Doliioletta gegenbauri
4905



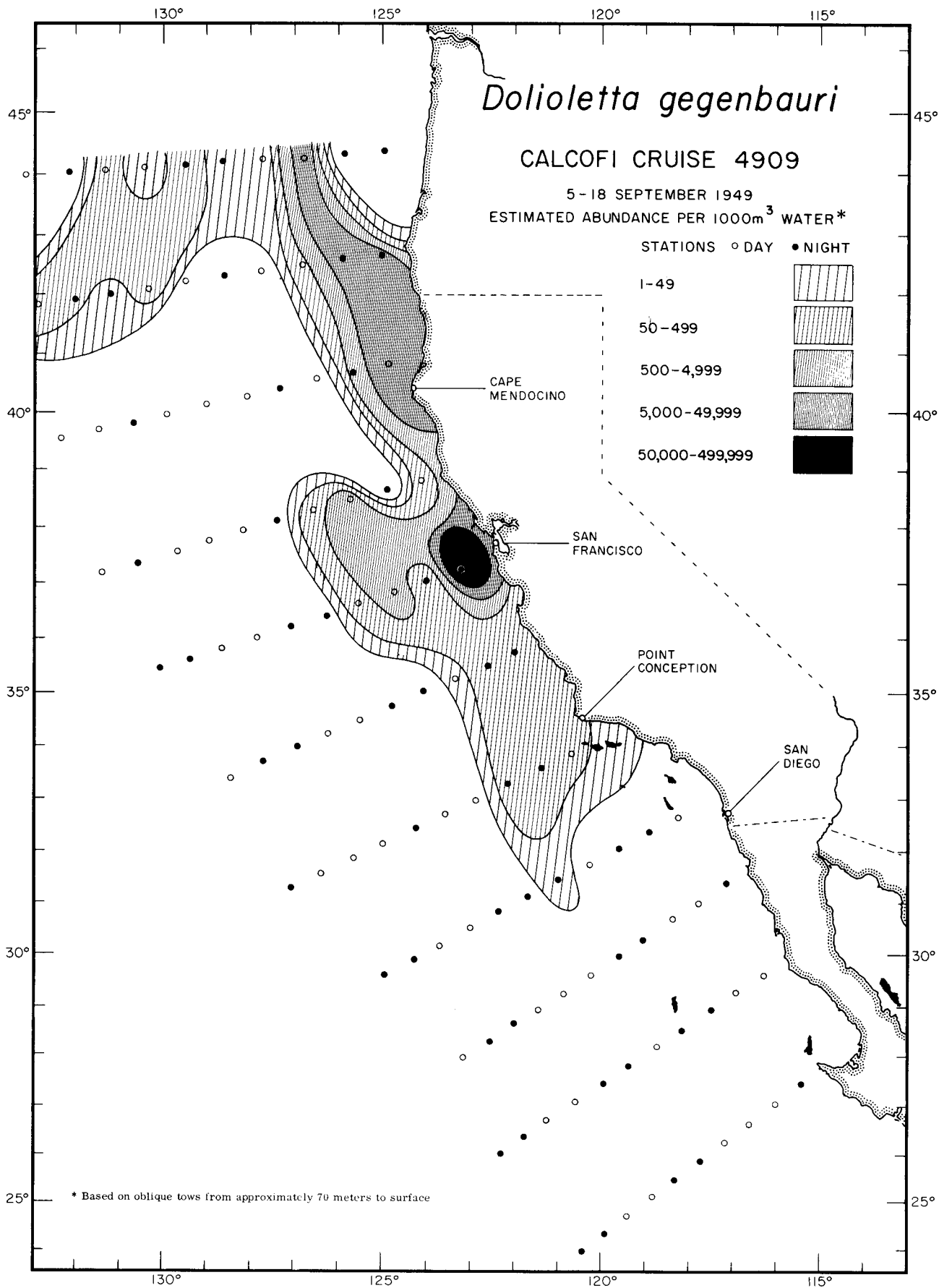
Thaliacea
Doliioletta gegenbauri
4906



Thaliacea
Doliioletta gegenbauri
4907

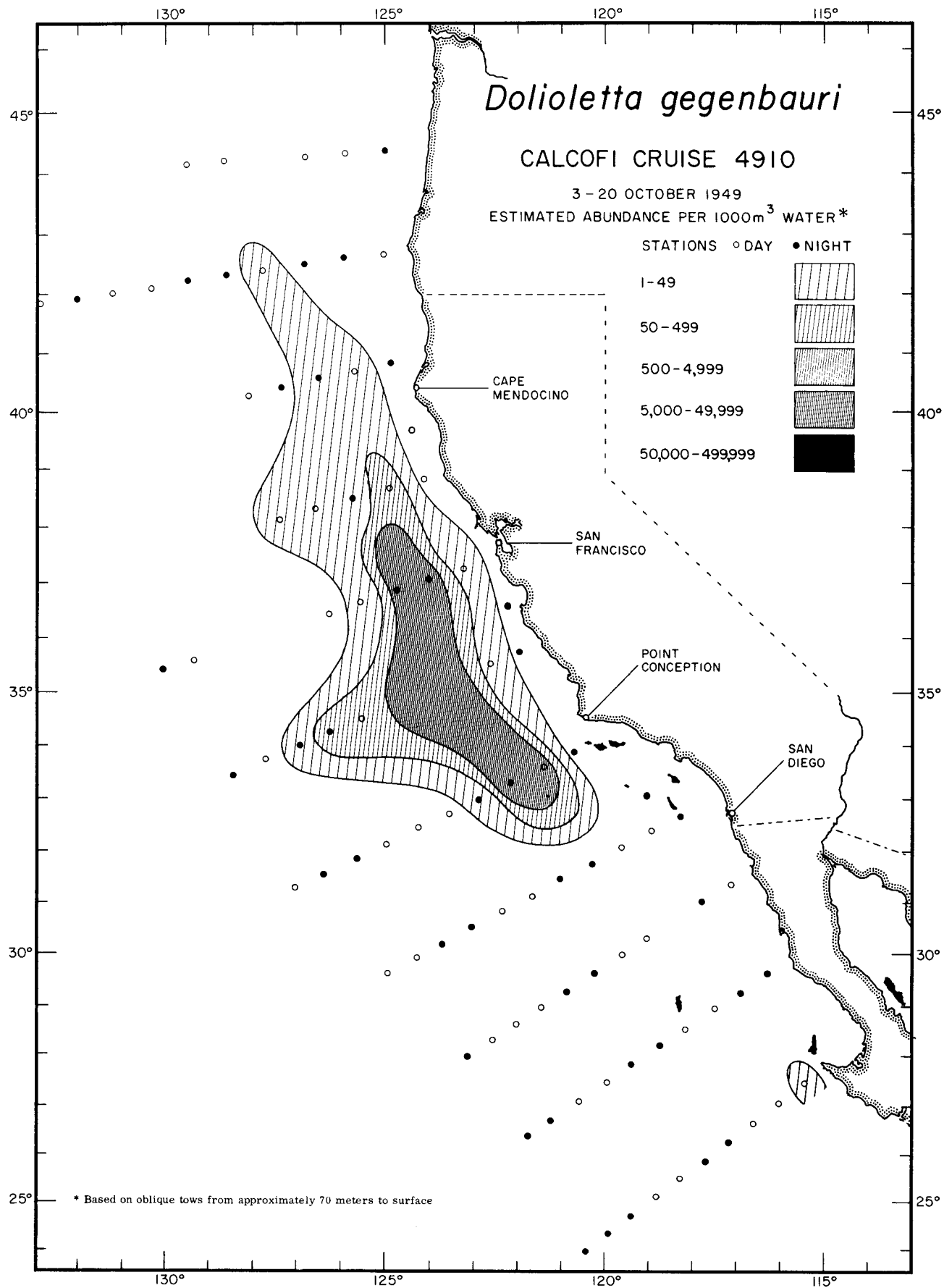


Thaliacea
Dolioletta gegenbauri
 4908



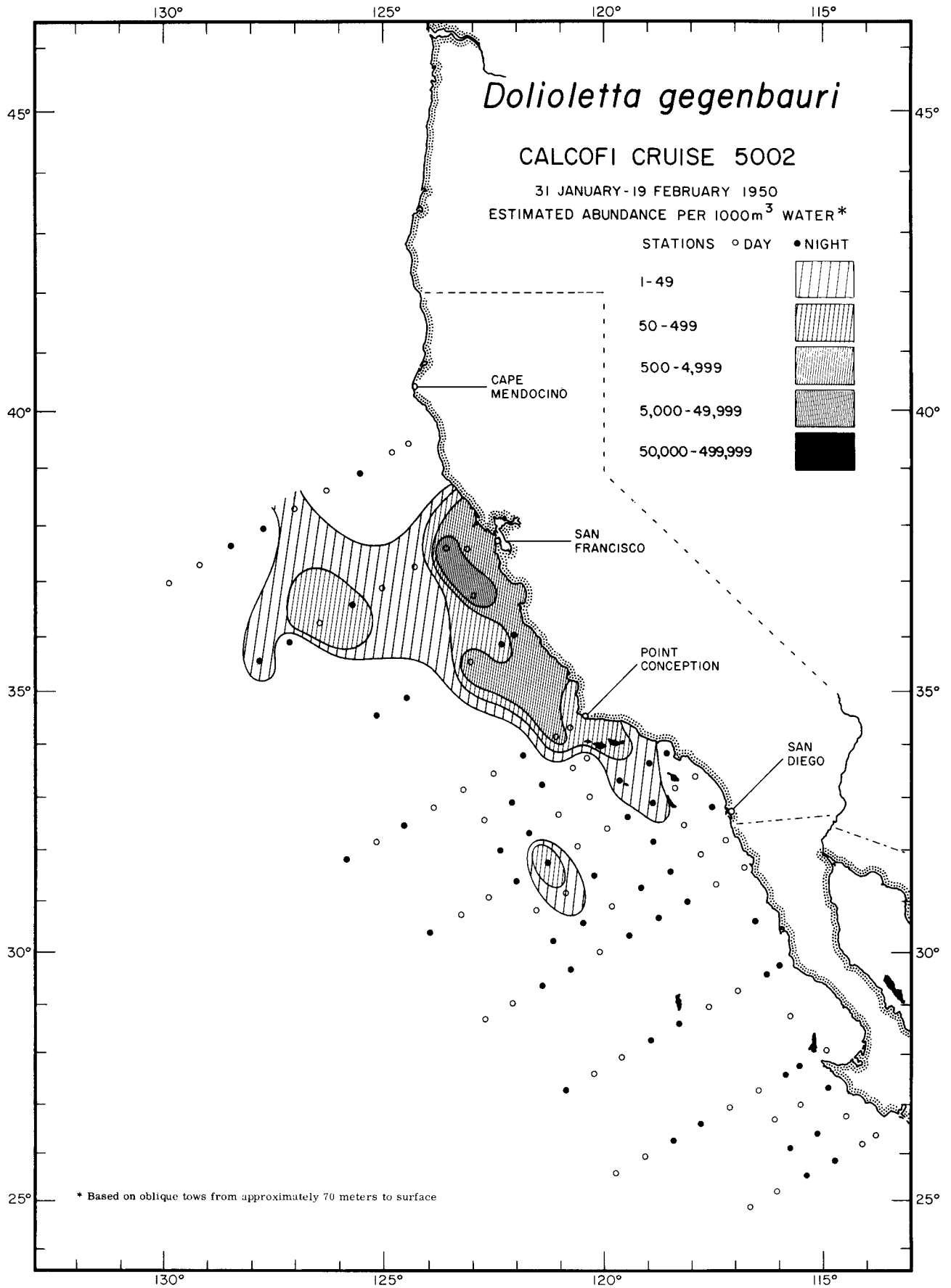
Thaliacea
Doliioletta gegenbauri

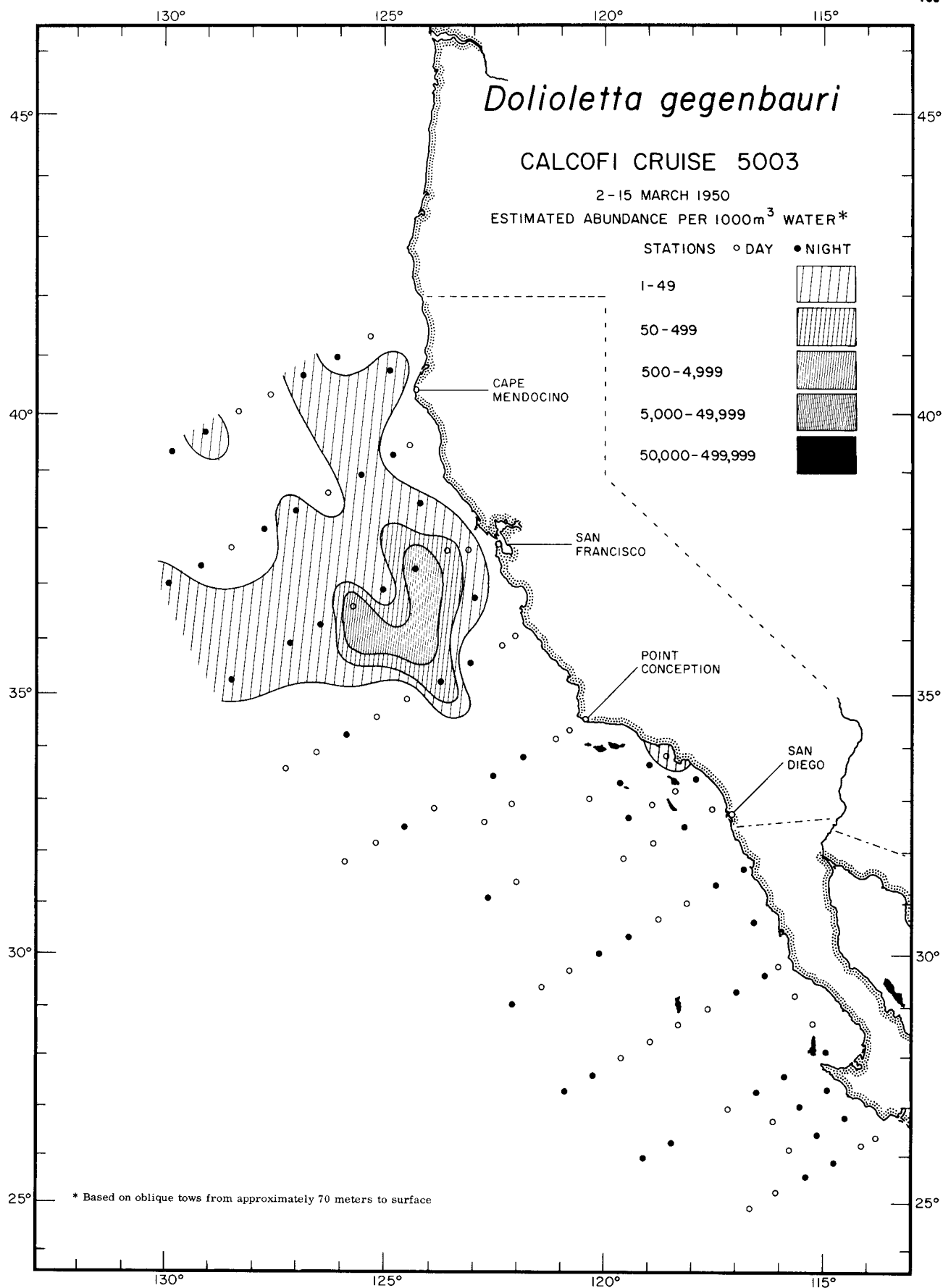
4909



Thaliacea
Dolioletta gegenbauri

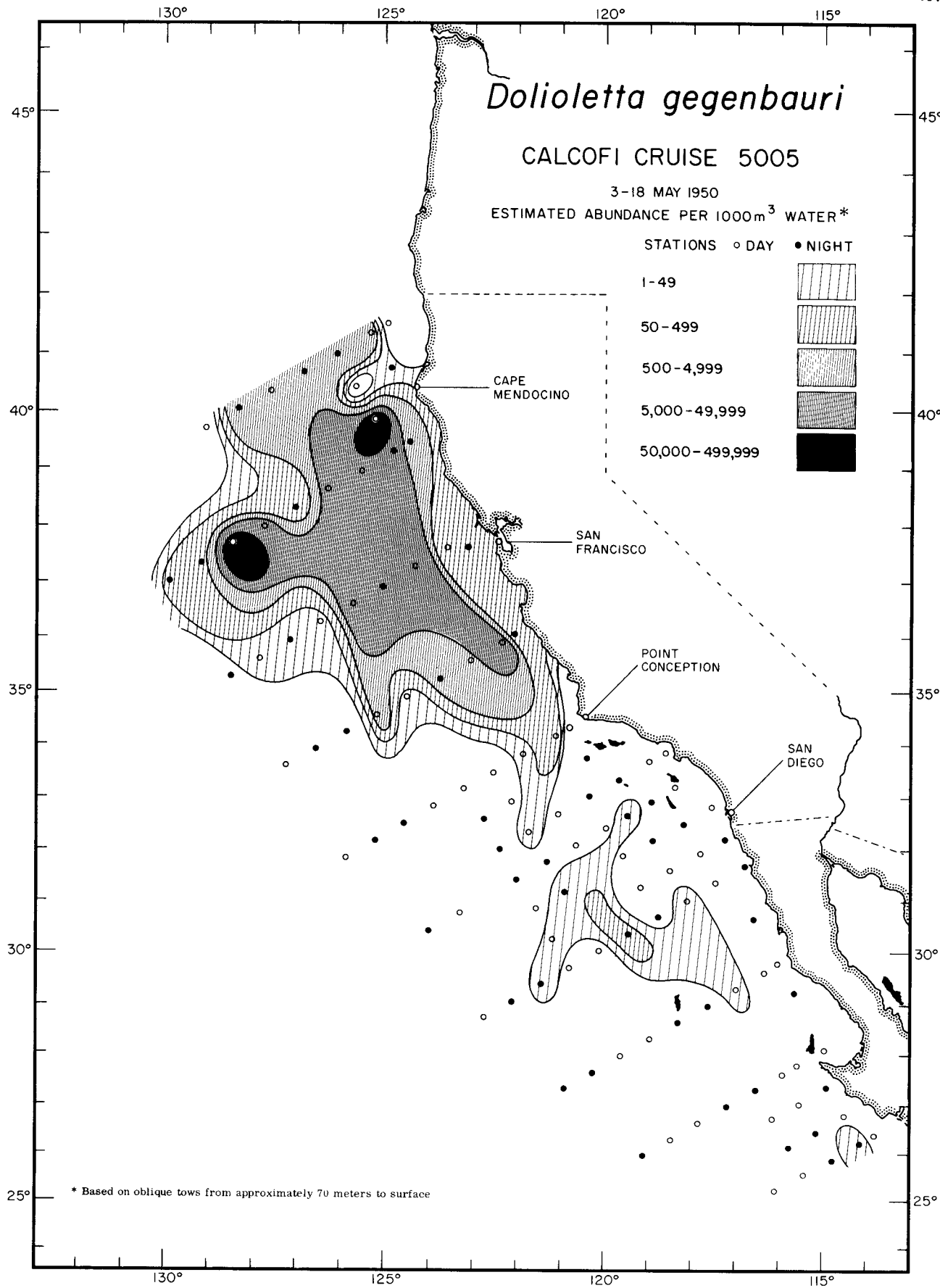
4910



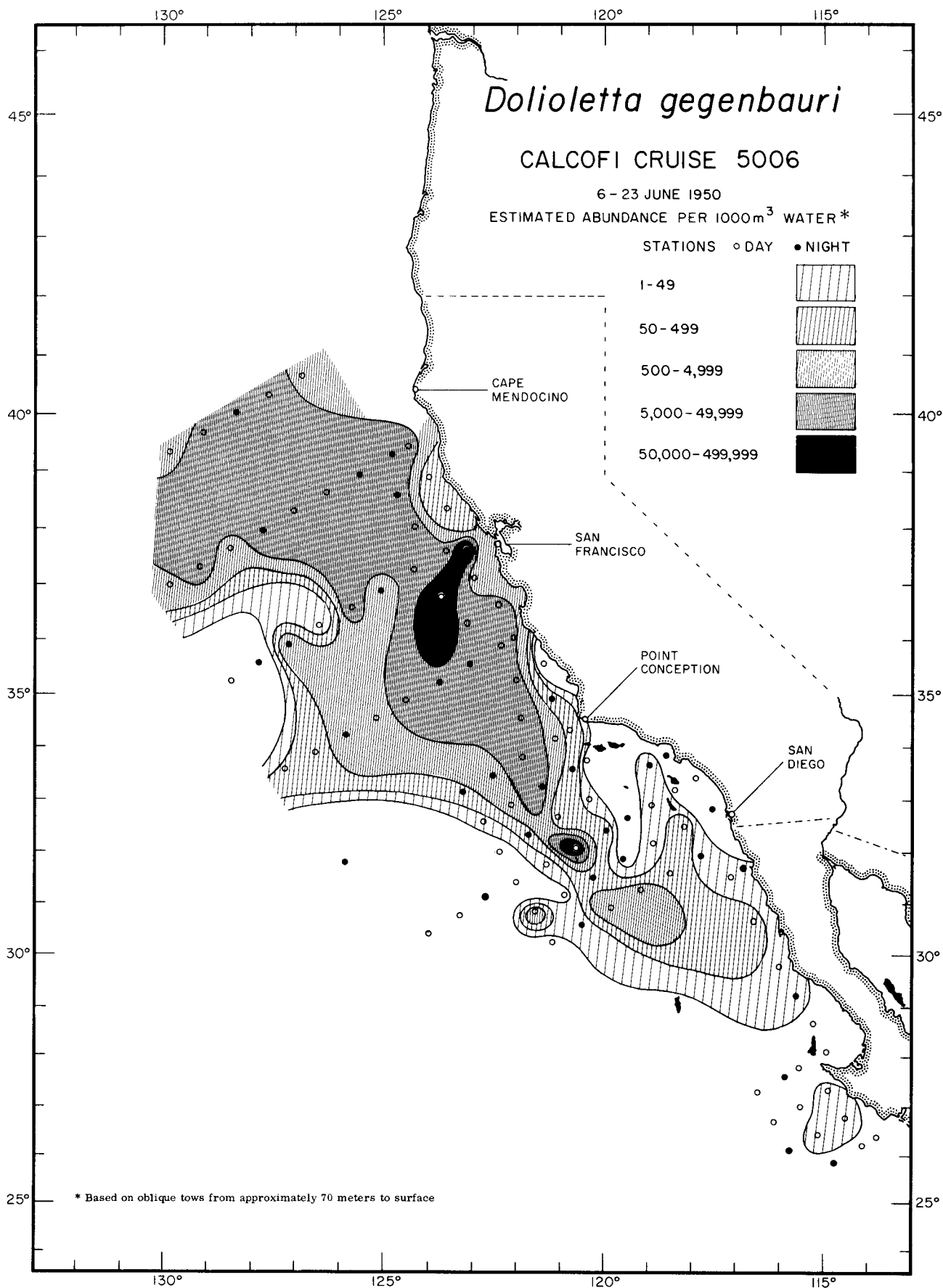


Thaliacea
Dolioletta gegenbauri

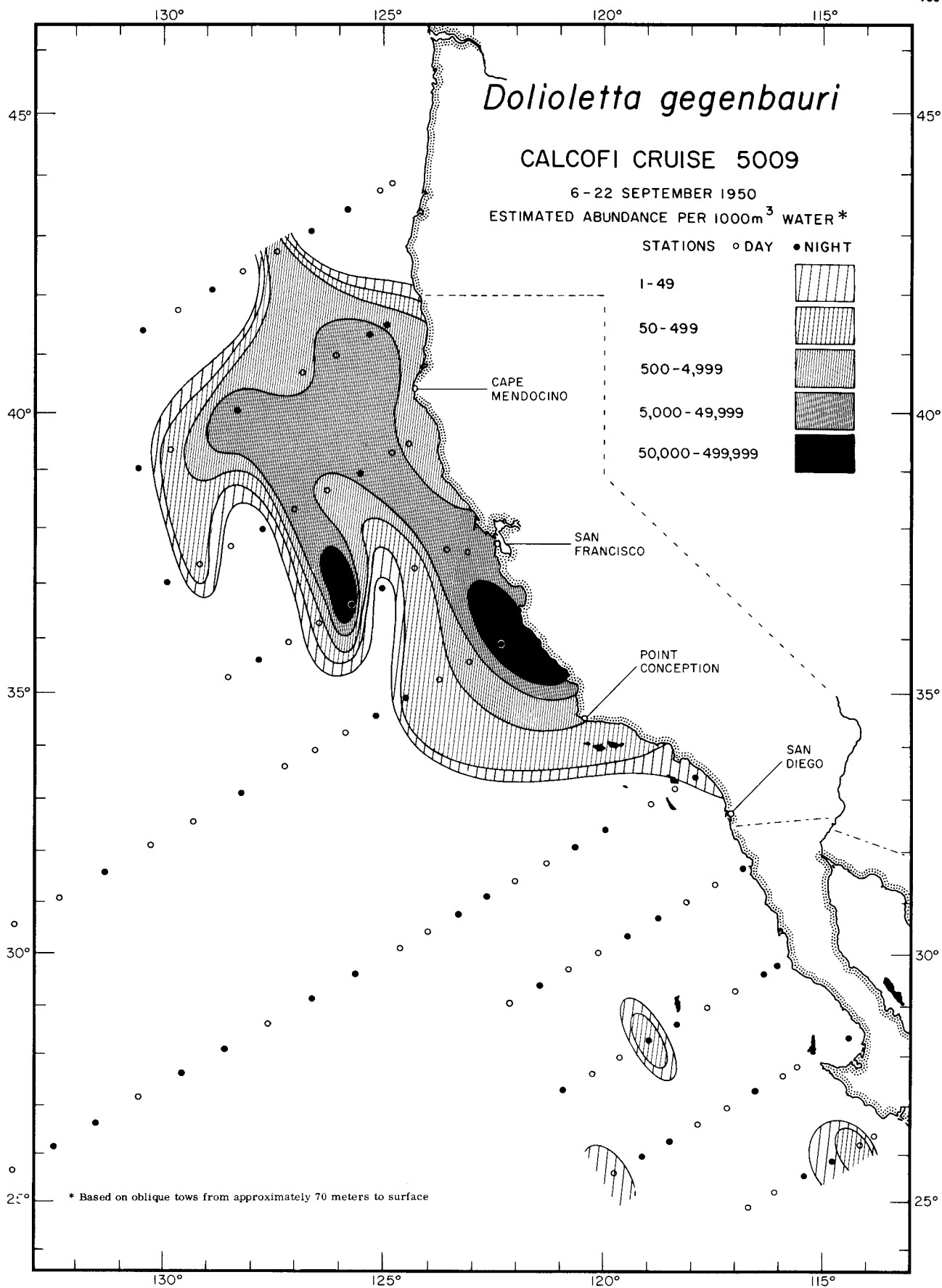
5003



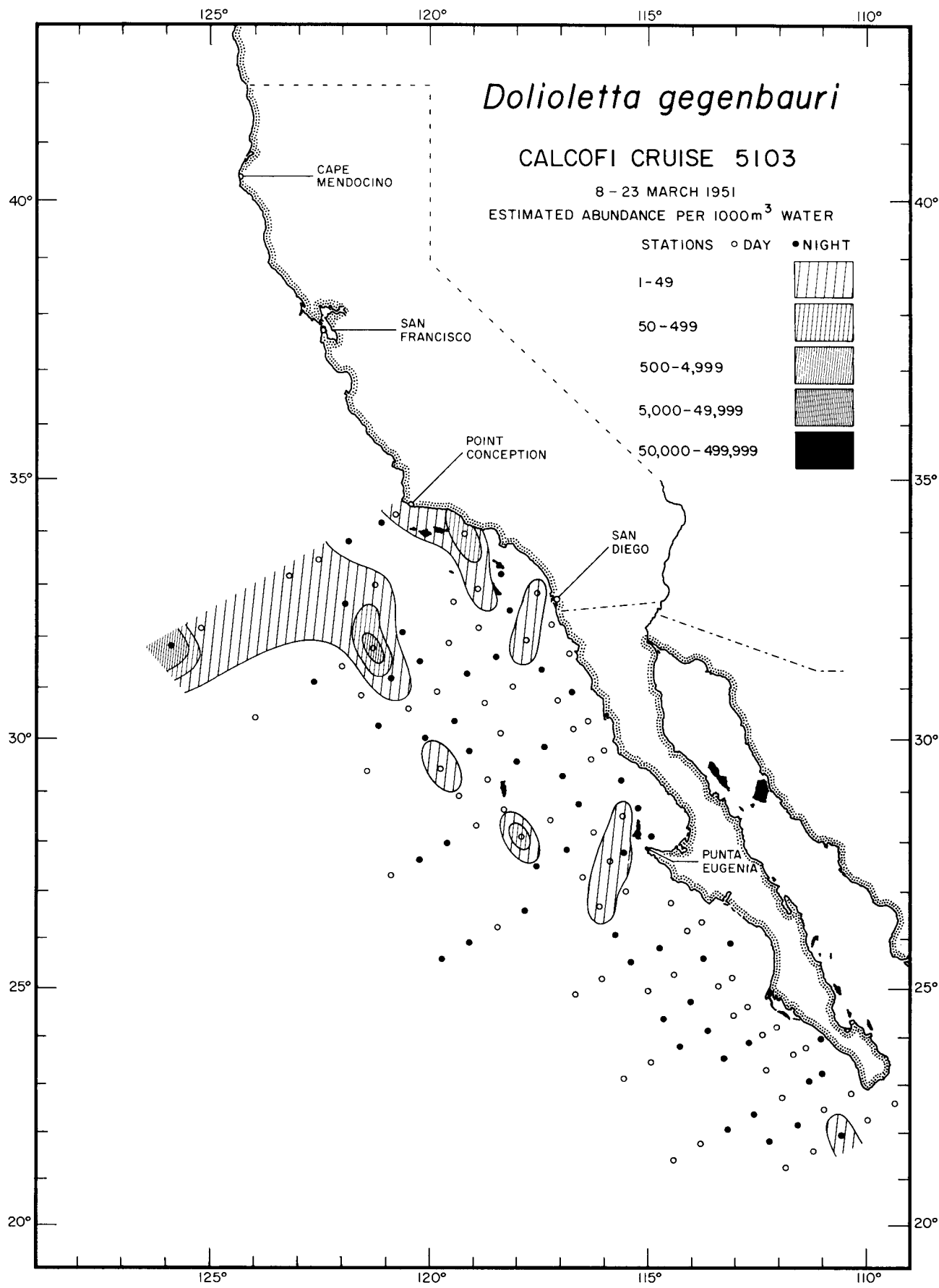
Thaliacea
Dolioletta gegenbauri
 5005



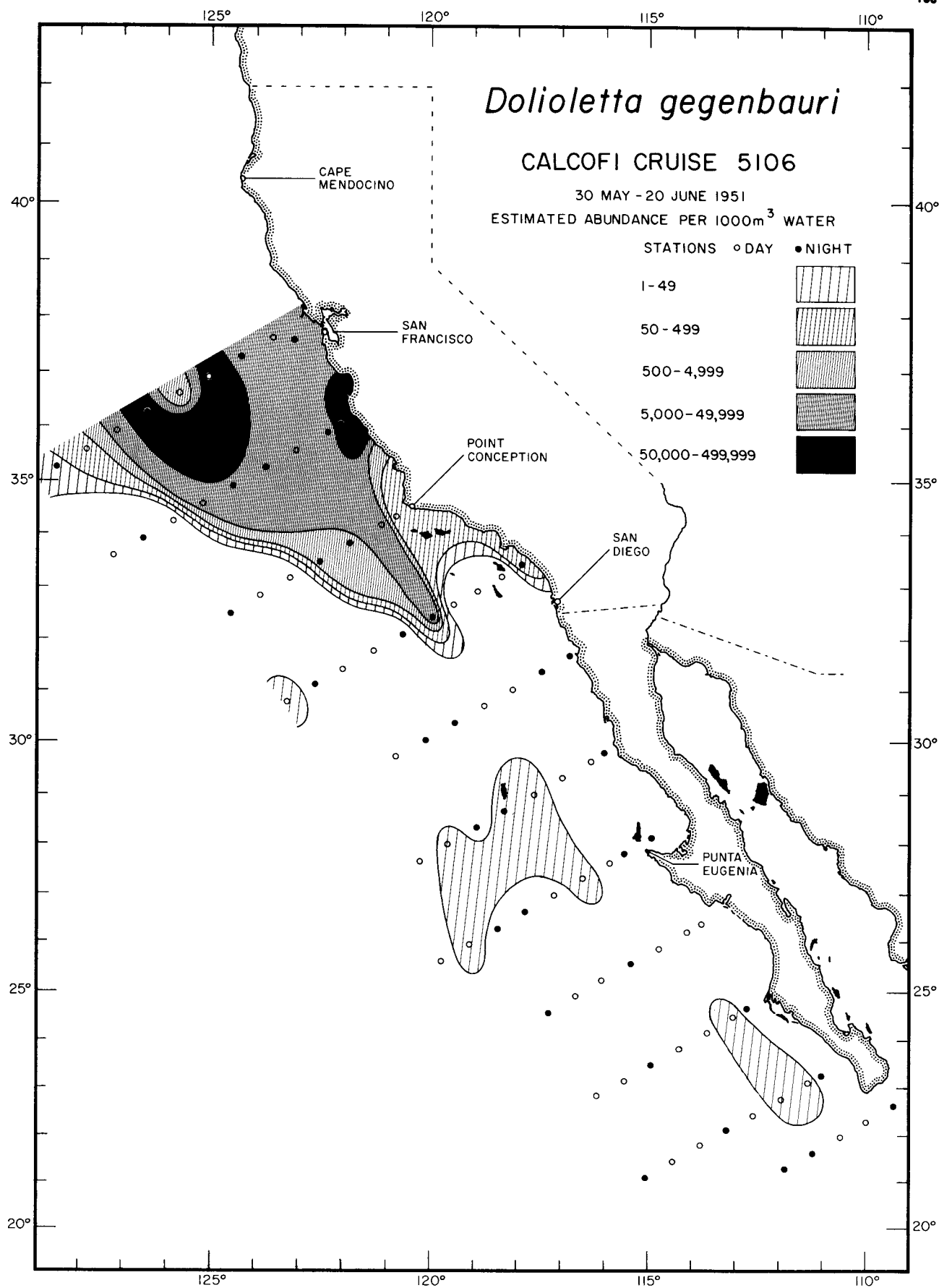
Thaliacea
Doliioletta gegenbauri
5006



Thaliacea
Doliioletta gegenbauri
5009

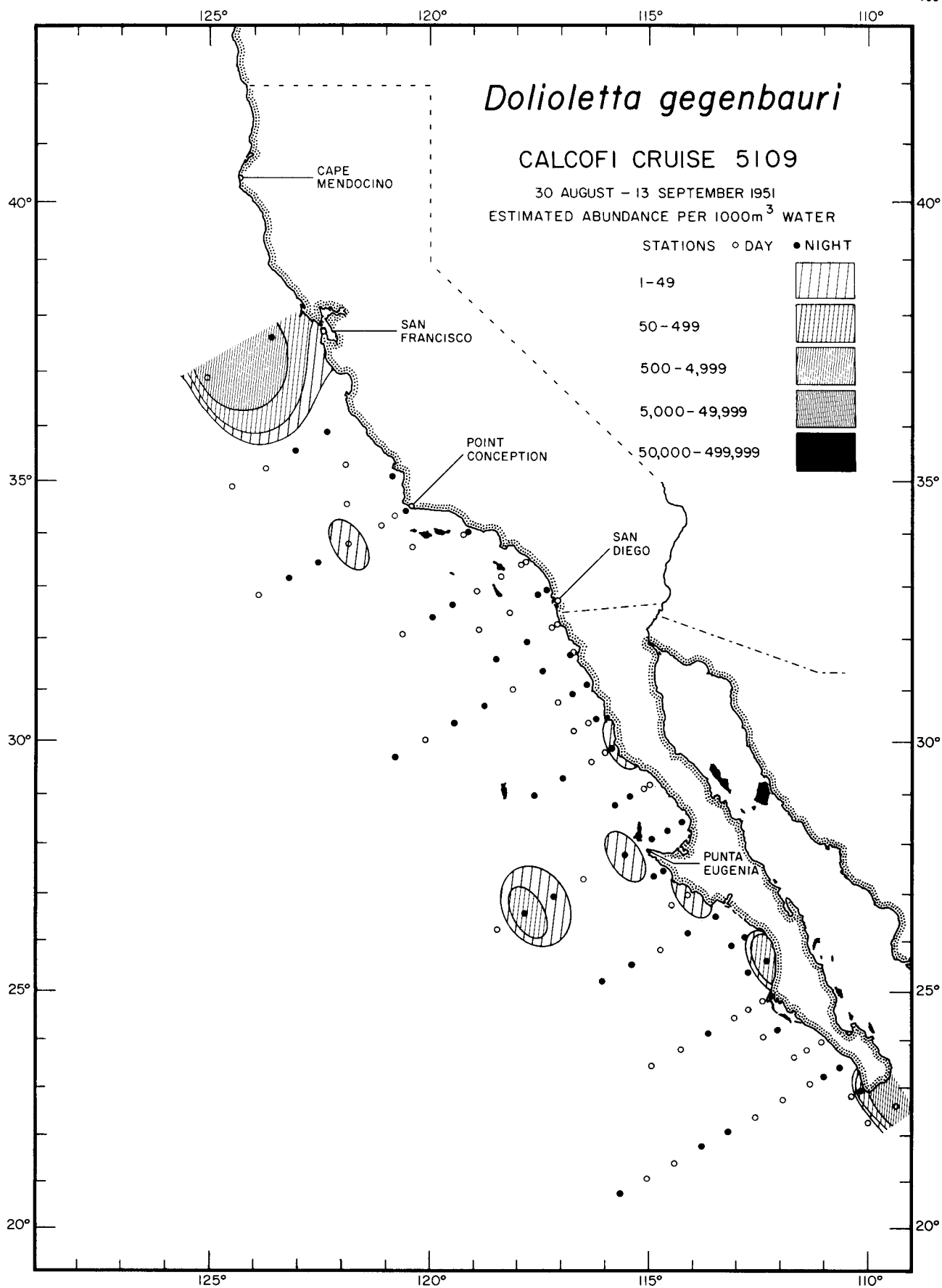


Thaliacea
Doliioletta gegenbauri
5103



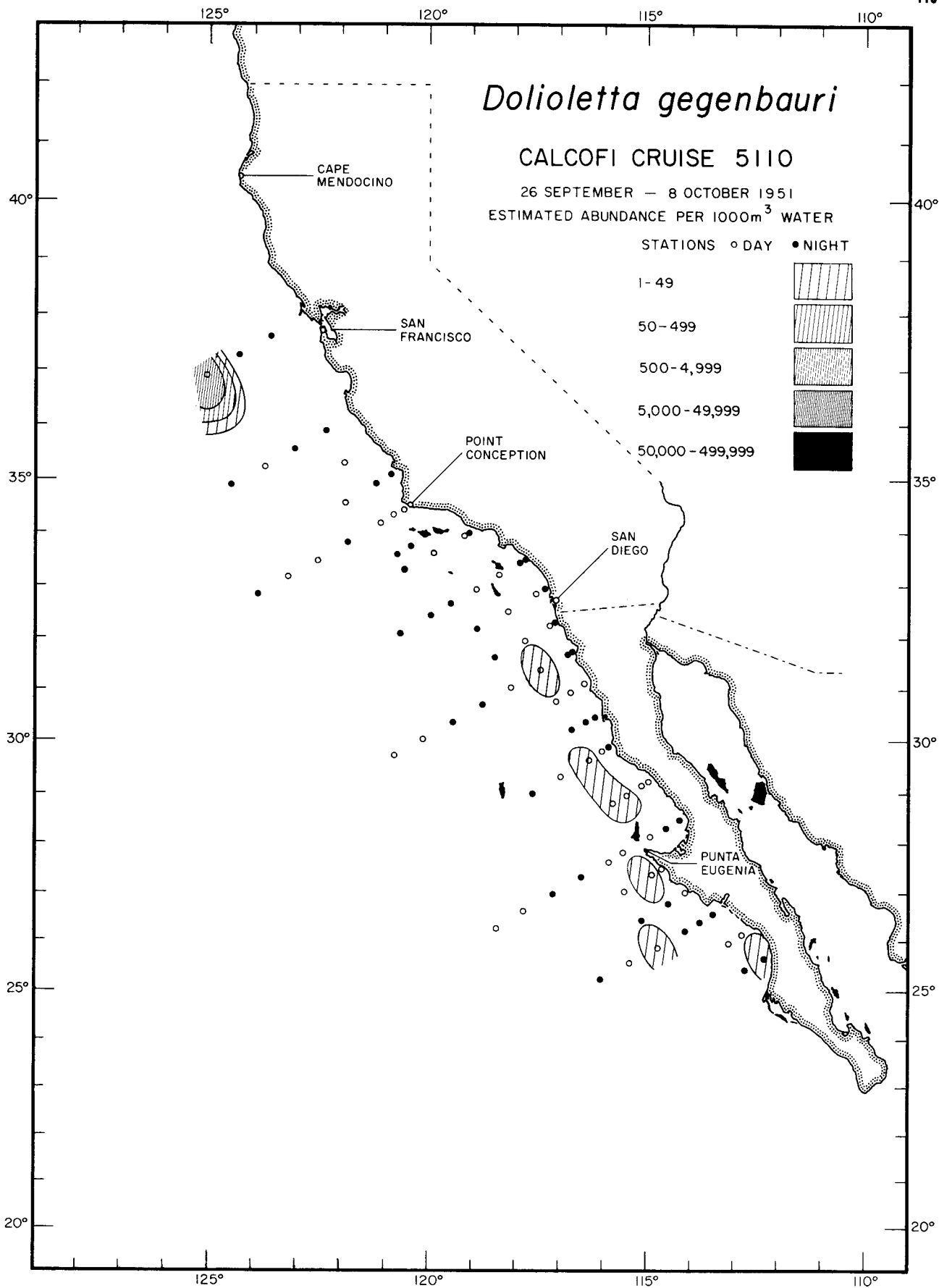
Thaliacea
Dolioletta gegenbauri

5106



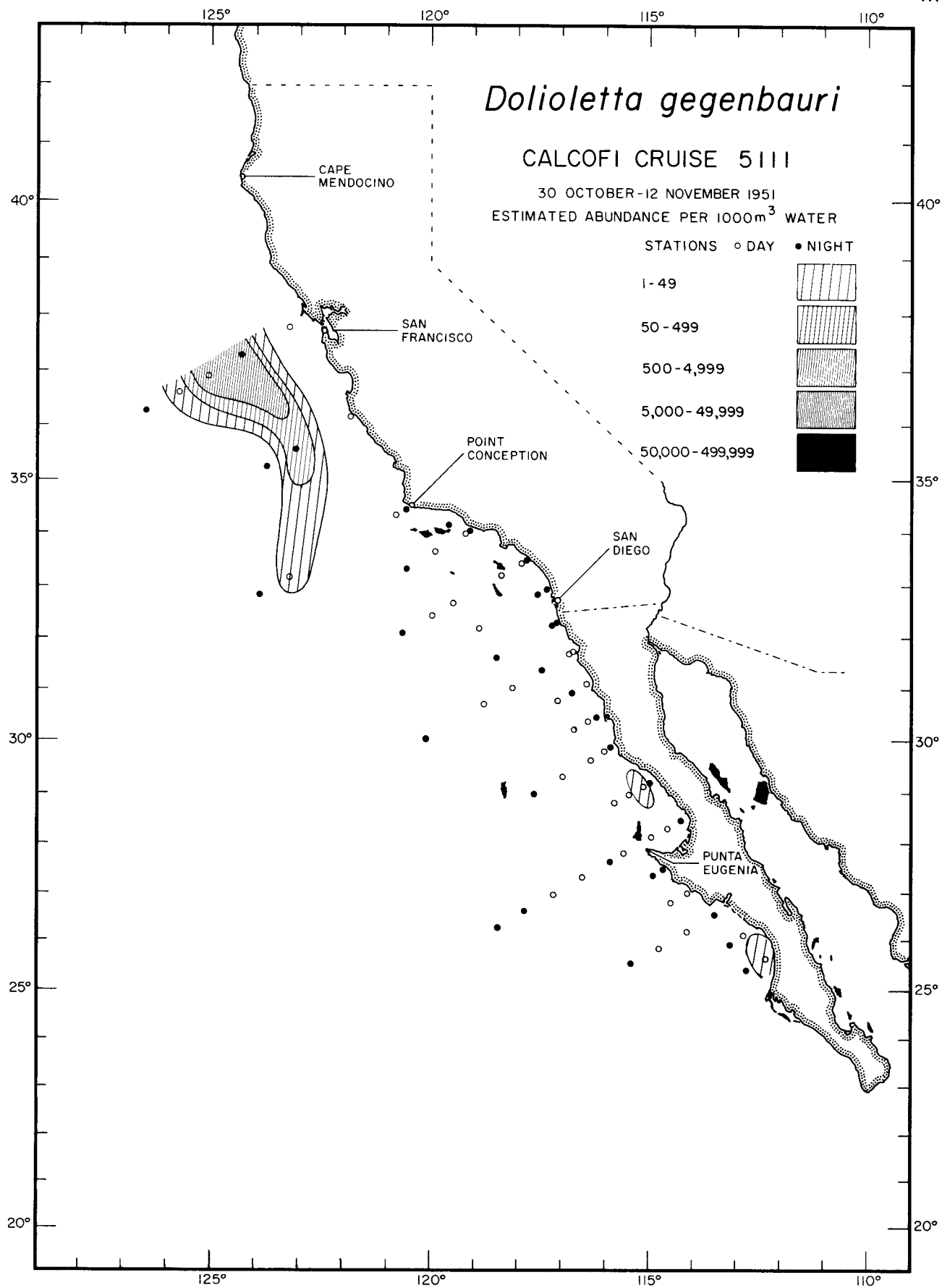
Thaliacea
Dolioletta gegenbauri

5109



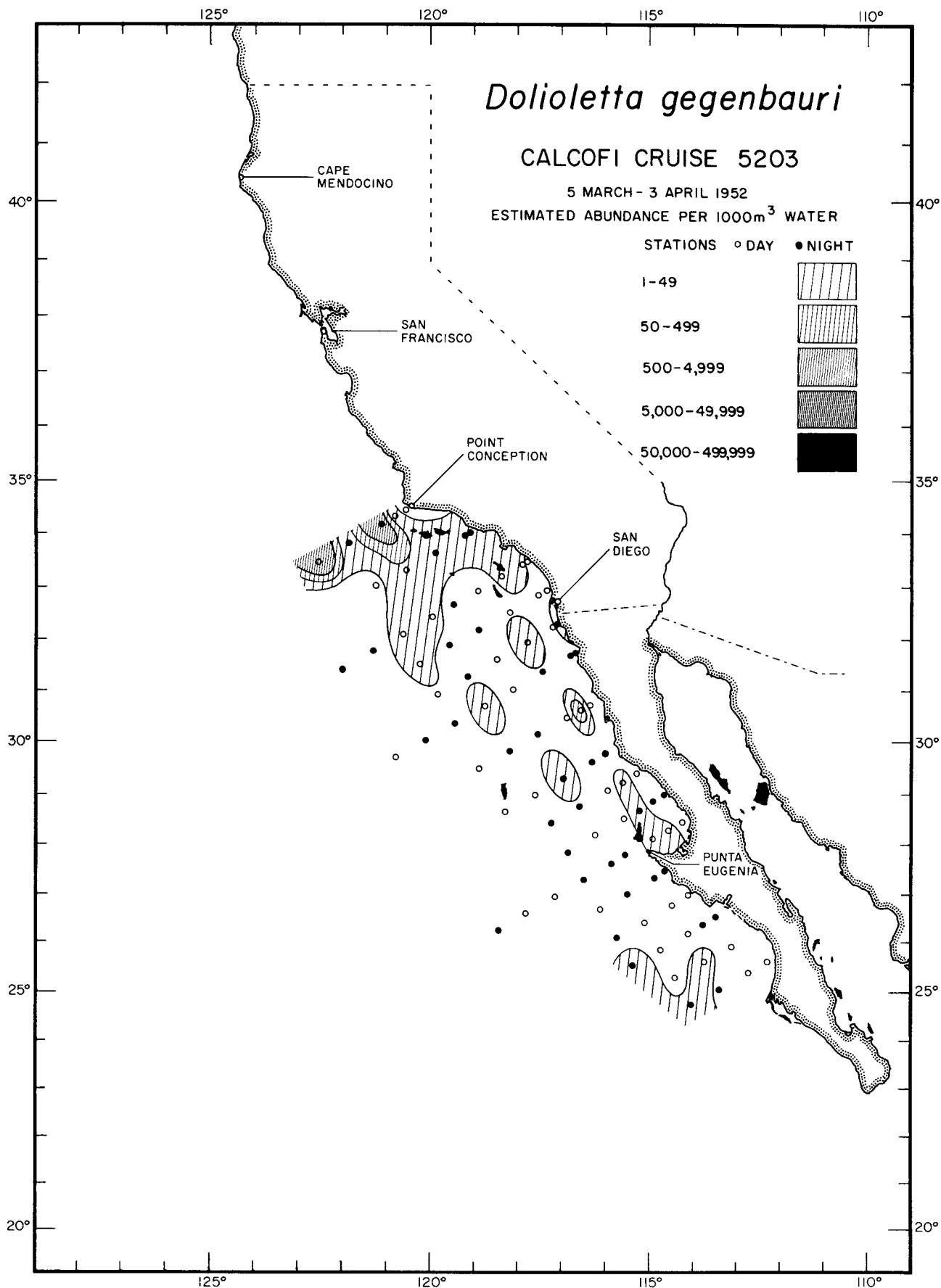
Thaliacea
Dolioletta gegenbauri

5110

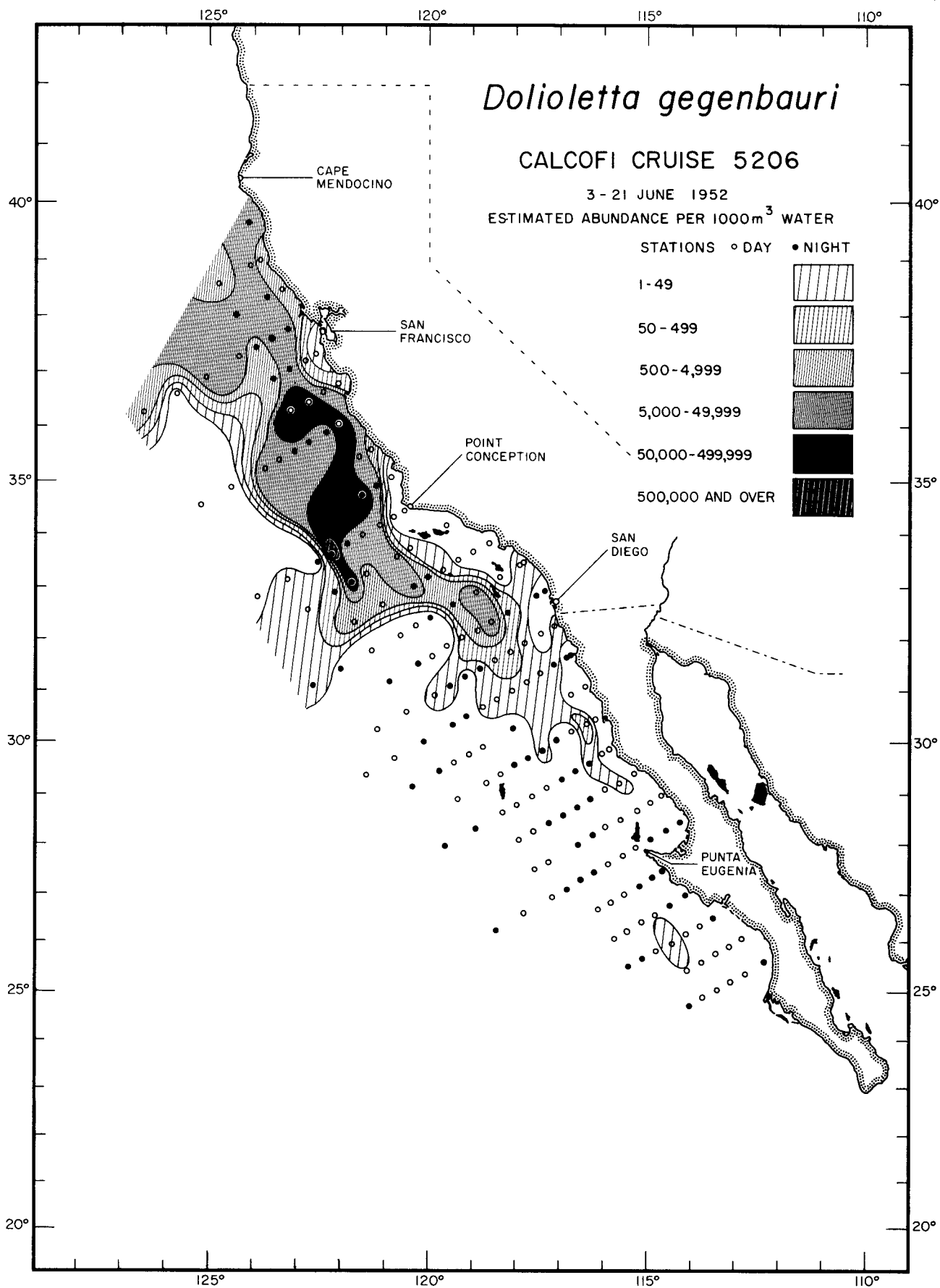


Thaliacea
Doliioletta gegenbauri

5111

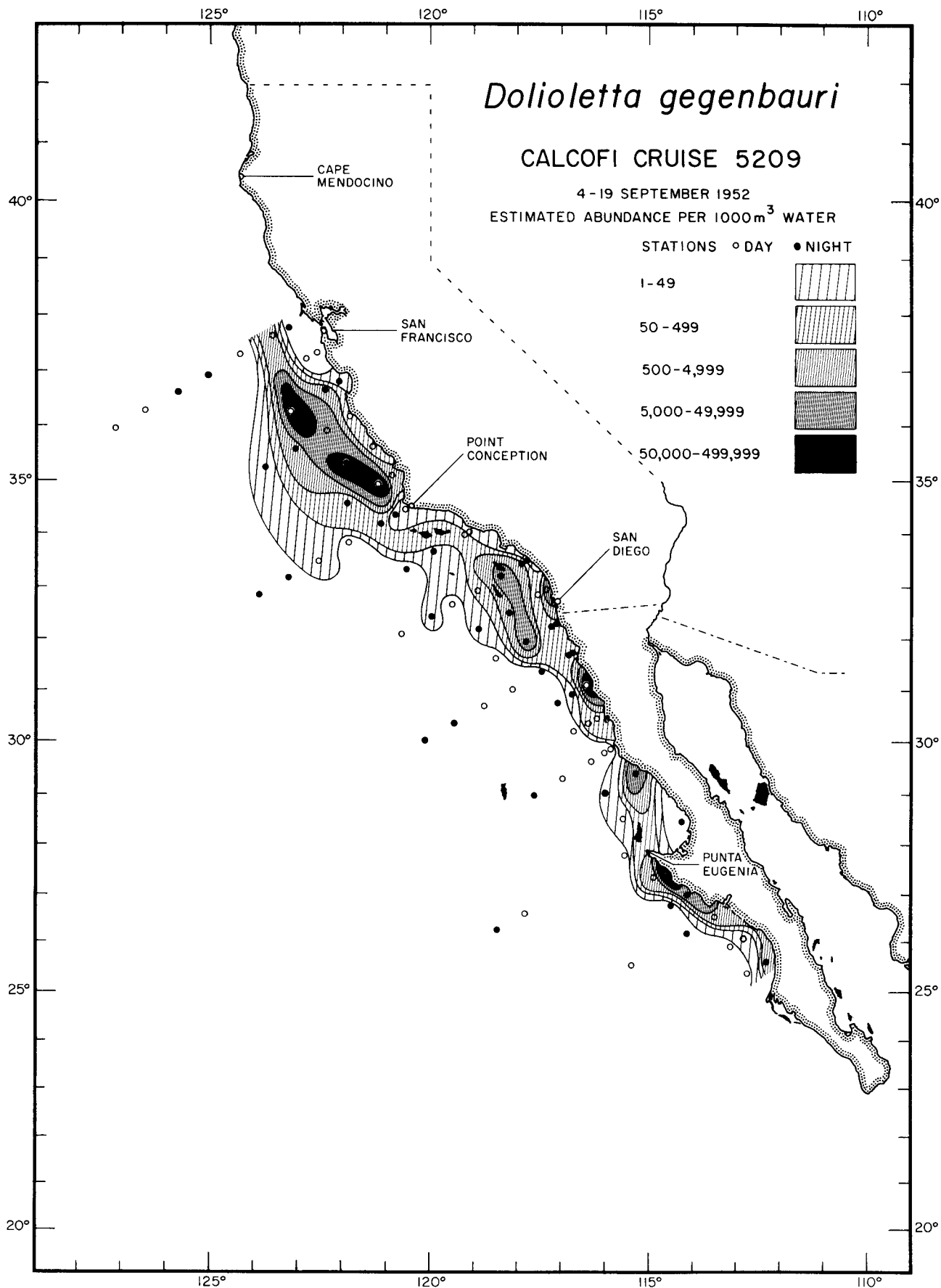


Thaliacea
Dolioletta gegenbauri
 5203



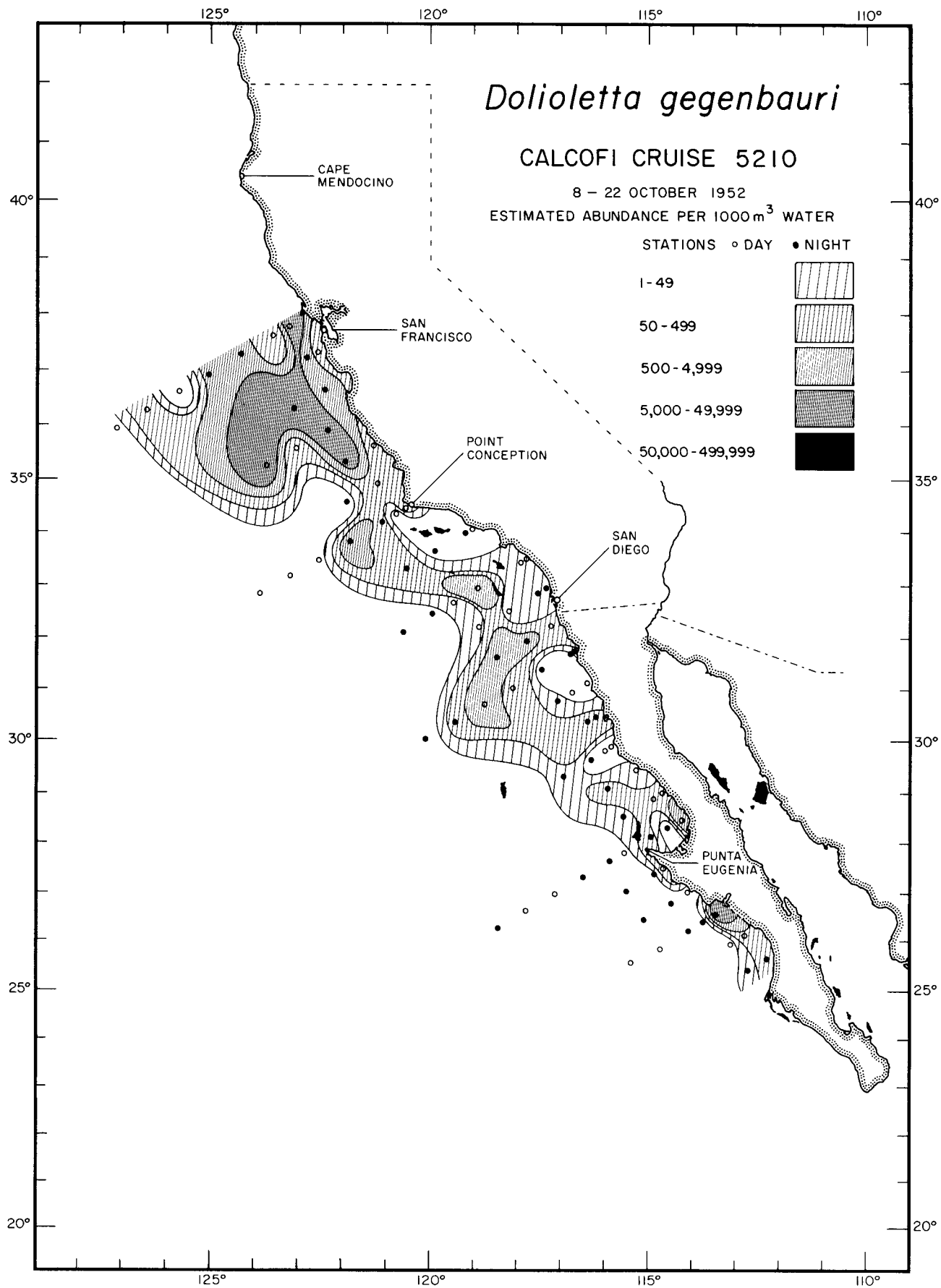
Thaliacea
Doliioletta gegenbauri

5206



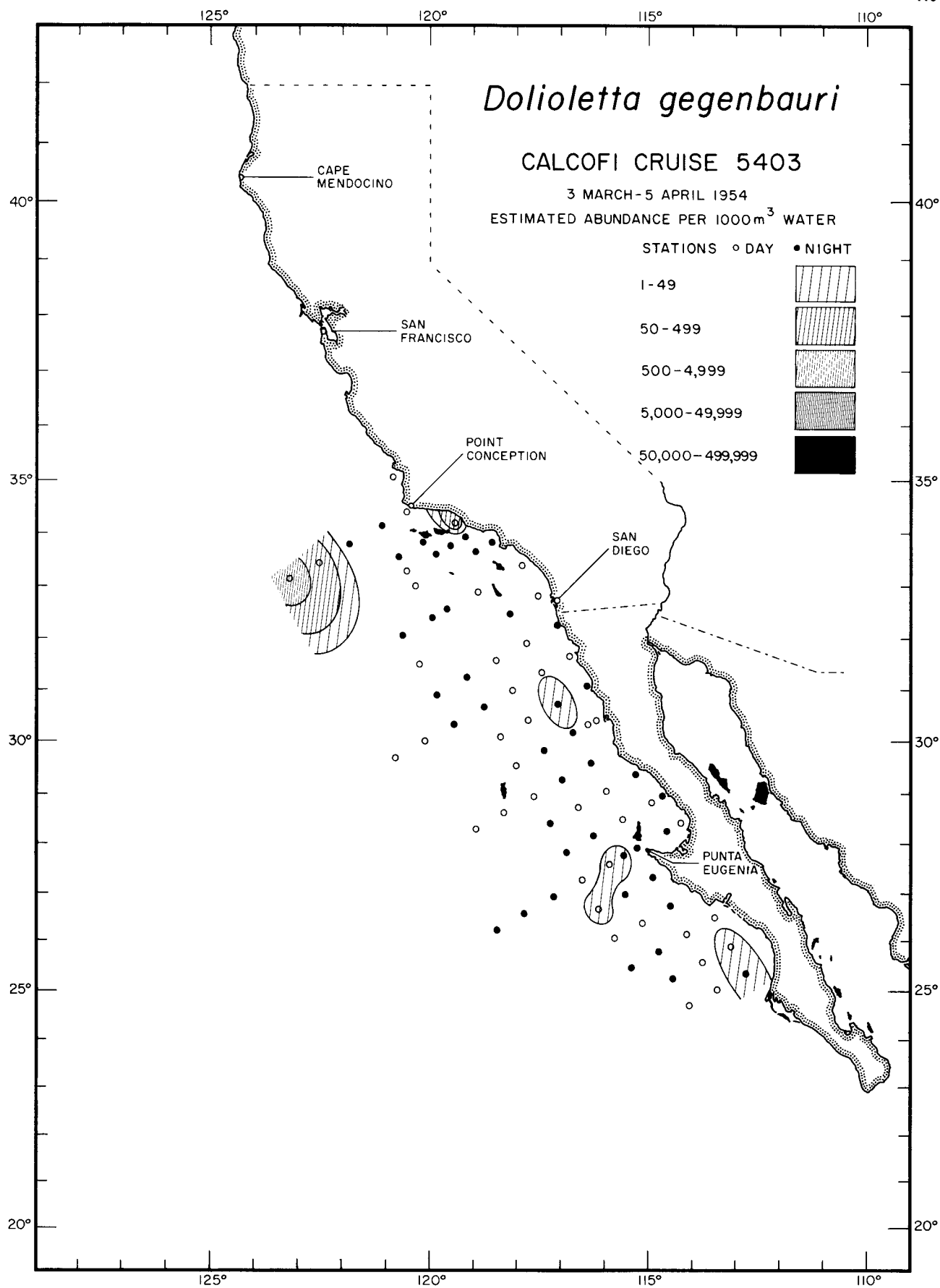
Thaliacea
Dolioletta gegenbauri

5209



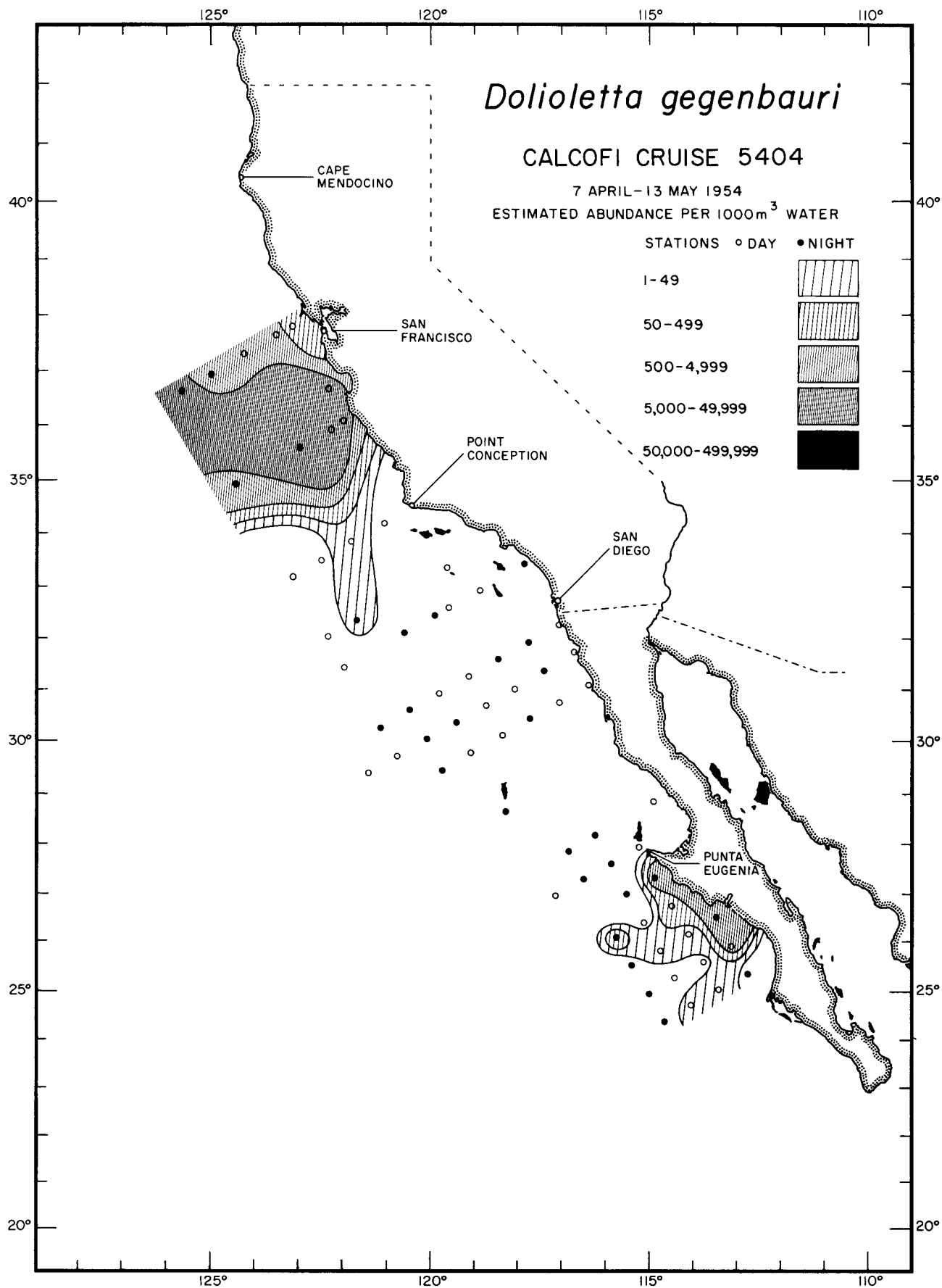
Thaliacea
Doliioletta gegenbauri

5210



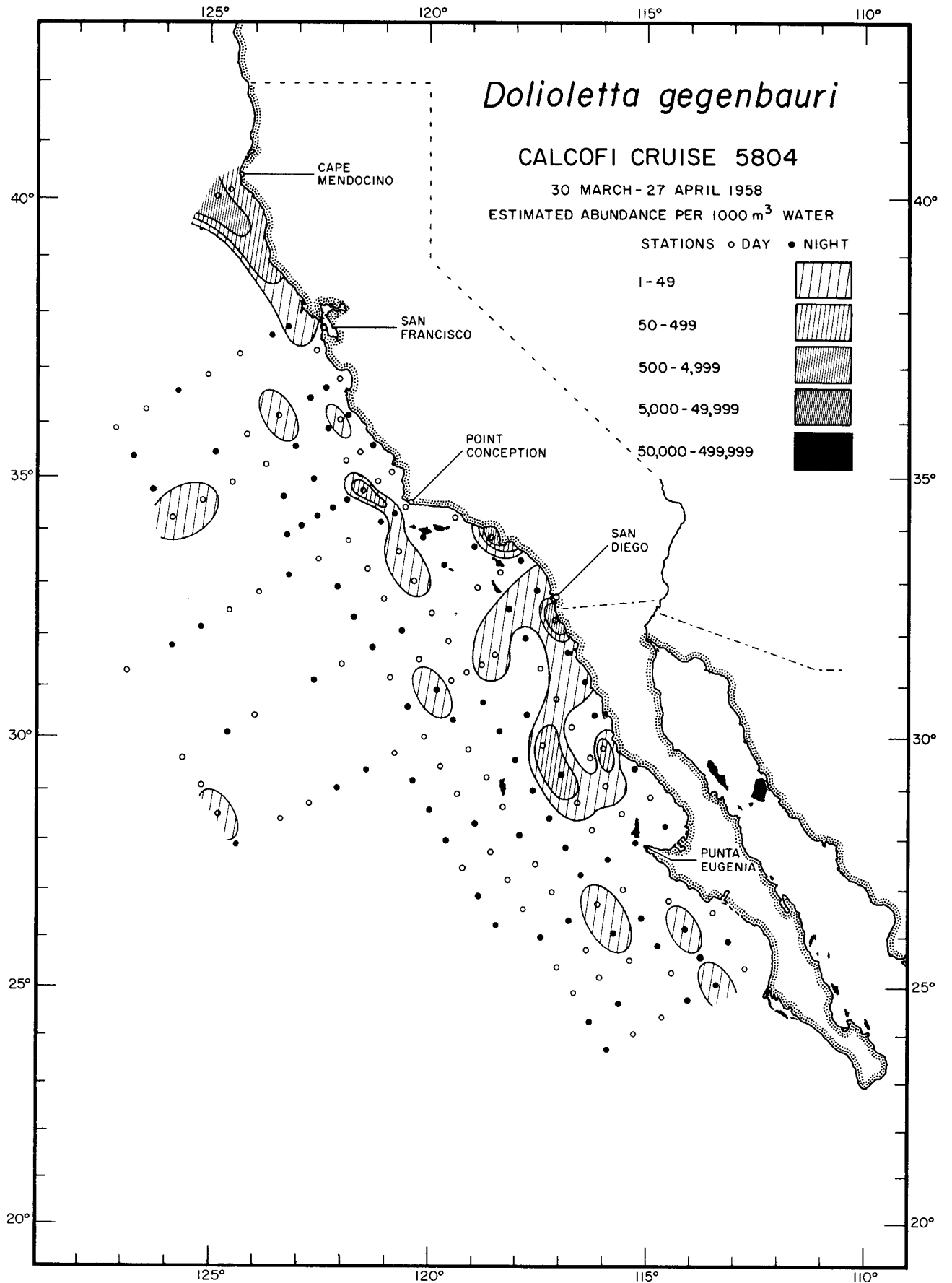
Thaliacea
Dolioletta gegenbauri

5403

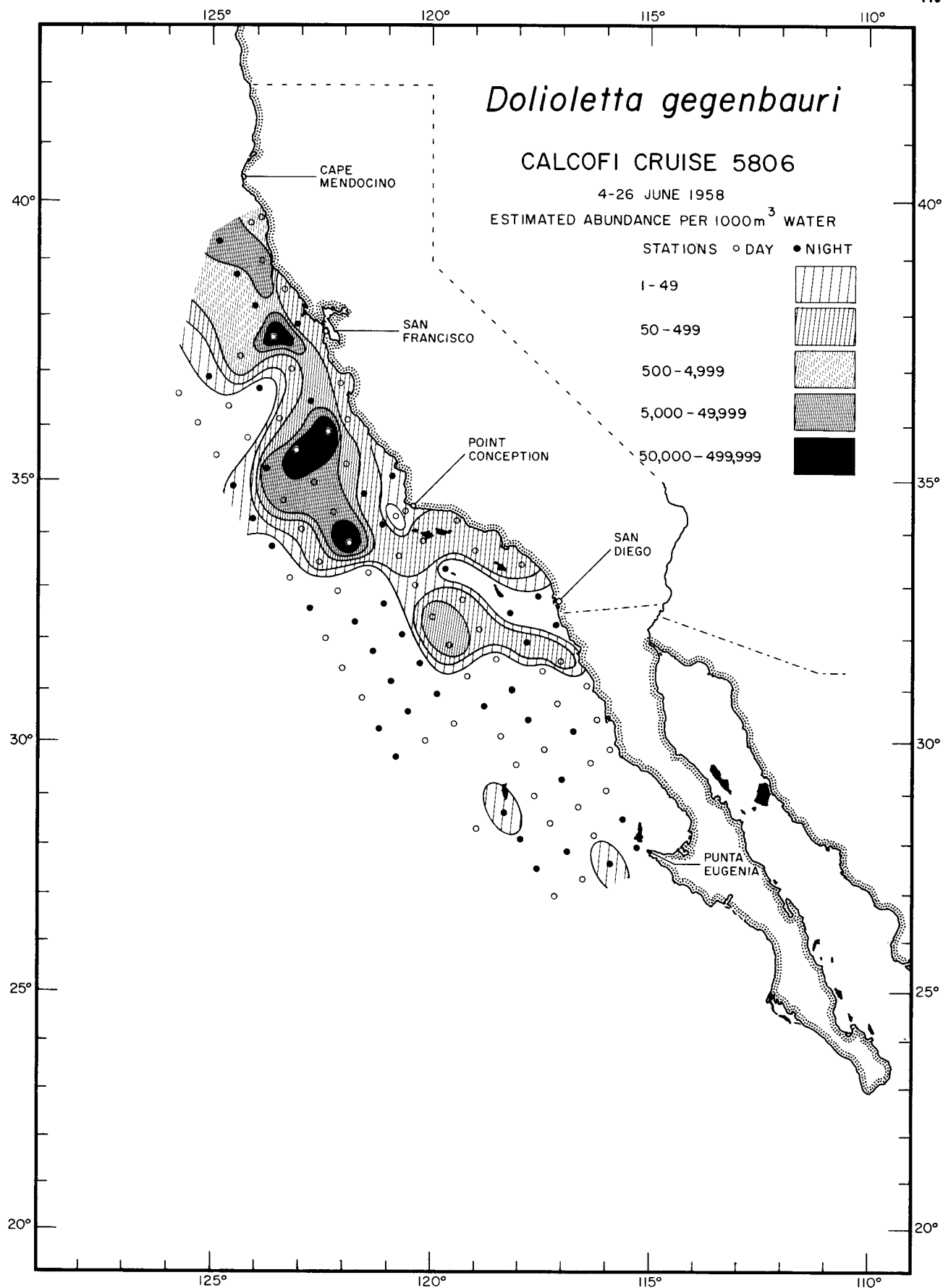


Thaliacea
Dolioletta gegenbauri

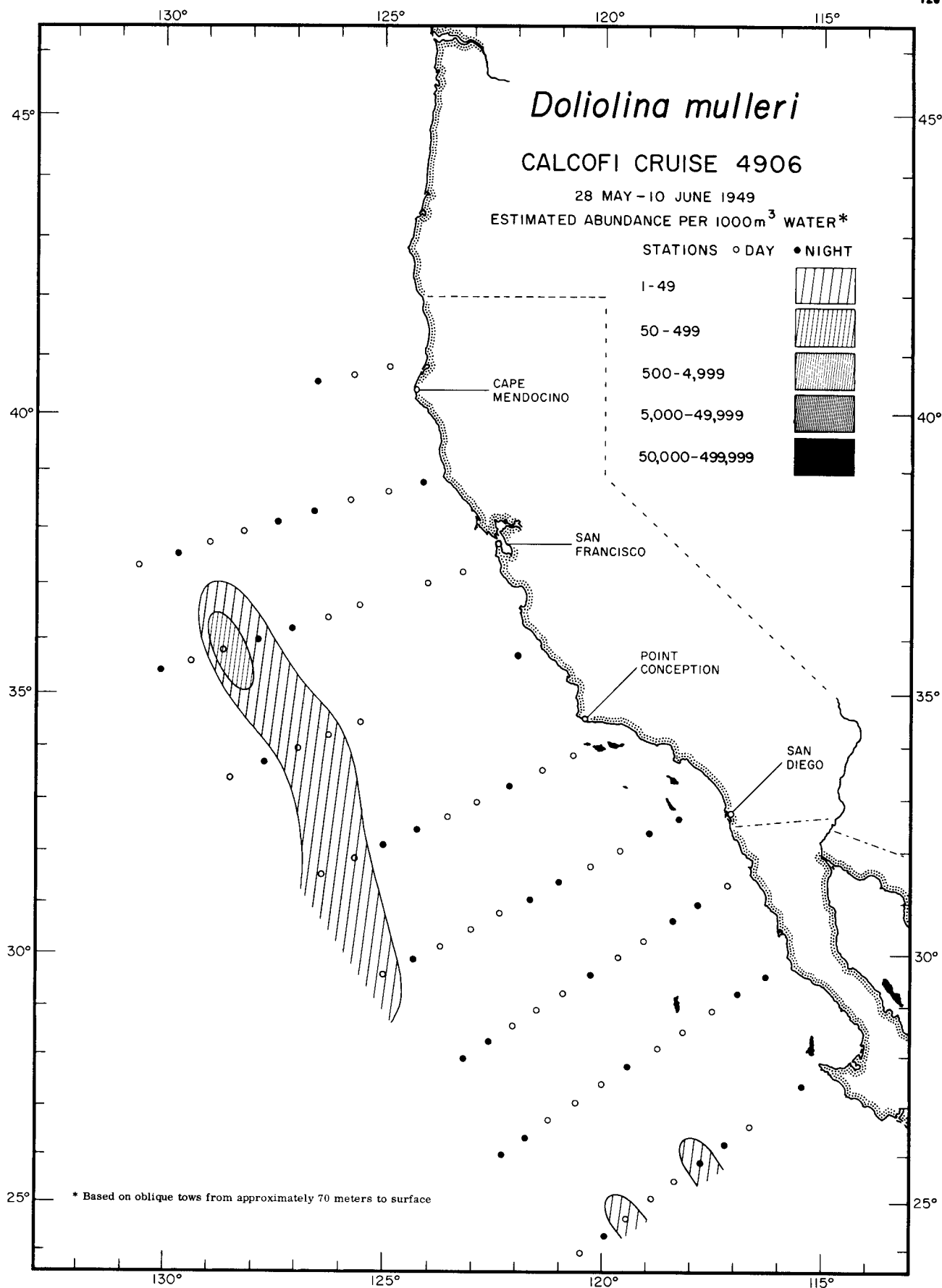
5404



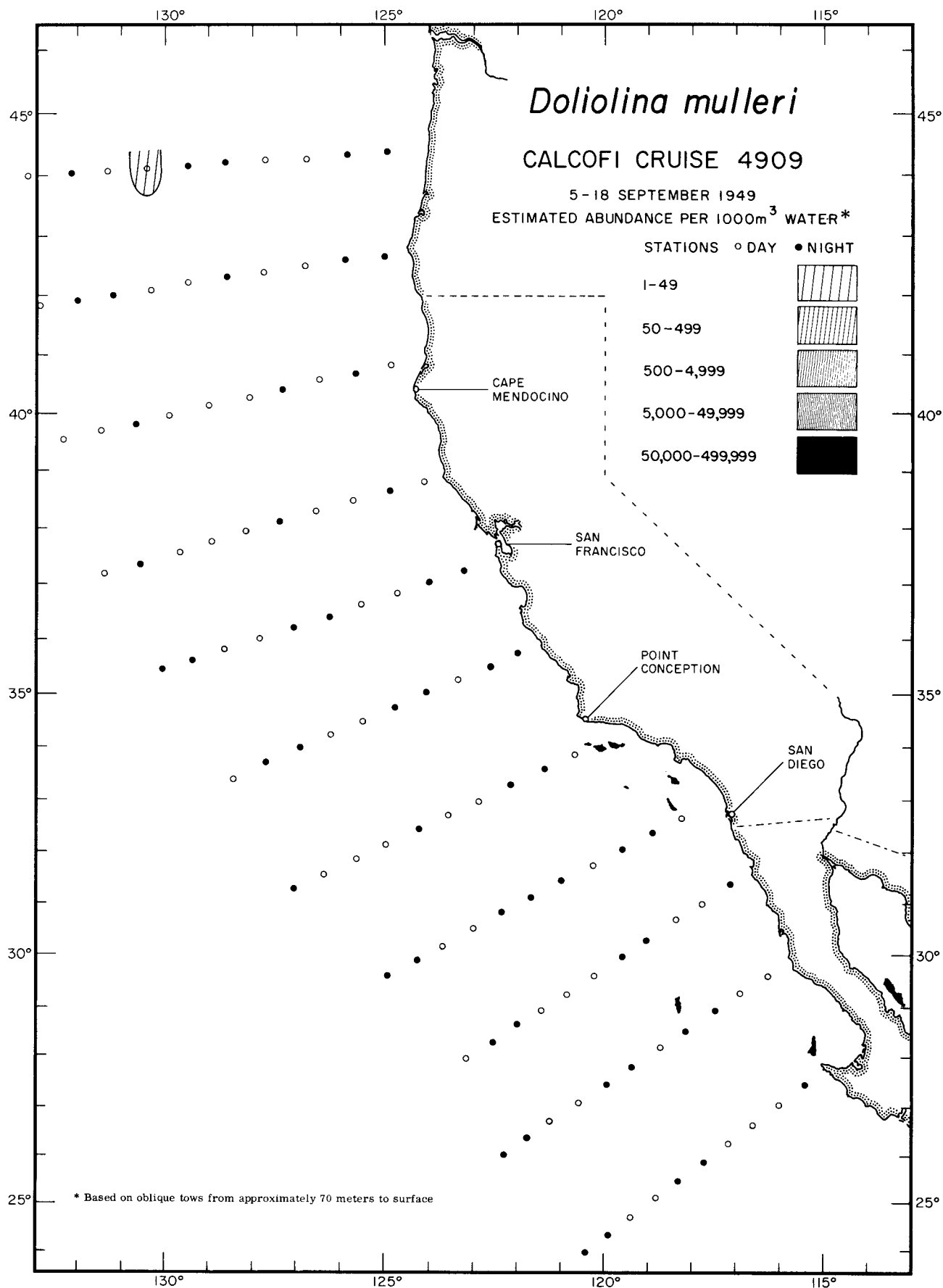
Thaliacea
Dolioletta gegenbauri
 5804



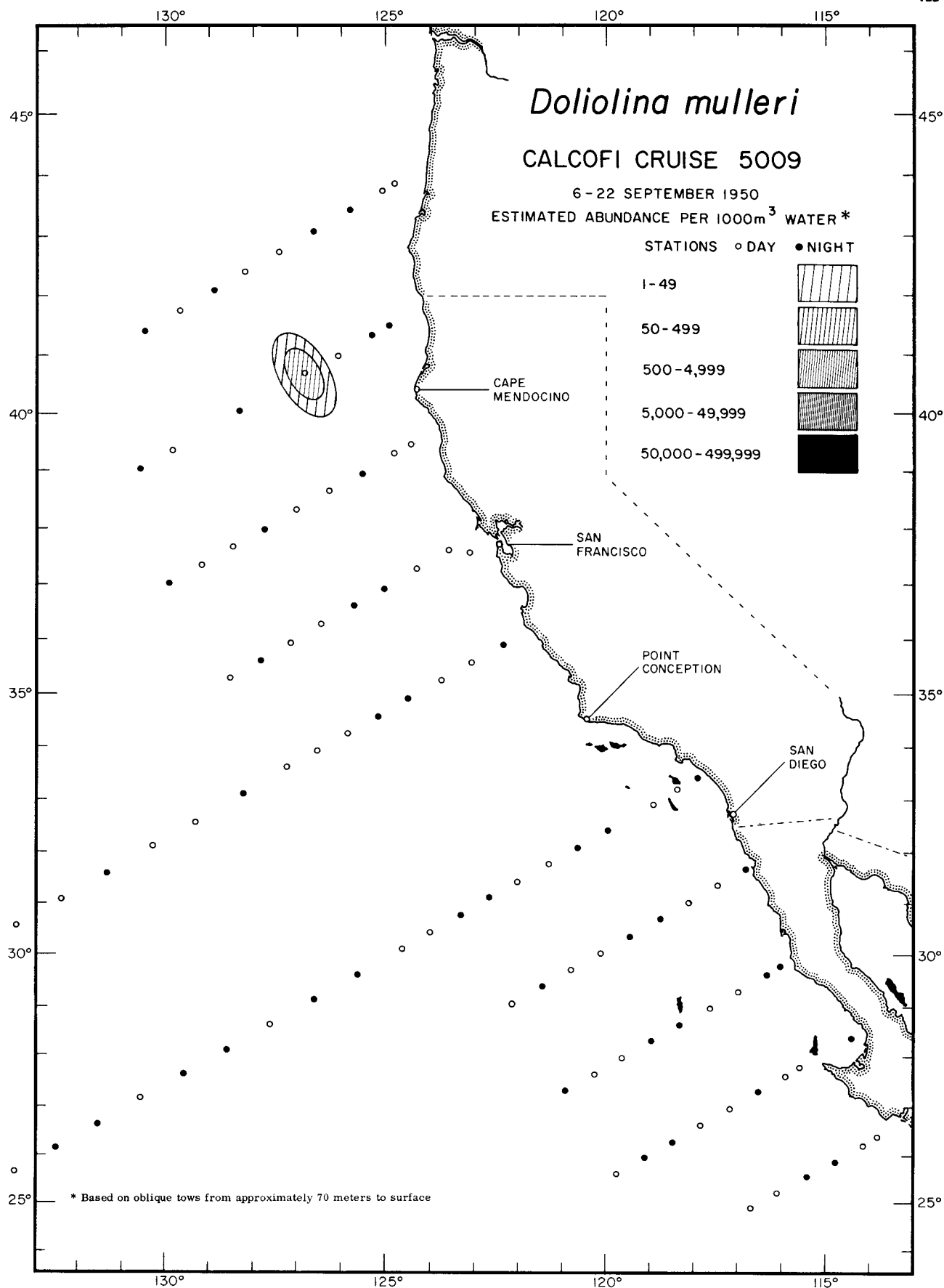
Thaliacea
Doliioletta gegenbauri
5806



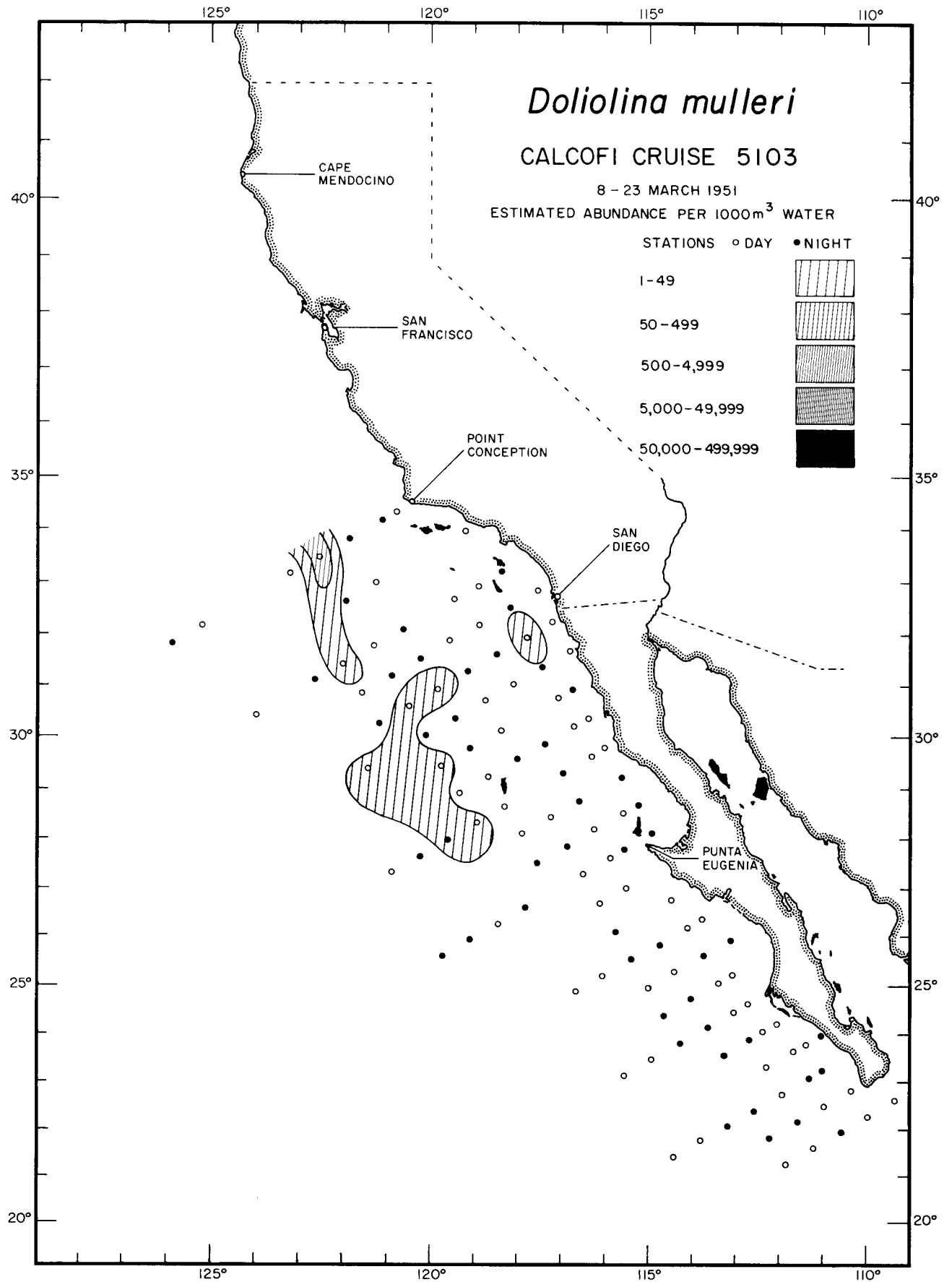
Thaliacea
Doliolina mulleri
4906



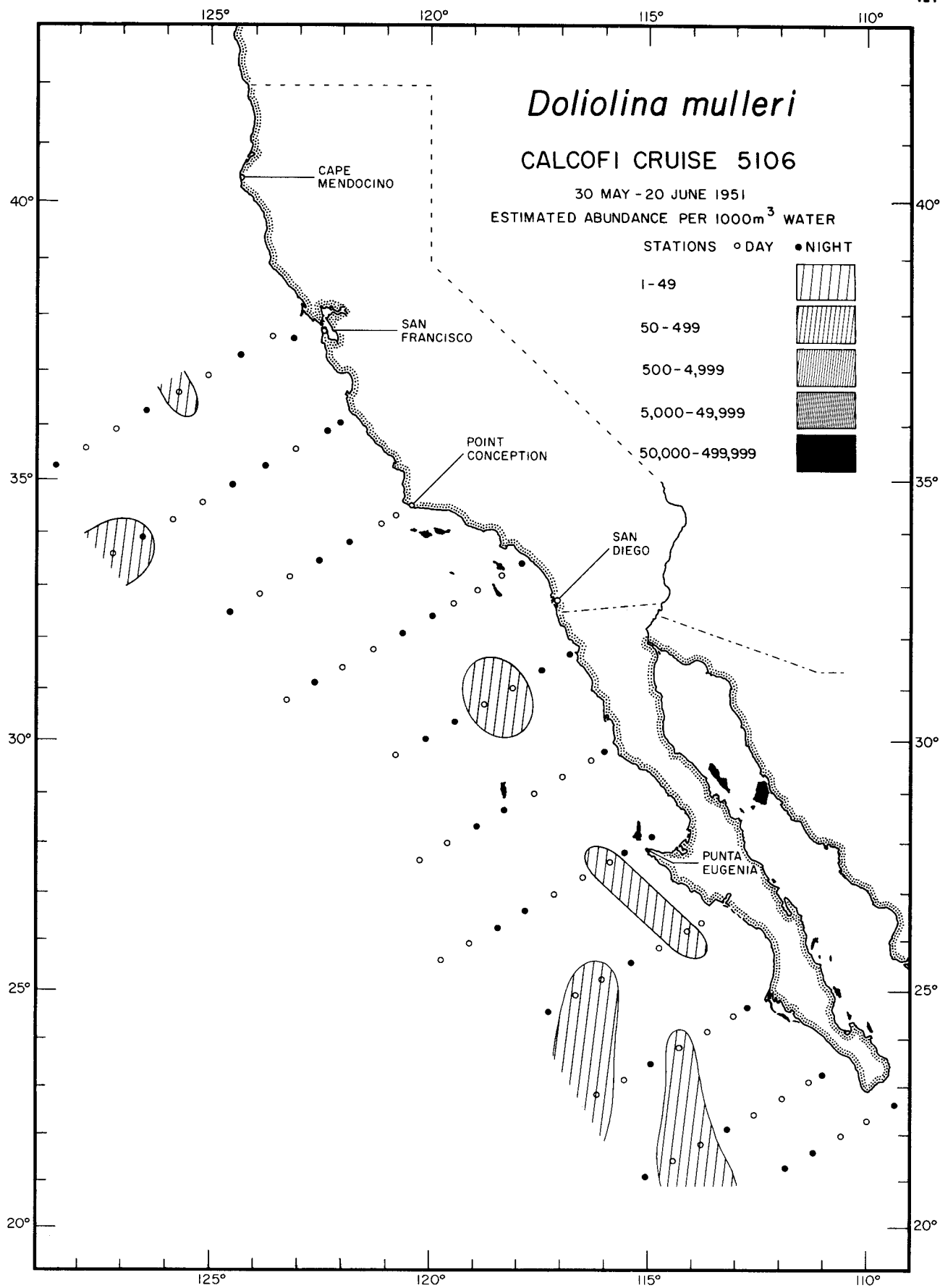
Thaliacea
Doliolina mulleri
4909



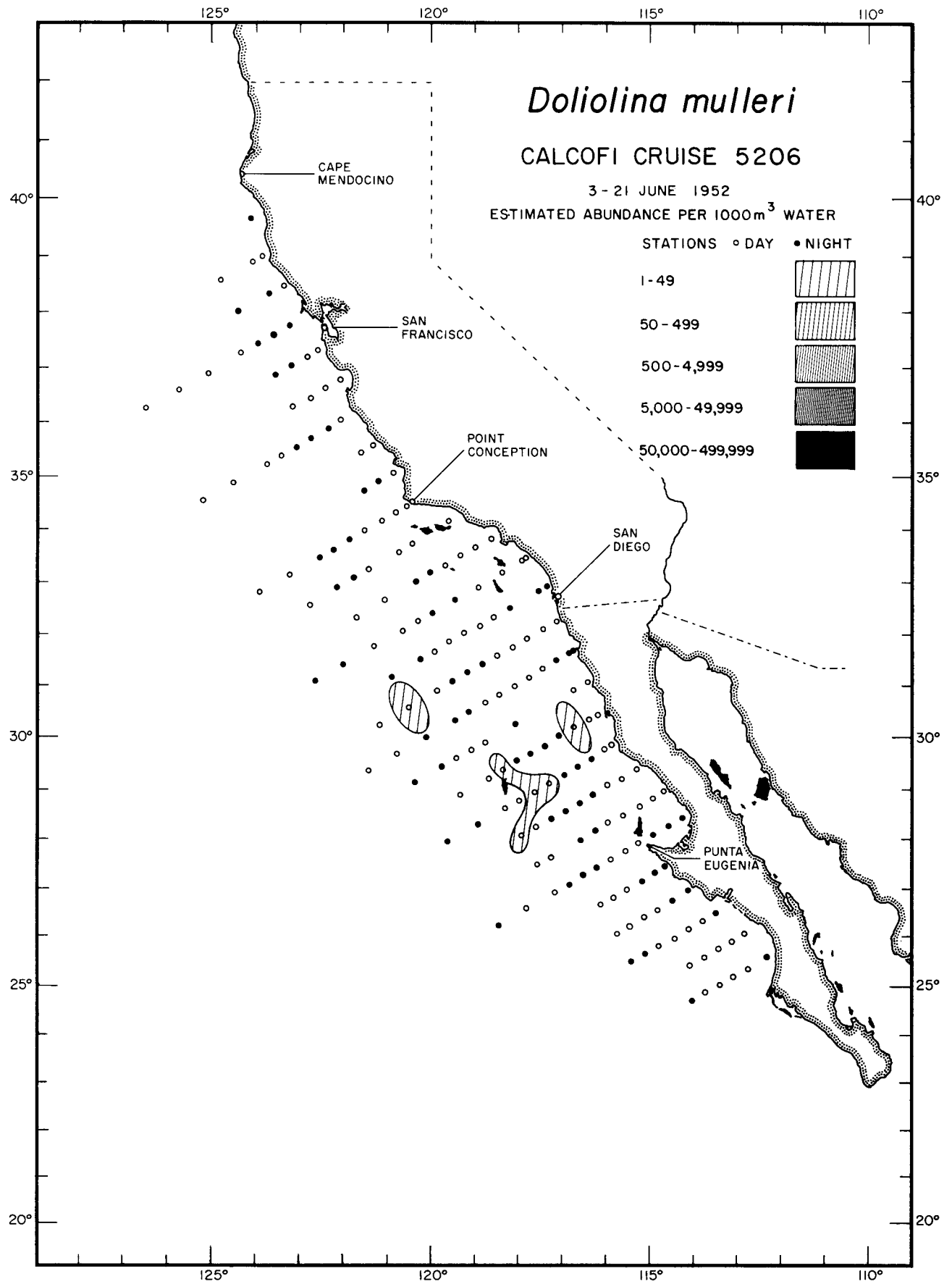
Thaliacea
Doliolina mulleri
5009



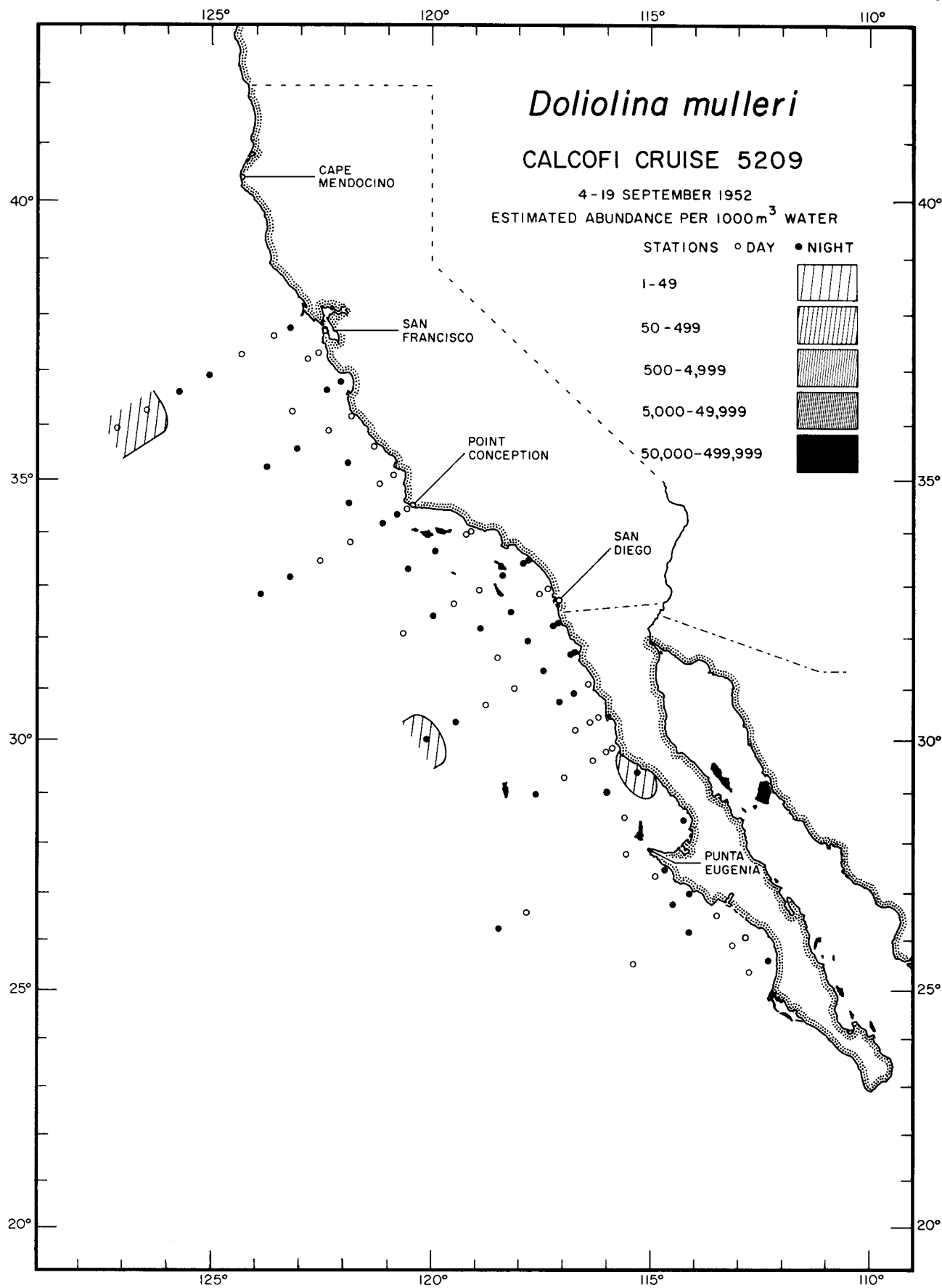
Thaliacea
Doliolina mulleri
5103



Thaliacea
Doliolina mulleri
5106



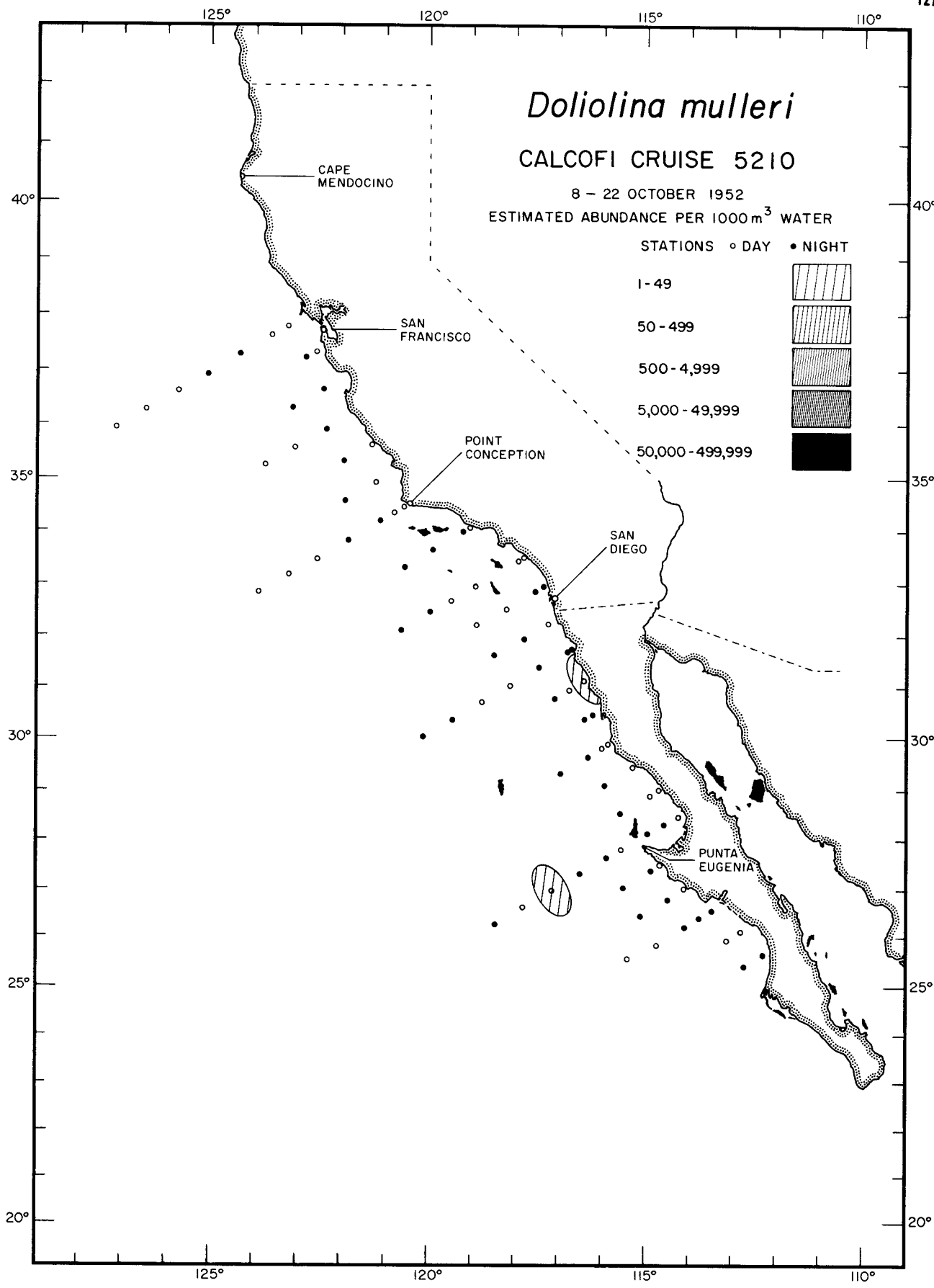
Thaliacea
Doliolina mulleri
 5206



