



Atlas 7: Fleminger, A. Distributional atlas of calanoid copepods in the California Current region, Part II. Published May 1967.

16 May 2007

The taxonomic nomenclature in the atlas is exactly as published, even though the copepods have undergone taxonomic revision. Below are several references that may be useful in updating the species names:

the Smithsonian web site,

http://ravenel.si.edu/iz/copepod/species/species_Search.cfm

Frost, B. and Fleminger, A. 1968. A revision of the genus *Clausocalanus* (Copepoda: Calanopoda) with remarks on distributional patterns in diagnostic characters. *Bulletin of the Scripps Institution of Oceanography* 12, 1-235.

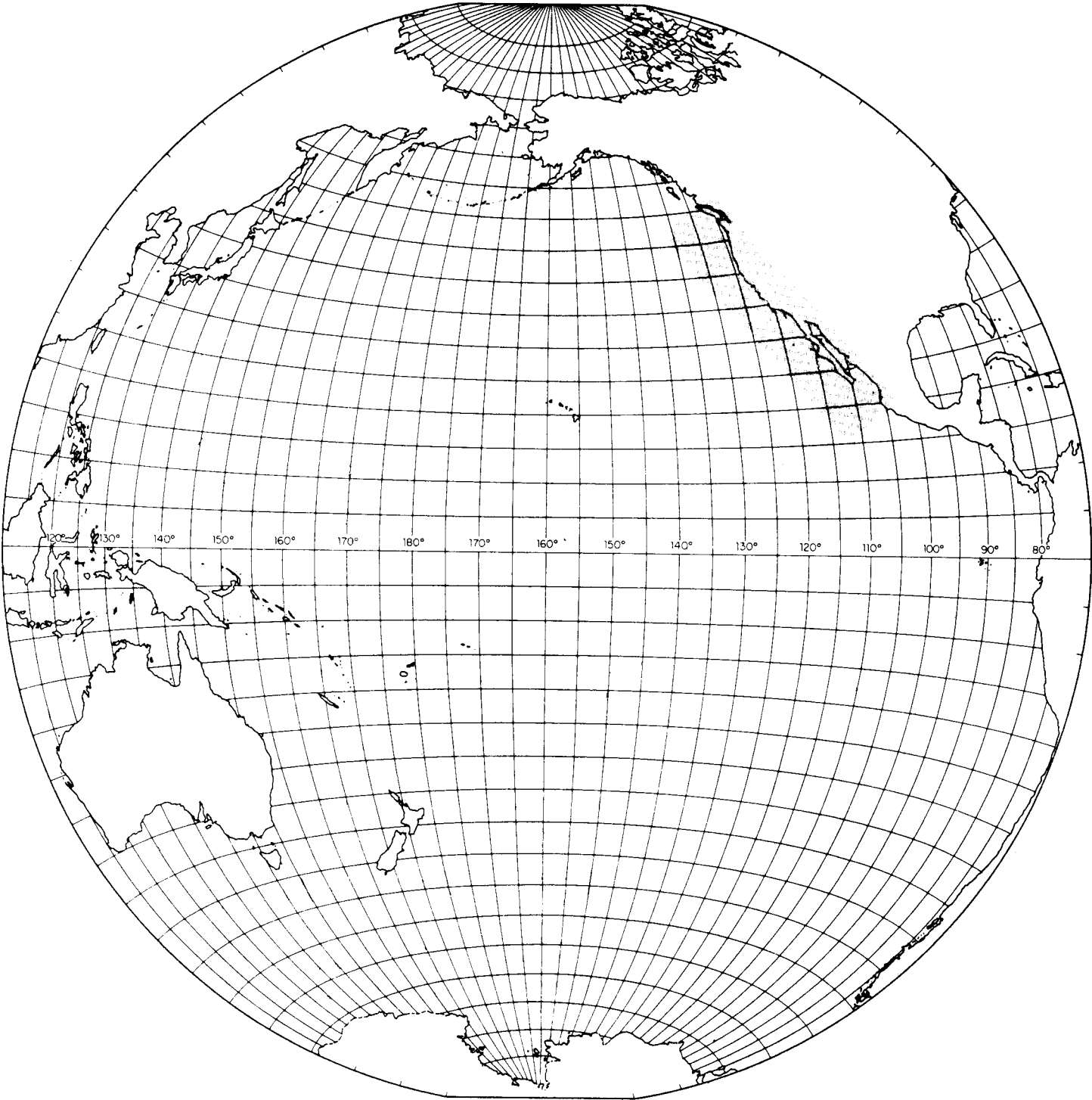
Bradford, J. 1976. Partial Revision of the *Acartia* subgenus *Acartiura* (Copepoda: Calanoida: Acartiidae). *N.Z. Journal of Marine and Freshwater Research* 19(1): 159-202.

Park, T. 1994. Taxonomy and distribution of the marine calanoid copepod family Euchaetidae. *Bulletin of the Scripps Institution of Oceanography* 29: 1-203.

Mauchline, J. 1998. The Biology of Calanoid Copepods. *Advances in Marine Biology* 33: 1-710.

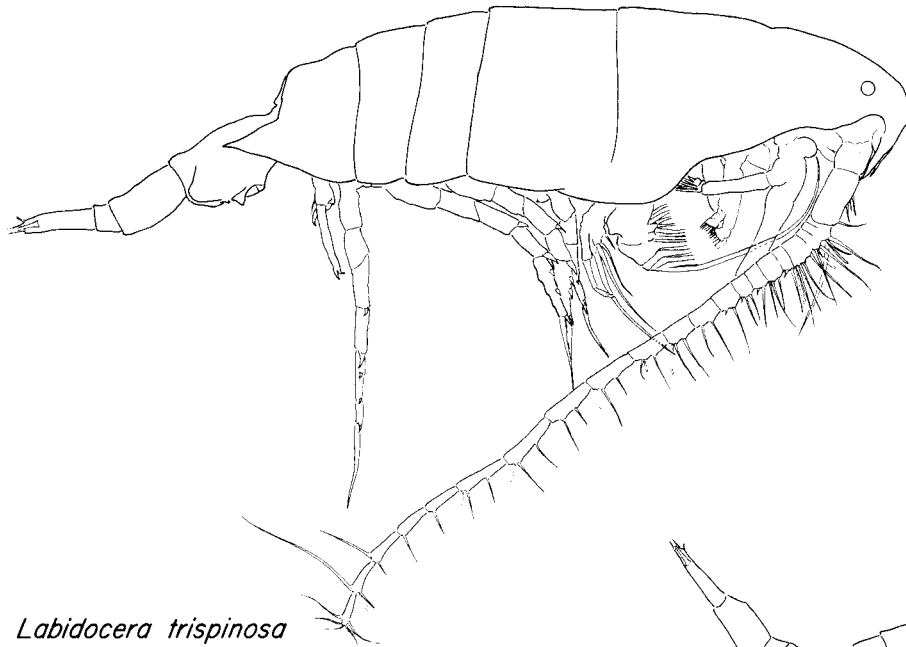
Park, T. 1999. Taxonomy and distribution of the marine calanoid copepod family Heterorhabdidae. *Bulletin of the Scripps Institution of Oceanography* 31: 1-269.