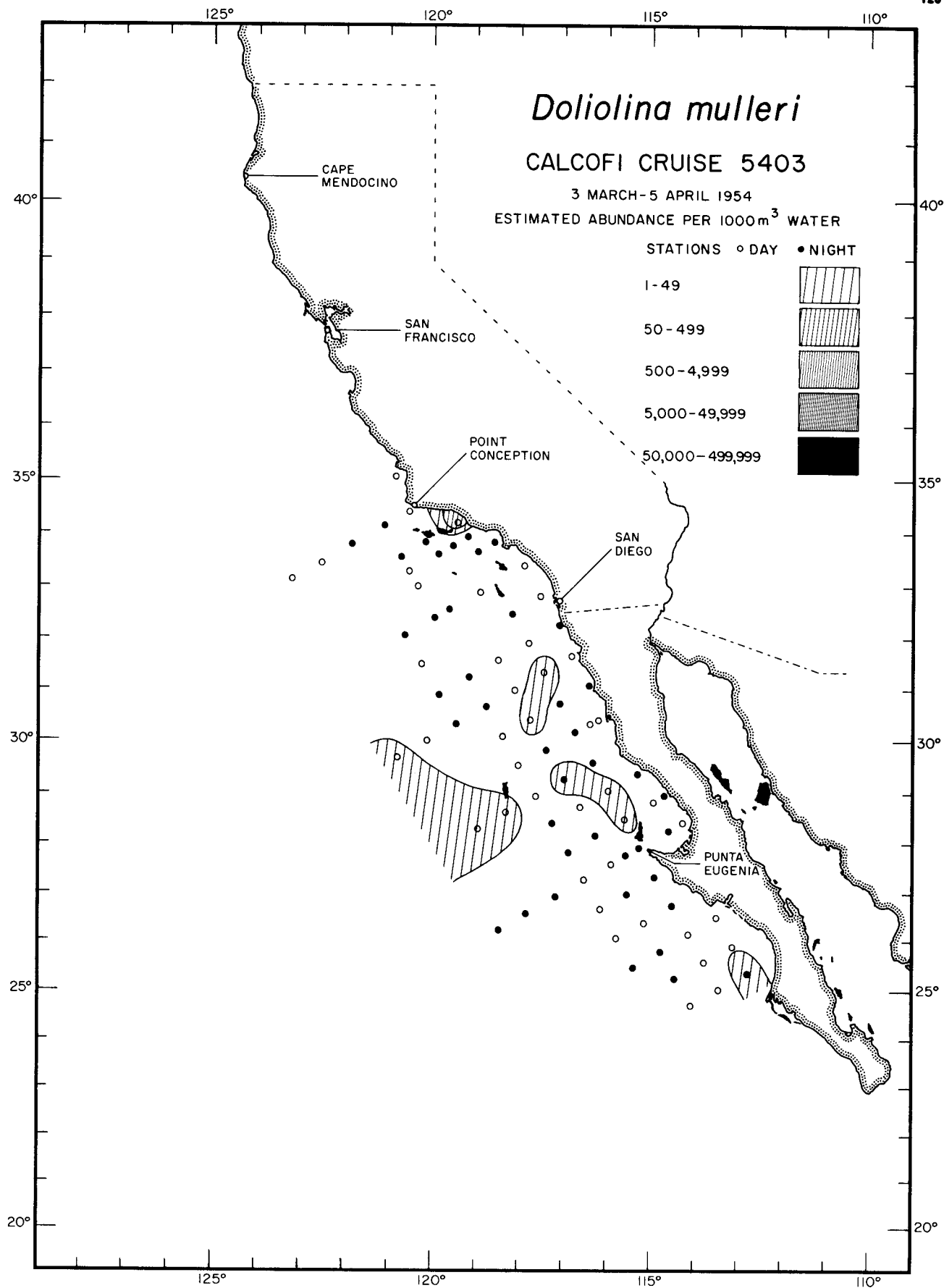
Thaliacea

Doliolina mulleri

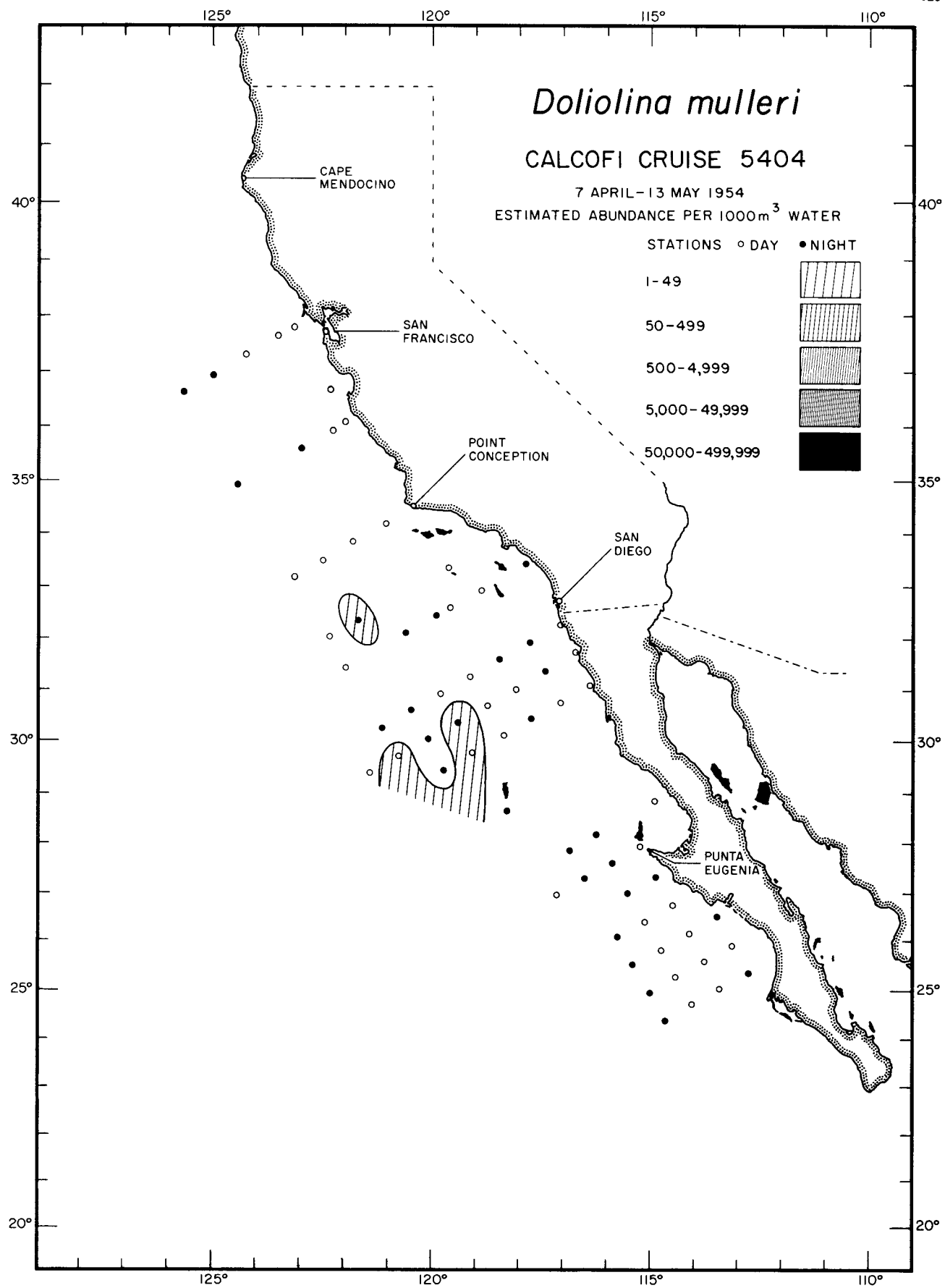
5209



Thaliacea
Doliolina mulleri
5210



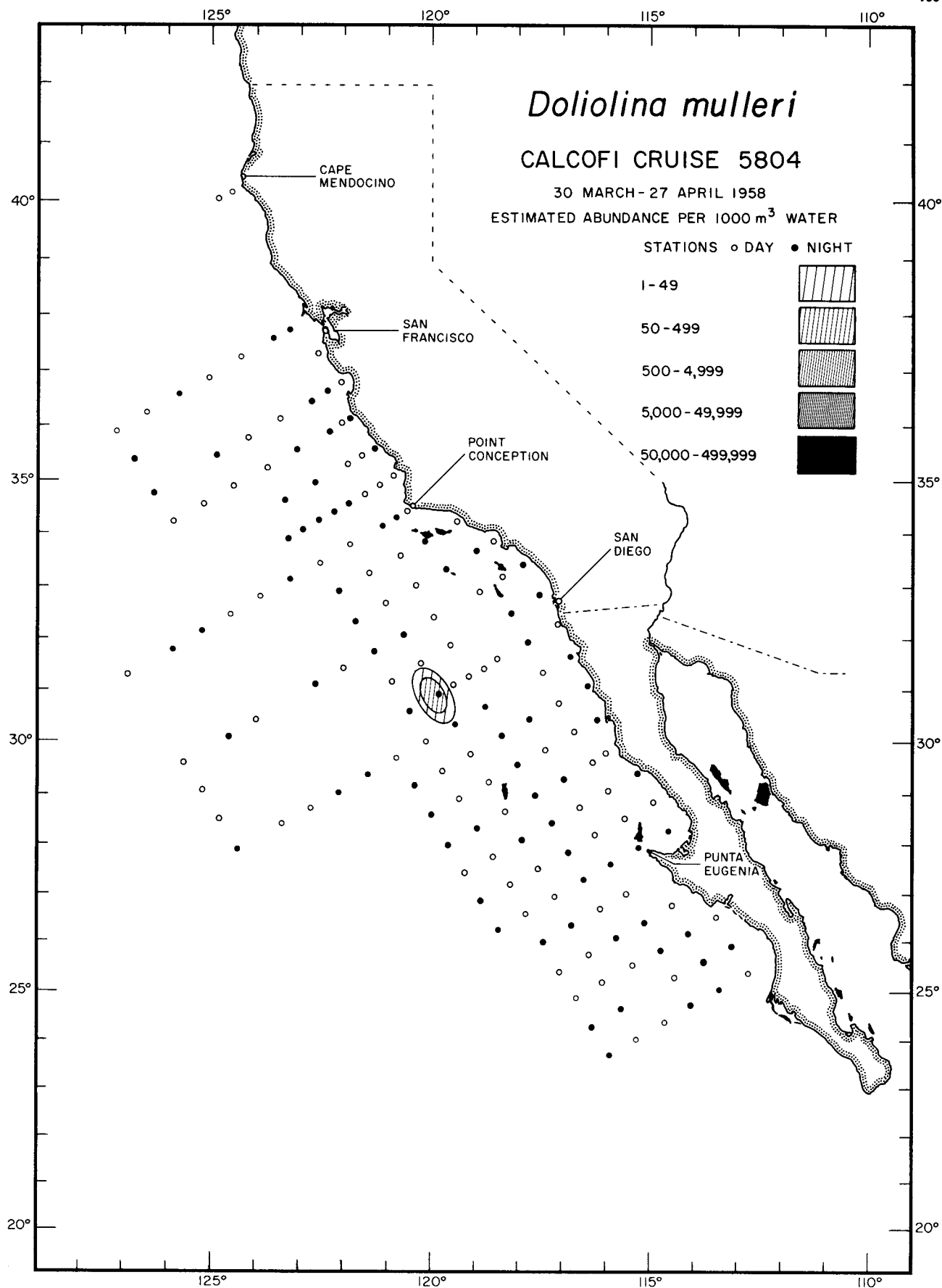
Thaliacea
Doliolina mulleri
5403



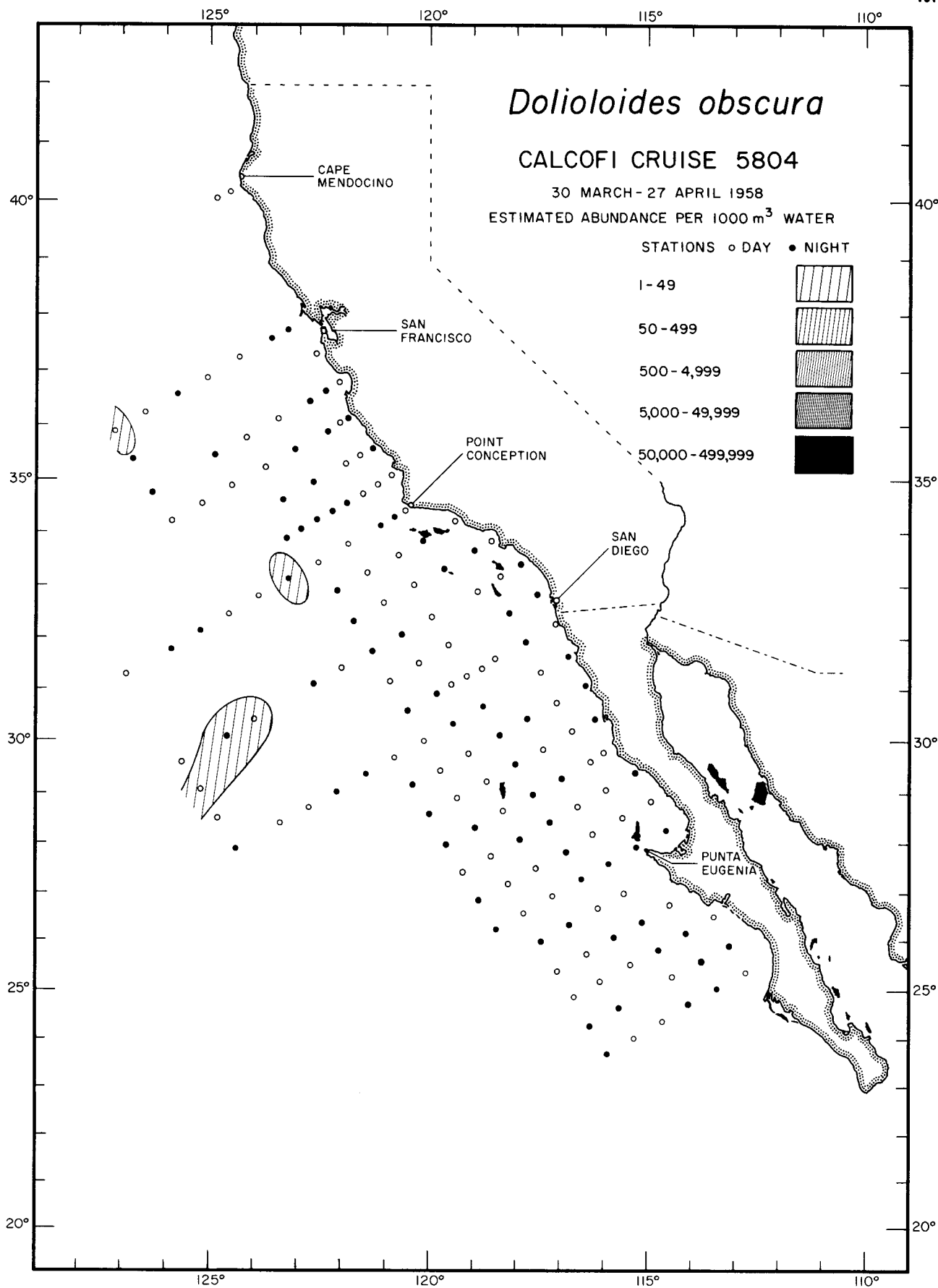
Thaliacea

Doliolina mulleri

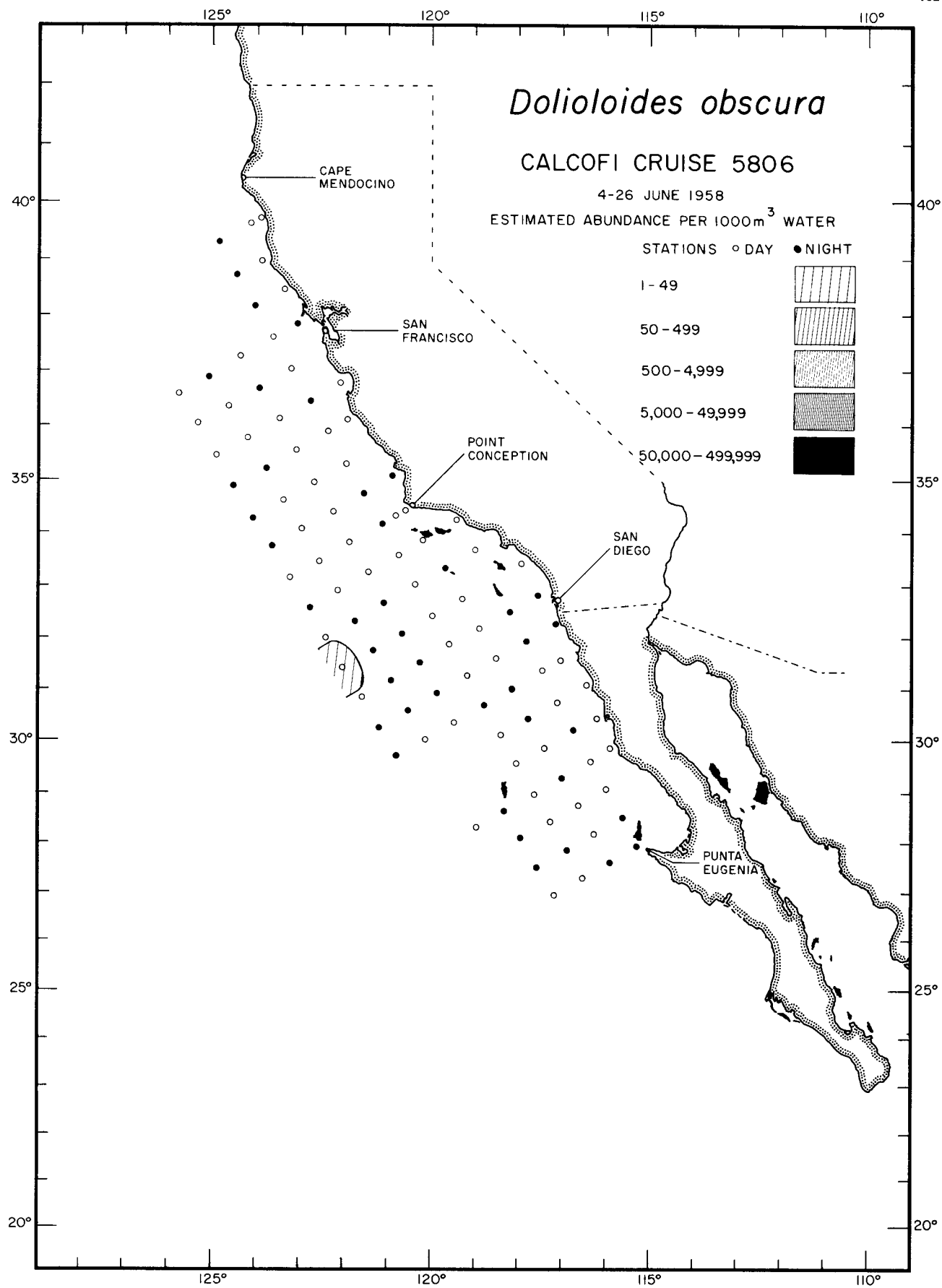
5404



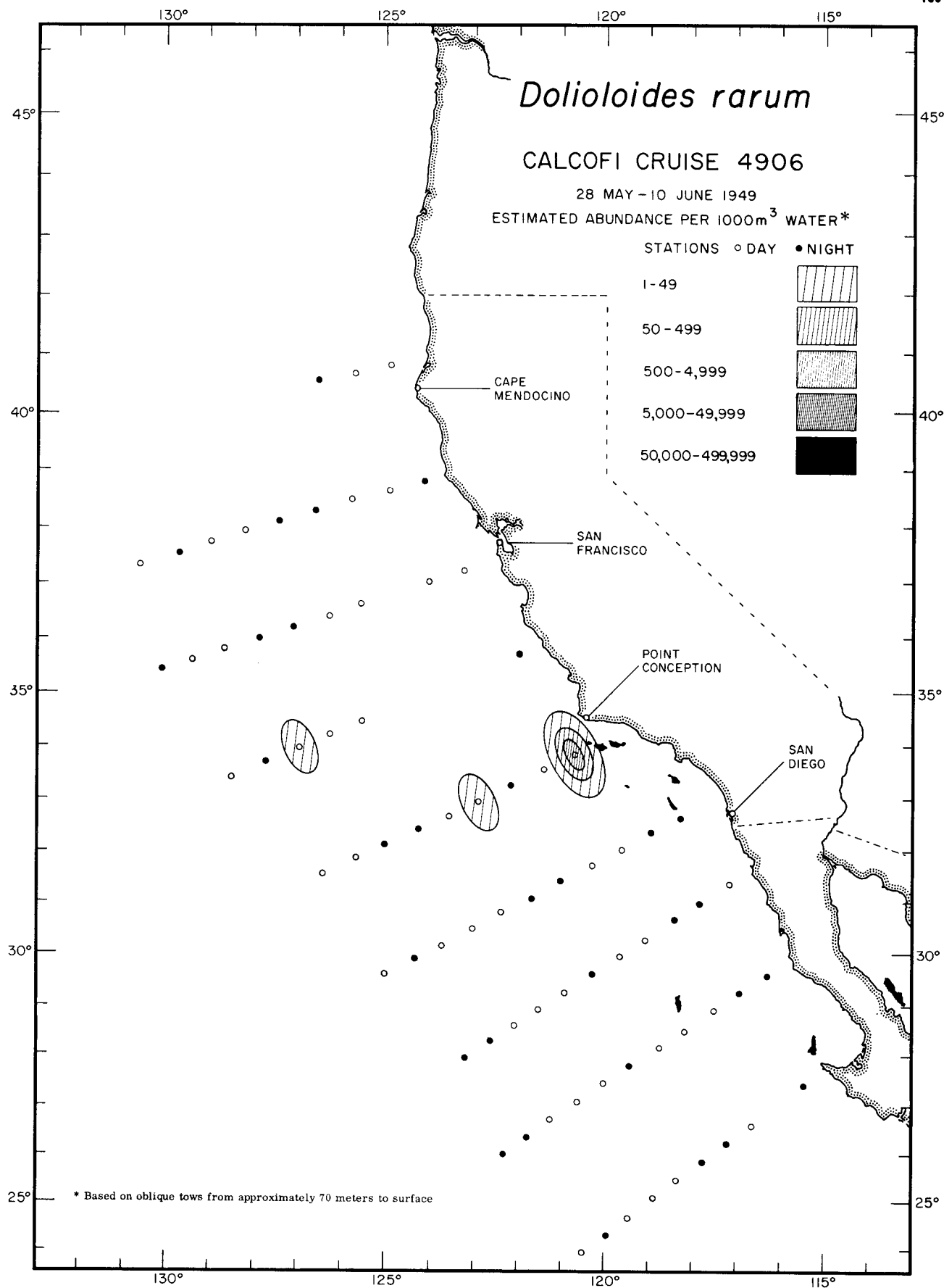
Thaliacea
Doliolina mulleri
5804



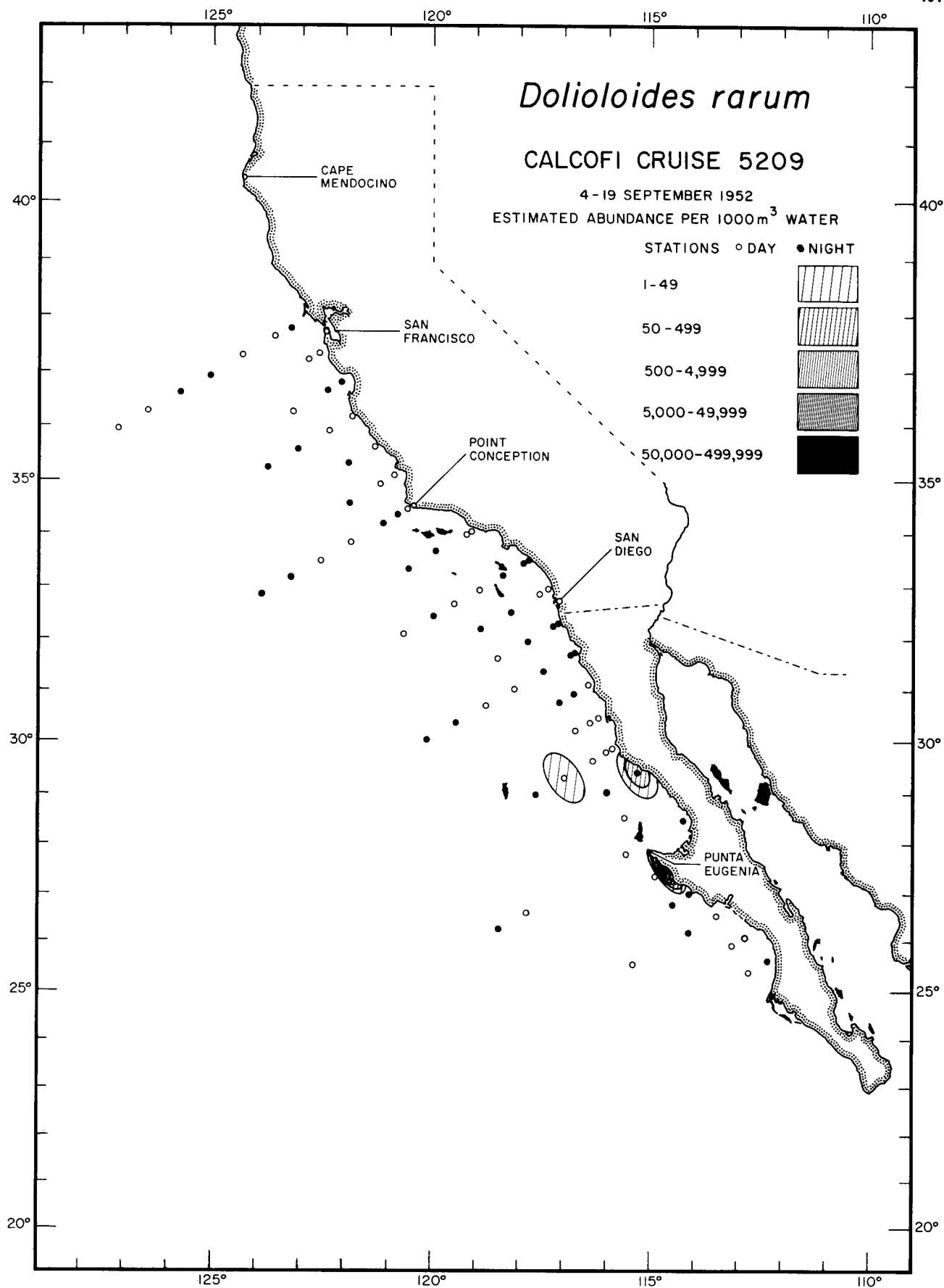
Thaliacea
Dolioloides obscura
5804



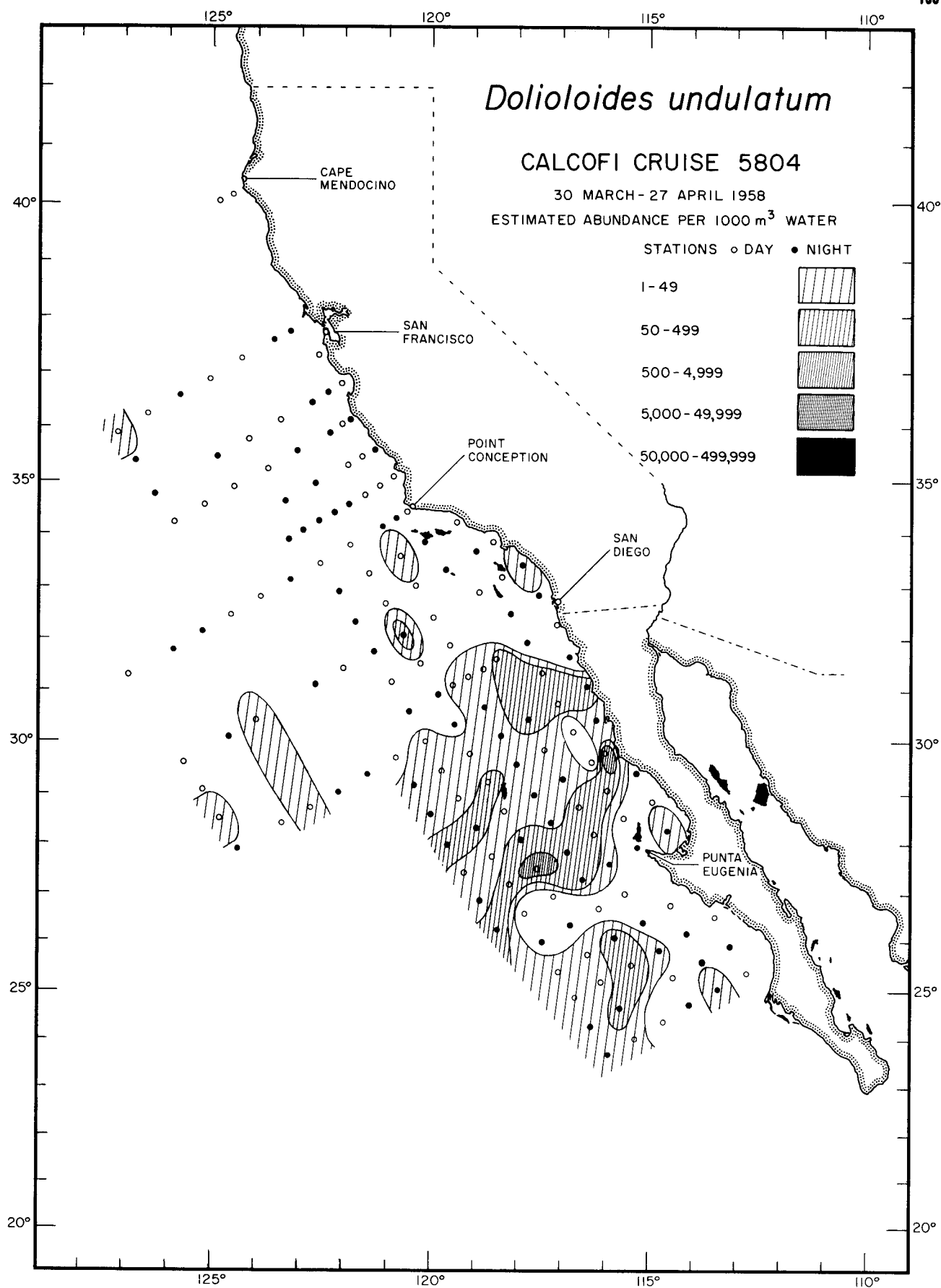
Thaliacea
Dolioloides obscura
5806



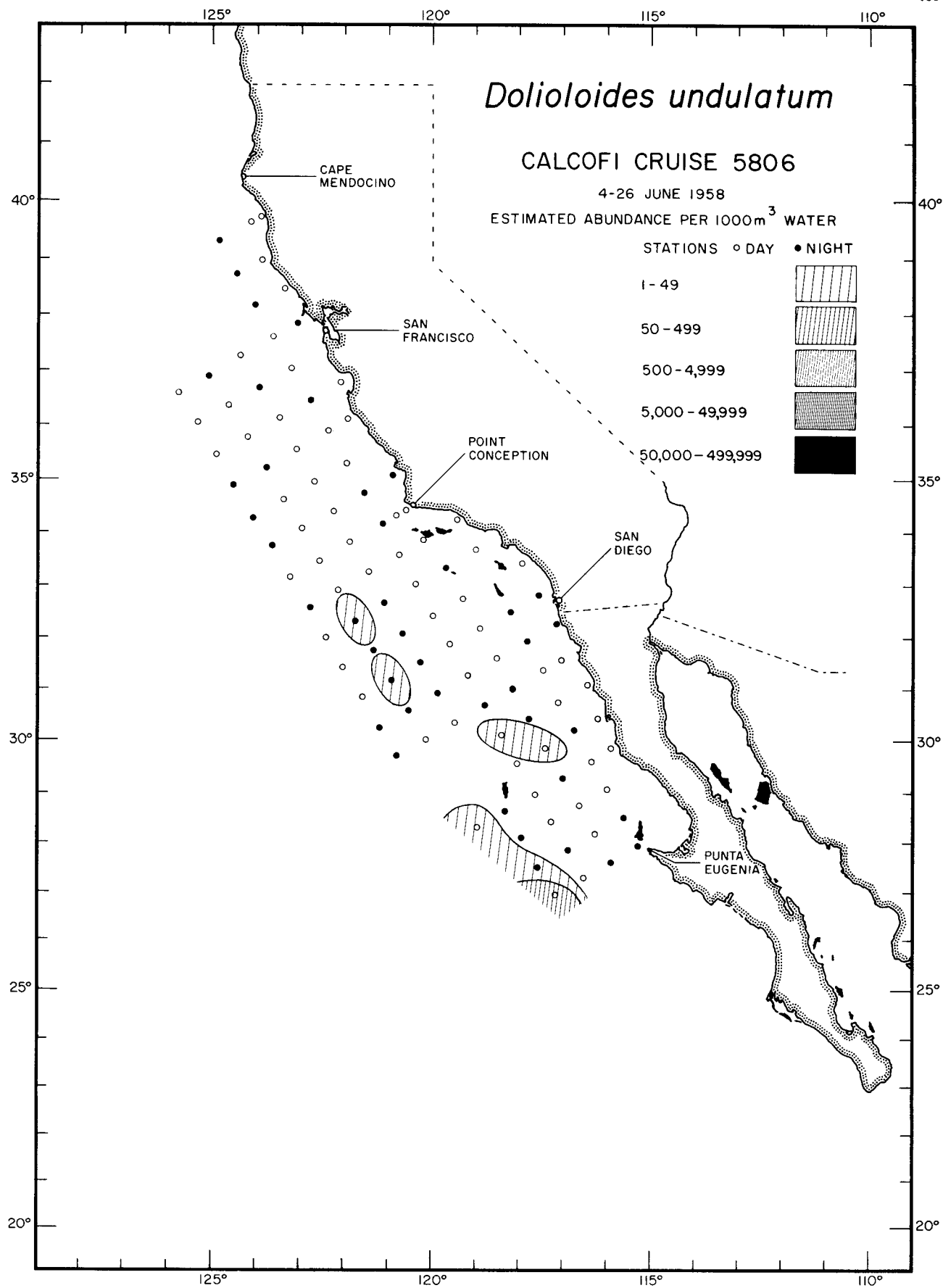
Thaliacea
Dolioloides rarum
4906



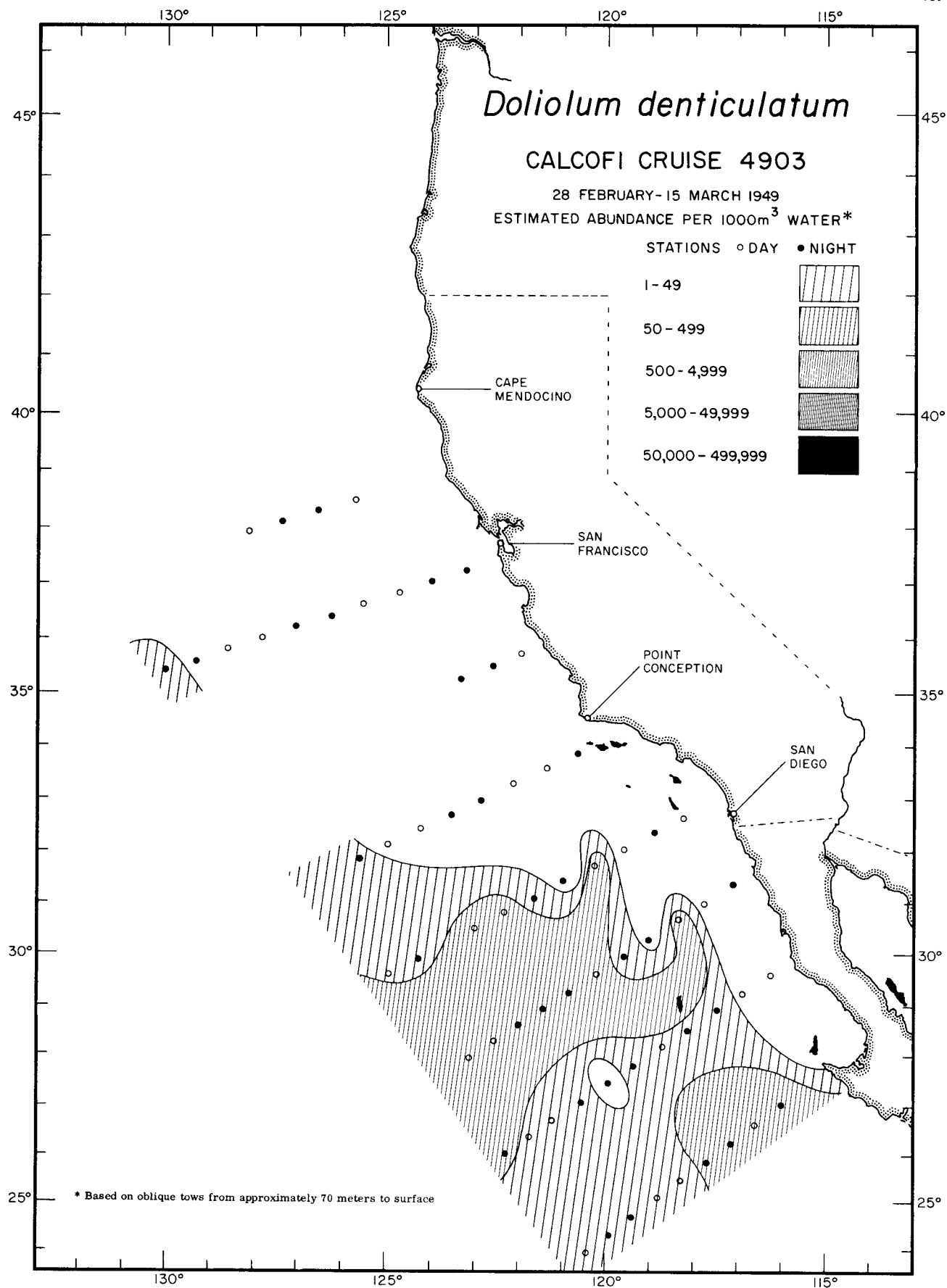
Thaliacea
Dolioloides rarum
5209



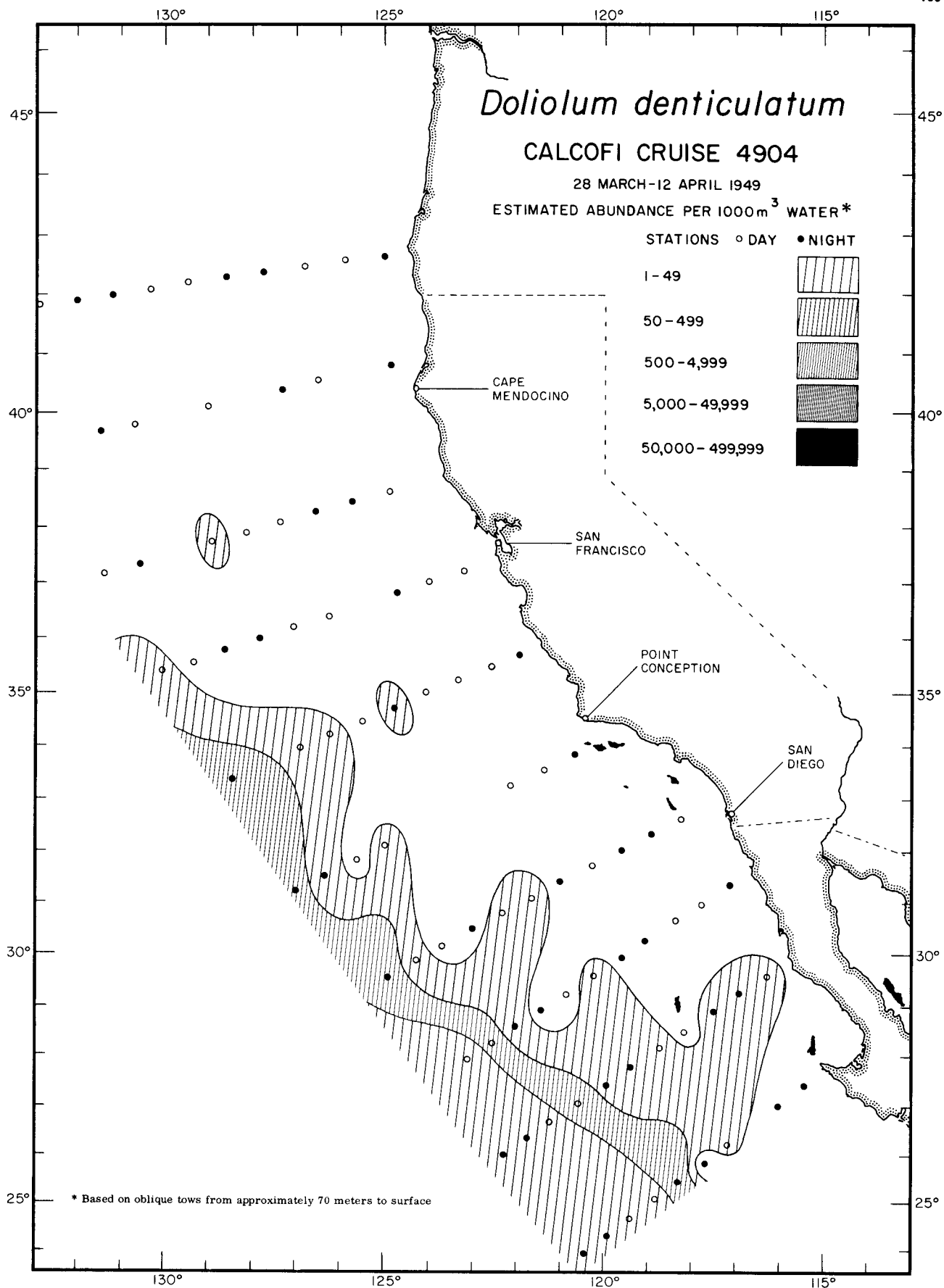
Thaliacea
Dolioloides undulatum
5804



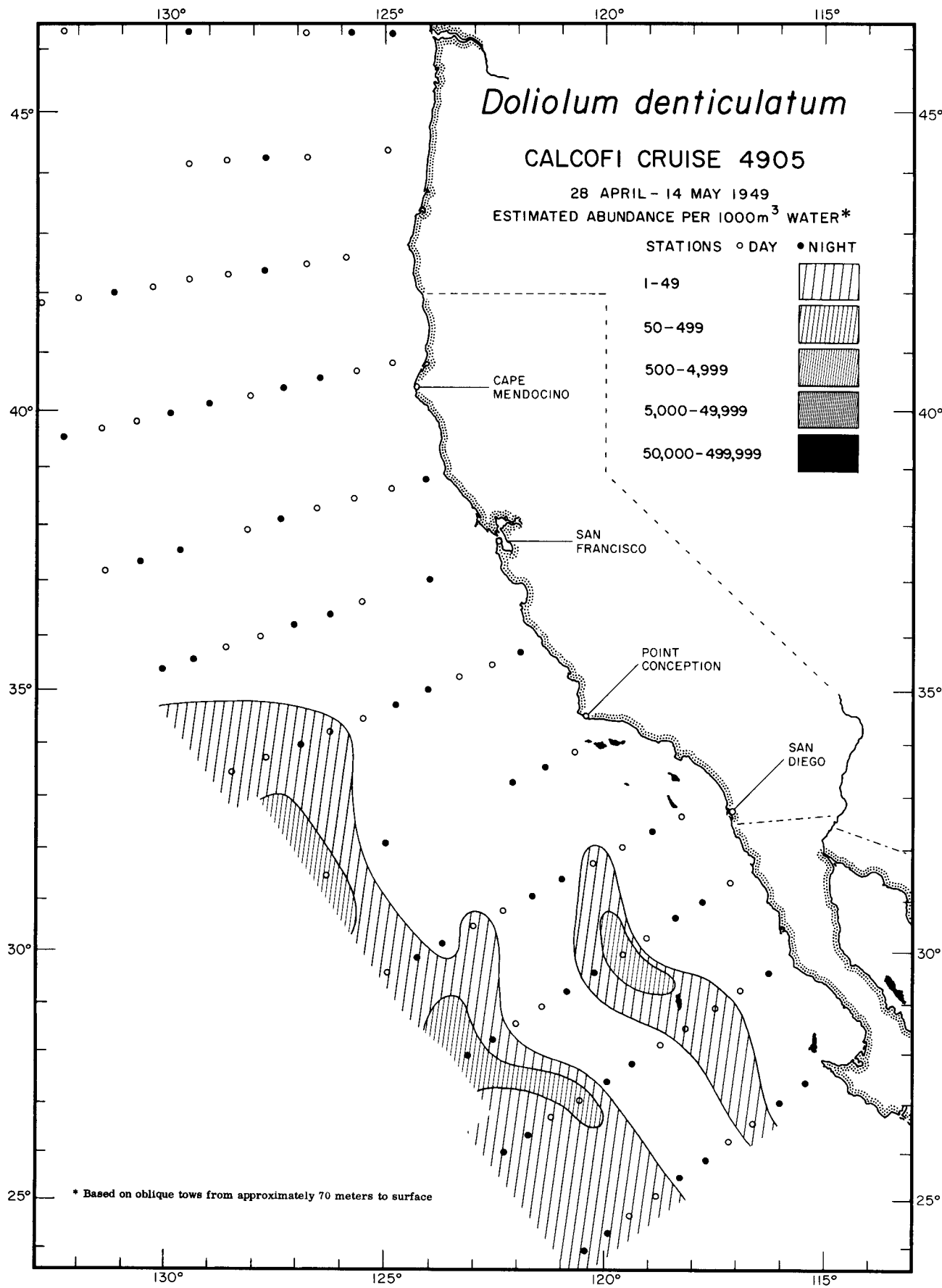
Thaliacea
Dolioloides undulatum
5806



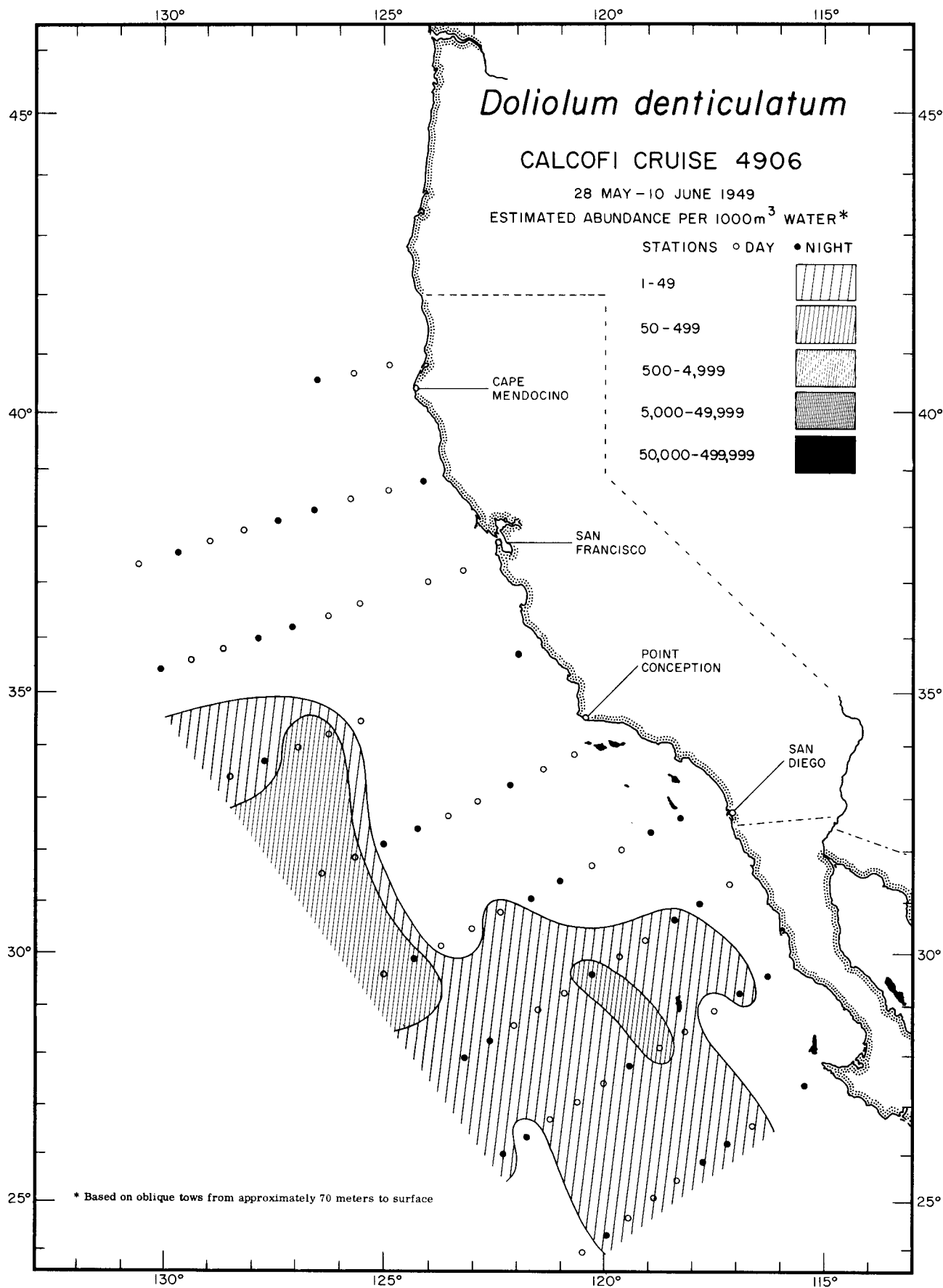
Thaliacea
Doliolum denticulatum
4903



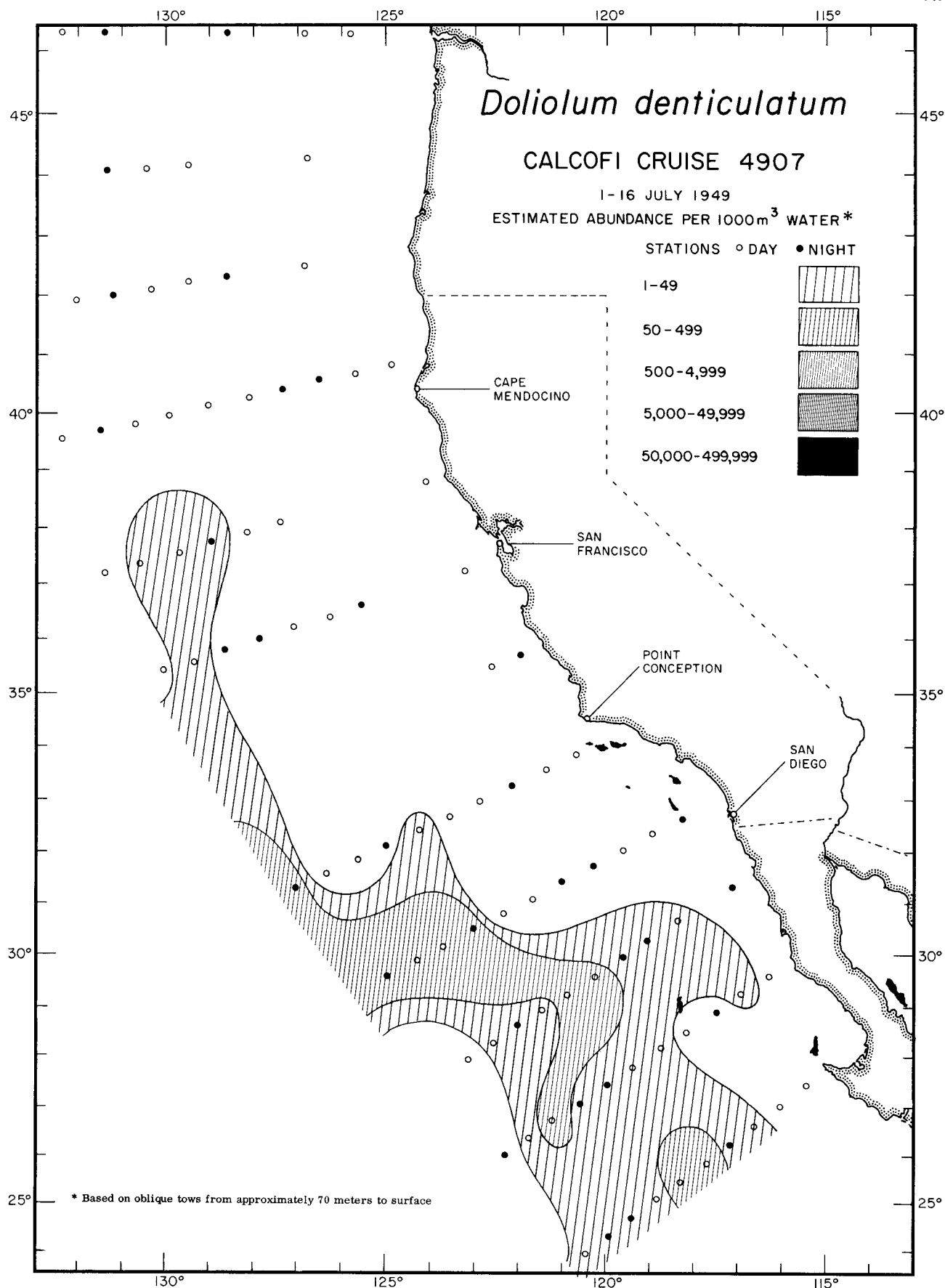
Thaliacea
Doliolum denticulatum
4904



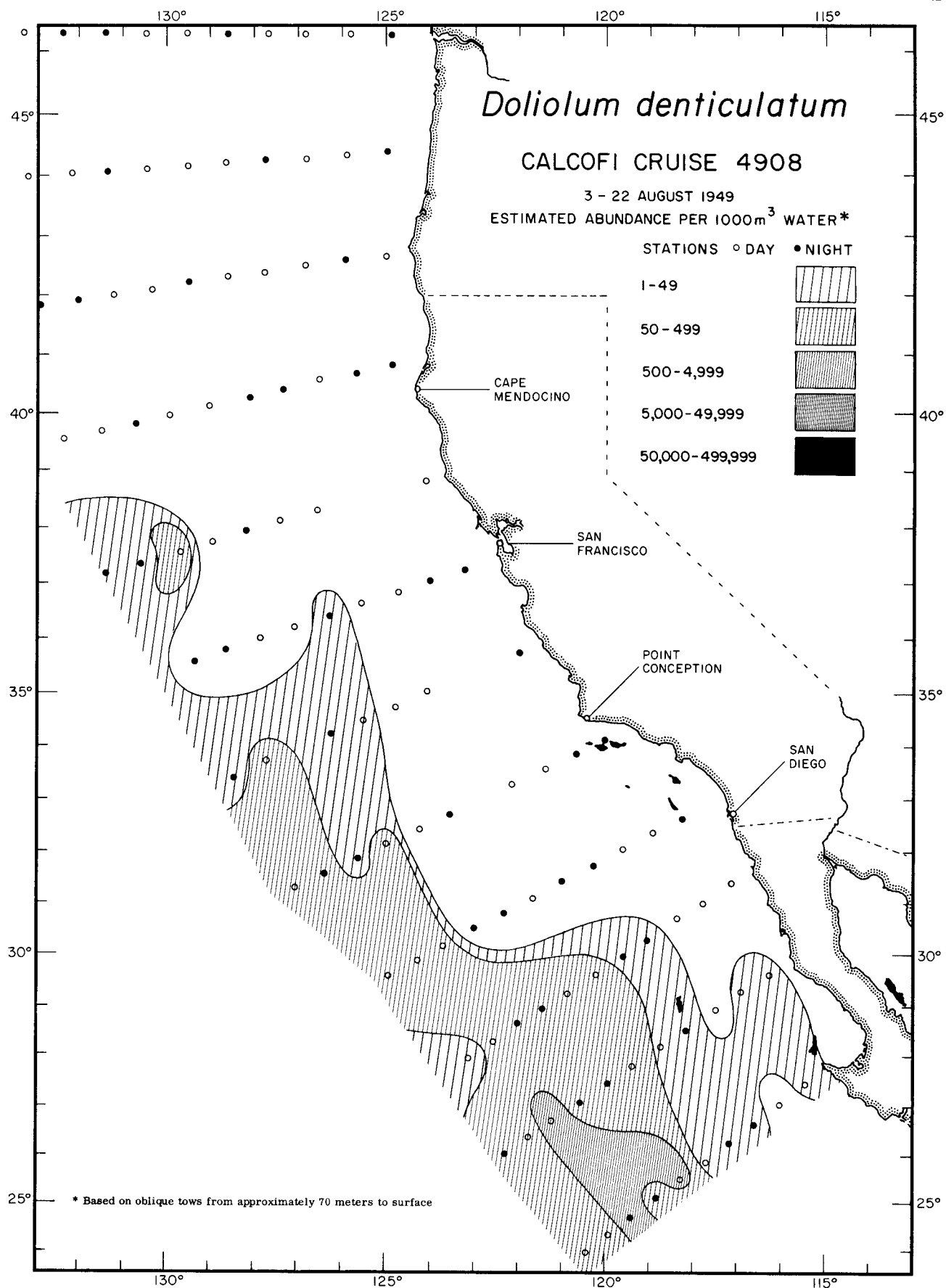
Thaliacea
Doliolum denticulatum
4905



Thaliacea
Doliolum denticulatum
4906



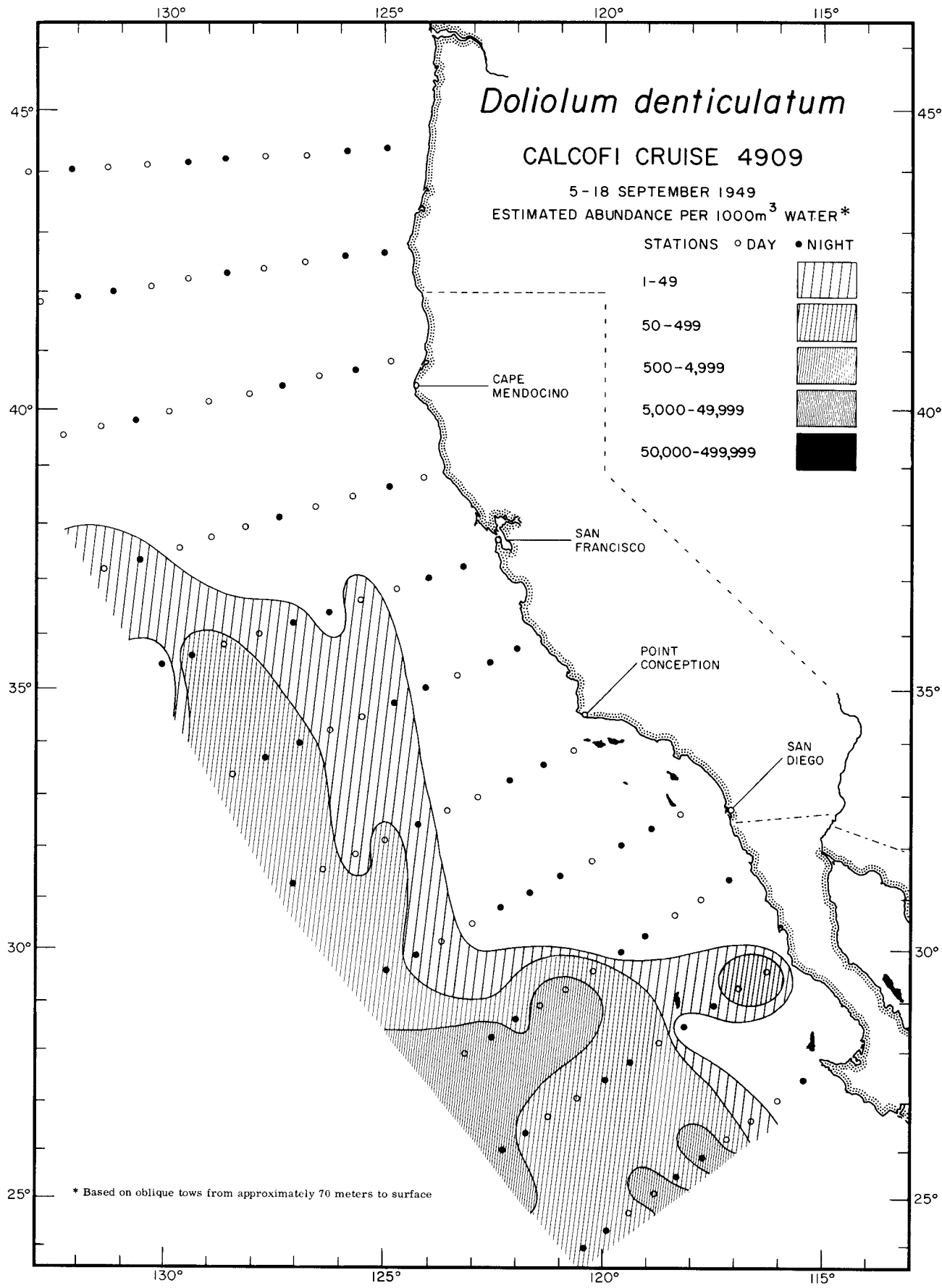
Thaliacea
Doliolum denticulatum
4907



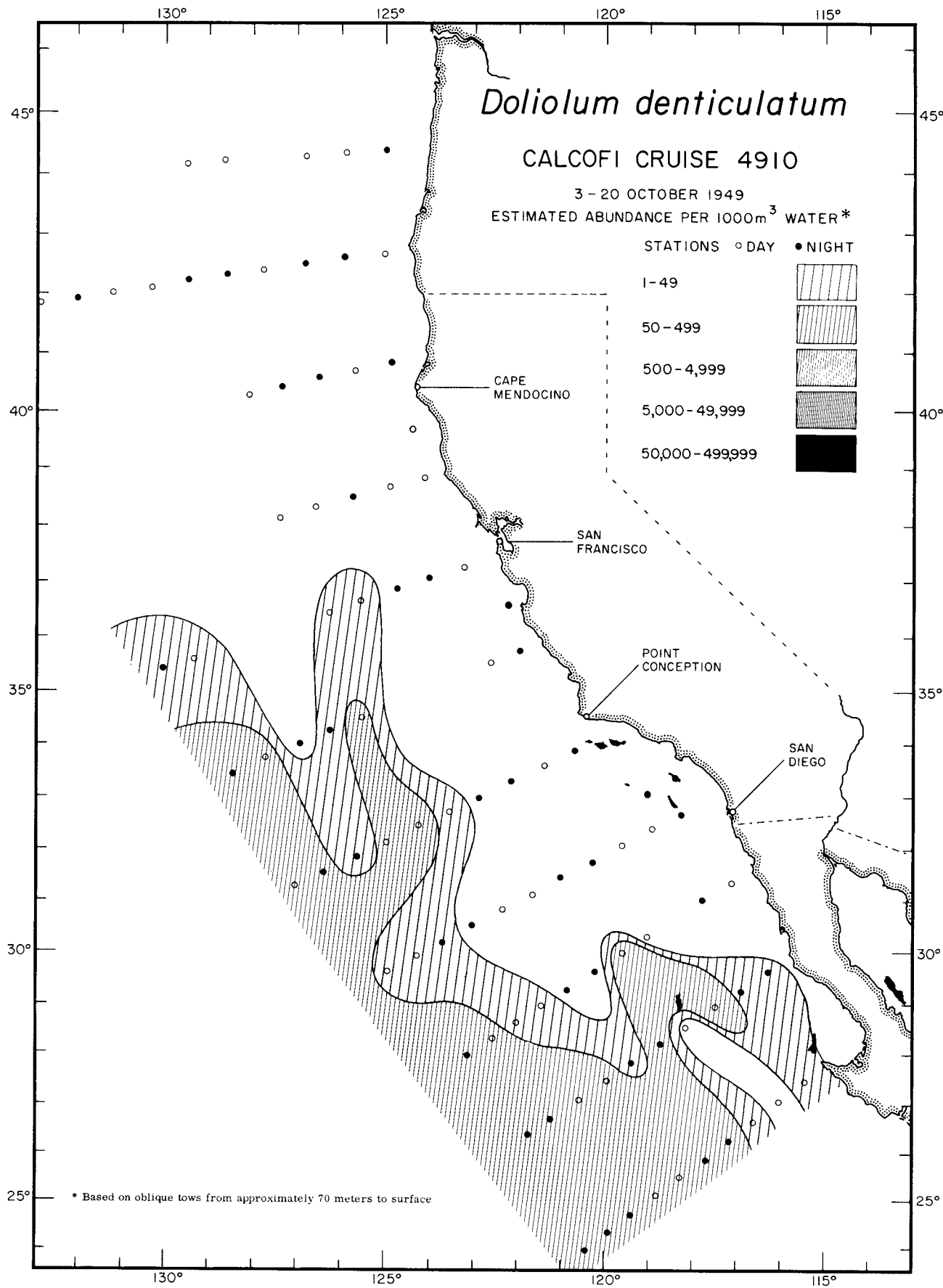
Thaliacea

Doliolum denticulatum

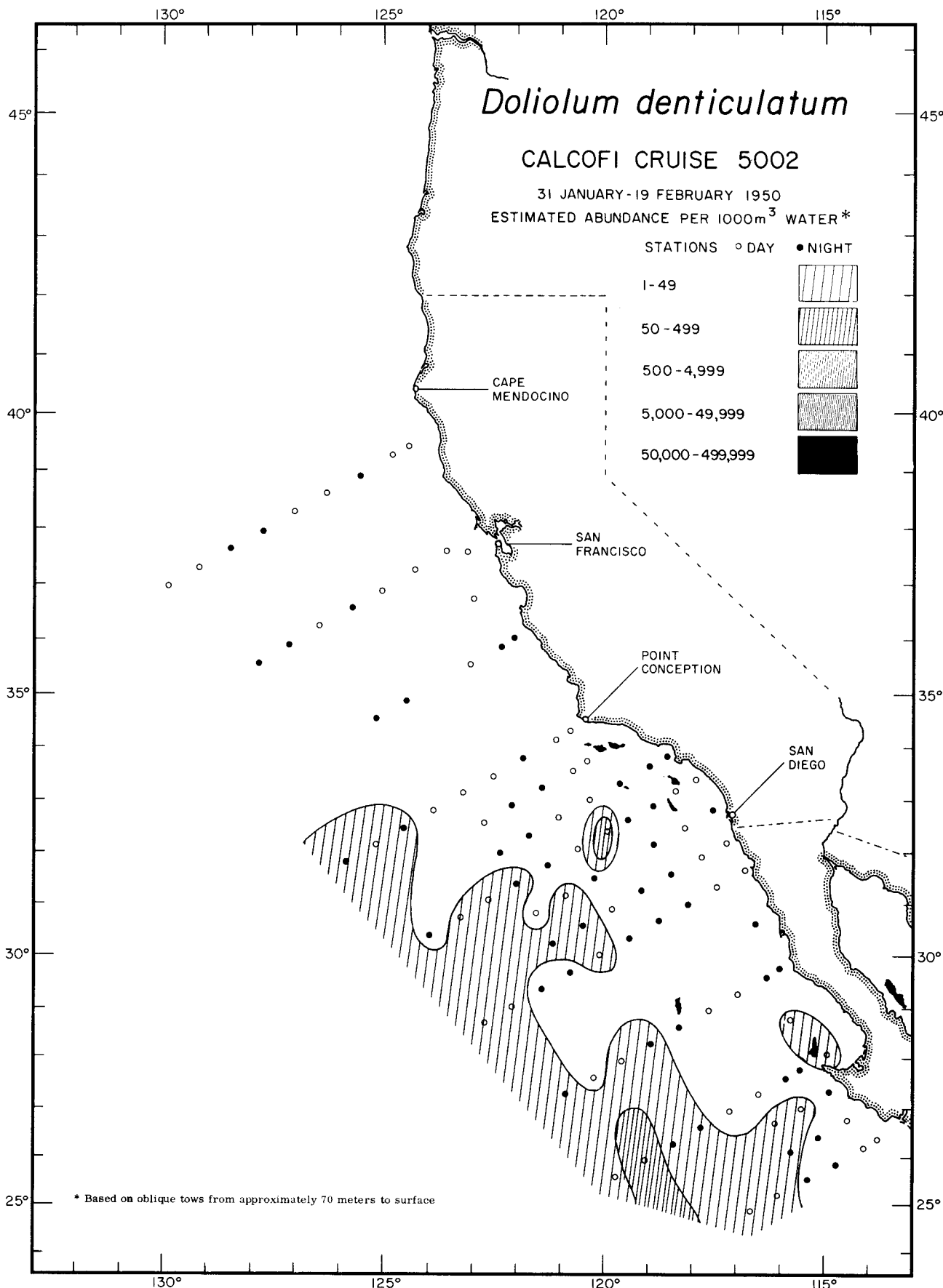
4908



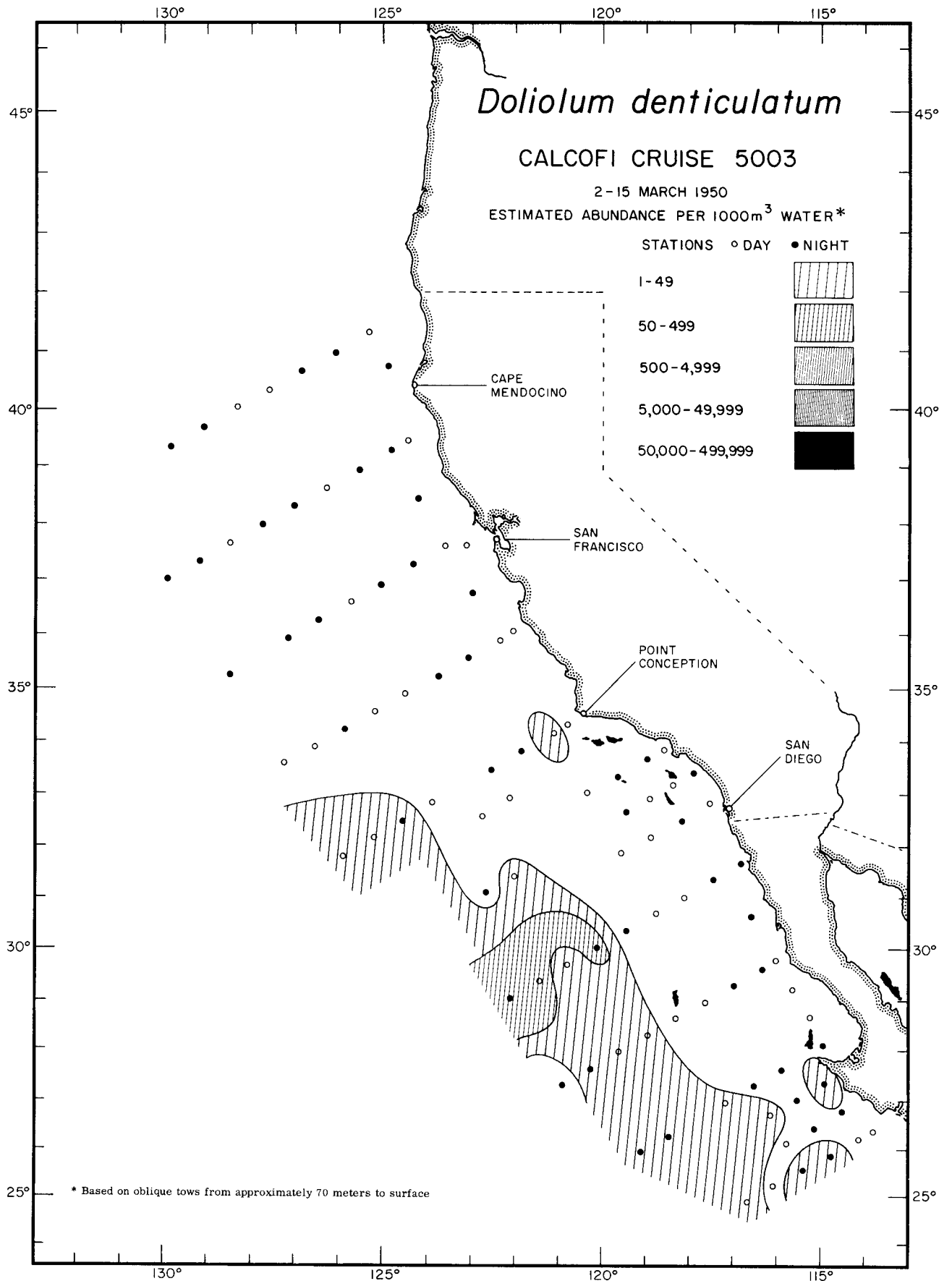
Thaliacea
Doliolum denticulatum
4909



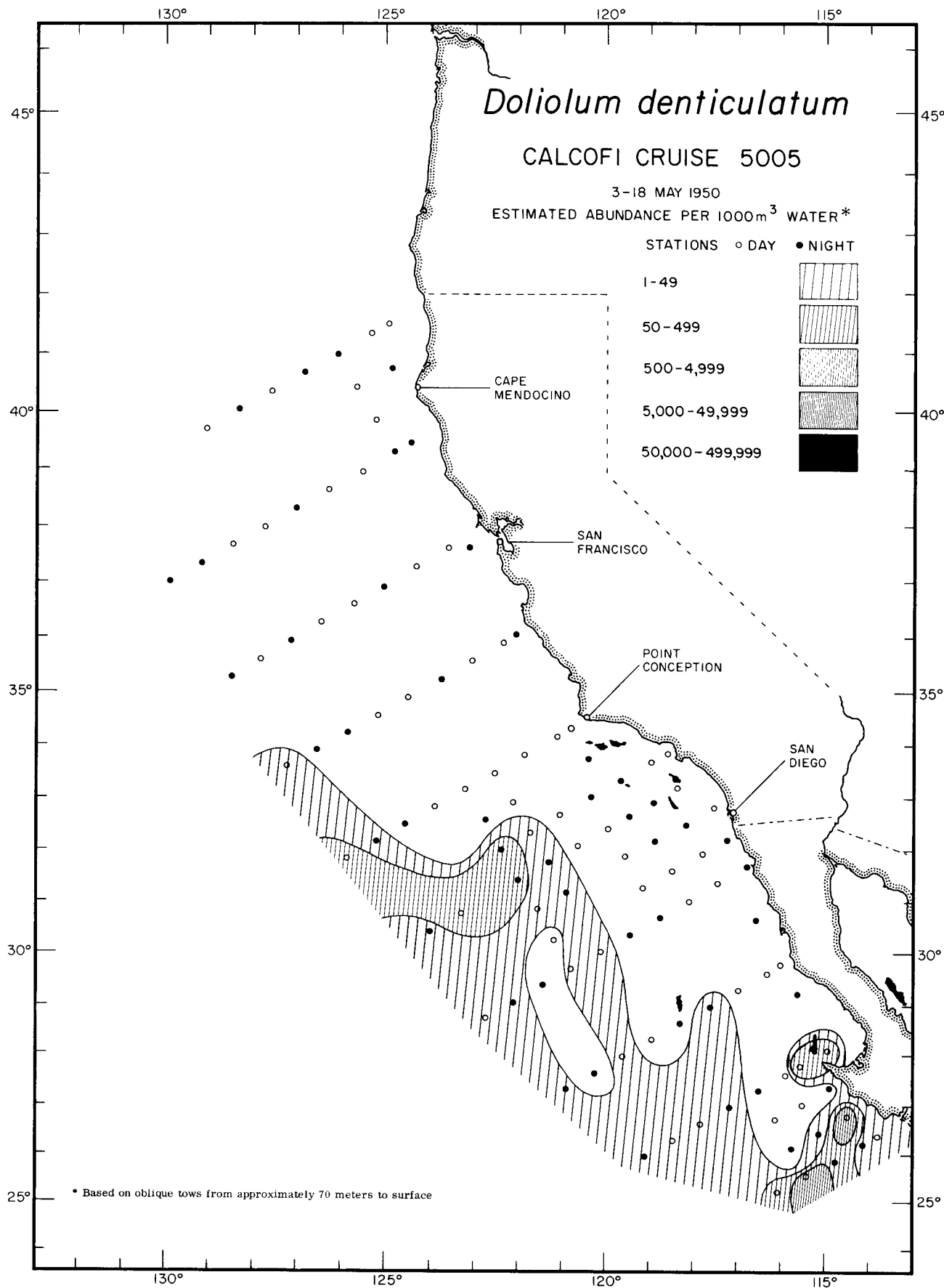
Thaliacea
Doliolum denticulatum
4910



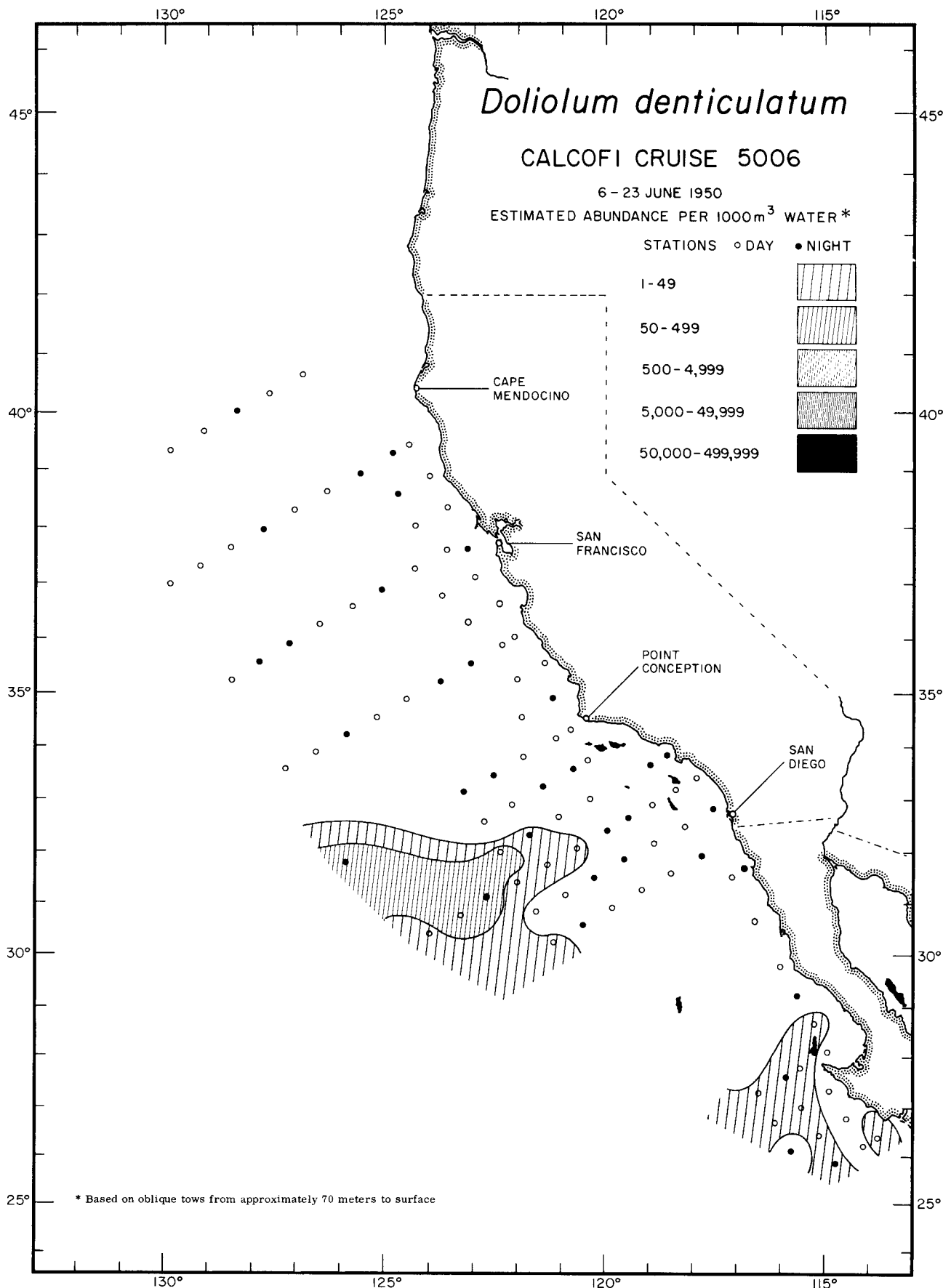
Thaliacea
Doliolum denticulatum
 5002



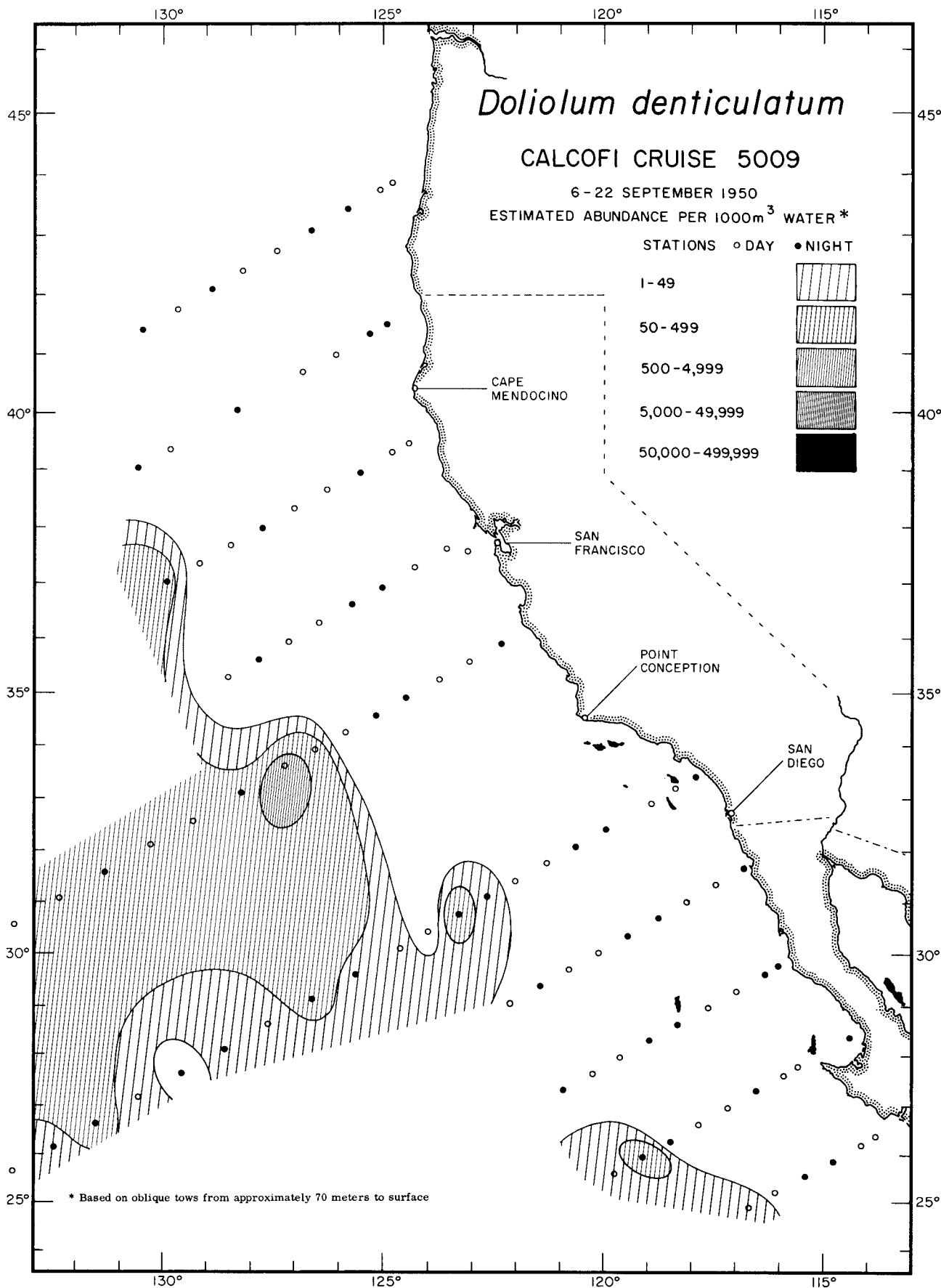
Thaliacea
Doliolum denticulatum
5003



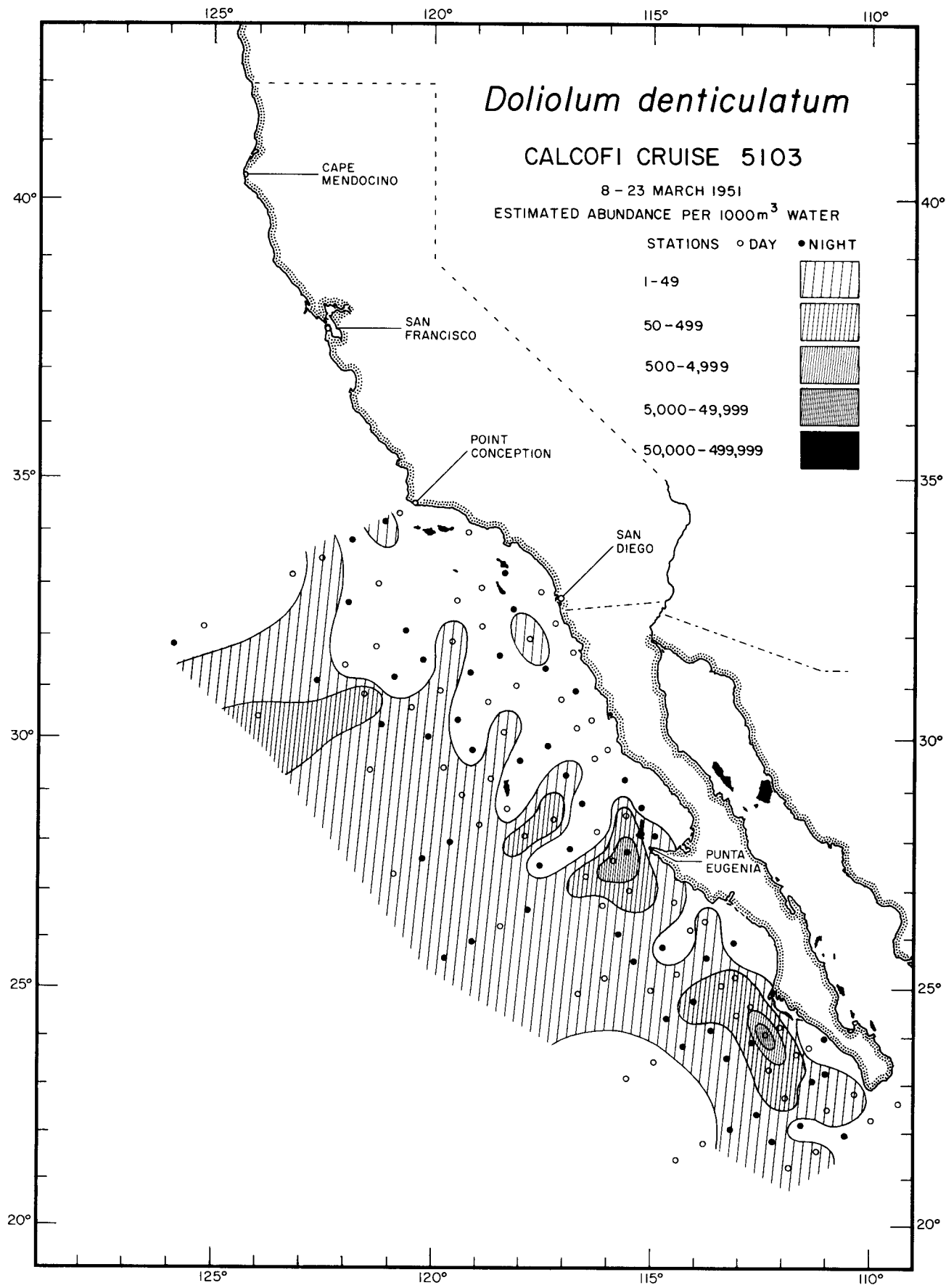
Thaliacea
Doliolum denticulatum
 5005



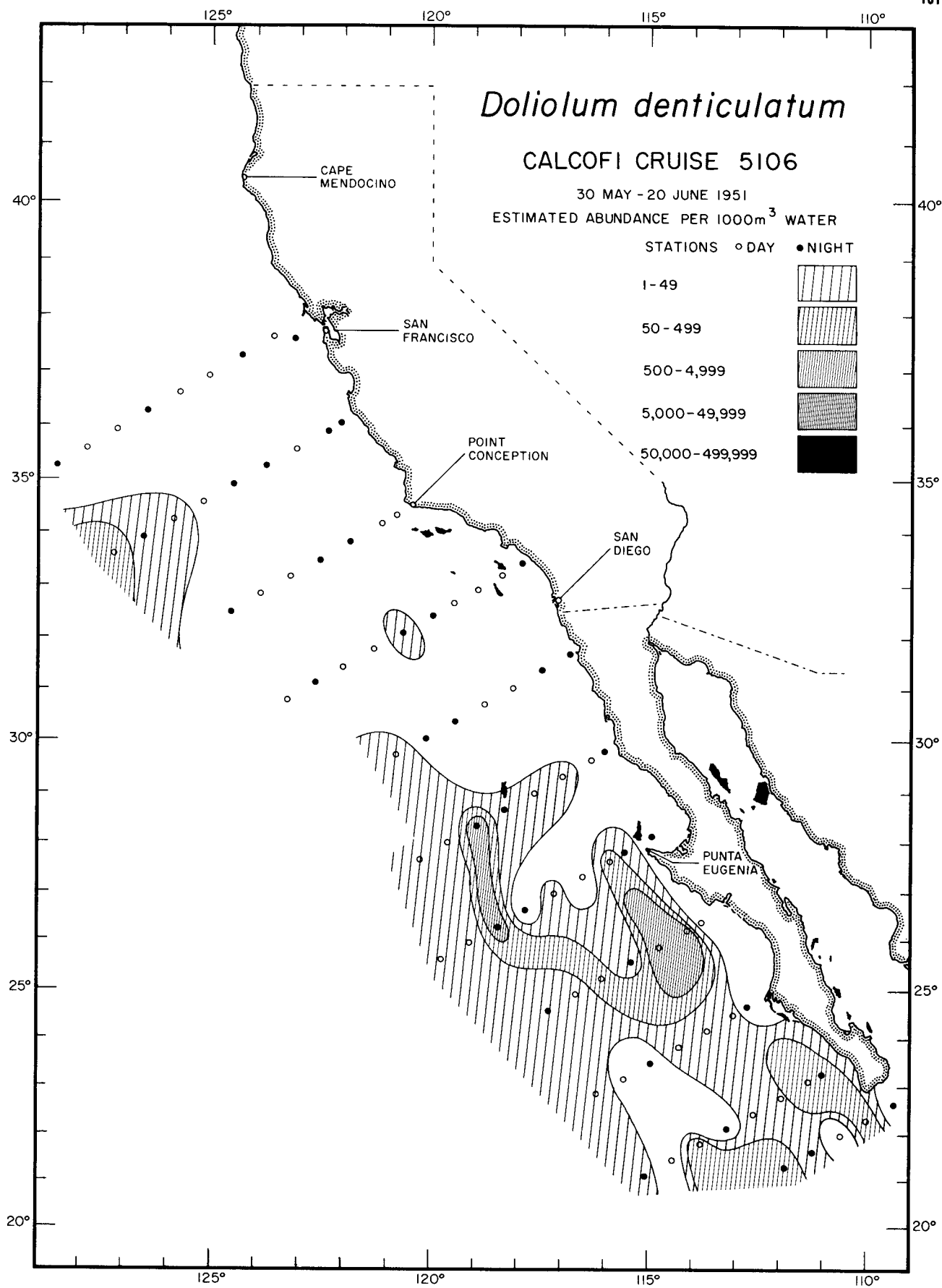
Thaliacea
Doliolum denticulatum
5006



Thaliacea
Doliolum denticulatum
 5009



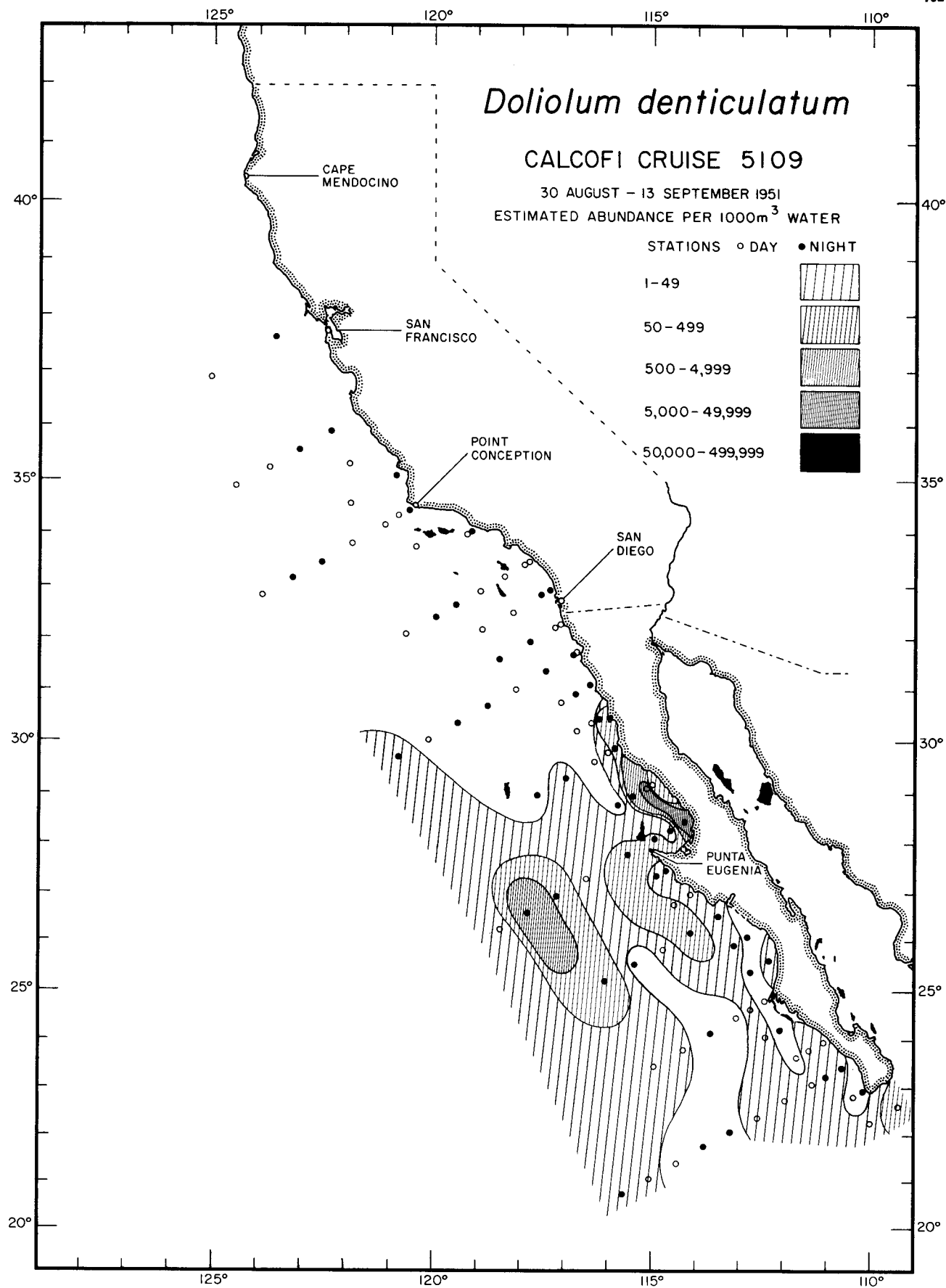
Thaliacea
Doliolum denticulatum
5103



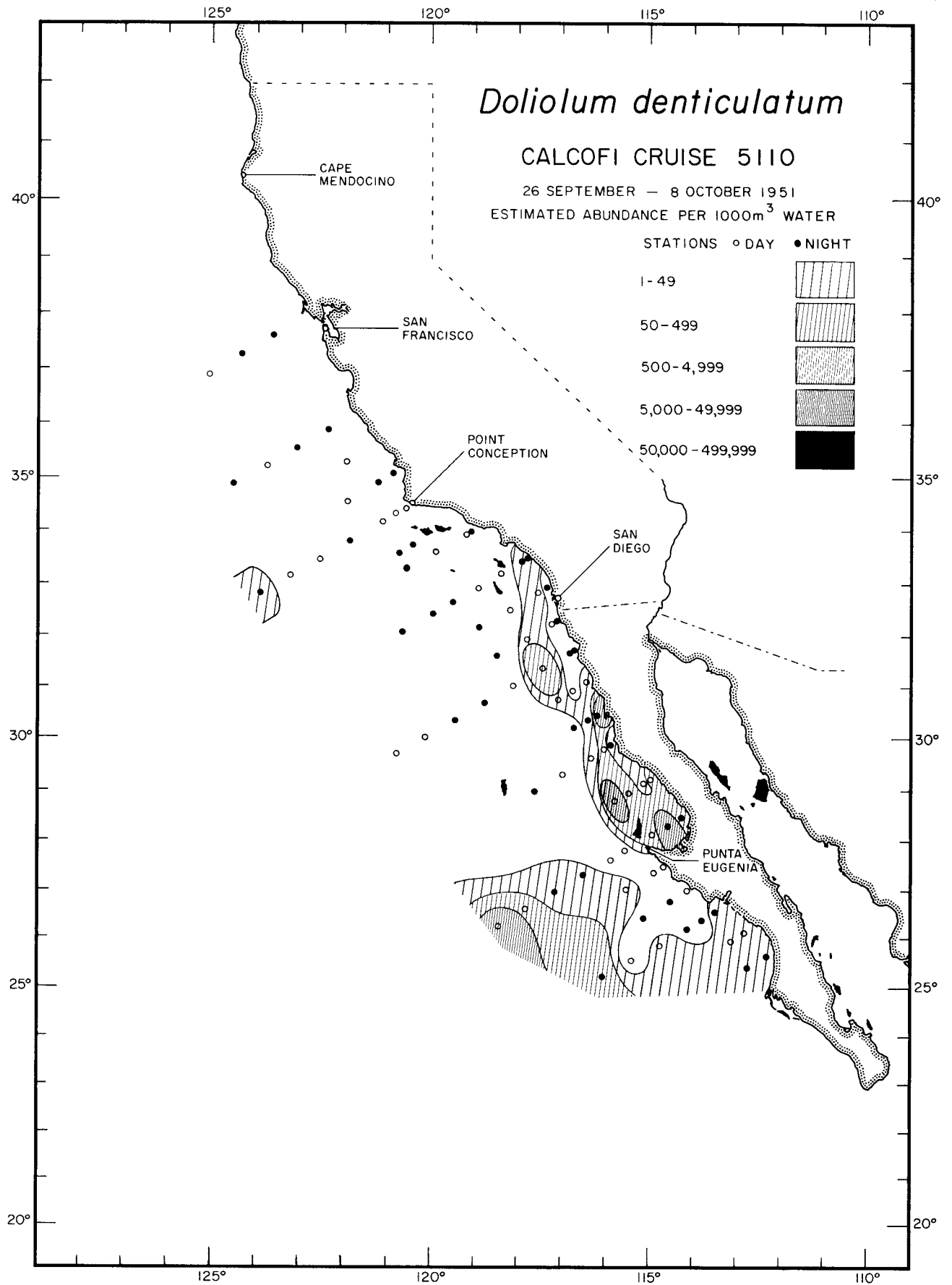
Thaliacea

Doliolum denticulatum

5106



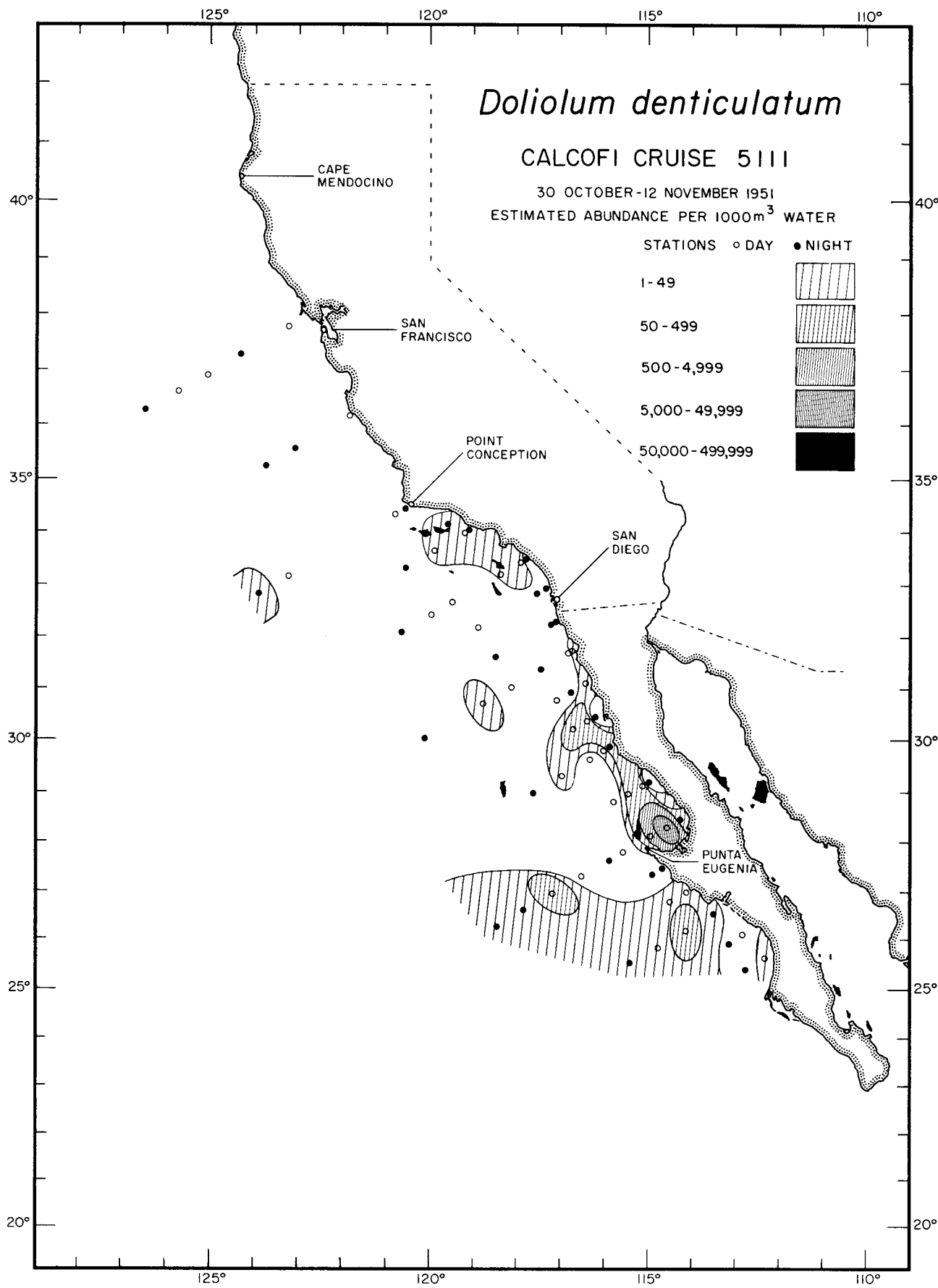
Thaliacea
Doliolum denticulatum
5109



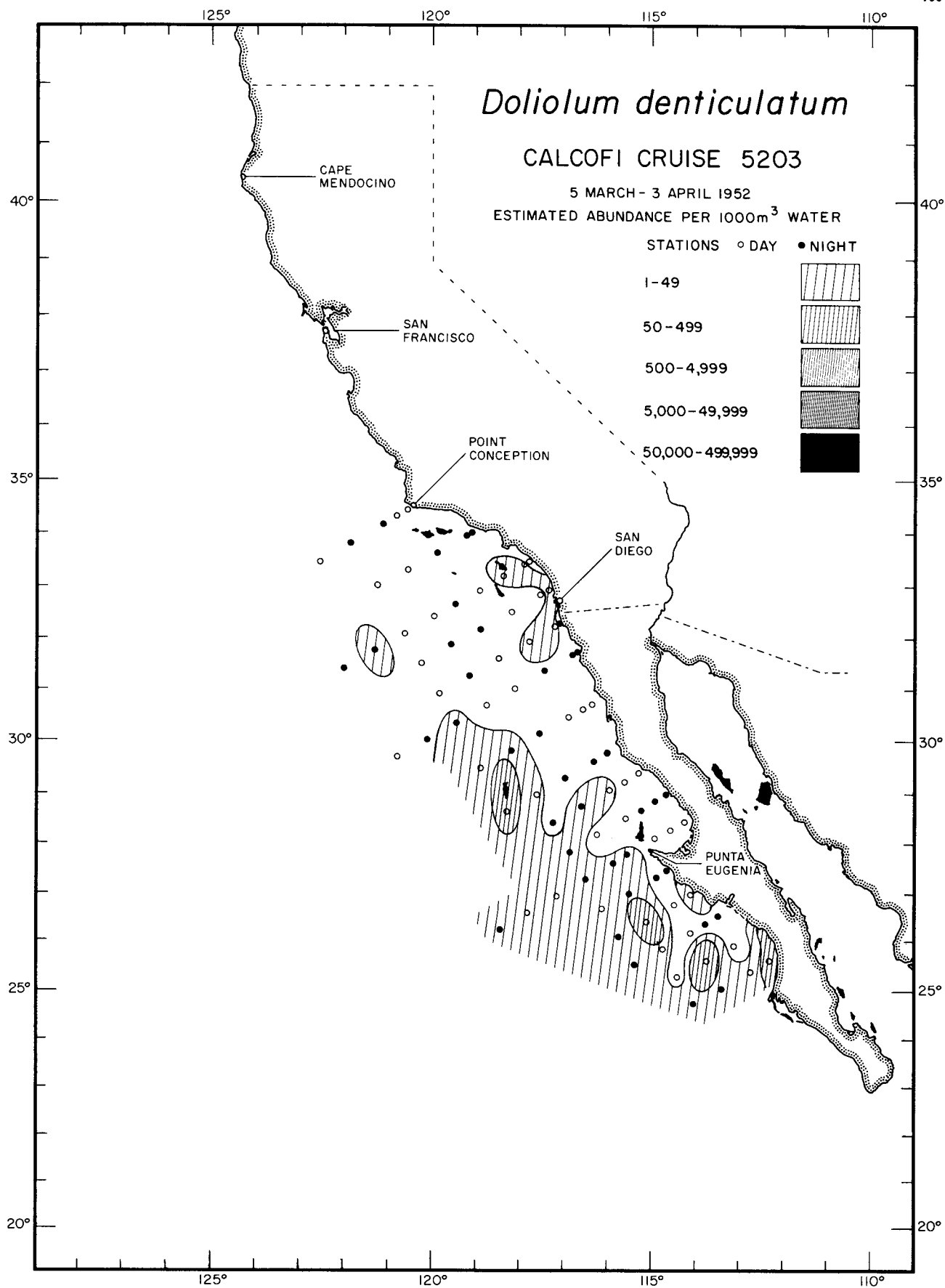
Thaliacea

Doliolum denticulatum

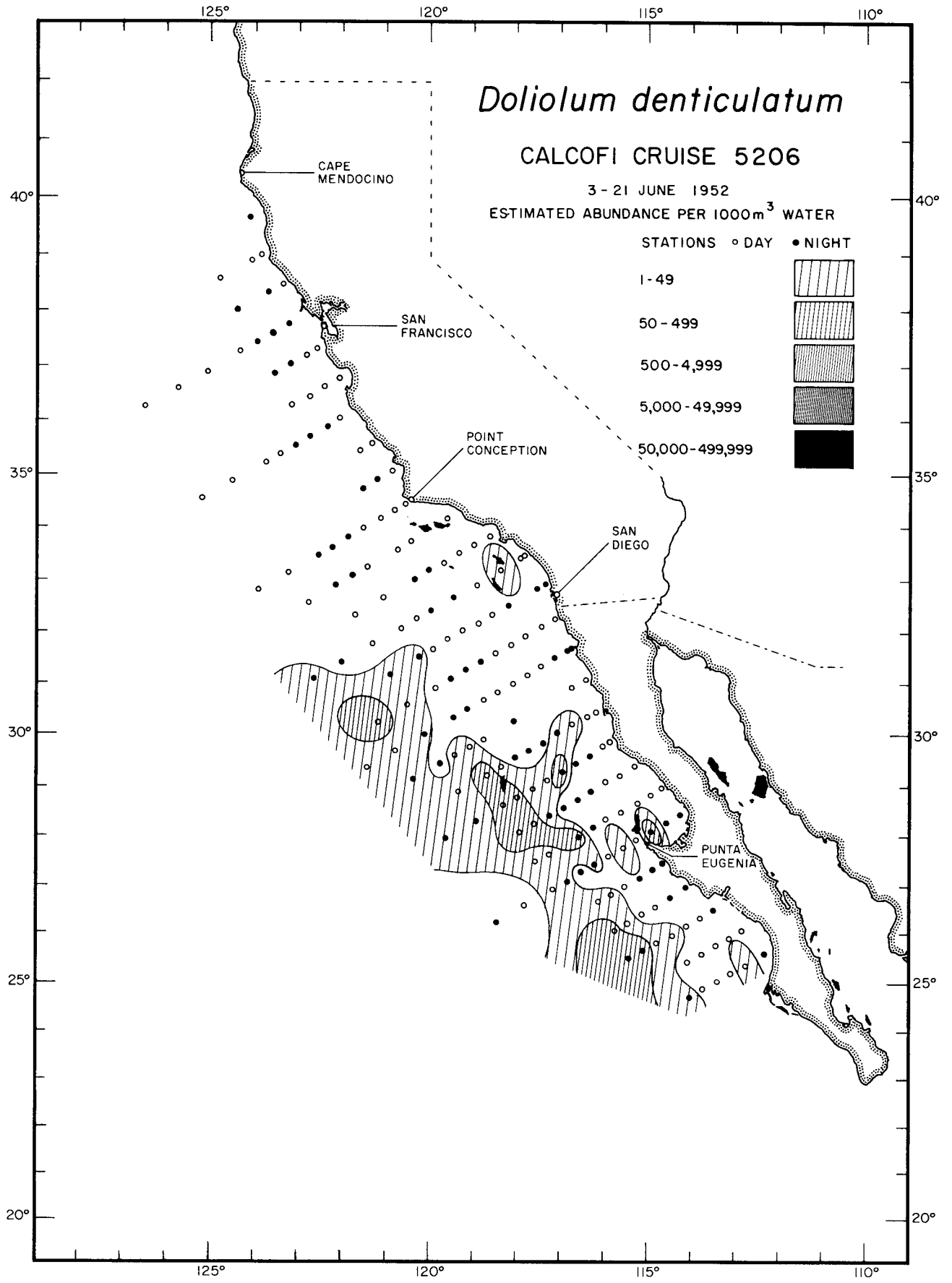
5110



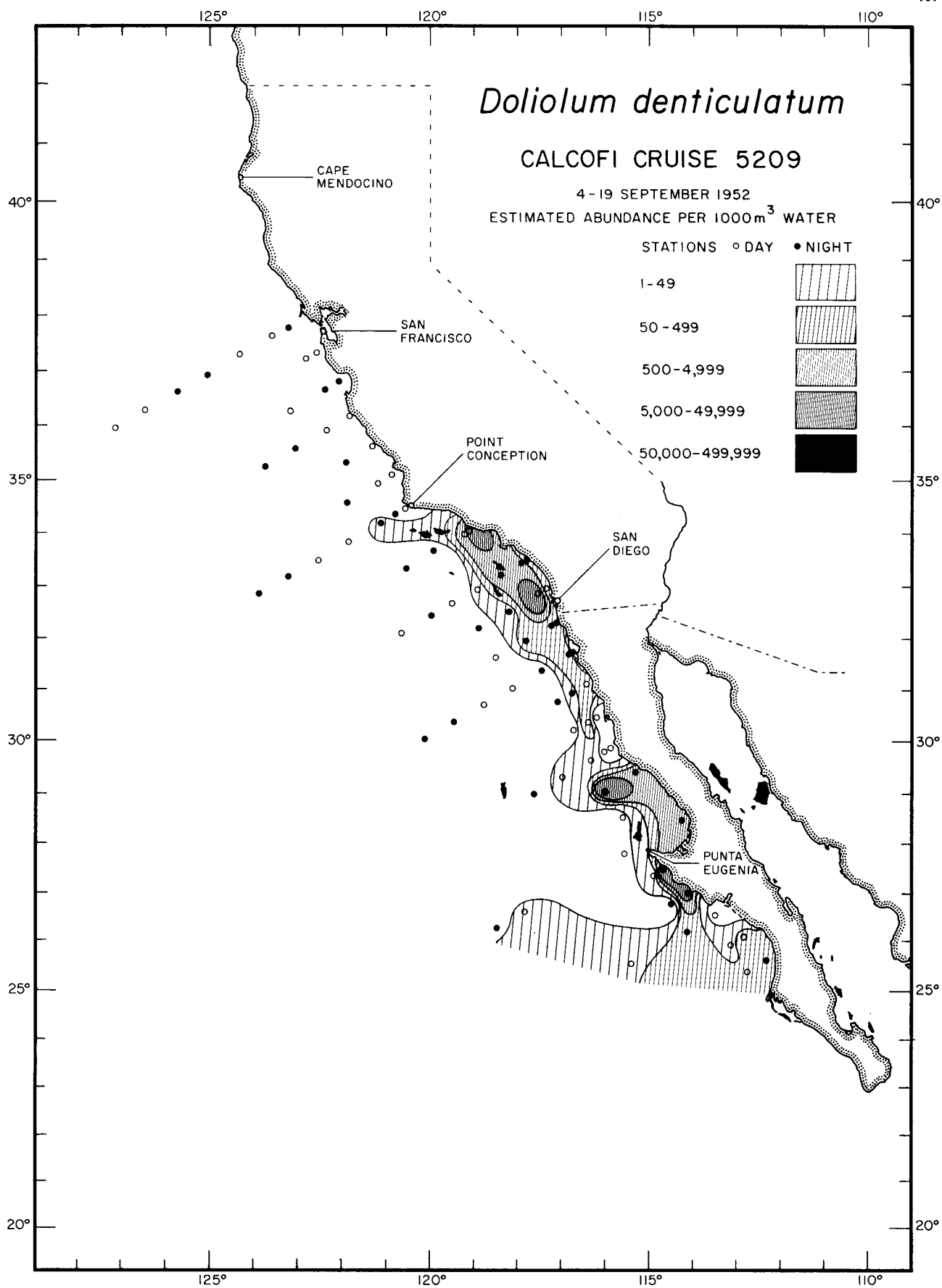
Thaliacea
Doliolum denticulatum
5111



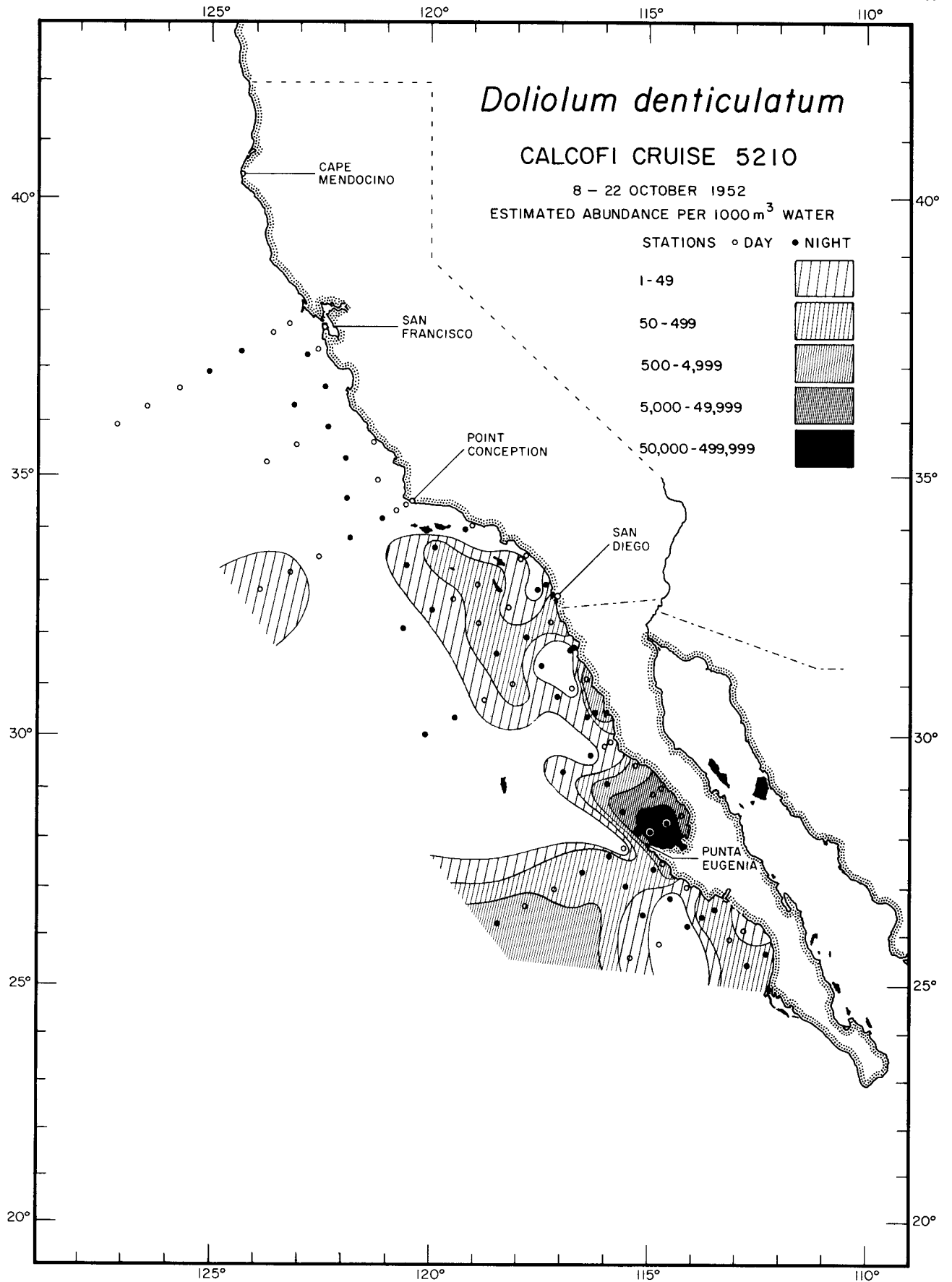
Thaliacea
Doliolum denticulatum
5203



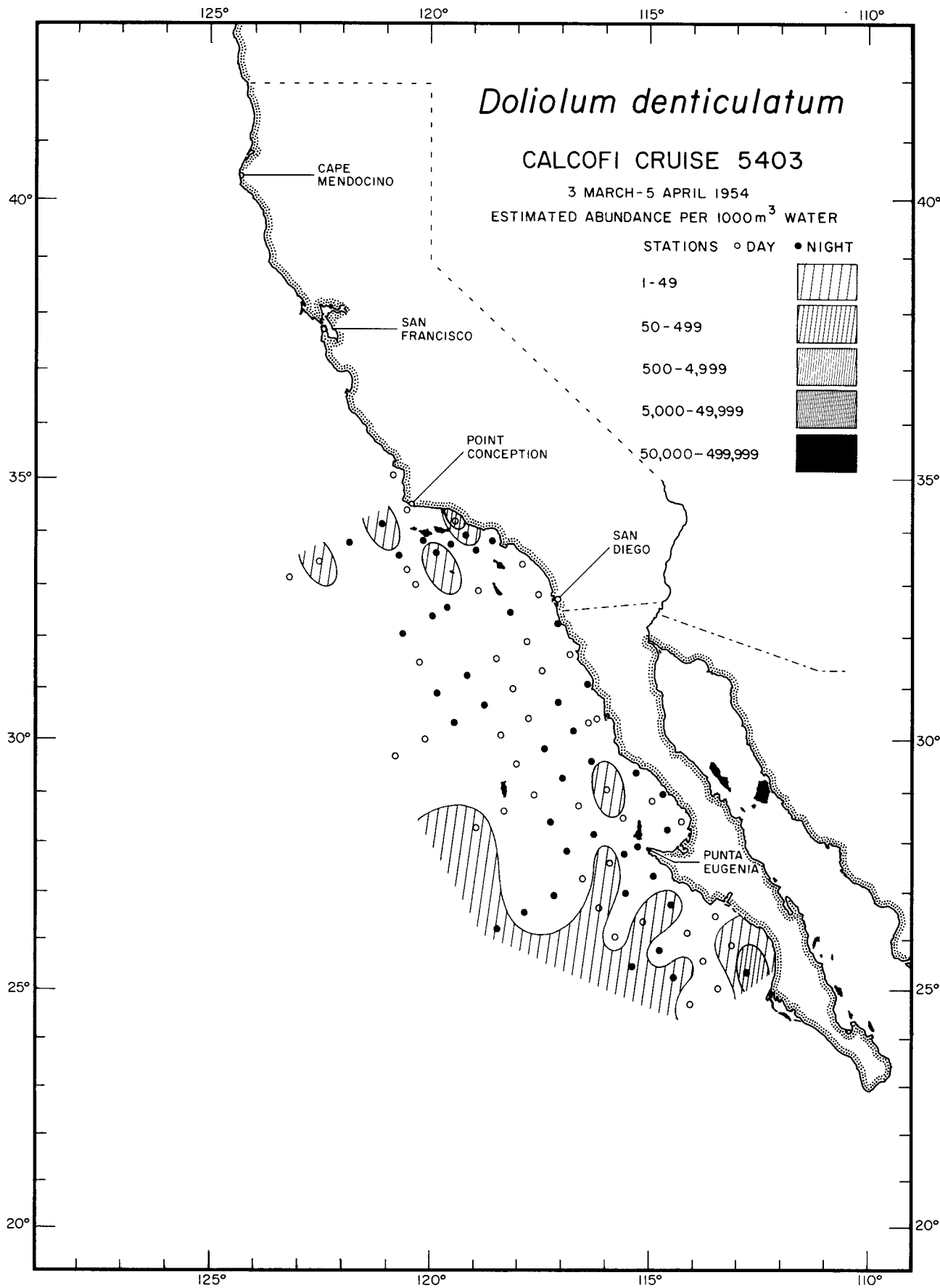
Thaliacea
Doliolum denticulatum
5206



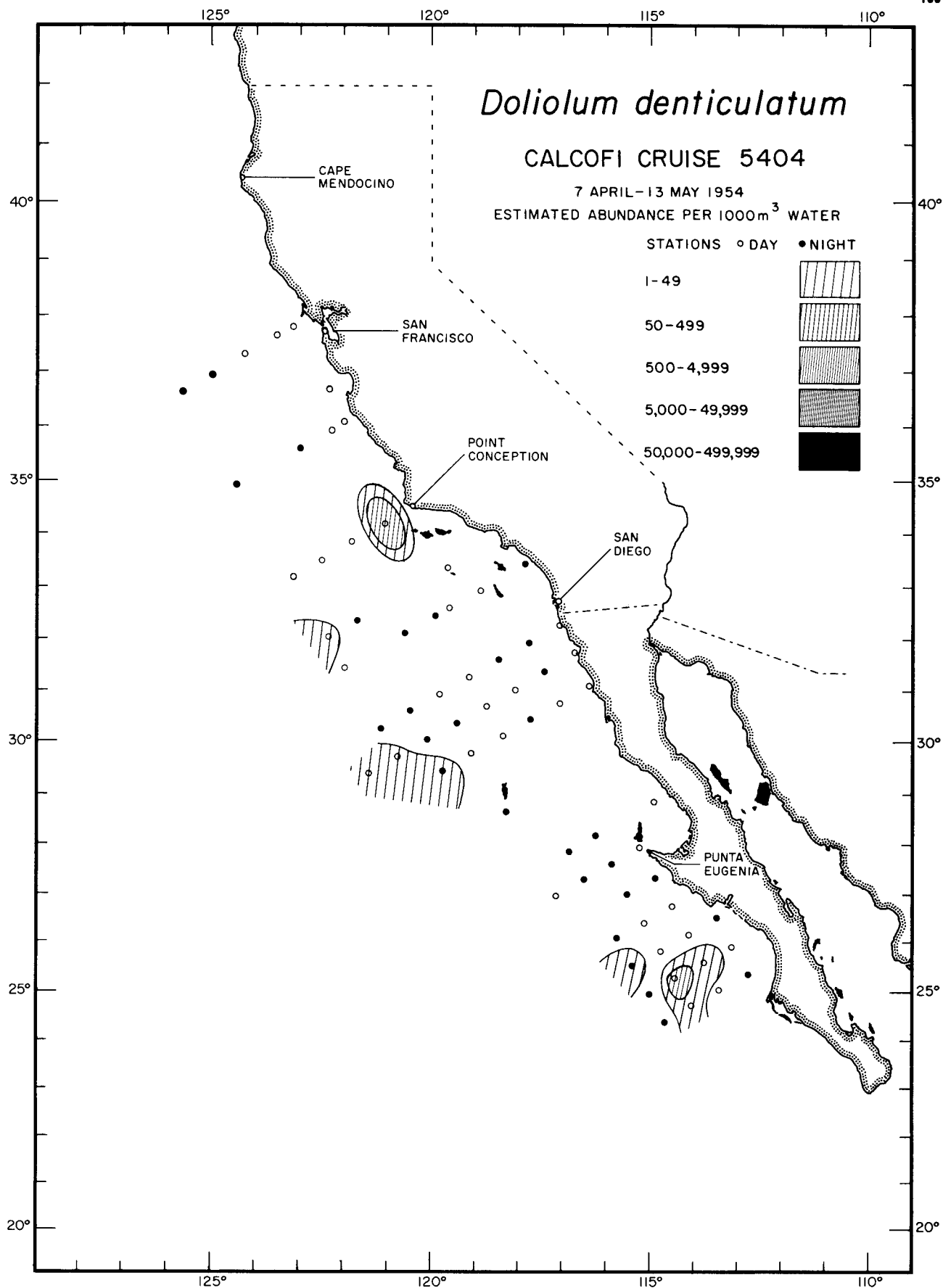
Thaliacea
Doliolum denticulatum
5209



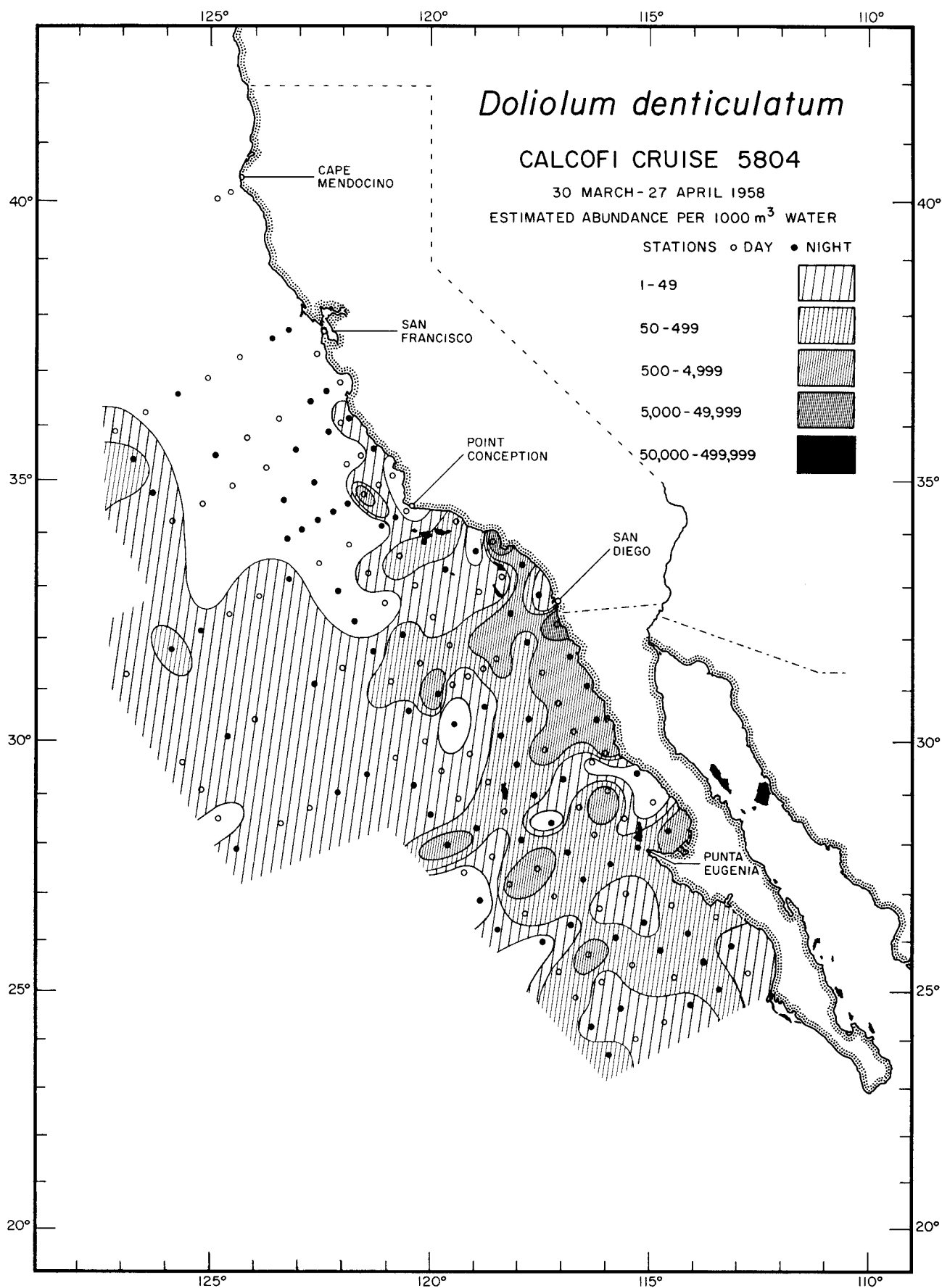
Thaliacea
Doliolum denticulatum
5210



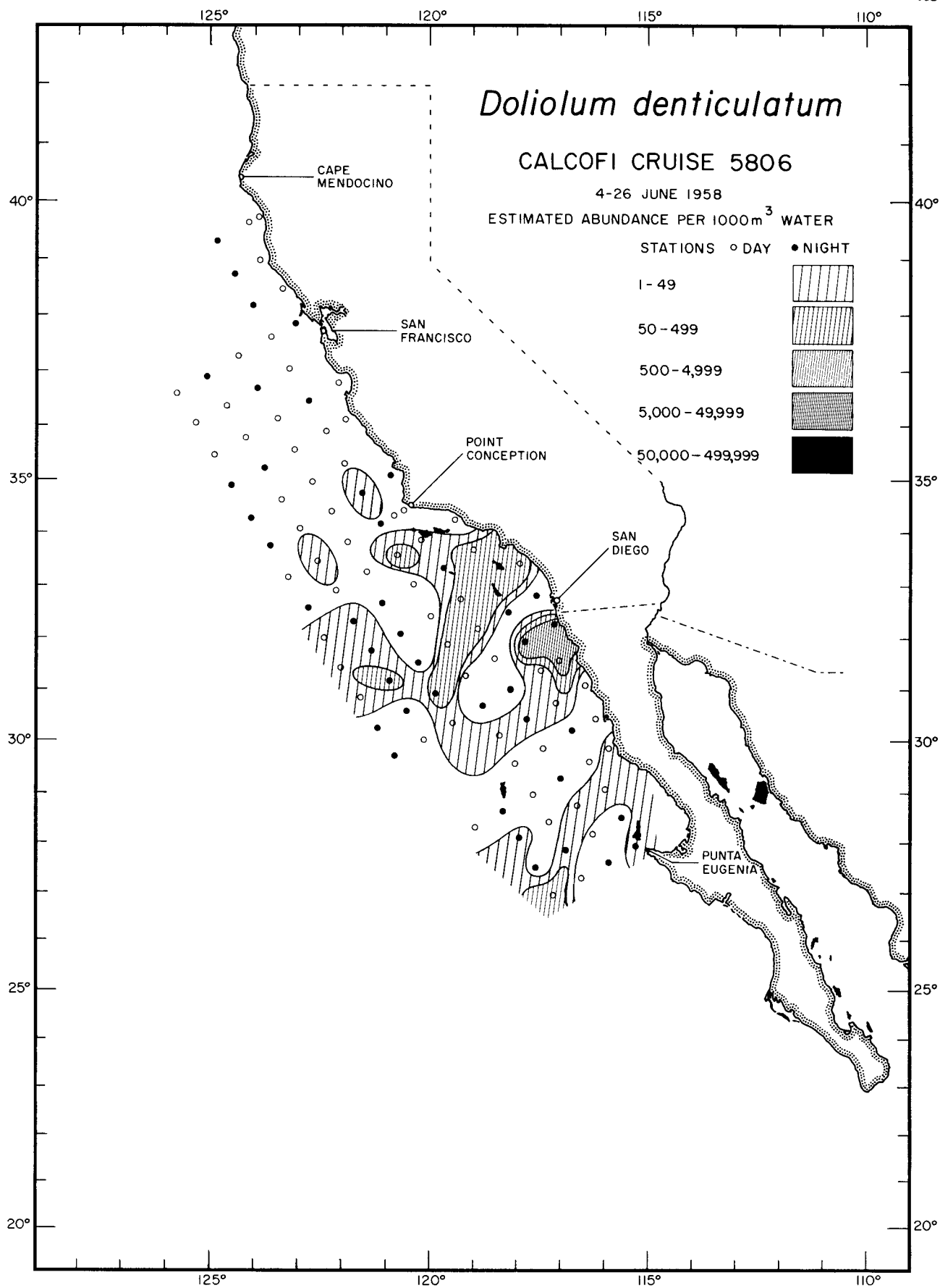
Thaliacea
Doliolum denticulatum
5403



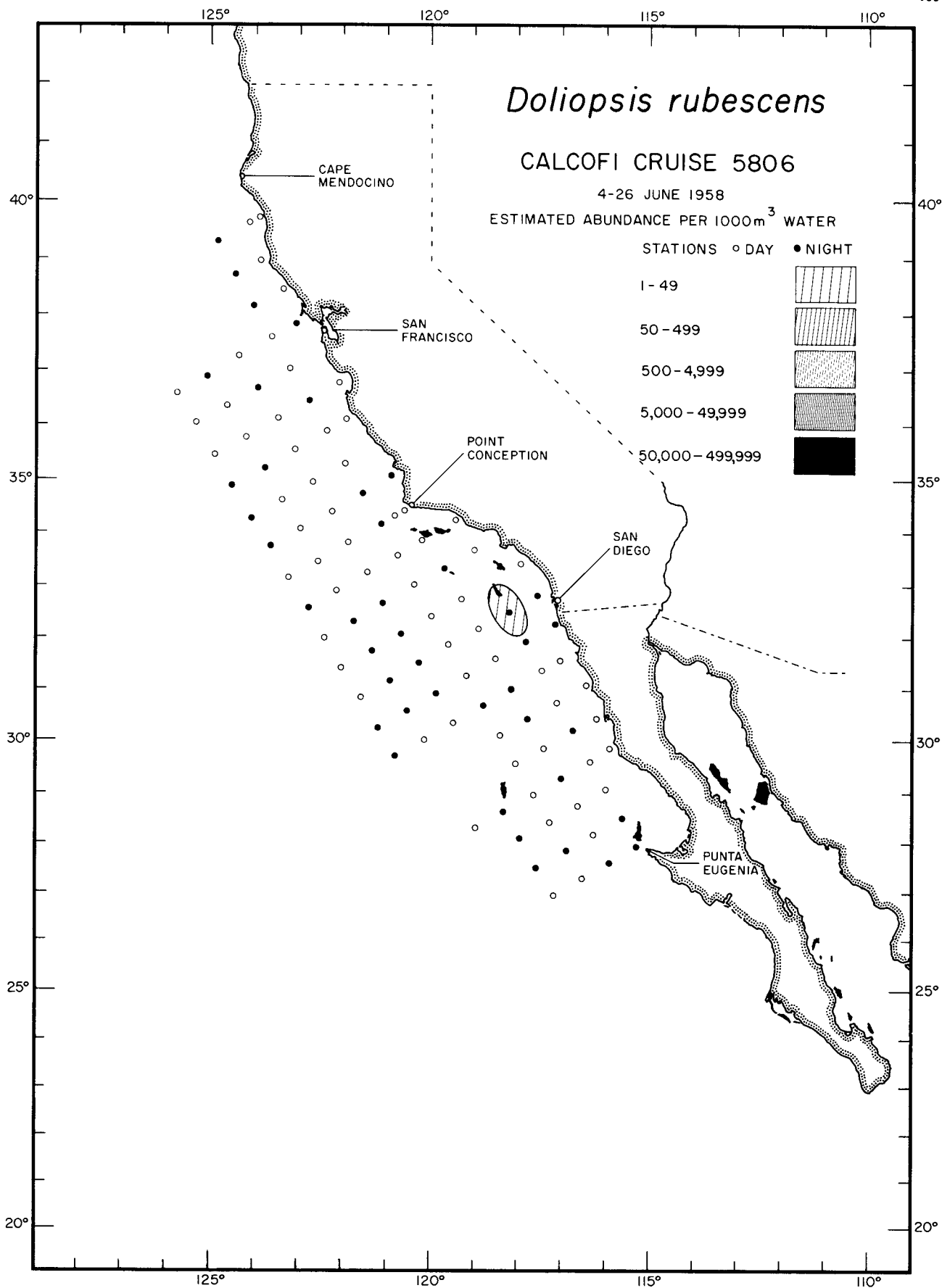
Thaliacea
Doliolum denticulatum
5404



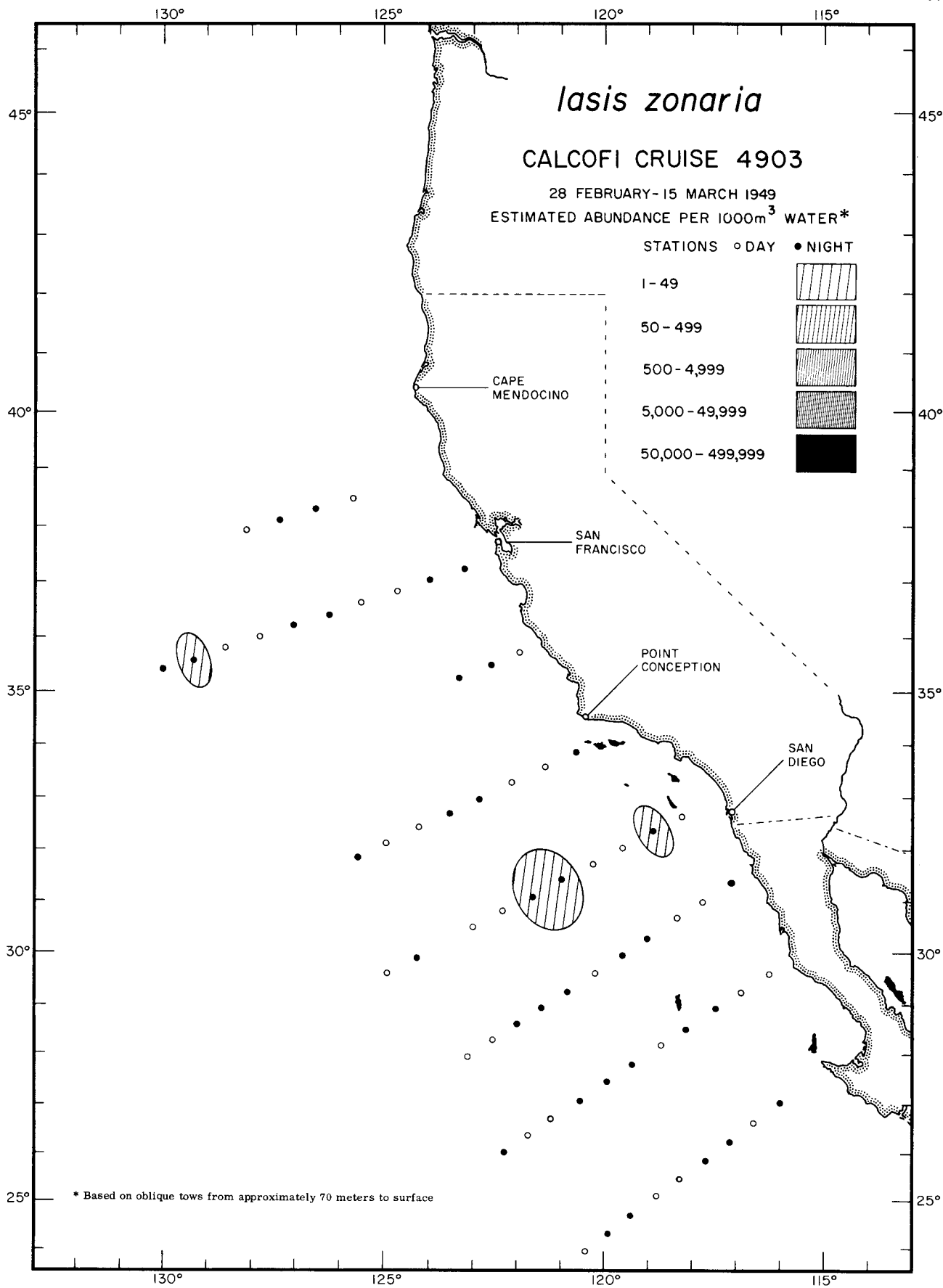
Thaliacea
Doliolum denticulatum
5804



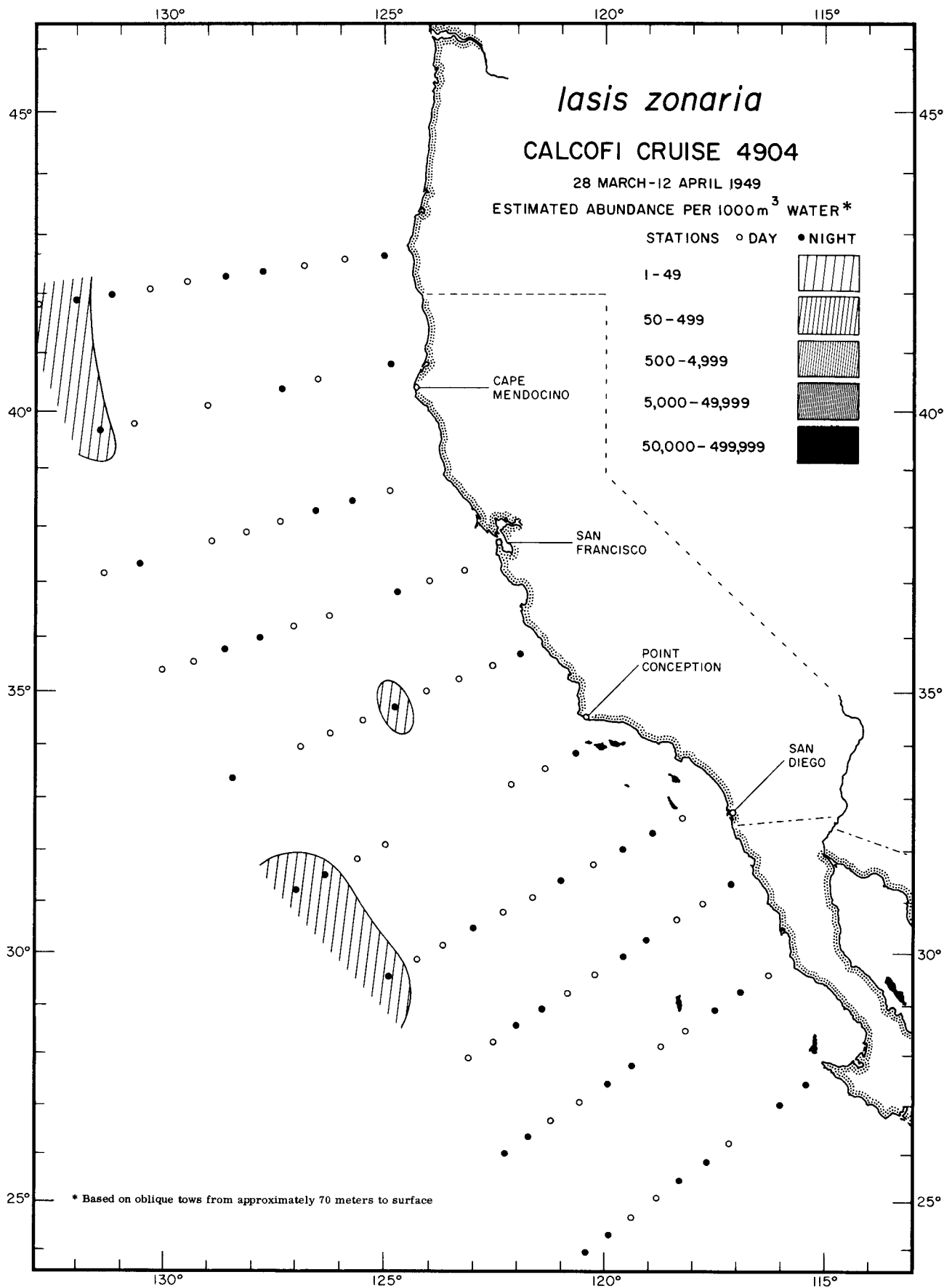
Thaliacea
Doliolum denticulatum
5806



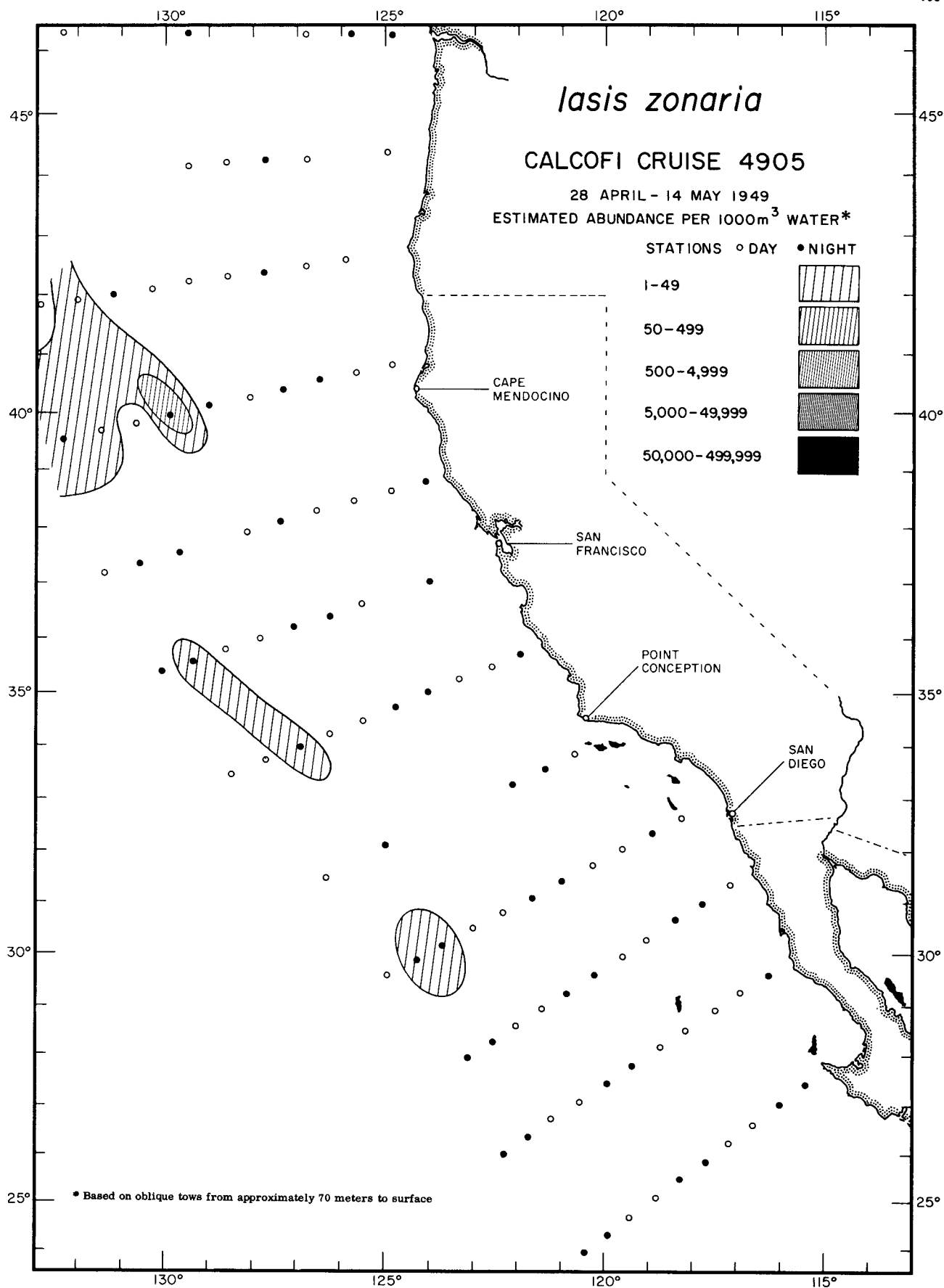
Thaliacea
Doliopsis rubescens
5806



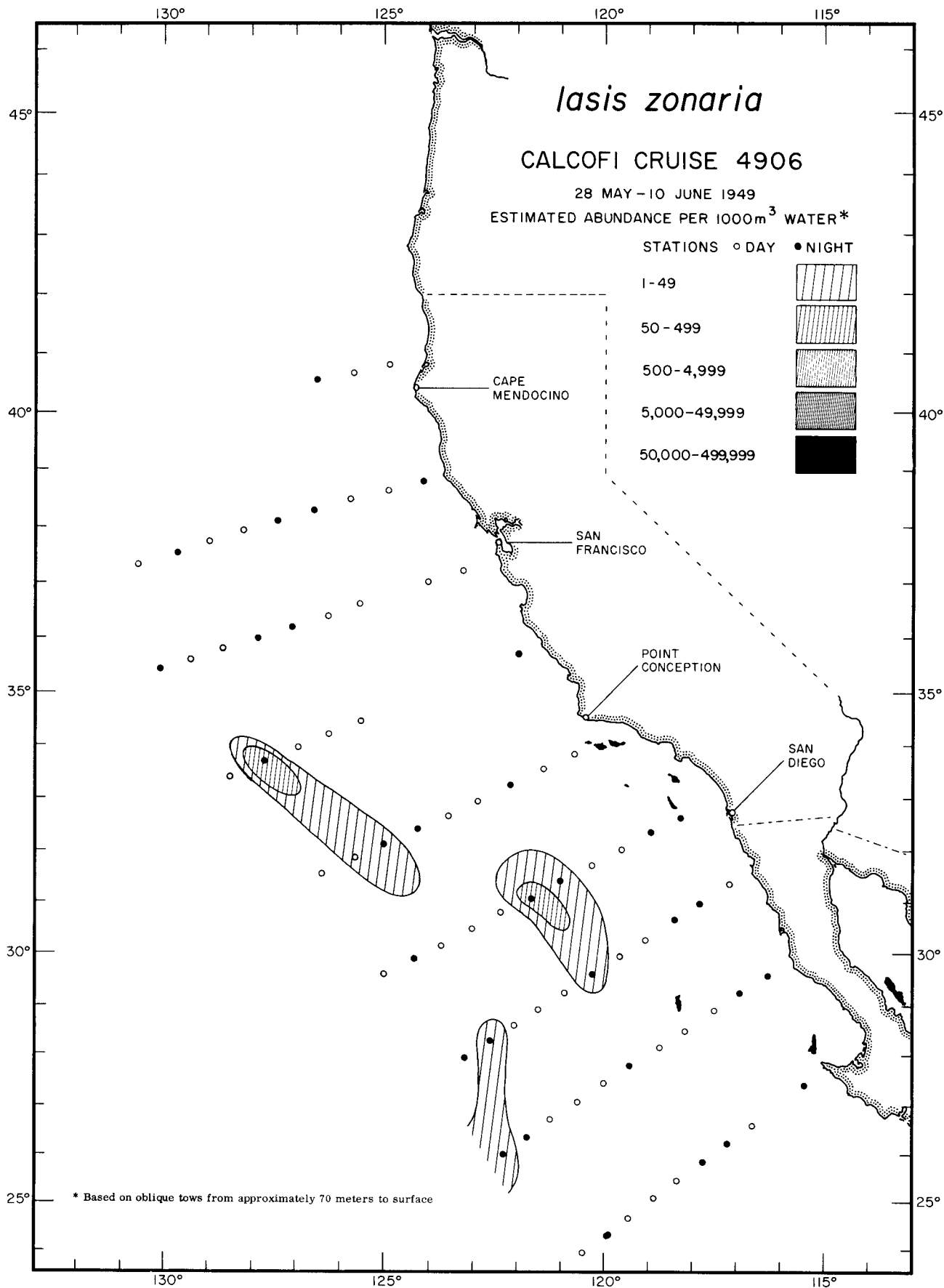
Thaliacea
lasis zonaria
4903



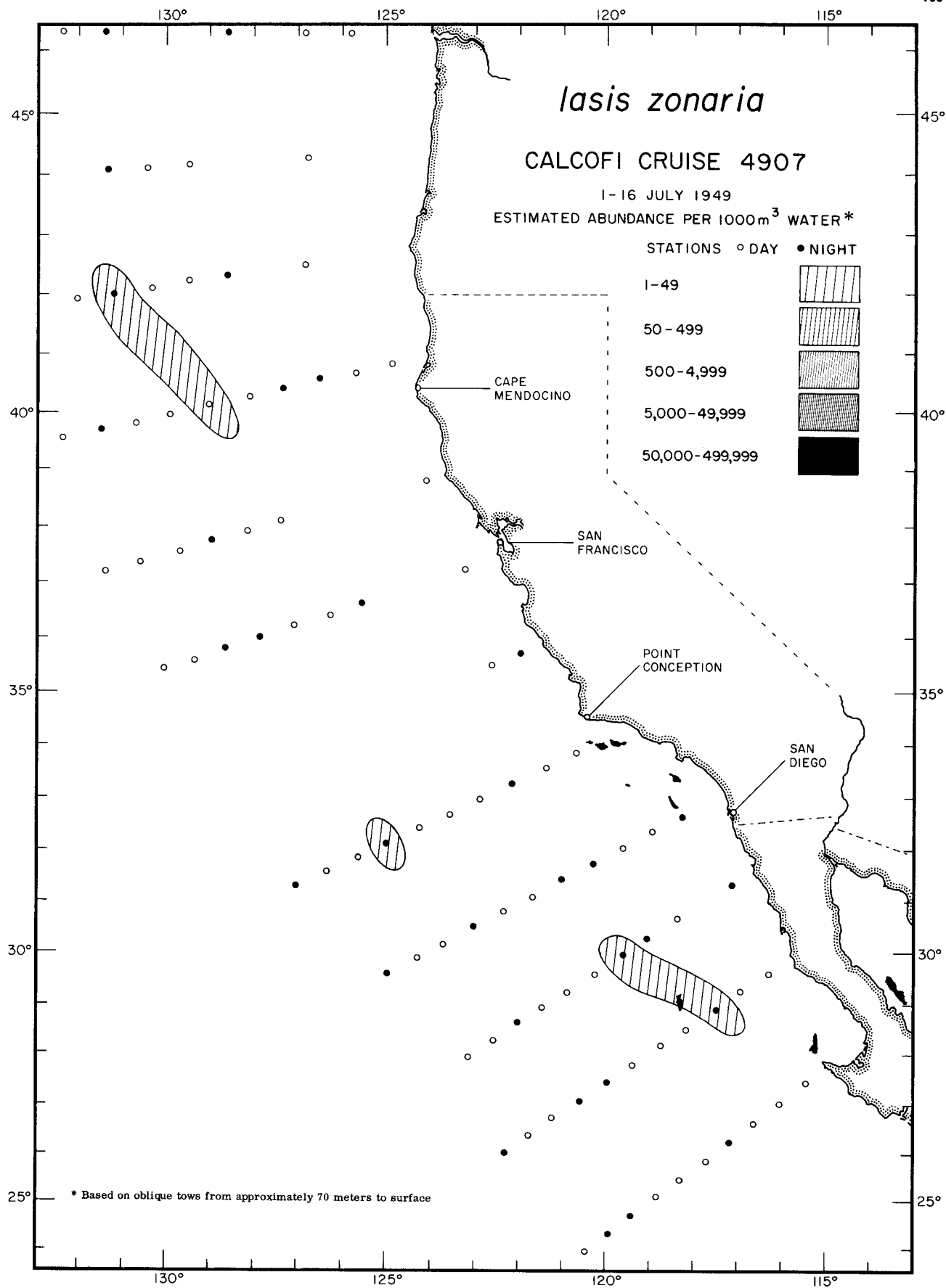
Thaliacea
lasis zonaria
4904



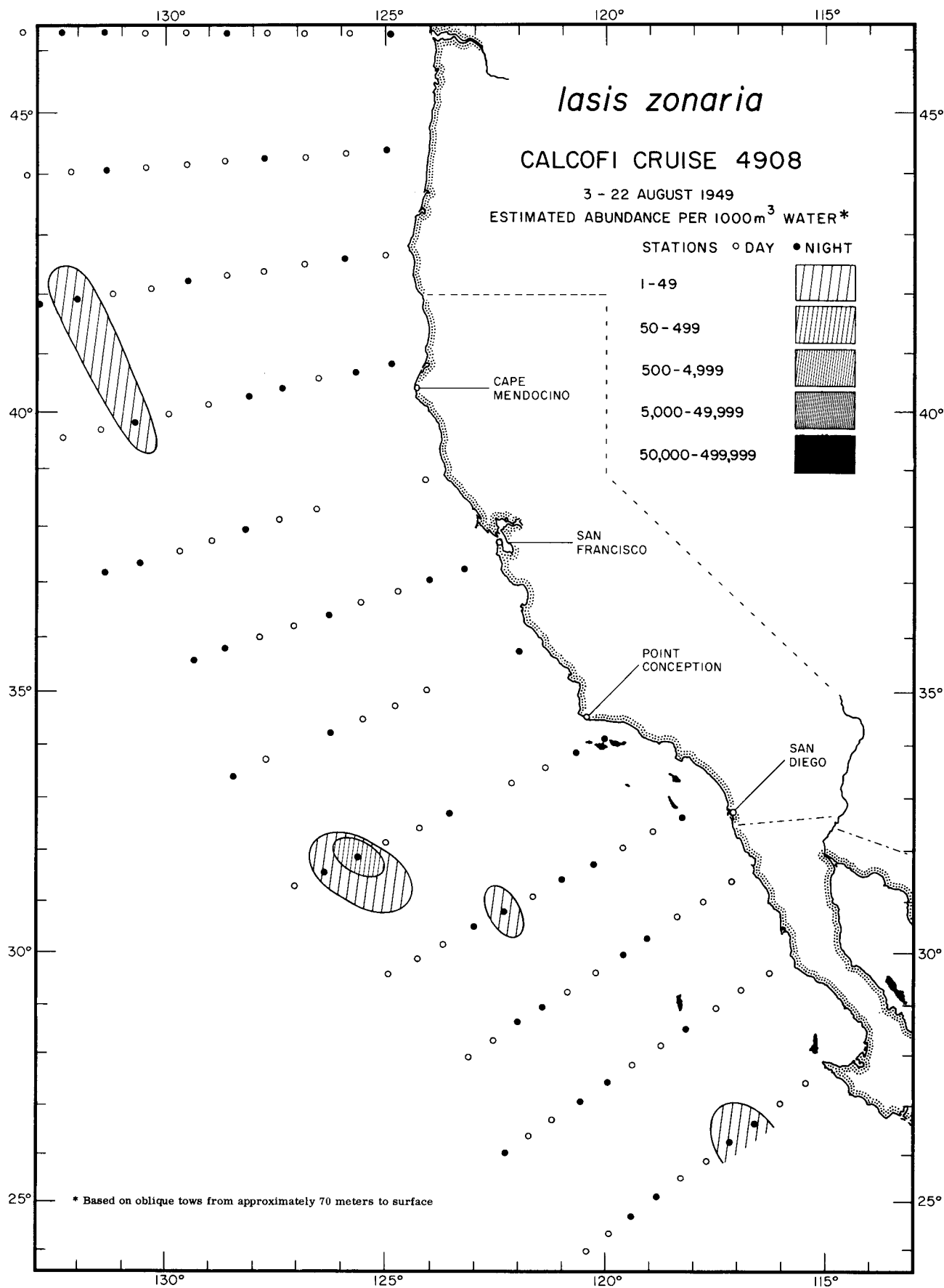
Thaliacea
lasis zonaria
4905



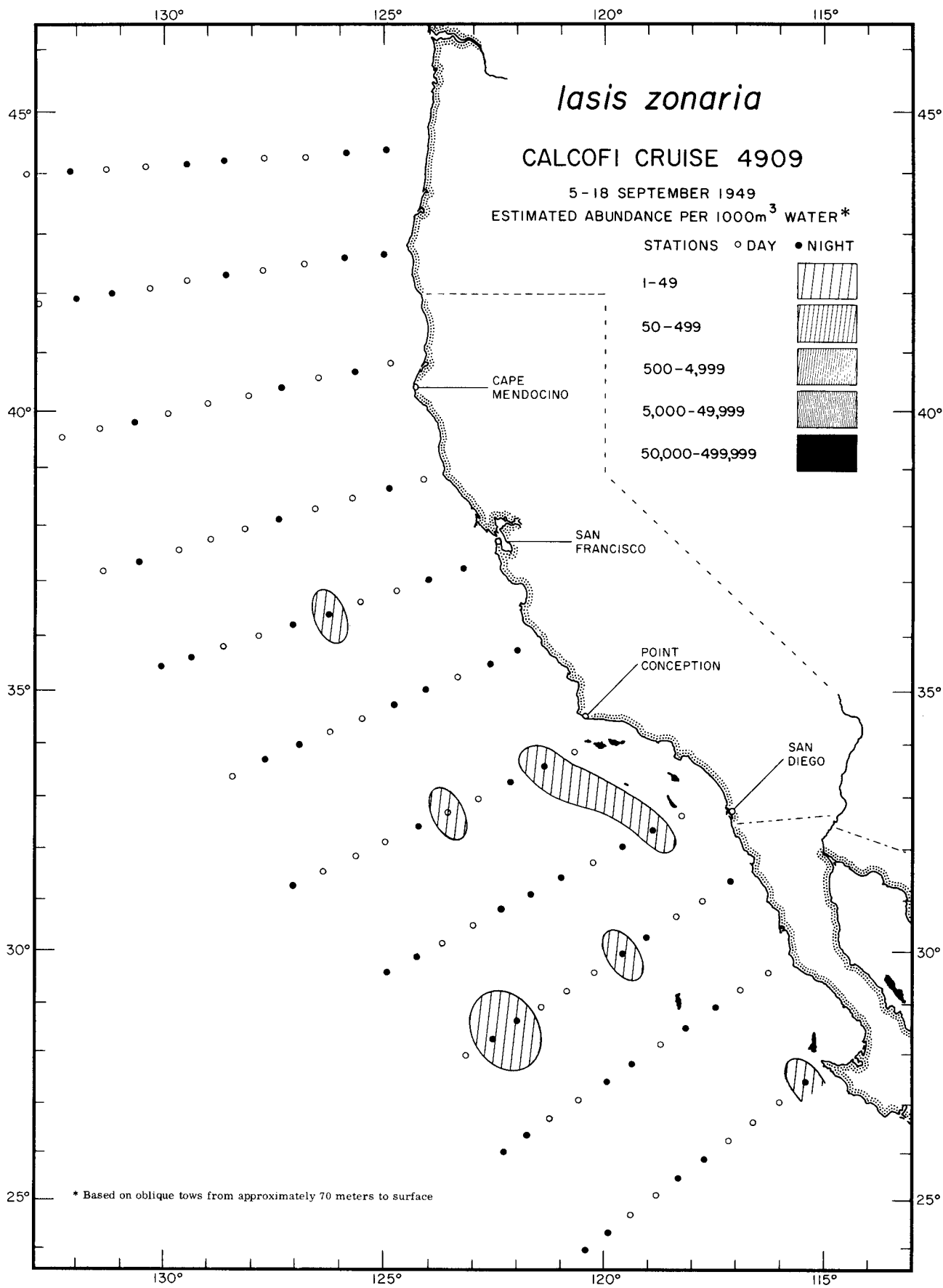
Thaliacea
lasis zonaria
4906



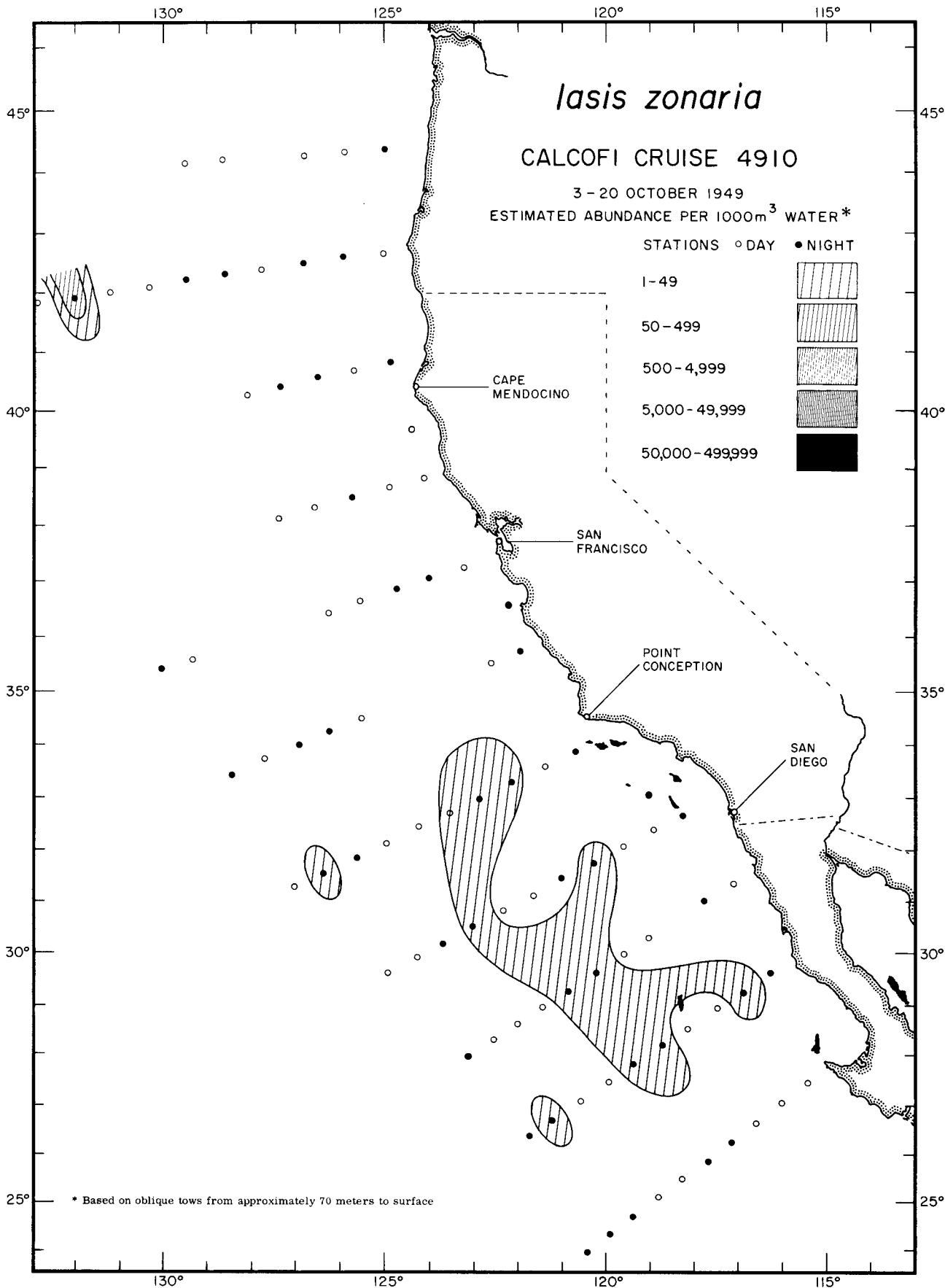
Thaliacea
lasis zonaria
4907



Thaliacea
lasis zonaria
4908

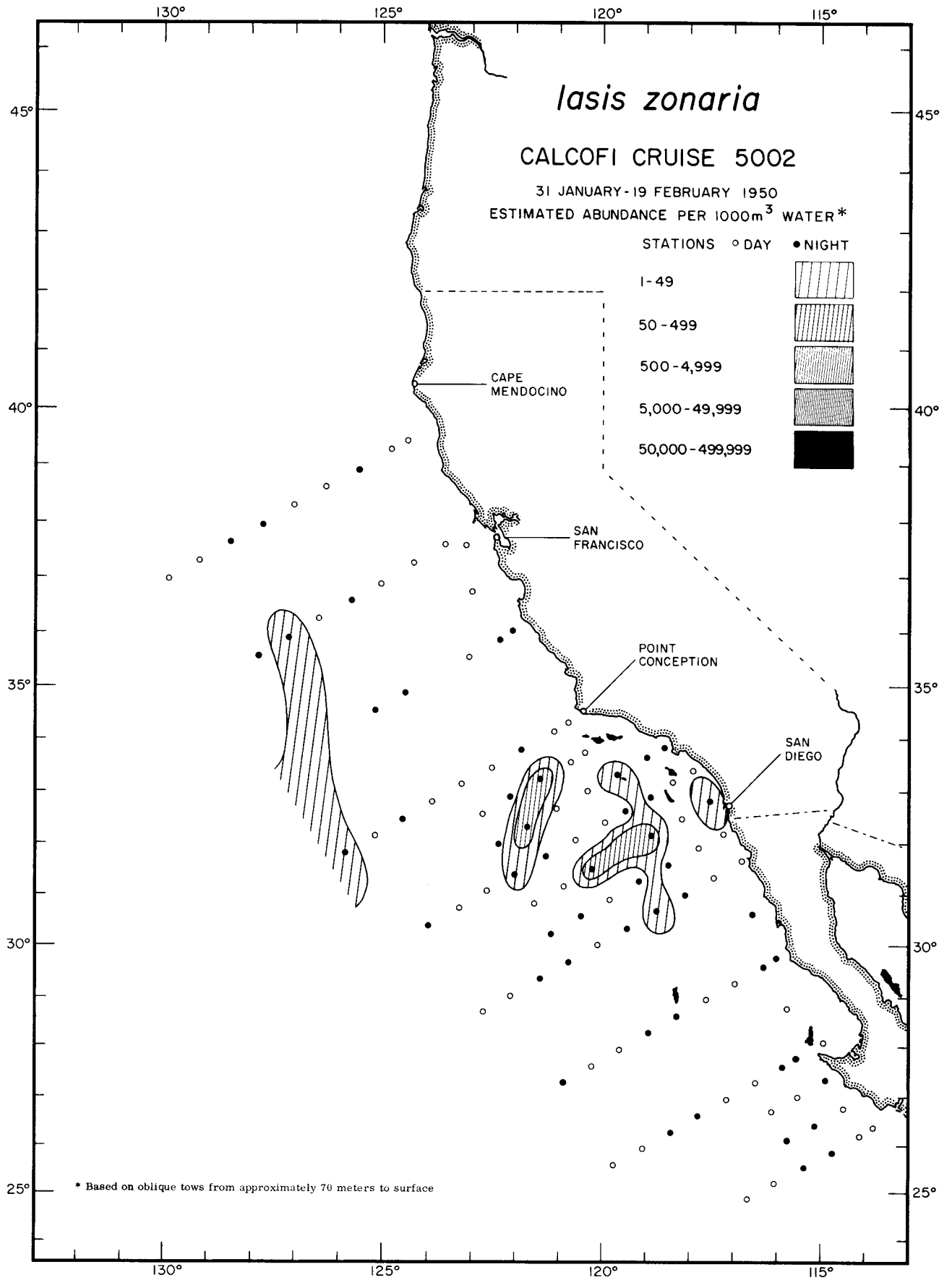


Thaliacea
lasis zonaria
4909

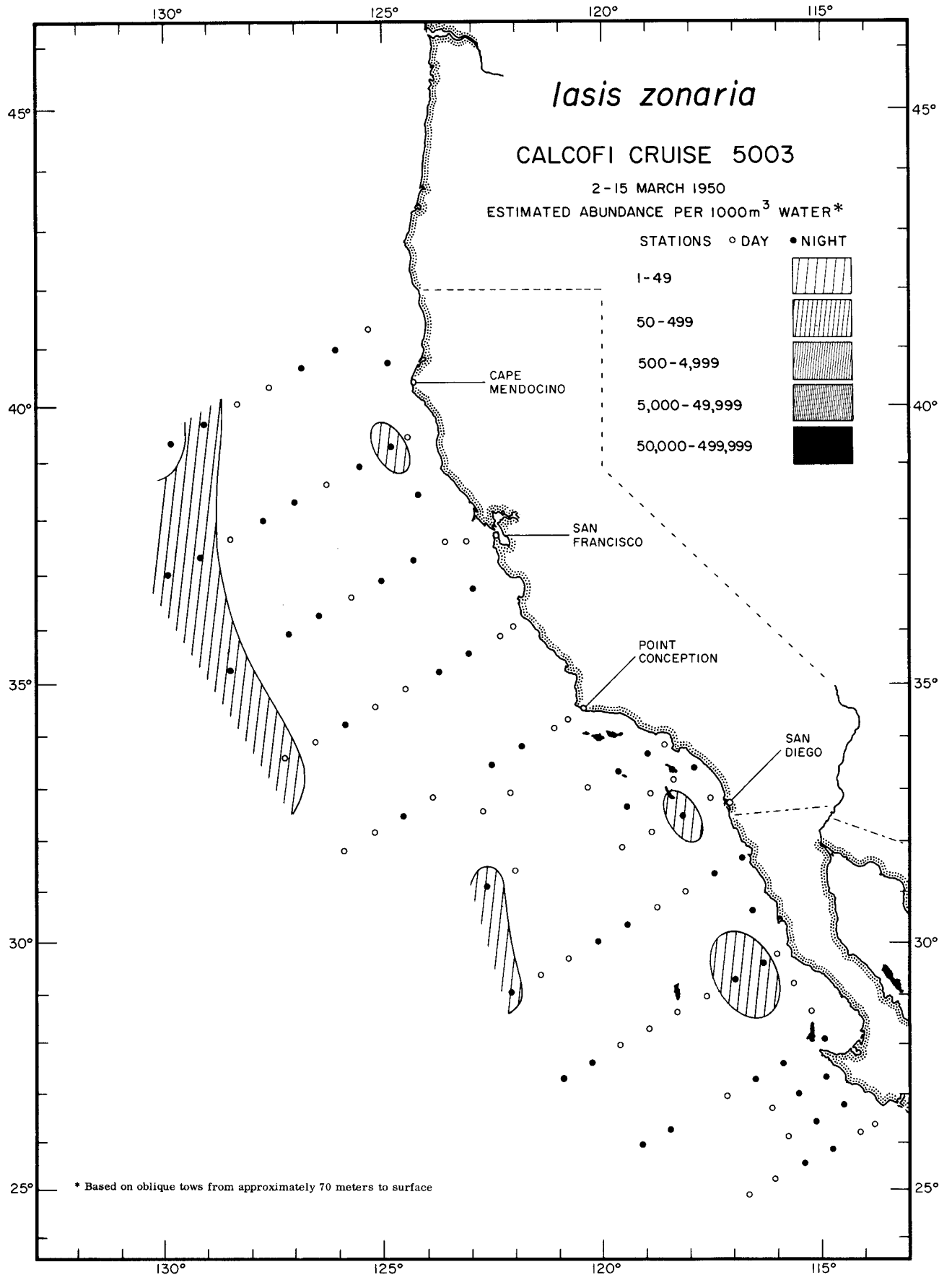


Thaliacea
lasis zonaria

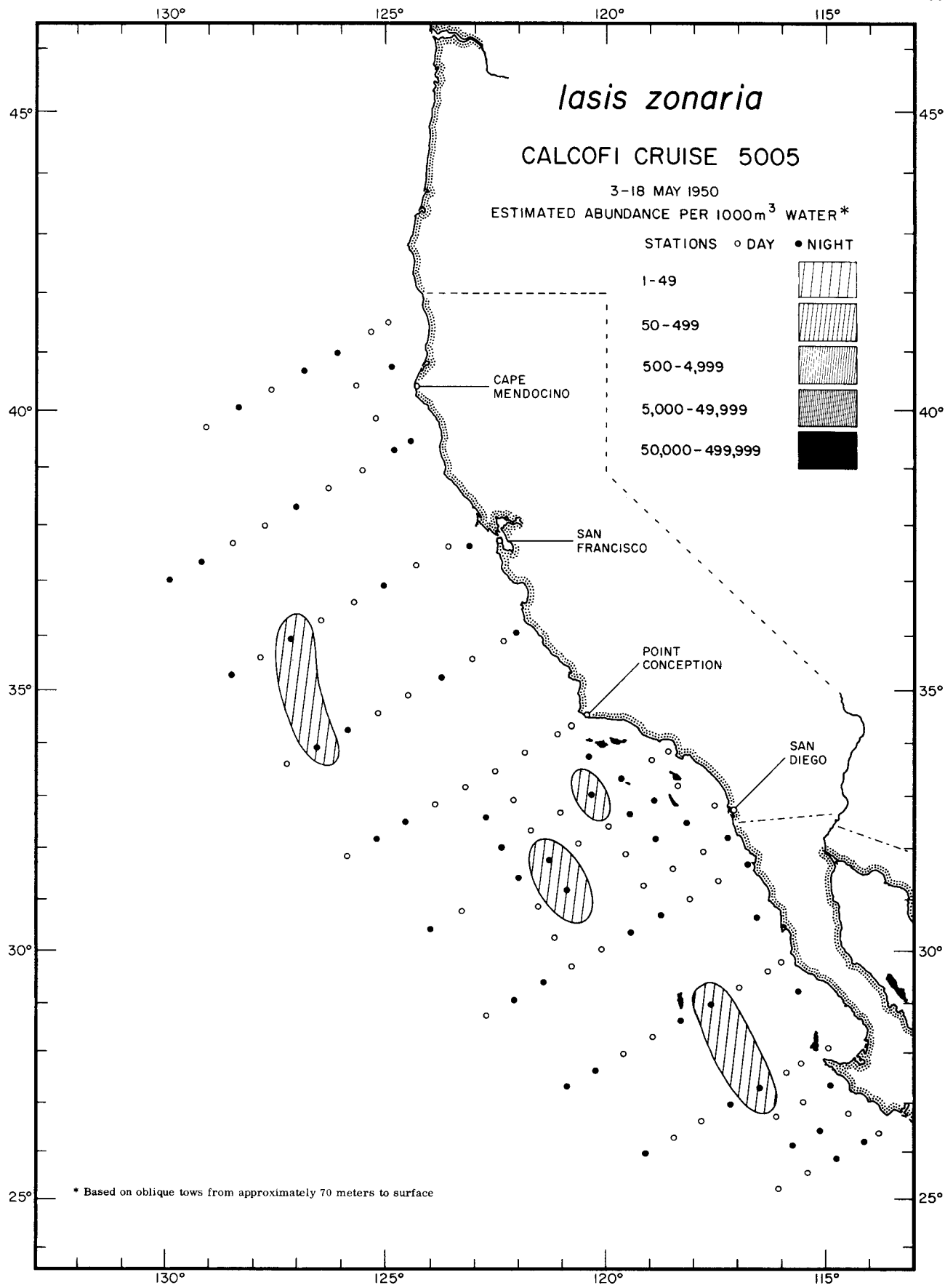
4910



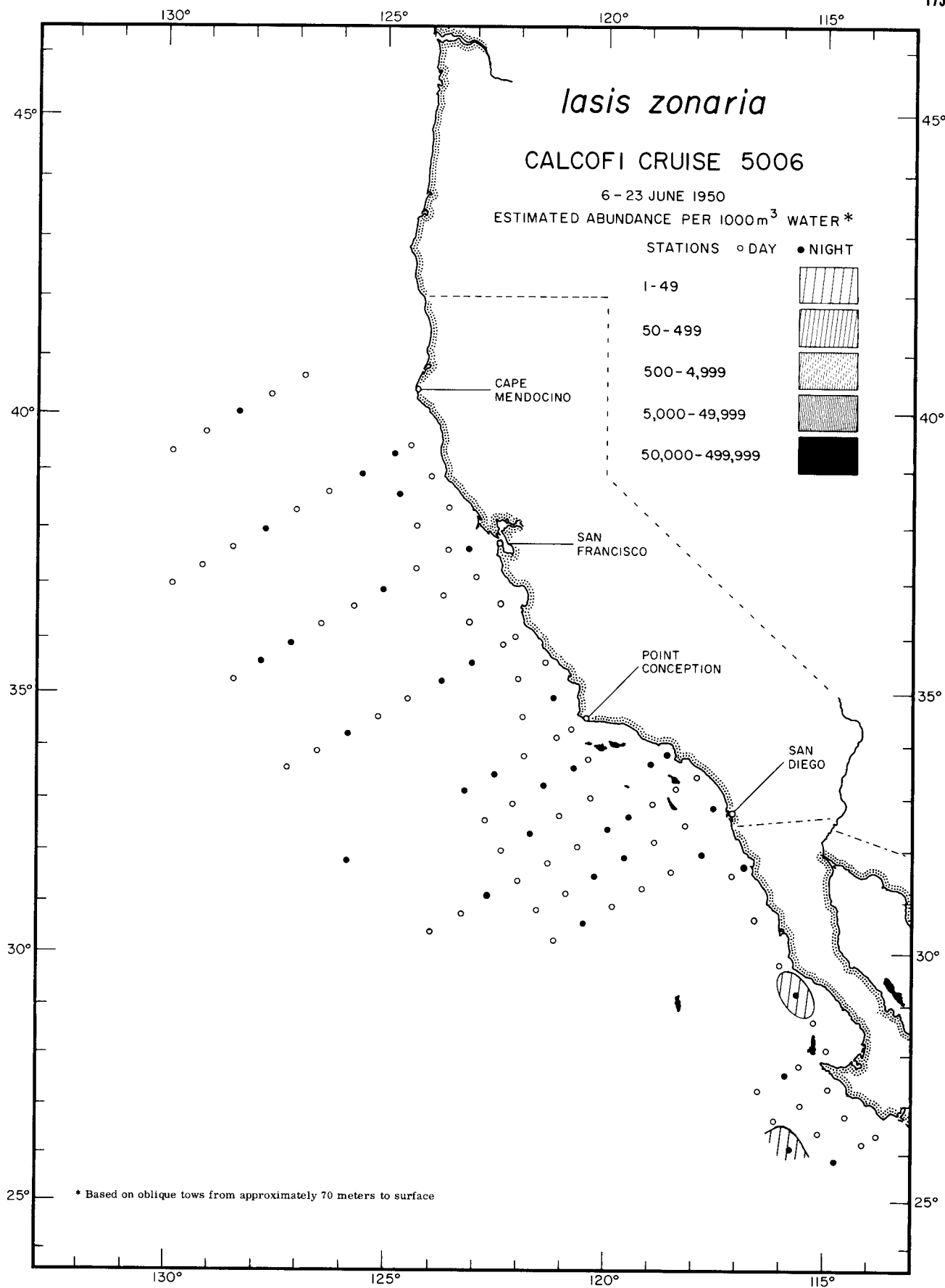
Thaliacea
lasis zonaria
5002



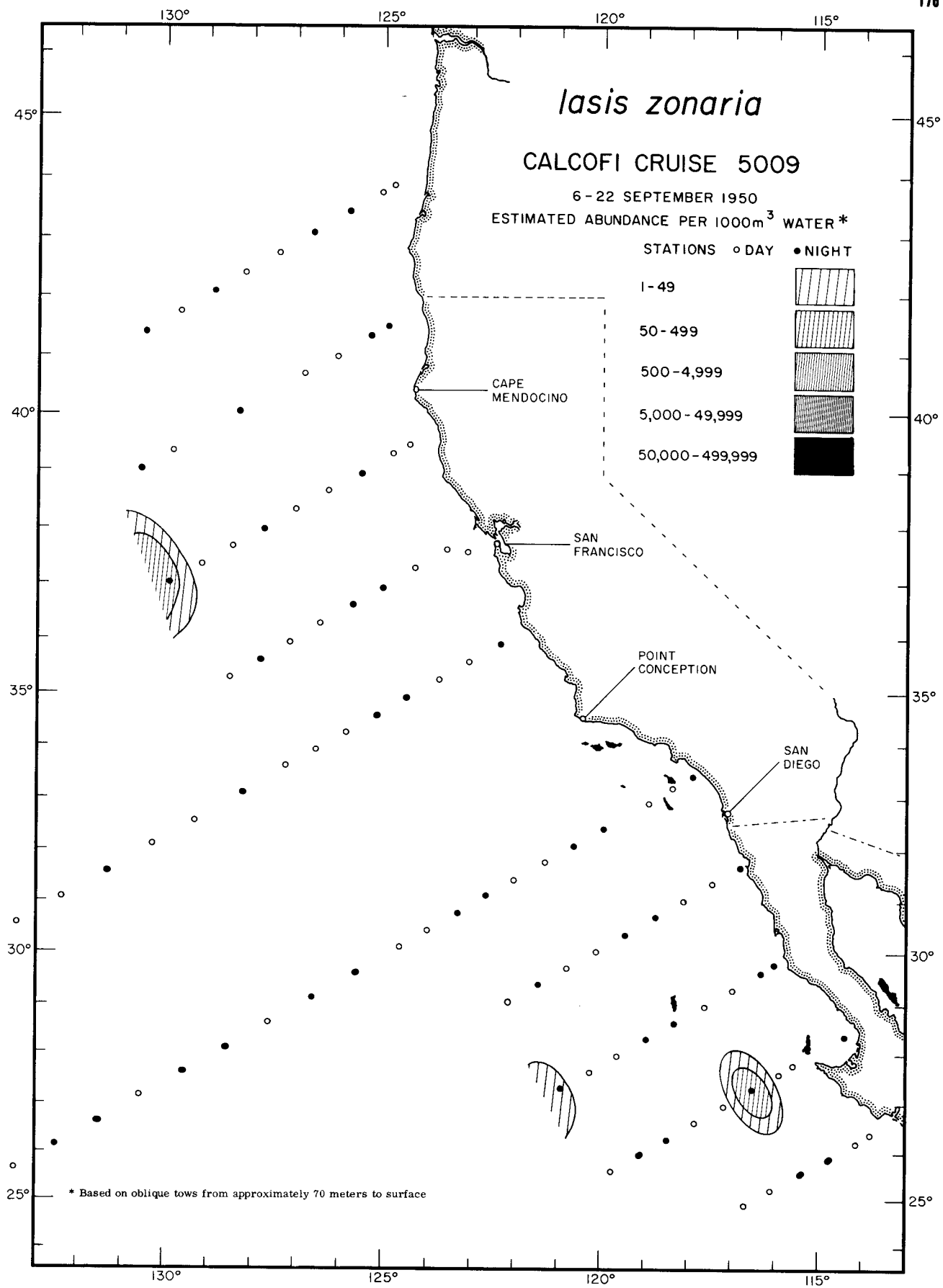
Thaliacea
lasis zonaria
5003



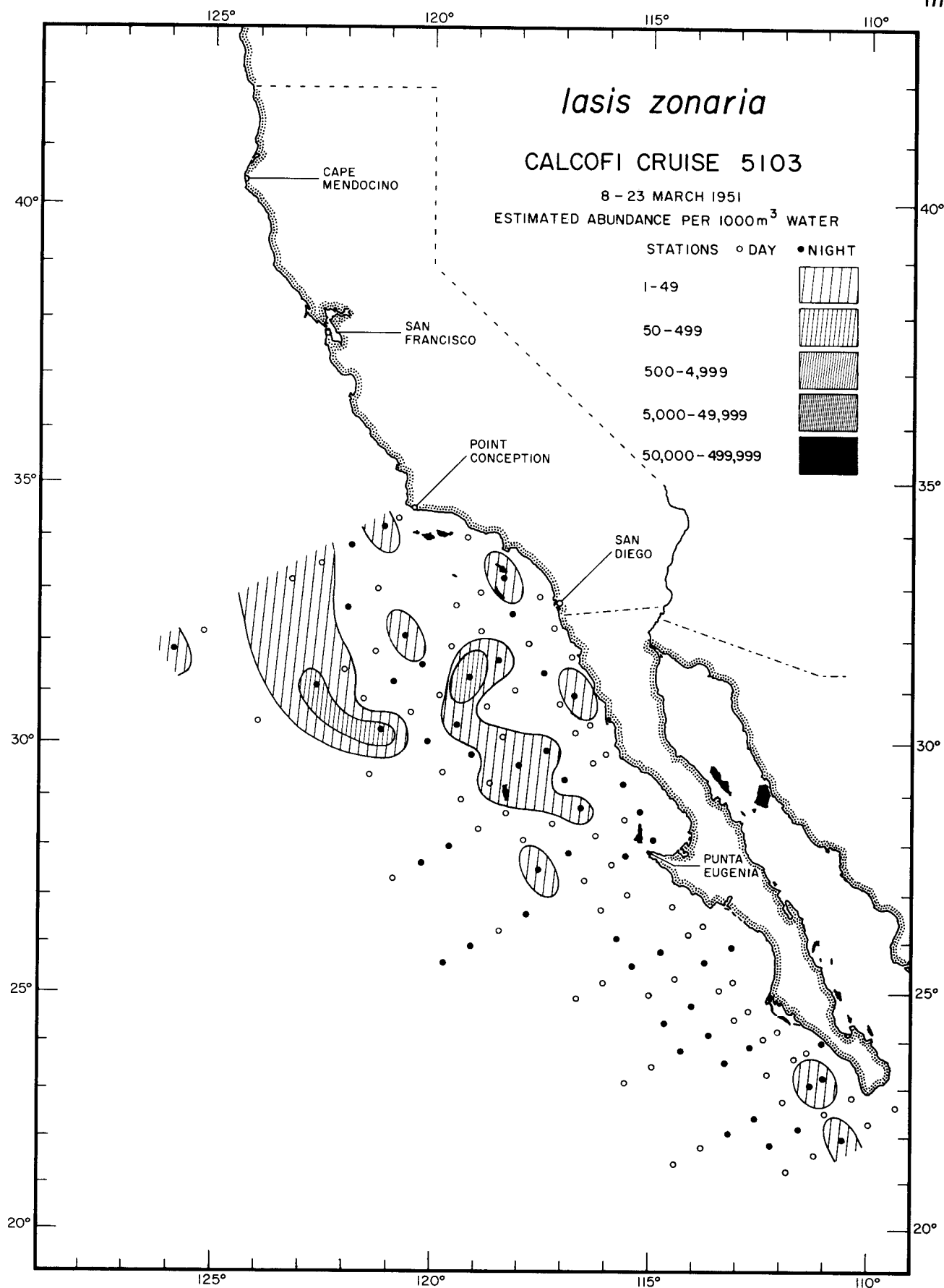
Thaliacea
lasis zonaria
5005



Thalassia
lasis zonaria
5006

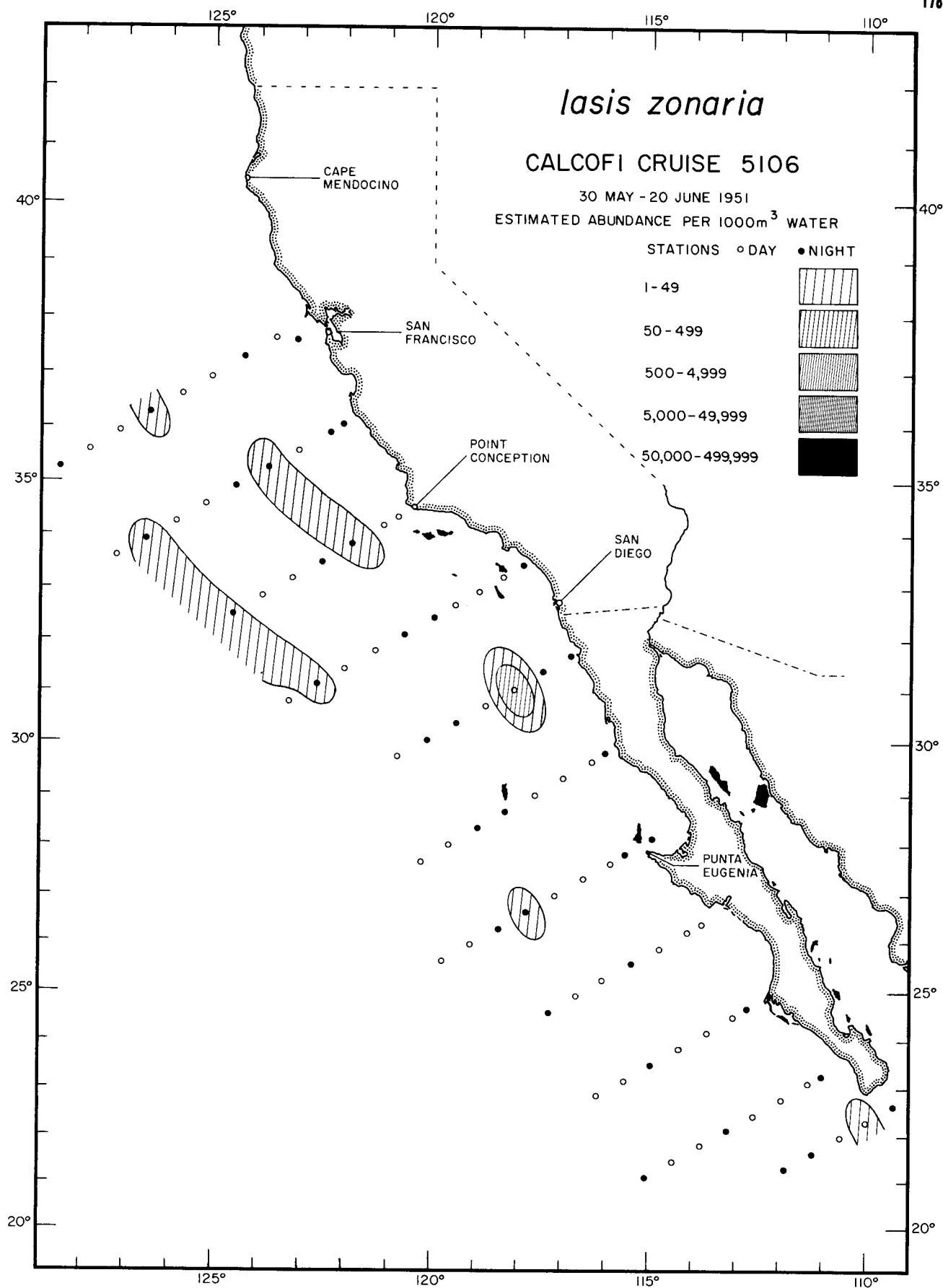


Thalassia
lasis zonaria
5009



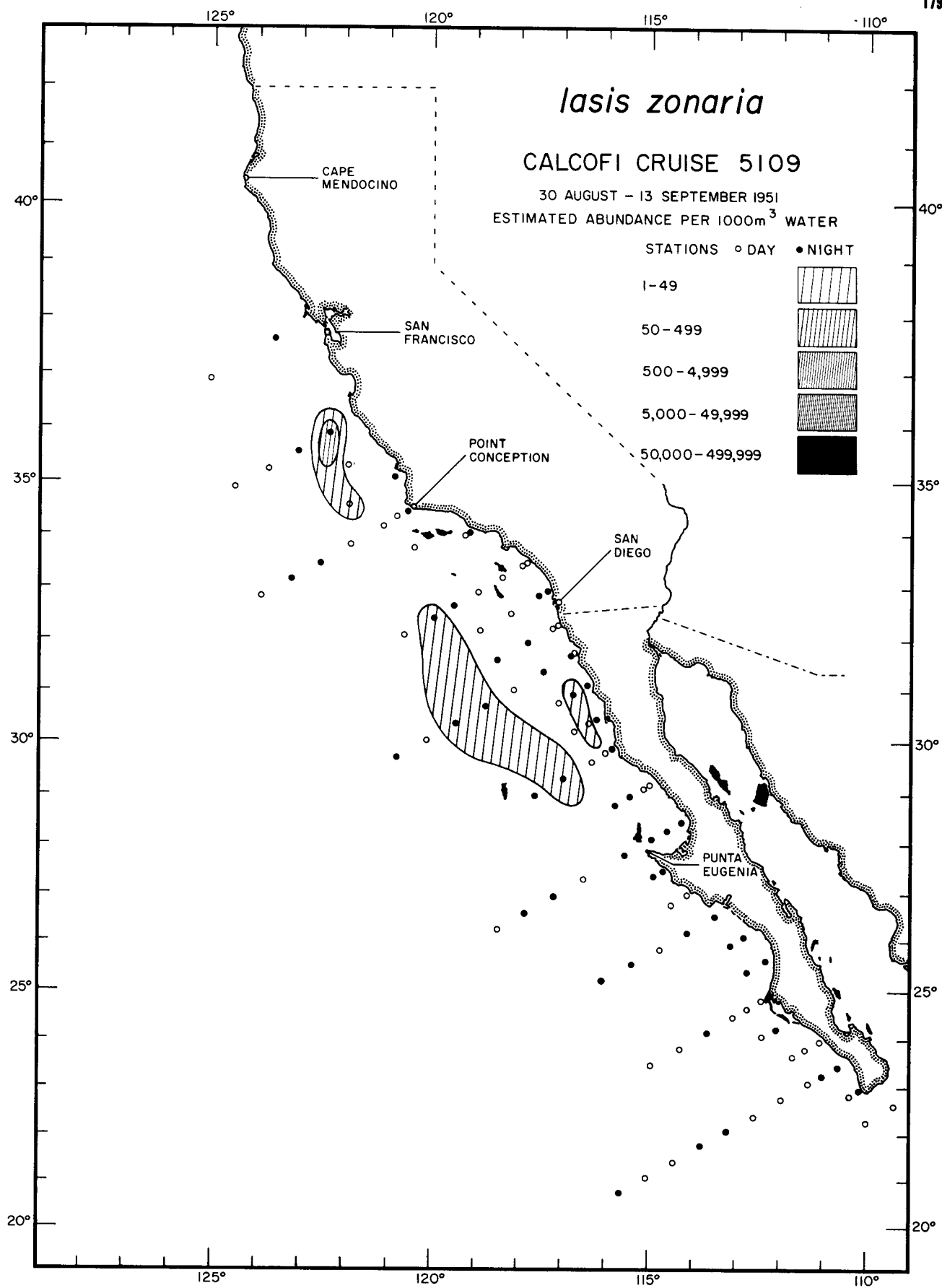
Thaliacea
lasis zonaria

5103

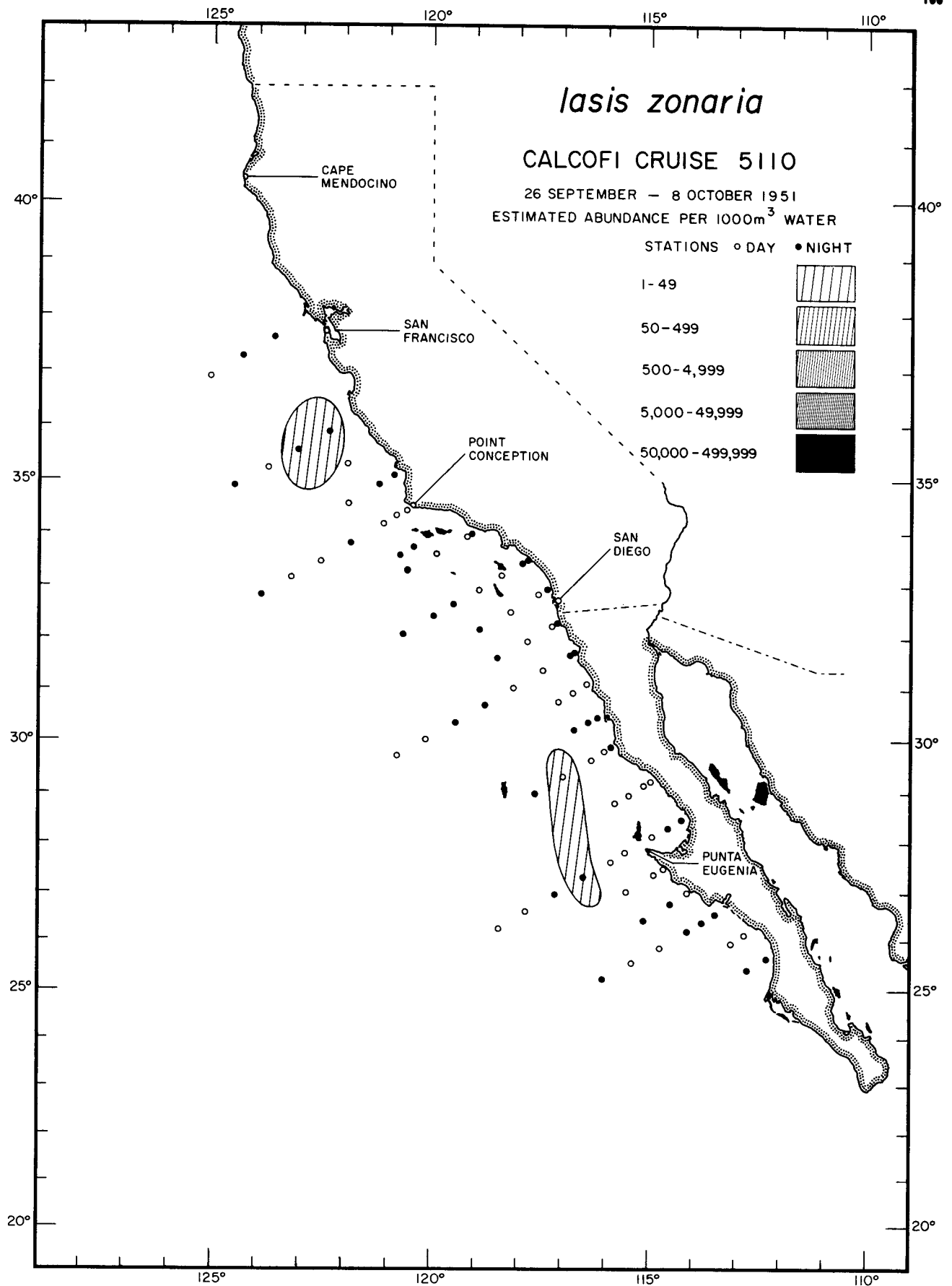


Thaliacea
lasis zonaria

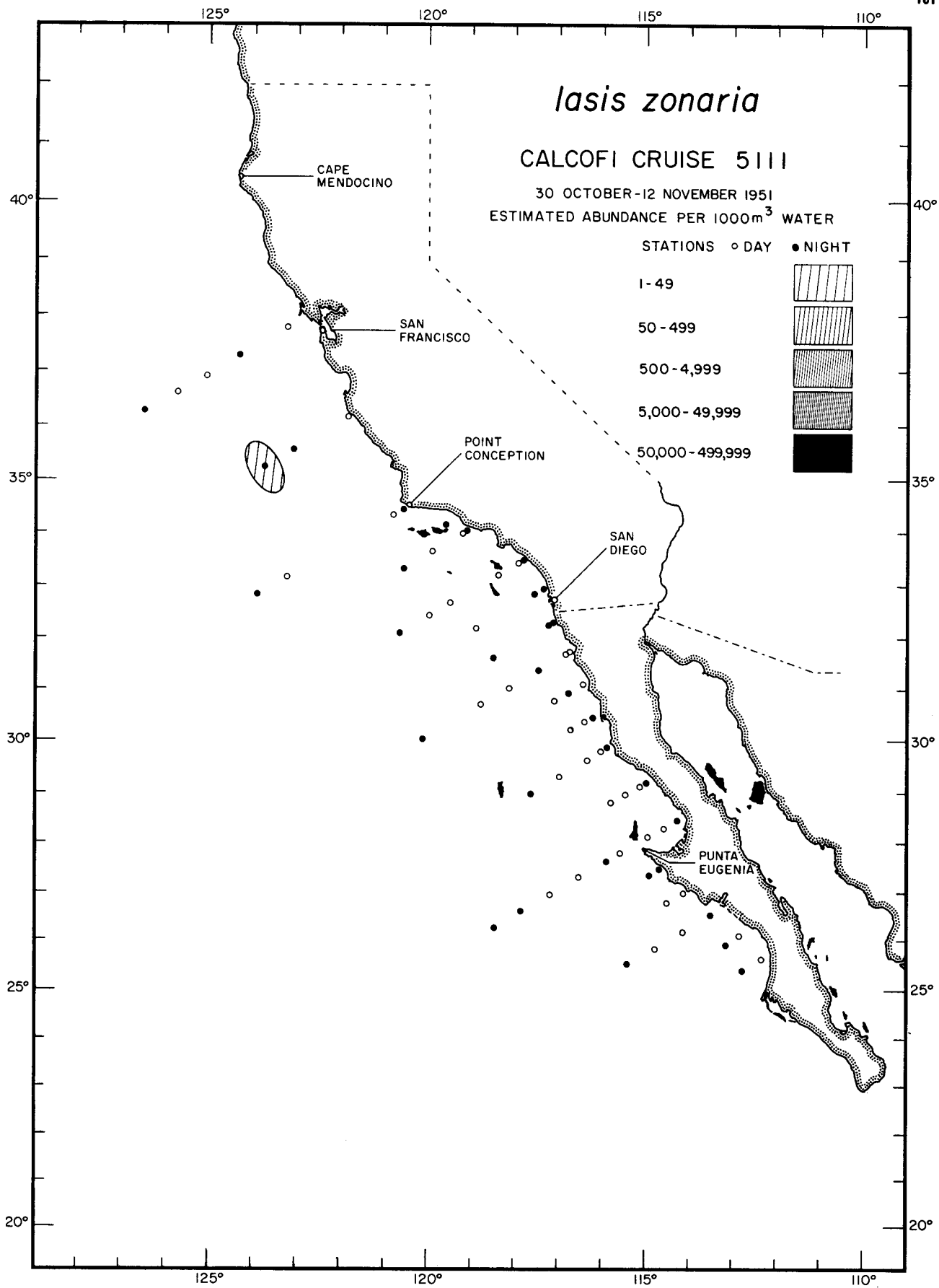
5106



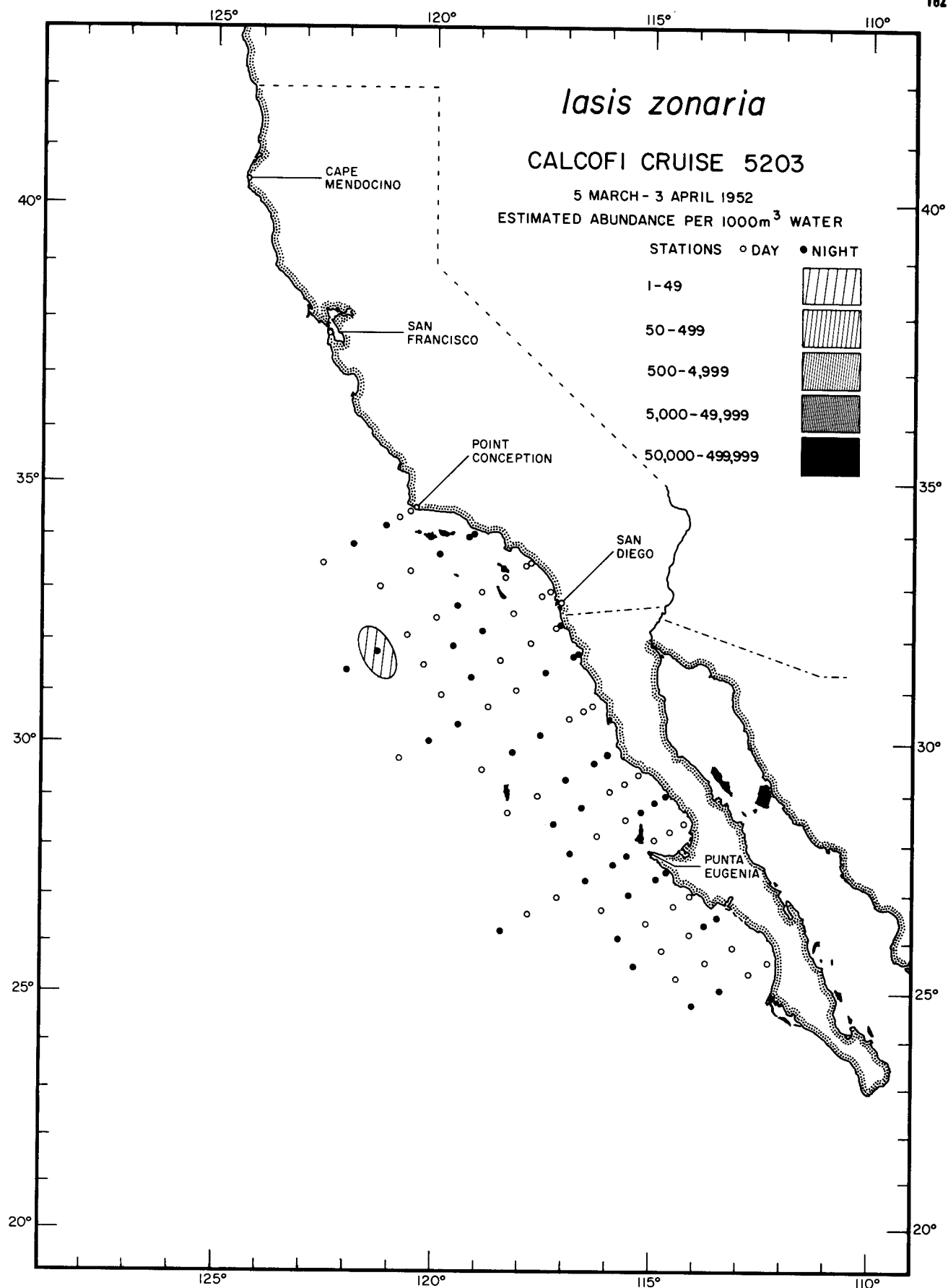
Thalassia
lasis zonaria
5109



Thaliacea
lasis zonaria
5110

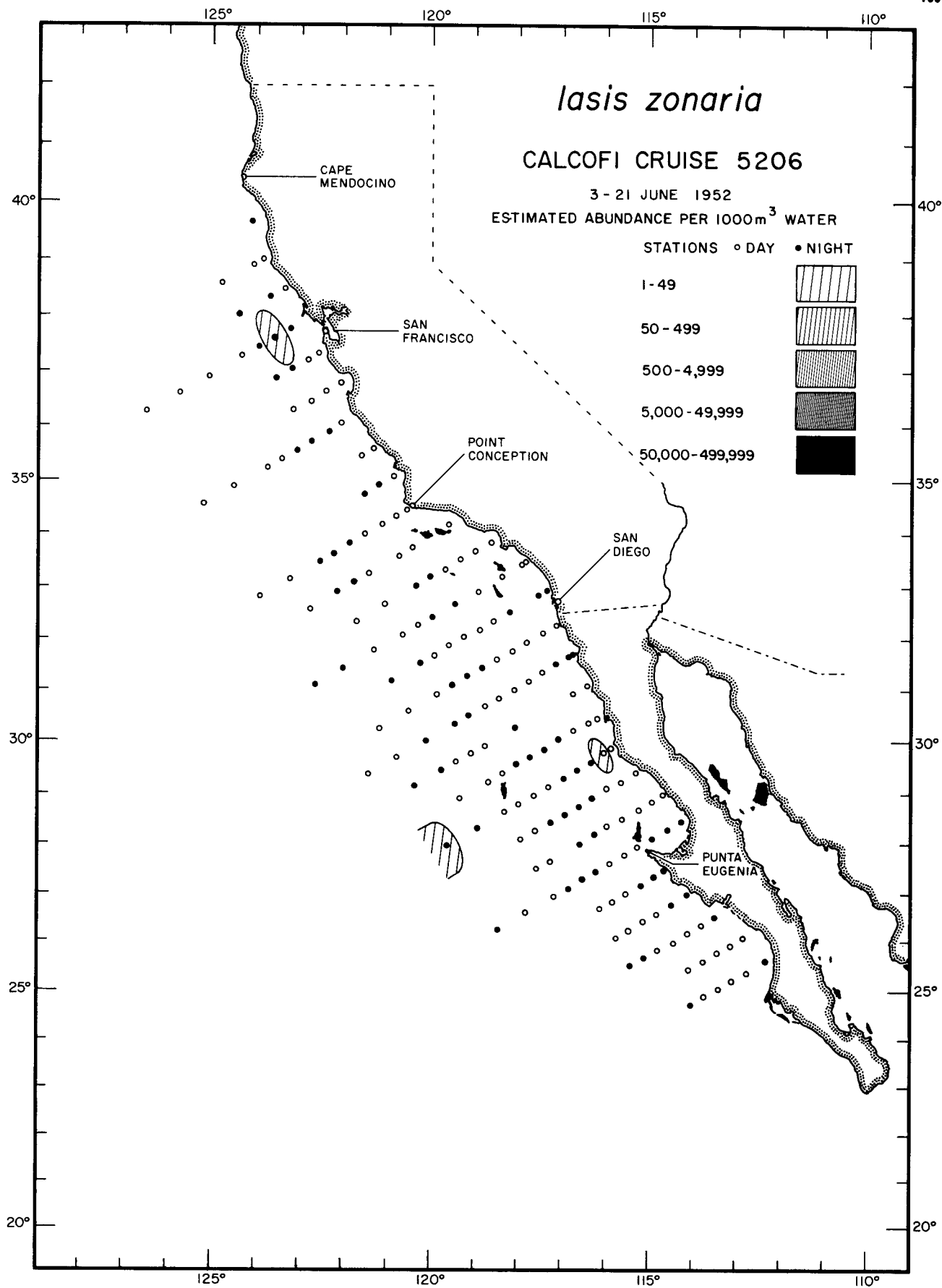


Thaliacea
lasis zonaria
5111



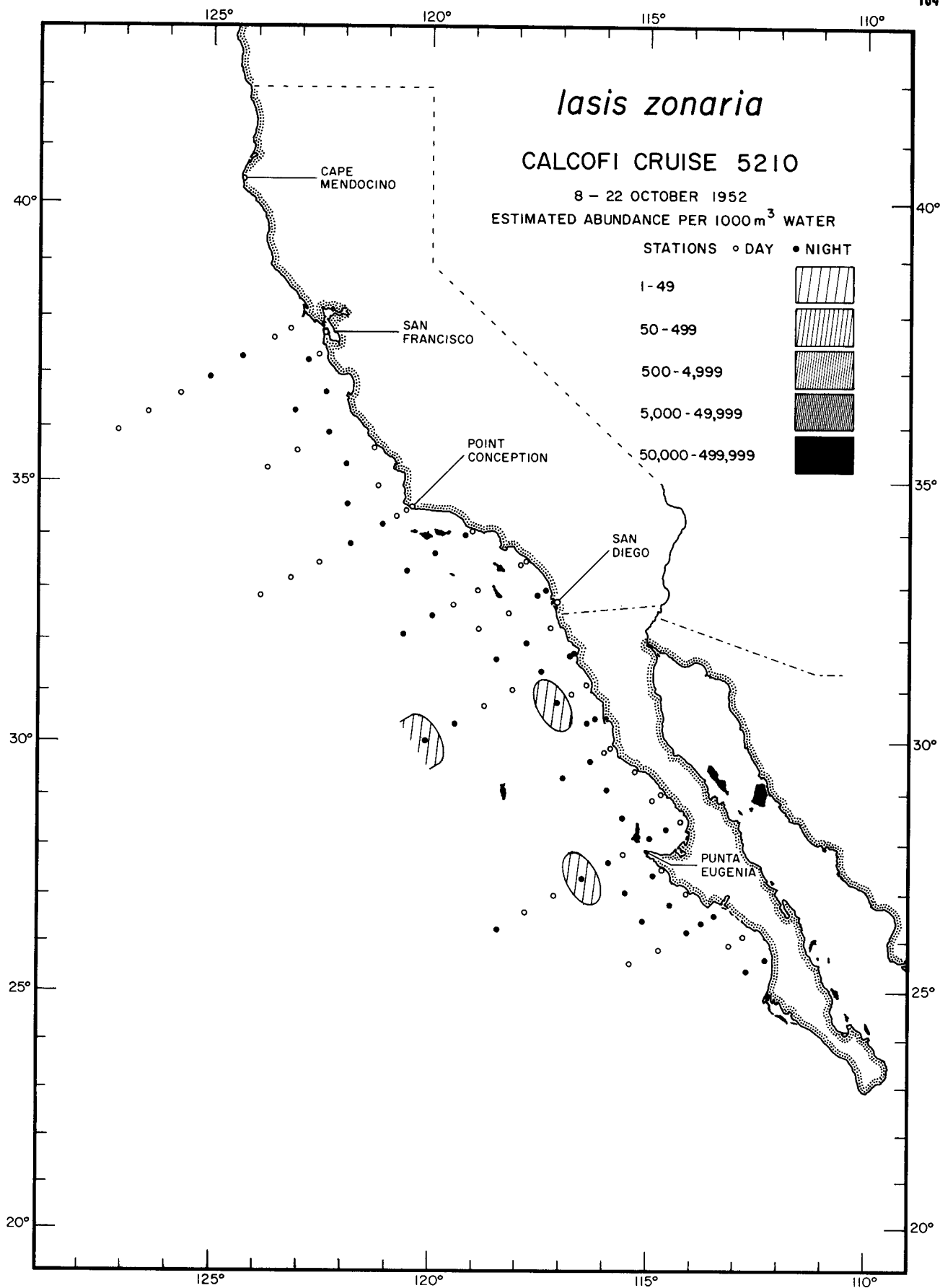
Thalassia
lasis zonaria

5203

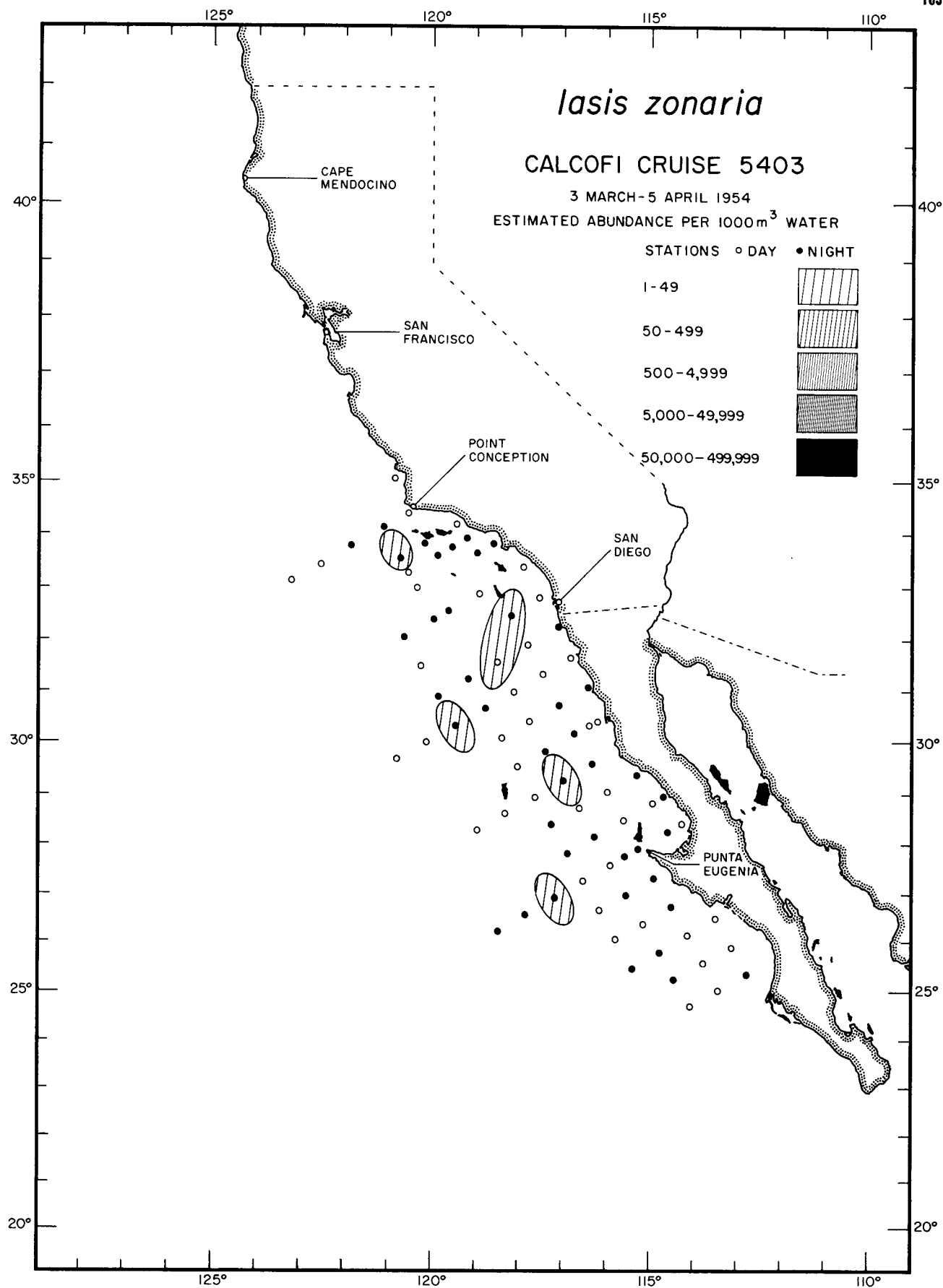


Thaliacea
lasis zonaria

5206

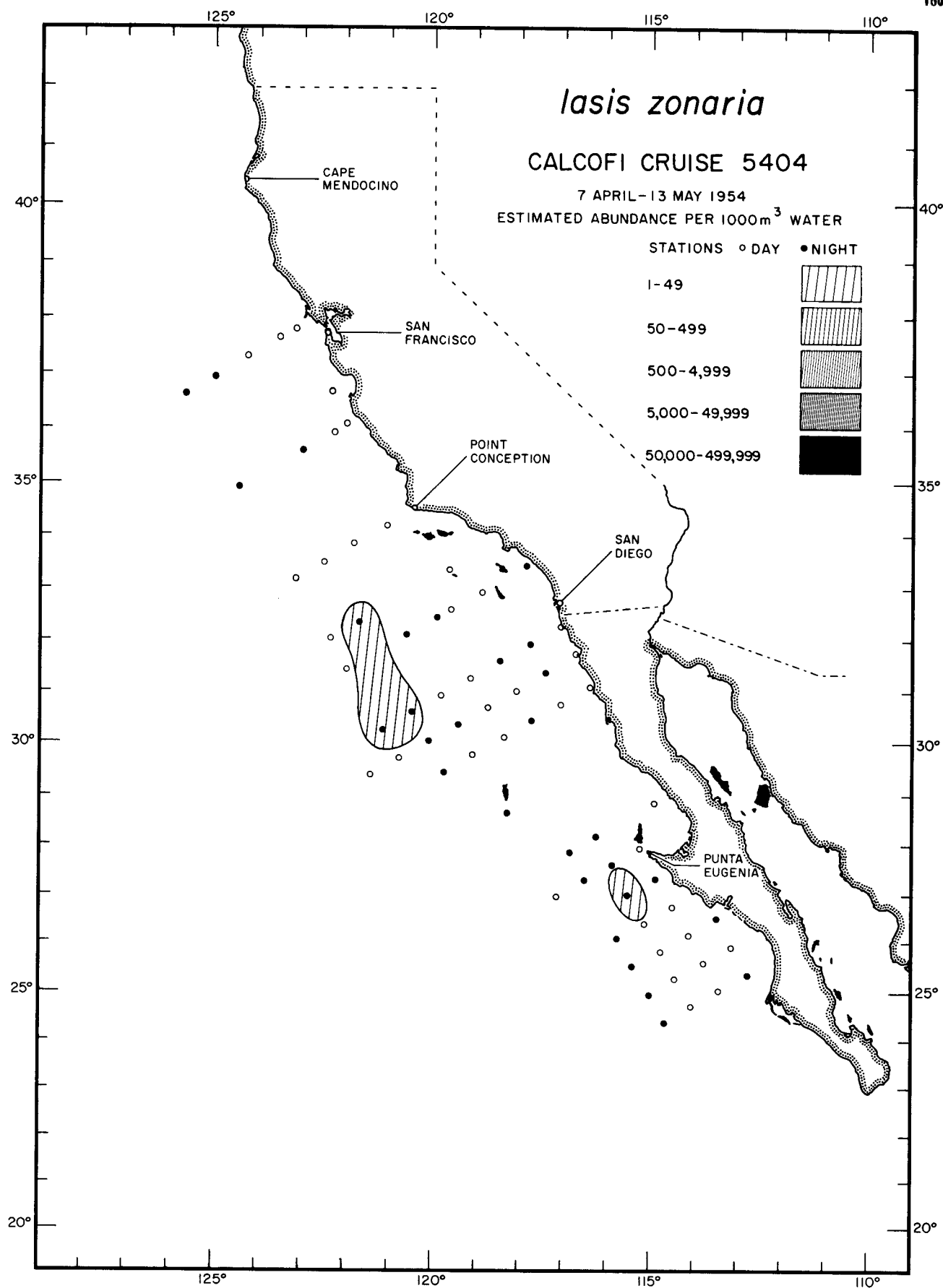


Thaliacea
lasis zonaria
5210

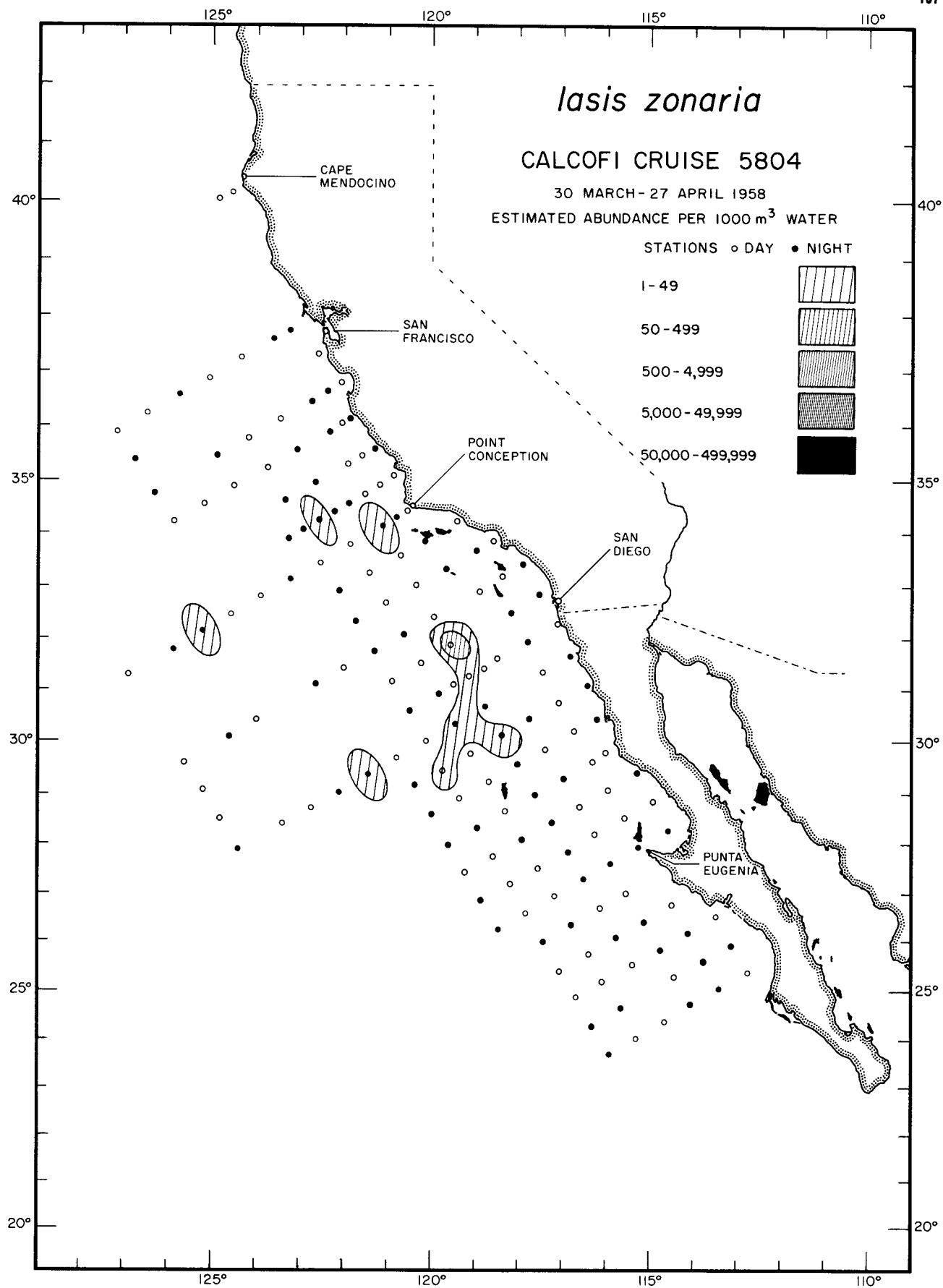