STATE OF CALIFORNIA
MARINE RESEARCH COMMITTEE

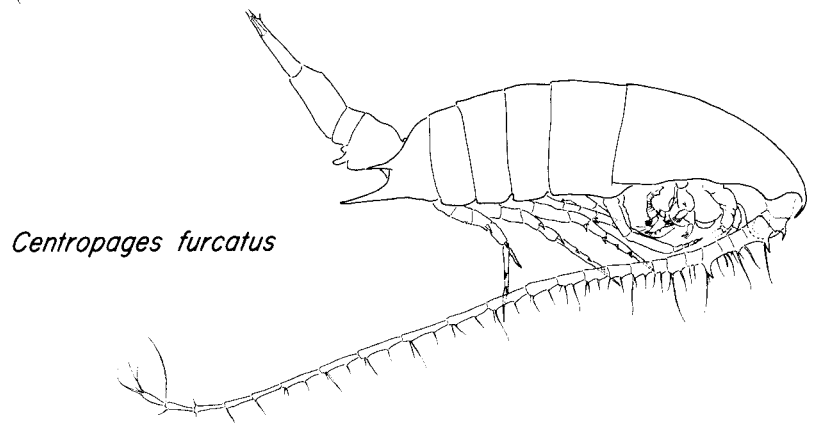


**CALIFORNIA COOPERATIVE OCEANIC
FISHERIES INVESTIGATIONS**

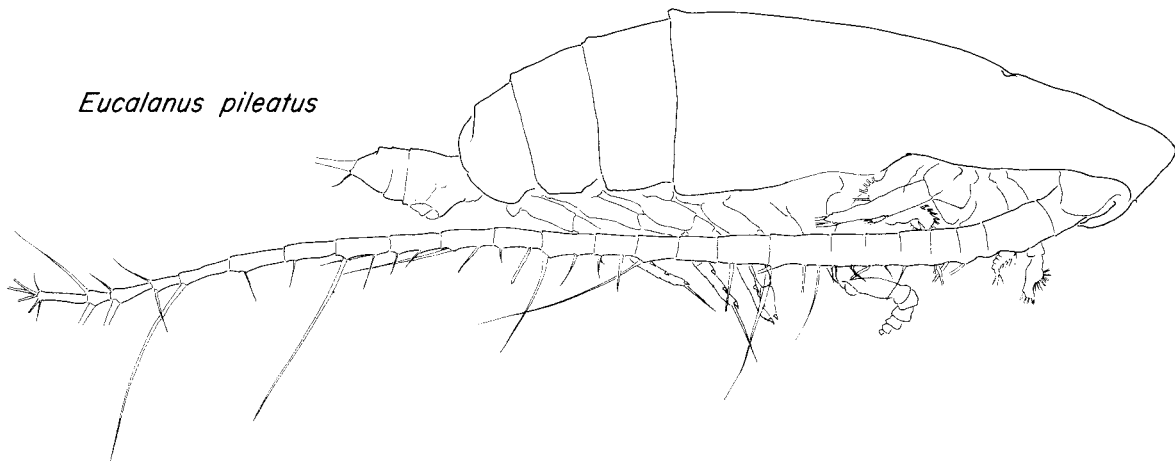
ATLAS No. 7



Labidocera trispinosa



Centropages furcatus



Eucalanus pileatus

CALIFORNIA
COOPERATIVE
OCEANIC
FISHERIES
INVESTIGATIONS

Atlas No. 7

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

May, 1967

THE CALCOFI ATLAS SERIES

This is the seventh 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. 7.

CONTENTS

A. Fleminger

Distributional atlas of calanoid copepods in
the California Current region, Part II

vii

Charts

1-213

DISTRIBUTIONAL ATLAS OF CALANOID COPEPODS
IN THE CALIFORNIA CURRENT REGION, PART II¹

A. Fleminger²

Introduction	vii
Remarks on Distribution and Abundance	viii
Table I	xii
Species List for CalCOFI Cruises 5804, 5807, 5810 and 5901	
Table II	xiii
Occurrence (%) and Relative Abundance of Common Species	
References	xiv
List of Charts	xv
Charts	1-213

Introduction

This Atlas, No. 7 in the CalCOFI series, contains the second and final part dealing with the distribution of calanoid copepods in the California Current region (Chart 1) during CalCOFI Cruises 5804, 5807, 5810 and 5901. The area surveyed by the four cruises is roughly outlined by the latitudes 20°N and 40°N, and by longitude 130°W and the Pacific coastline of North America. Part I (Fleminger, 1964) appears in CalCOFI Atlas No. 2, which also contains descriptive accounts of plankton-collecting methods of the CalCOFI Program, procedures used in enumerating calanoid copepods in this study and charted distributions for 92 of the species that were found.

Distribution of the remaining 84 species of Calanoida are shown in the present Atlas. A combined list of calanoid species whose distributions appear in Parts I and II is given in Table I. Descriptive faunal, biogeographical and quantitative notes on these species are summarized in the paragraphs that follow.

¹ This research was carried out under the Scripps Institution's Marine Life Research Program with partial support from the National Science Foundation, Grant GB-2861.

² Scripps Institution of Oceanography, University of California, San Diego, La Jolla, California.

Remarks on Distribution and Abundance

A total of 176 species, belonging to 57 genera, 21 families (Table I), was found in the 154 samples selected for examination. Most of these species occur regularly within the epiplanktonic layer and, in fact, above the thermocline for at least a portion of each 24-hour cycle.

A number of species (e.g., Undeuchaeta intermedia, Scottocalanus helenae, Lophothrix frontalis, Euchirella galeata, Pleuromamma xiphias) occur primarily in samples collected during night hours (local time) with sufficient regularity to suggest that during daylight hours they normally occur below the stratum sampled (about 140 to 0 meters) by the standardized CalCOFI tow. Some, perhaps 10% or less, appear only in isolated instances and are probably based on stray individuals rising from mesoplanktonic depths (e.g., Gaussia, Arietellus). Relatively few surprises are to be found in Table I.