Thaliacea
lasis zonaria

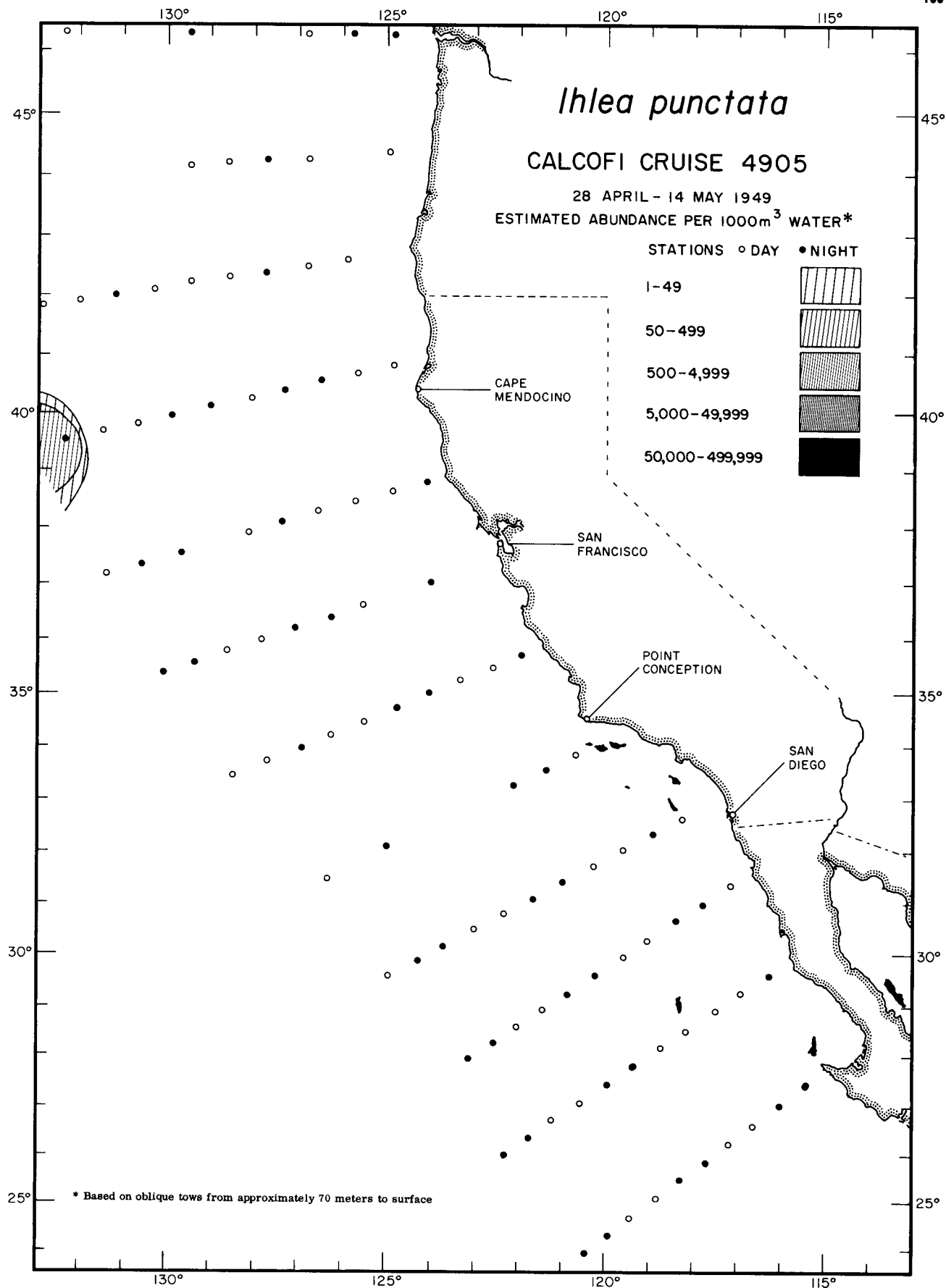
5403



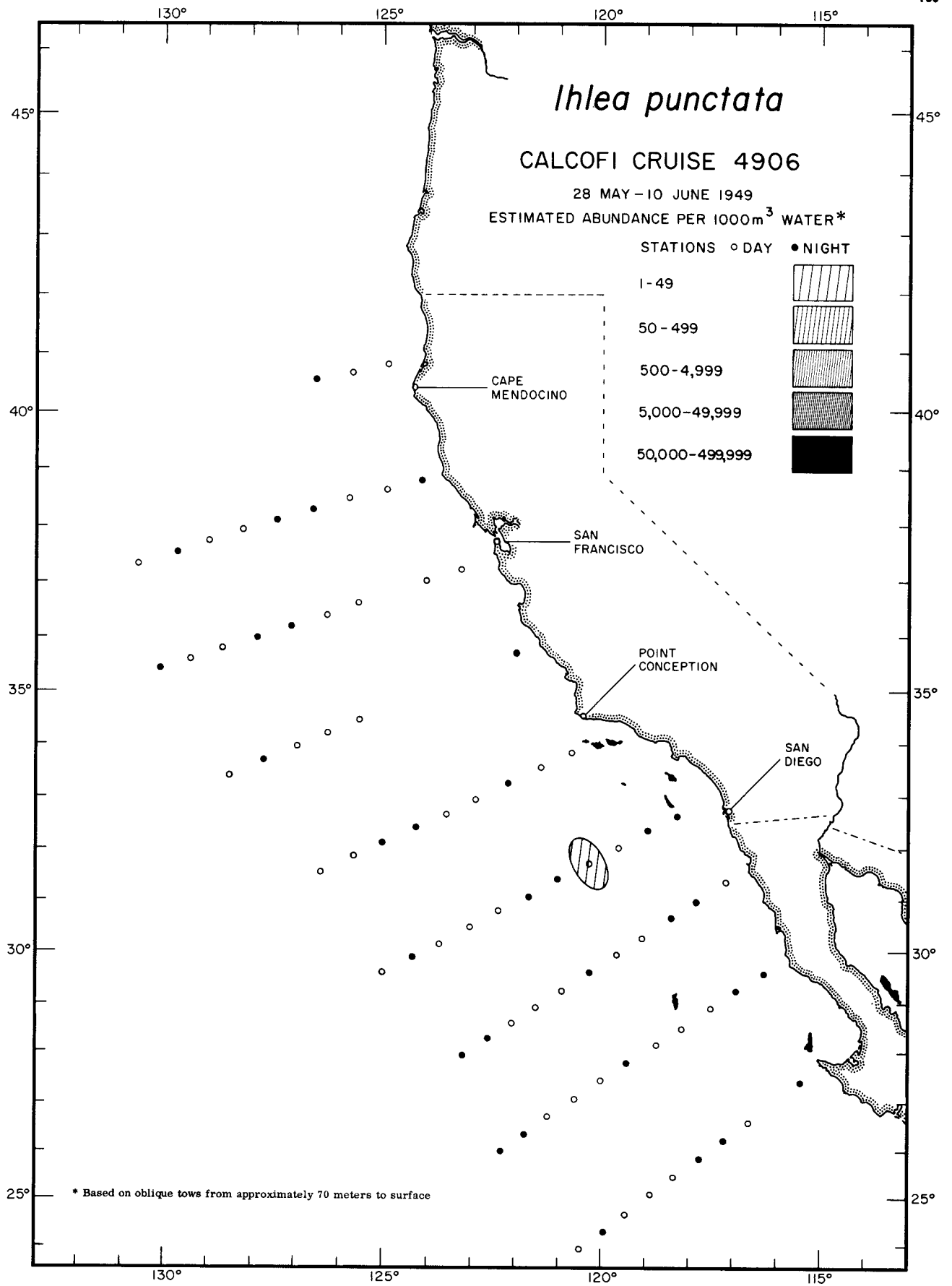
Thaliacea
lasis zonaria
5404



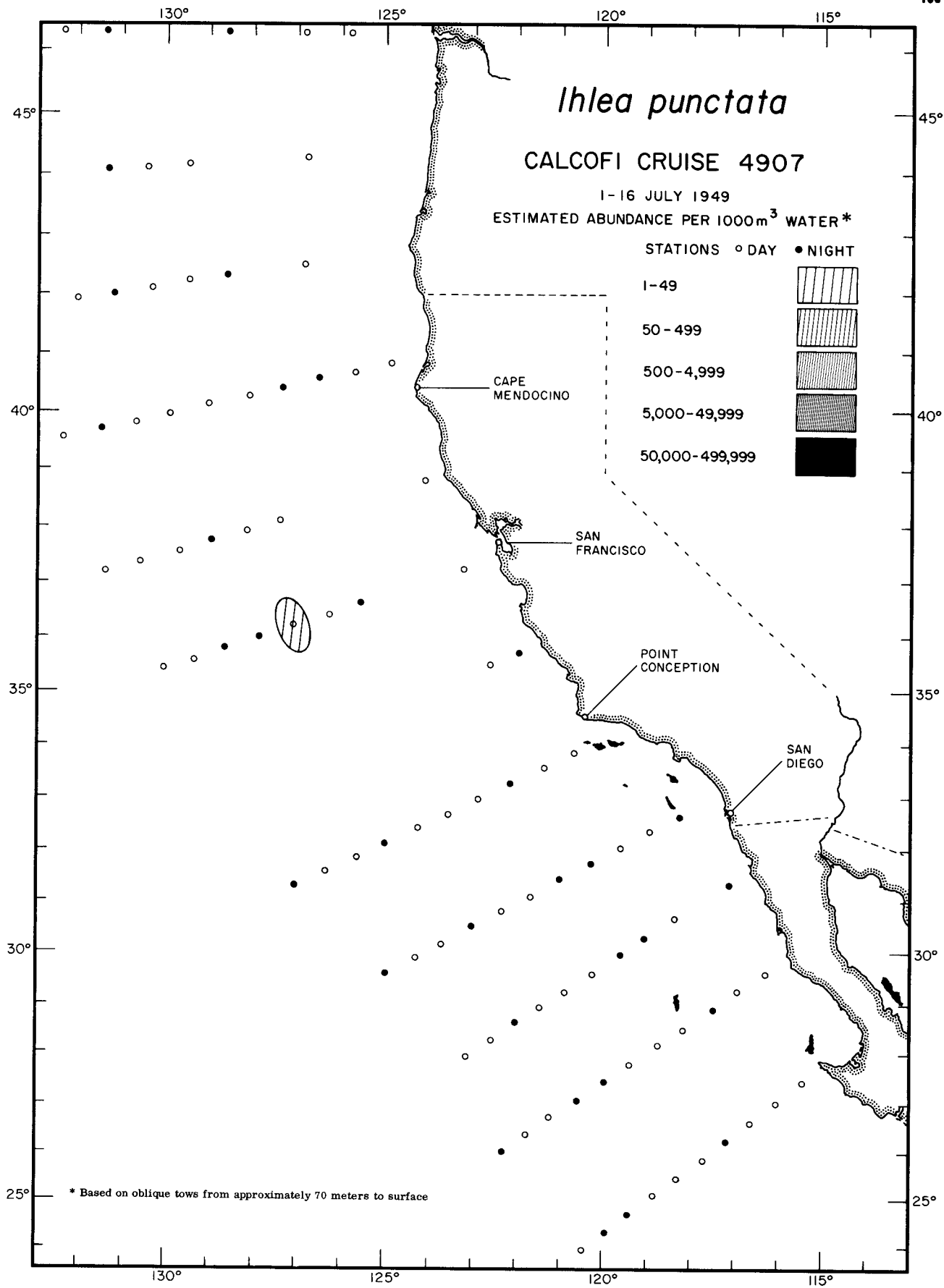
Thaliacea
lasis zonaria
5804



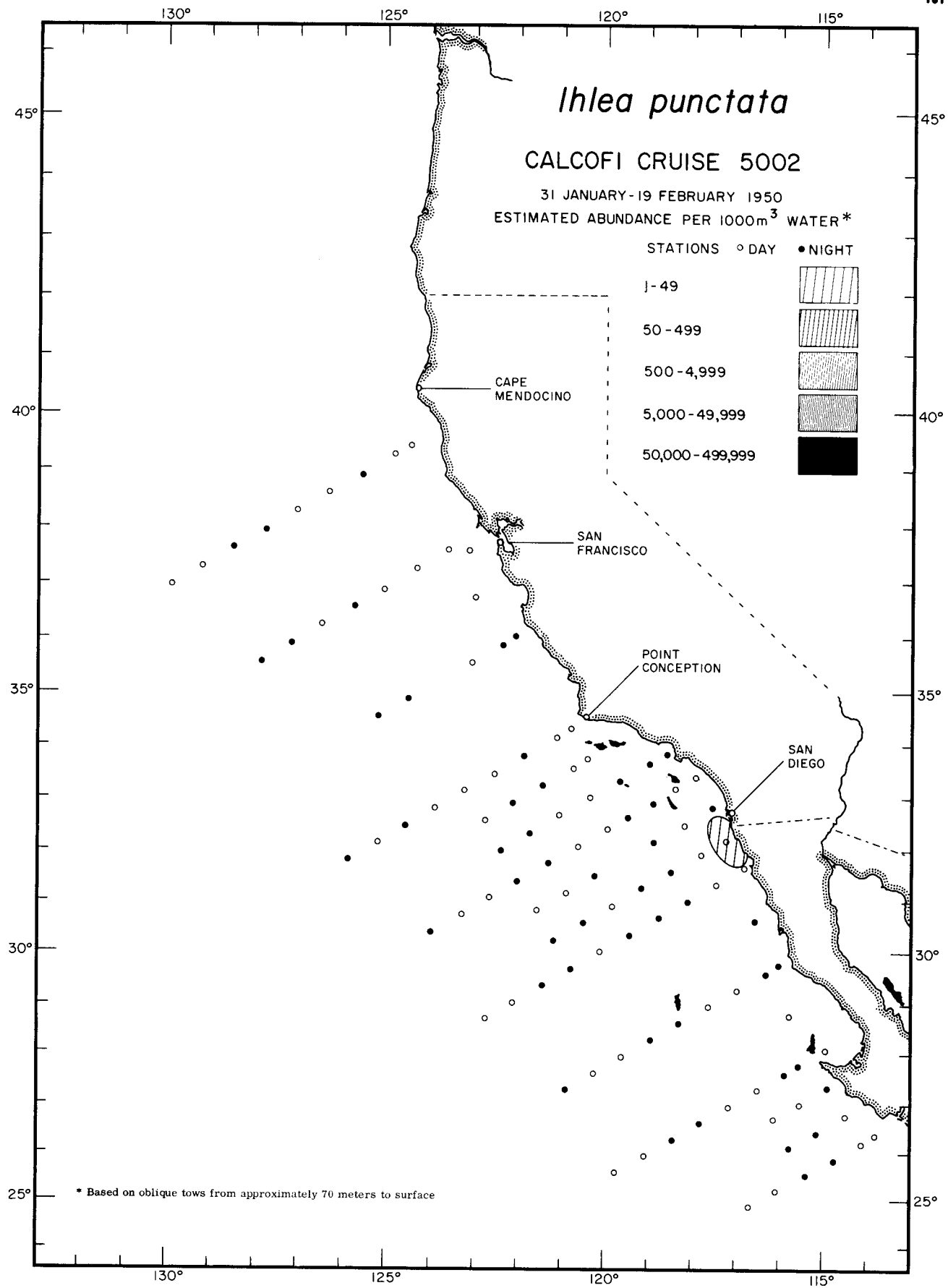
Thaliacea
Ihlea punctata
4905



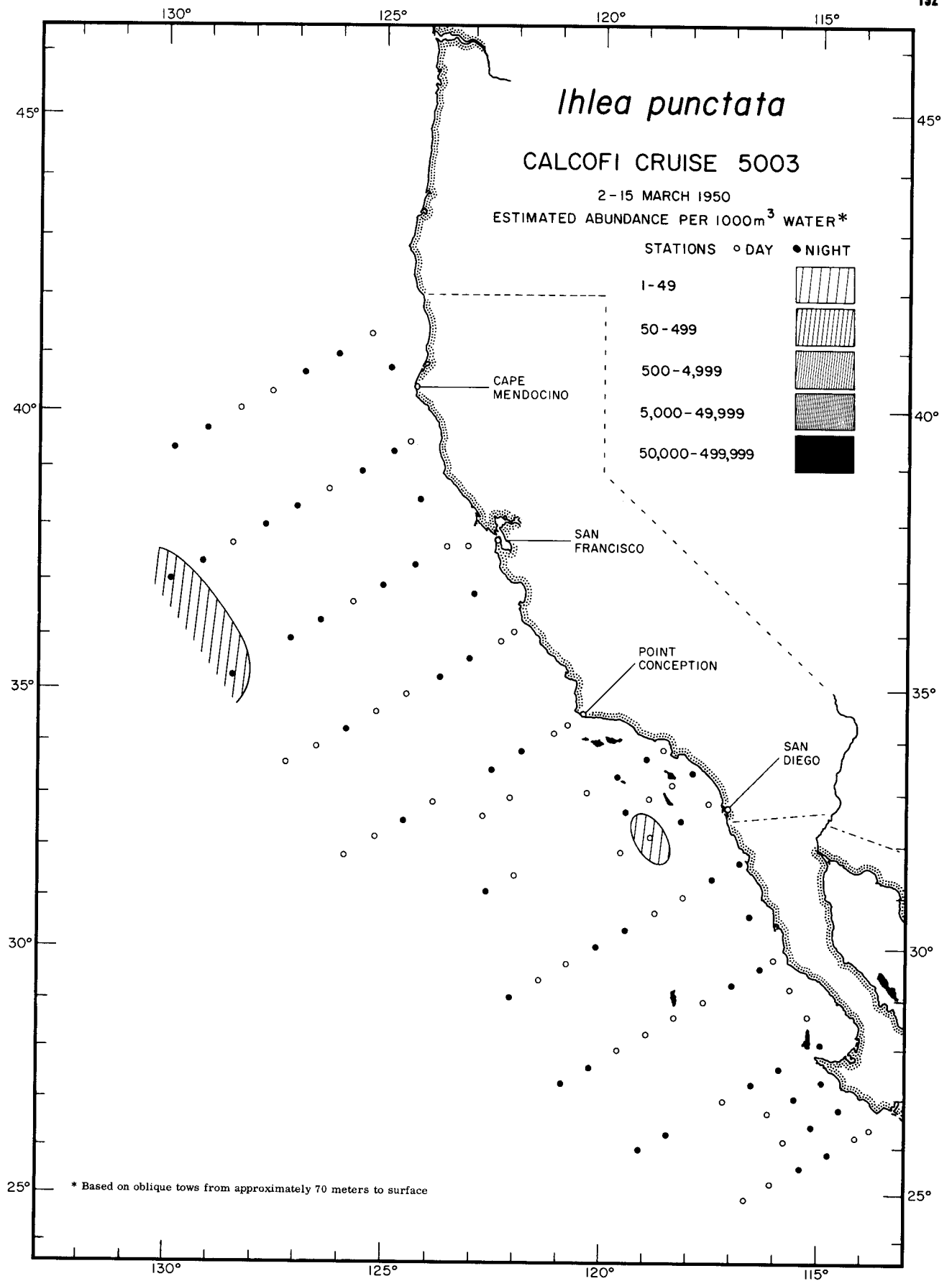
Thaliacea
Ihlea punctata
4906



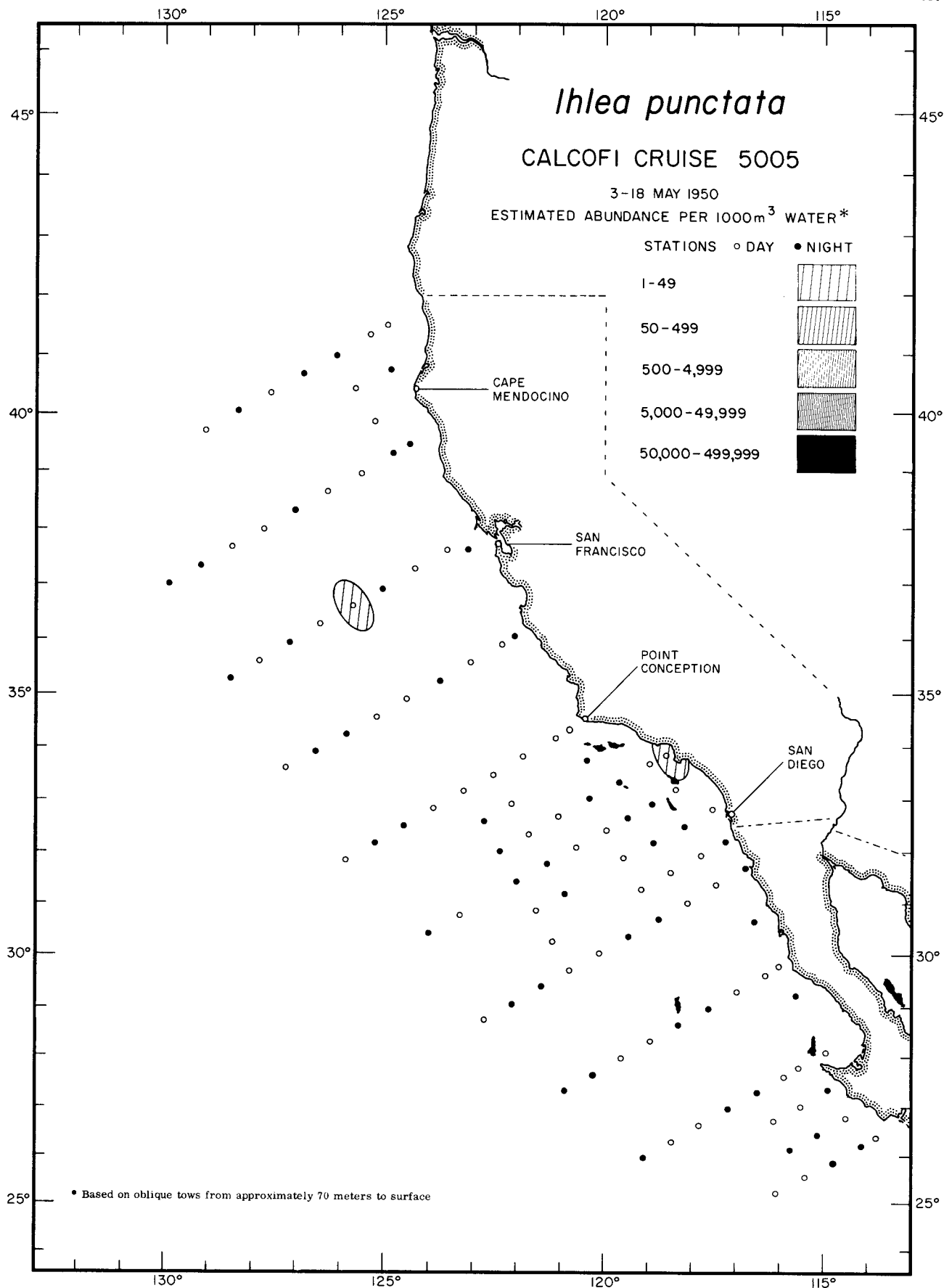
Thaliacea
Ihlea punctata
4907



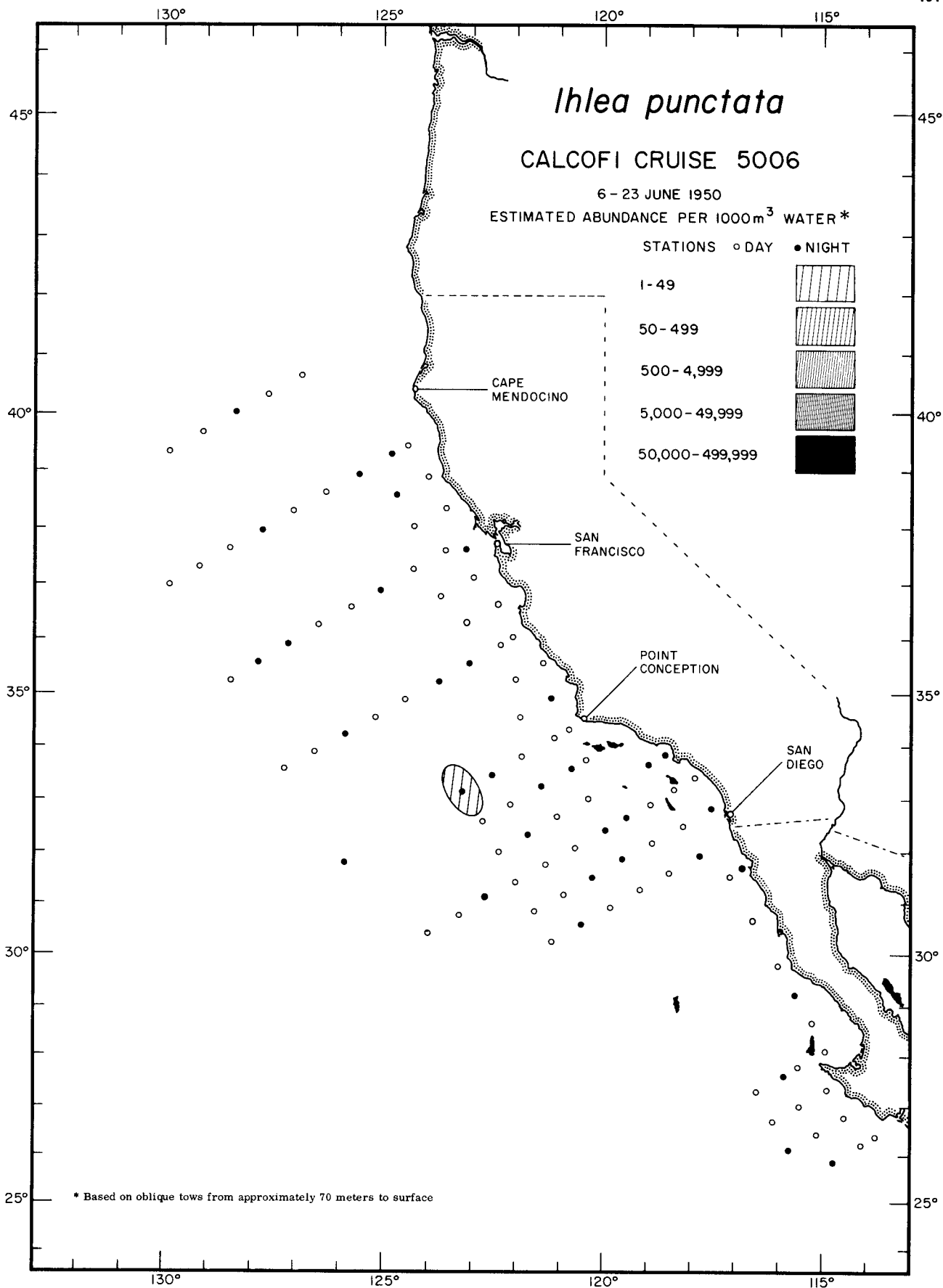
Thaliacea
Ihlea punctata
5002



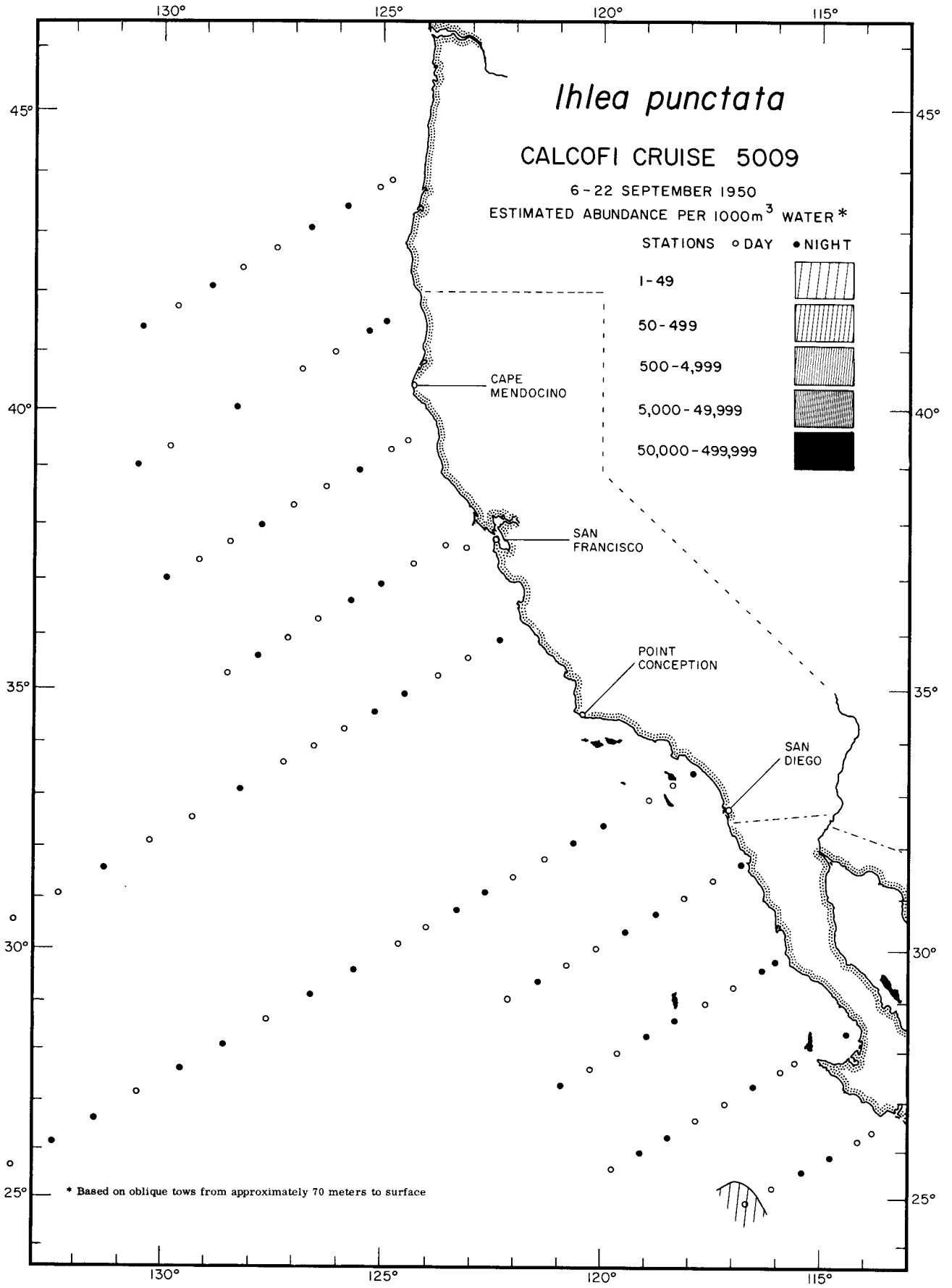
Thaliacea
Ihlea punctata
5003



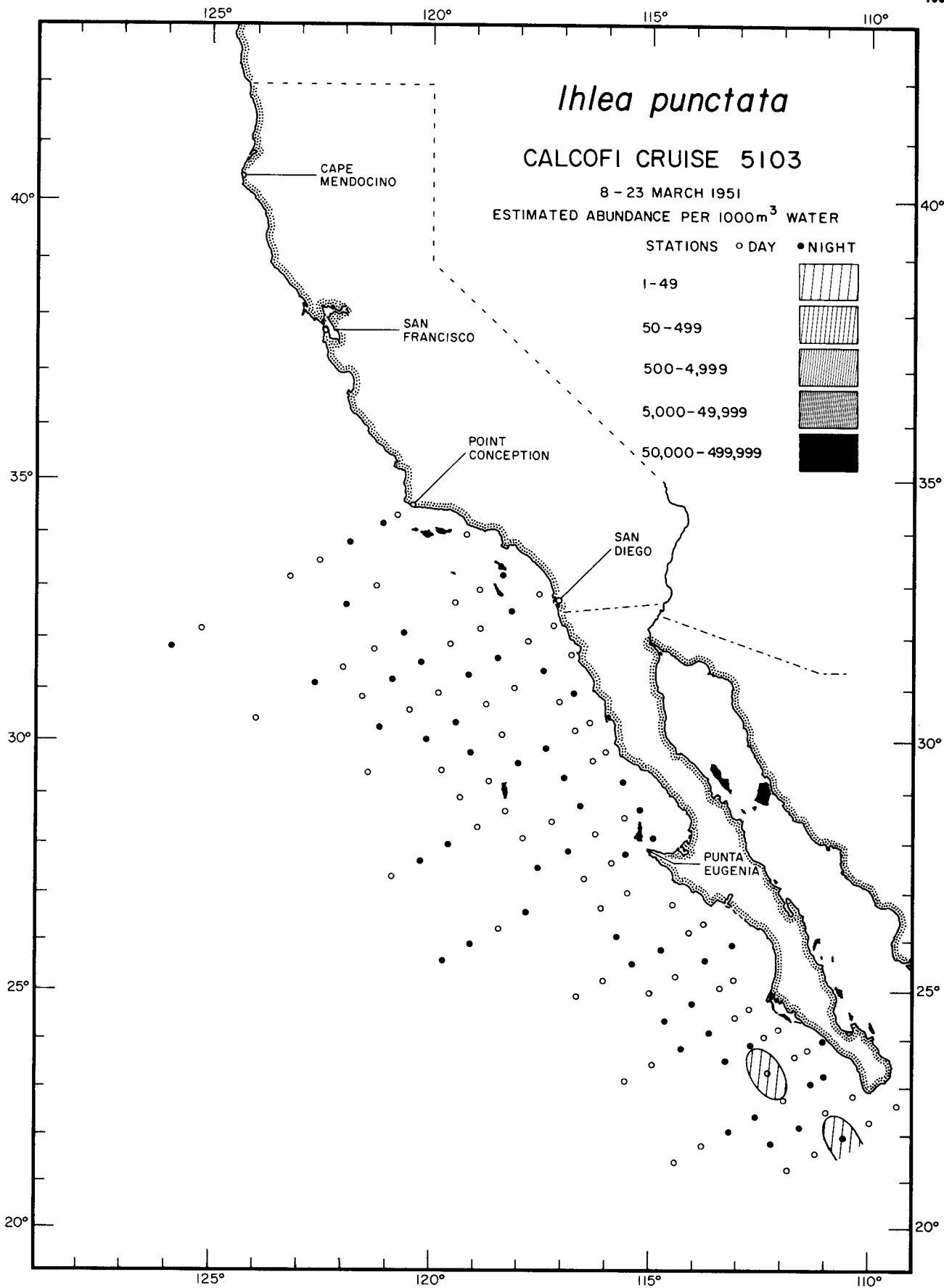
Thaliacea
Ihlea punctata
5005



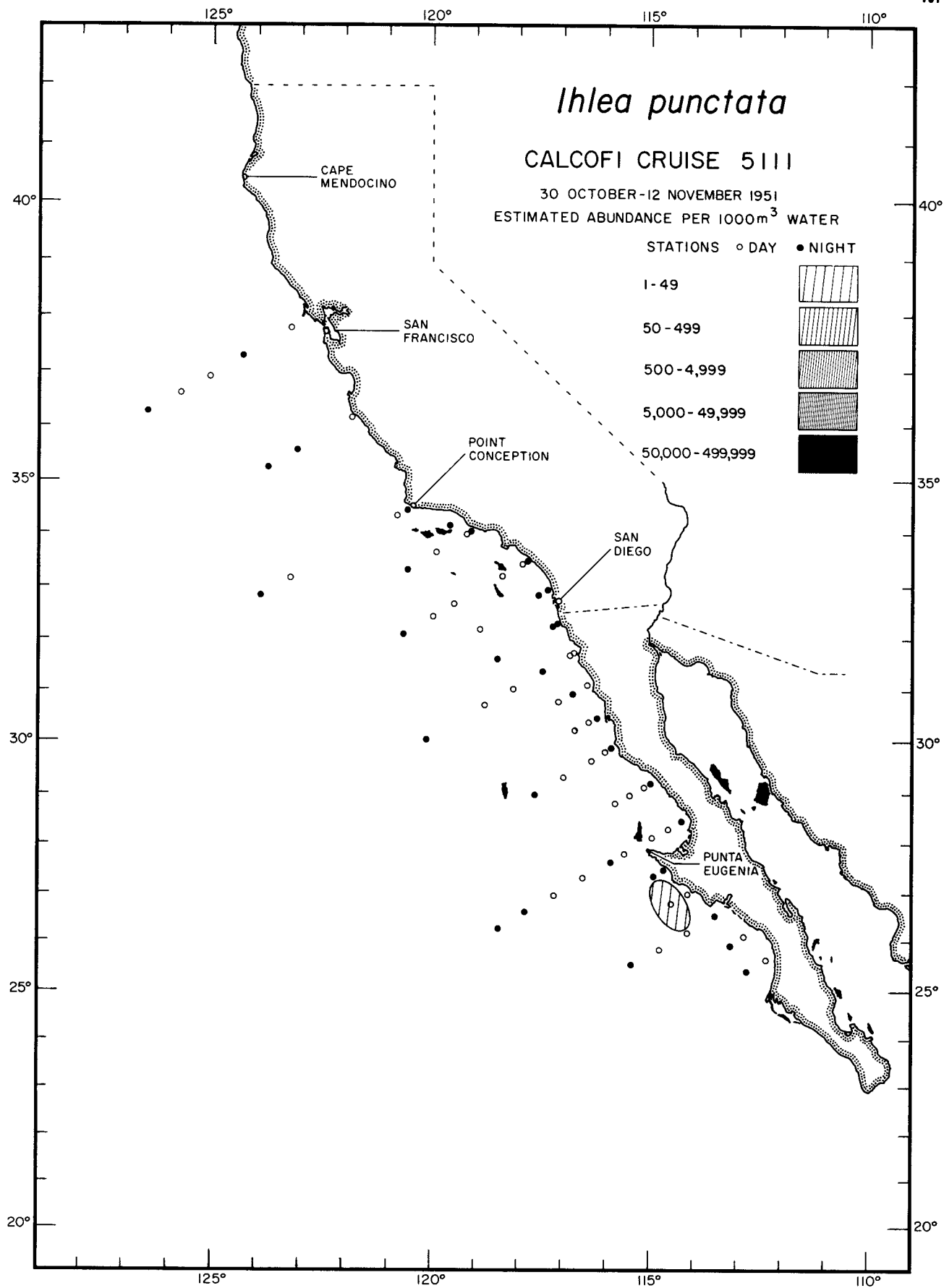
Thaliacea
Ihlea punctata
5006



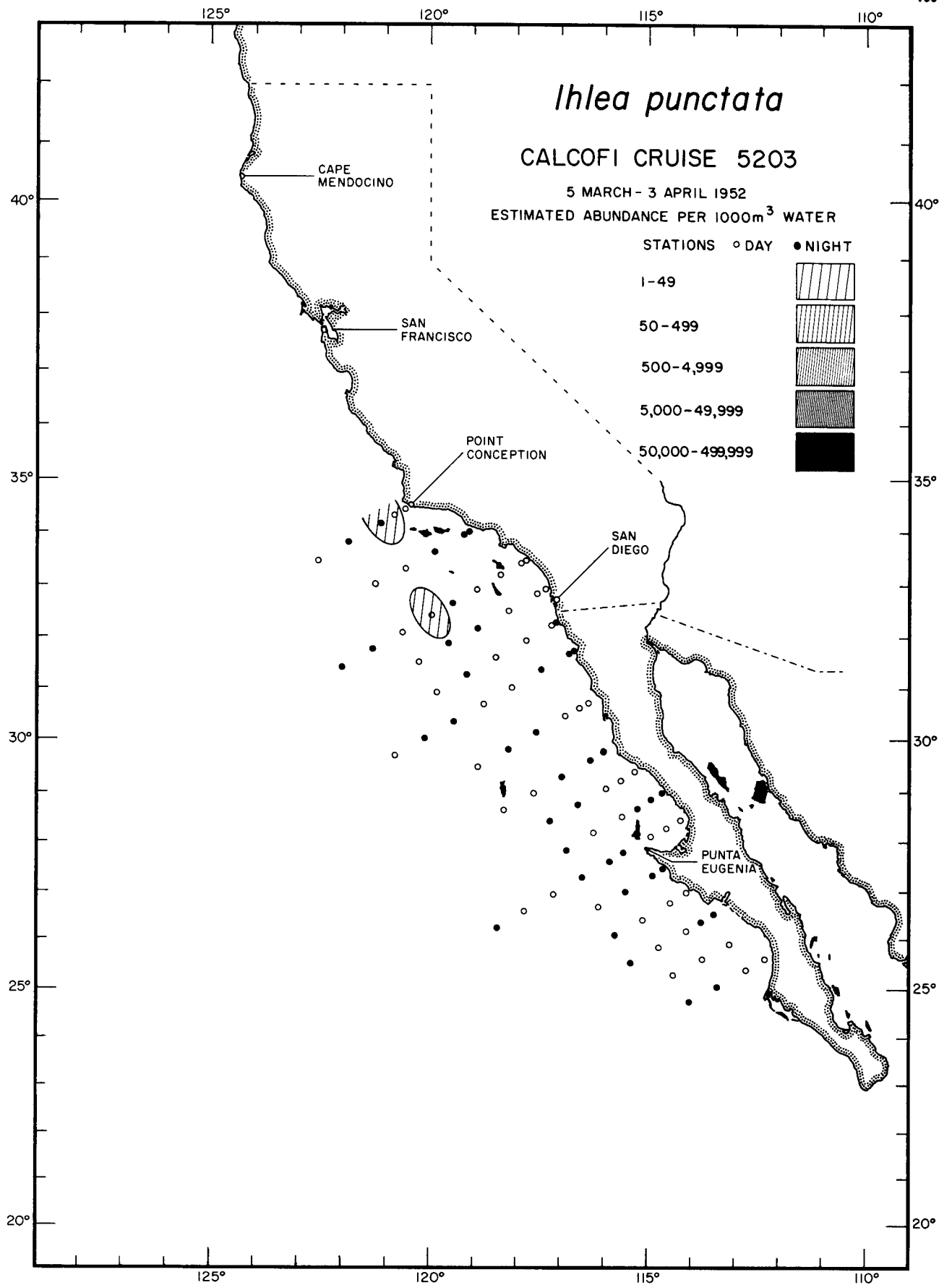
Thaliacea
Ihlea punctata
 5009



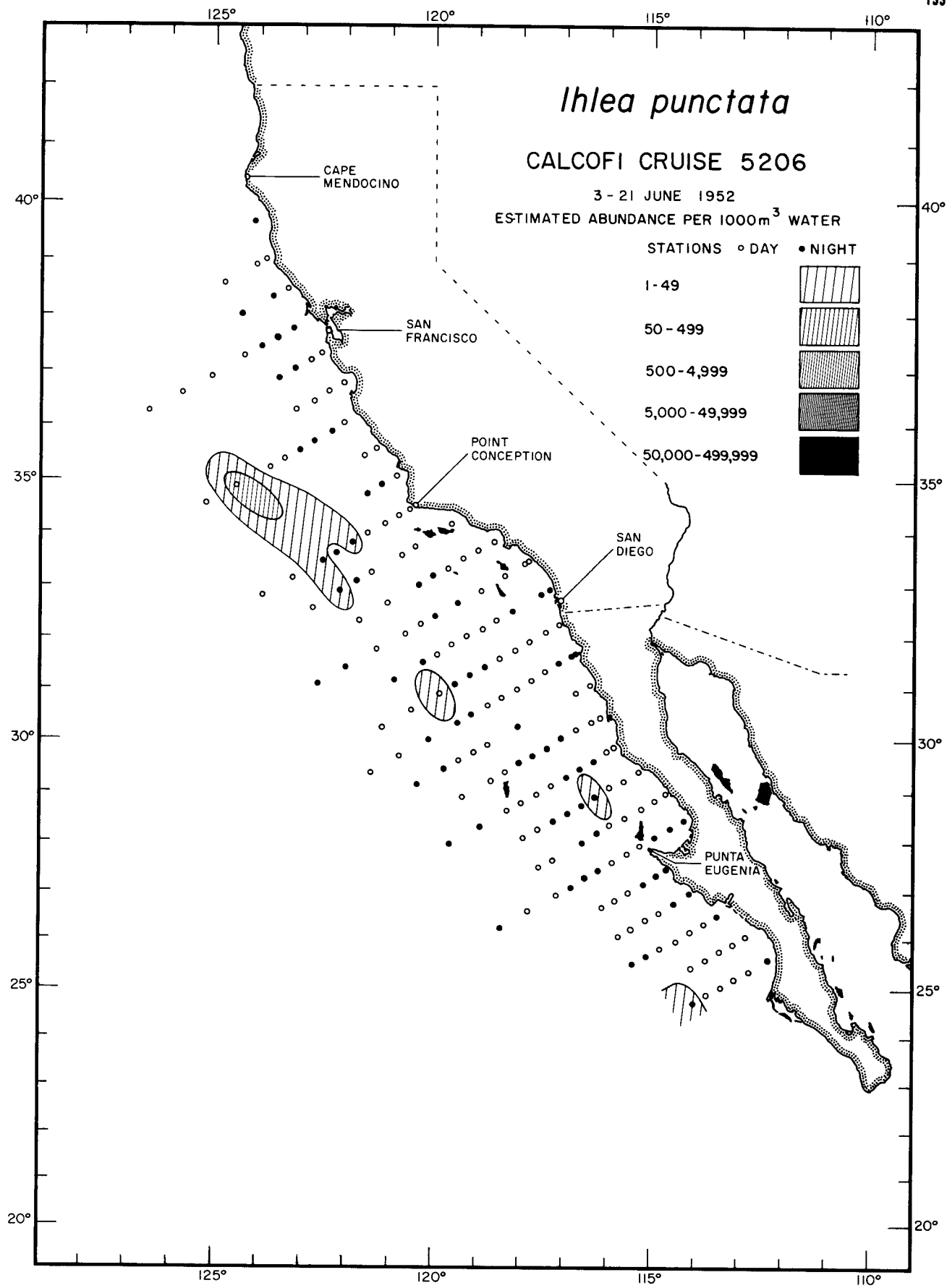
Thaliacea
Ihlea punctata
5103



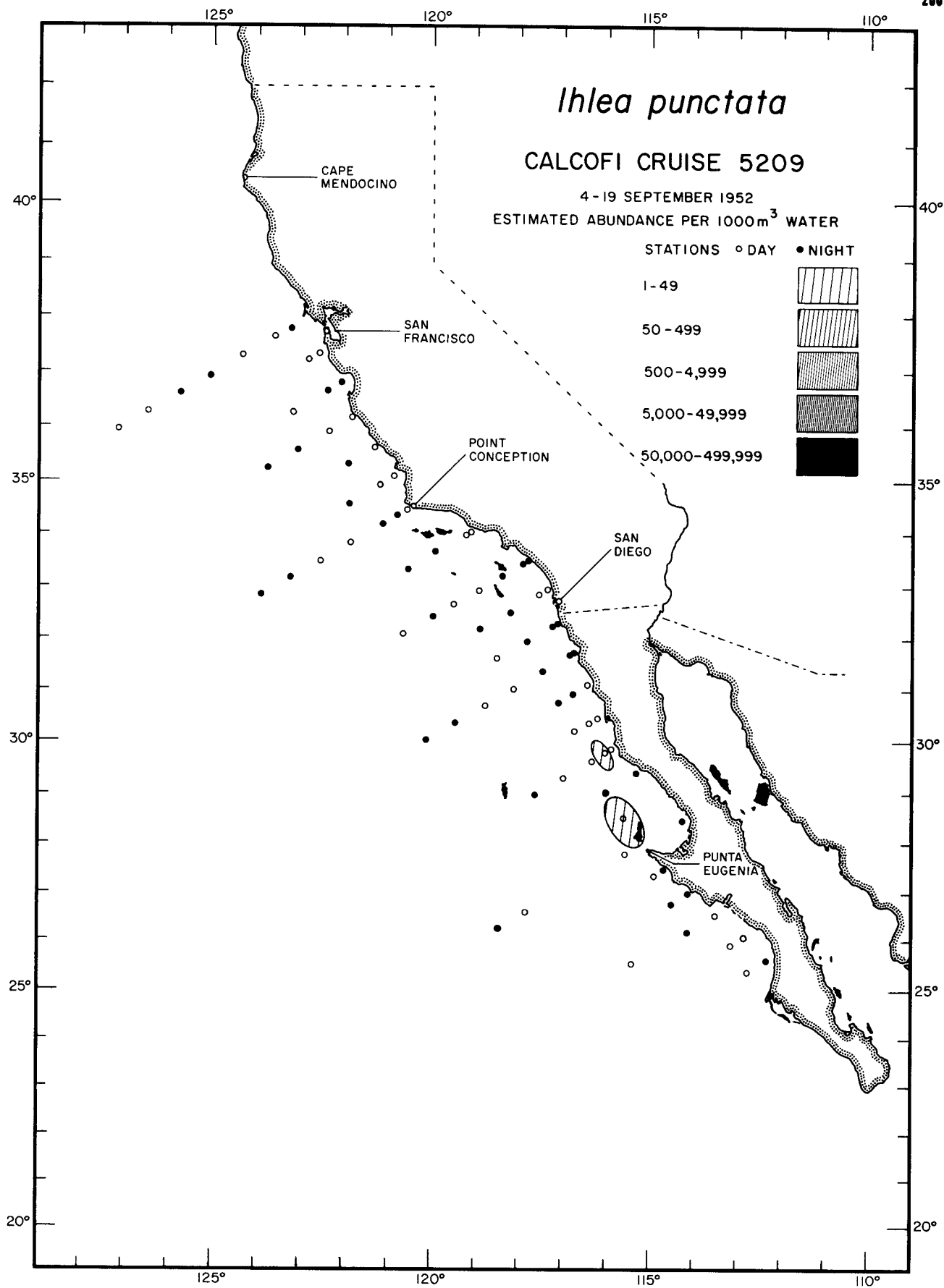
Thaliacea
Ihlea punctata
5111



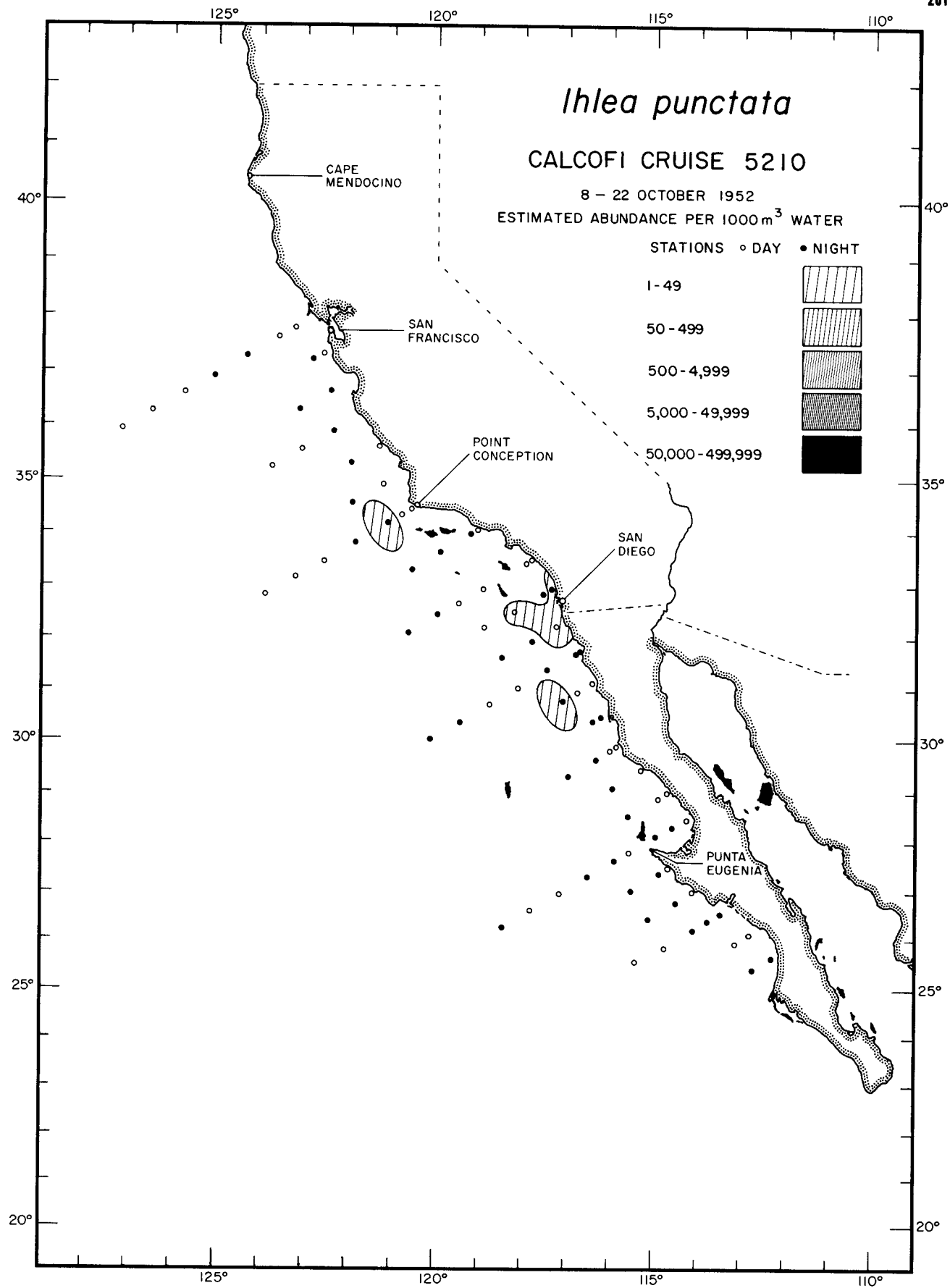
Thaliacea
Ihlea punctata
5203



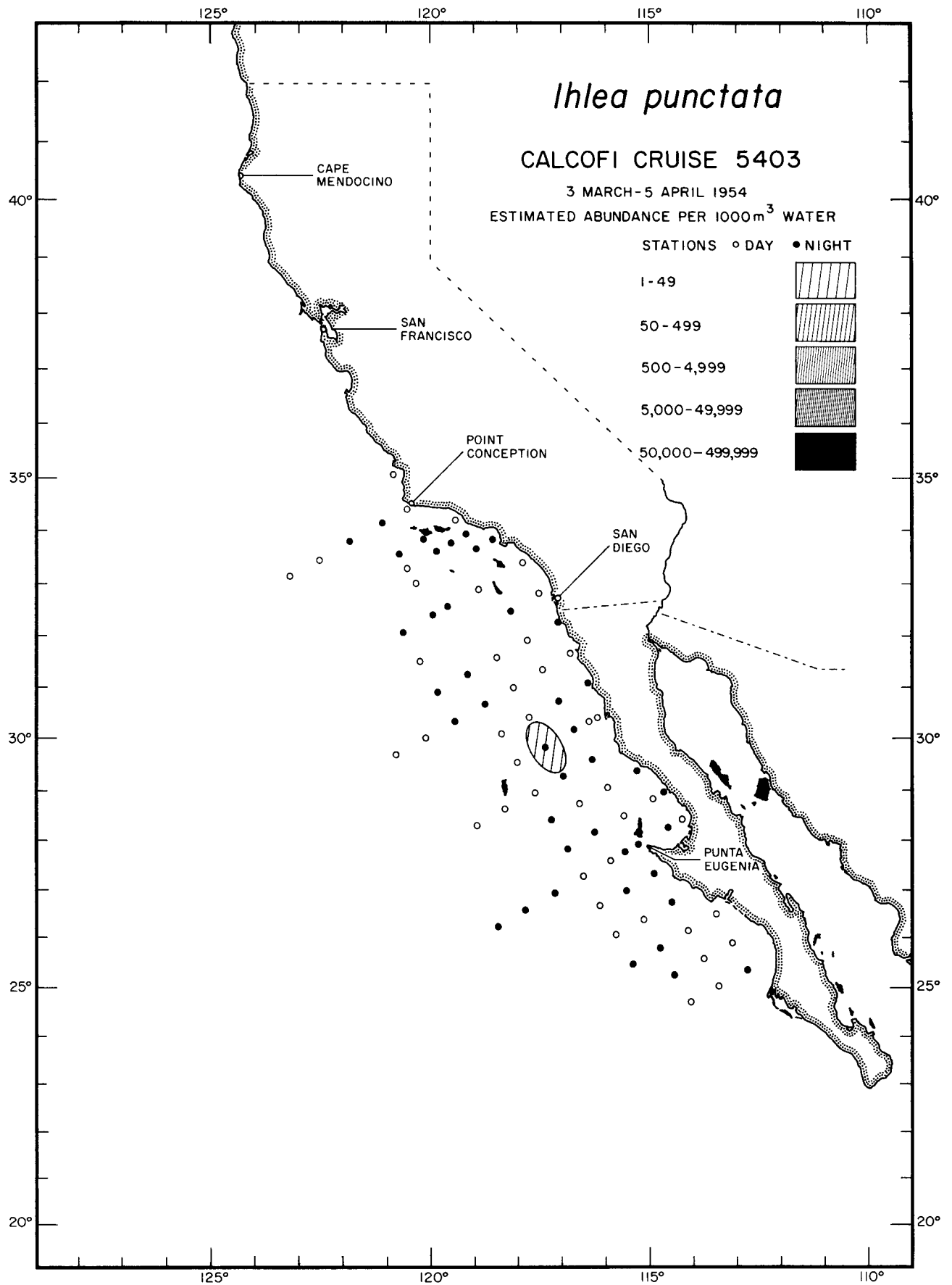
Thaliacea
Ihlea punctata
5206



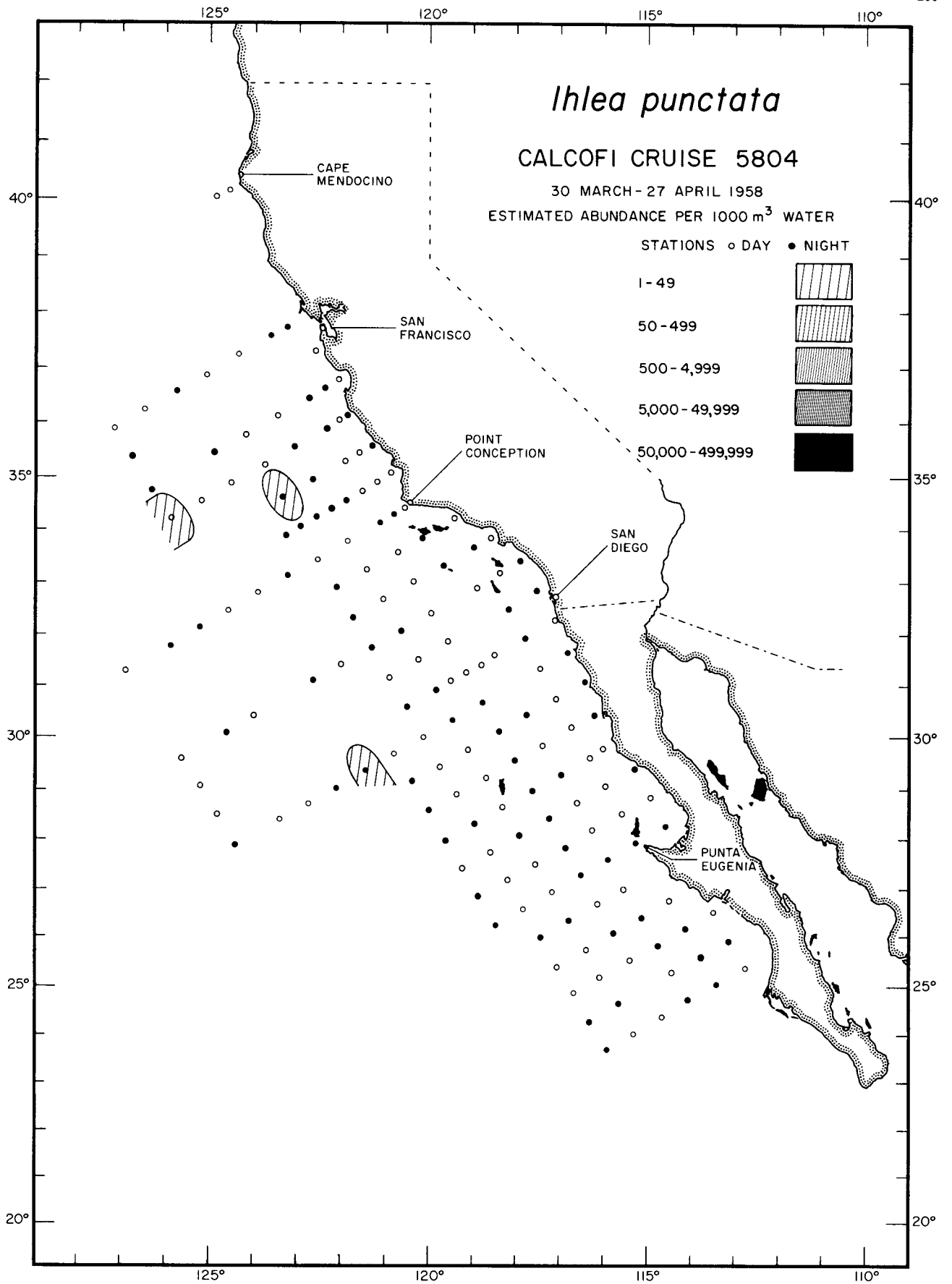
Thaliacea
Ihlea punctata
5209



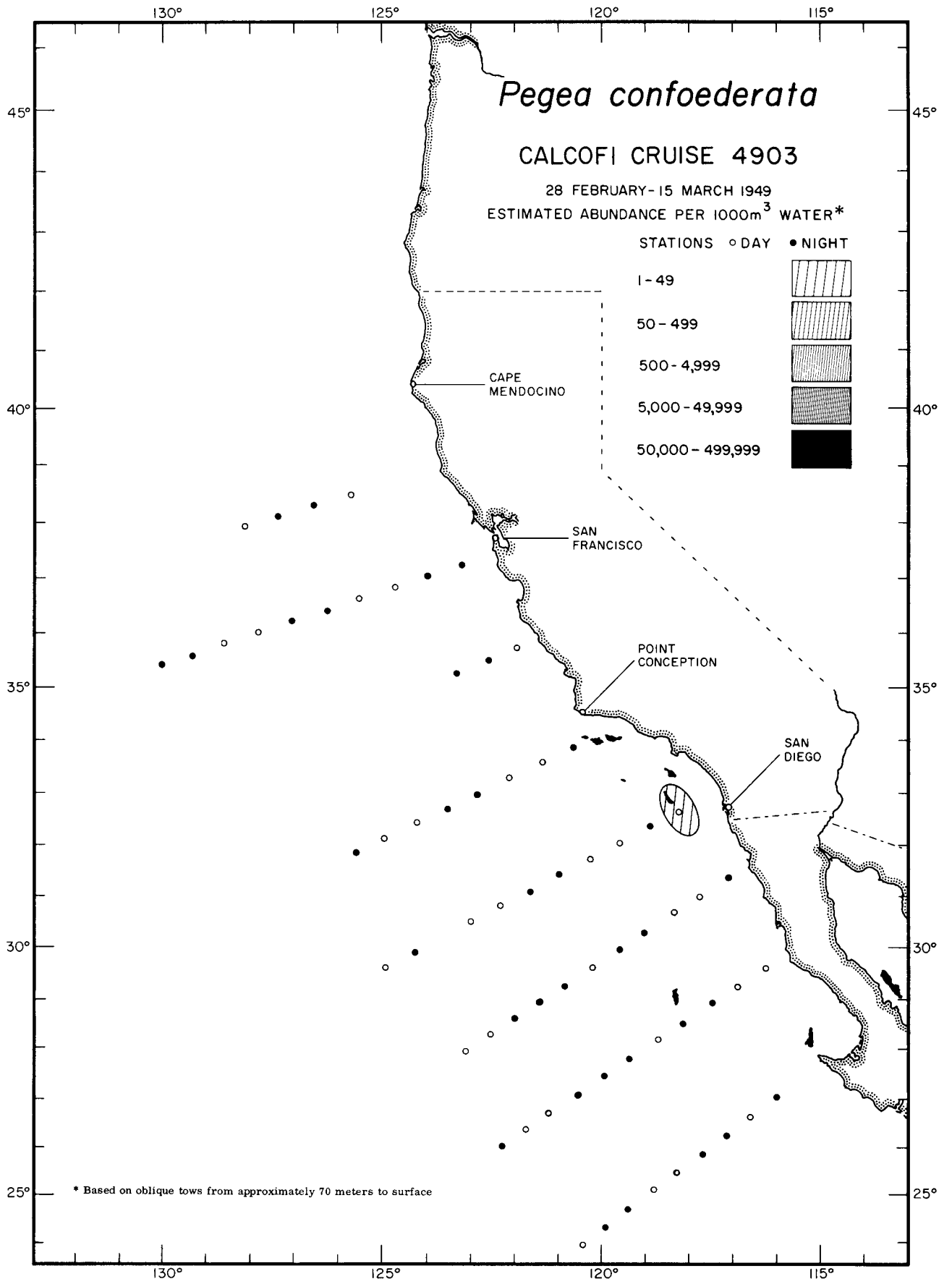
Thaliacea
Ihlea punctata
5210



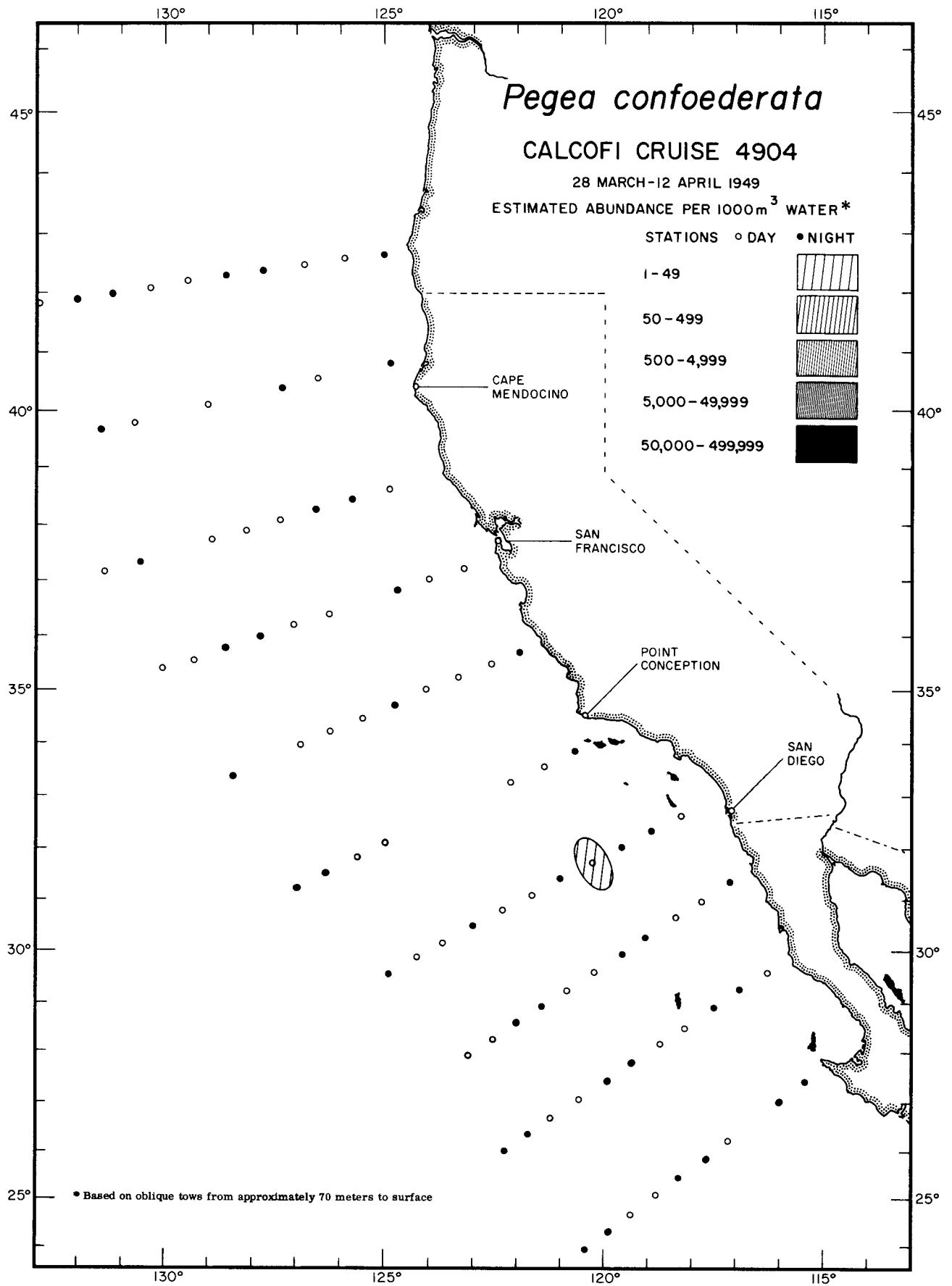
Thaliacea
Ihlea punctata
5403



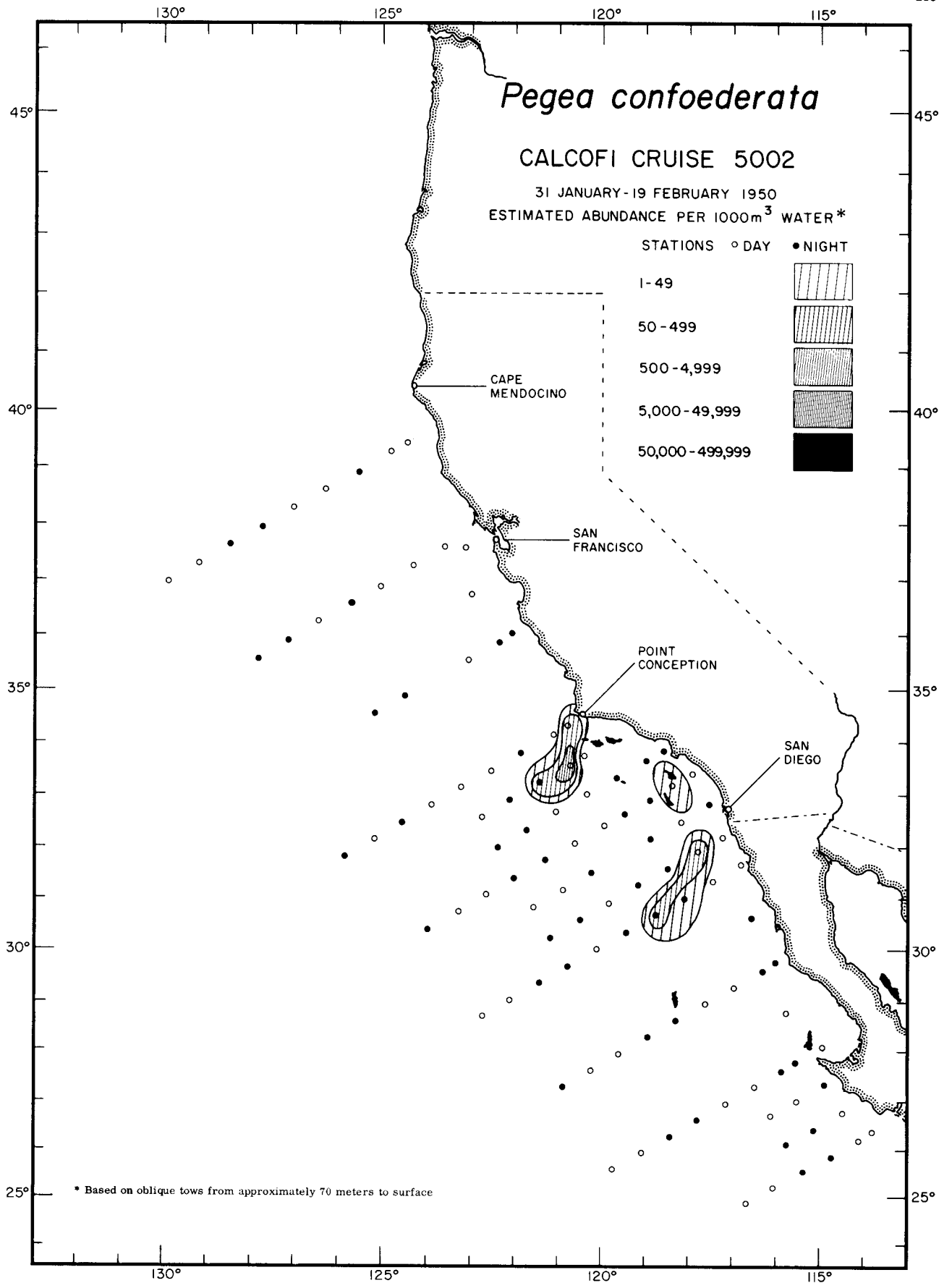
Thaliacea
Ihlea punctata
5804



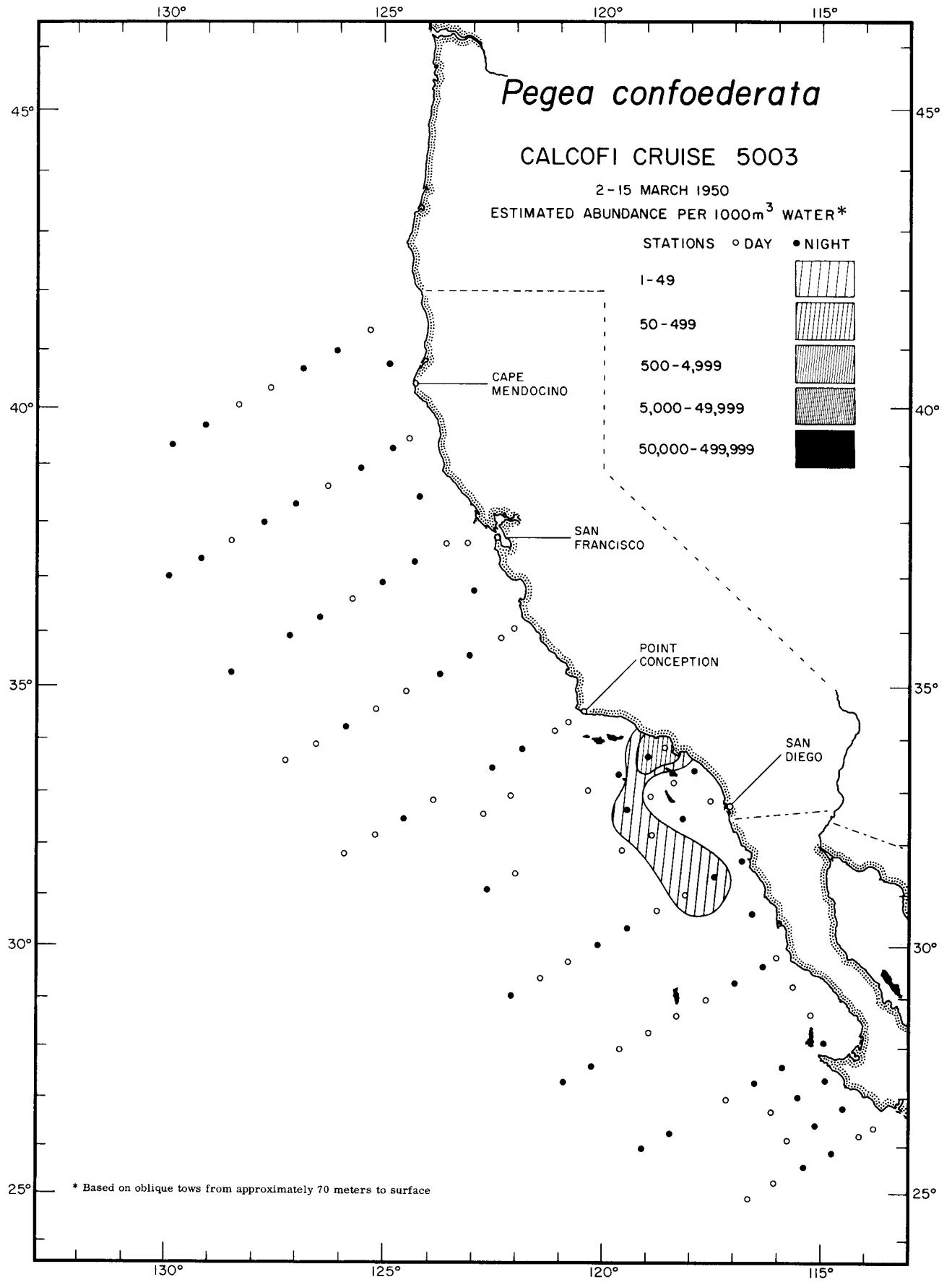
Thaliacea
Pegaea confoederata
4903



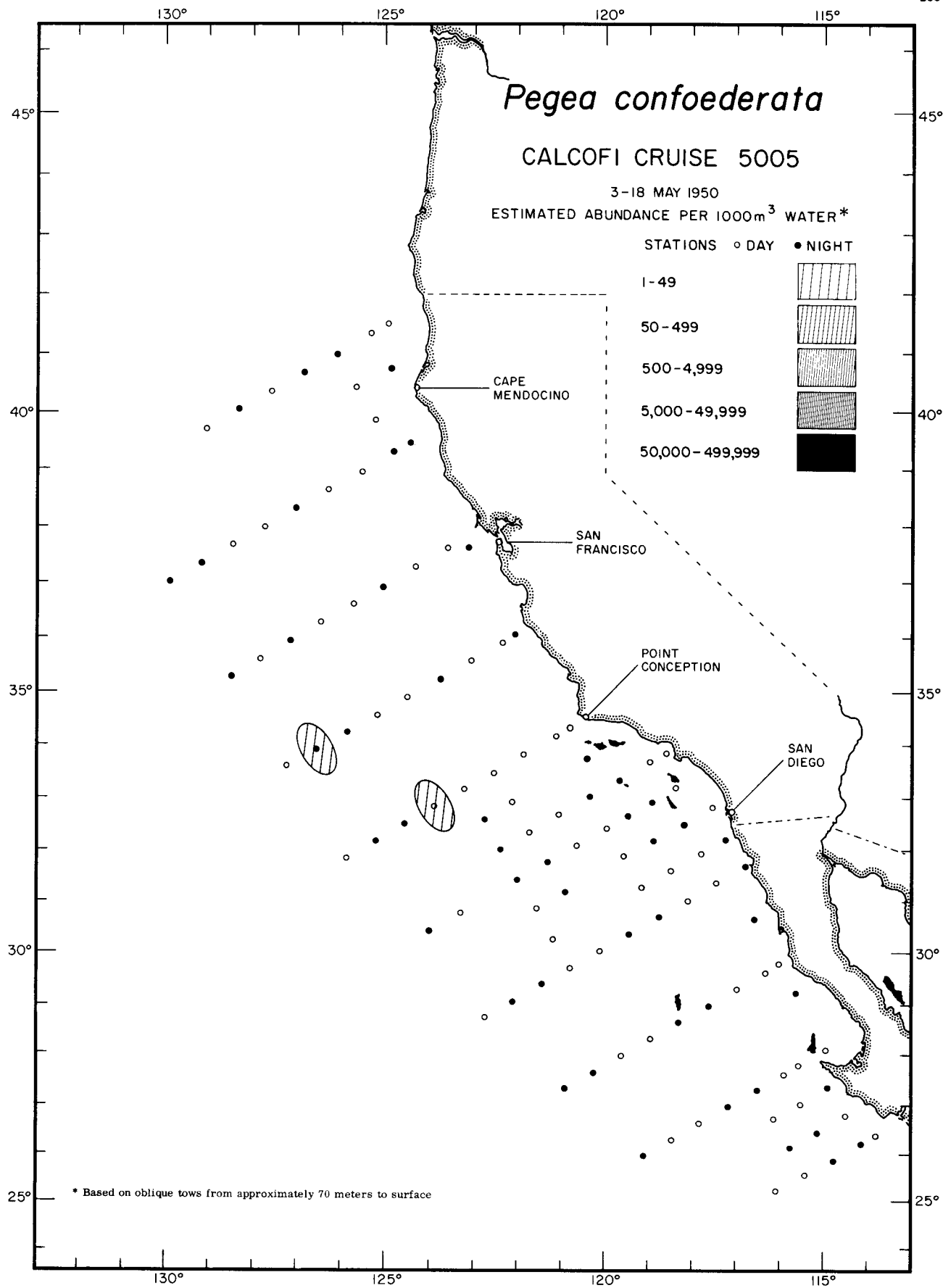
Thaliacea
Pegea confoederata
4904



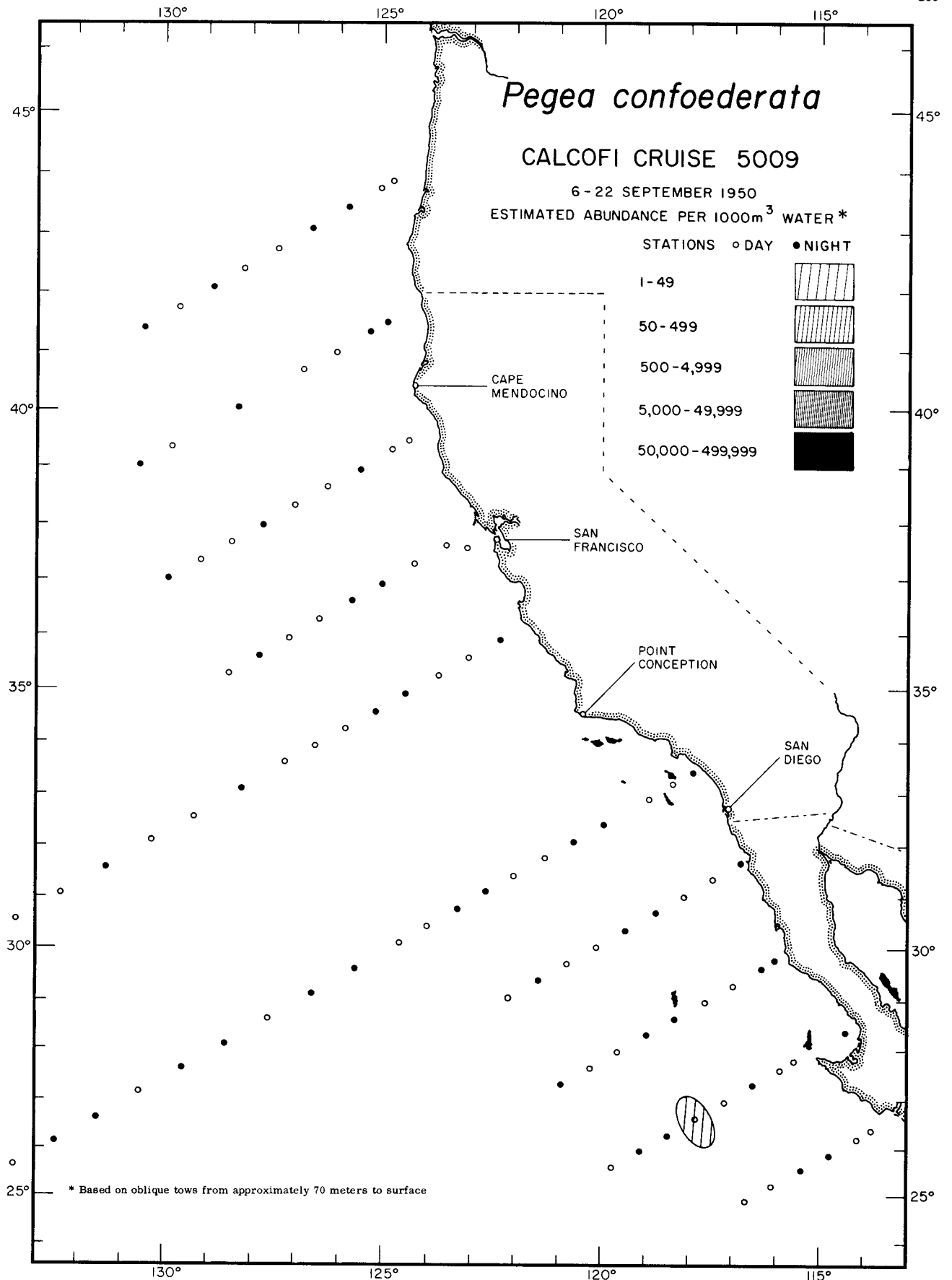
Thaliacea
Pega confoederata
 5002



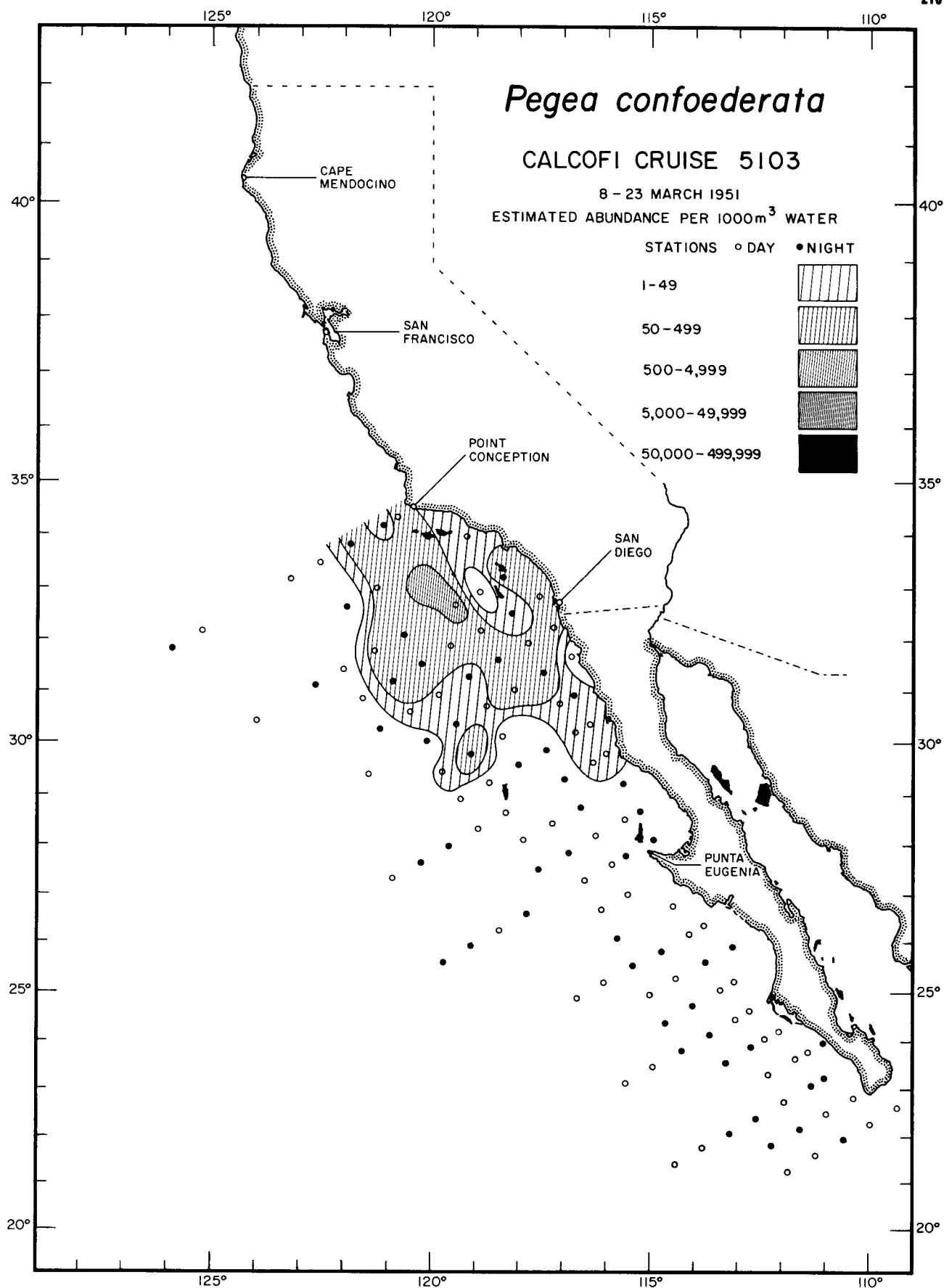
Thaliacea
Pegaea confoederata
5003



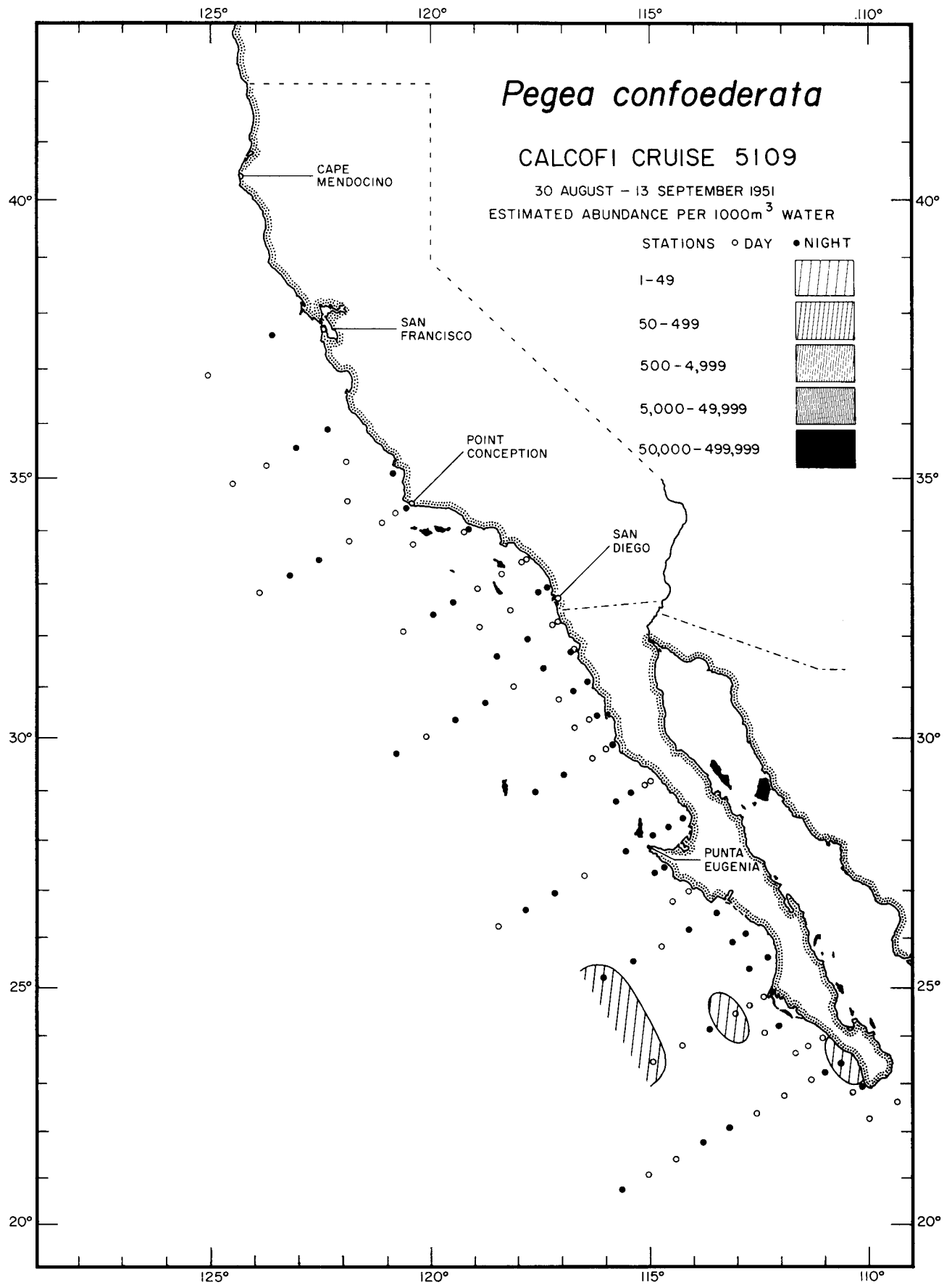
Thaliacea
Pegea confoederata
5005



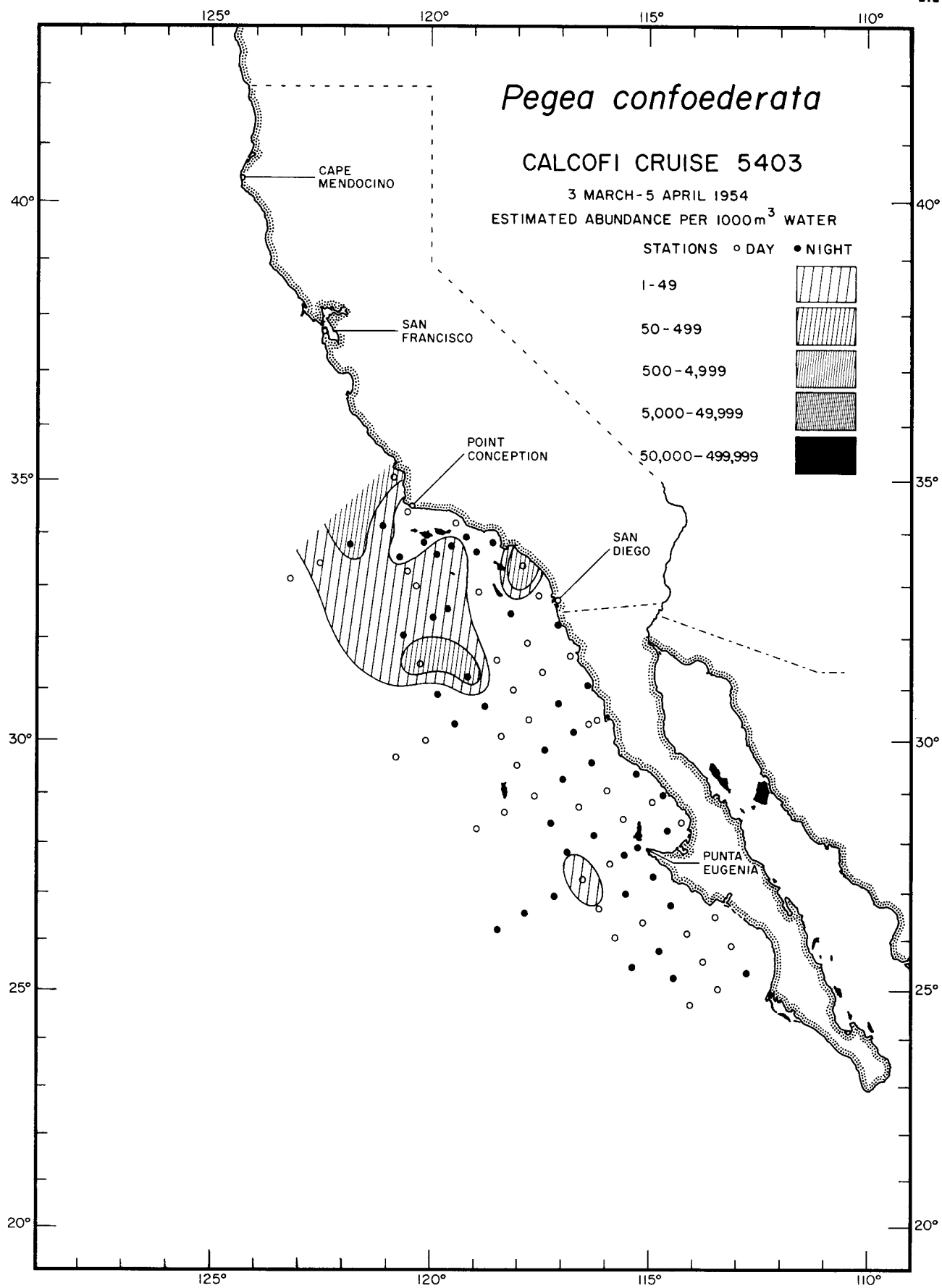
Thaliacea
Pegaea confoederata
5009



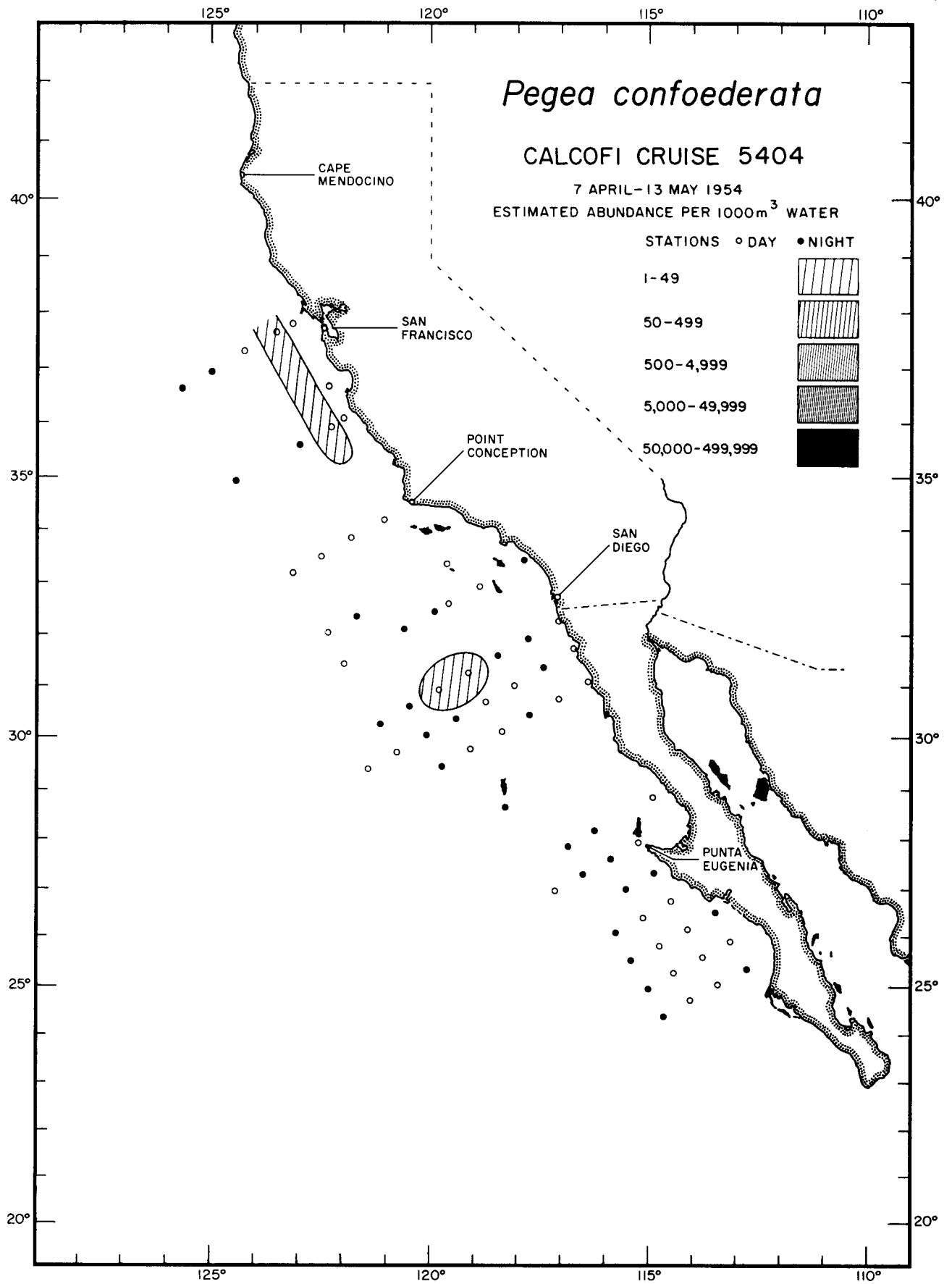
Thaliacea
Pegaea confoederata
5103



Thaliacea
Pegaea confoederata
5109



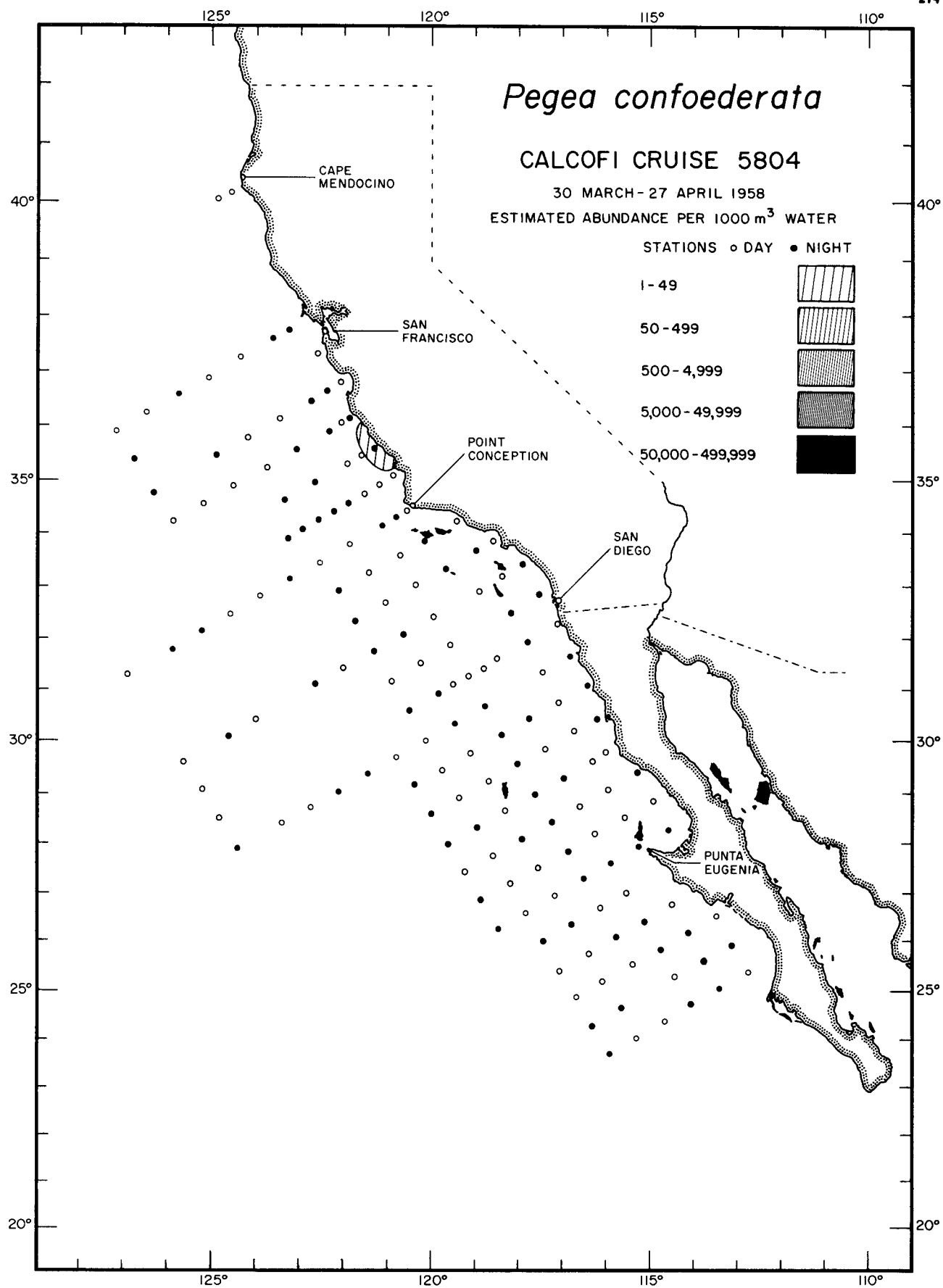
Thaliacea
Pegaea confoederata
5403



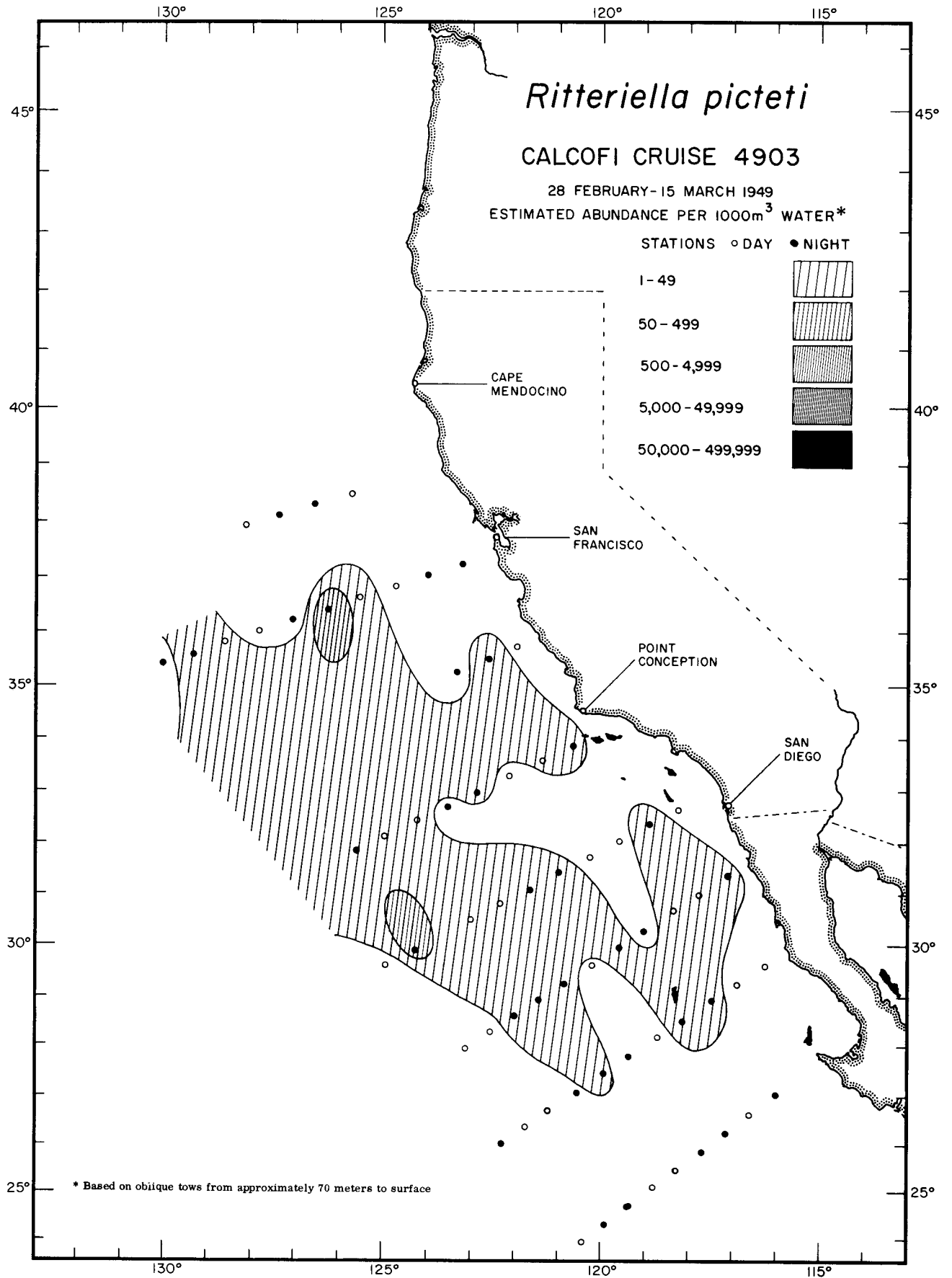
Thaliacea

Pegaea confoederata

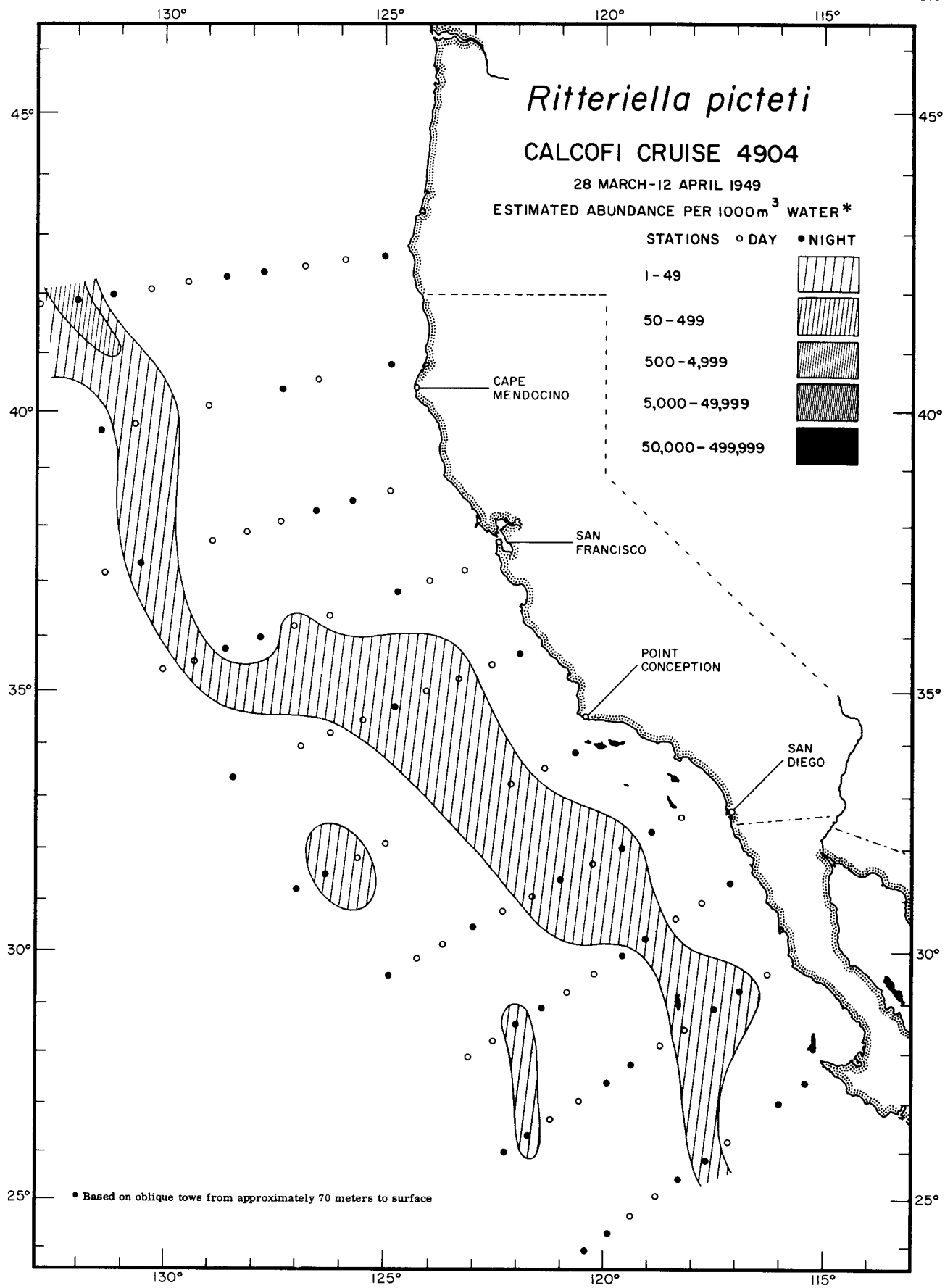
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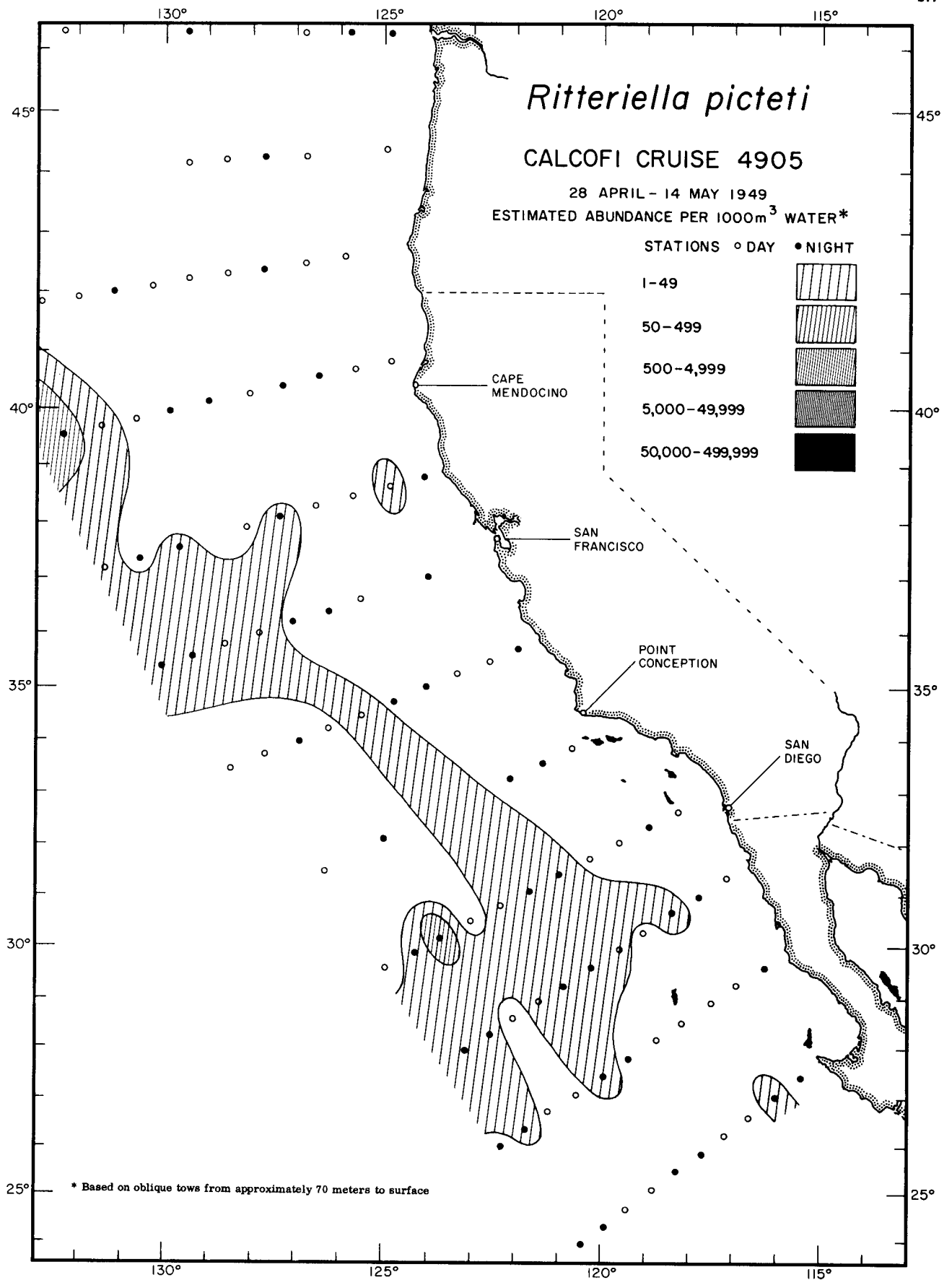
Thaliacea
Pegaea confoederata
5804



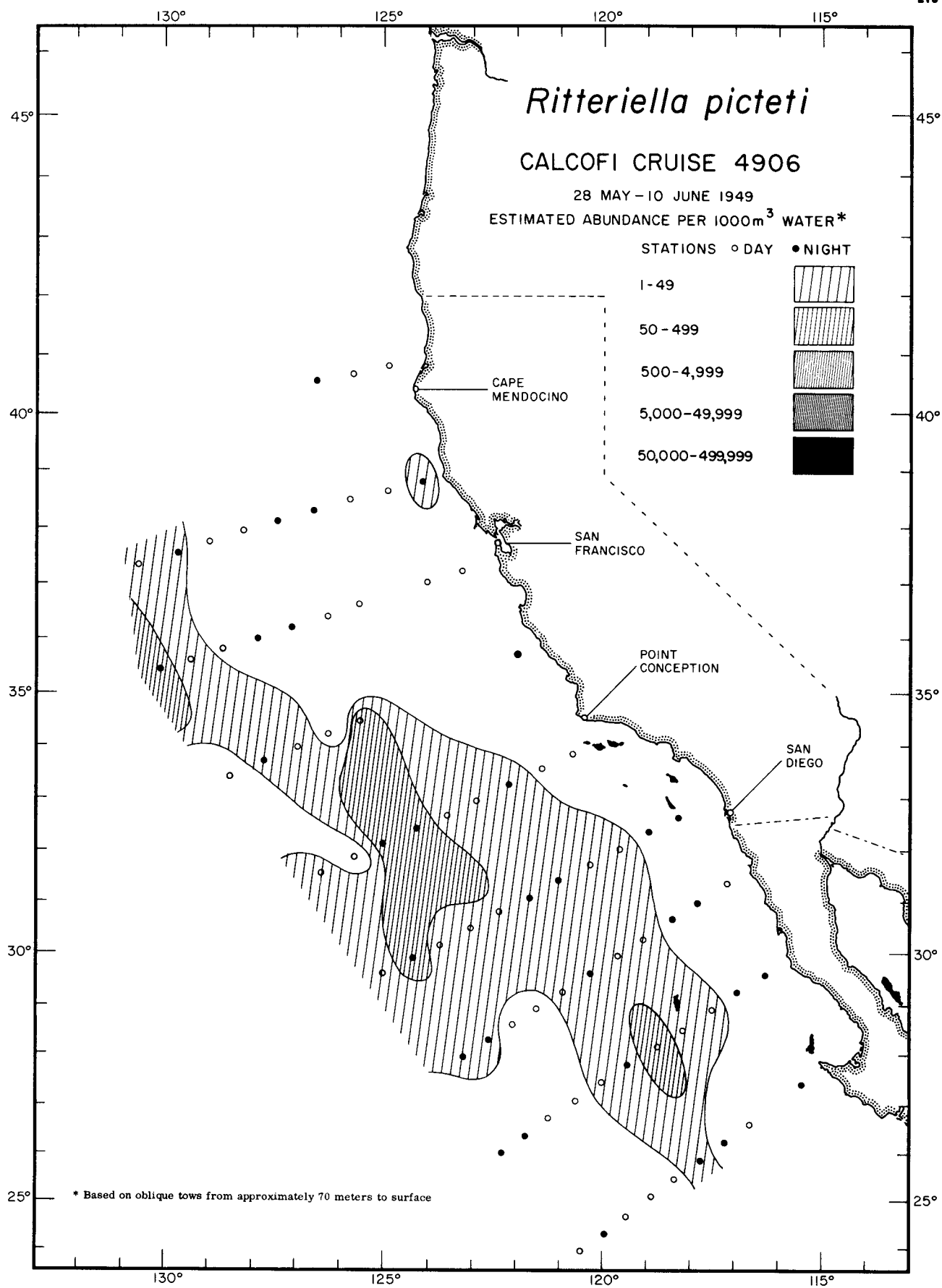
Thaliacea
Ritteriella picteti
4903



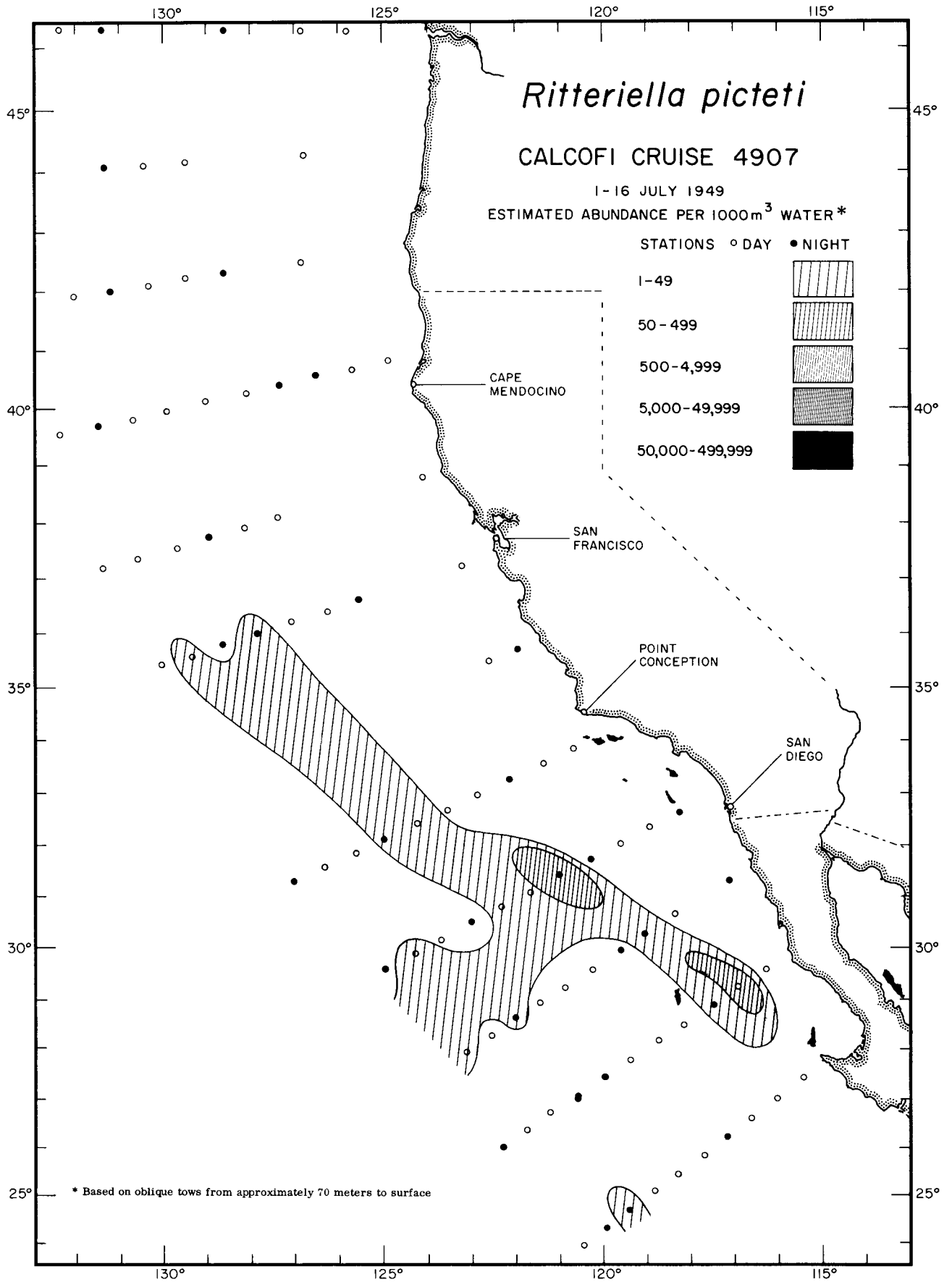
Thaliacea
Ritteriella picteti
4904



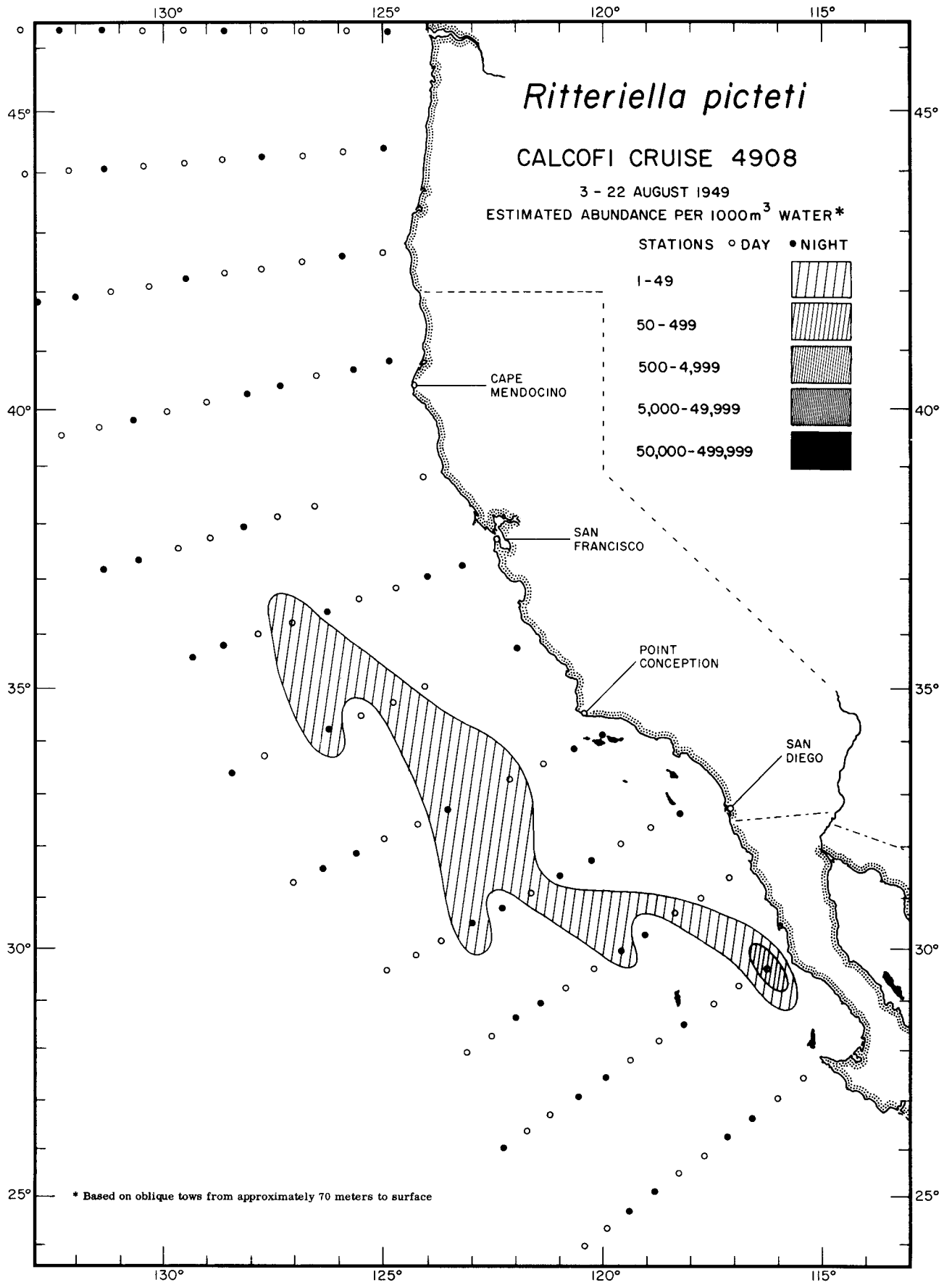
Thaliacea
Ritteriella picteti
4905



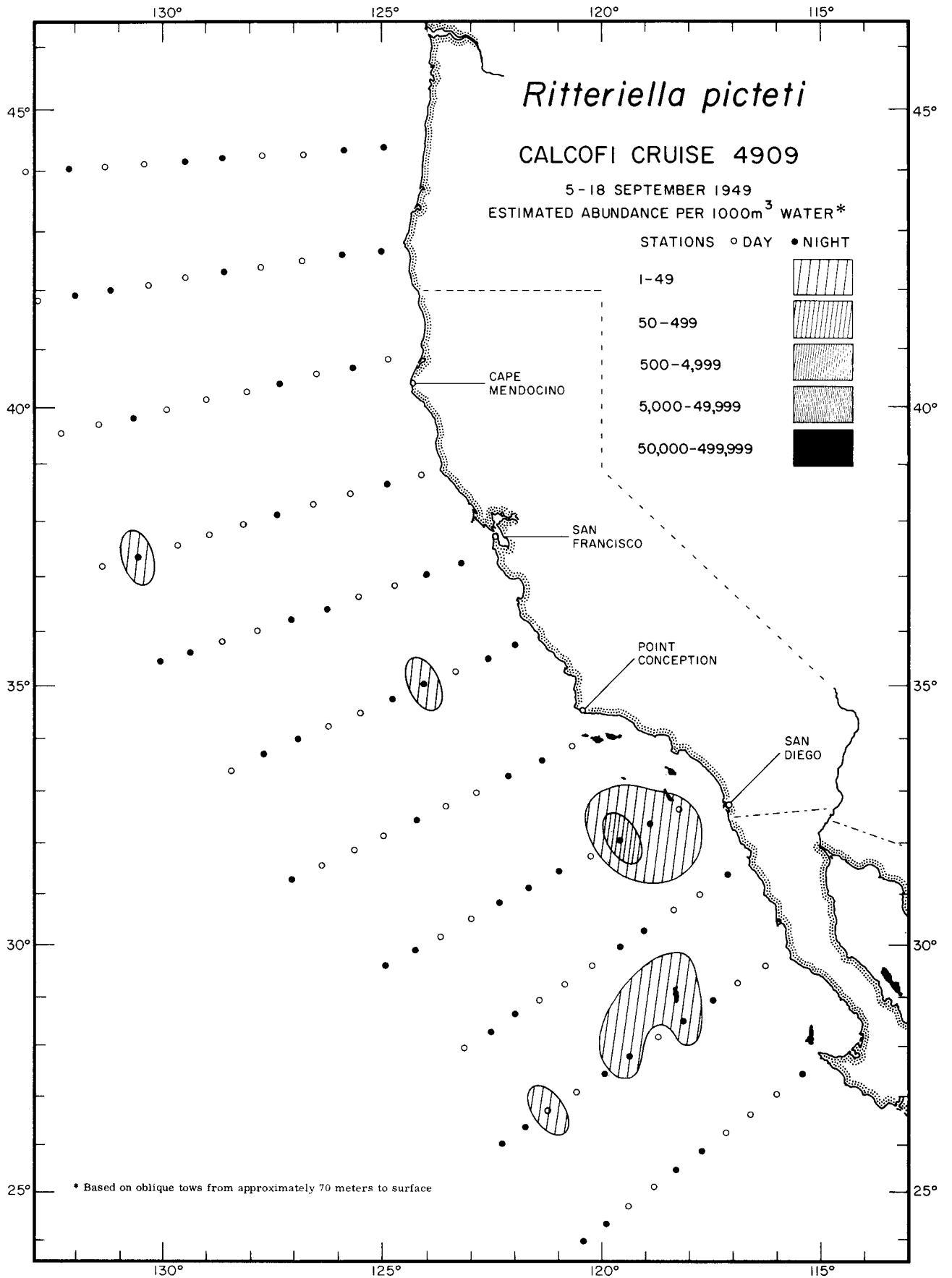
Thaliacea
Ritteriella picteti
4906



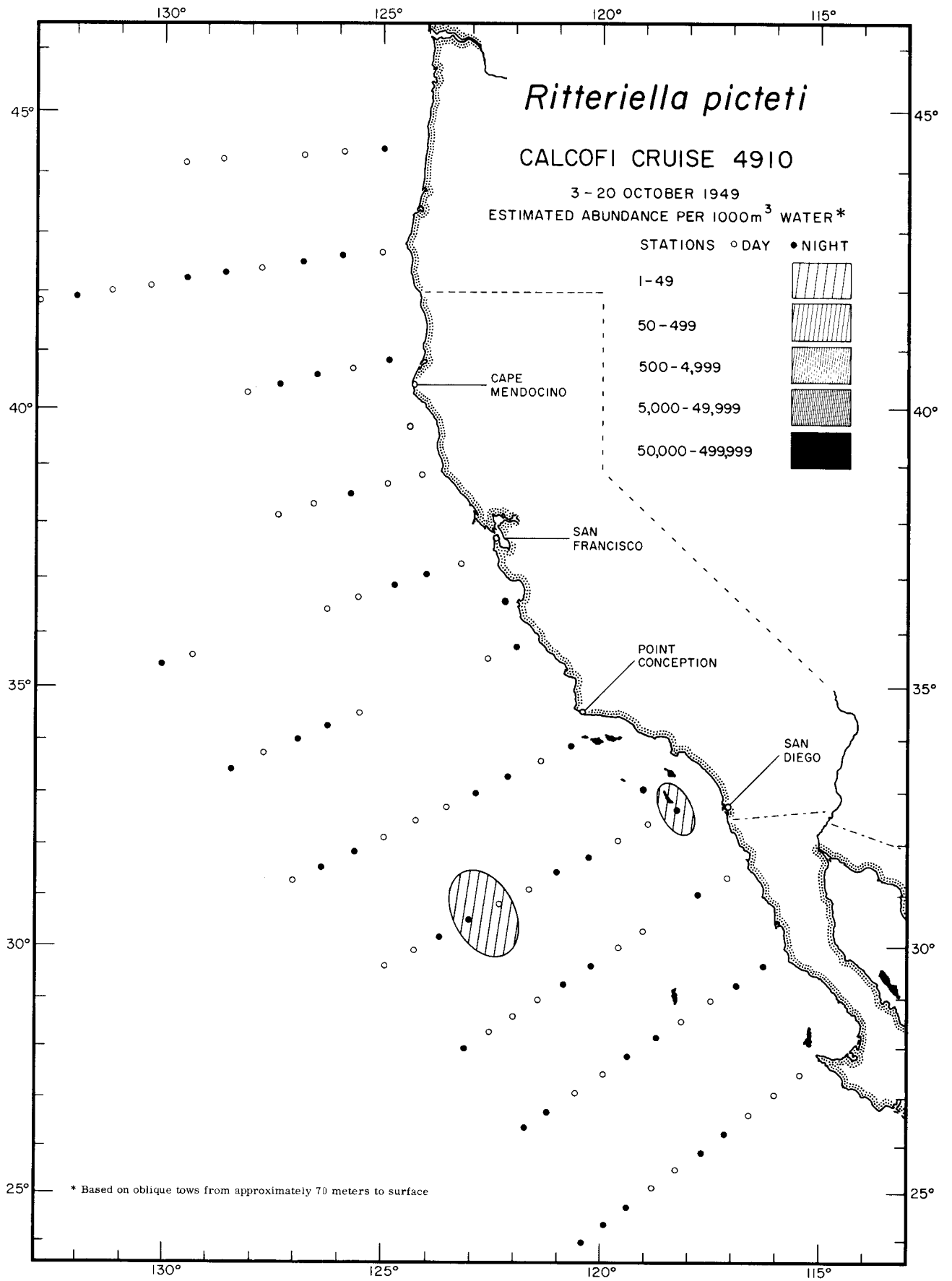
Thaliacea
Ritteriella picteti
4907



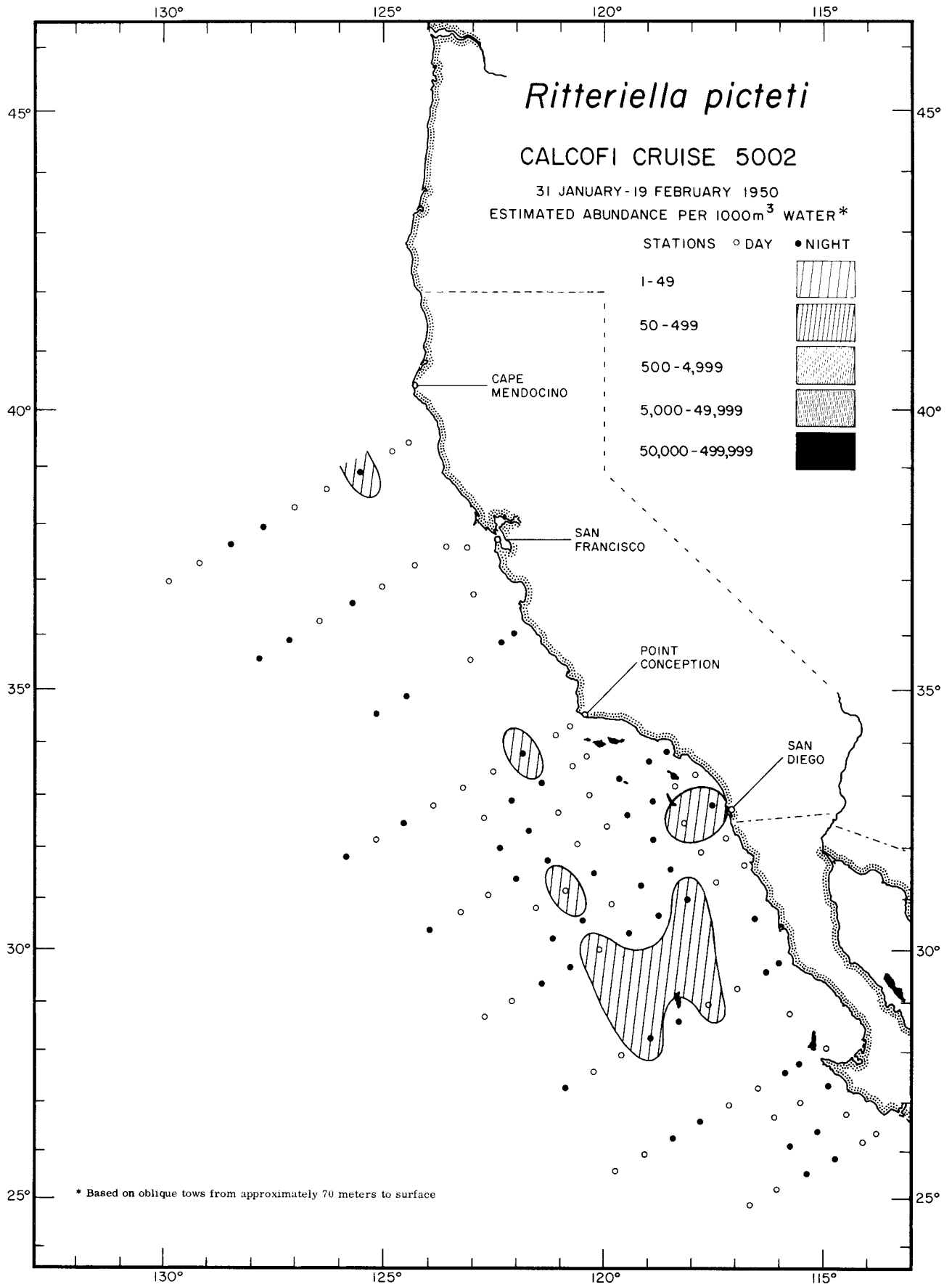
Thaliacea
Ritteriella picteti
 4908

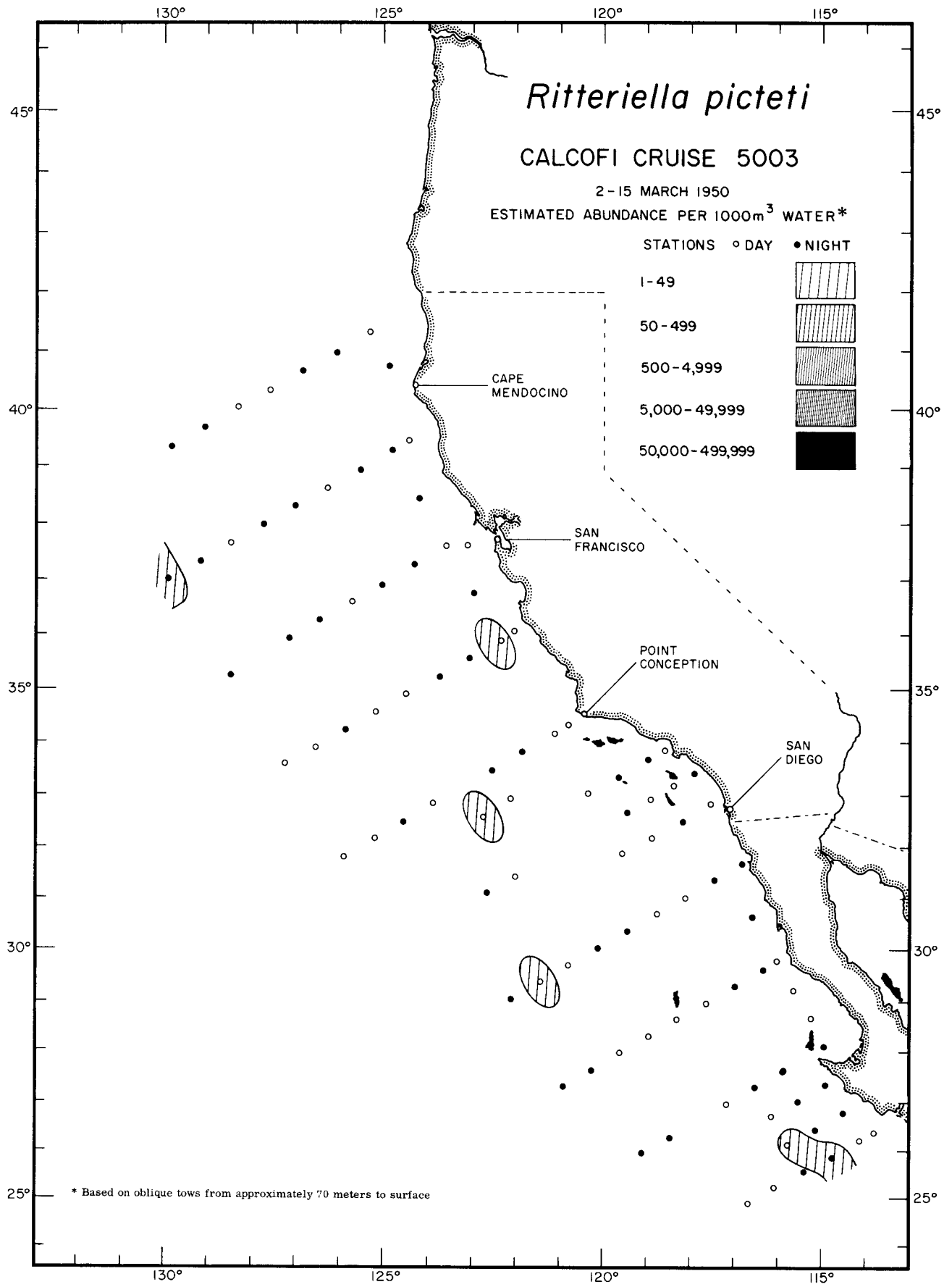


Thaliacea
Ritteriella picteti
4909

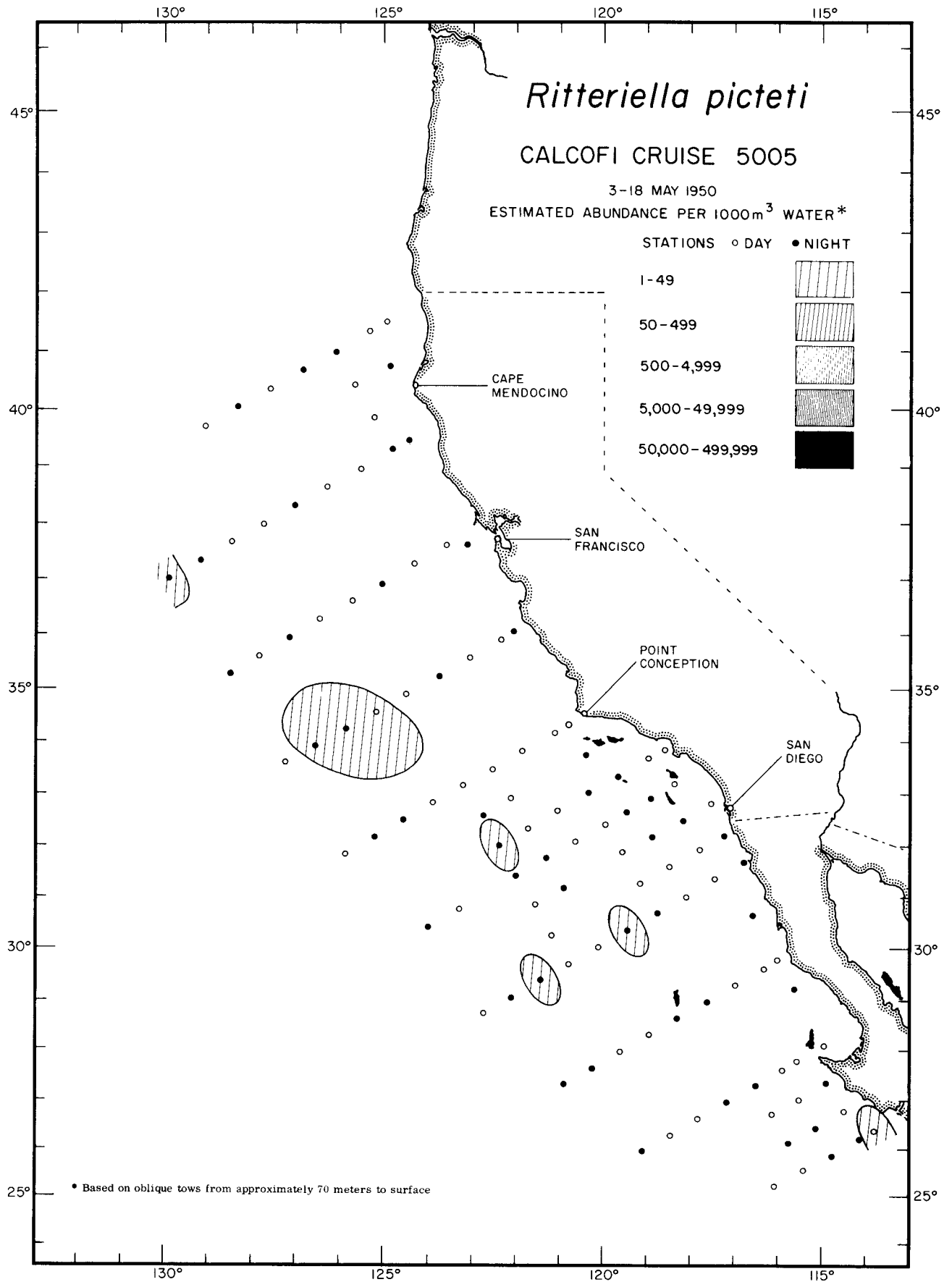


Thaliacea
Ritteriella picteti
4910

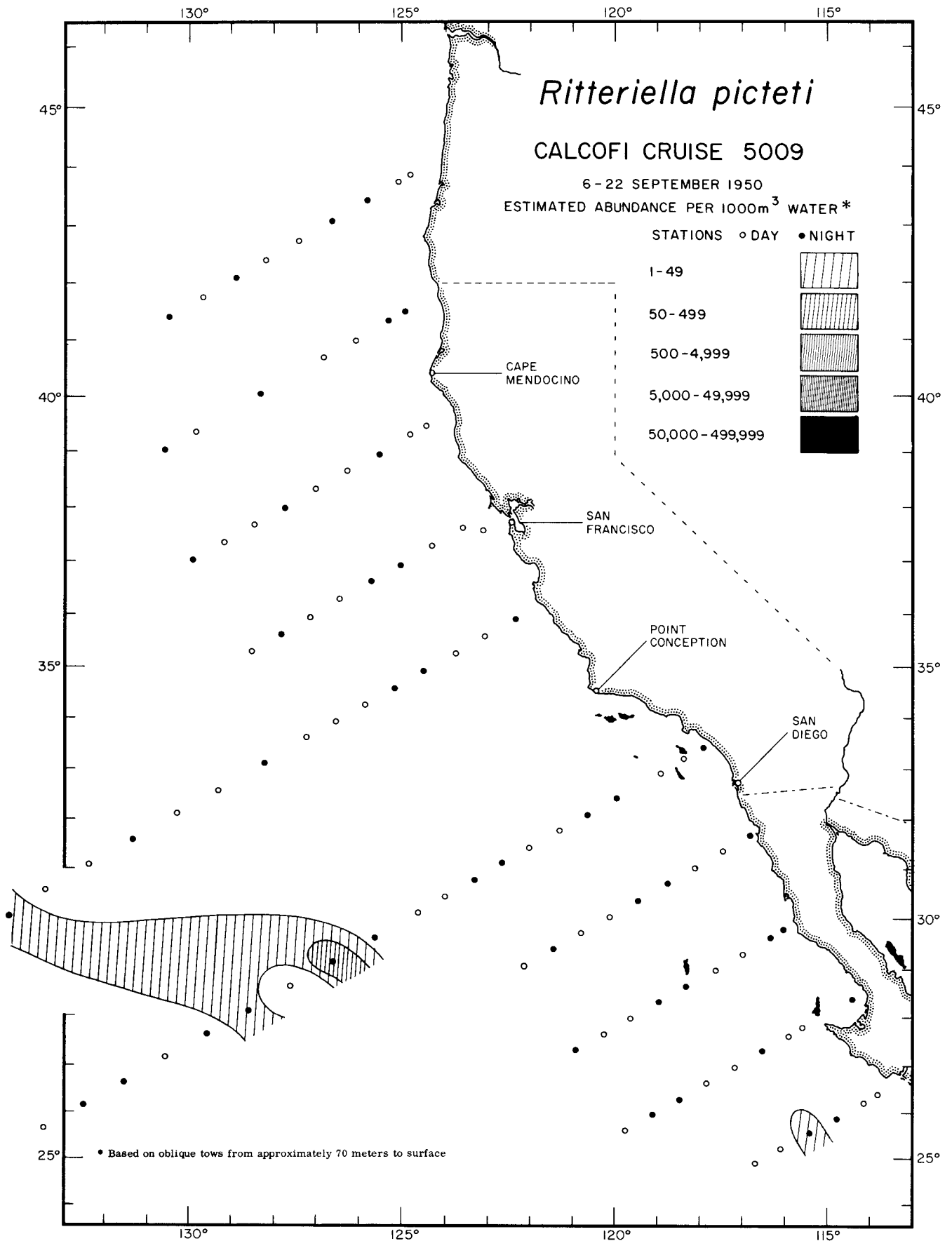




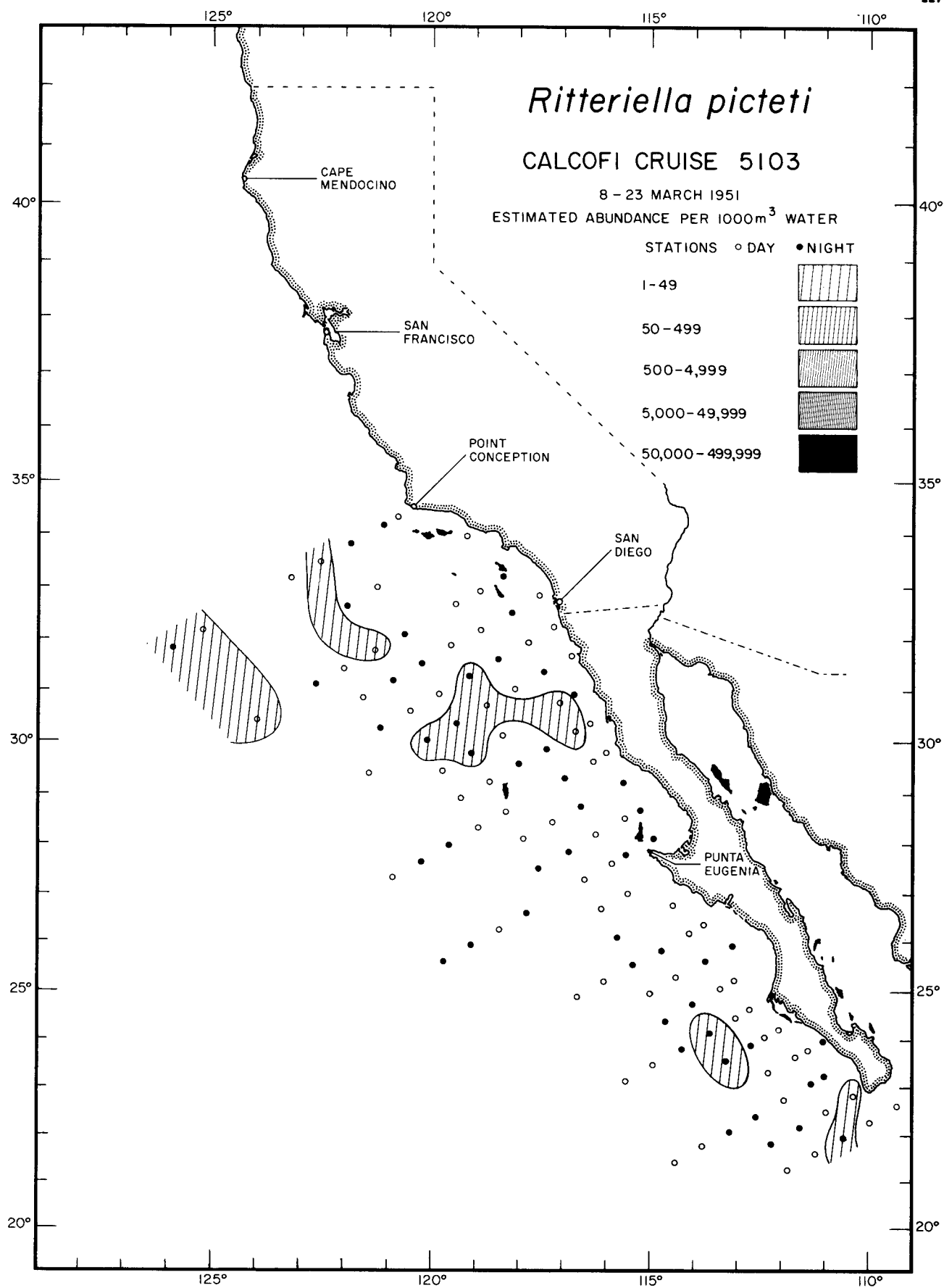
Thaliacea
Ritteriella picteti
5003



Thaliacea
Ritteriella picteti
5005

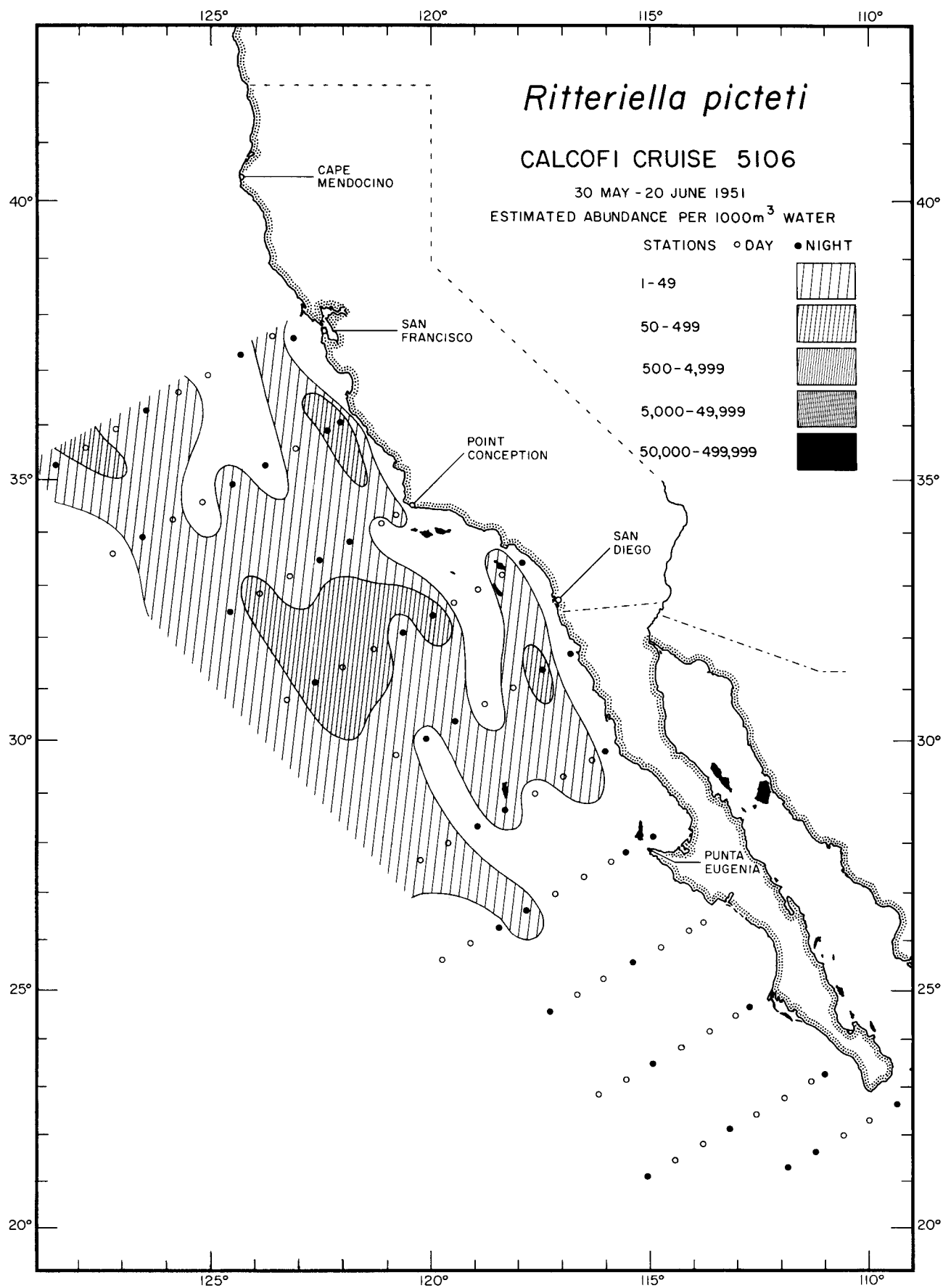


Thaliacea
Ritteriella picteti
5009



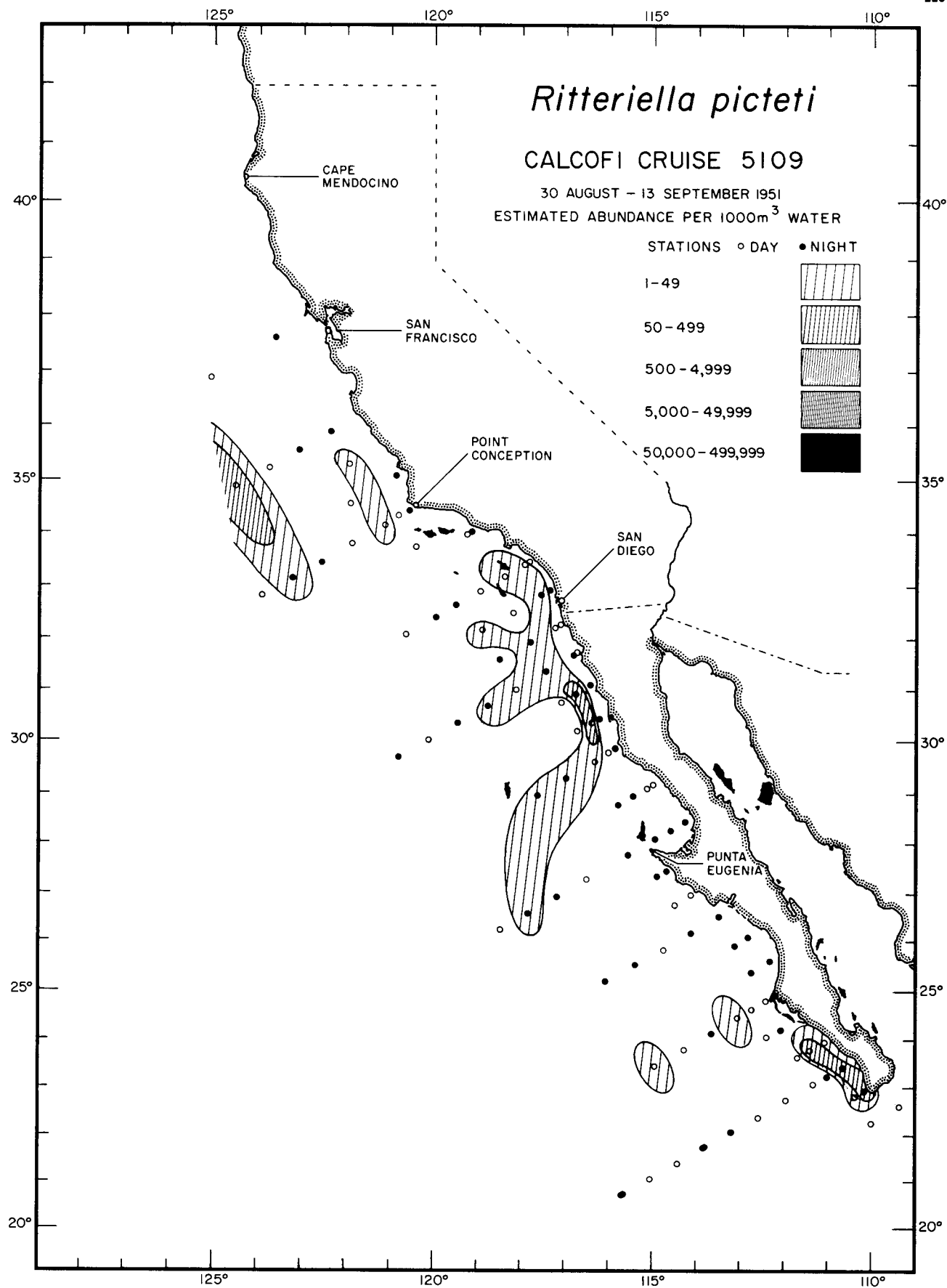
Thaliacea
Ritteriella picteti

5103



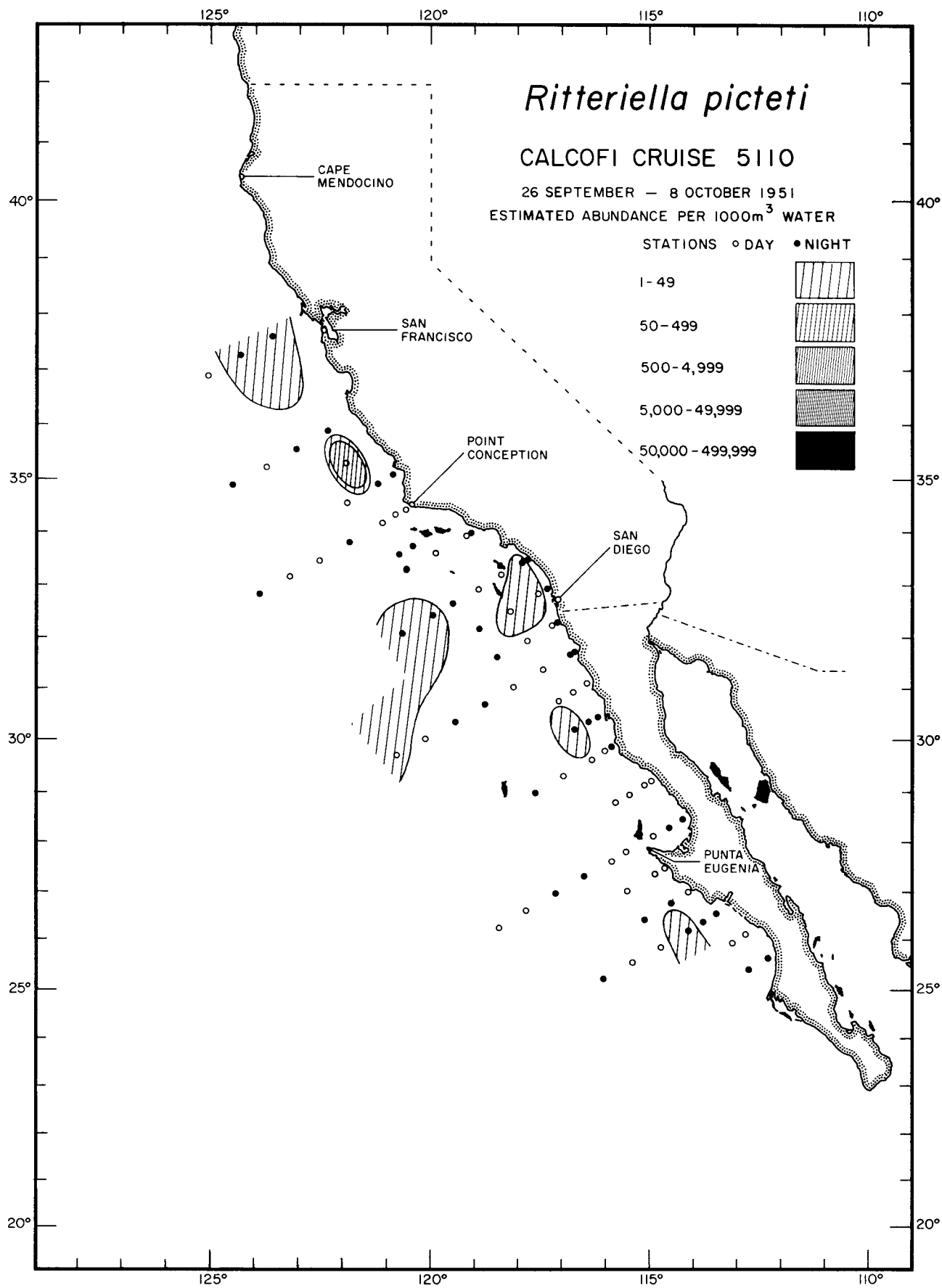
Thaliacea
Ritteriella picteti

5106

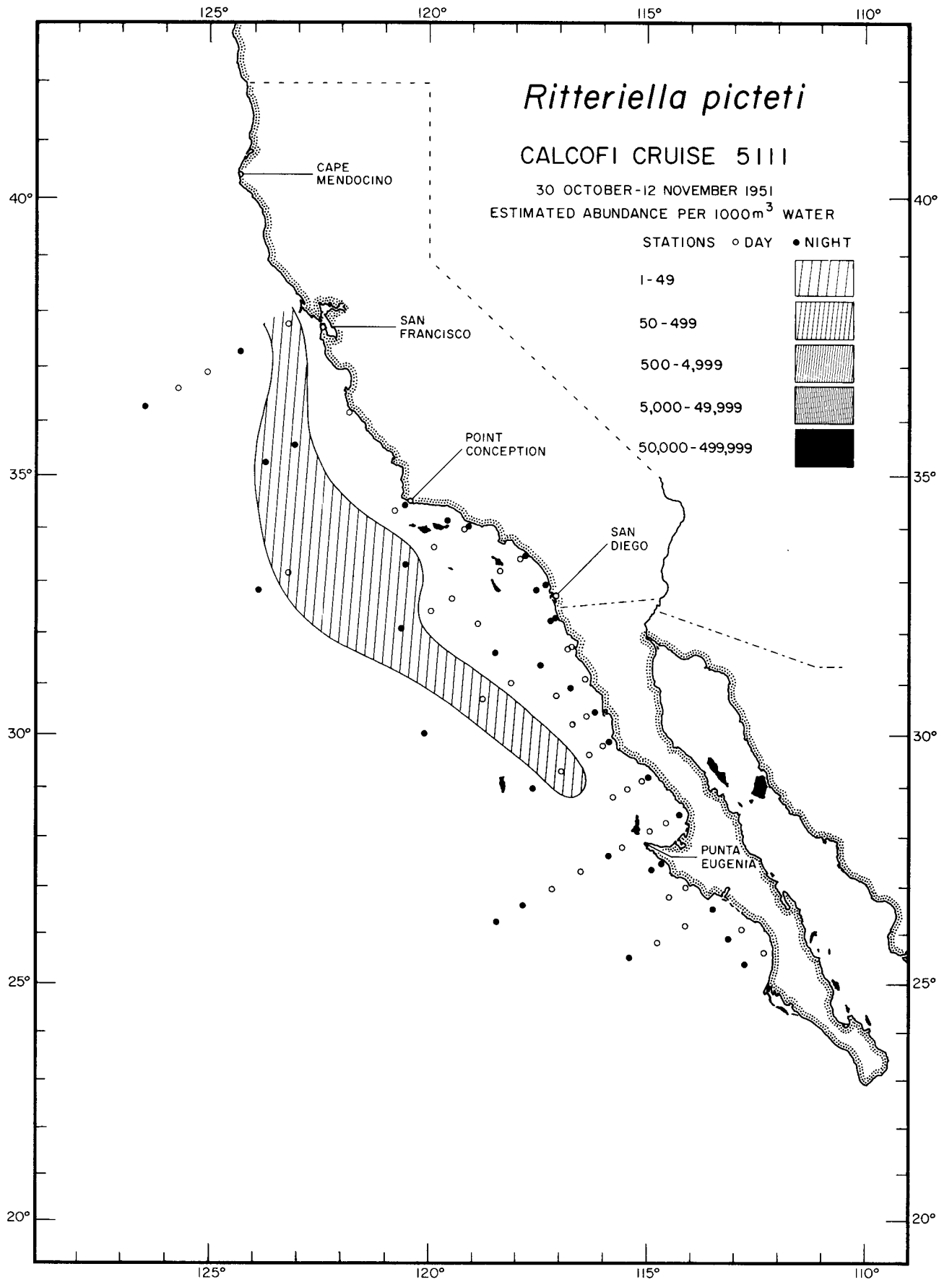


Thaliacea
Ritteriella picteti

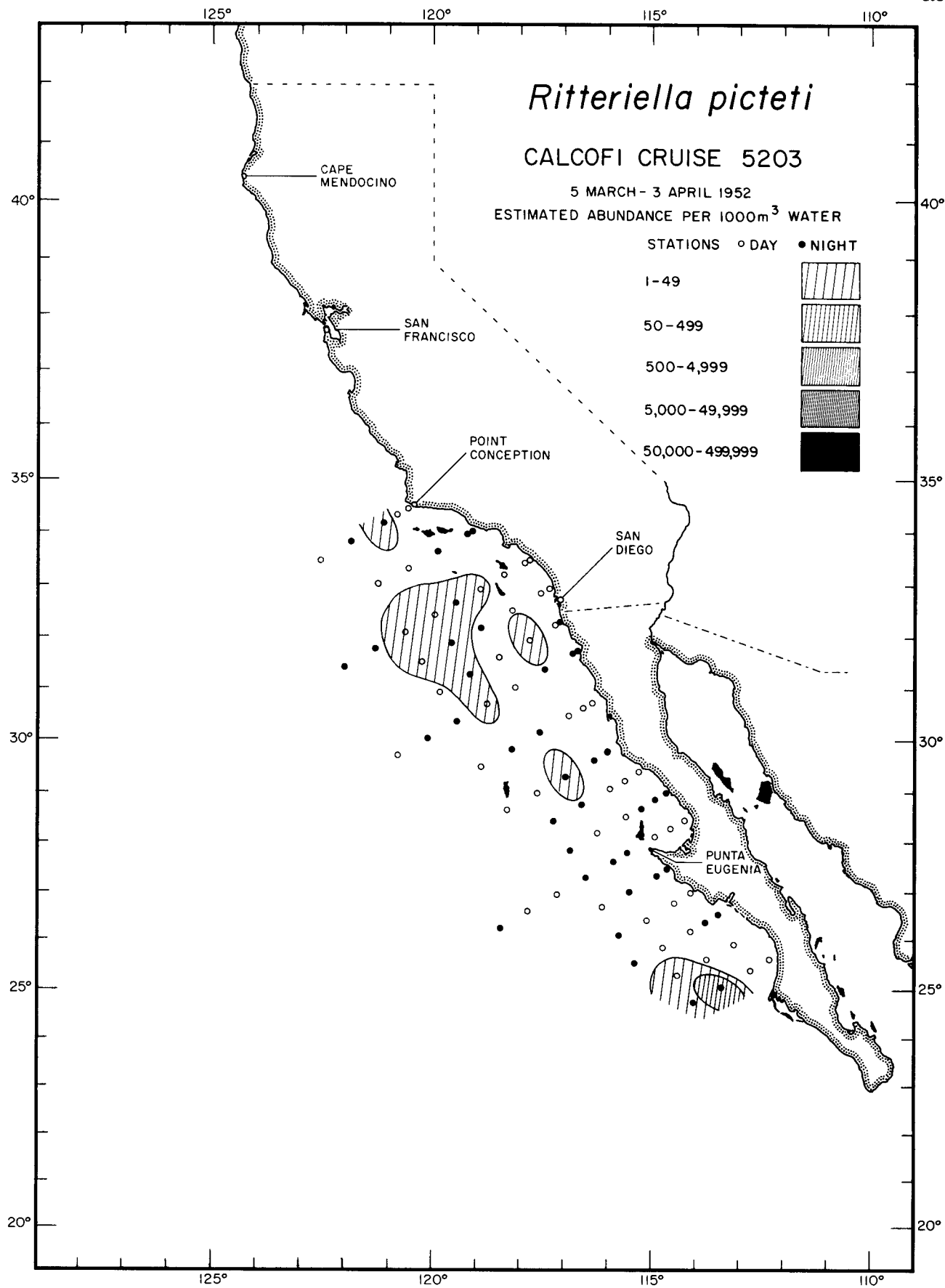
5109



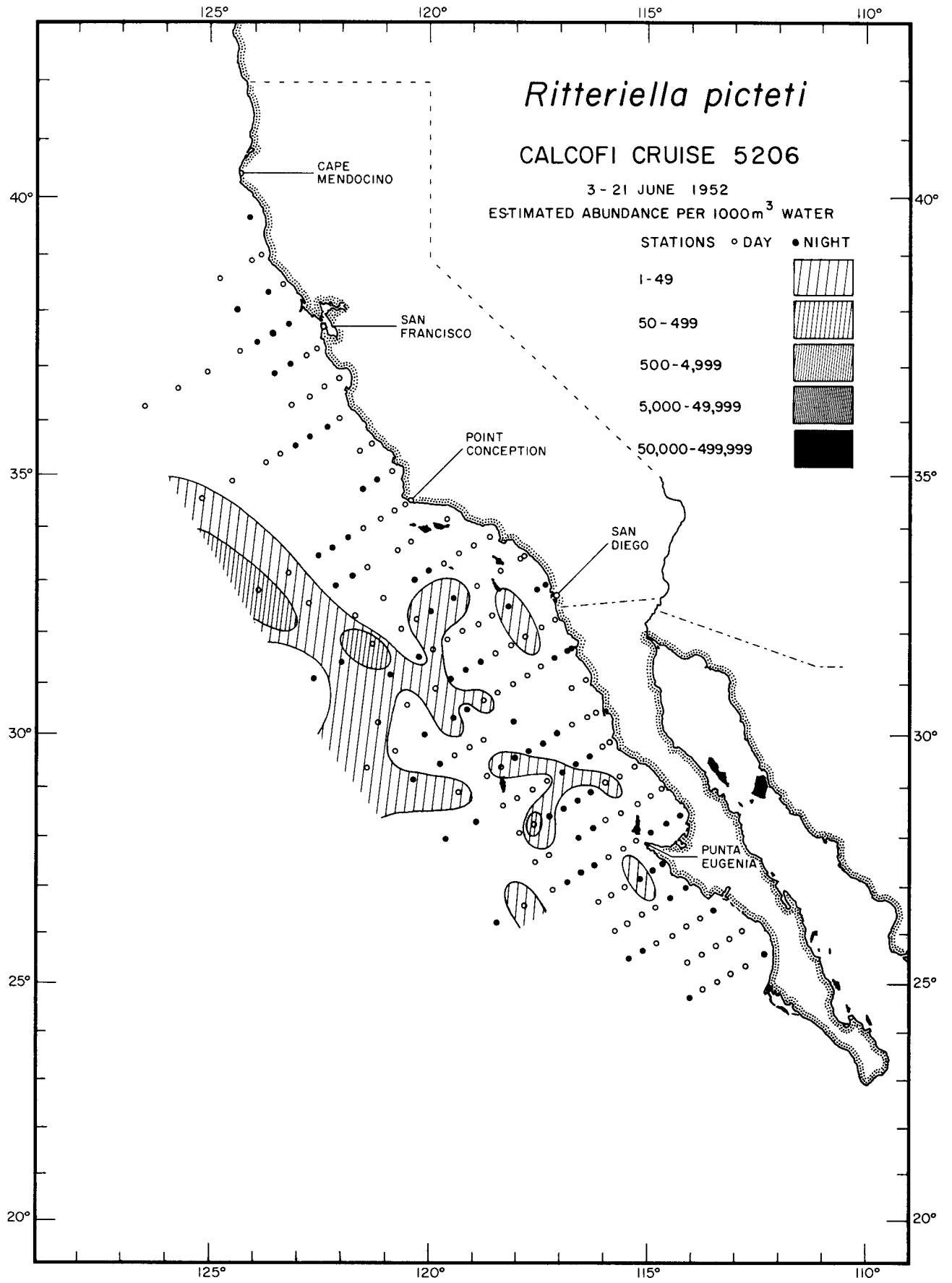
Thaliacea
Ritteriella picteti
 5110



Thaliacea
Ritteriella picteti
5111

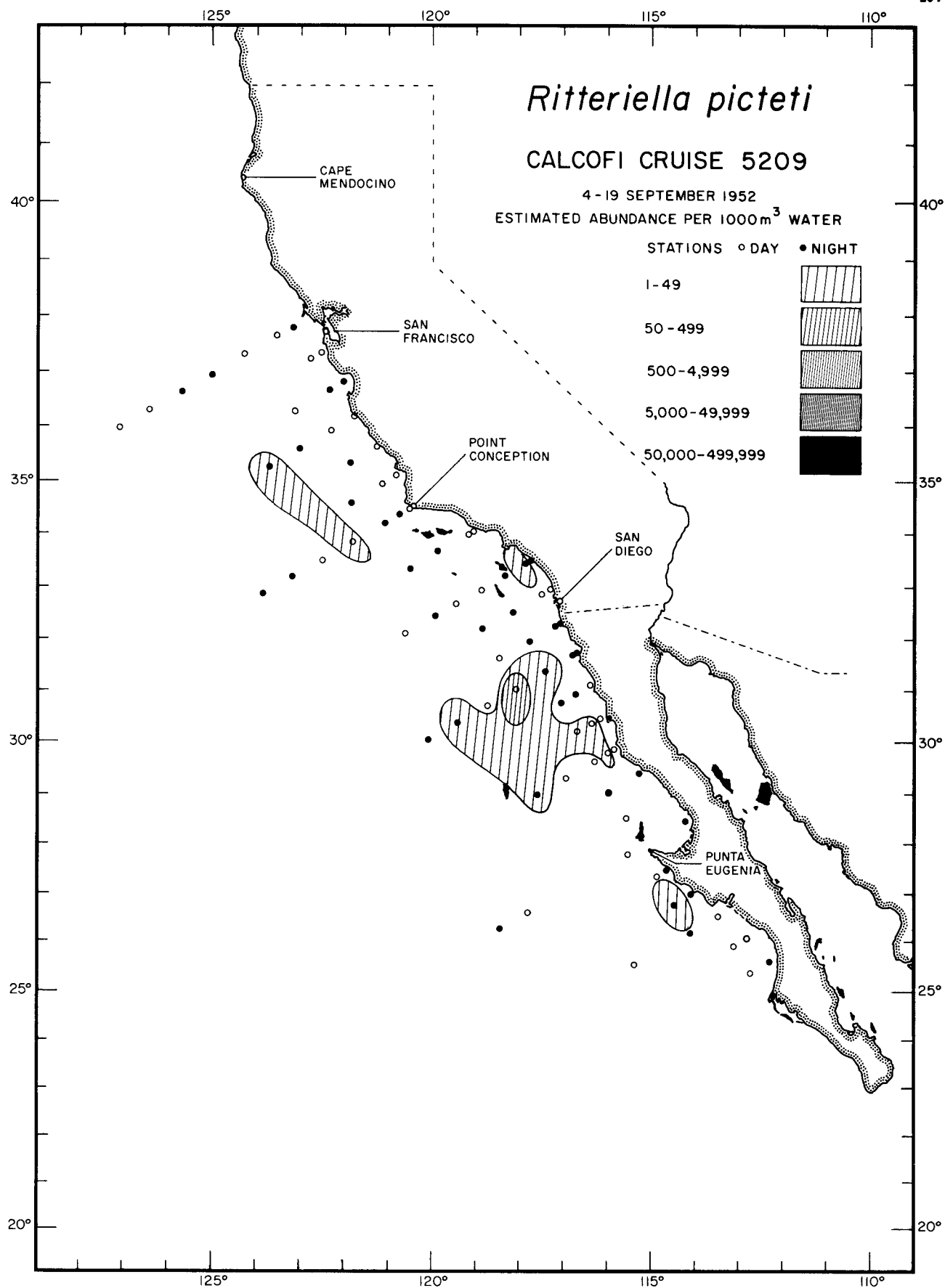


Thaliacea
Ritteriella picteti
5203



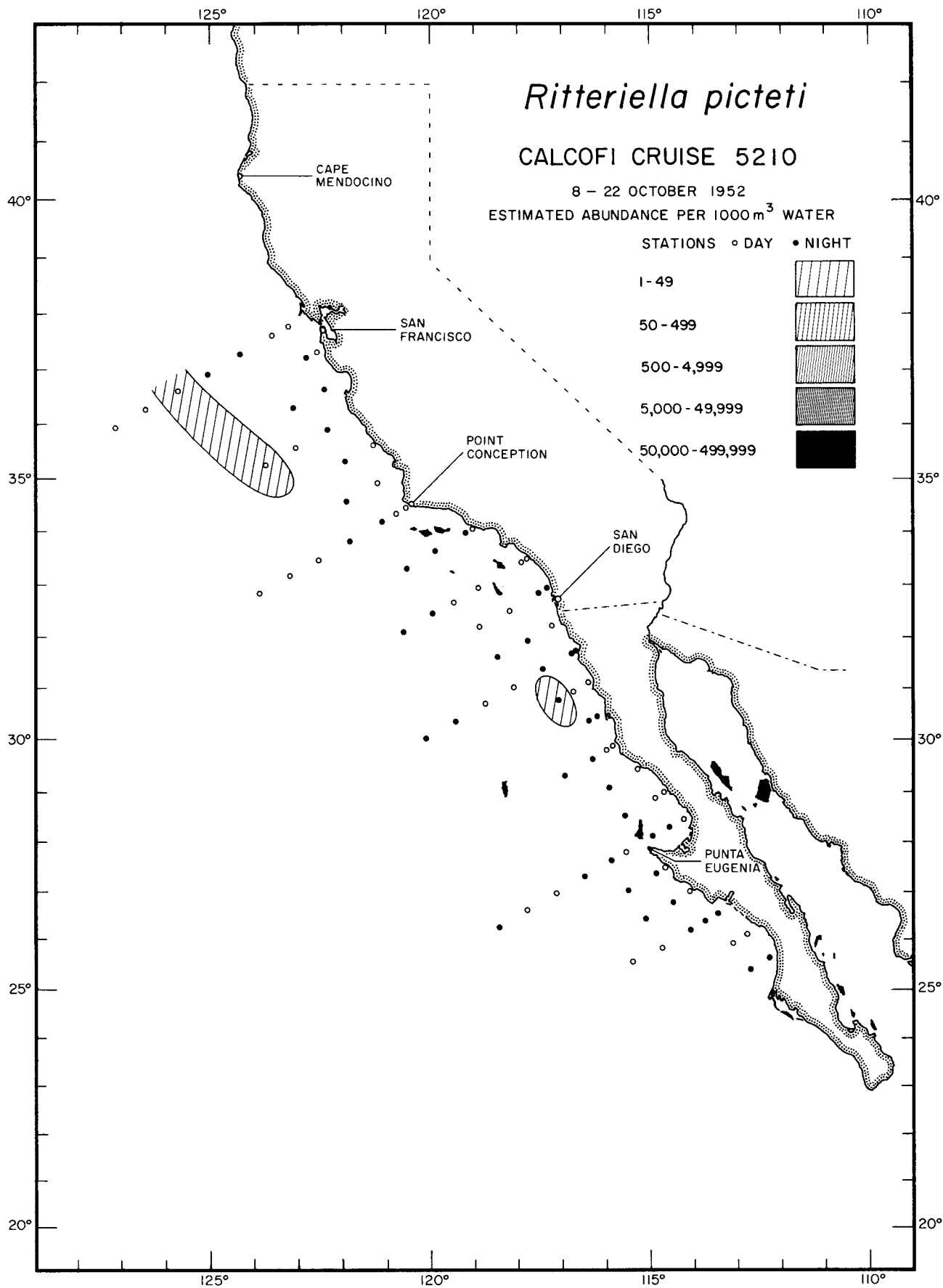
Thaliacea
Ritteriella picteti

5206



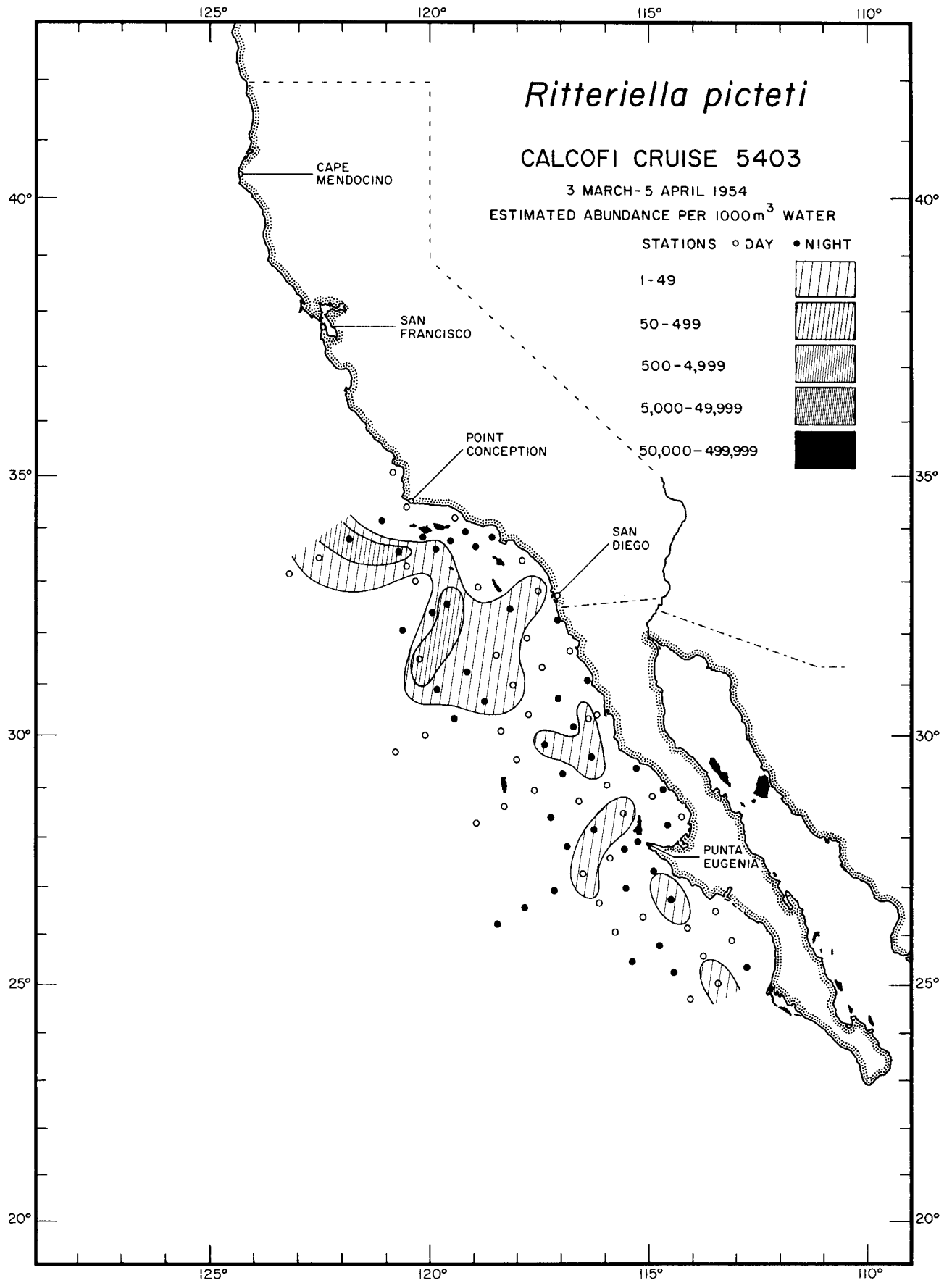
Thaliacea
Ritteriella picteti

5209



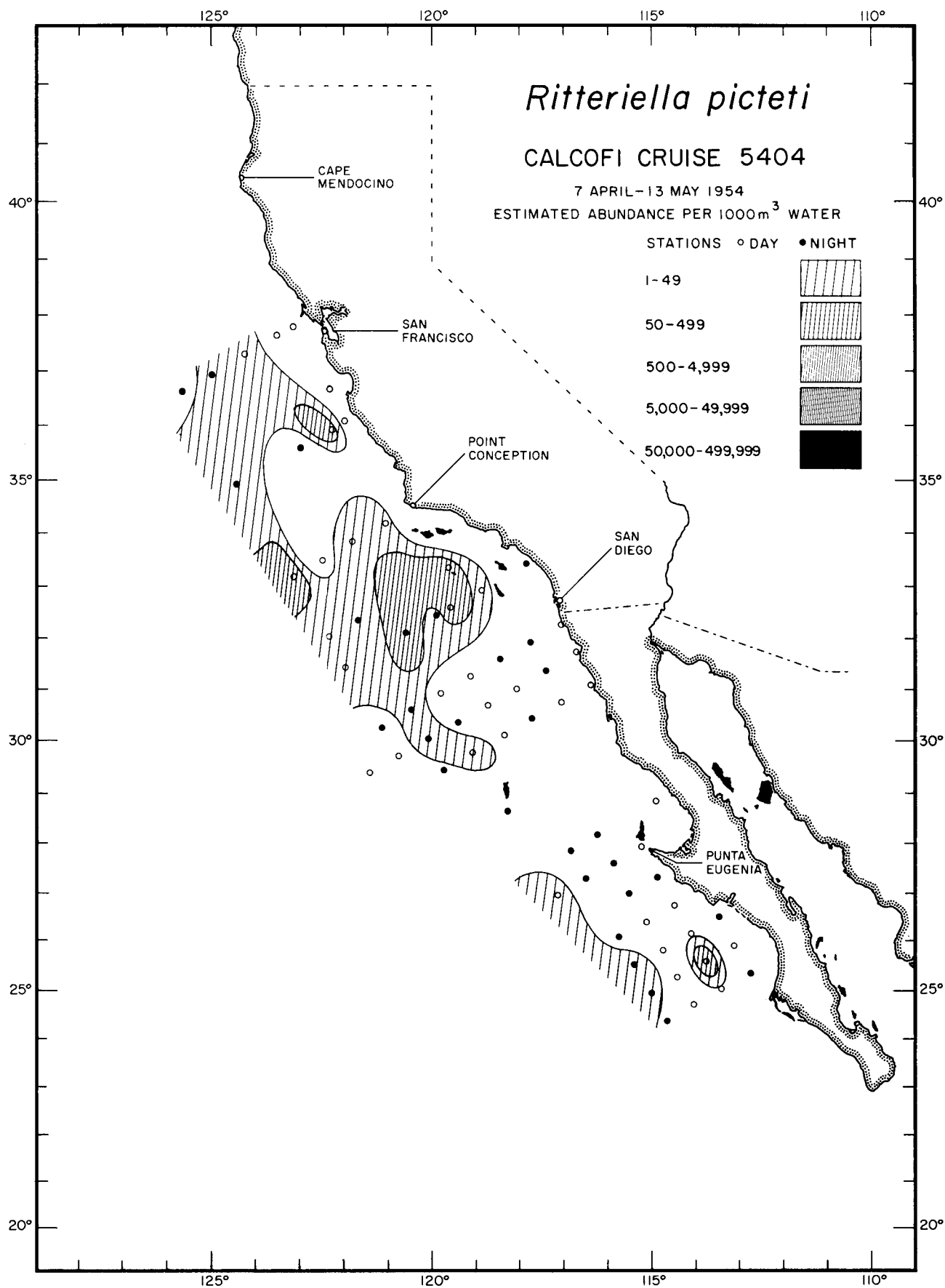
Thaliacea
Ritteriella picteti

5210



Thaliacea
Ritteriella picteti

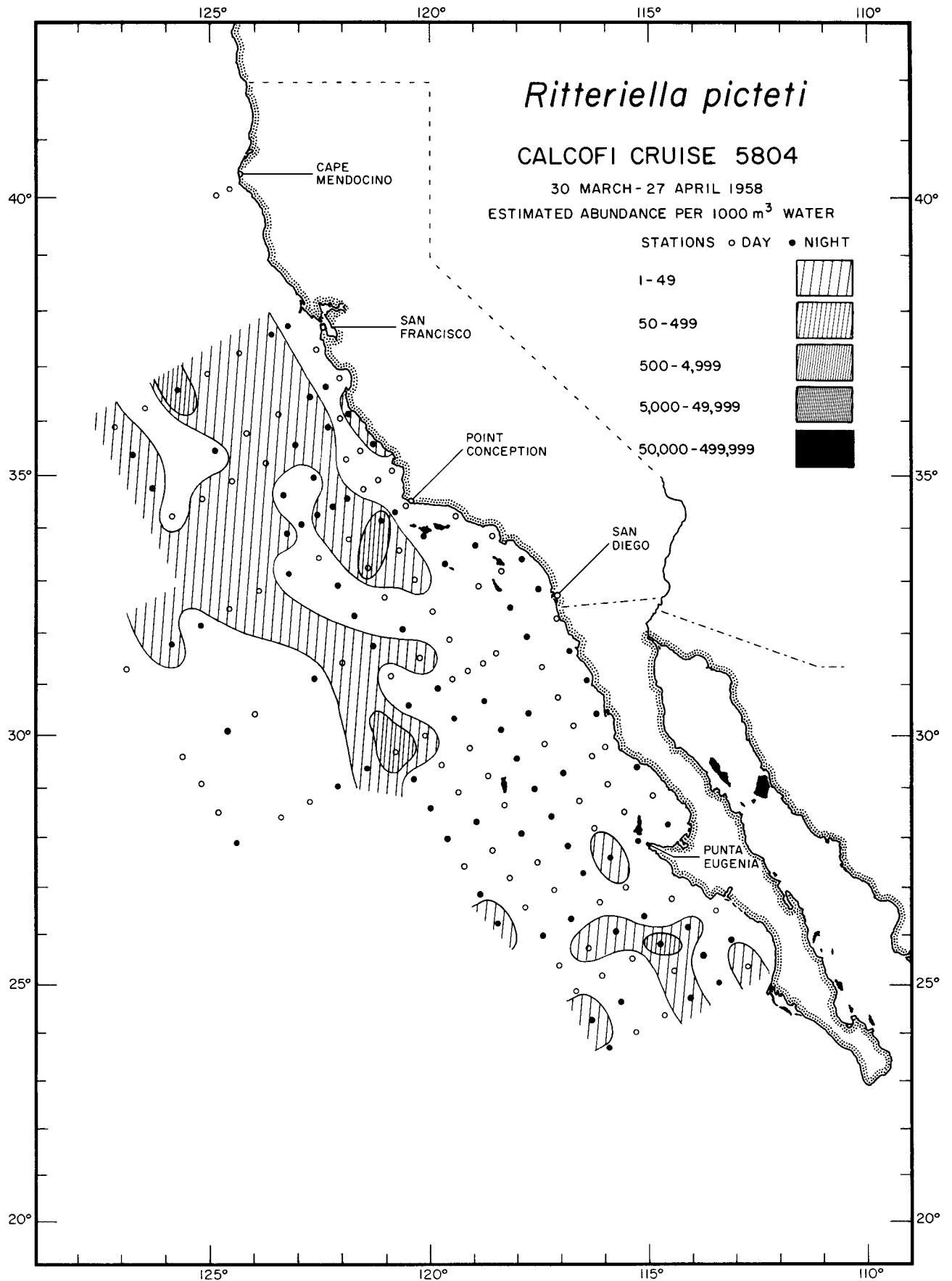
5403



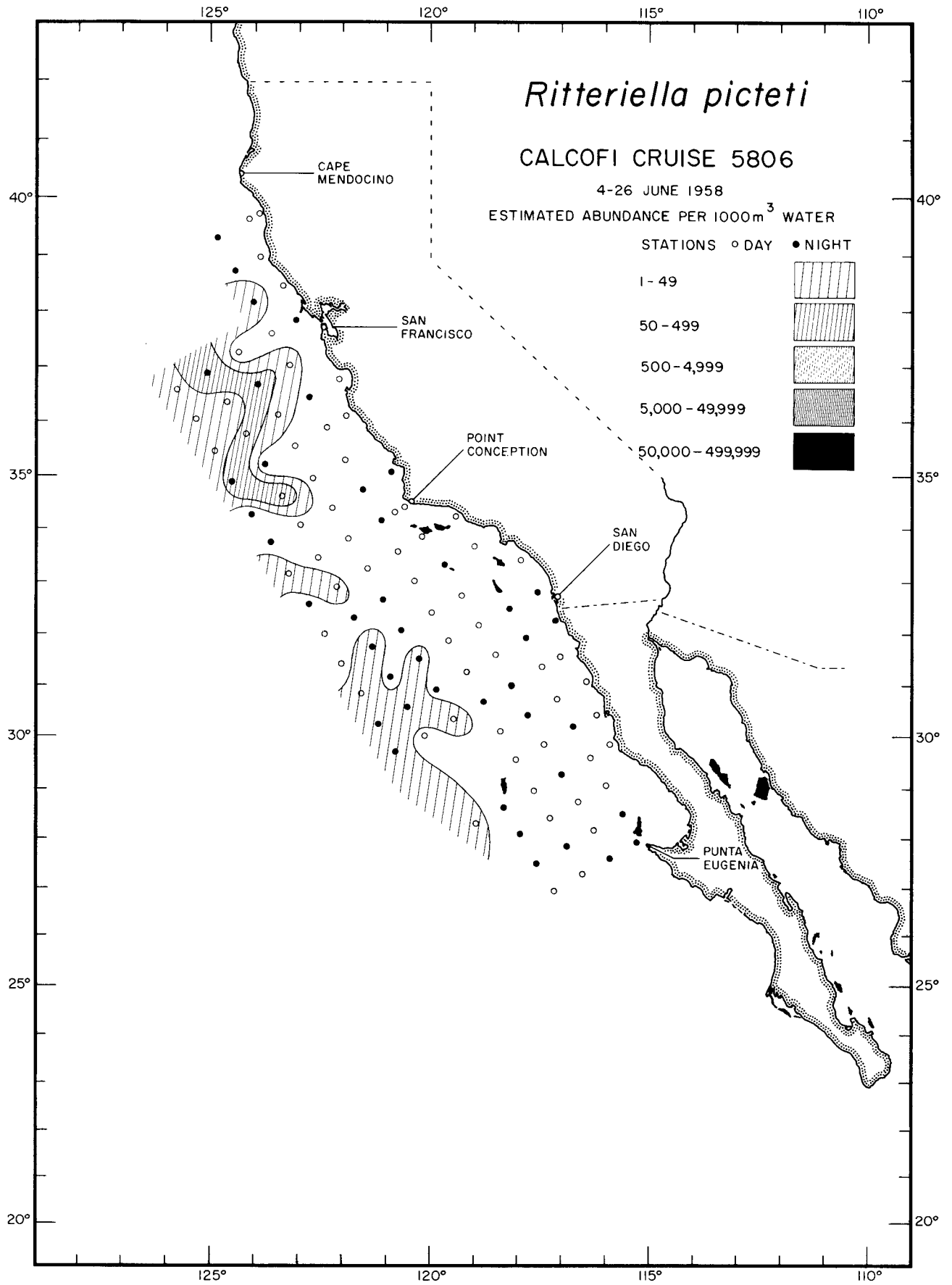
Thaliacea

Ritteriella picteti

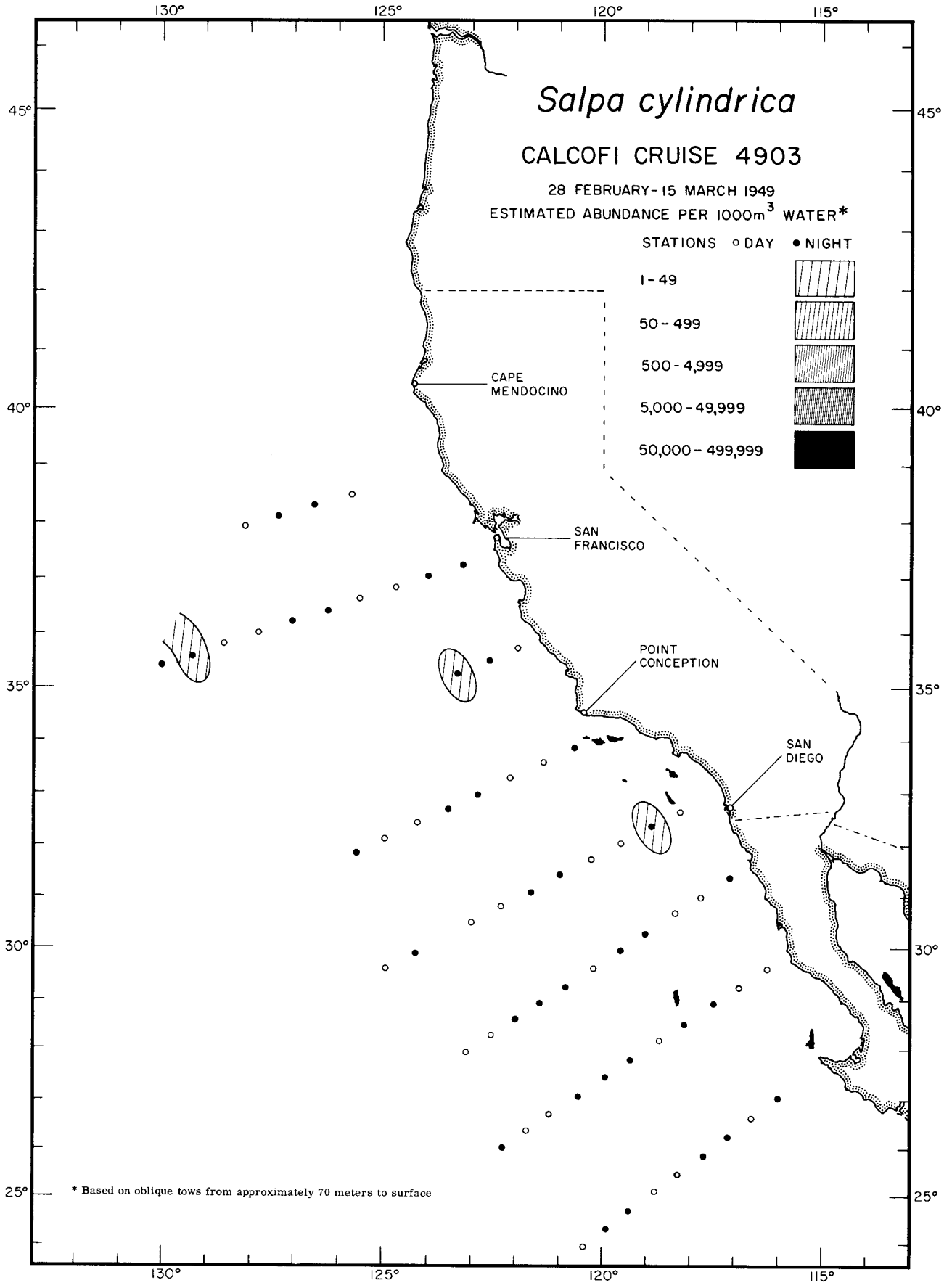
5404



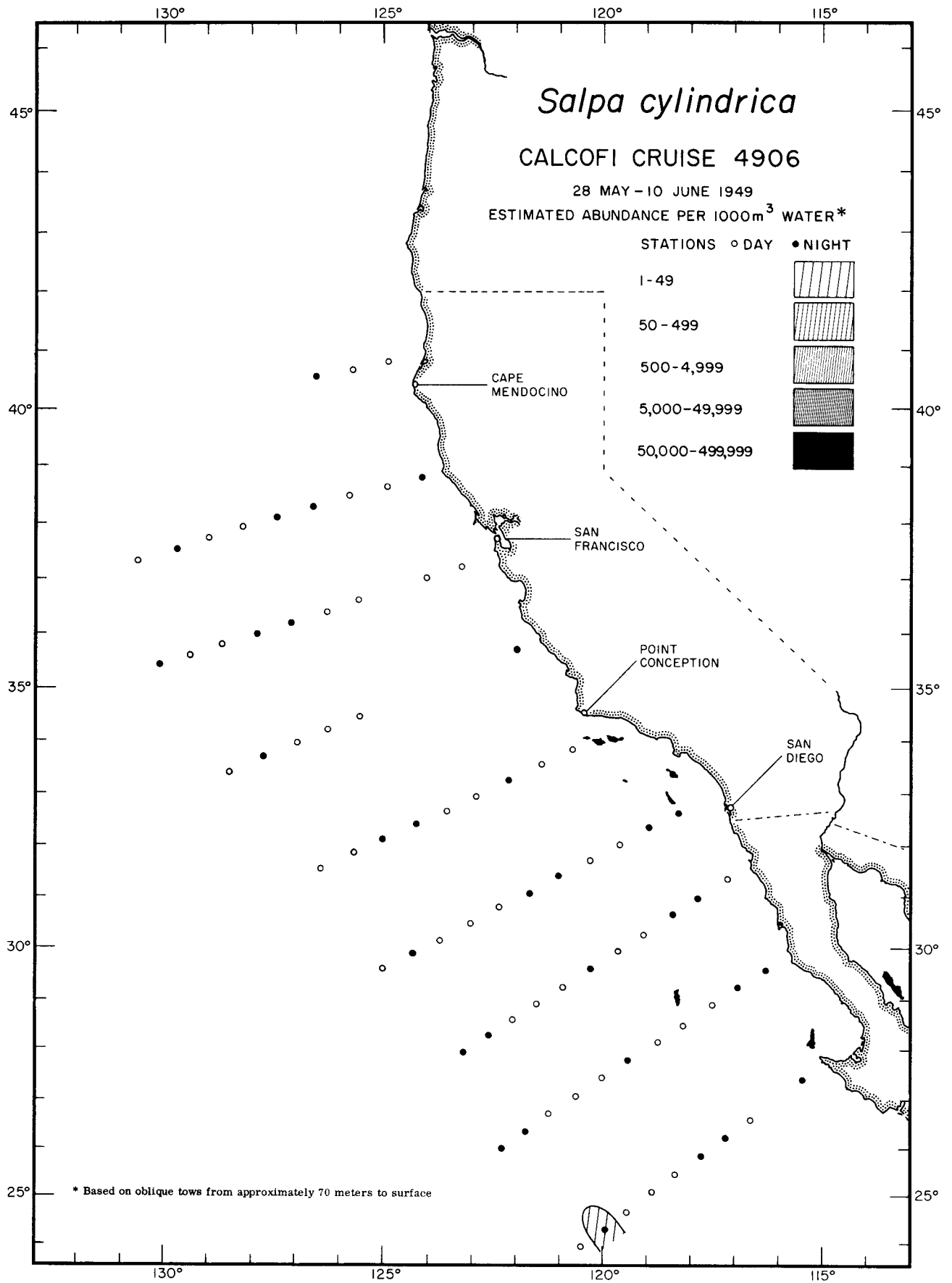
Thaliacea
Ritteriella picteti
5804



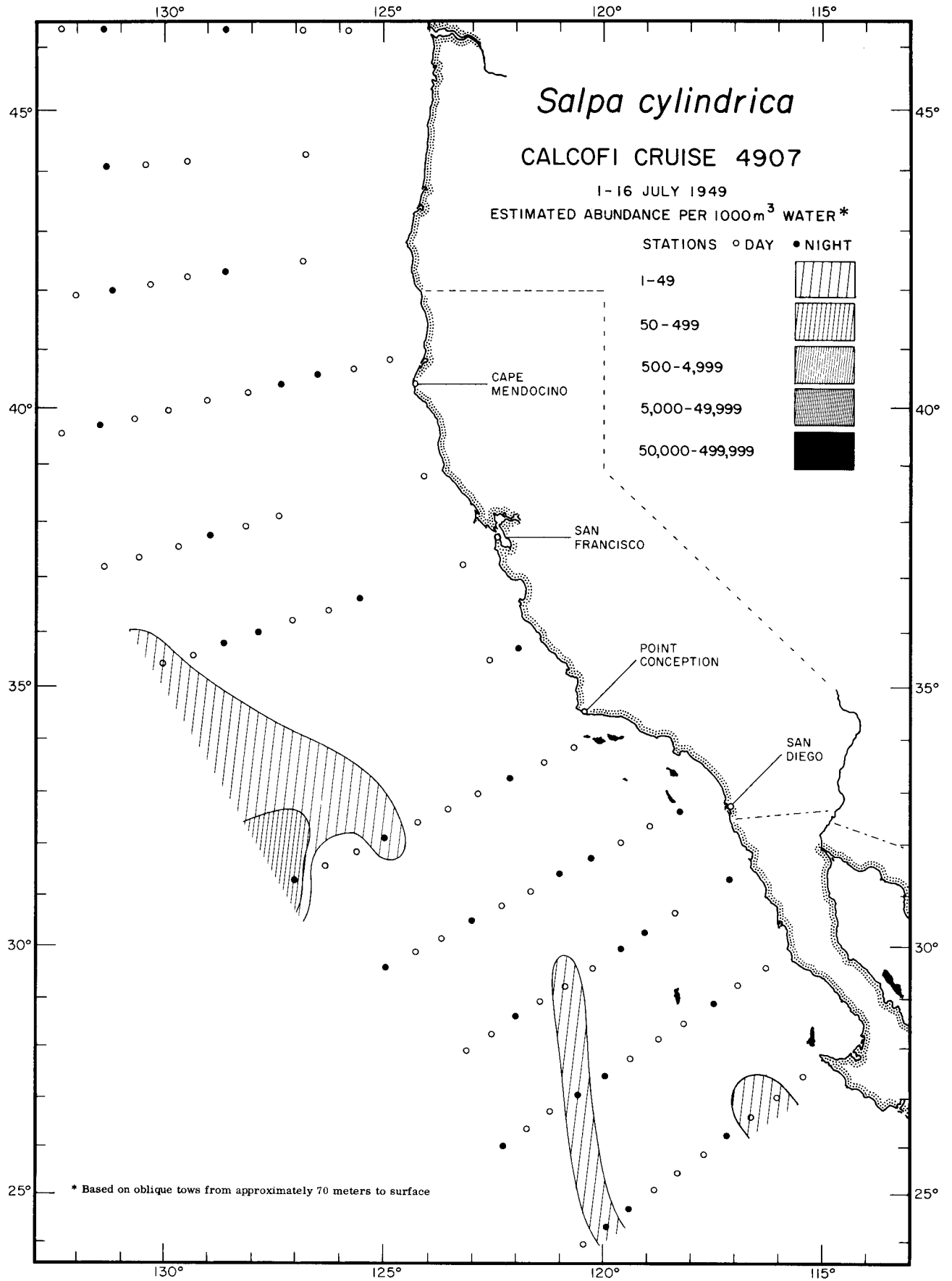
Thaliacea
Ritteriella picteti
5806