A critical collation by the author of previously published records of calanoid copepods from within this region has yielded a list of about 190 species and 65 genera (unpublished; see Davis, 1949, for a review of the older literature). Many of these records are from tows taken hundreds of meters below the epiplanktonic stratum sampled by CalCOFI tows. They include, for example, 50 meso- or bathyplanktonic species known only from the original description (mostly species of Esterly, 1906-1913). Also contained in the collated list are species broadly neritic in habitat and characteristically restricted to the boreal Subarctic region lying north of Cape Mendocino (e.g., Candacia columbiae Campbell and Centropages abdominalis Sato), or to the equatorial Panamic region bordering on the south (e.g., Pontella agassizi Giesbrecht and Labidocera lubbockii Giesbrecht). Otherwise, Table I contains all the species found previously in the region together with some additions.

Subsequent investigations I have carried out in the California Current region have not added appreciably to this list of species. Thus I consider it likely that Table I contains at least 90% of the epiplanktonic calanoids to be found within the California Current region under the general climatic conditions prevailing during the past decade.

To provide a measure of the epiplanktonic calanoid fauna under discussion, a comparison can be made with a recent zooplankton study undertaken off eastern North America (Grice and Hart, 1962). The two studies are not strictly comparable but Grice and Hart's list of calanoid copepods appears to be about as complete for sampling across the western boundary current of the North Atlantic Ocean as the present list is for sampling across the eastern boundary current in the North Pacific Ocean. In 44 samples Grice and Hart found 115 species of Calanoida. Individually,

the four CalCOFI cruises yielded somewhat higher numbers of species for similar sampling intensities: 5804 -- 141 species in 43 samples; 5807 -- 148 species in 35 samples; 5810 -- 137 species in 37 samples; 5901 -- 139 species in 39 samples. Combining the four CalCOFI seasonal lists brings the total number of different species to 176. Twenty (or 11%) of the California Current species appear in 57% or more of the total number of samples examined. Only two species (or 2%) in the Atlantic study occurred at this frequency. In both studies 70 to 75% of the species occurred in less than 25% of the samples.

At present, faunal and habitat affinities of the calanoids listed in Table I cannot be judged for all species. Some are known from too few localities to assess their affinities with reasonable assurance. Many, however, can be assigned on the combined bases of local distributions, previously published records (too lengthy to cite sources here) and generalized faunal patterns derived from studies on other zooplankton of the region (summarized by Johnson and Brinton, 1963). These species can be classified as to probable faunal affinity with regard to the North Pacific Ocean but it should be pointed out that in other sectors of the world's oceans they may exhibit some what different relationships.

Within the California Current region the copepods appear to fall into the following major biogeographical-habitat groups:

Subarctic species -- Calanus cristatus, C. plumchrus, Scolecithricella minor

Transitional species -- Calanus helgolandicus, Eucalanus bungii californicus, Candacia bipinnata, Rhincalanus nasutus, Pleuromamma borealis, Metridia lucens, Clausocalanus pergens 2, Heterorhabdus tanneri, Racovitzanus antarcticus, Scolecithricella ovata

Central species -- Calanus gracilis, Clausocalanus arcuicornis 2, C. farrani 2, C. paululus, Euchaeta media, Mecynocera clausi, Centropages violaceus, C. elegans, C. elongatus, Pleuromamma xiphias, Paracandacia bispinosa, P. simplex, Eucalanus elongatus hyalinus

Equatorial oceanic species -- Scolecithricella abyssalis, Euchaeta acuta, E. longicornis, Clausocalanus minor, Eucalanus inermis, Centropages gracilis, Paracandacia truncata, Candacia pofi

Coastal-neritic species

Endemics -- Labidocera trispinosa, L. jollae, Pontellopsis occidentalis

Non-endemics, boreal-temperate -- Acartia clausi, Tortanus discaudatus, Epilabidocera longipedata

Non-endemics, temperate-subtropical -- Acartia tonsa, Paracalanus parvus, Temora discaudata, Clausocalanus farrani 1, Candacia curta

Non-endemics, tropical -- Acartia lilljeborgi, Euchaeta wolfendini, Centropages furcatus, Candacia catula, Eucalanus pileatus, Labidocera acuta.