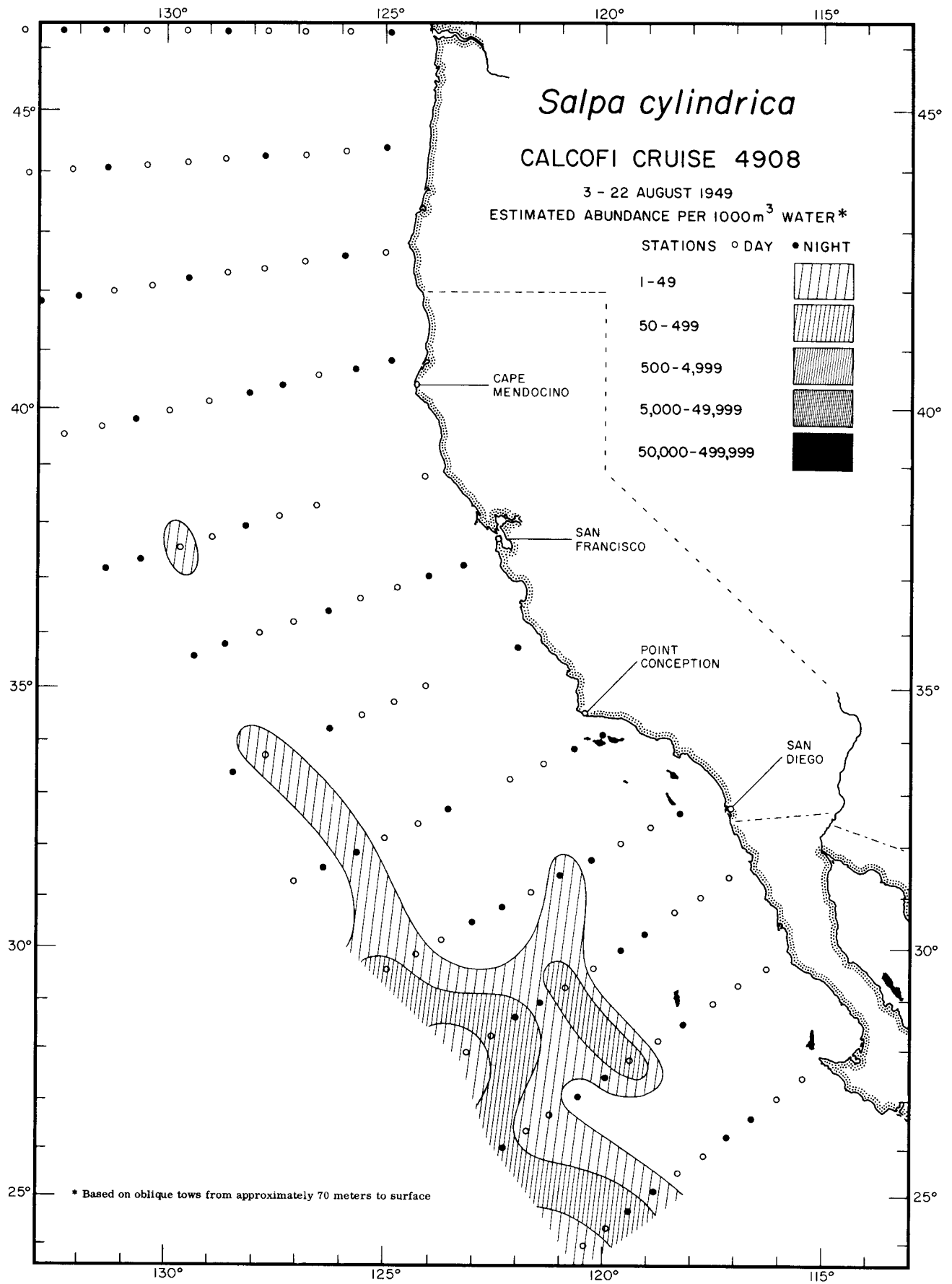
Thaliacea
Salpa cylindrica
4903



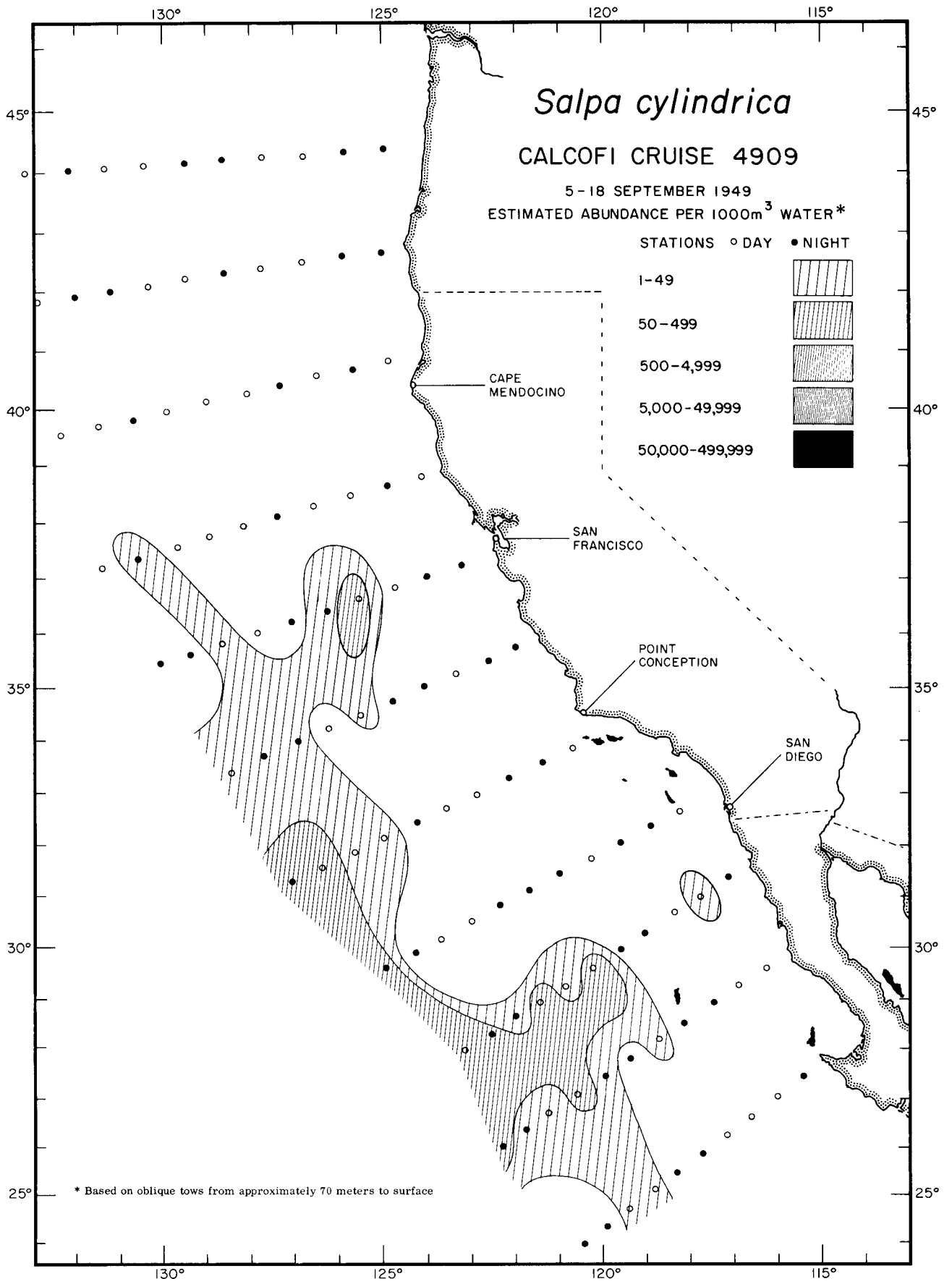
Thaliacea
Salpa cylindrica
4906



Thaliacea
Salpa cylindrica
4907

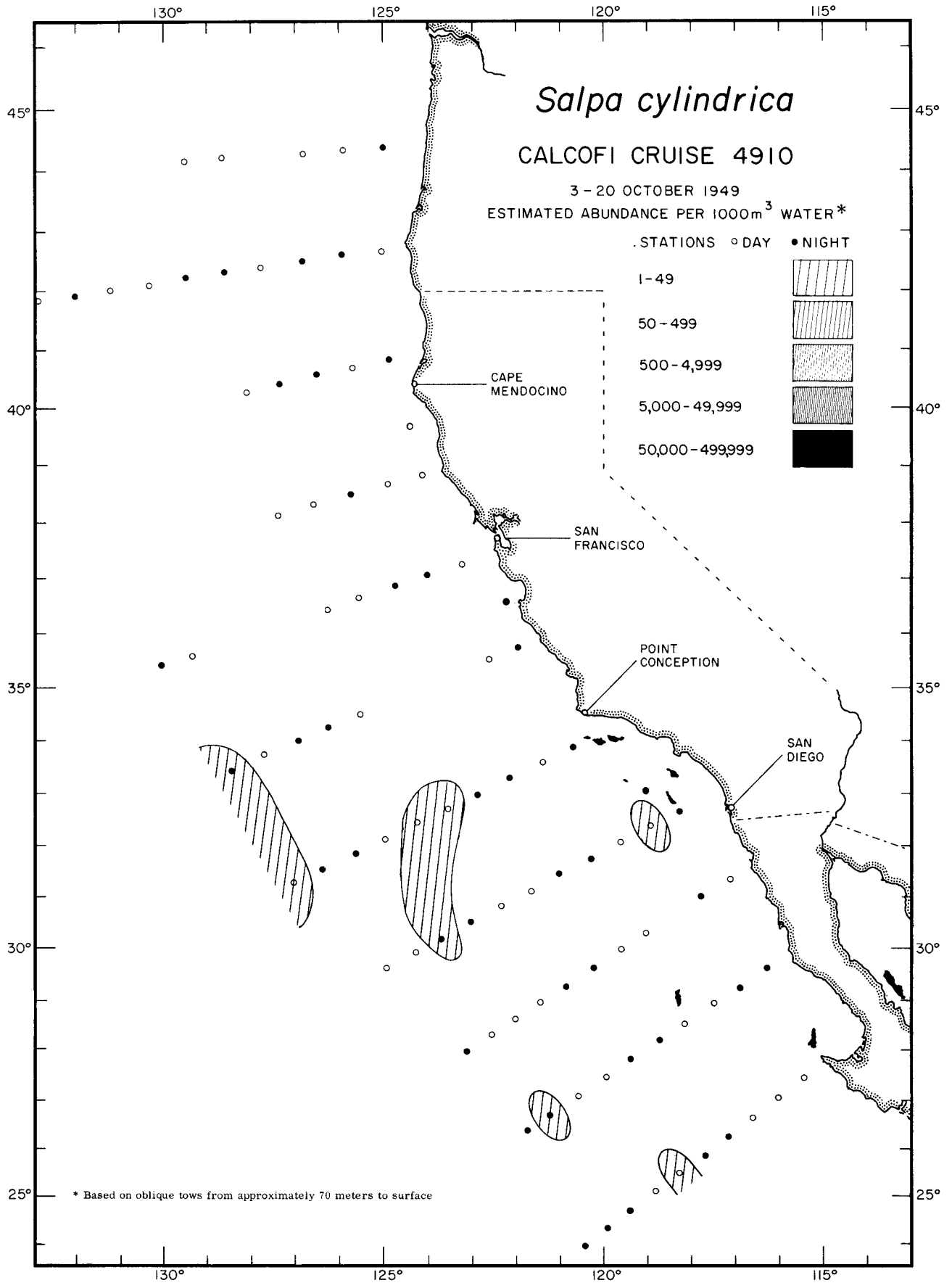


Thaliacea
Salpa cylindrica
4908

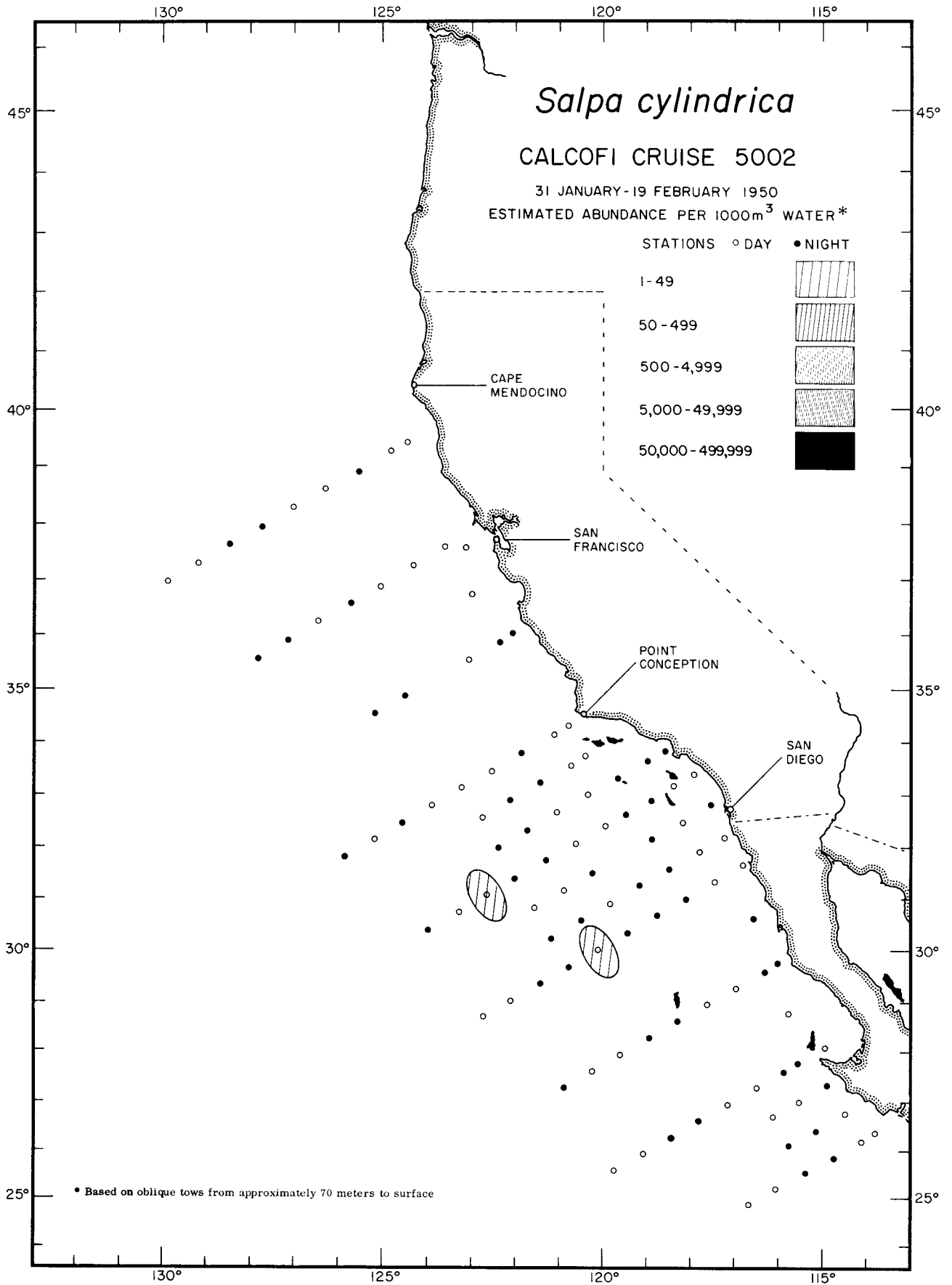


Thaliacea

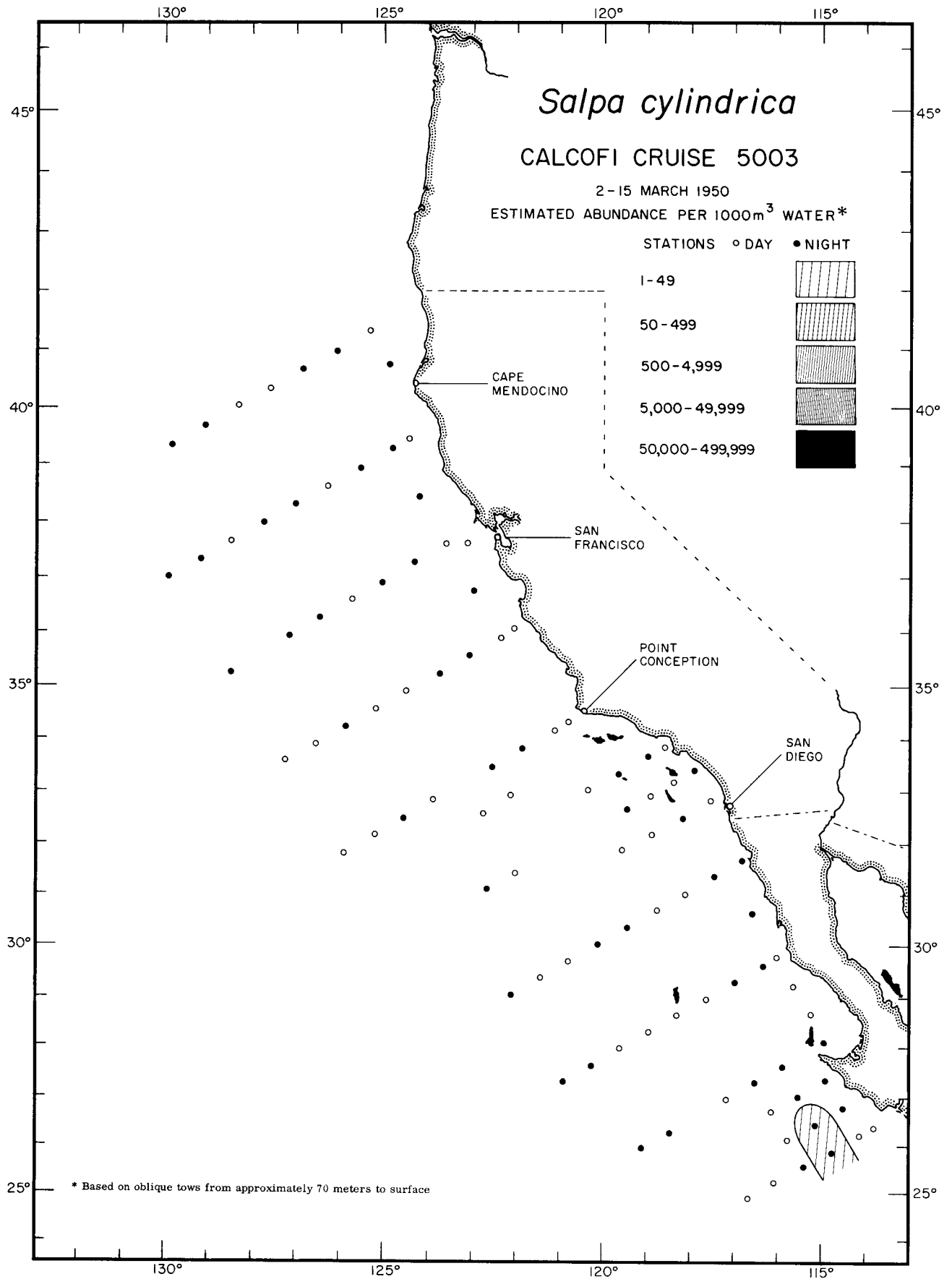
Salpa cylindrica
 4909



Thaliacea
Salpa cylindrica
4910



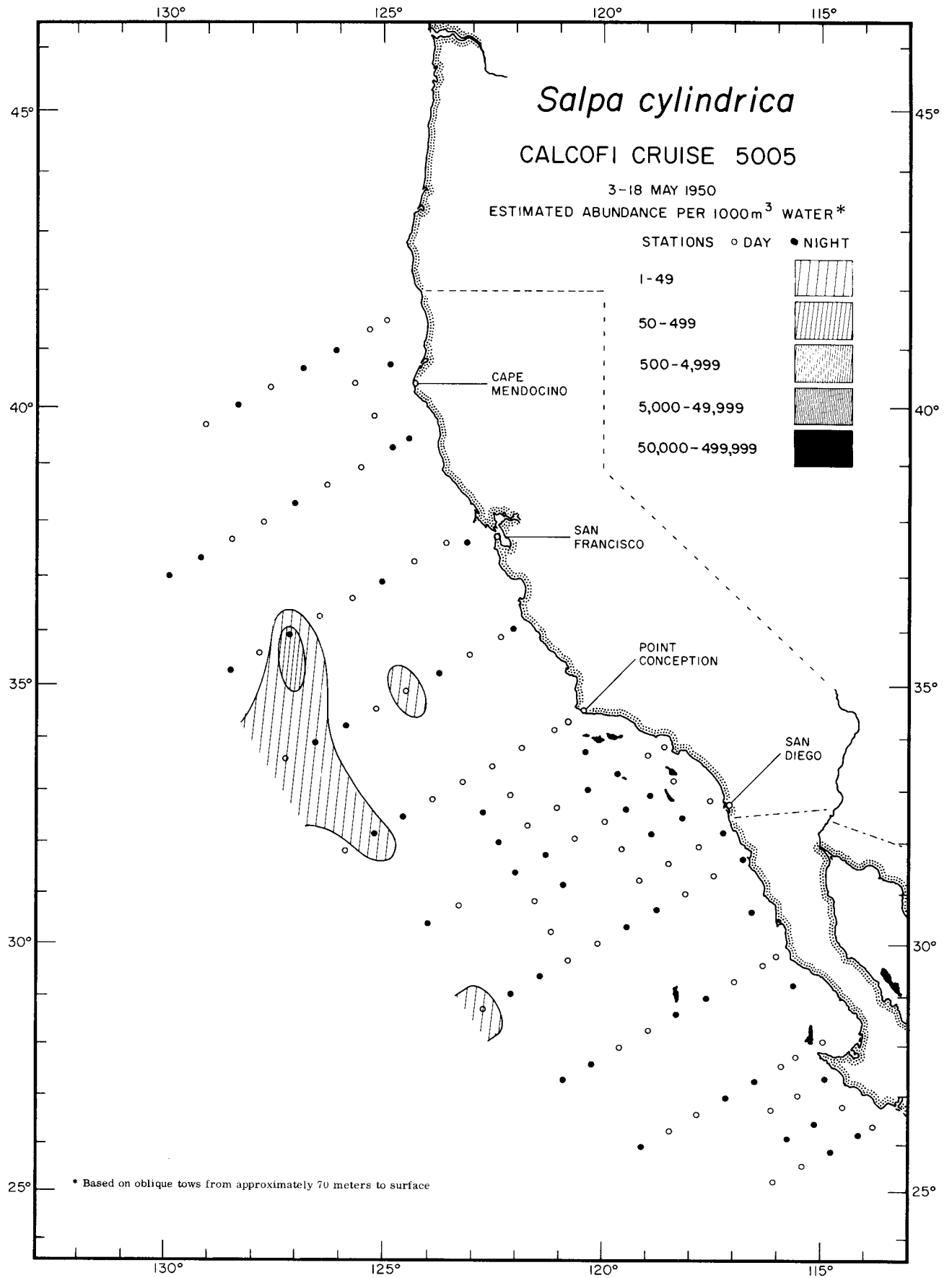
Thaliacea
Salpa cylindrica
 5002



Thaliacea

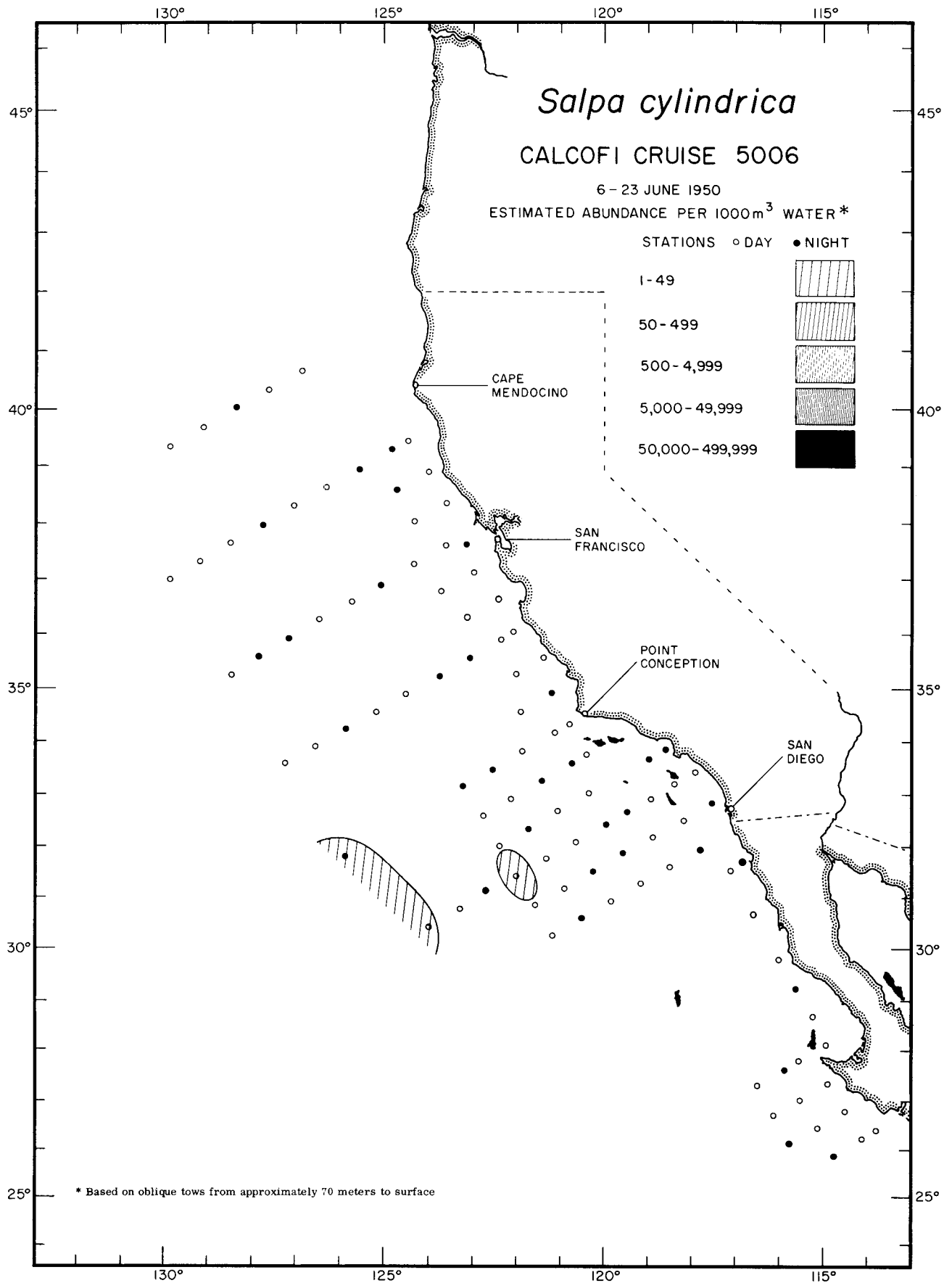
Salpa cylindrica

5003



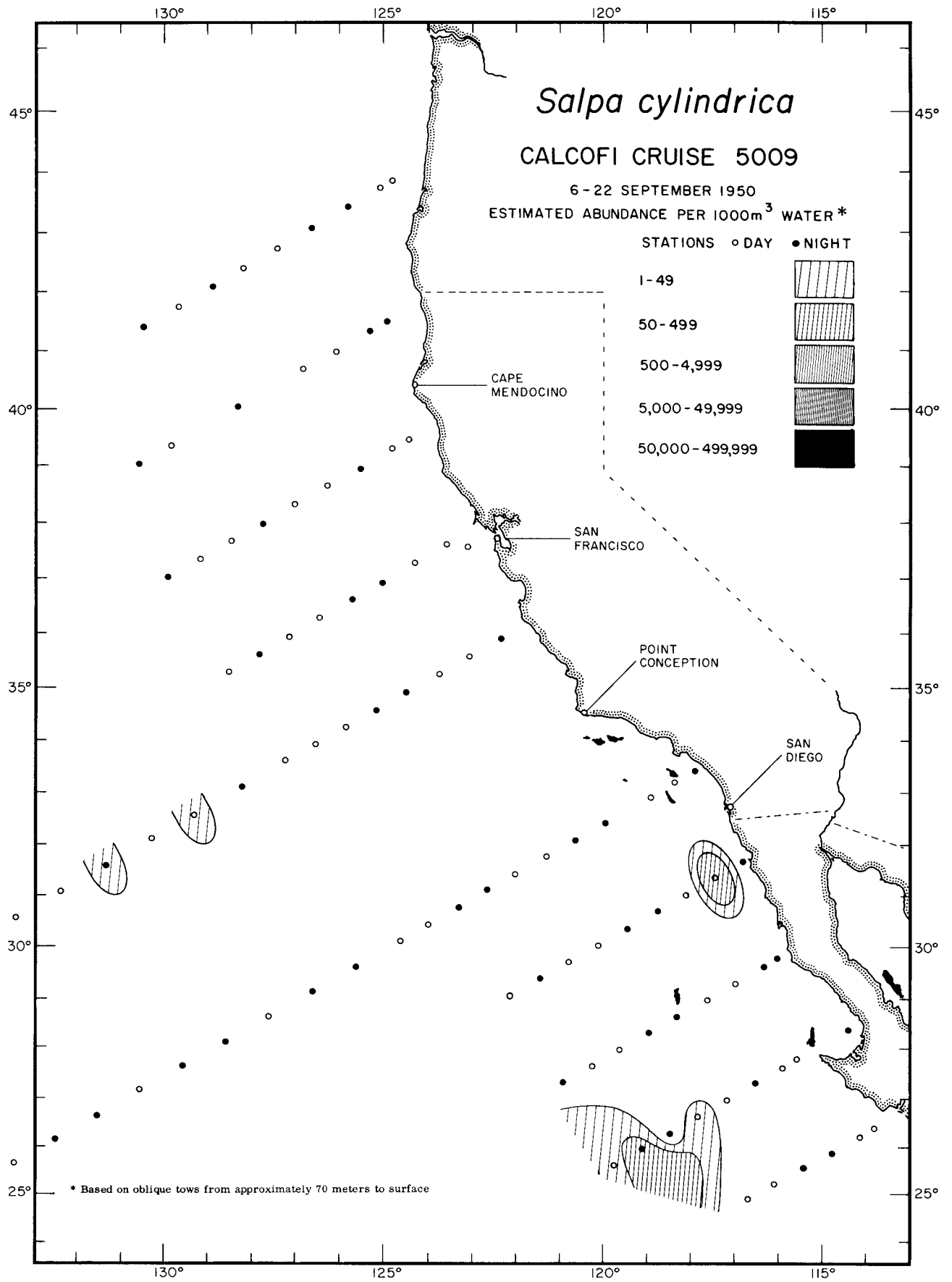
Thaliacea

Salpa cylindrica
5005



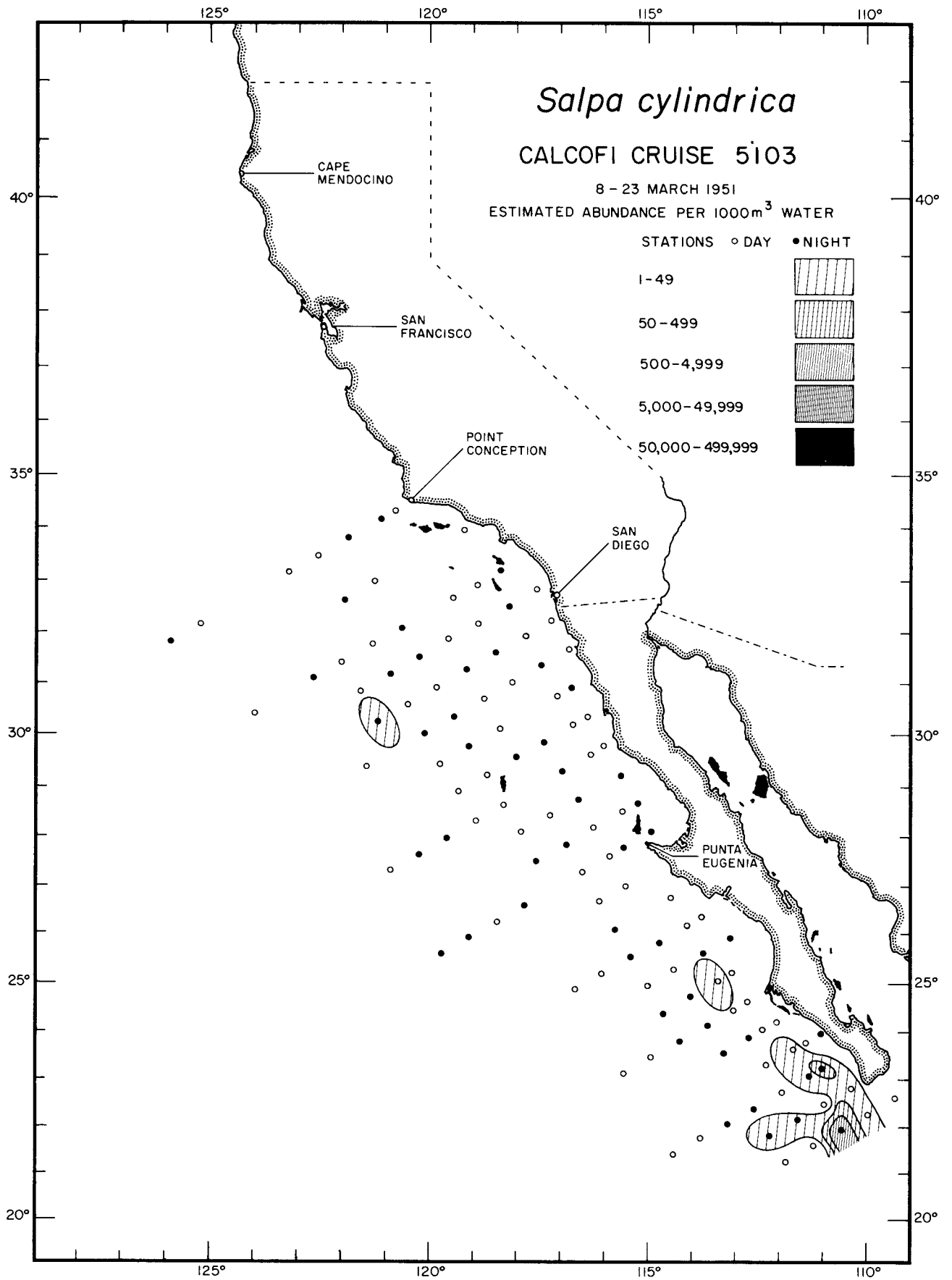
Thaliacea

Salpa cylindrica
5006

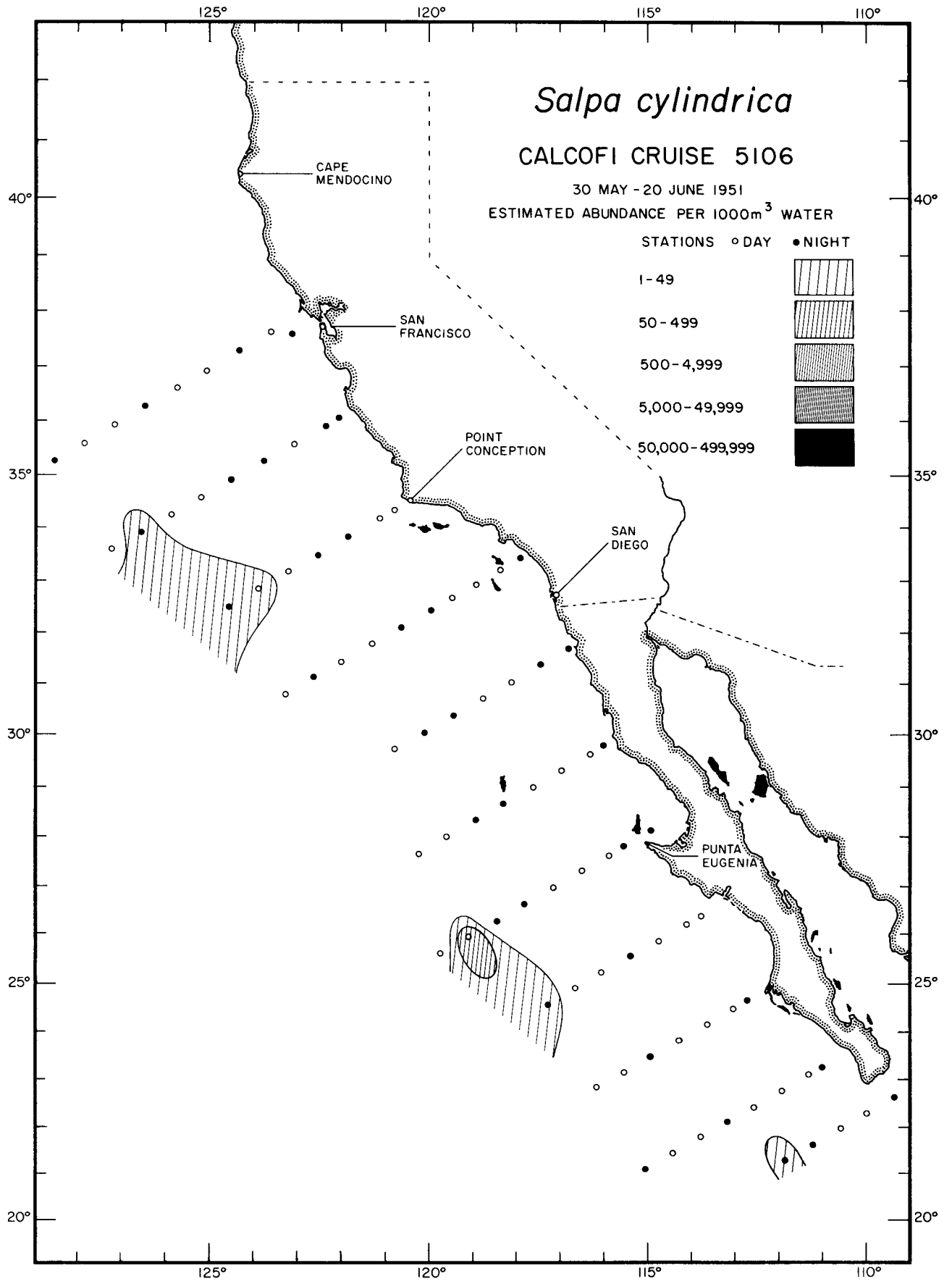


Thaliacea

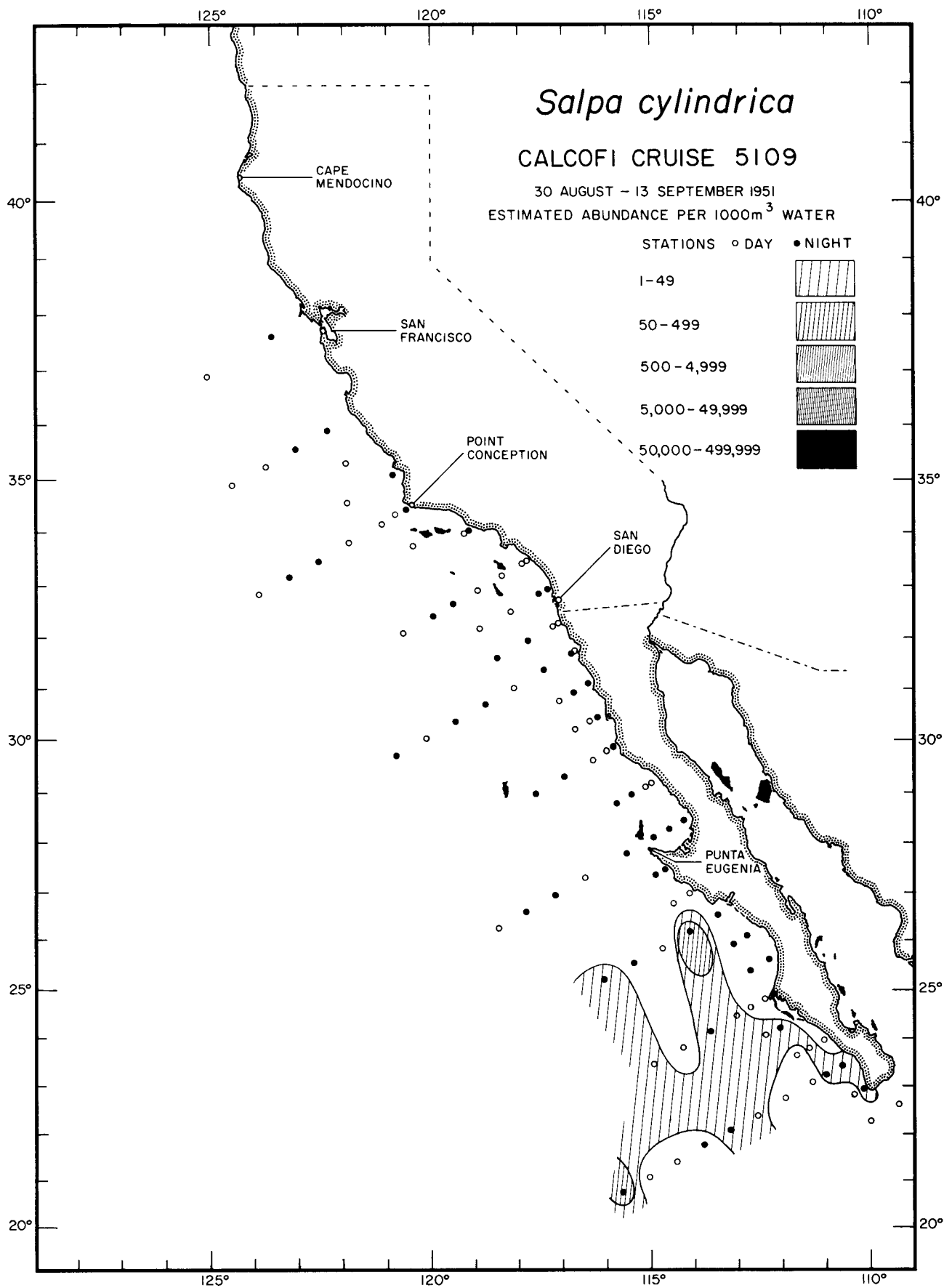
Salpa cylindrica
5009



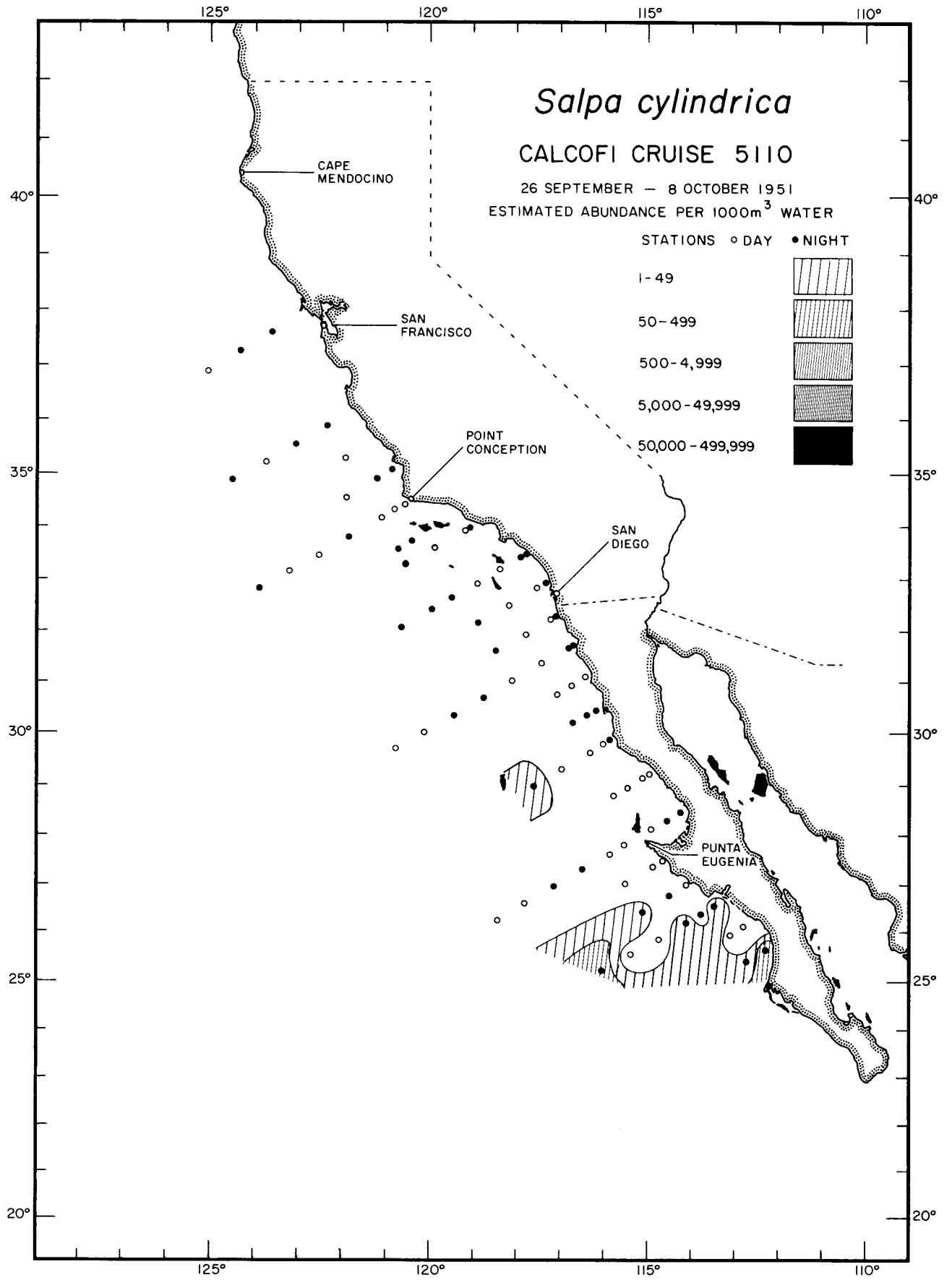
Thaliacea
Salpa cylindrica
5103



Thaliacea
Salpa cylindrica
5106

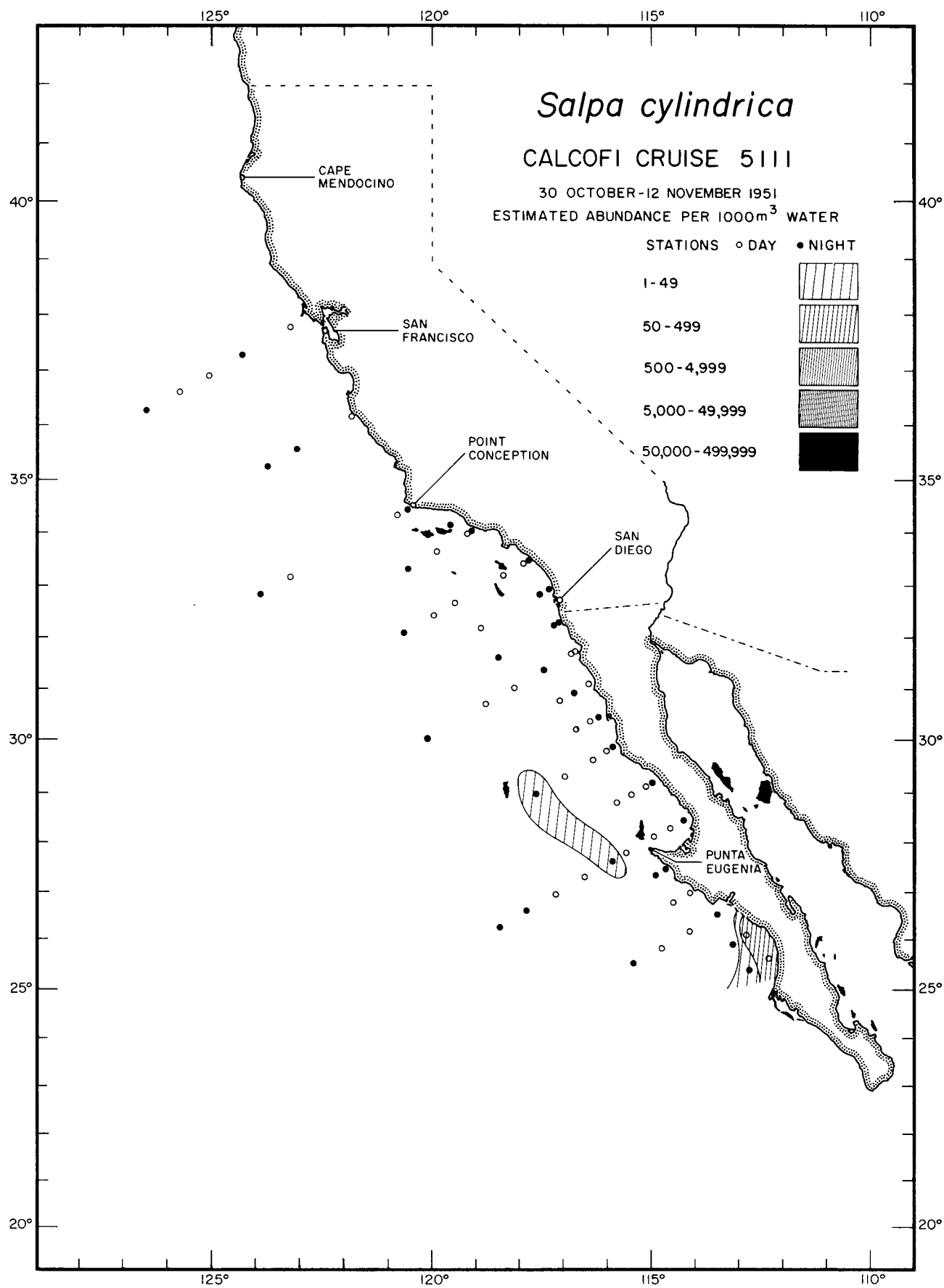


Thaliacea
Salpa cylindrica
 5109

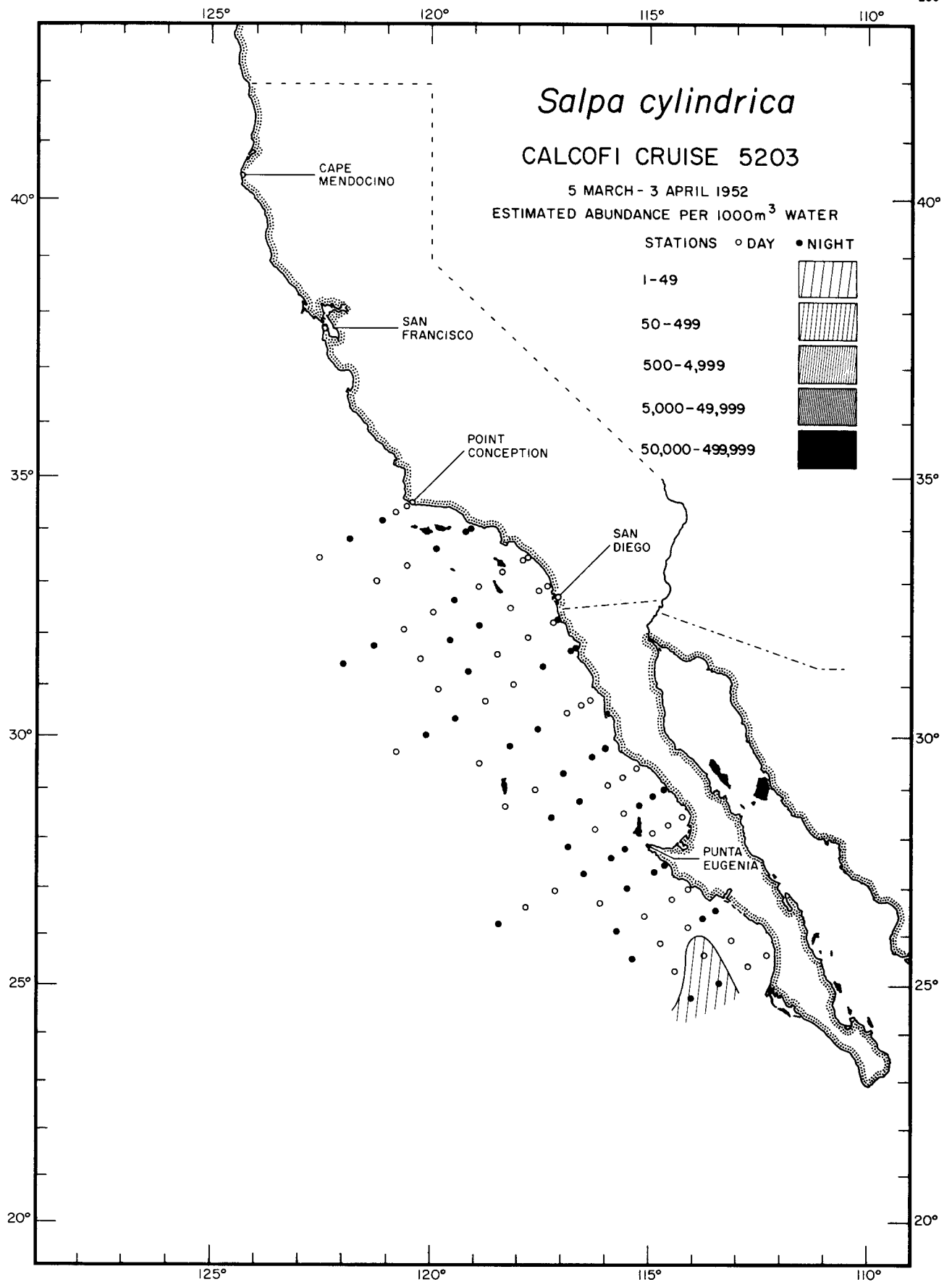


Thaliacea

Salpa cylindrica
5110



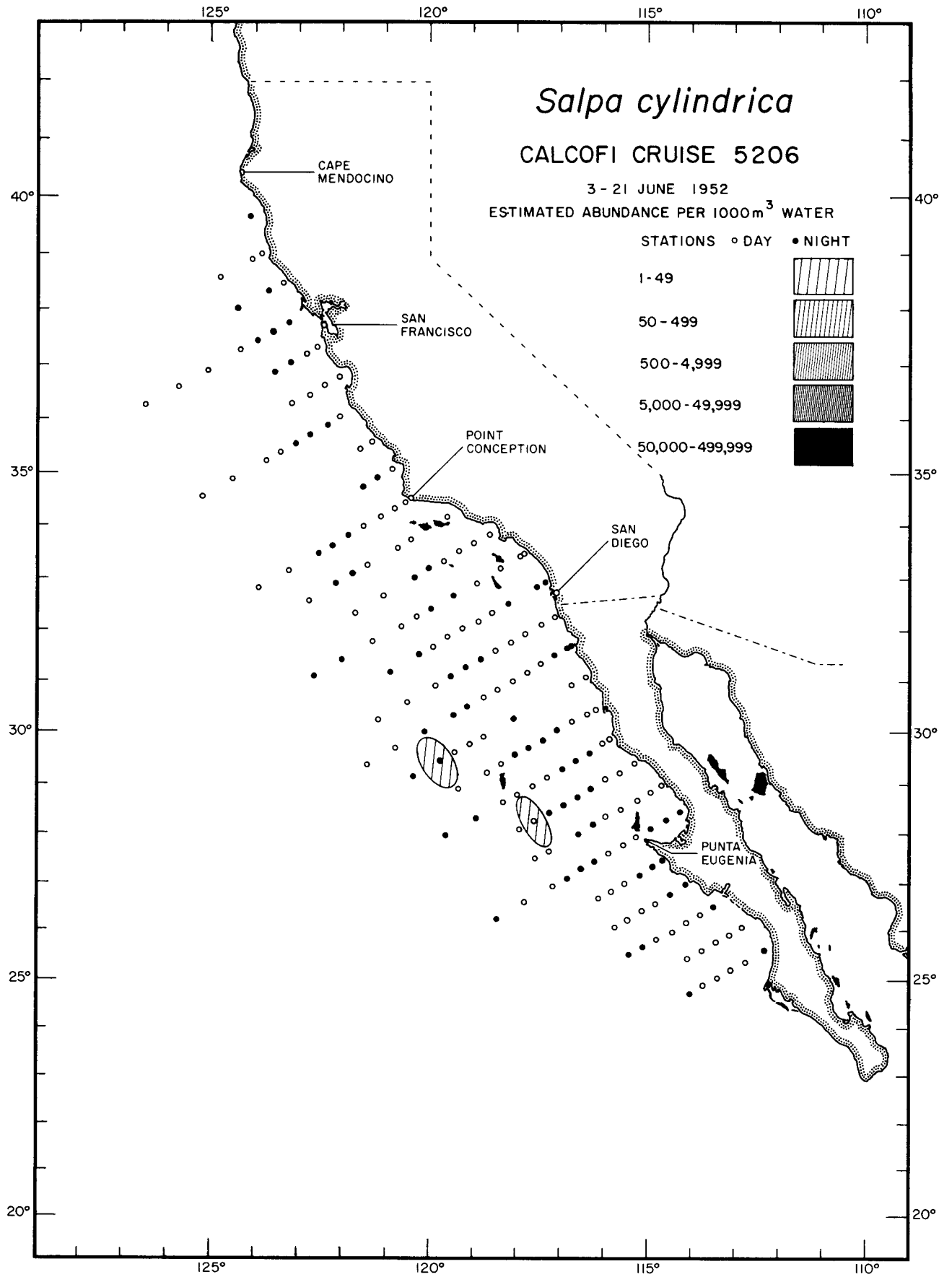
Thaliacea
Salpa cylindrica
5111



Thaliacea

Salpa cylindrica

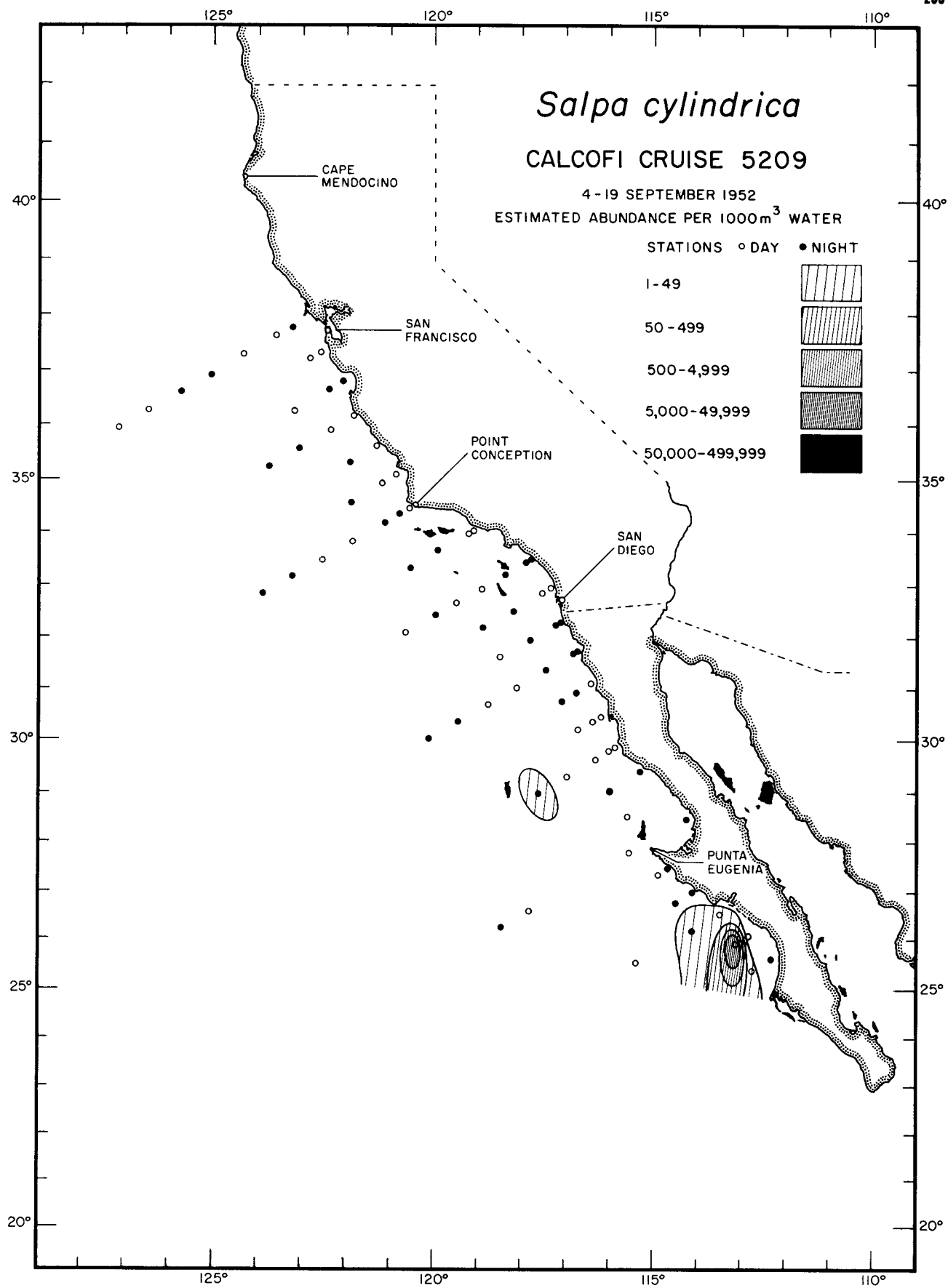
5203



Thaliacea

Salpa cylindrica

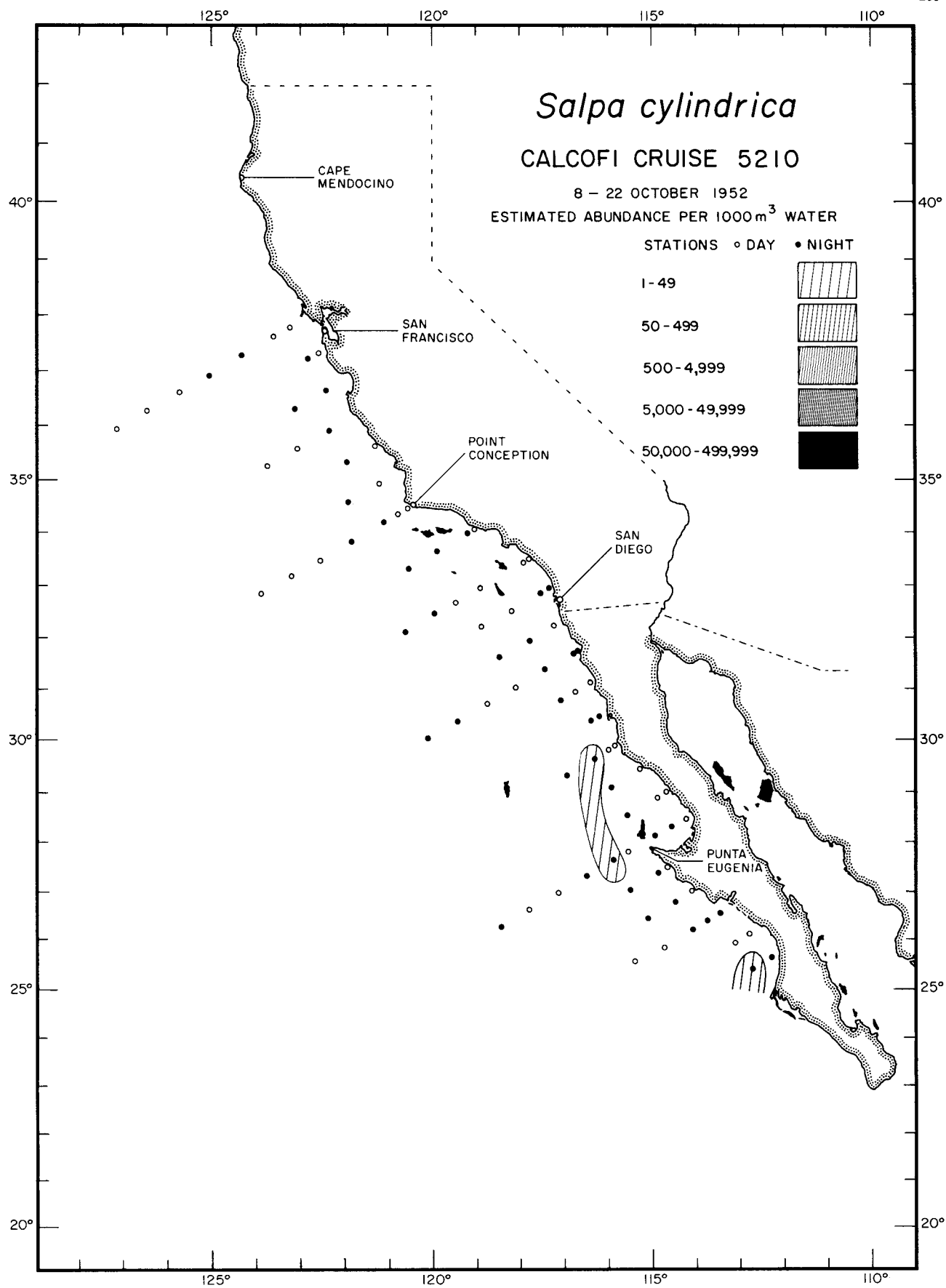
5206



Thaliacea

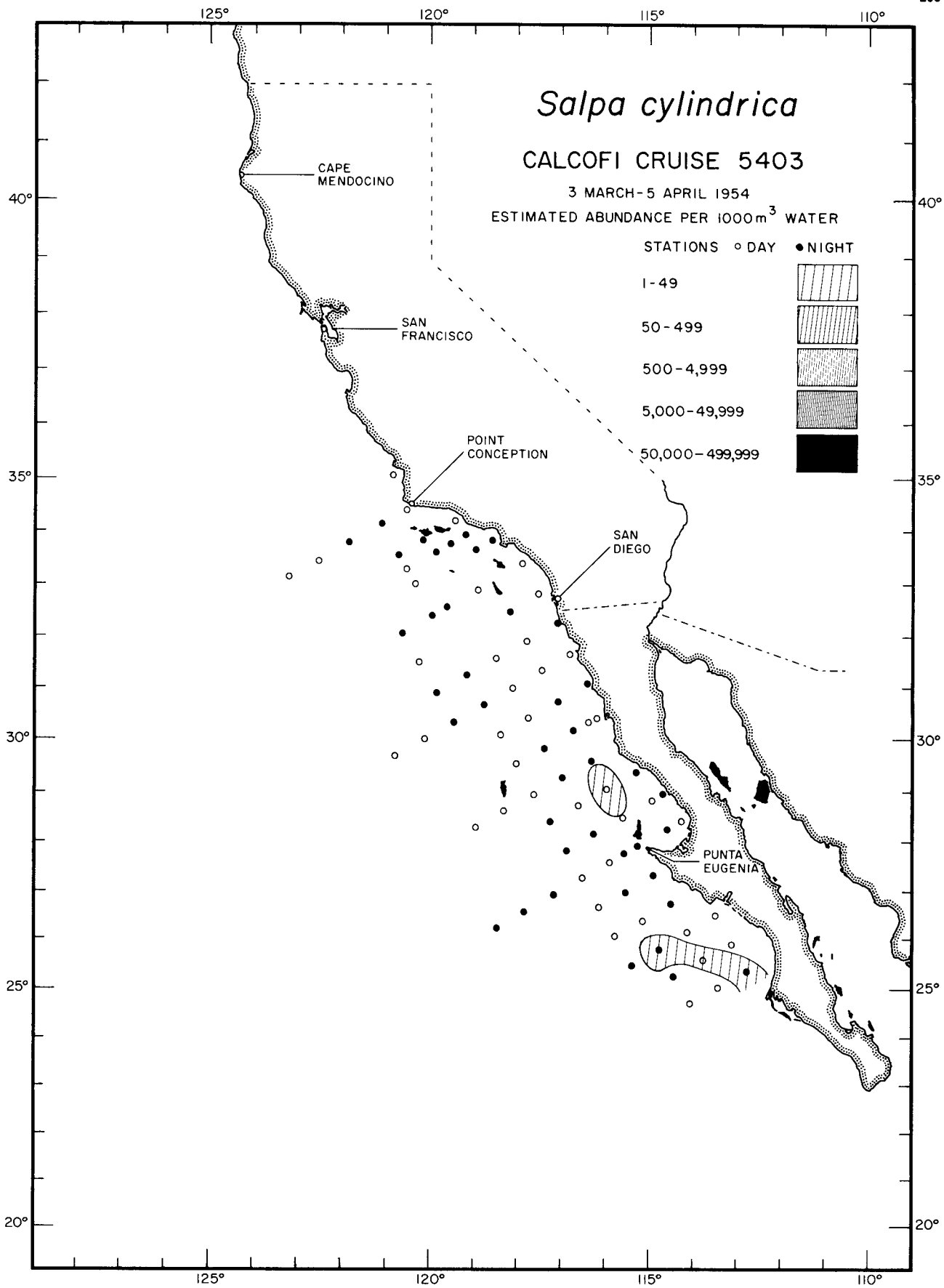
Salpa cylindrica

5209

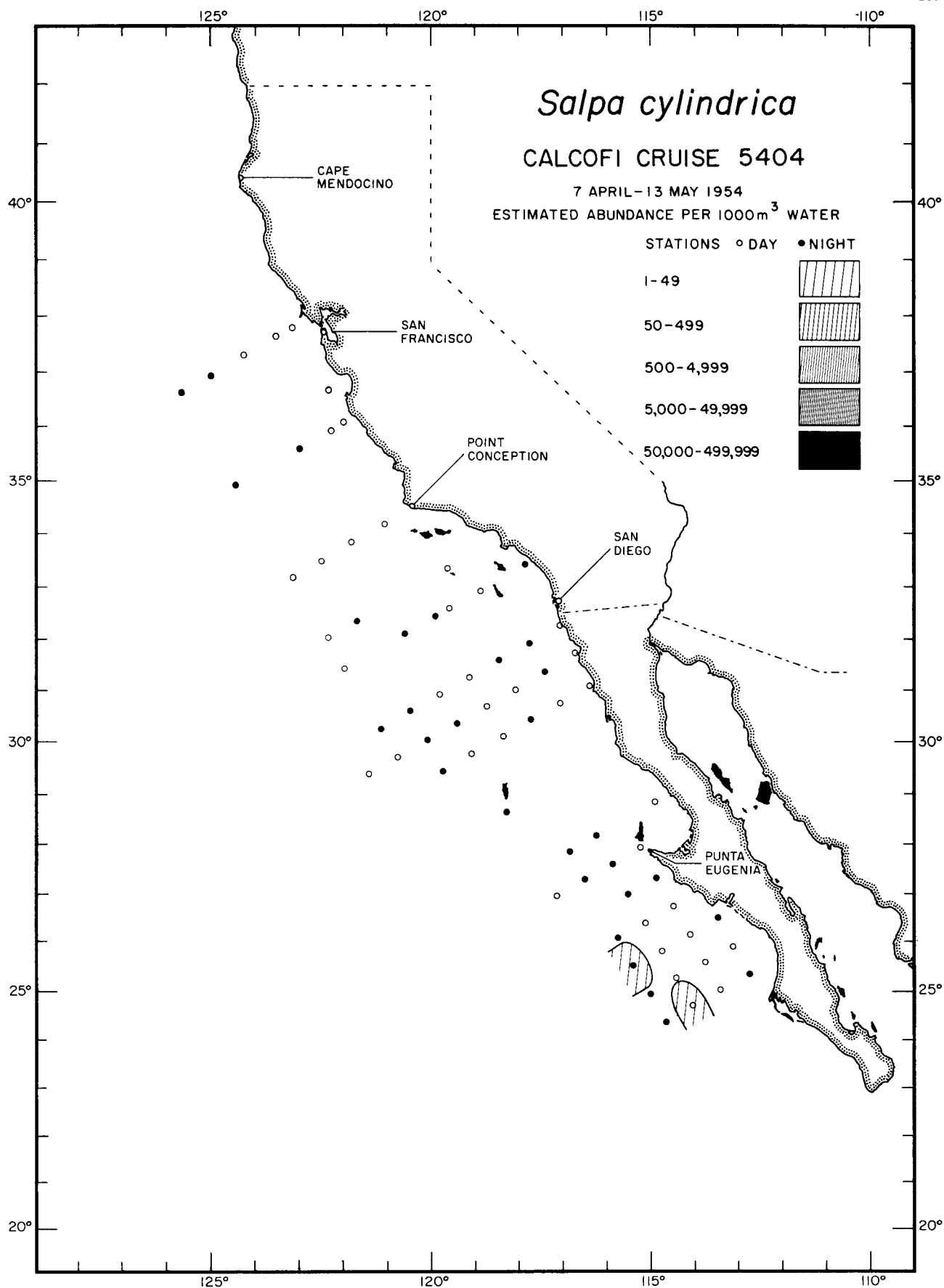


Thaliacea

Salpa cylindrica
5210

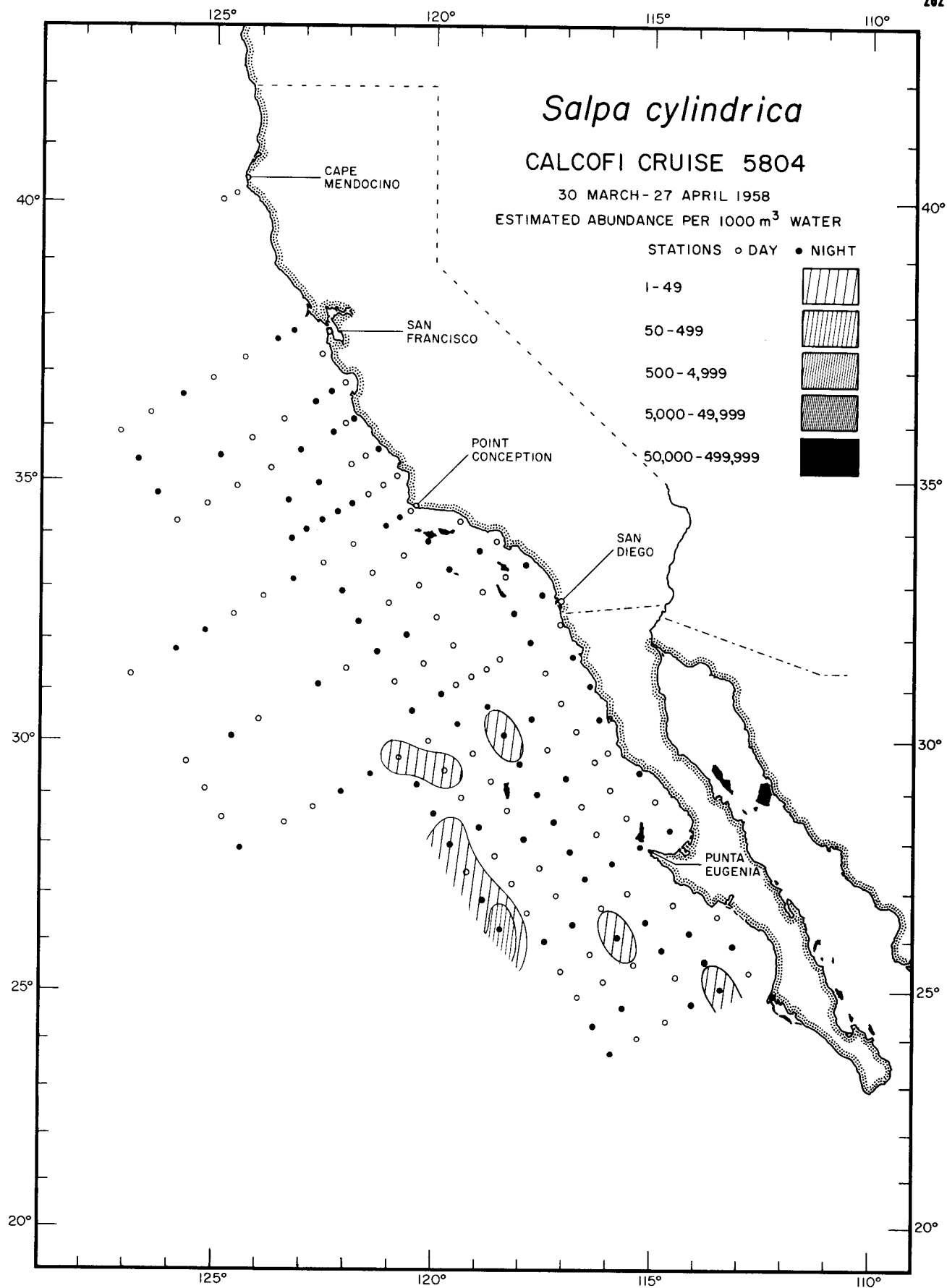


Thaliacea
Salpa cylindrica
5403



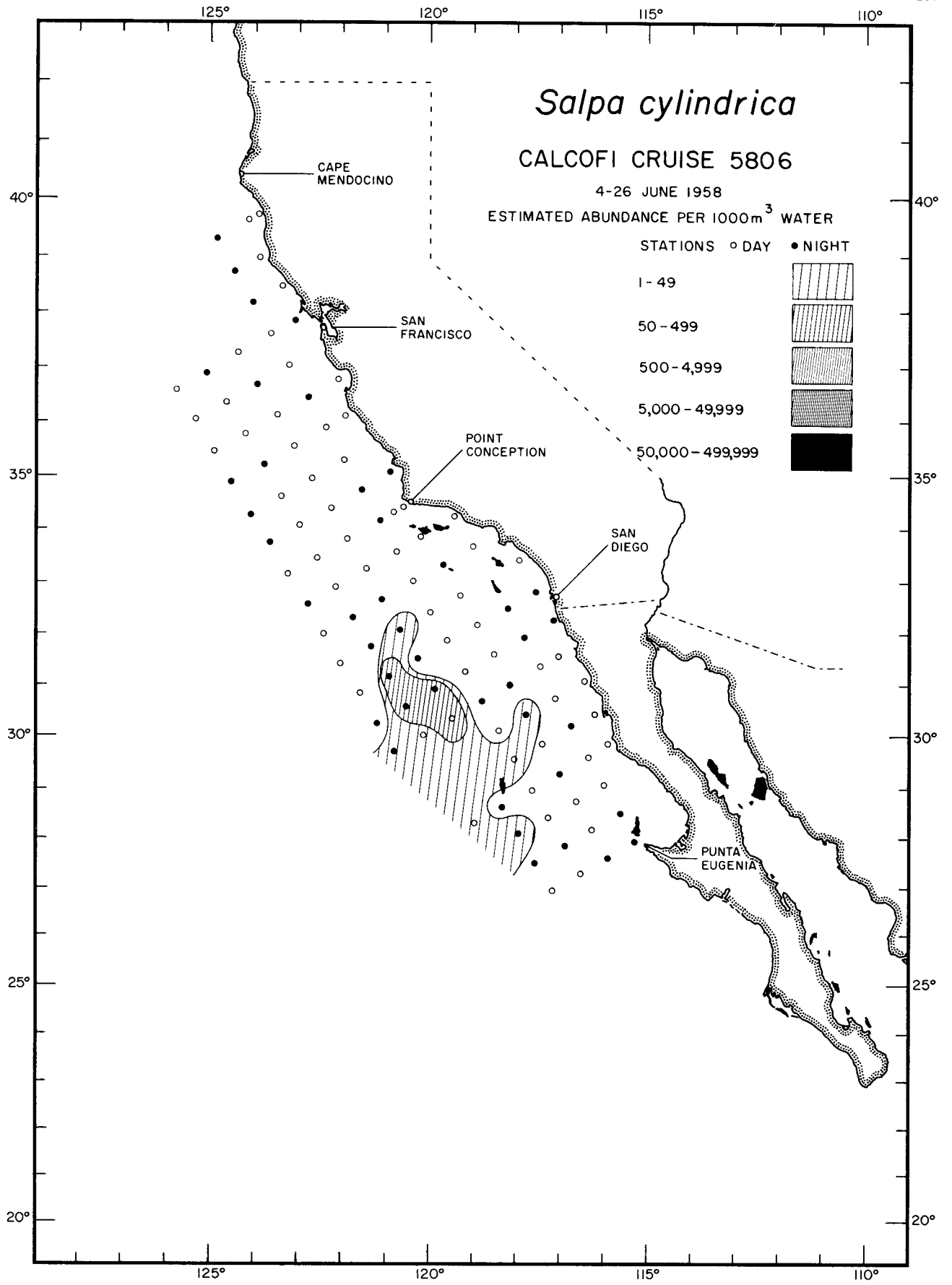
Thaliacea

Salpa cylindrica
5404

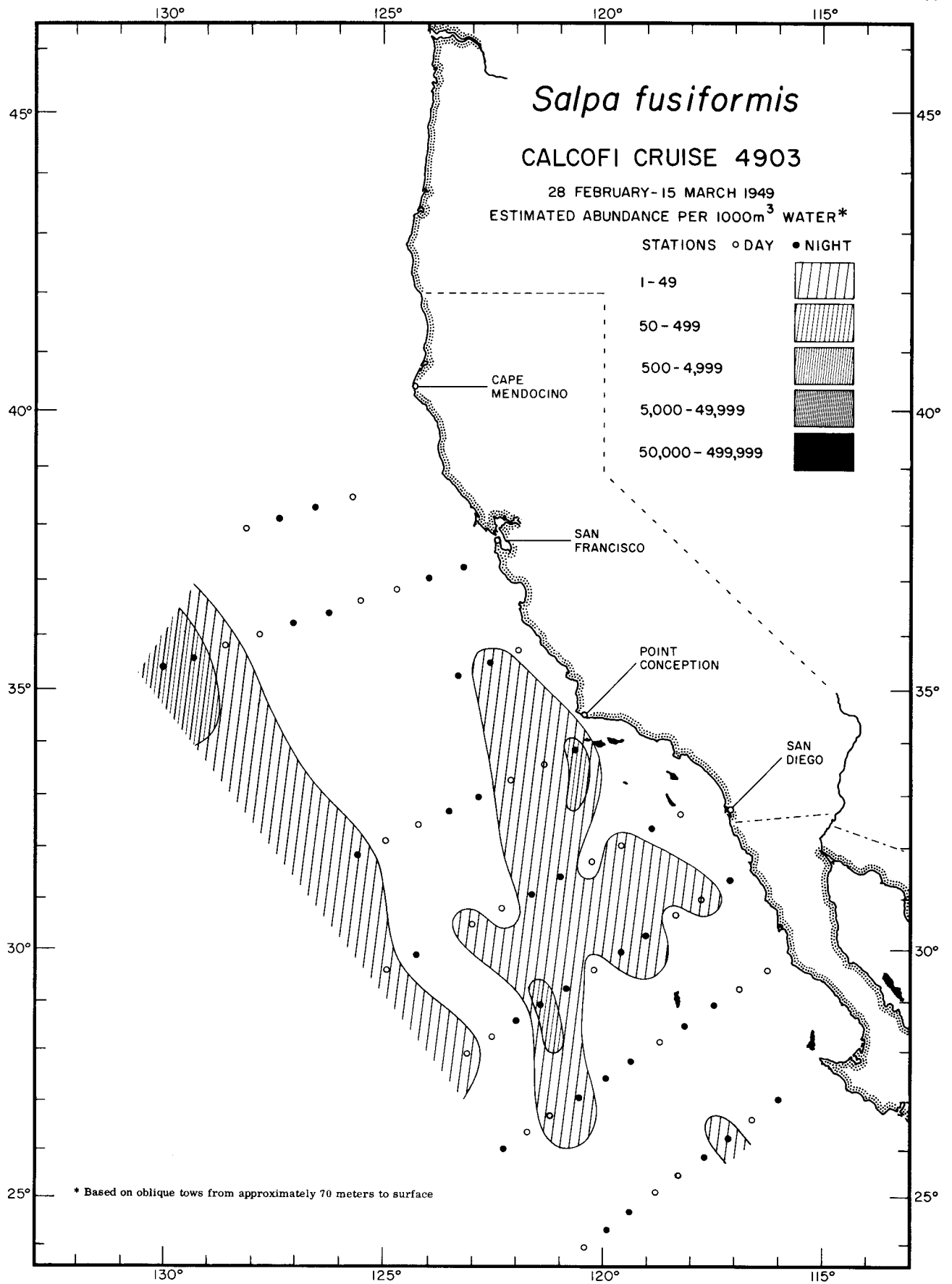


Thaliacea

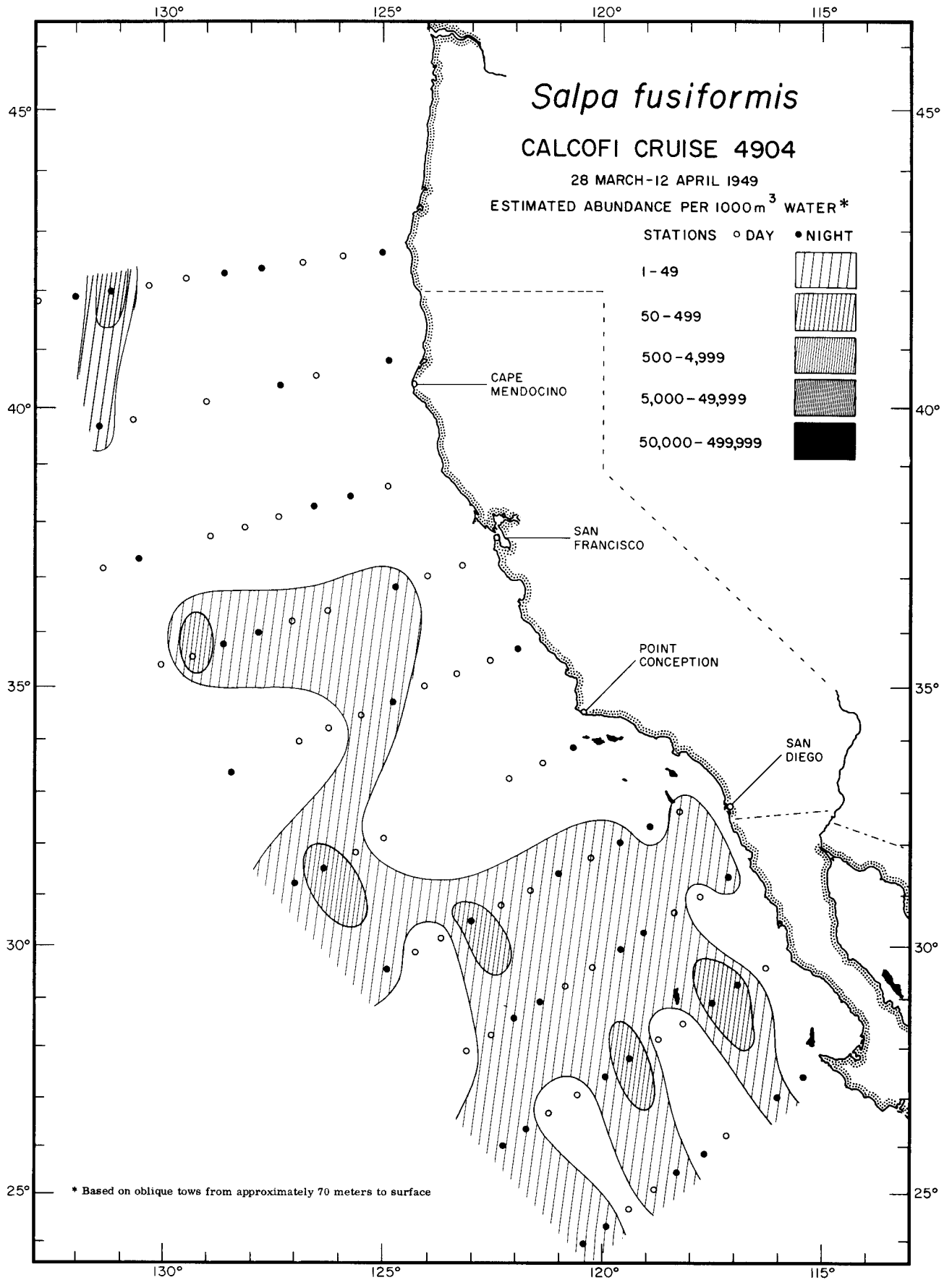
Salpa cylindrica
5804



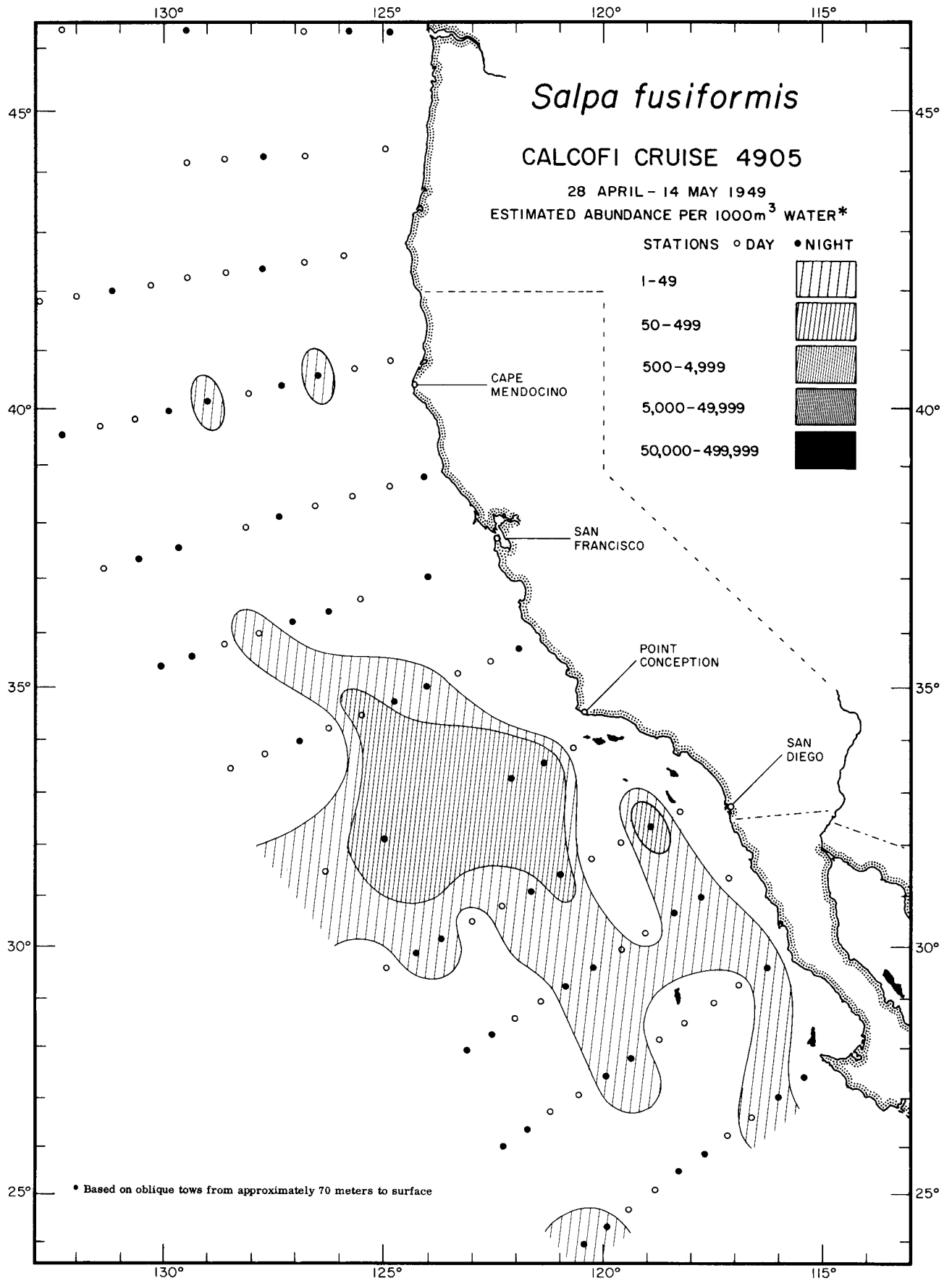
Thaliacea
Salpa cylindrica
5806



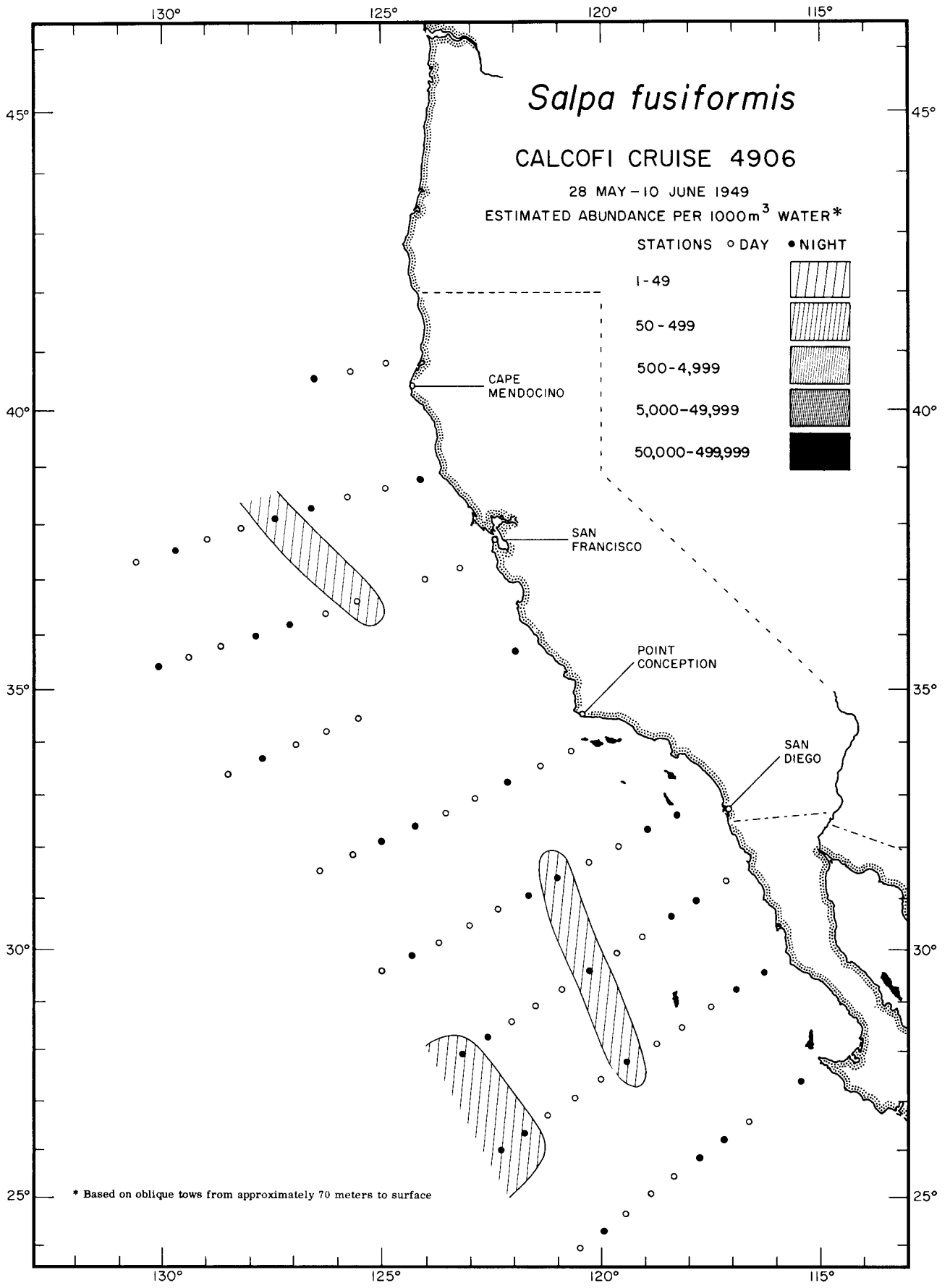
Thaliacea
Salpa fusiformis
4903



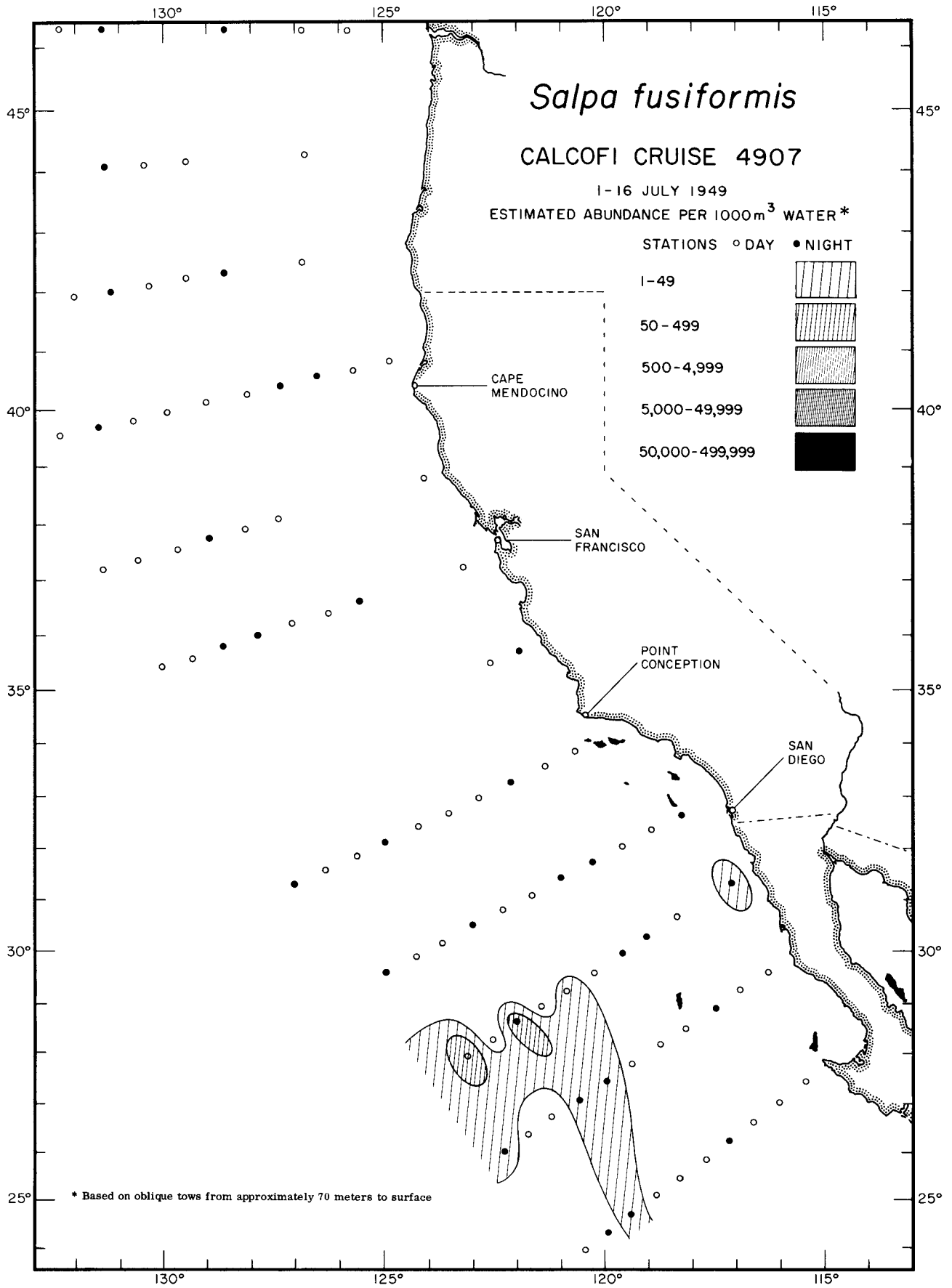
Thaliacea
Salpa fusiformis
4904



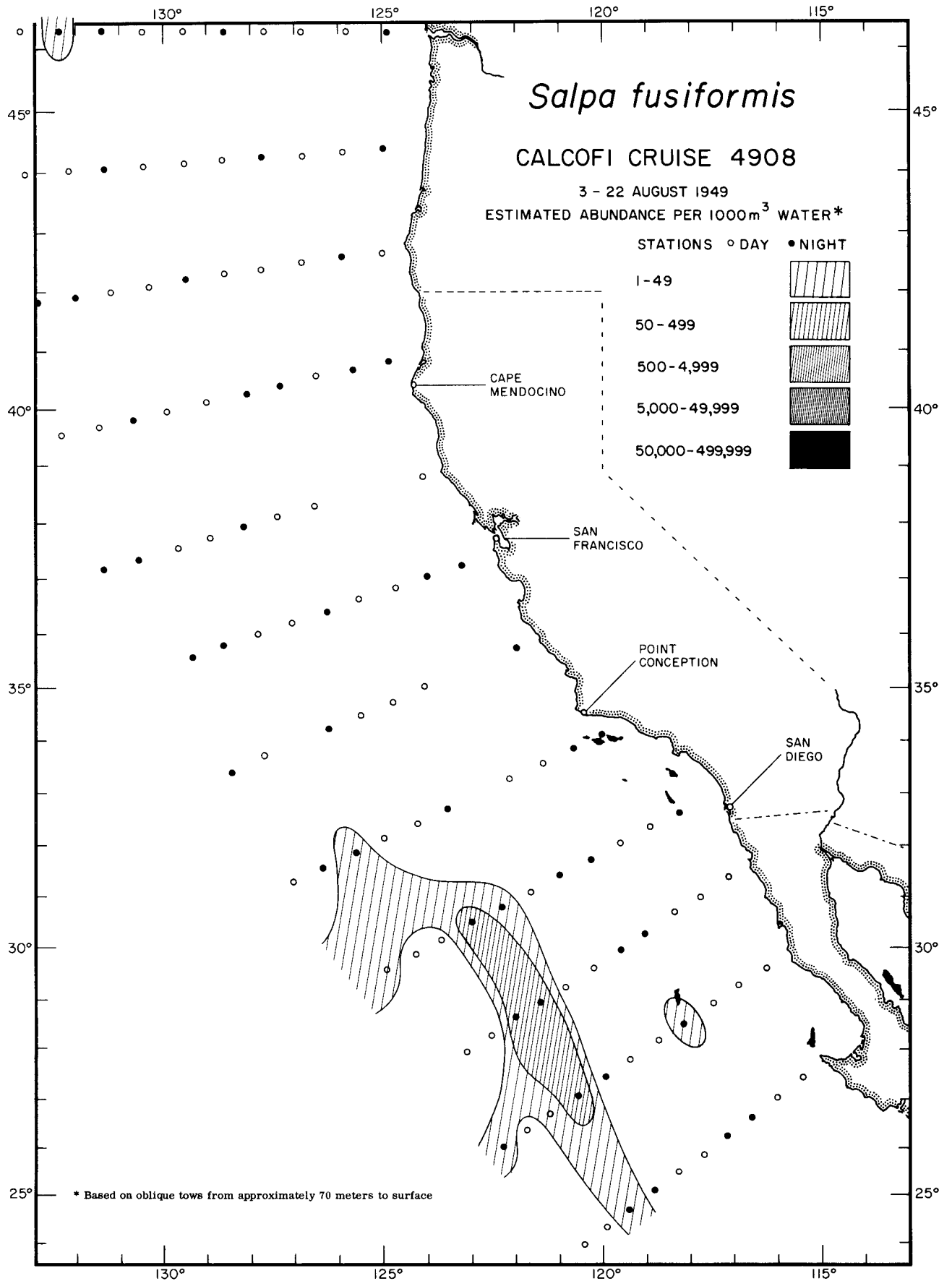
Thaliacea
Salpa fusiformis
4905



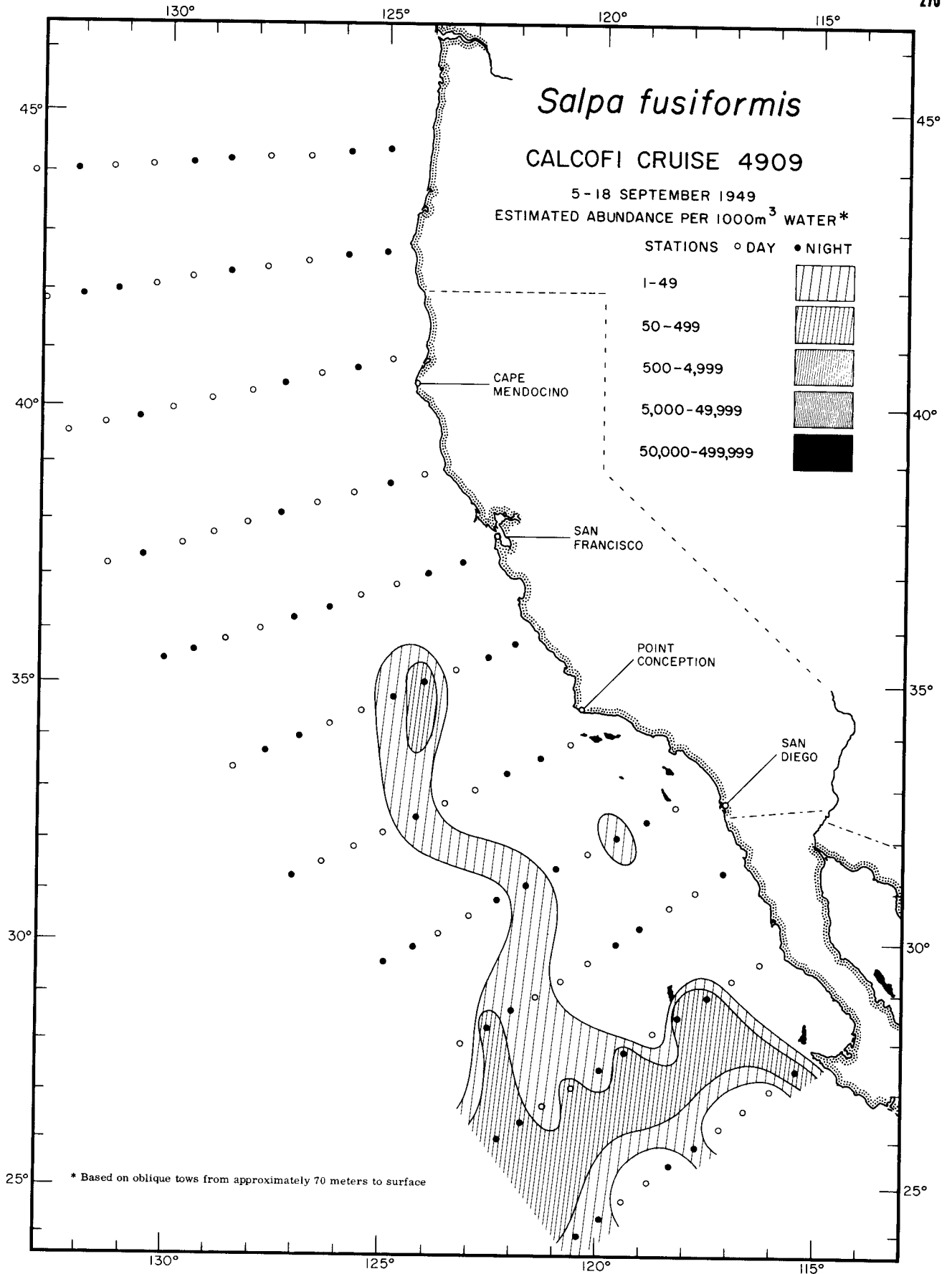
Thaliacea
Salpa fusiformis
4906



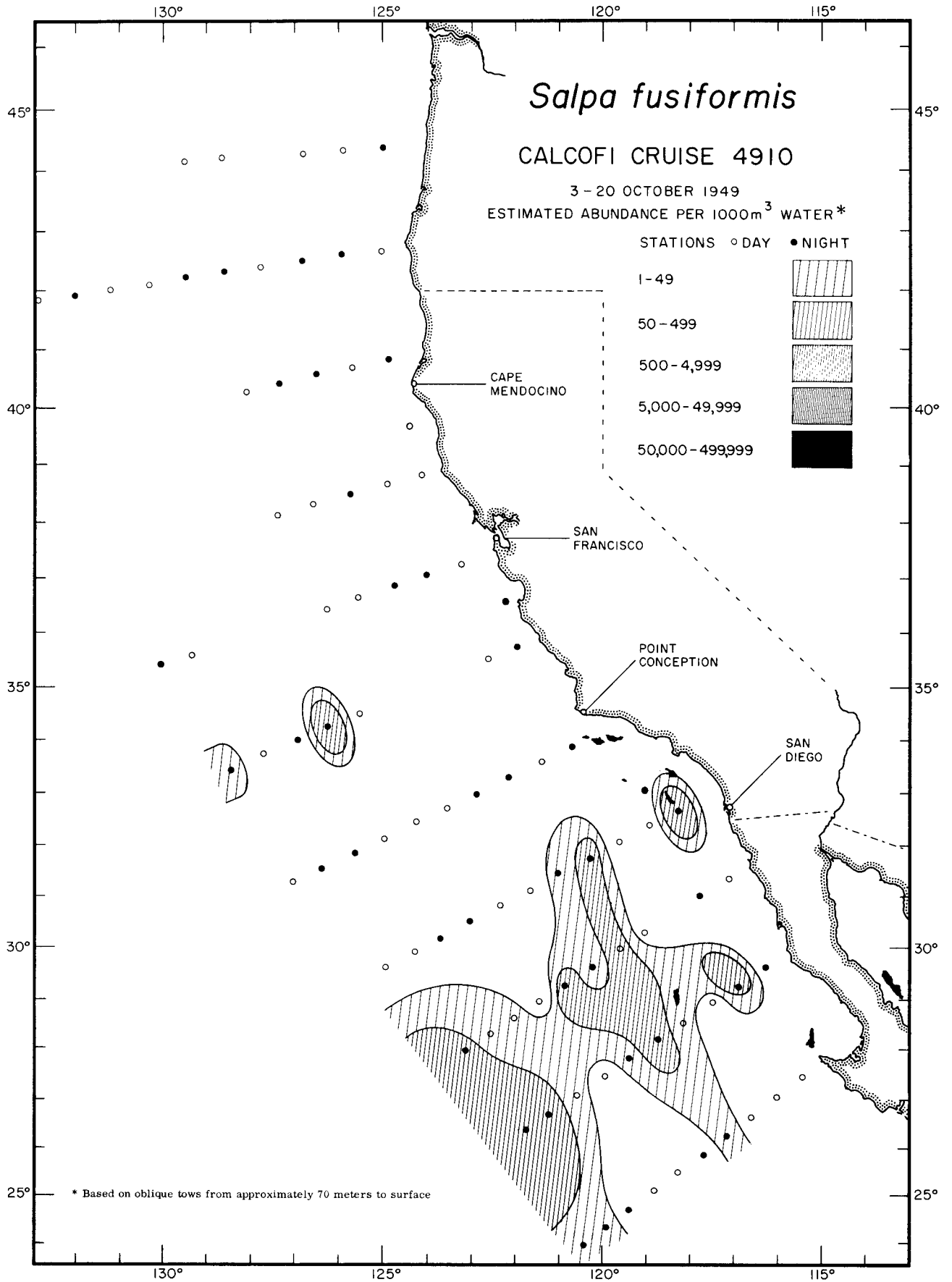
Thaliacea
Salpa fusiformis
 4907



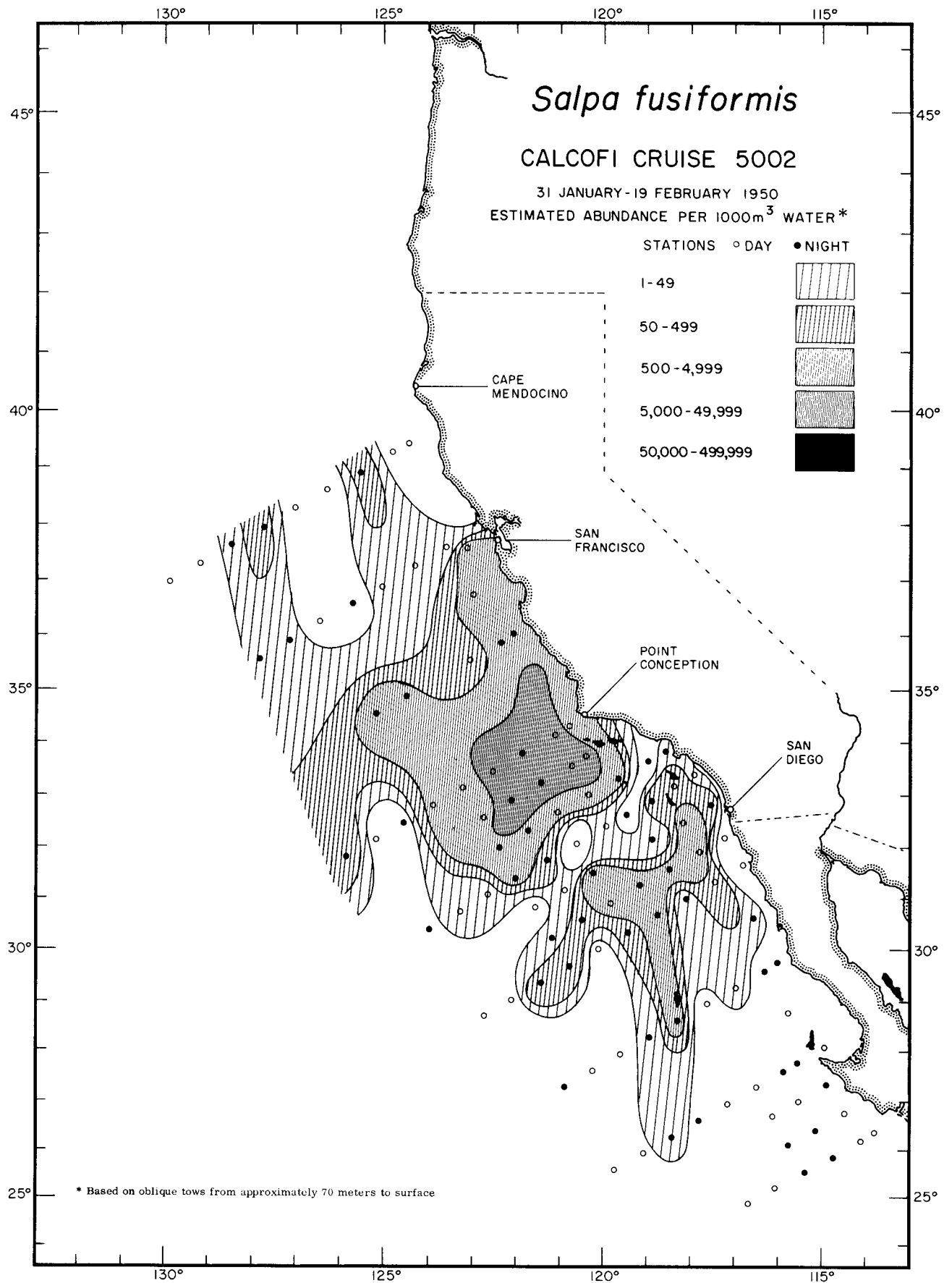
Thaliacea
Salpa fusiformis
4908



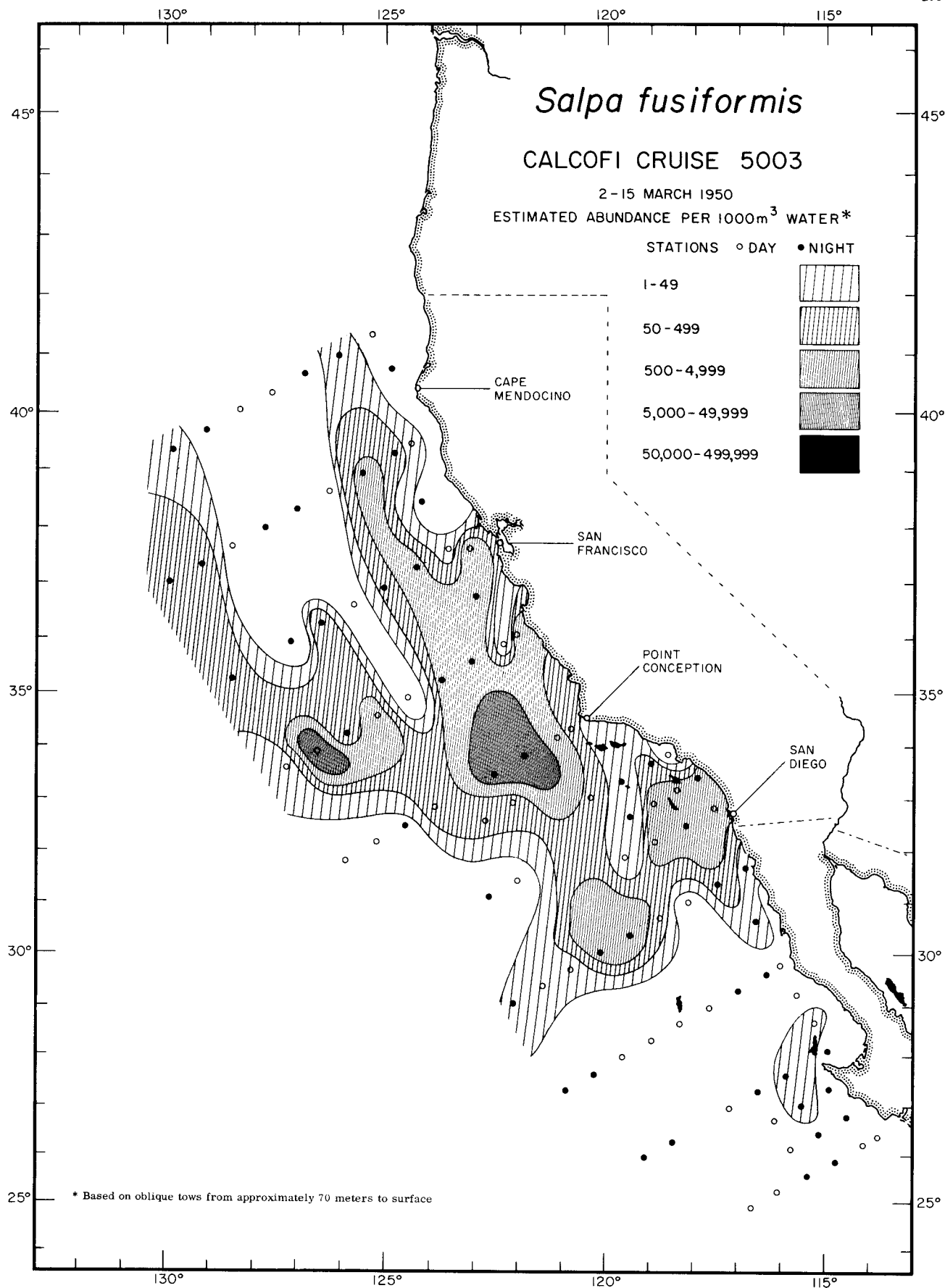
Thaliacea
Salpa fusiformis
 4909



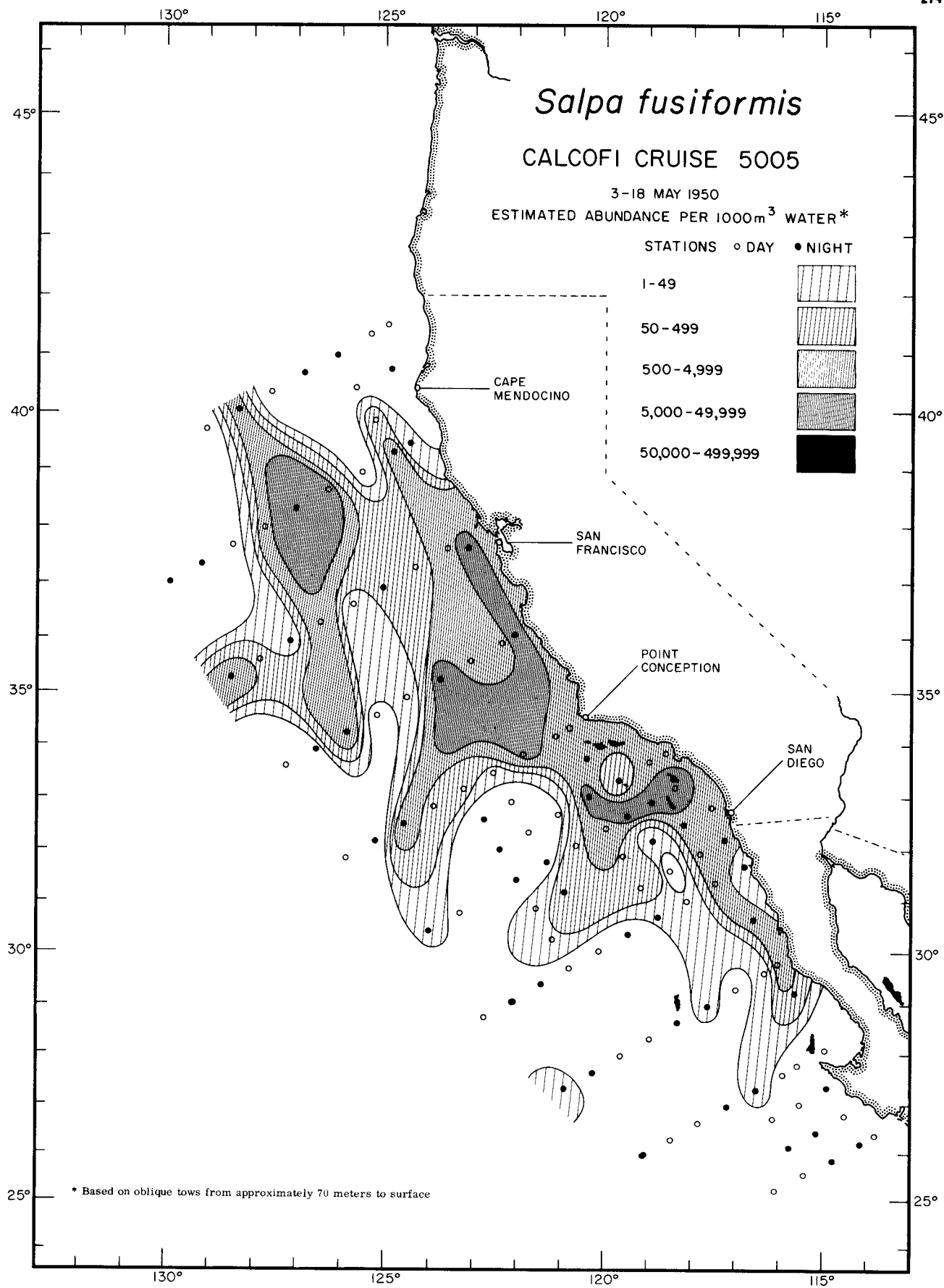
Thaliacea
Salpa fusiformis
 4910



Thaliacea
Salpa fusiformis
5002



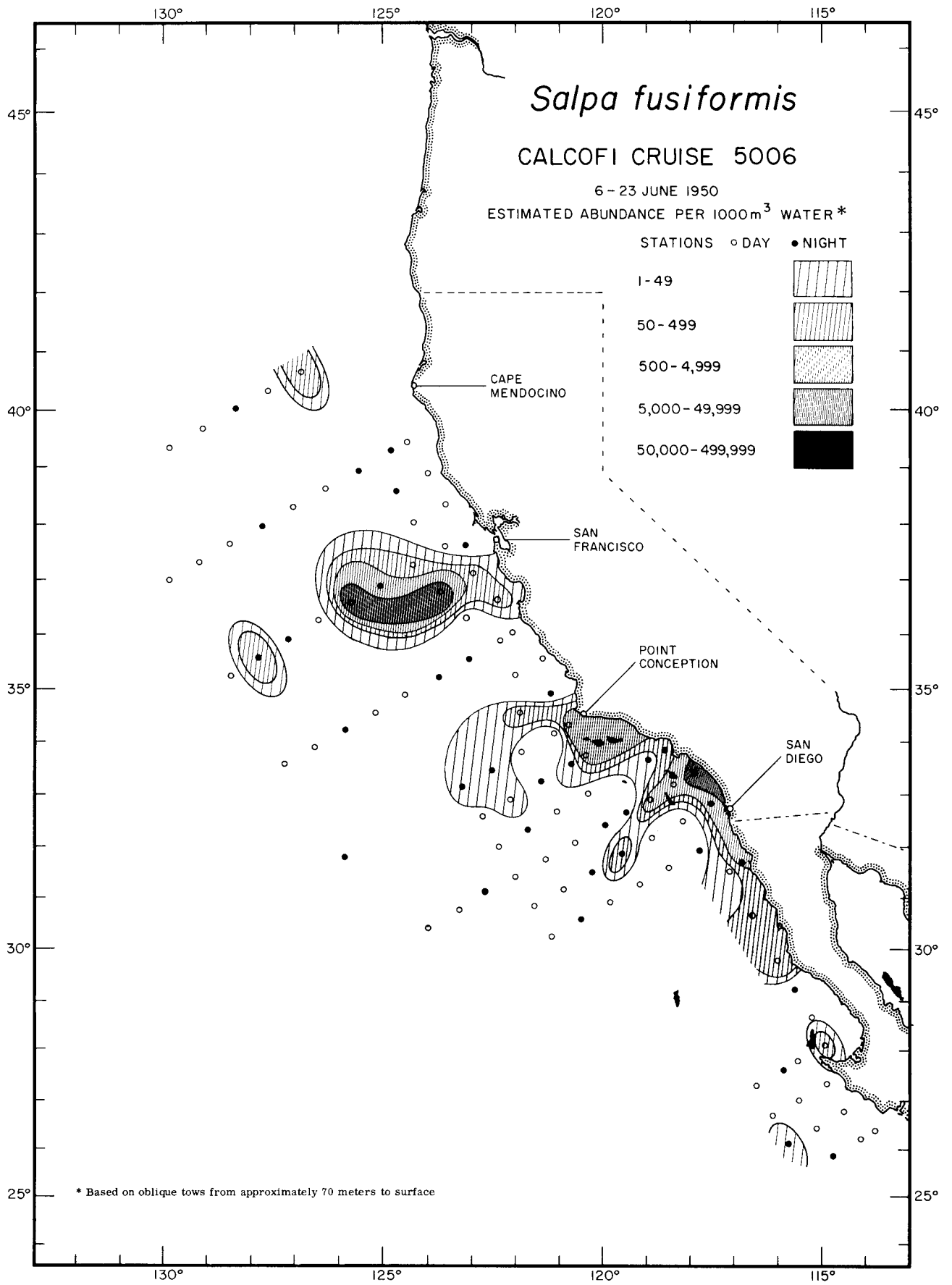
Thaliacea
Salpa fusiformis
5003



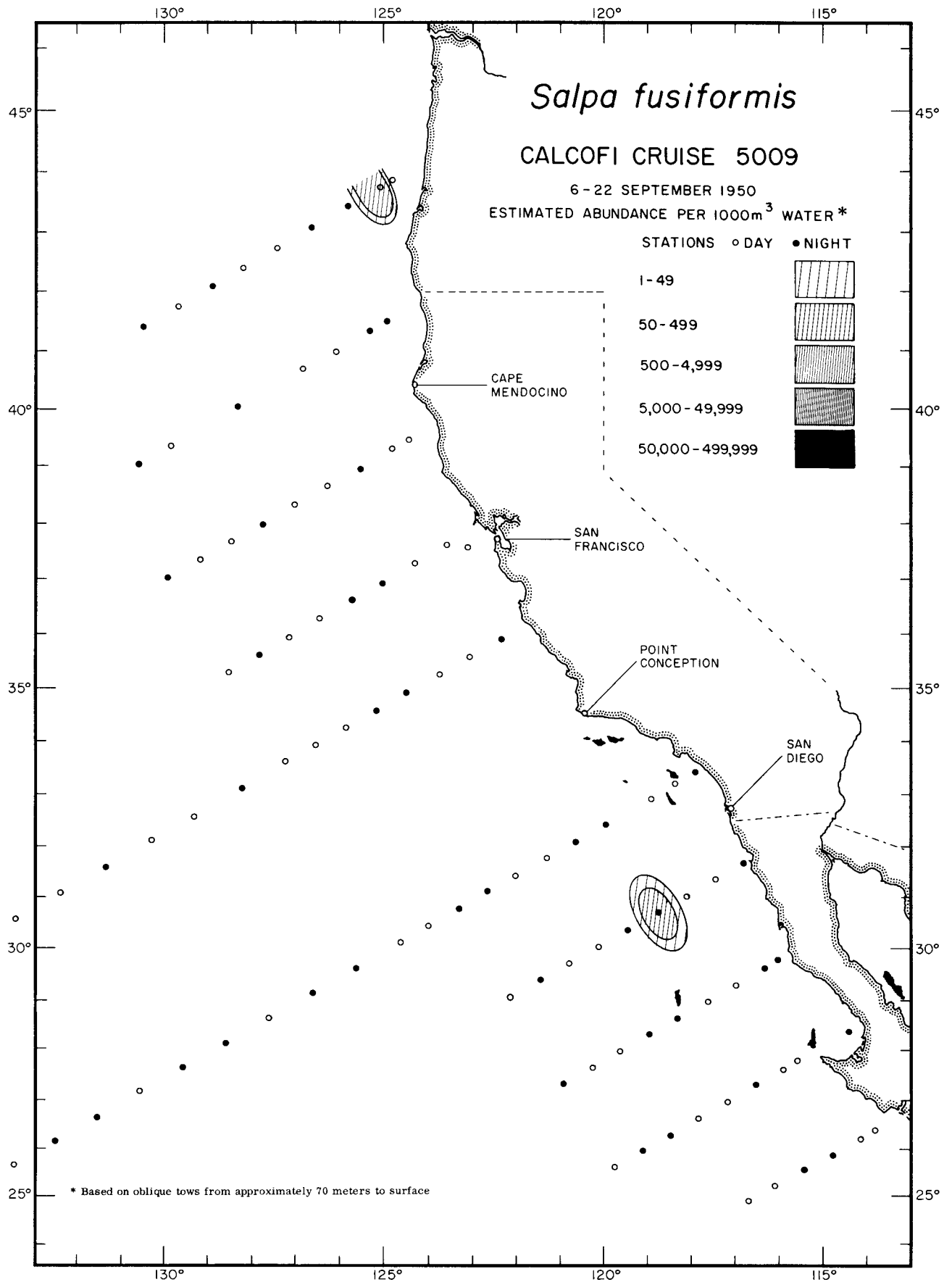
Thaliacea

Salpa fusiformis

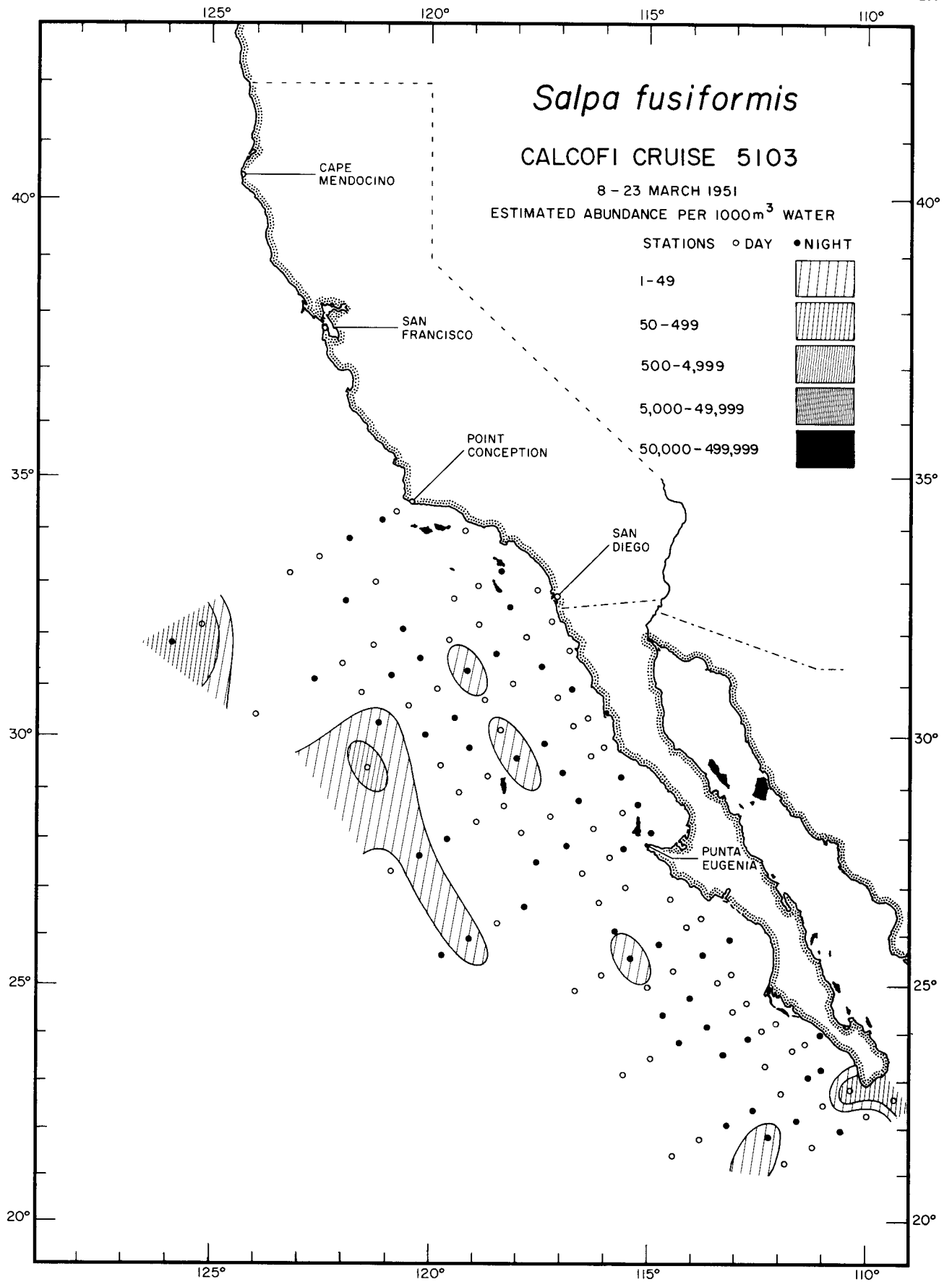
5005



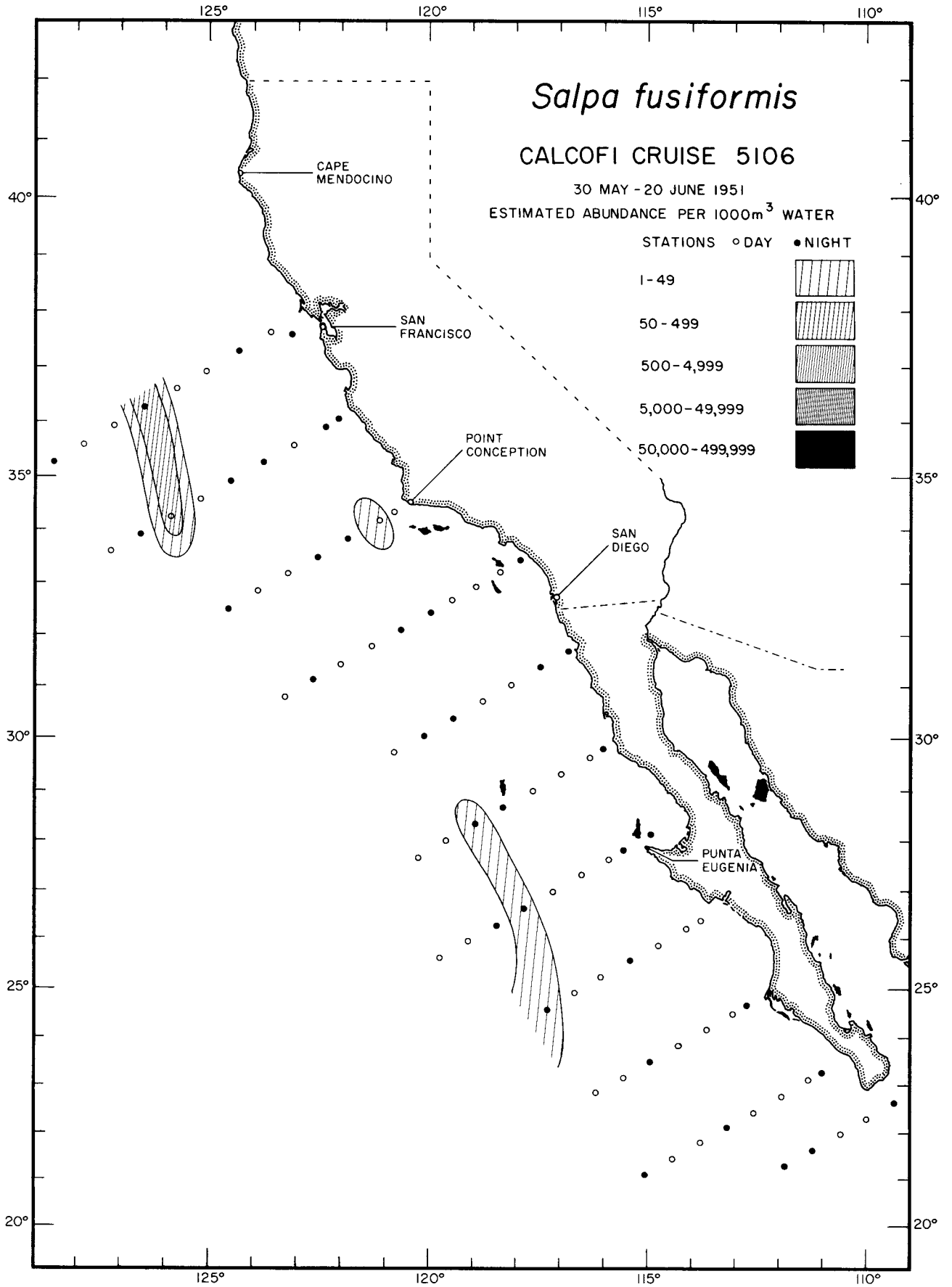
Thaliacea
Salpa fusiformis
5006



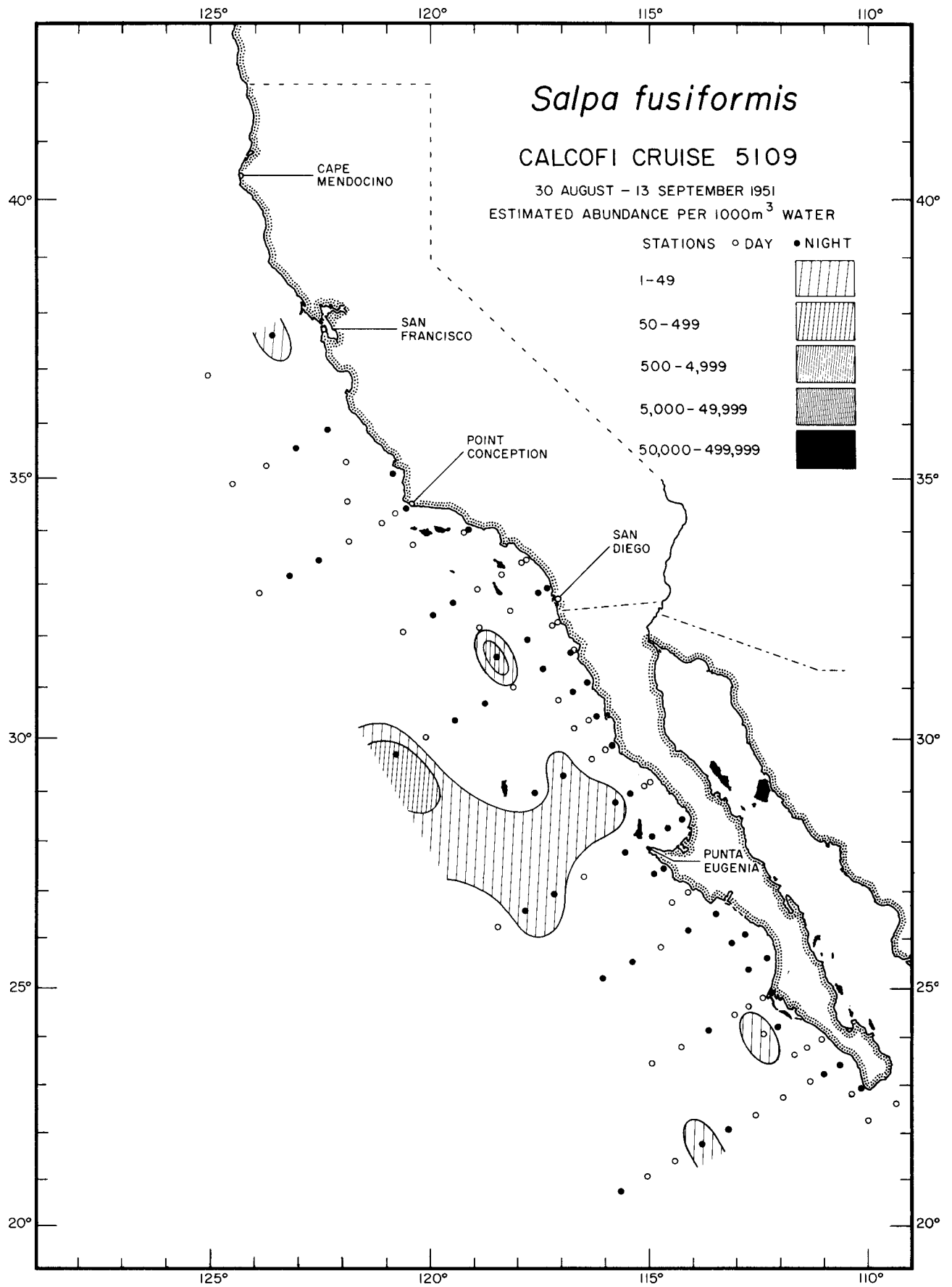
Thaliacea
Salpa fusiformis
5009



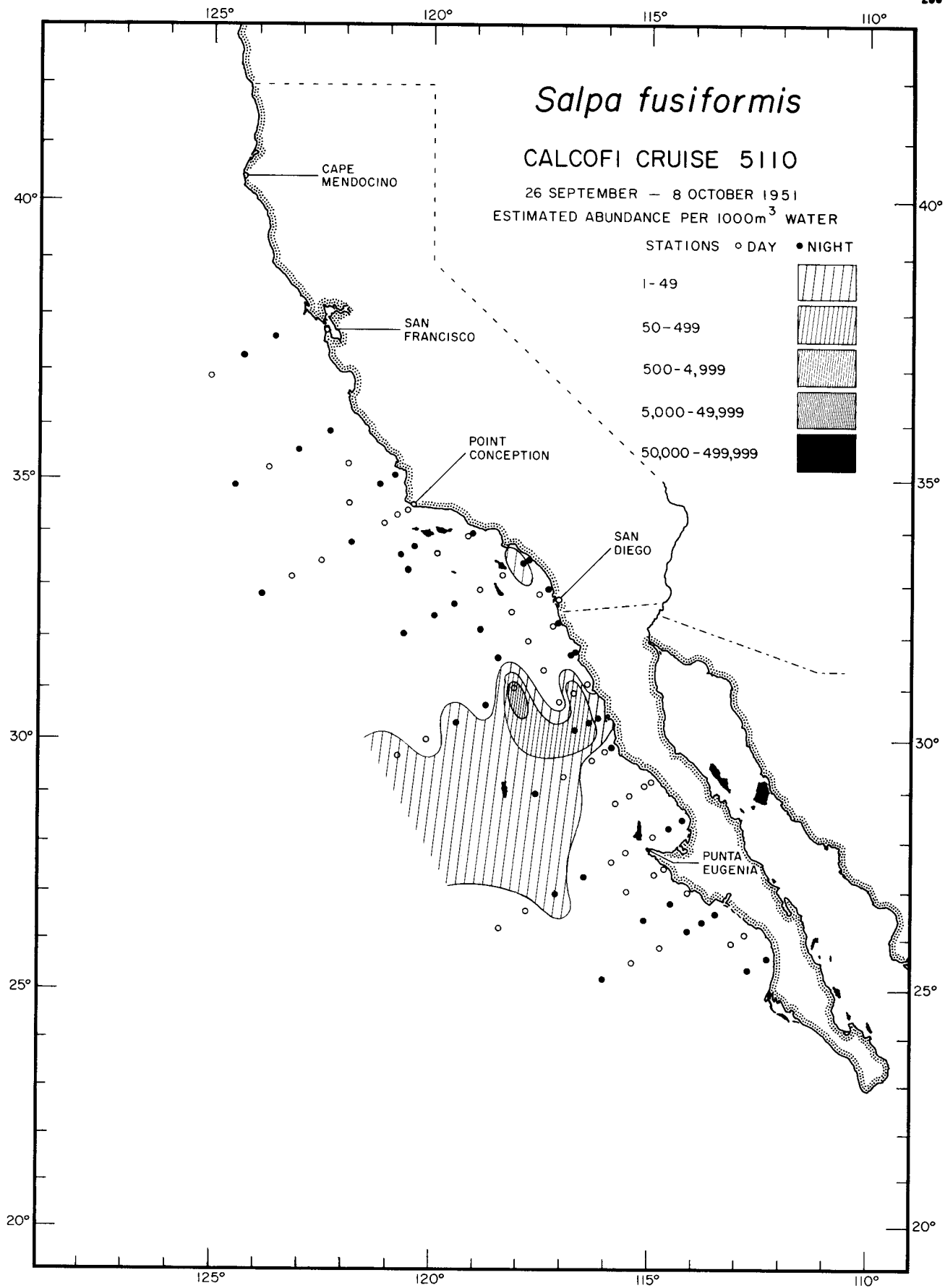
Thaliacea
Salpa fusiformis
5103



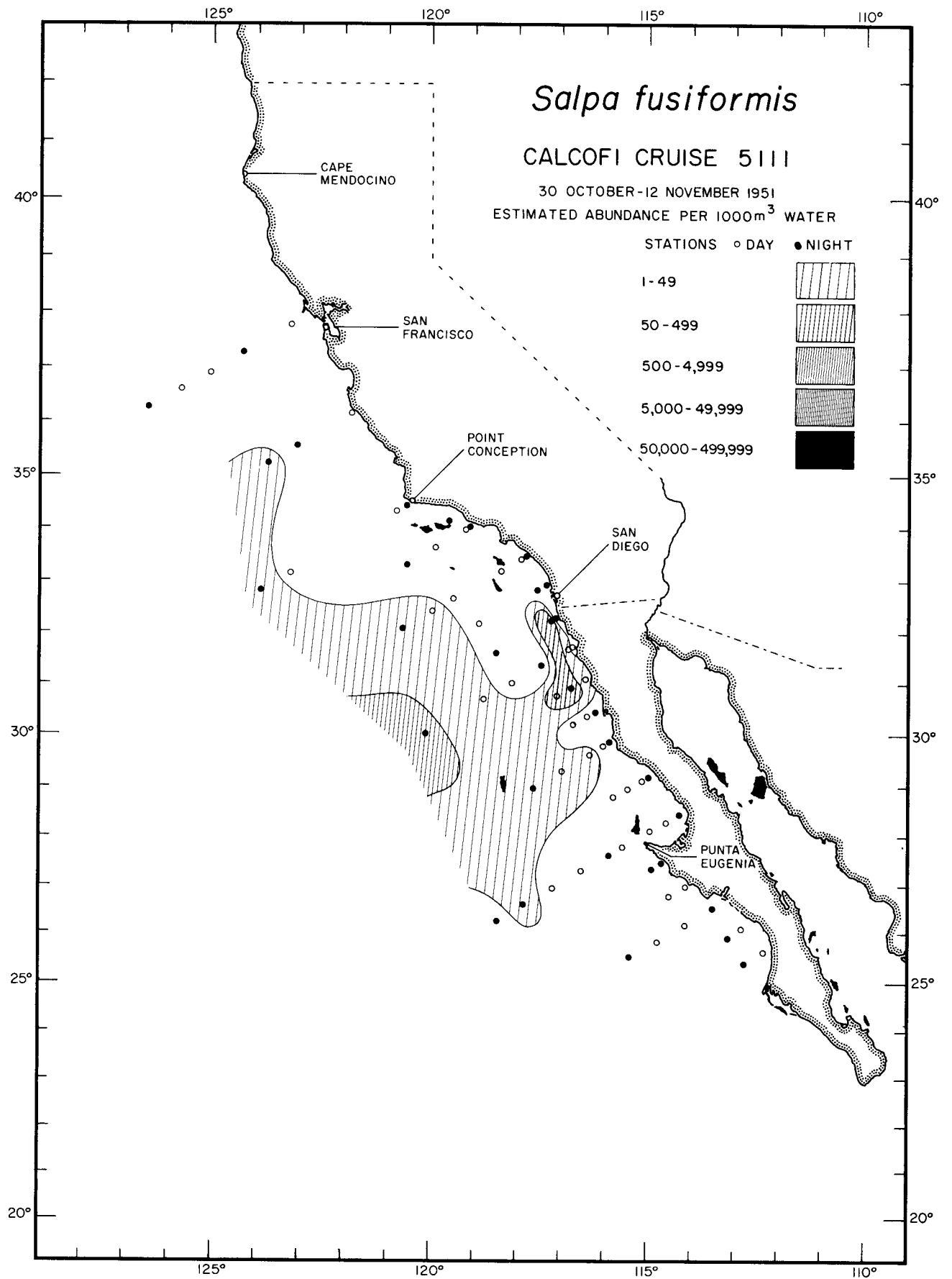
Thaliacea
Salpa fusiformis
5106



Thaliacea
Salpa fusiformis
5109

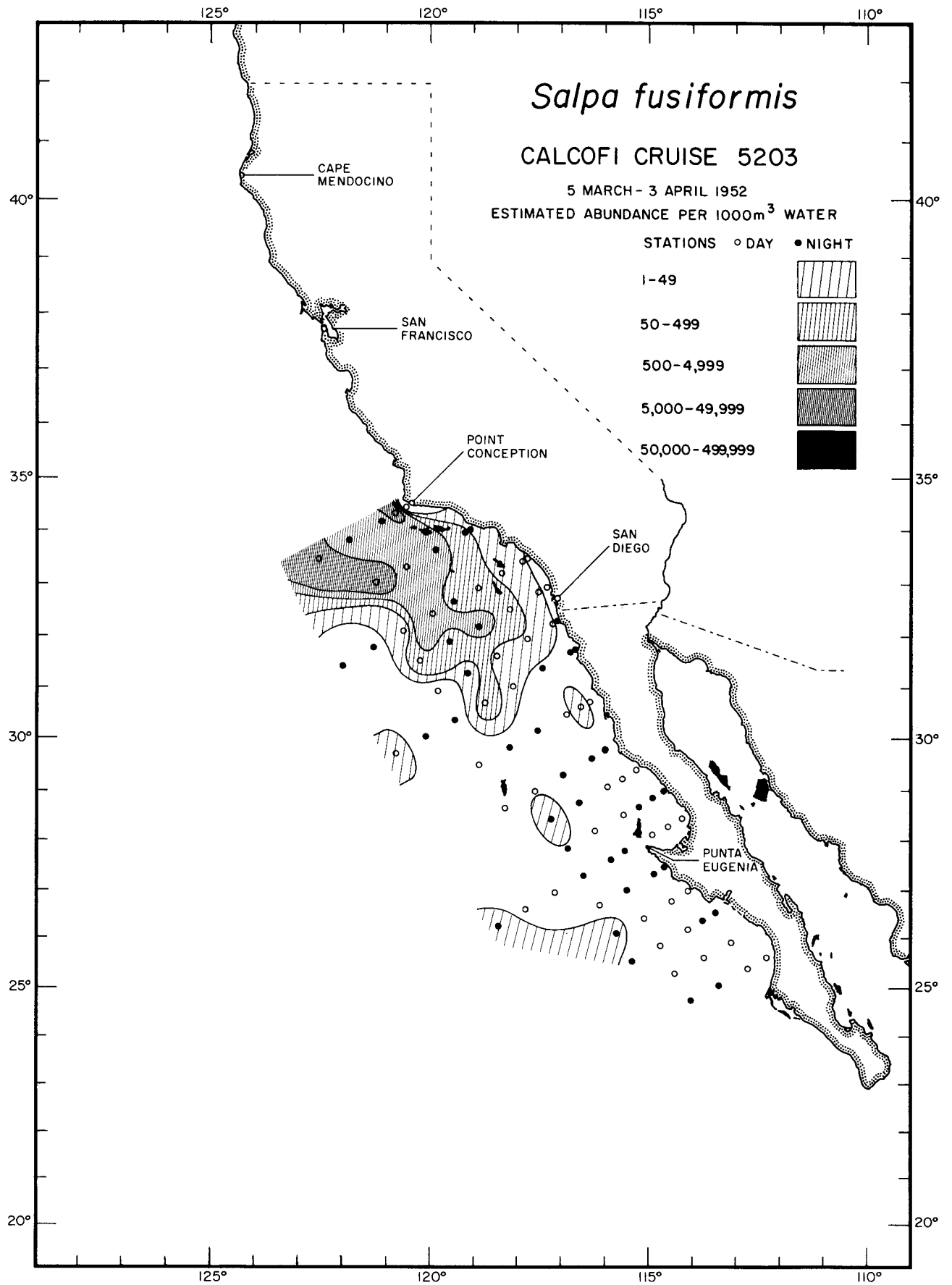


Thaliacea
Salpa fusiformis
5110

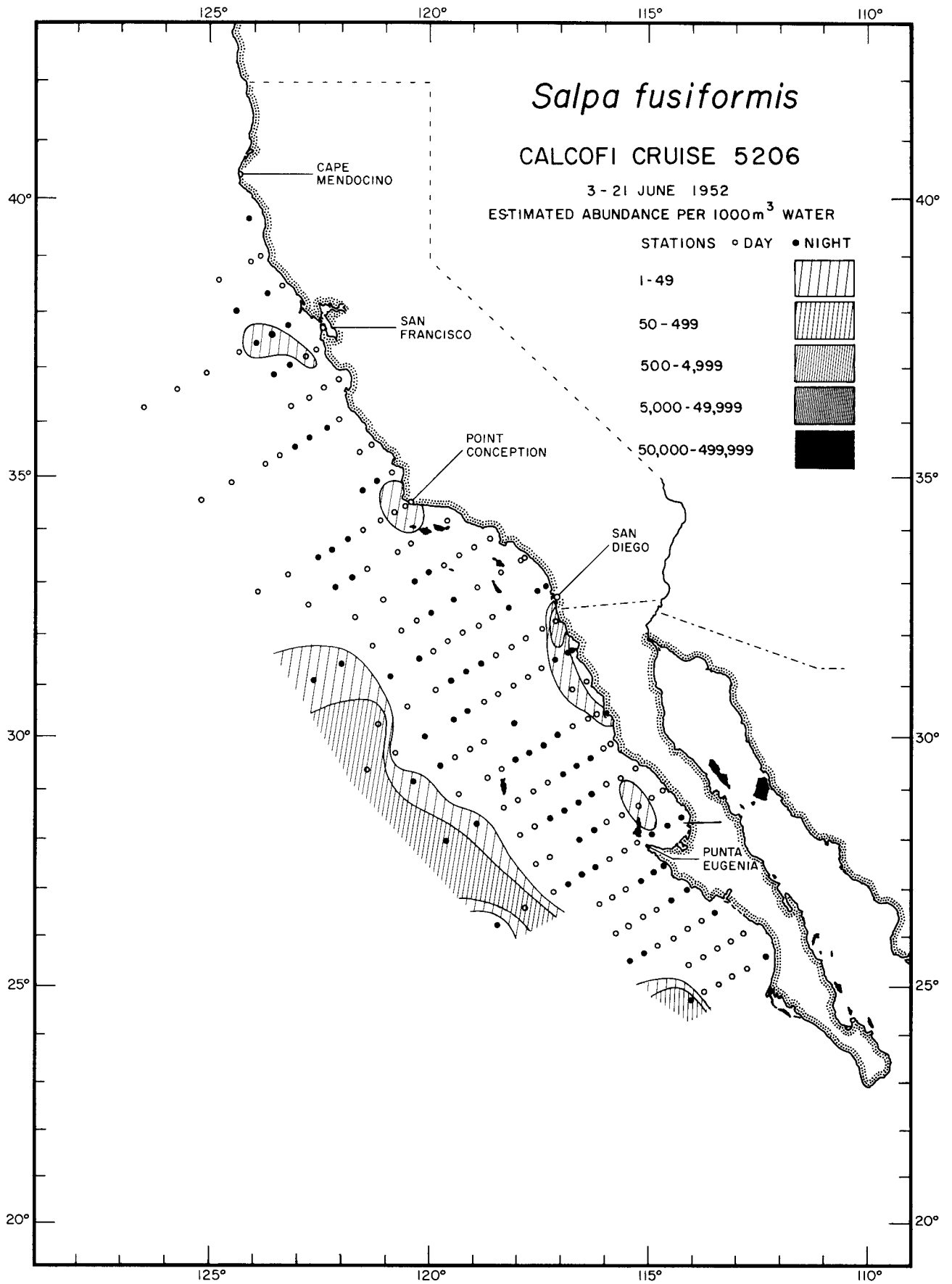


Thaliacea
Salpa fusiformis

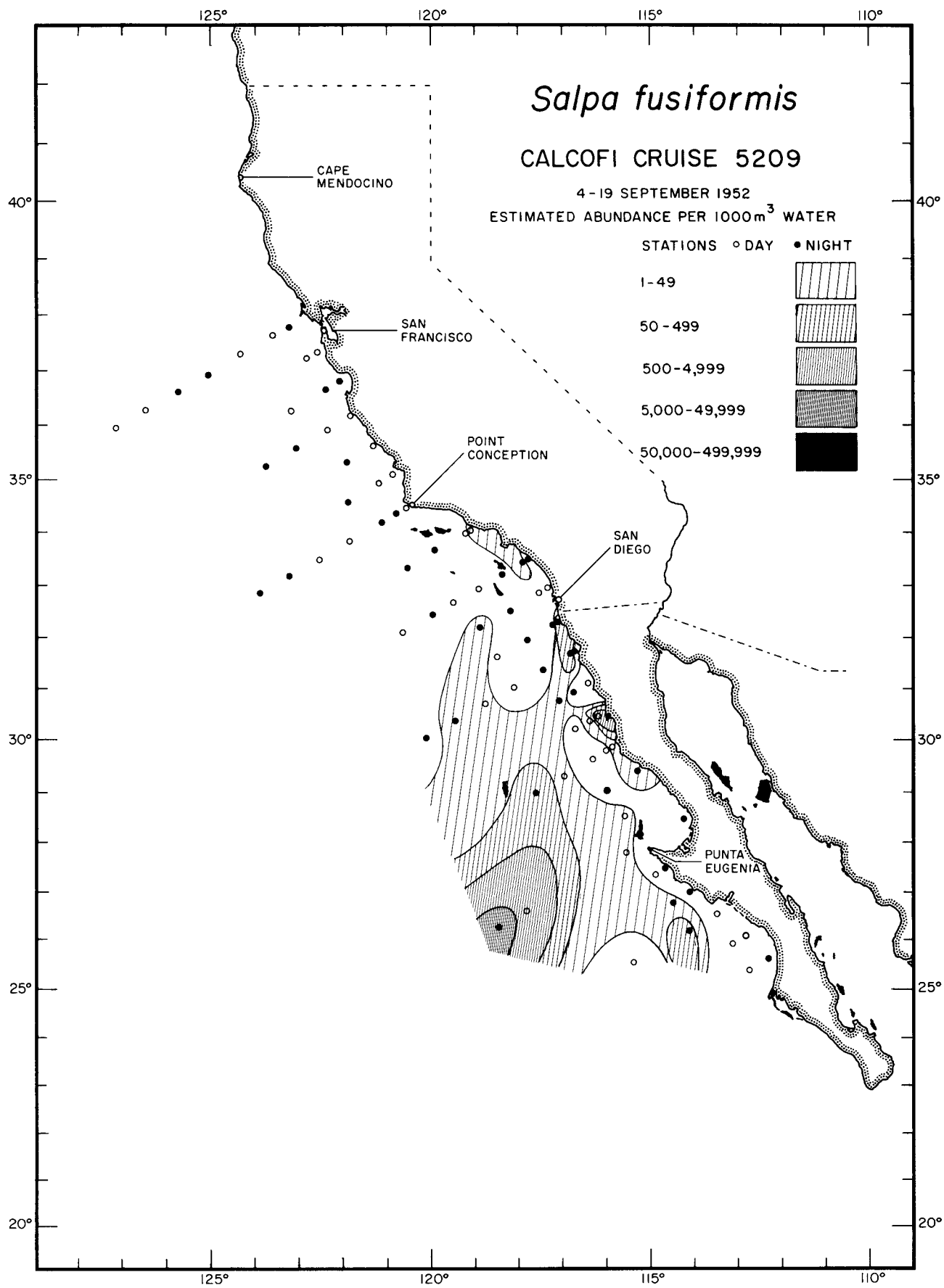
5111



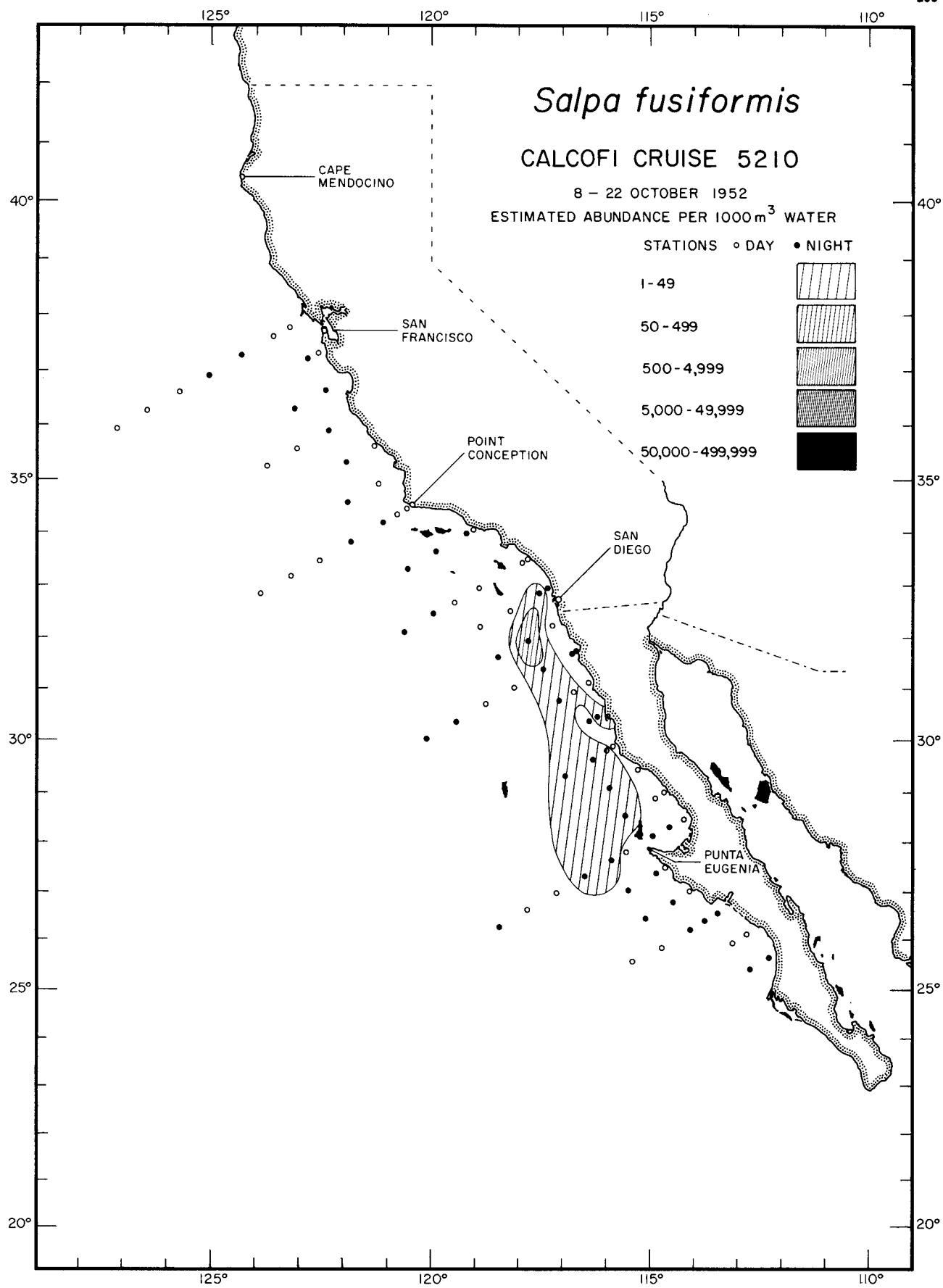
Thaliacea
Salpa fusiformis
5203



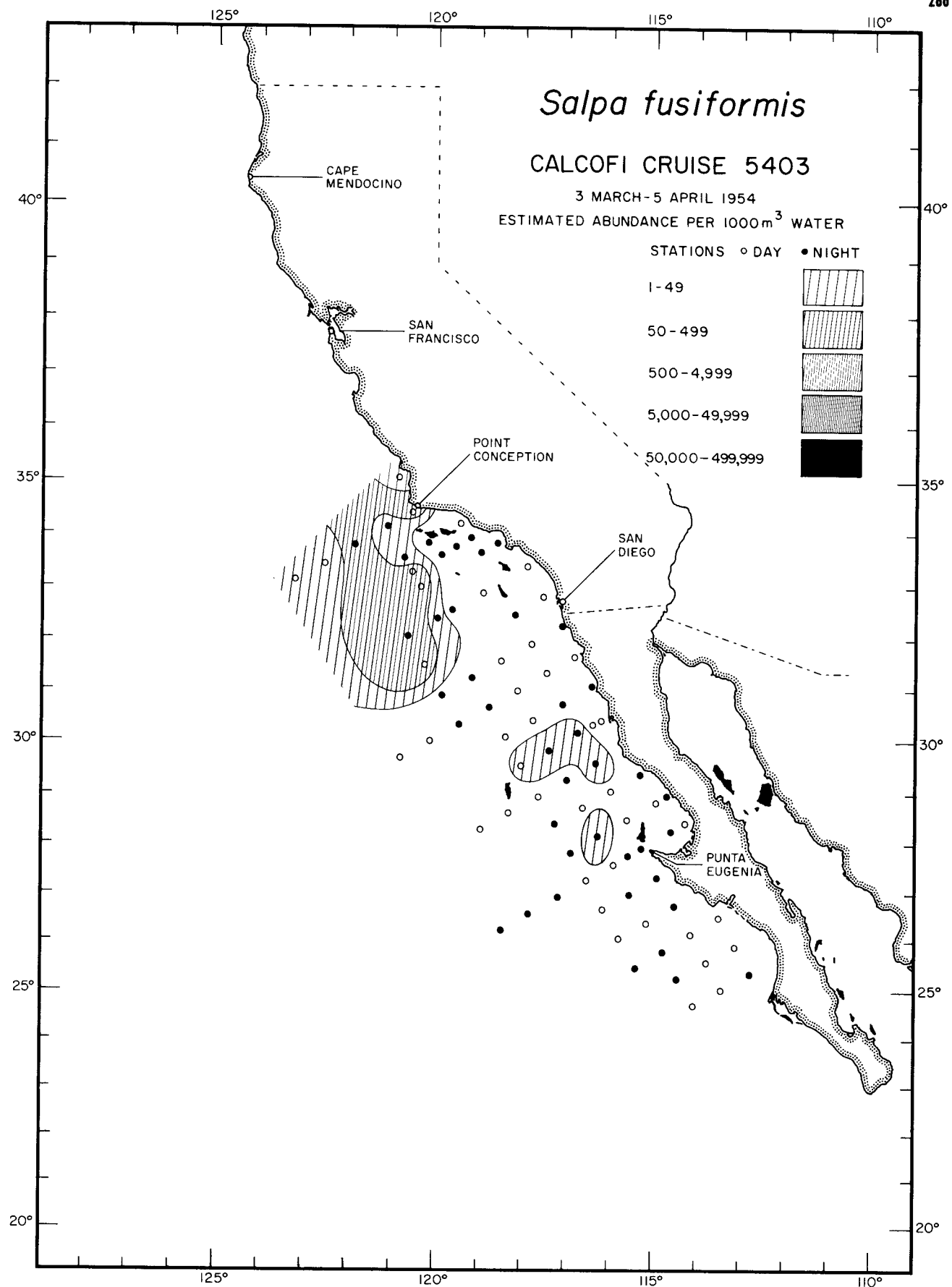
Thaliacea
Salpa fusiformis
 5206



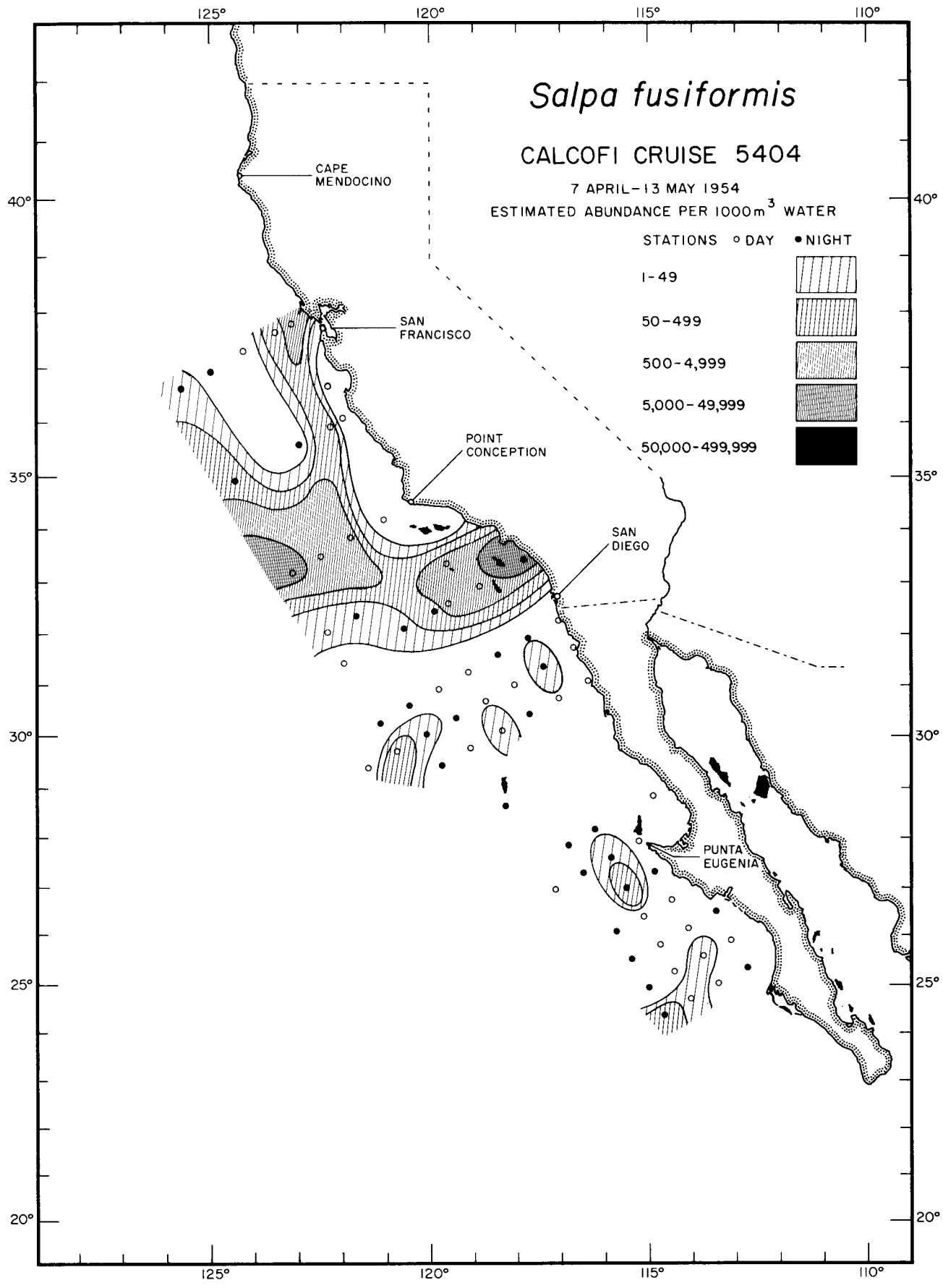
Thaliacea
Salpa fusiformis
5209



Thaliacea
Salpa fusiformis
 5210



Thaliacea
Salpa fusiformis
5403



Salpa fusiformis

CALCOFI CRUISE 5404

7 APRIL-13 MAY 1954

ESTIMATED ABUNDANCE PER 1000m³ WATER

STATIONS ○ DAY ● NIGHT

1-49



50-499



500-4,999



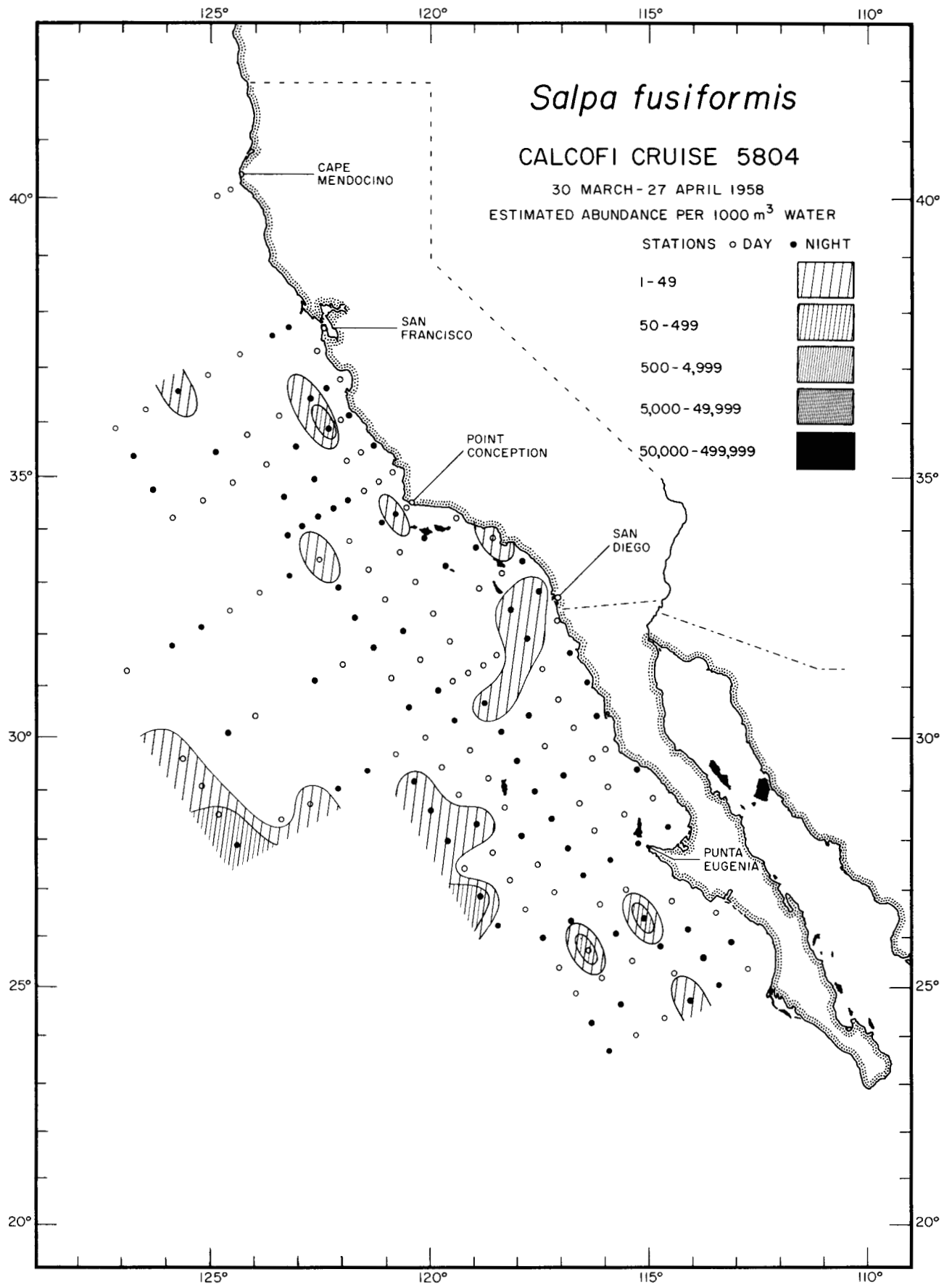
5,000-49,999



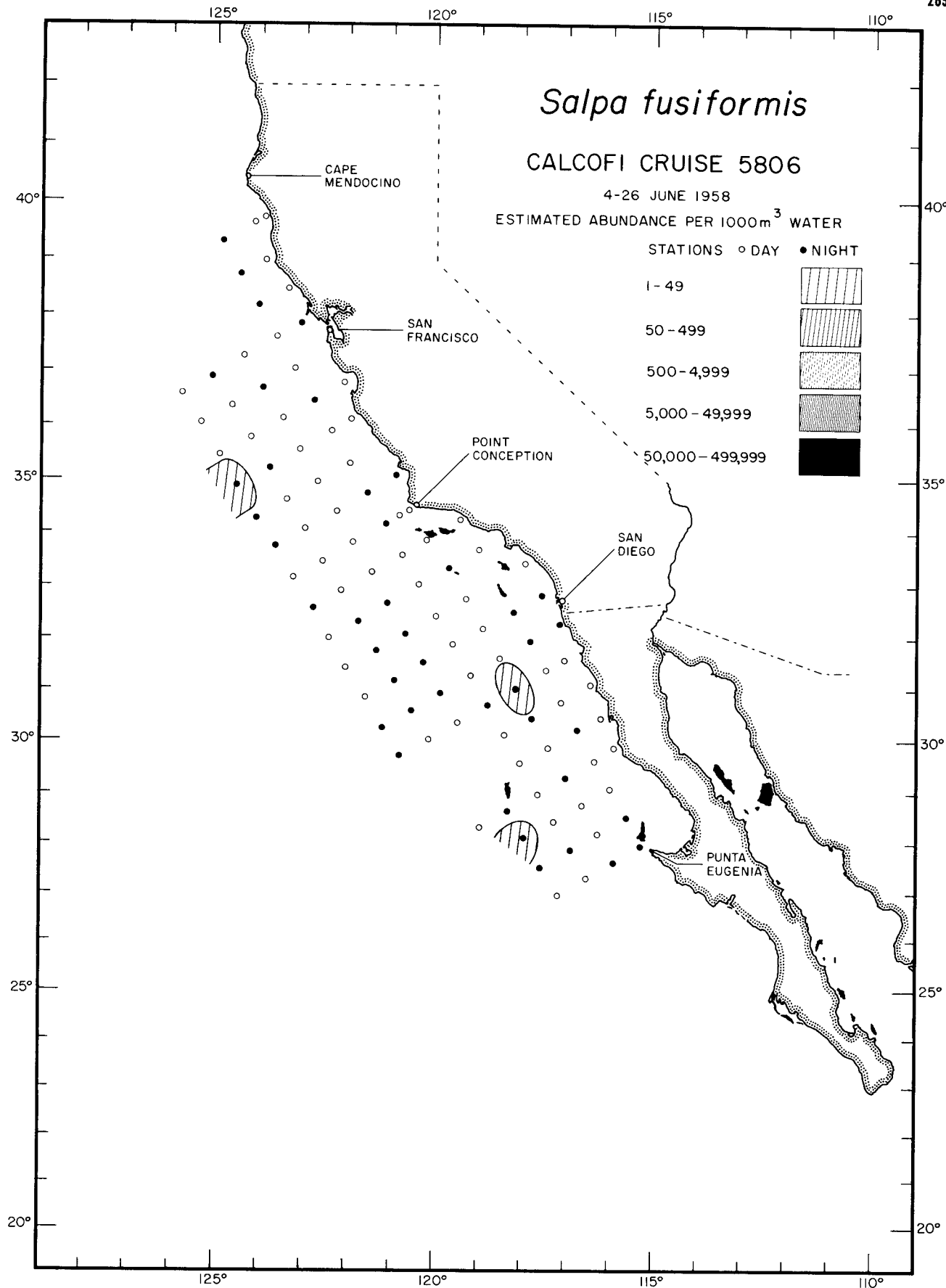
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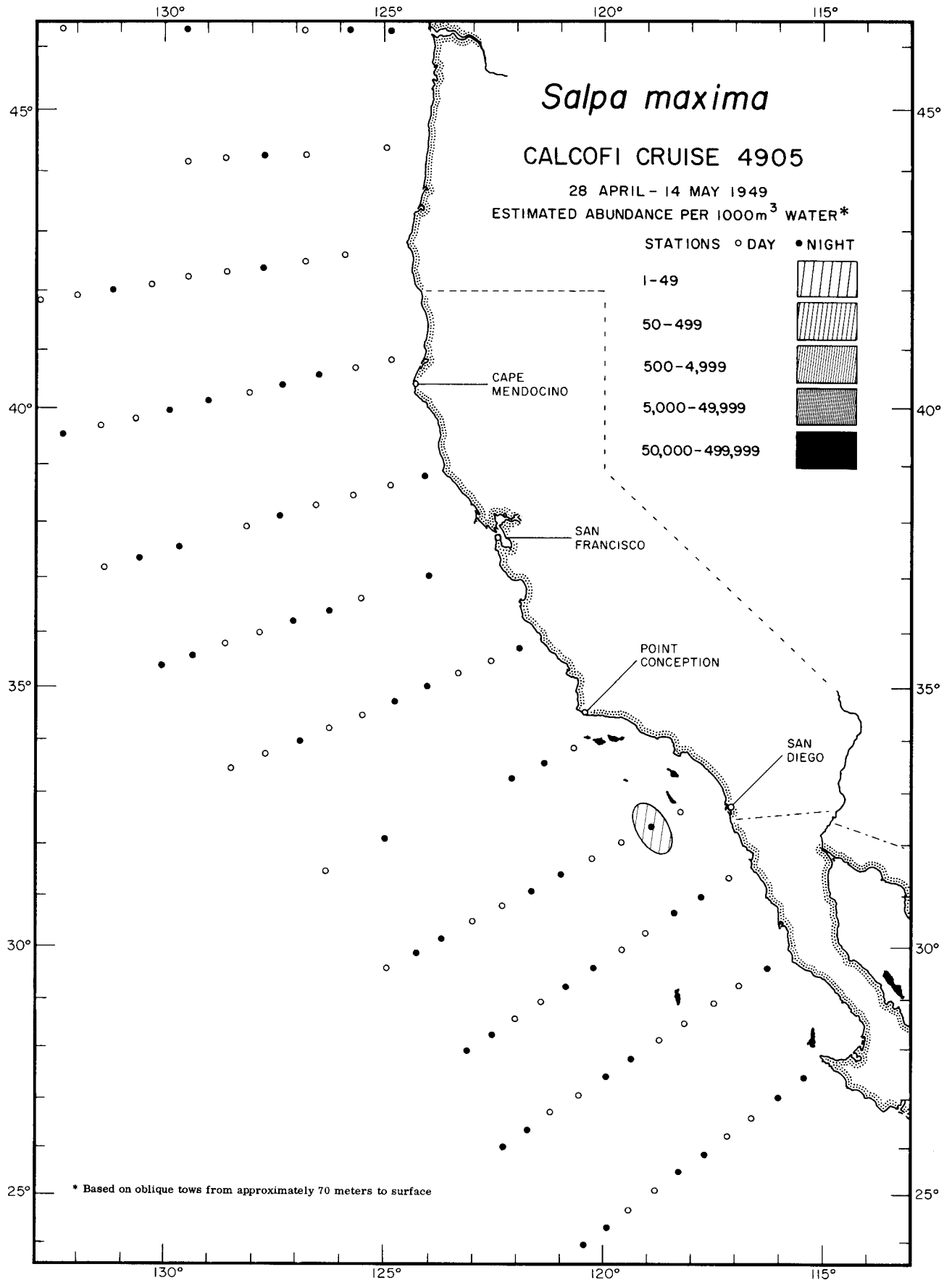
Thaliacea
Salpa fusiformis
 5404



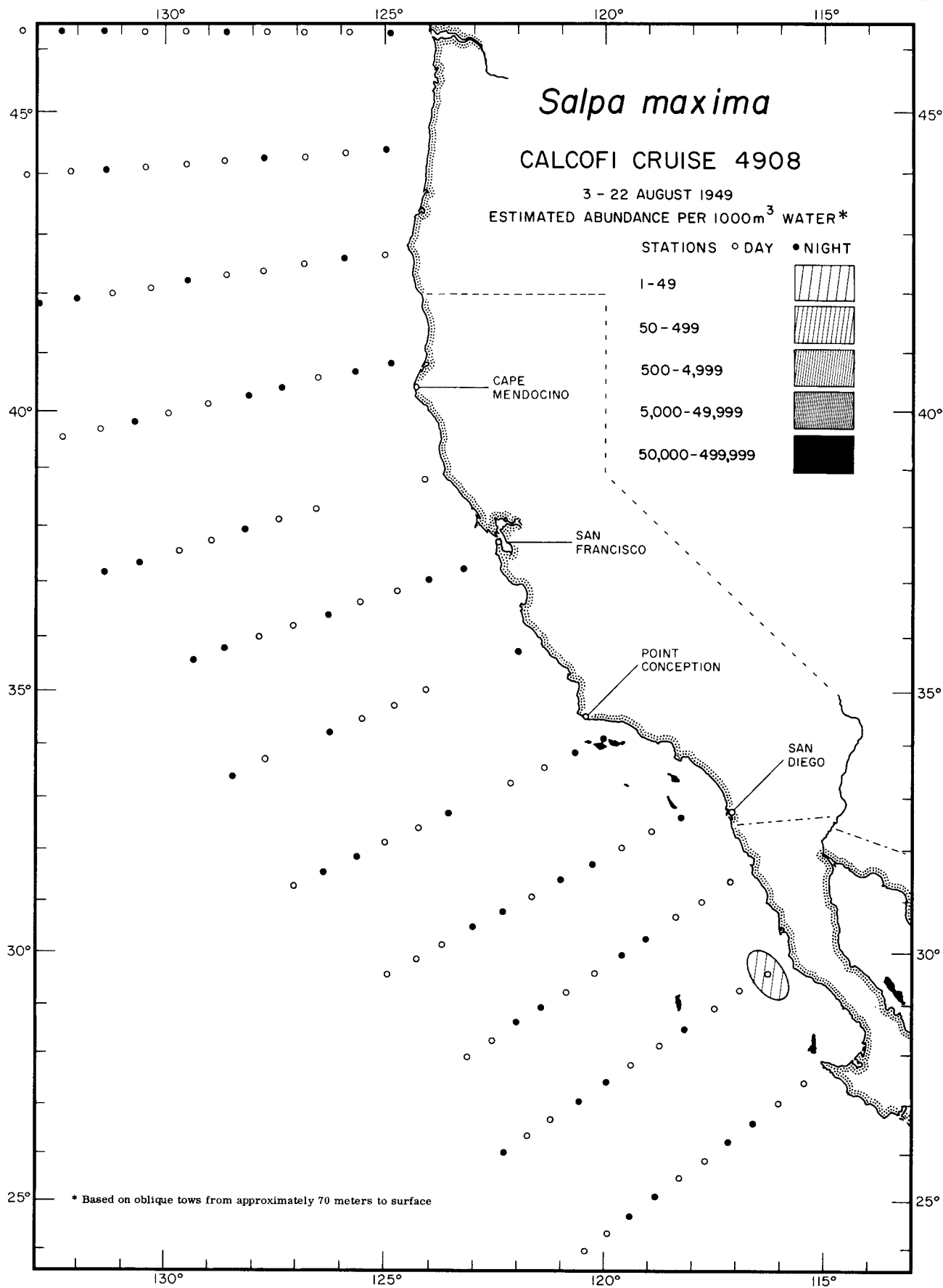
Thaliacea
Salpa fusiformis
5804



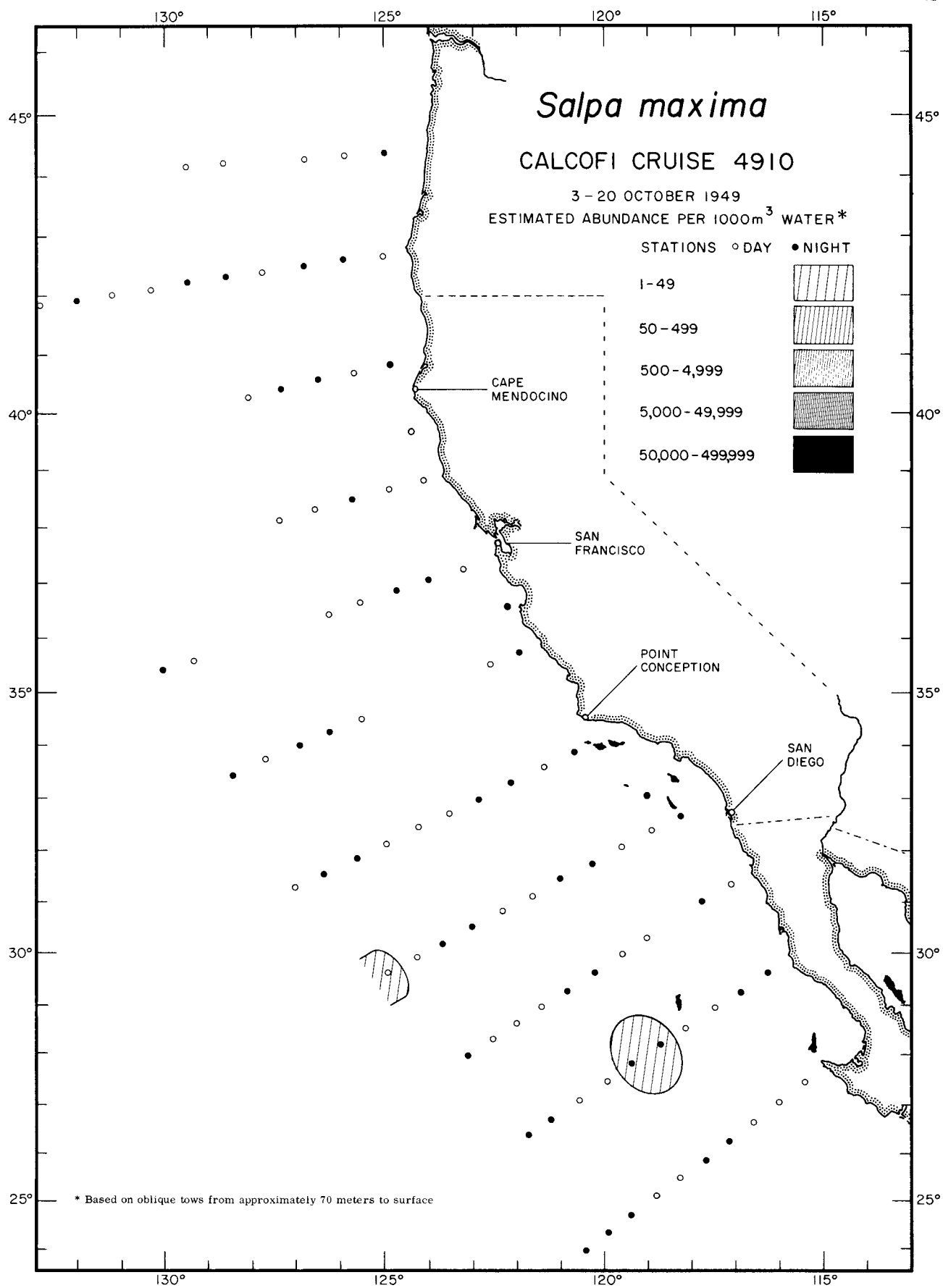
Thaliacea
Salpa fusiformis
5806



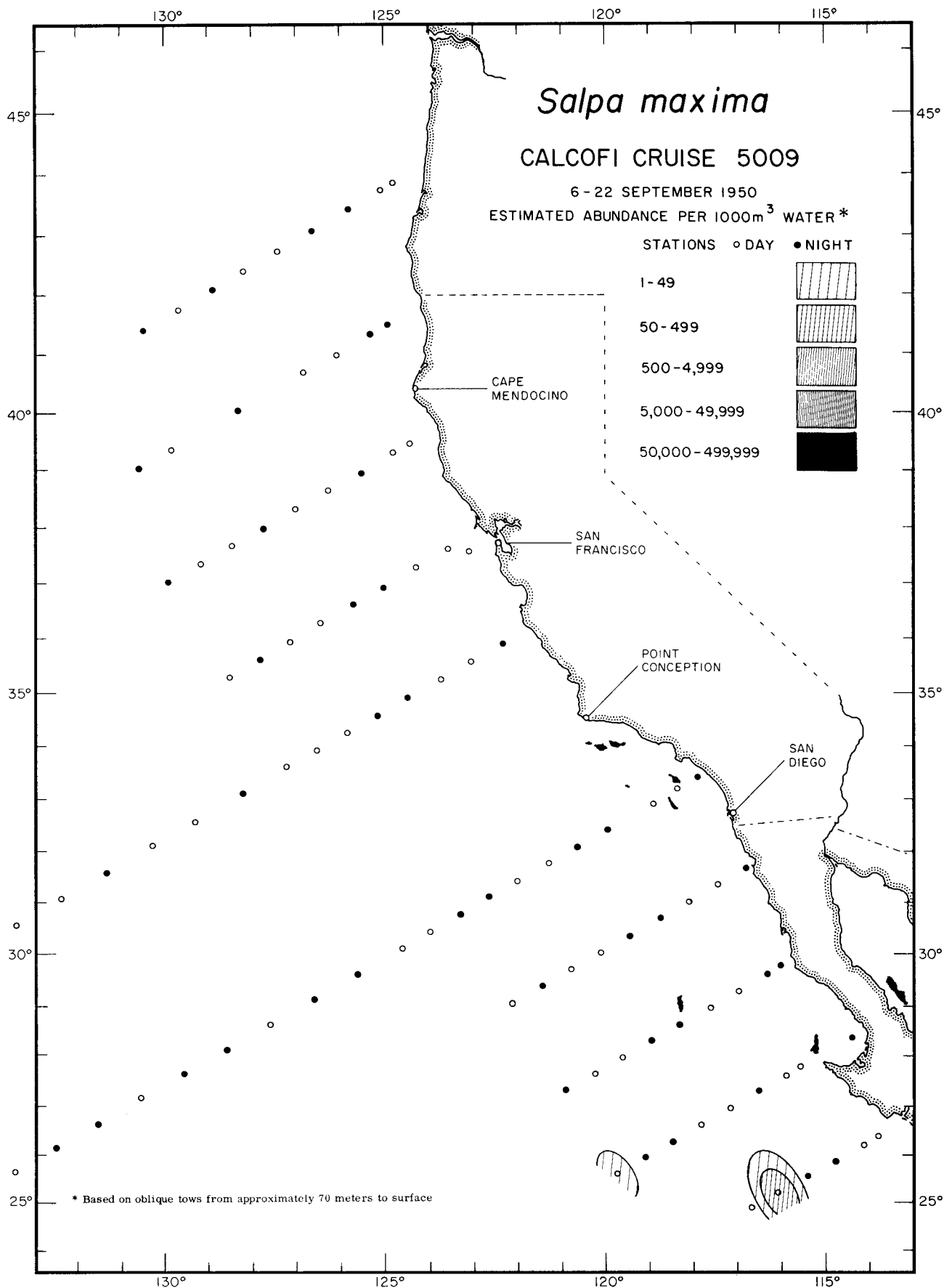
Thaliacea
Salpa maxima
4905



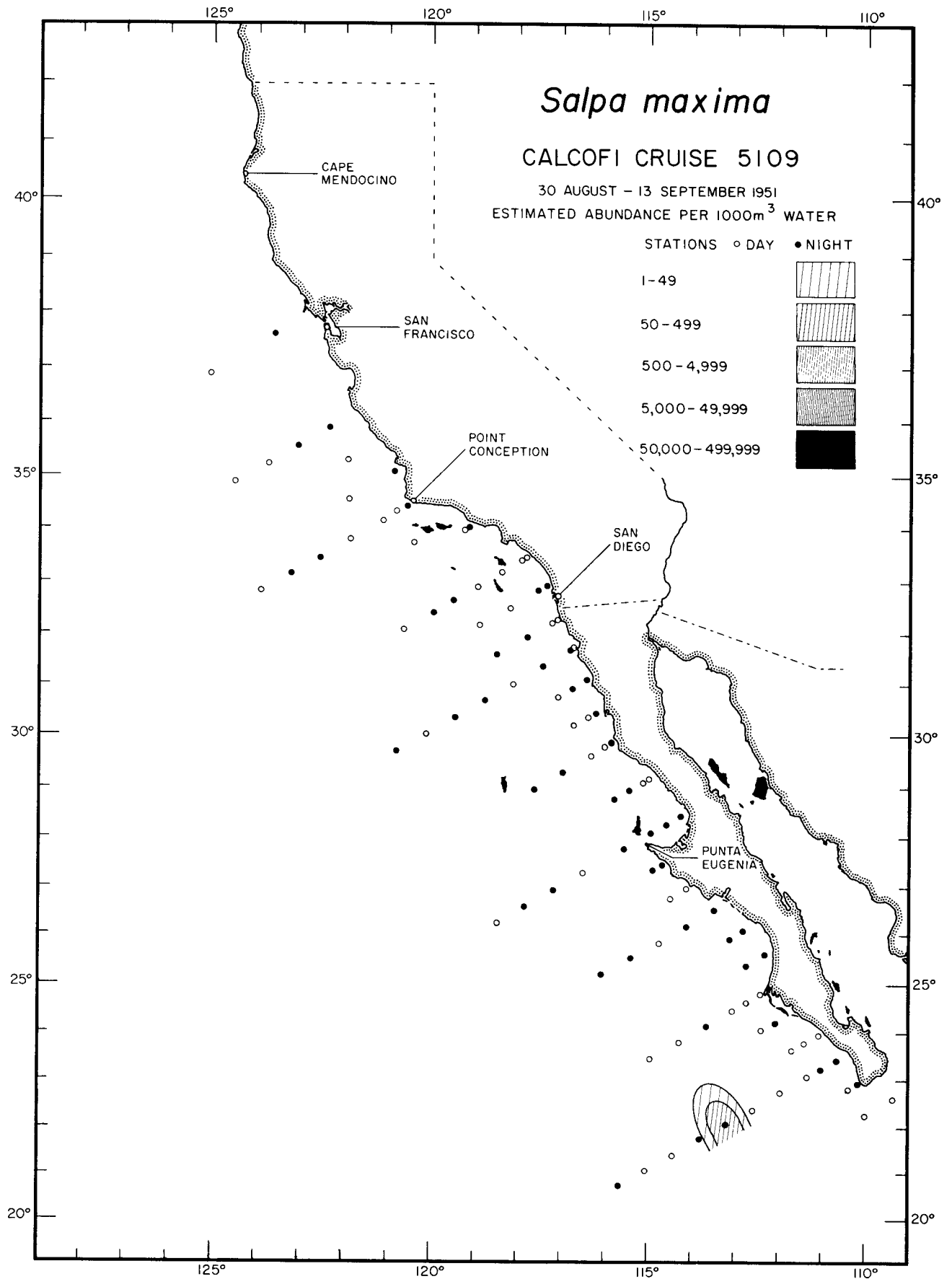
Thaliacea
Salpa maxima
4908



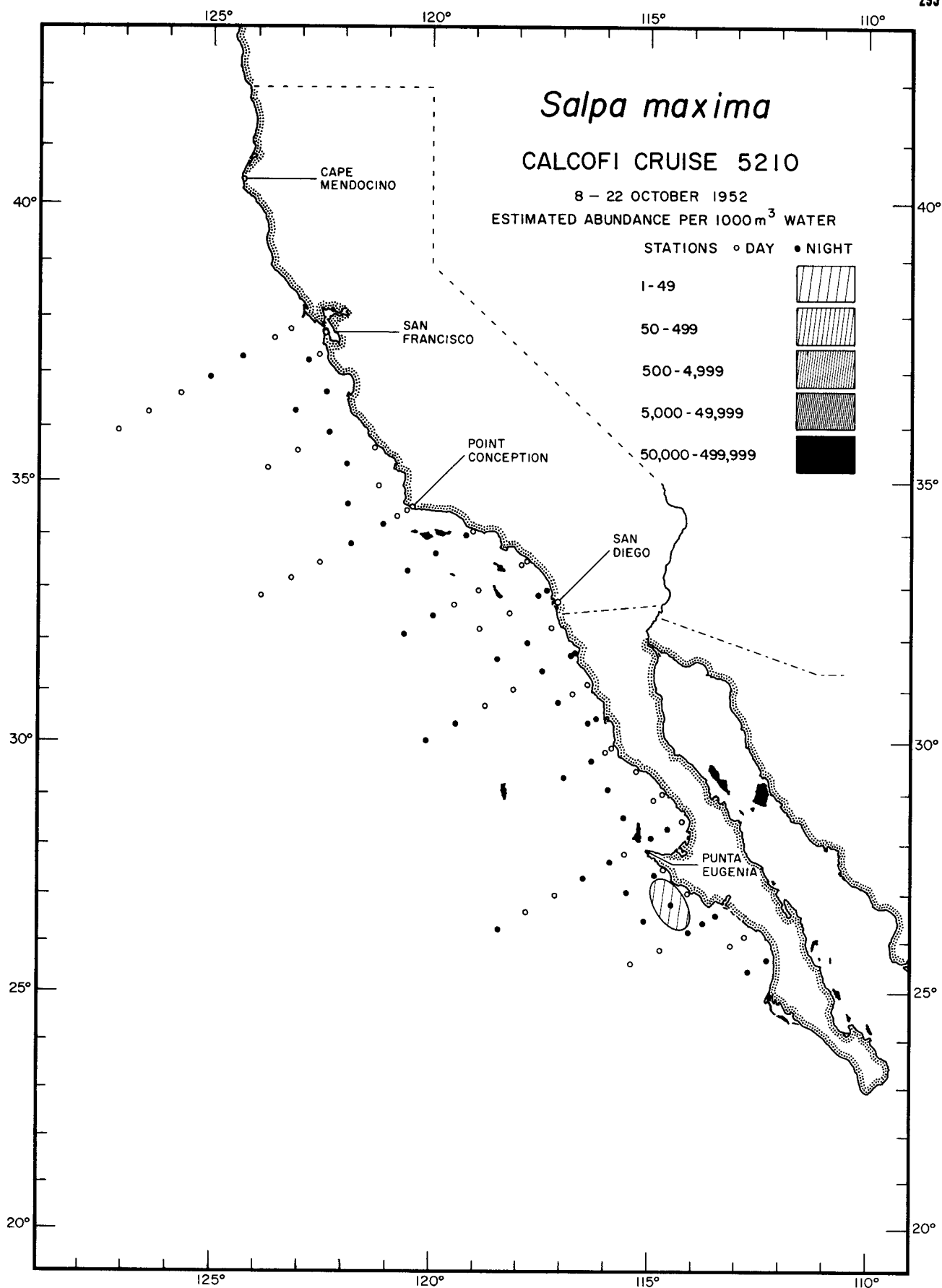
Thaliacea
Salpa maxima
4910



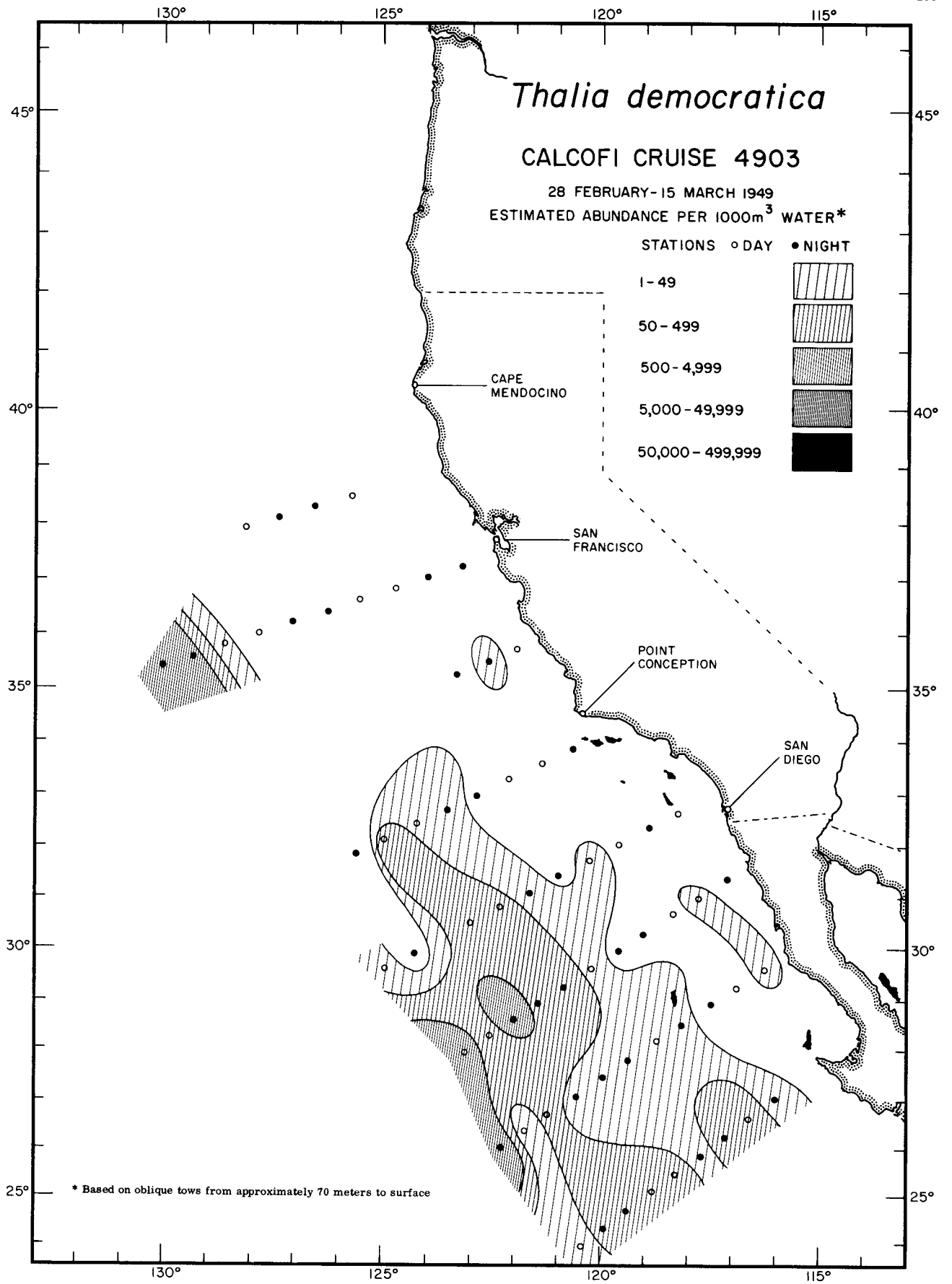
Thaliacea
Salpa maxima
5009



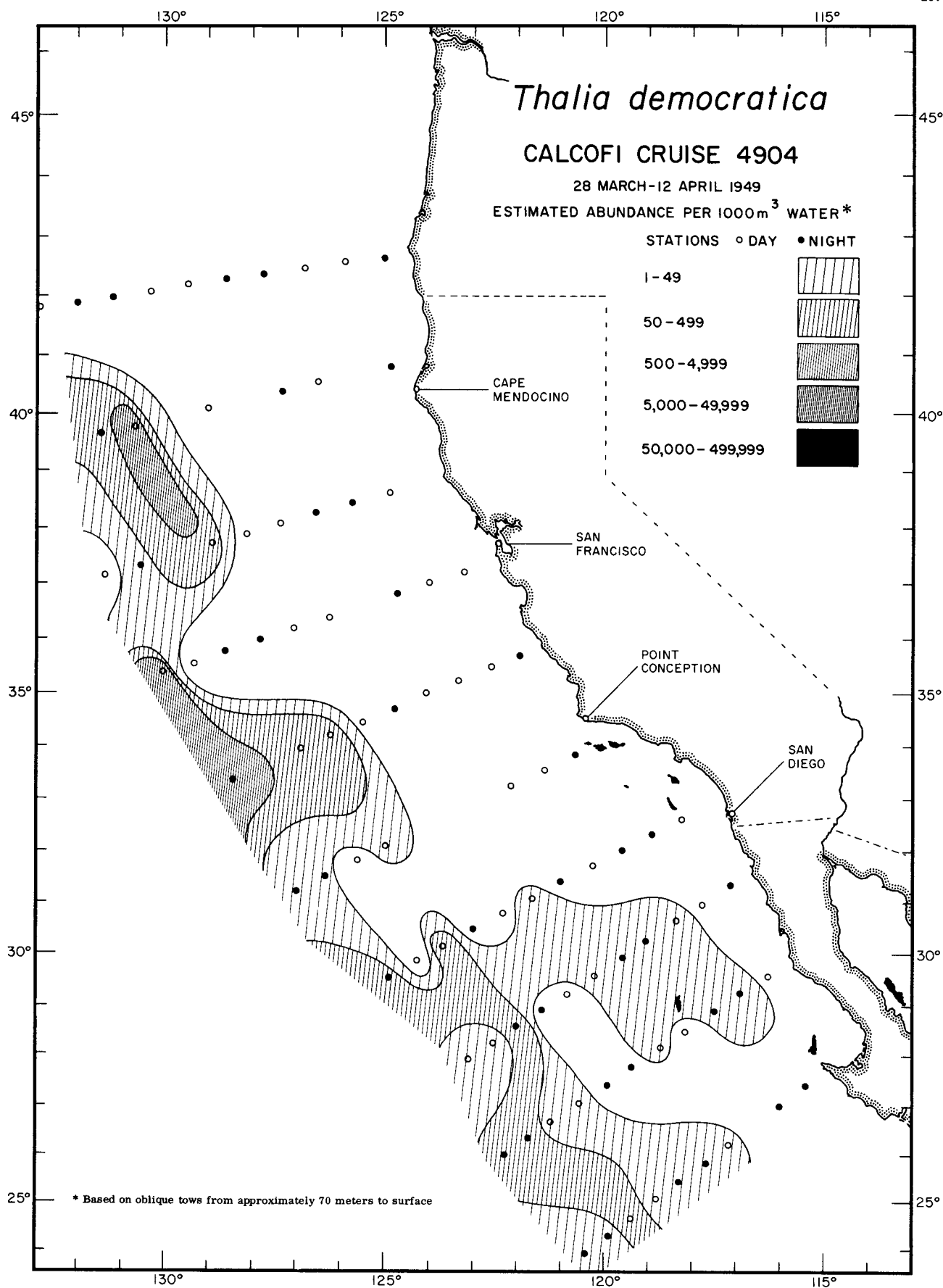
Thaliacea
Salpa maxima
5109



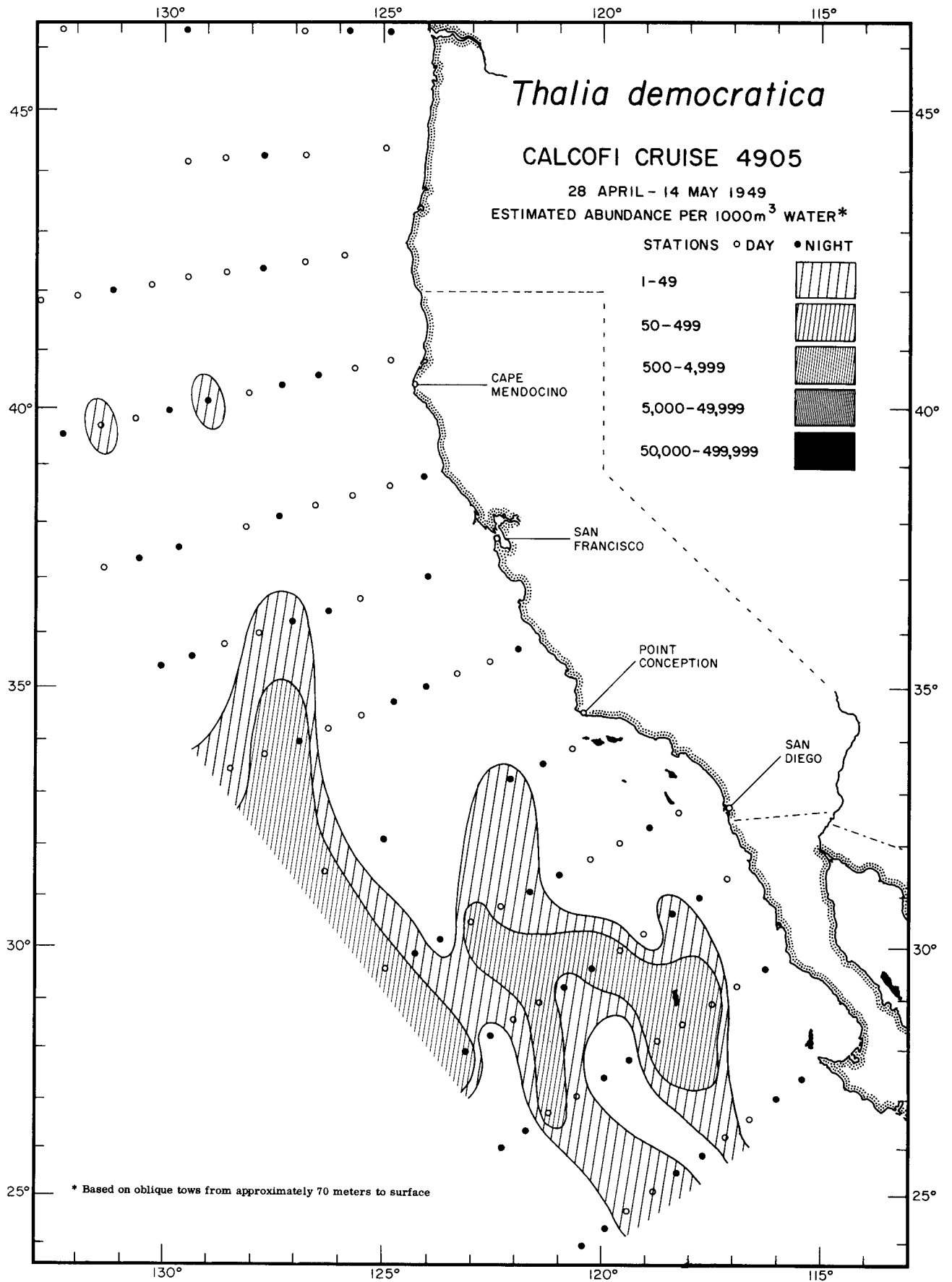
Thaliacea
Salpa maxima
5210



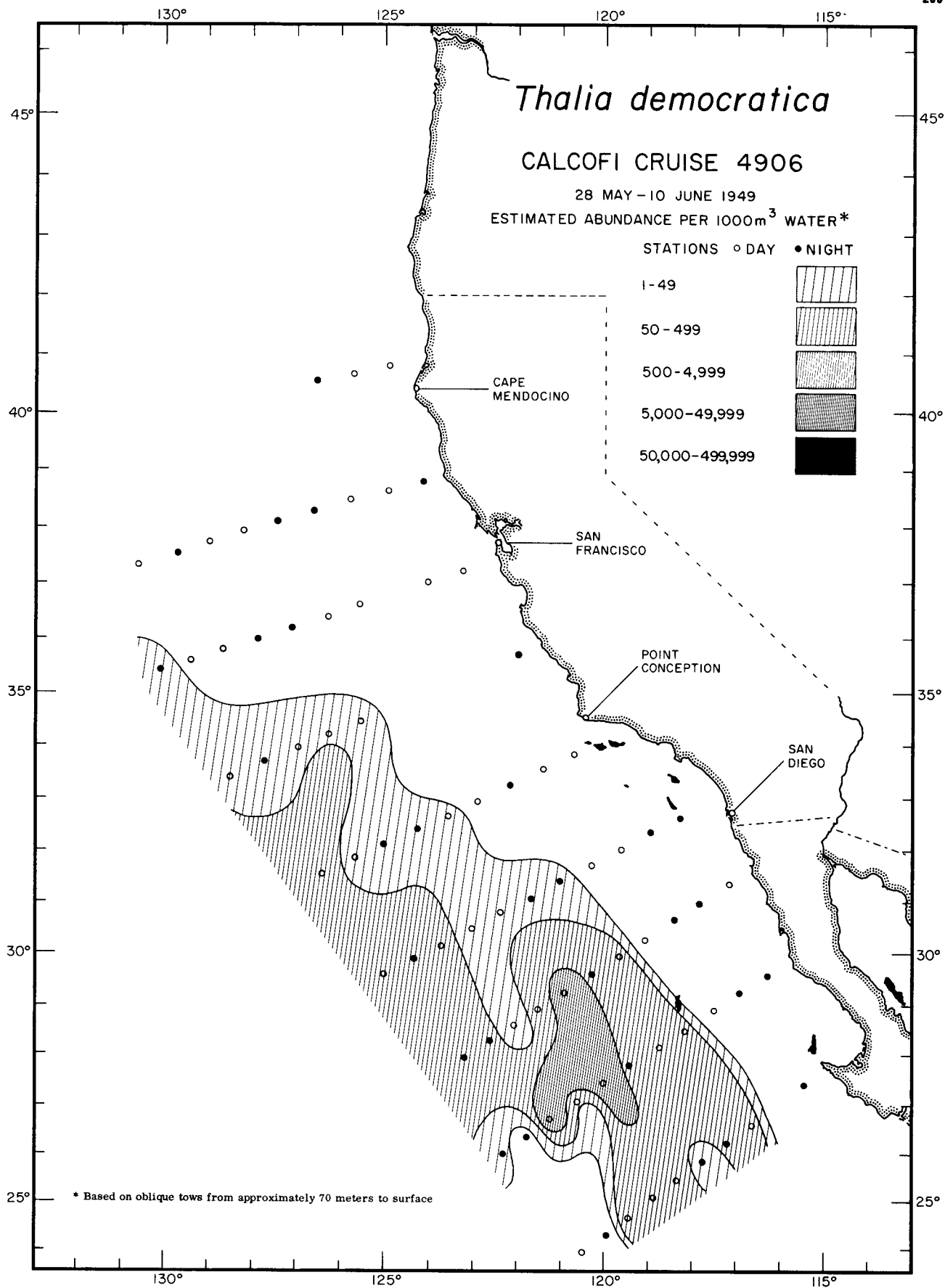
Thaliacea
Thalia democratica
4903



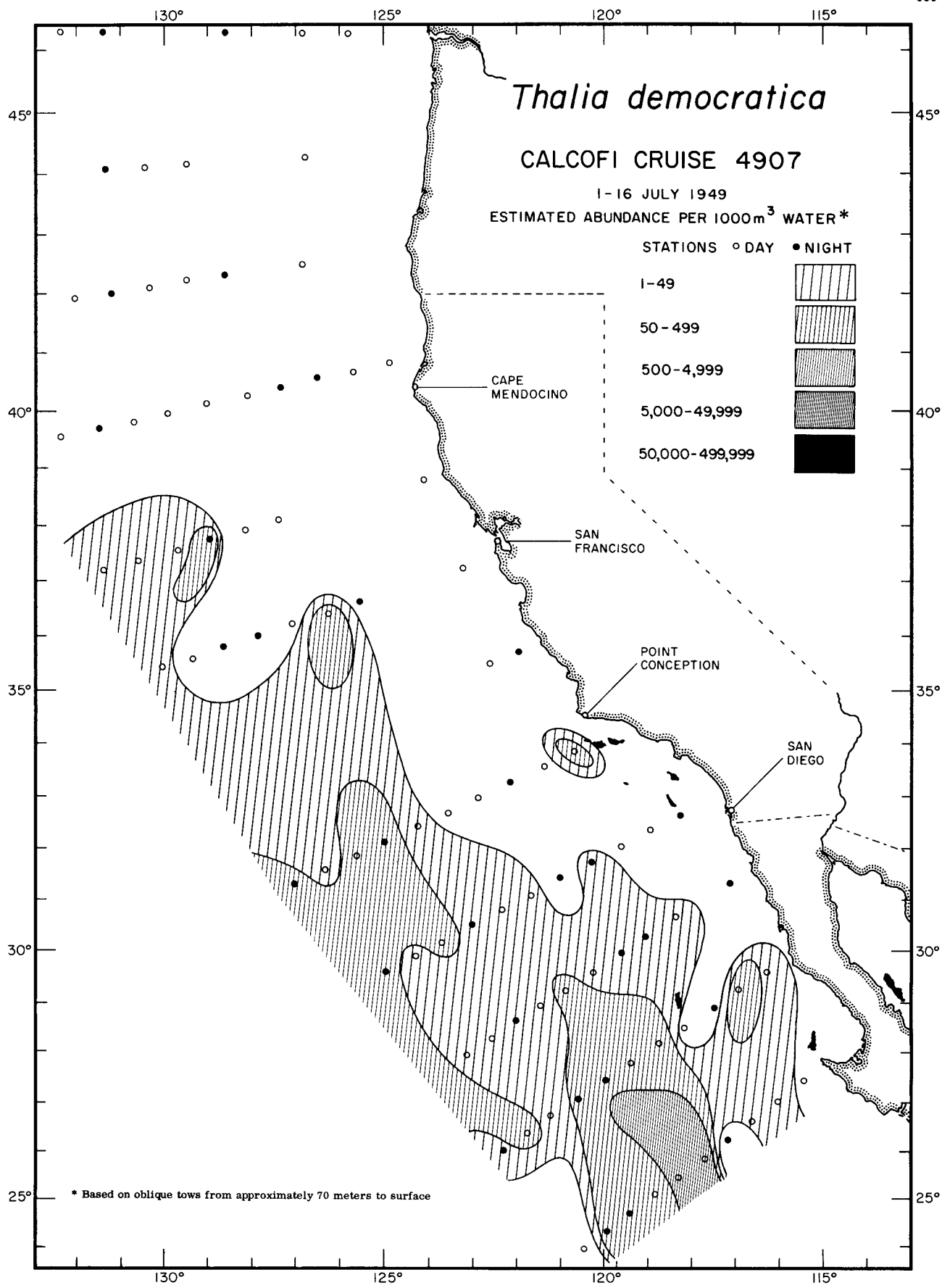
Thaliacea
Thalia democratica
4904



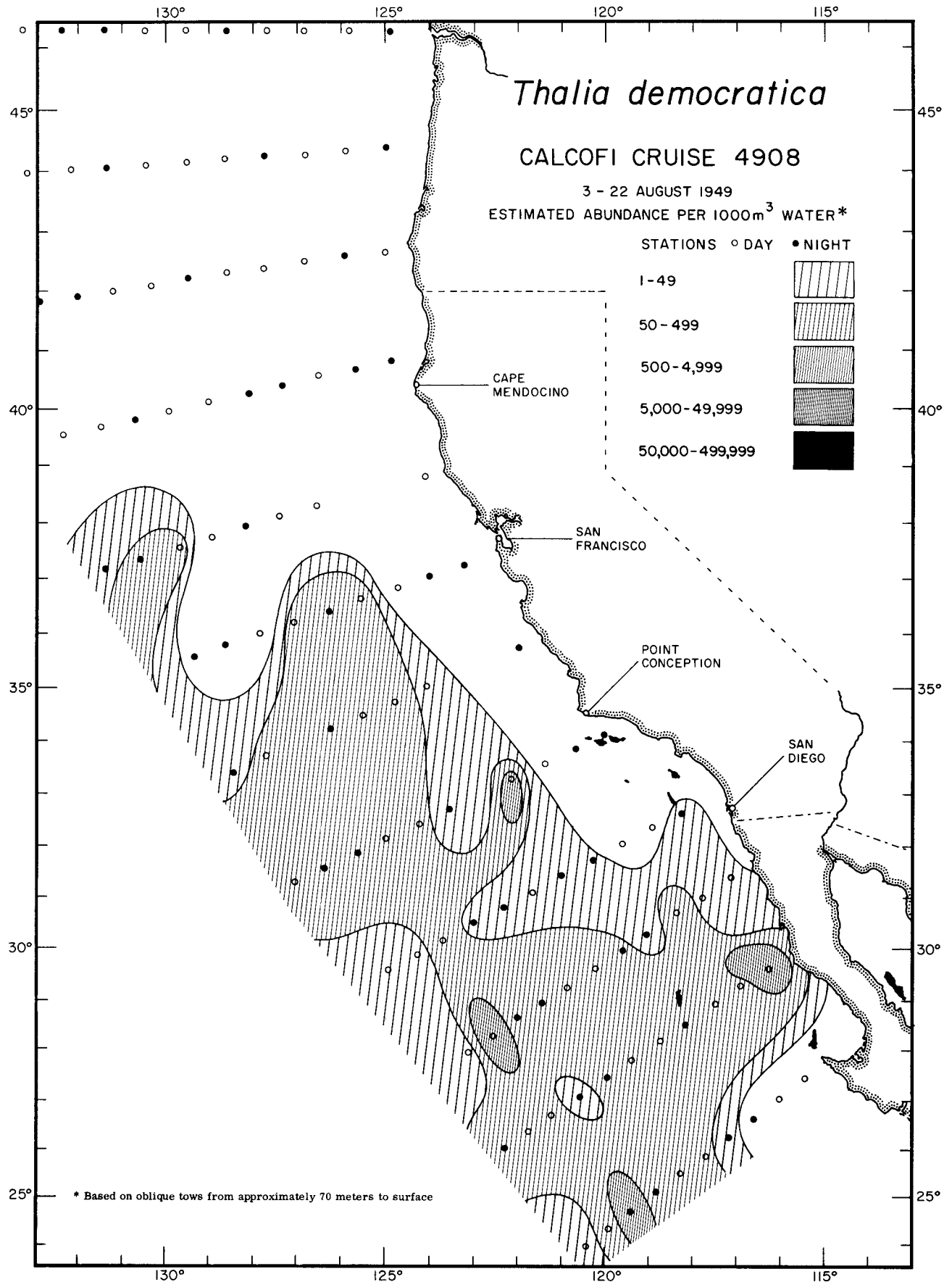
Thaliacea
Thalia democratica
 4905

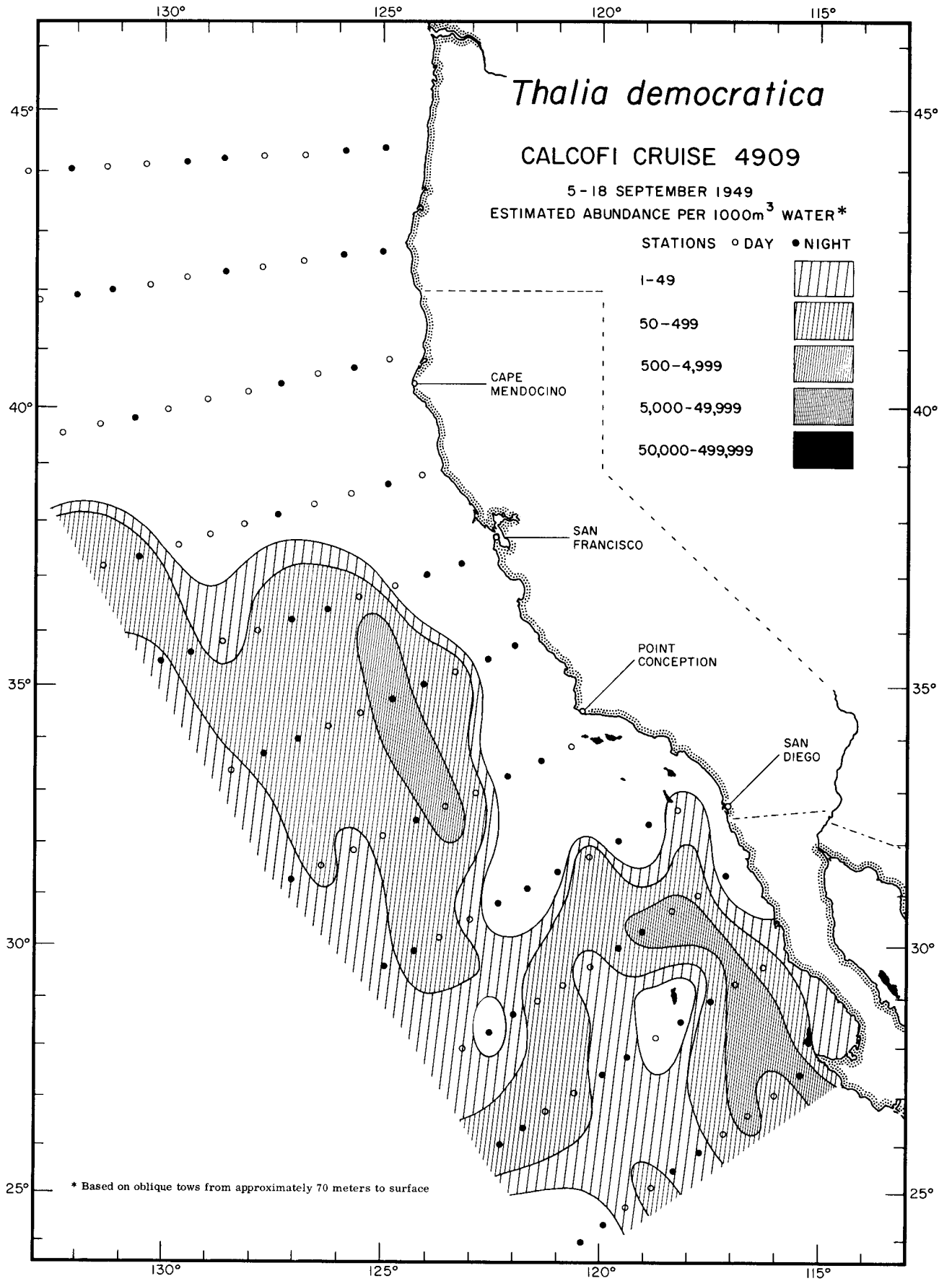


Thaliacea
Thalia democratica
4906

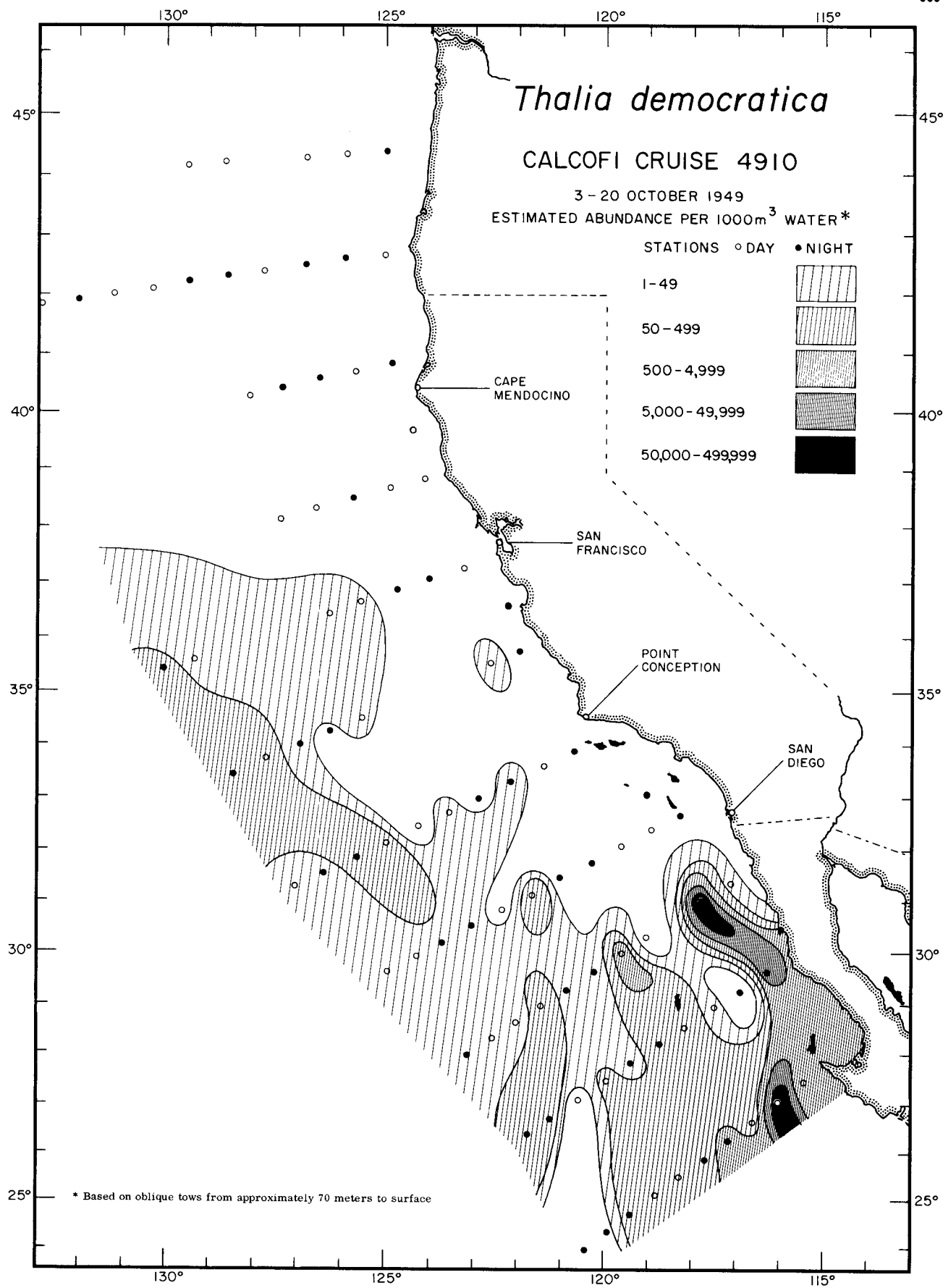


Thaliacea
Thalia democratica
4907



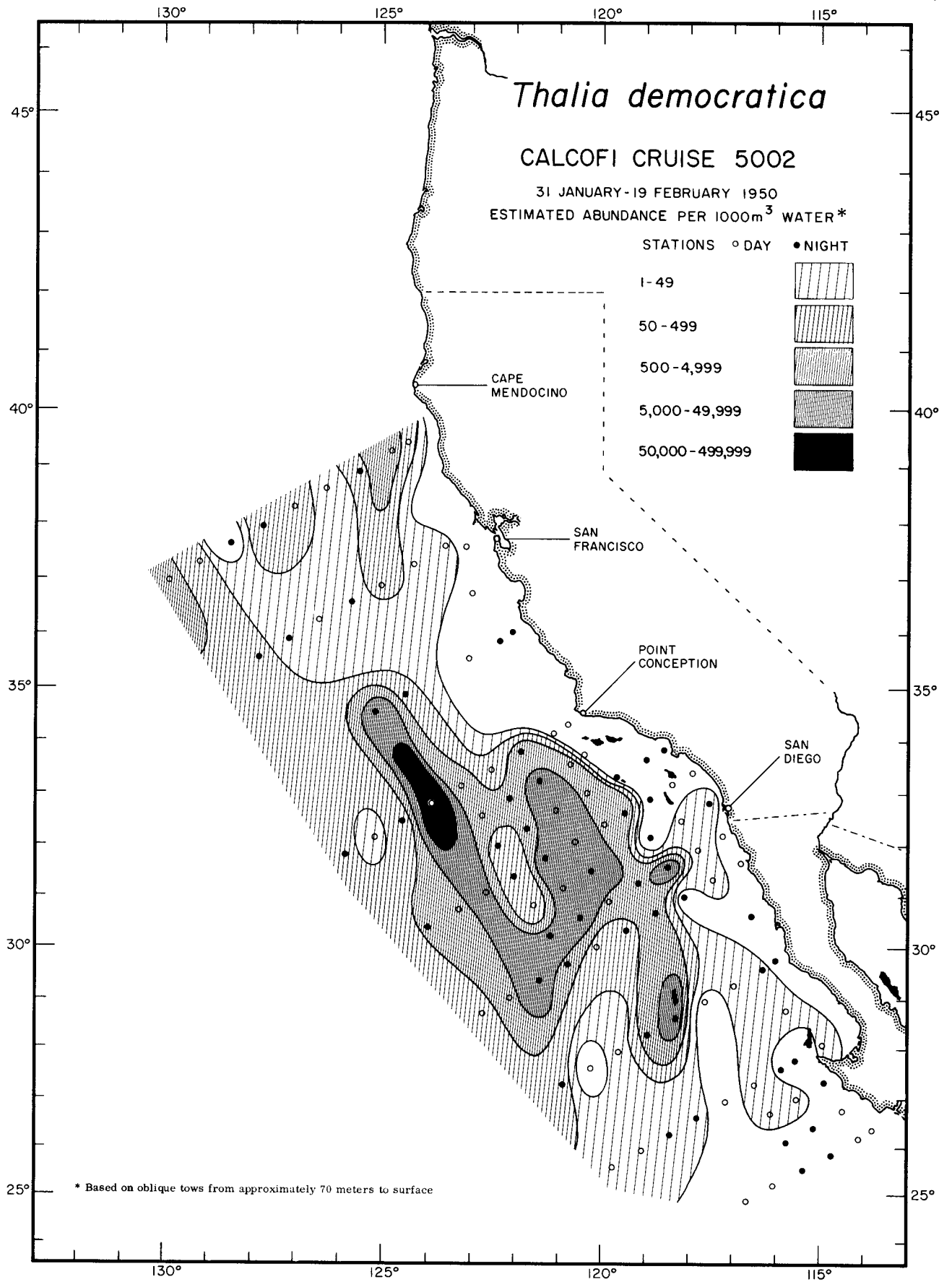


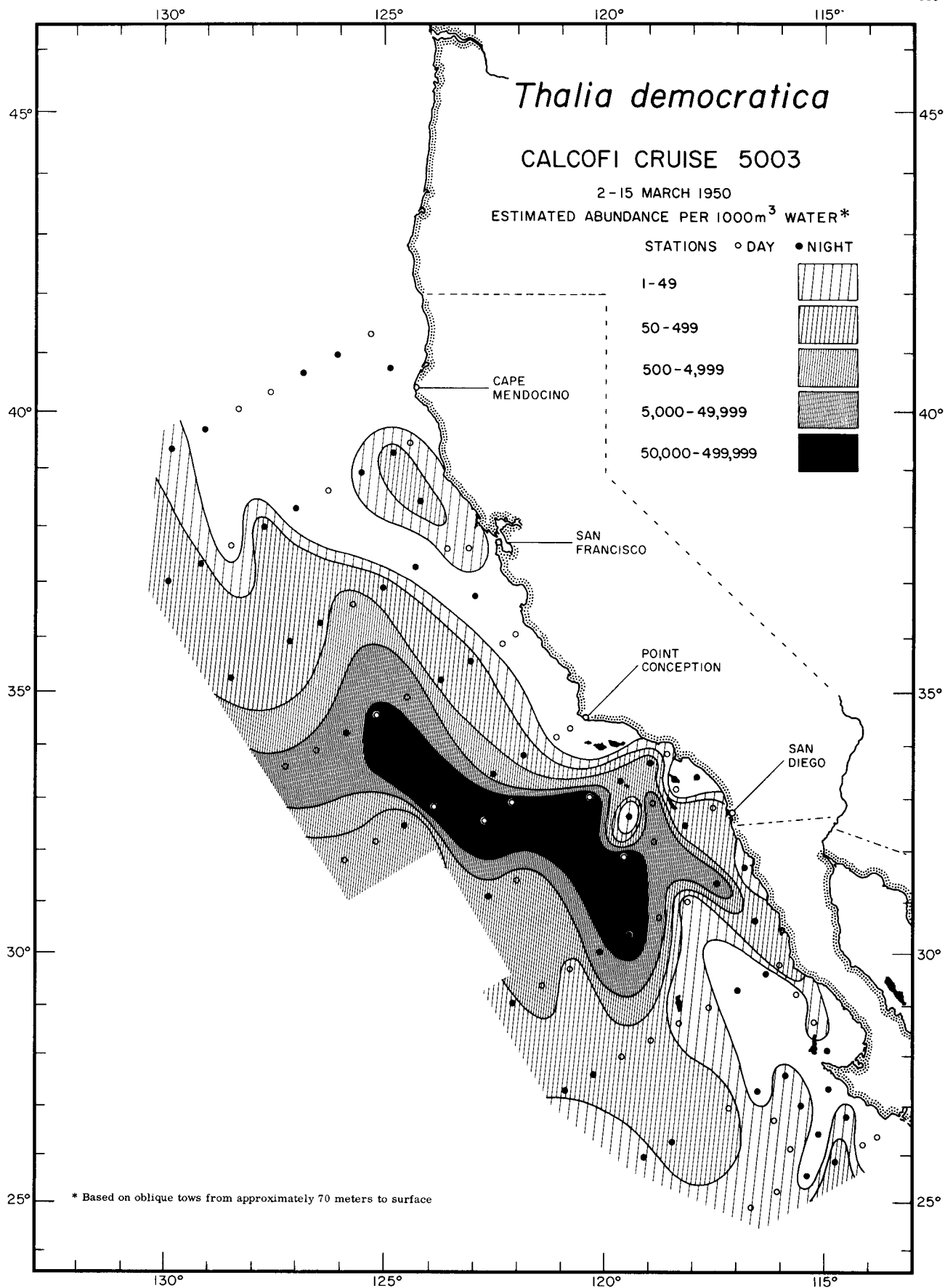
Thaliacea
Thalia democratica
4909



Thaliacea
Thalia democratica

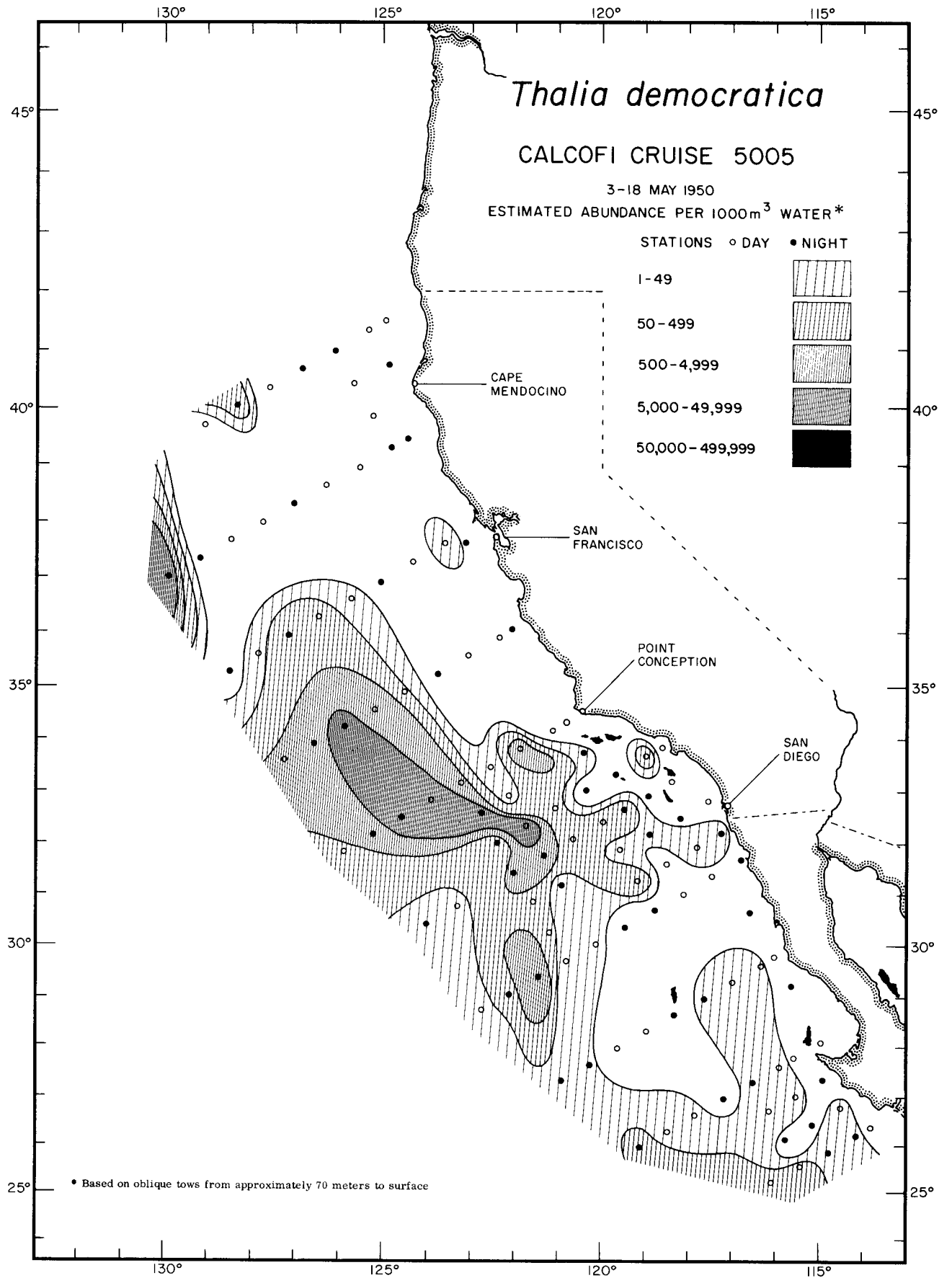
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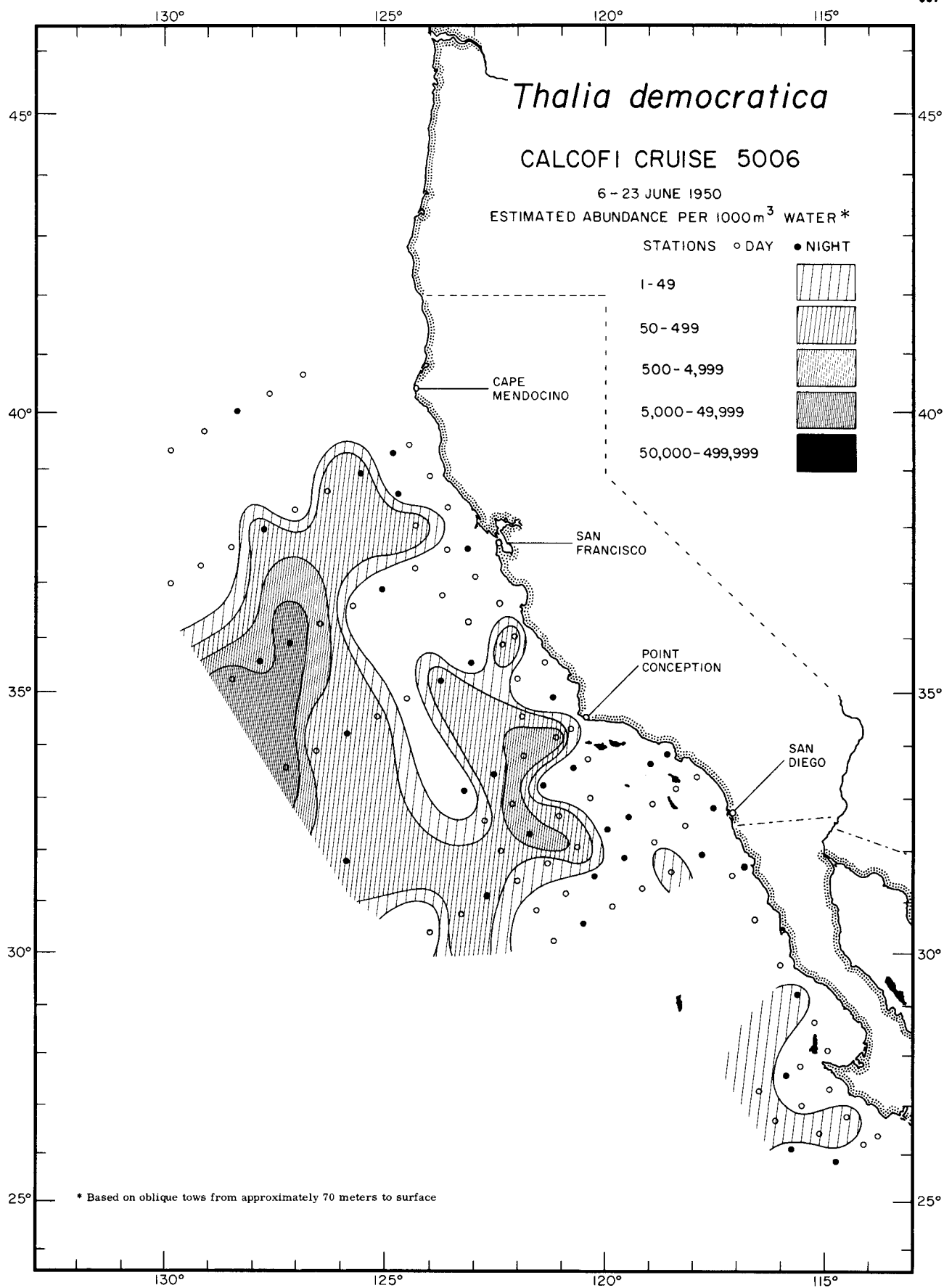




Thaliacea
Thalia democratica

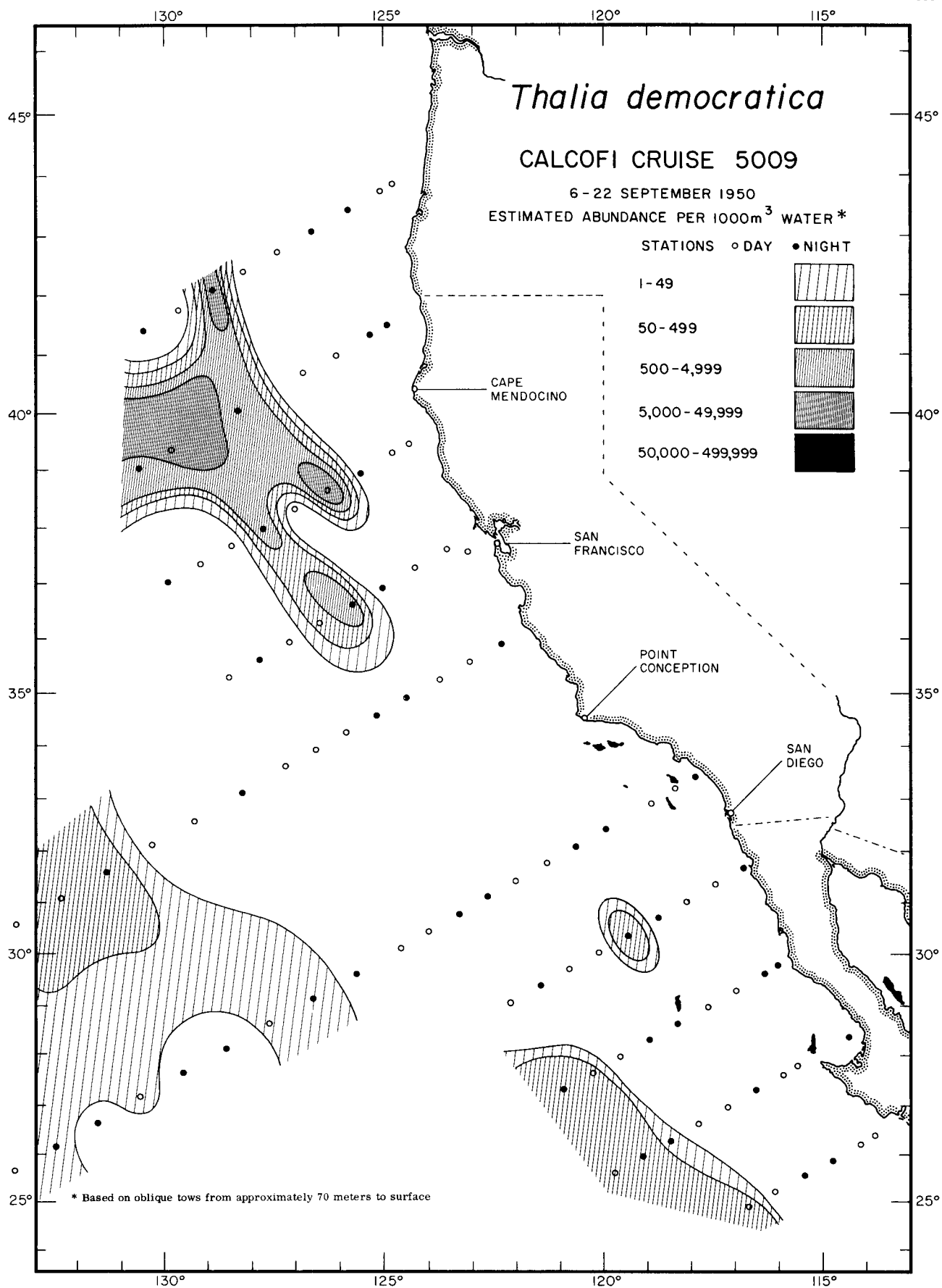
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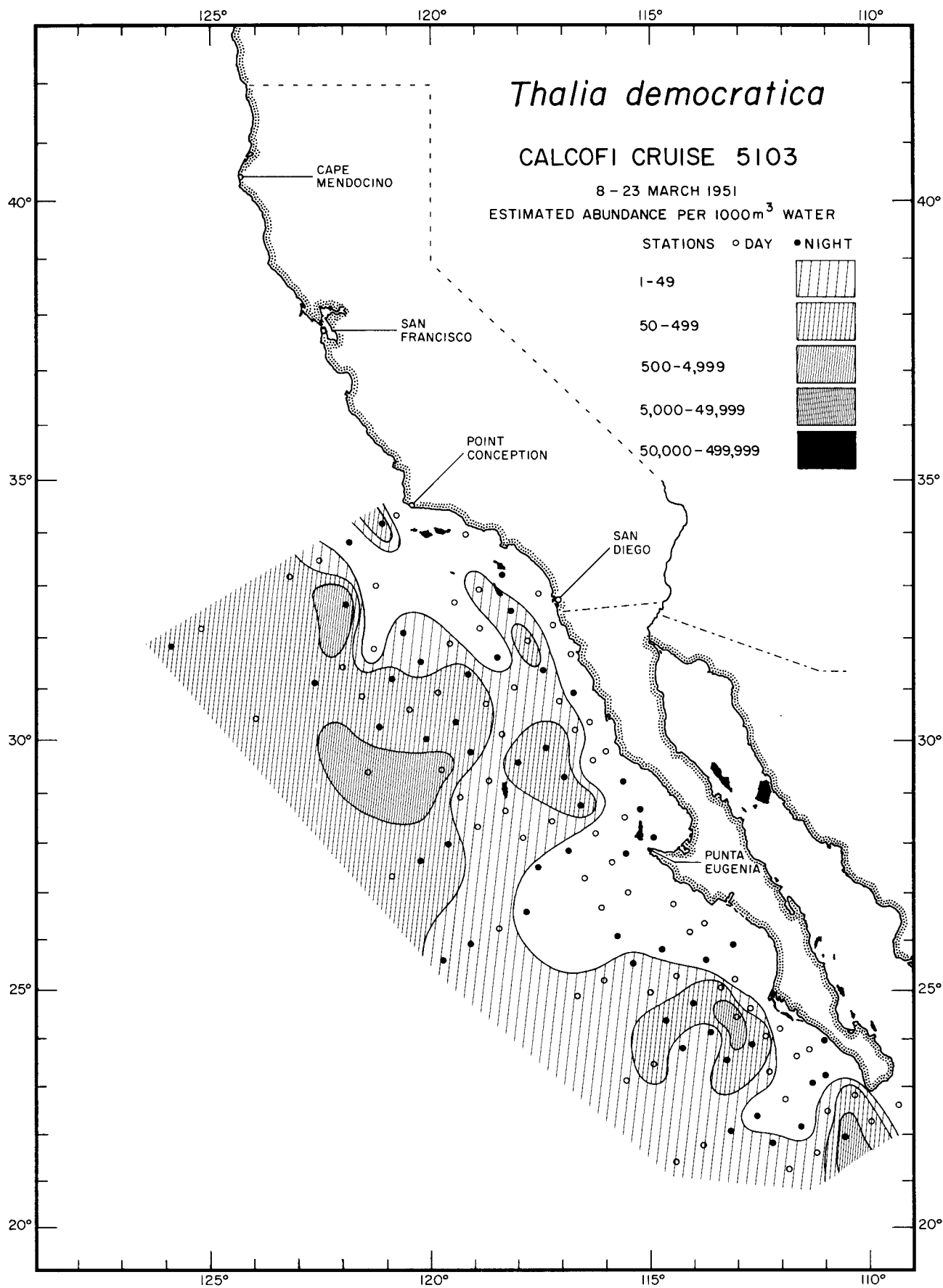


Thaliacea
Thalia democratica

5006

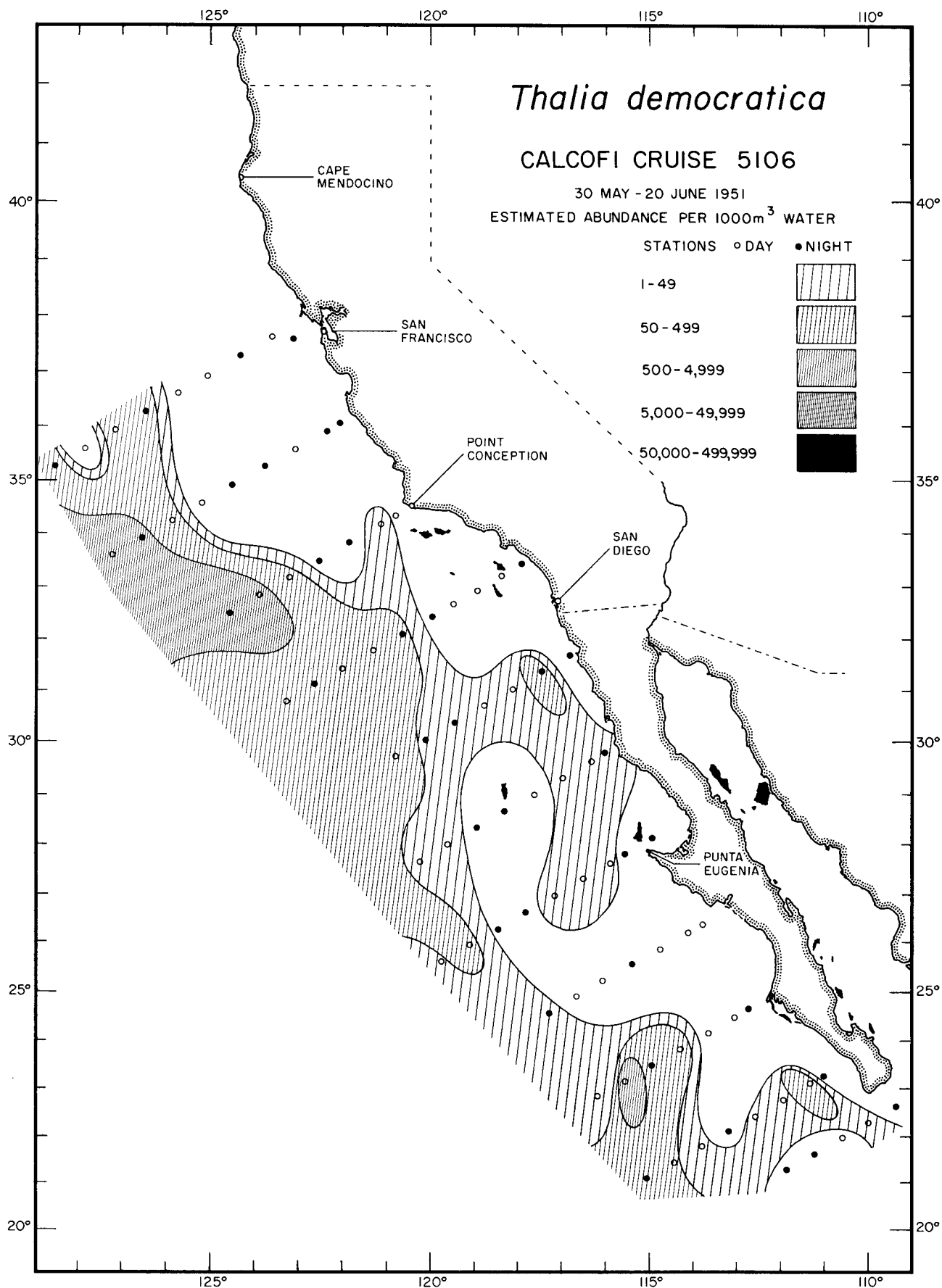


Thaliacea
Thalia democratica
5009



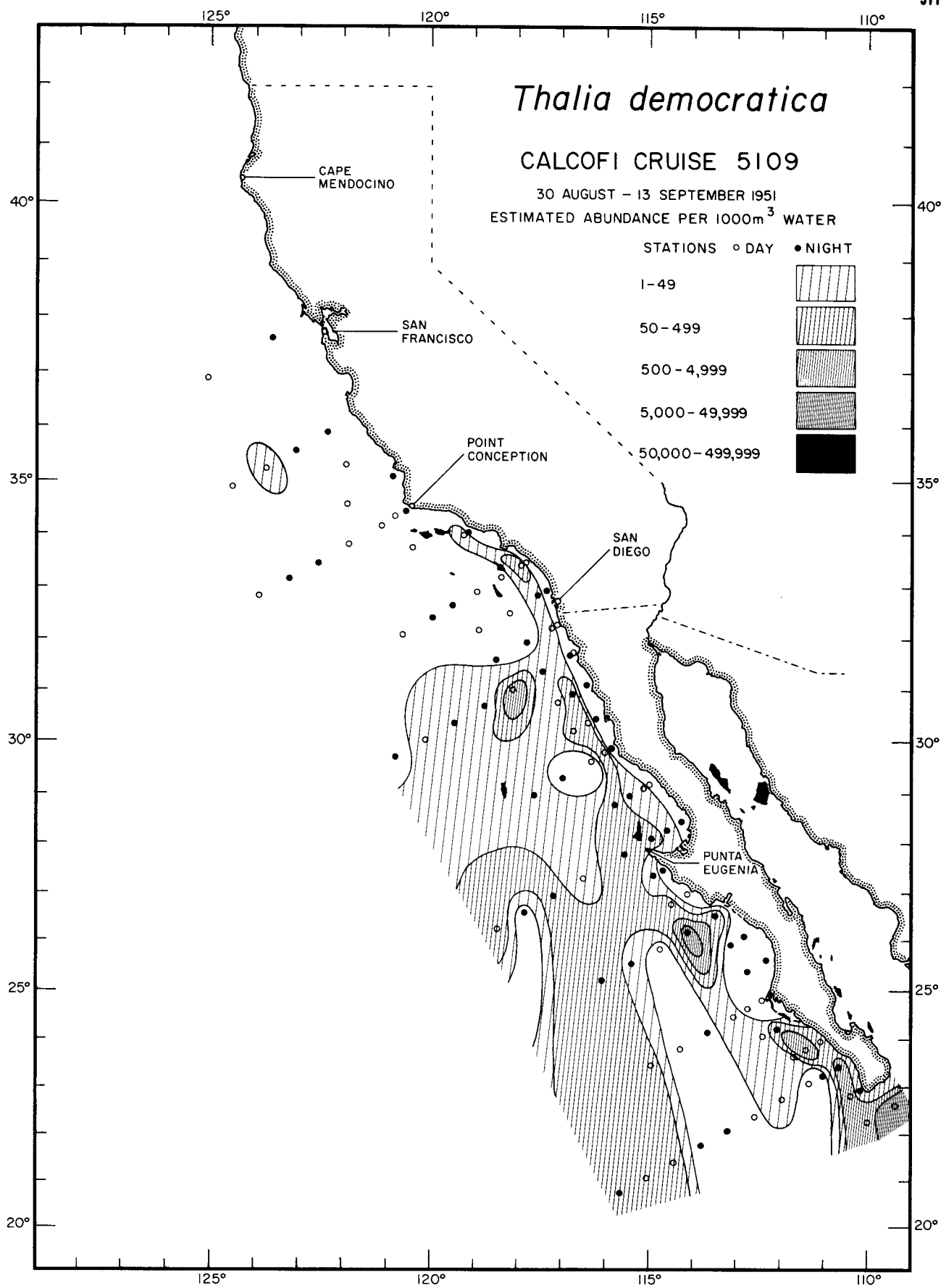
Thaliacea
Thalia democratica

5103



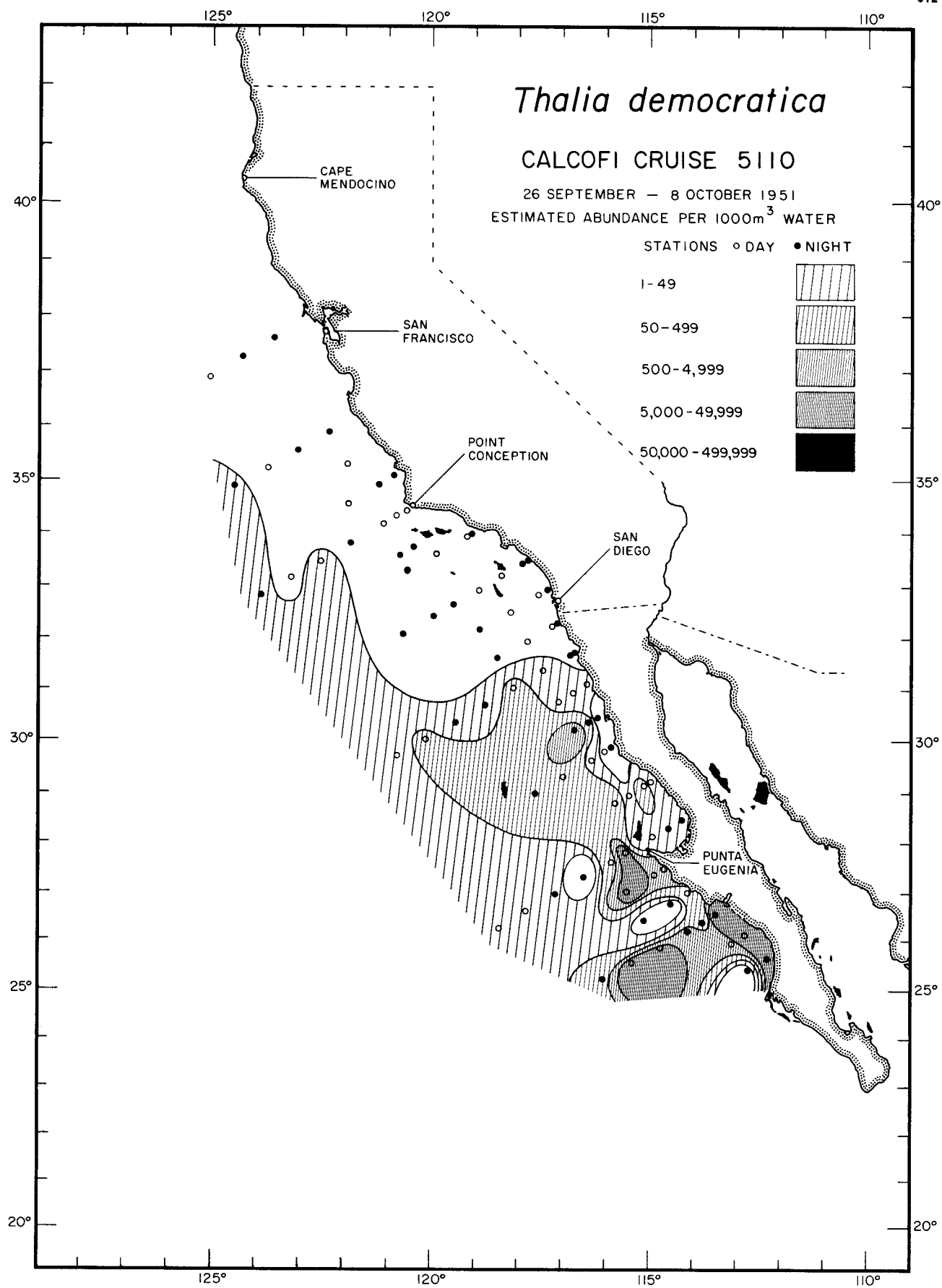
Thaliacea
Thalia democratica

5106

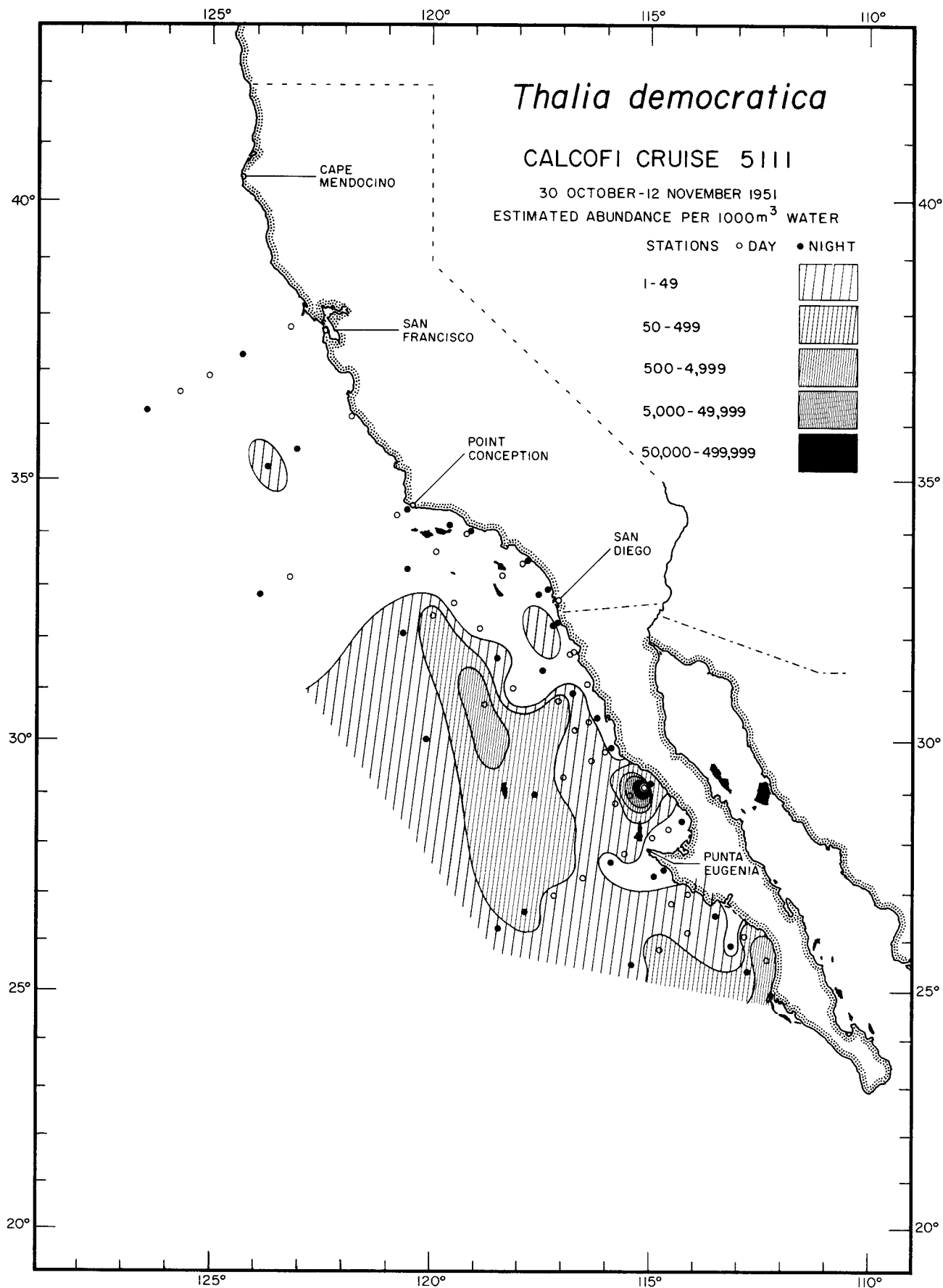


Thaliacea
Thalia democratica

5109

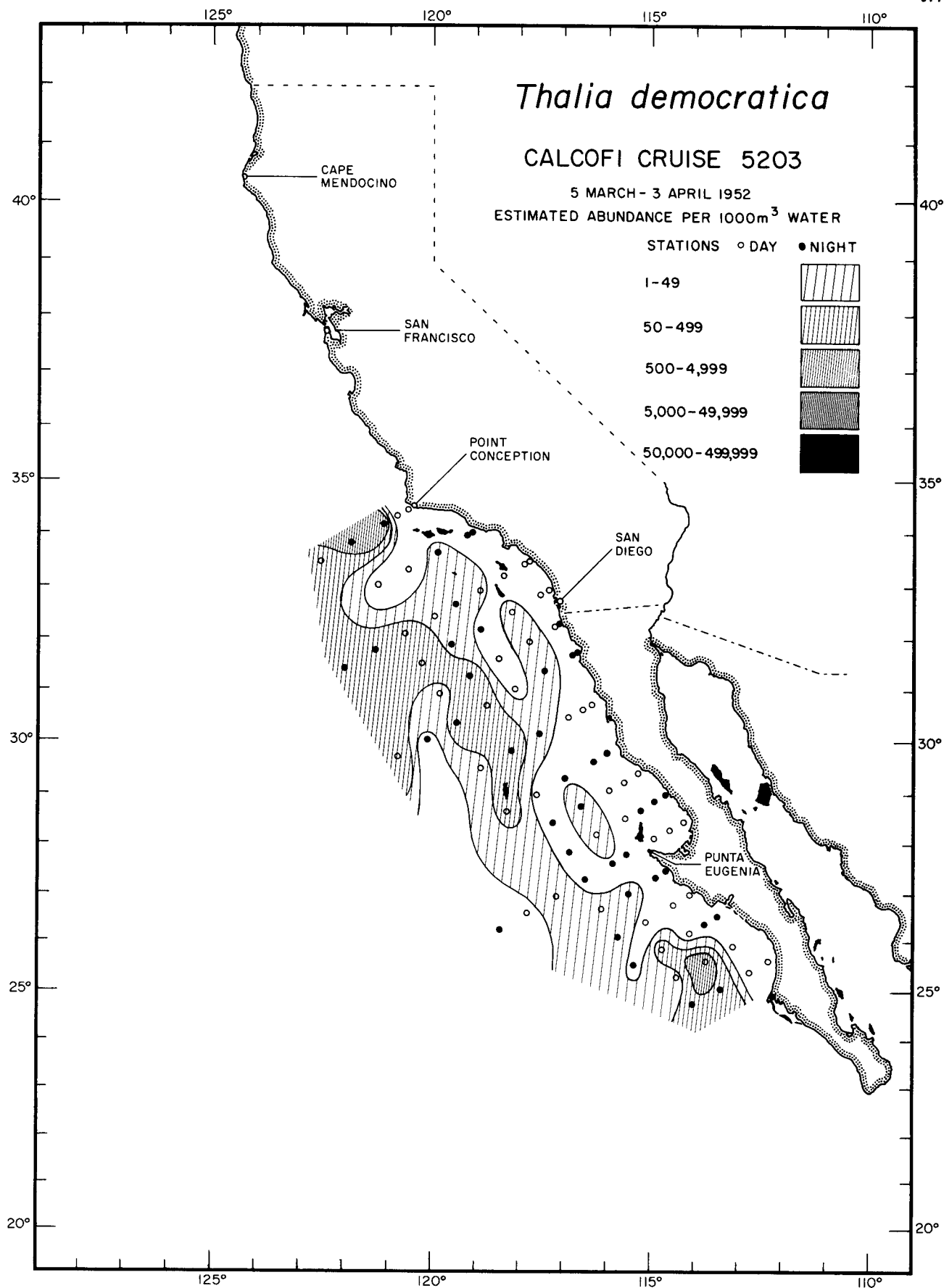


Thaliacea
Thalia democratica
5110



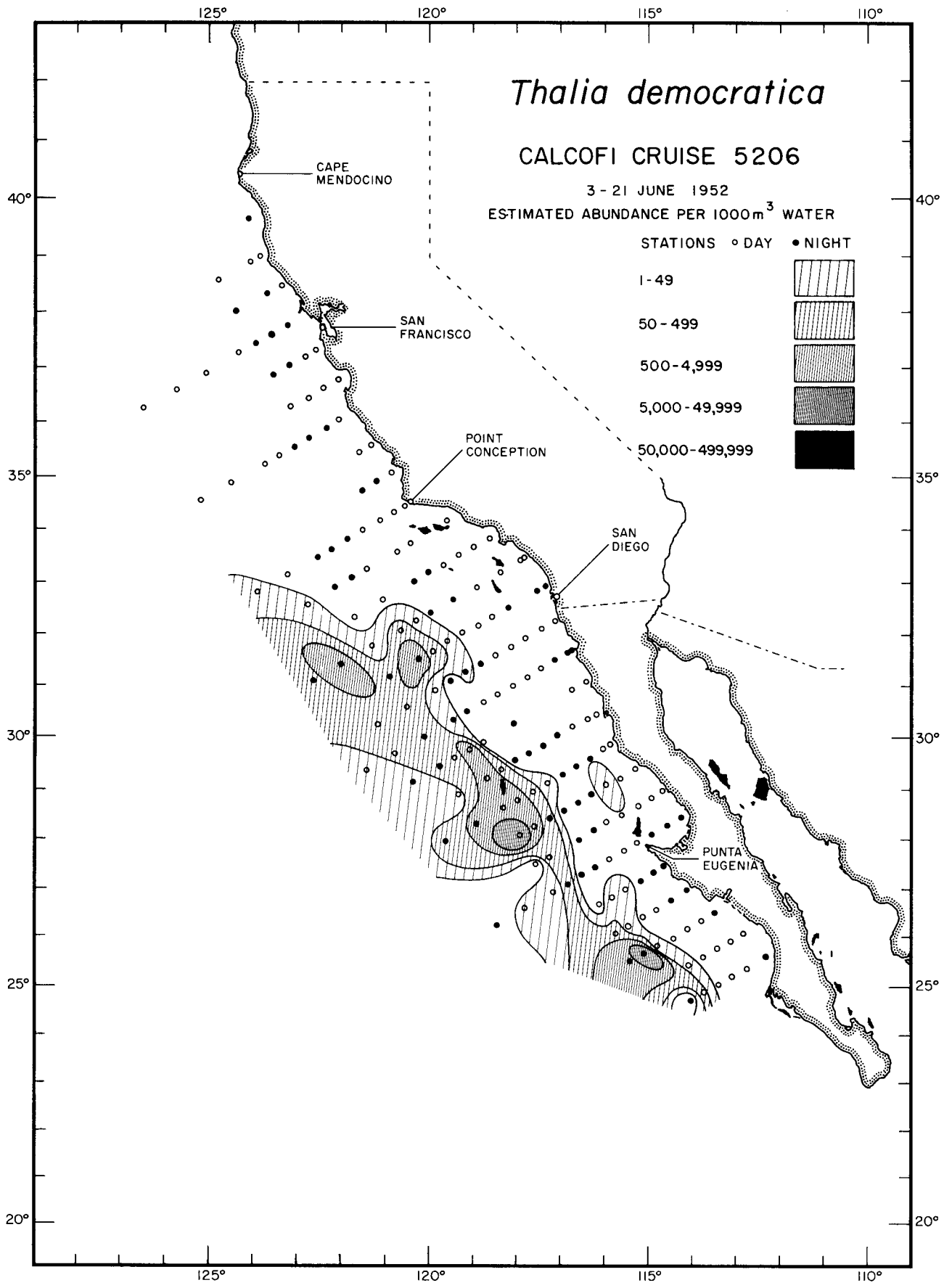
Thaliacea
Thalia democratica

5111

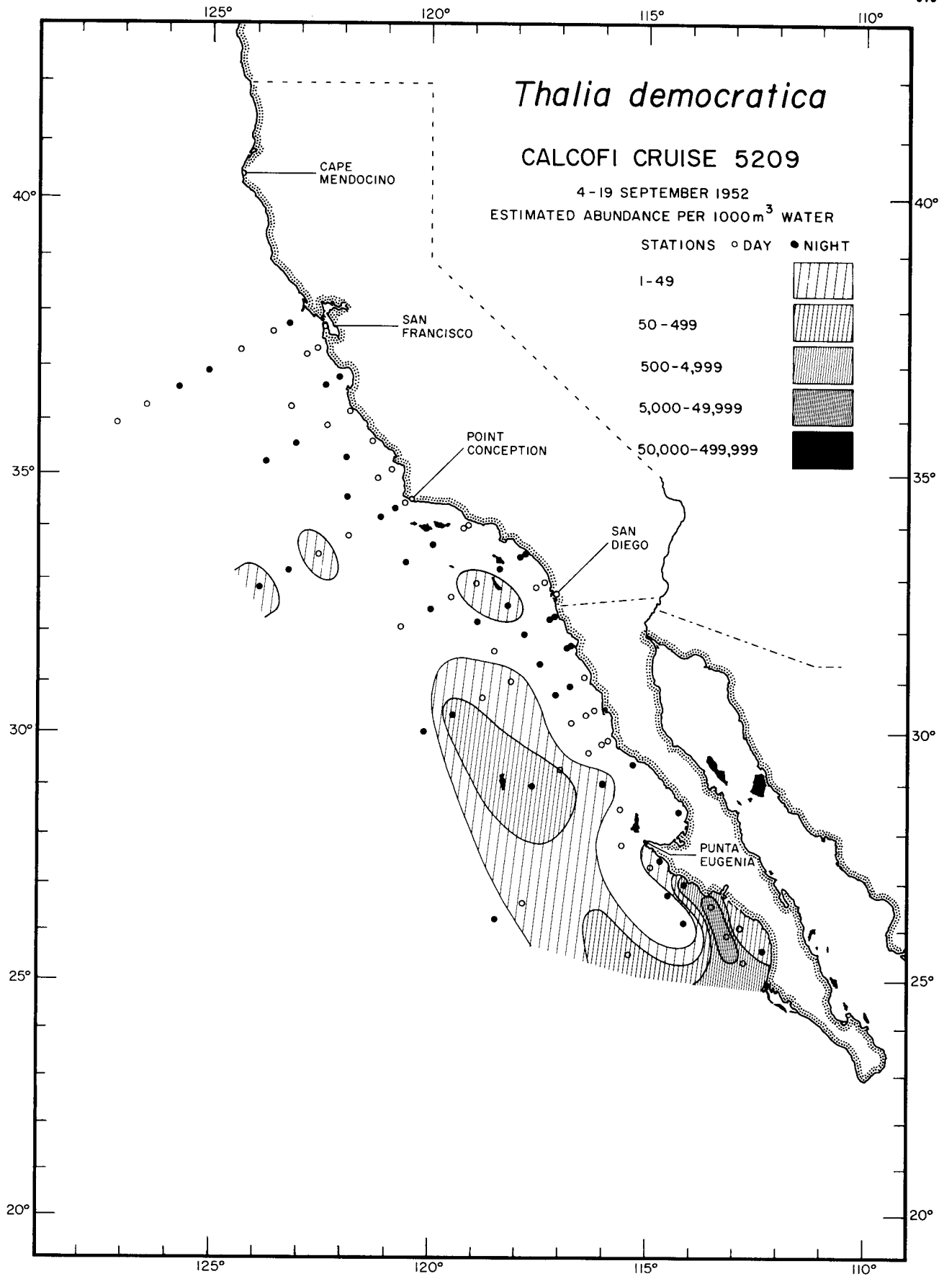


Thaliacea
Thalia democratica

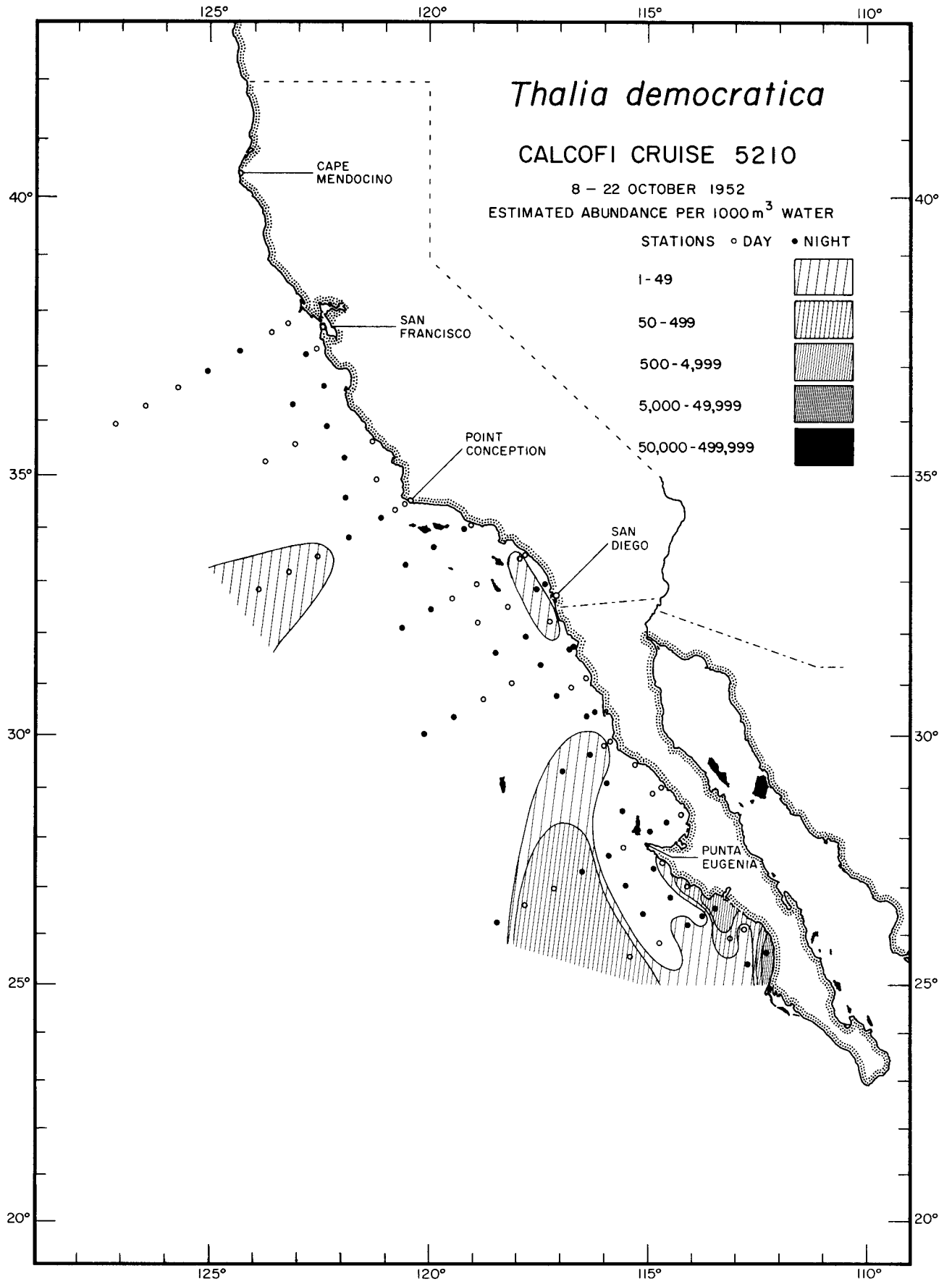
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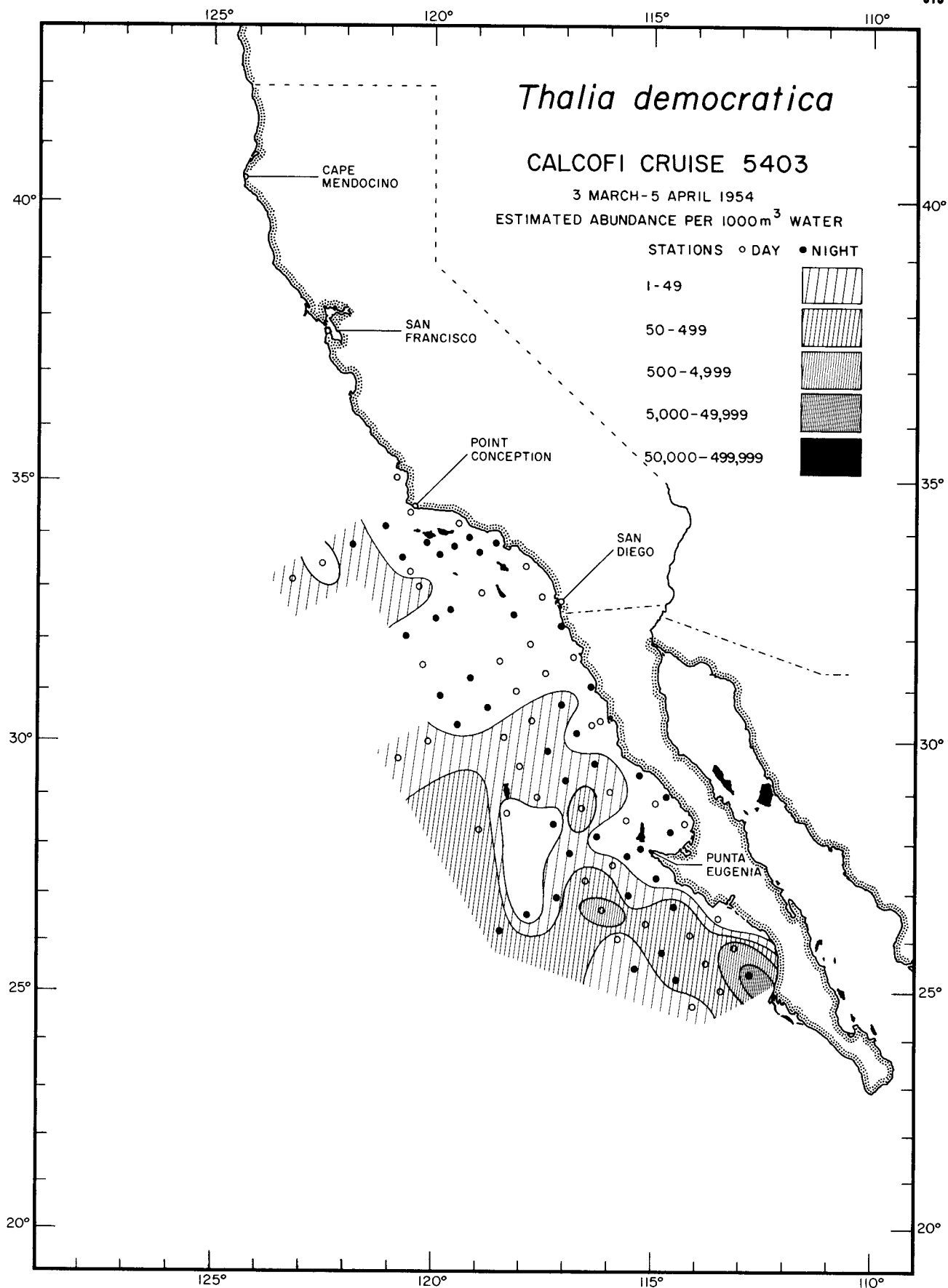
Thaliacea
Thalia democratica
 5206



Thaliacea
Thalia democratica
5209

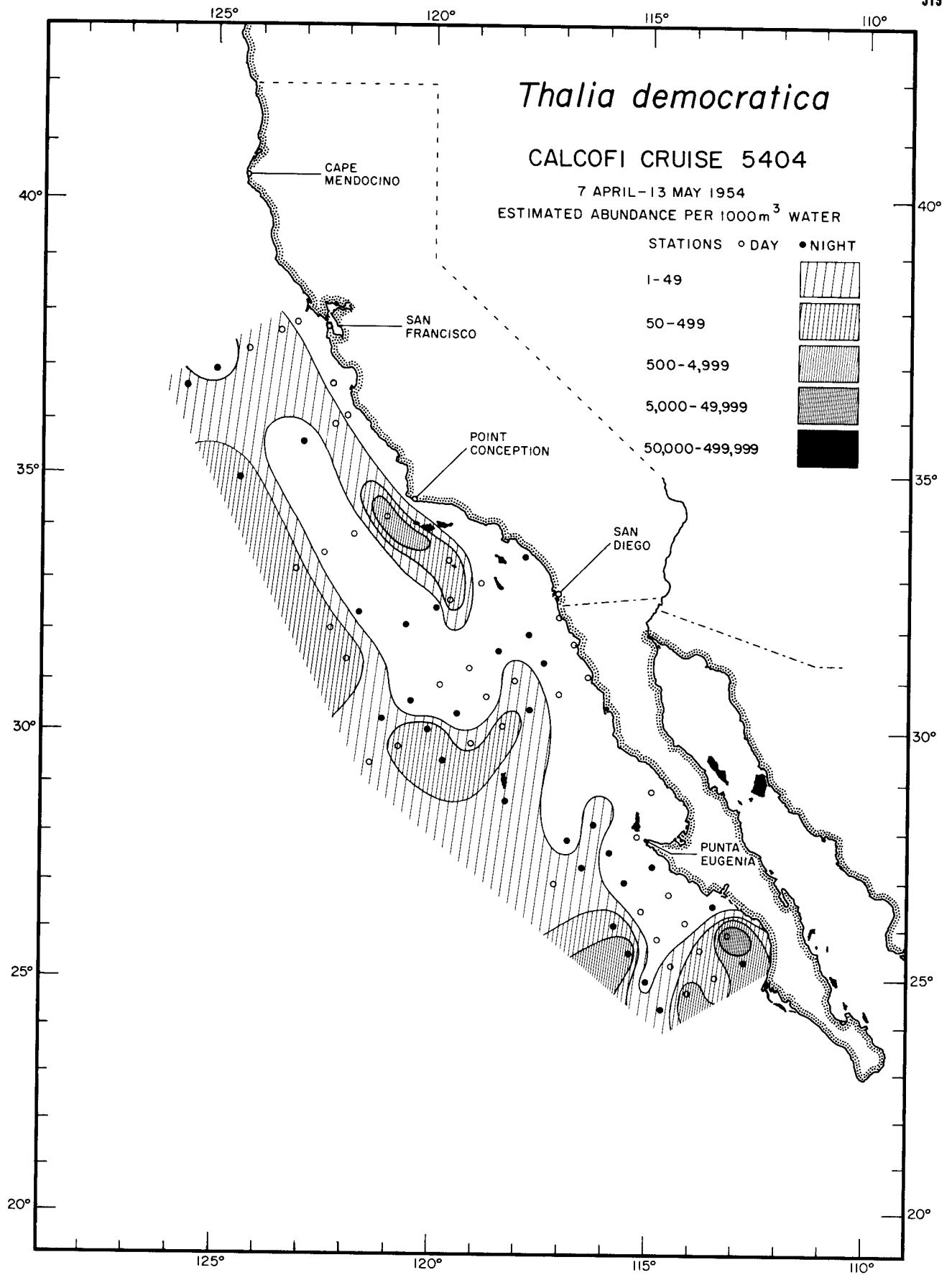


Thaliacea
Thalia democratica
5210



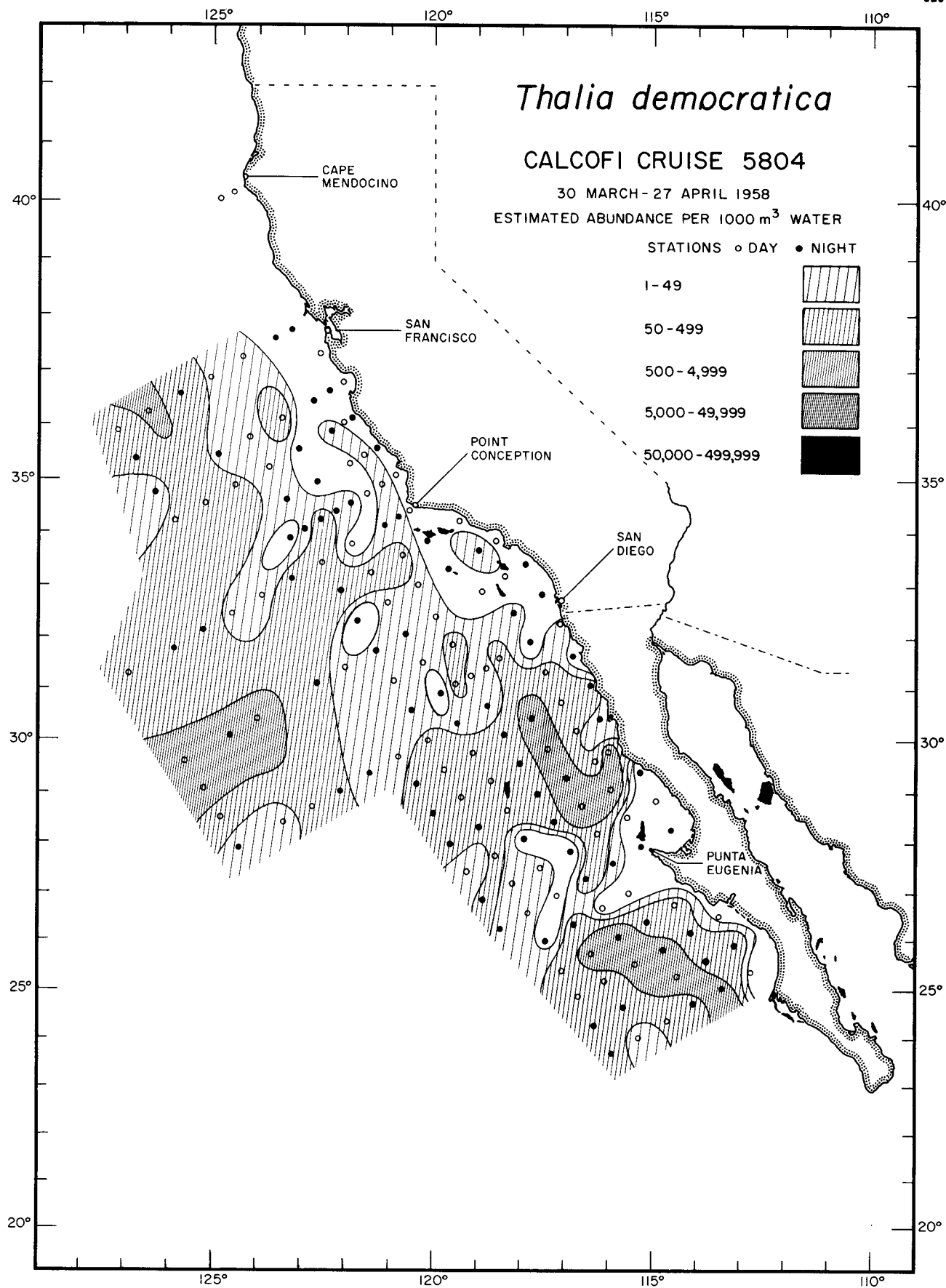
Thaliacea
Thalia democratica

5403

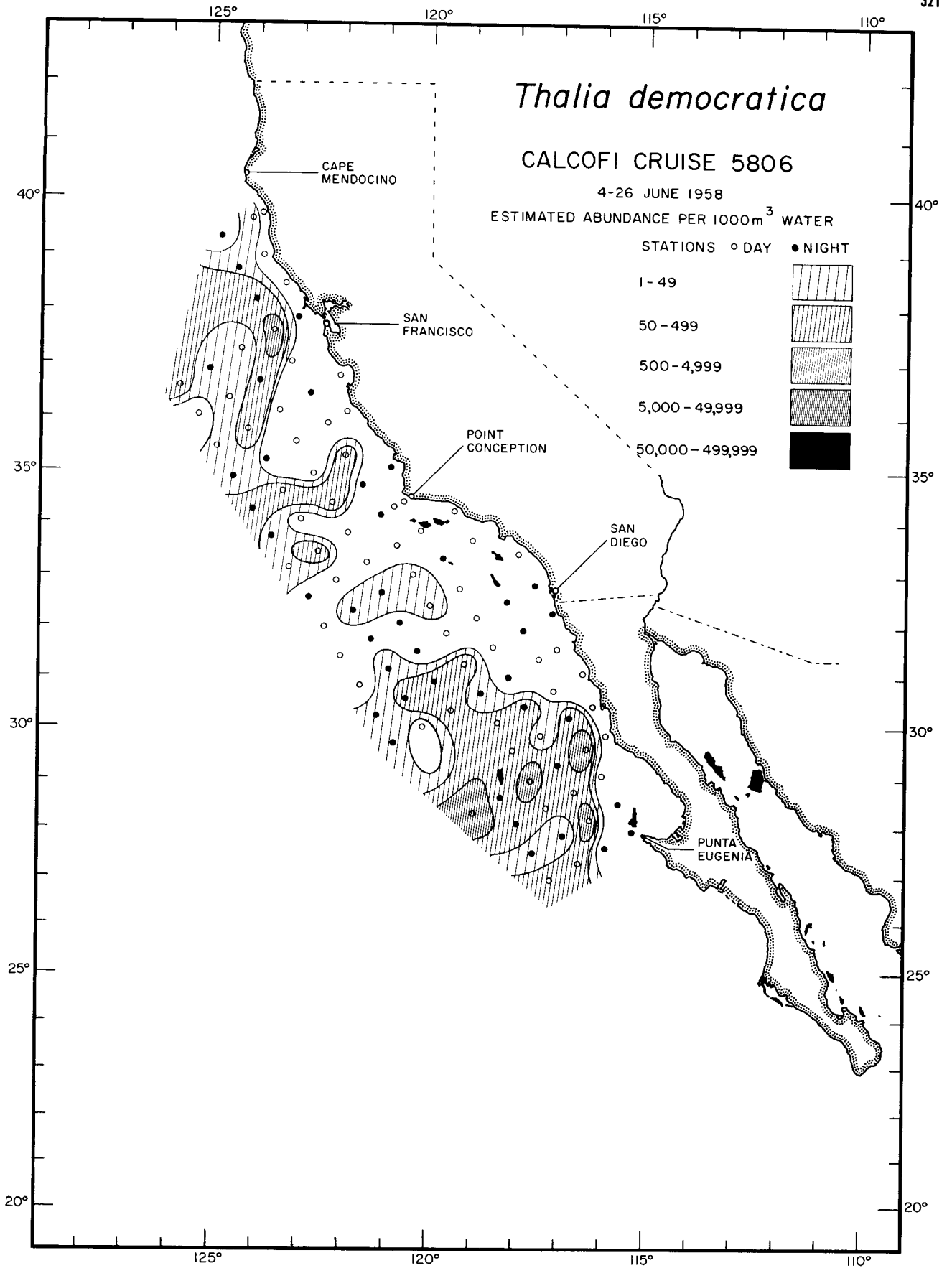


Thaliacea
Thalia democratica

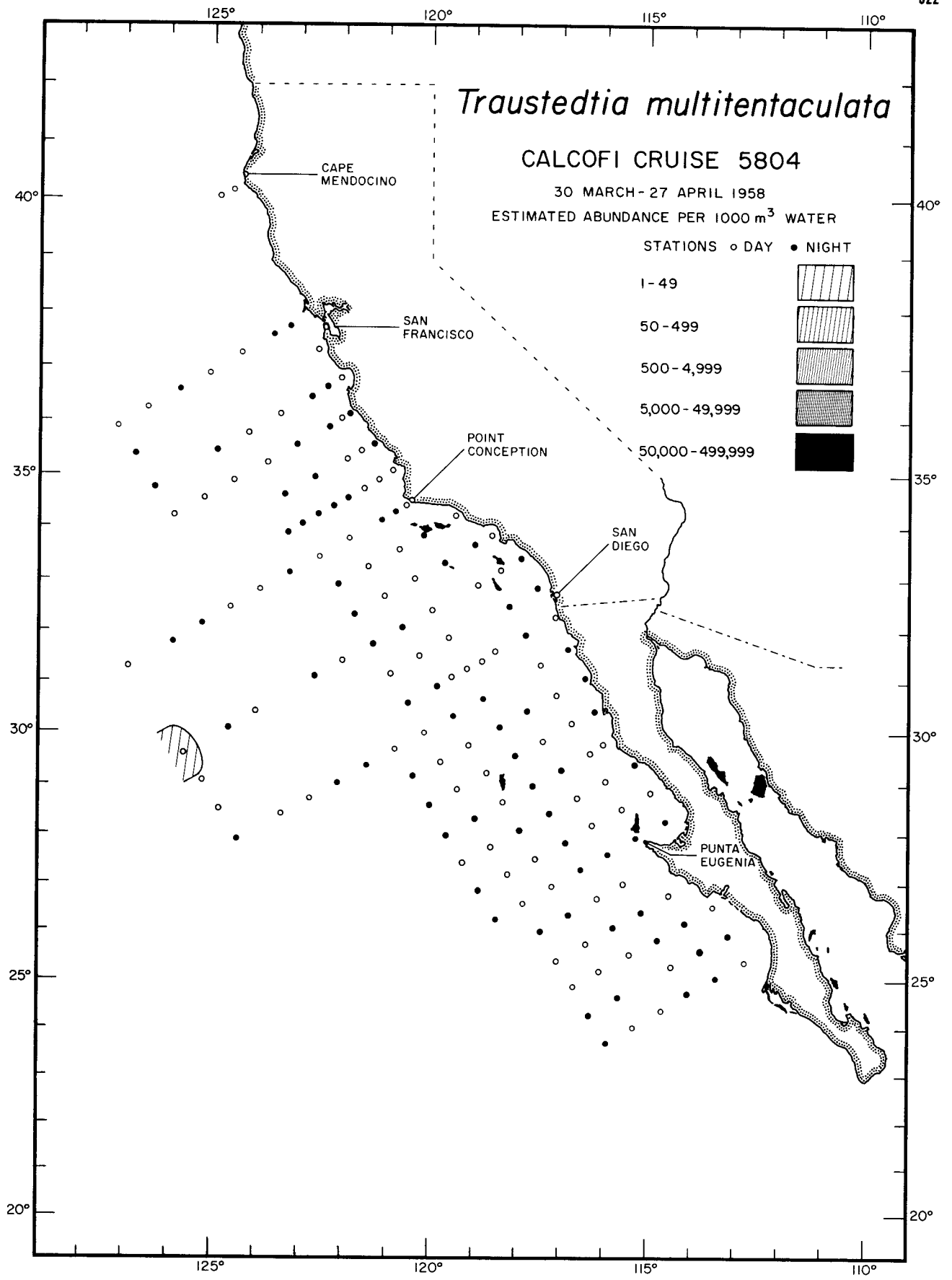
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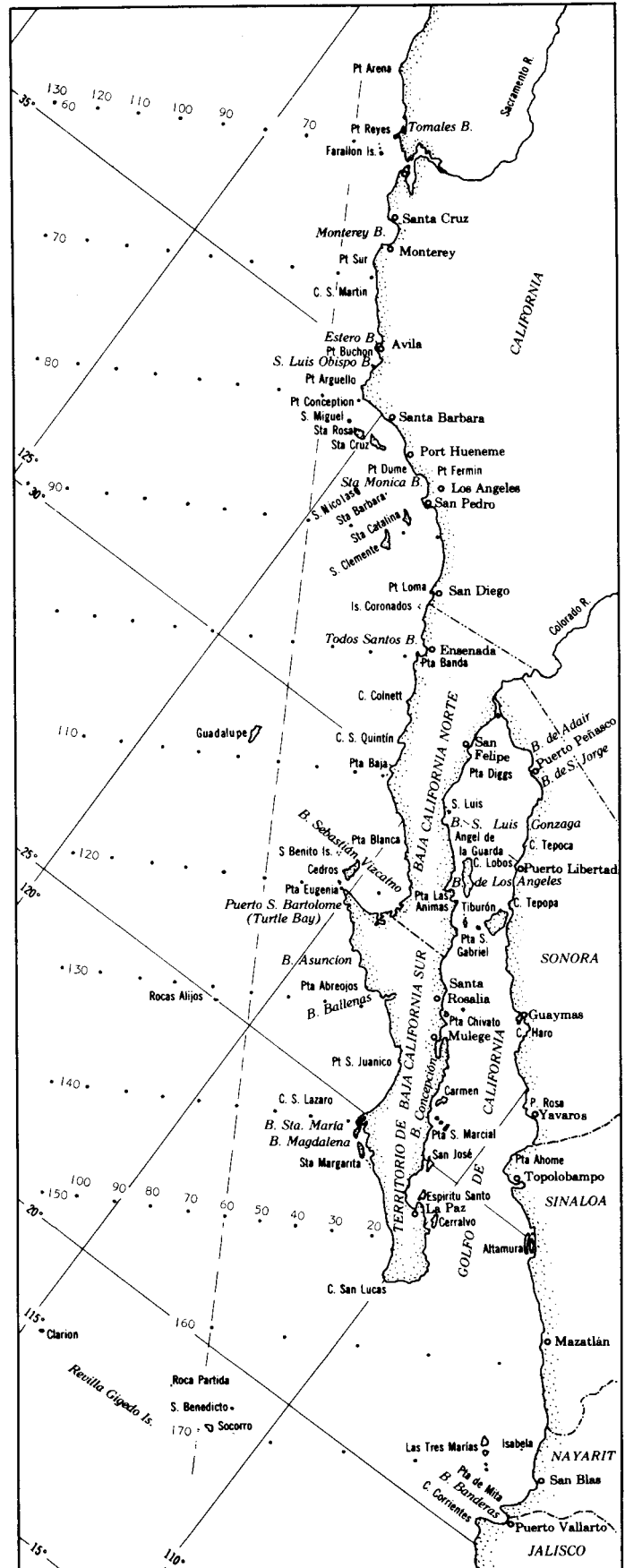
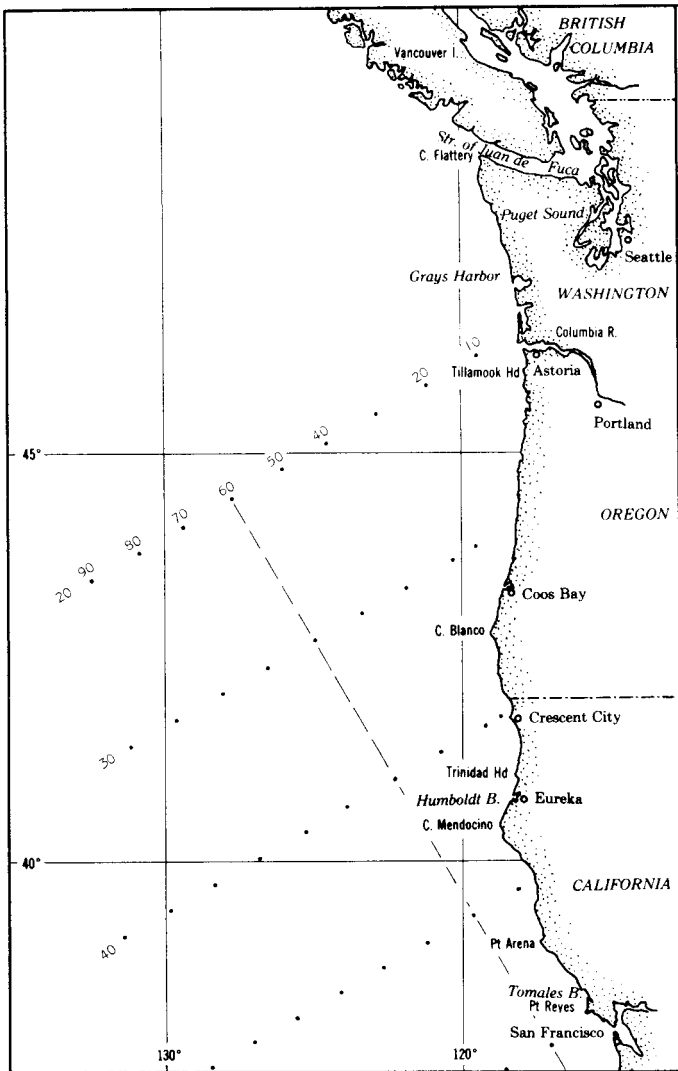
Thaliacea
Thalia democratica
5804



Thaliacea
Thalia democratica
5806



Thaliacea
Traustedia multitentaculata
5804



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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