Many of the oceanic species appear regularly in both Central and Equatorial waters: Euchaeta marina, Scolecithrix danae, S. bradyi, Calanus minor, Pleuromamma abdominalis, P. gracilis, Clausocalanus furcatus, C. arcuicornis 1, Eucalanus attenuatus, Scaphocalanus echinatus, Labidocera detruncata, L. acutifrons. Thus, the Calanoida found in the California Current region comprise a heterogeneous group of several faunal and habitat assemblages.

As suggested by the variety of faunal and habitat groupings, plankton sampling by the CalCOFI Program is carried out in a variety of zoned habitats (coastal and offshore neritic, slope, and oceanic waters), and yields a mixture of several biogeographical faunas (Transitional, Central, Equatorial). In general, the assortment of copepods taken in any single CalCOFI sample is not representative of any single faunal or habitat assemblage mentioned above. Usually, a sample contains combinations of Transitional and Subarctic, or Transitional and Central assemblages. More rarely, and only in the southernmost third of the region, Transitional-Equatorial assemblages are encountered. Mixtures of inshore and offshore forms as well as excursions of mesoplanktonic elements also typically affect the composition of individual samples. The absence of sharply zoned assemblages can be attributed to two factors. The first is the over-all oceanic climate of our region characterized by relatively weak physical and chemical gradients, seasonally variable winds, counter-currents and semi-permanent eddies, all of which enhance advection and faunal mixing. The second is sampling through a water column about 140 meters deep, a procedure that obscures vertically zoned habitat or faunal groupings in accordance with the behavior of a species as well as with layering or interleaving of adjacent water masses.

Expatriated forms can be followed to the extent that they remain viable away from their typical habitat, occur in sufficient numbers to satisfy the resolving power of sampling intensity and do not react to expatriation by extensive one-way vertical migration as apparently practiced by certain of the California Current copepods (Fleminger, 1966). CalCOFI plankton-tows taken seaward of the zone dominated by coastal plankton, especially south of Point Conception and north of Punta Eugenia, can and usually do contain a highly diverse, non-homogeneous mixture of different faunal and habitat types.

Finally, note should be taken of the most frequently occurring species in the region (Table II). The 24 species are listed in decreasing order of their appearance in the 154 samples examined during this study. If the list is subdivided by faunal-habitat affinity, and the probable differences in sampling efficiency due to size and behavior of the organisms are overlooked, we find 11 species with joint Central-Equatorial distributions, seven from Transitional water, two from Central water and four broadly neritic, non-endemic, temperate to tropical, species. Thus, faunal heterogeneity of the copepods in the California Current region is evident even among the most frequently appearing species.

Table I. Species List for CalCOFI Cruises 5804, 5807, 5810 and 5901

<p>Family Acartiidae</p> <p><i>Acartia clausi</i> Giesbrecht 1889*</p> <p><i>danae</i> Giesbrecht 1889*</p> <p><i>Hilobobry</i> Giesbrecht 1889*</p> <p><i>negligens</i> Dana 1849*</p> <p><i>tonsa</i> Dana 1849*</p>	<p>Family Lucicutiidae</p> <p><i>Lucicutia clausi</i> (Giesbrecht 1889)</p> <p><i>flavicornis</i> (Claus 1863)*^a</p> <p><i>gaussae</i> Grice 1963</p>
<p>Family Aetideidae</p> <p><i>Aetideus armatus</i> (Boeck 1872)</p> <p><i>Chirundina streetsi</i> Giesbrecht 1895</p> <p><i>Euaetideus acuta</i> (Farran 1929)</p> <p><i>bradyi</i> (A. Scott 1909)</p> <p><i>giesbrechti</i> (Cleve 1904)</p> <p><i>Euchirella amoena</i> Giesbrecht 1888</p> <p><i>carlicauda</i> Giesbrecht 1892</p> <p><i>formosa</i> Verwoort 1949</p> <p><i>galata</i> (Giesbrecht 1888)</p> <p><i>intermedia</i> With 1915</p> <p><i>maxima</i> Wolfenden 1905</p> <p><i>pulchra</i> (Lubbock 1856)</p> <p><i>rostrata</i> (Claus 1866)</p> <p>sp.</p> <p><i>Gaetanus miles</i> Giesbrecht 1888</p> <p><i>minor</i> Farran 1905</p> <p><i>Gaidius pungens</i> Giesbrecht 1895</p> <p><i>Undeuchaeta intermedia</i> A. Scott 1909</p> <p><i>plumosa</i> (Lubbock 1856)</p>	<p>Family Metridiidae</p> <p><i>Gaussia princeps</i> (T. Scott 1894)</p> <p><i>Metridia brevicauda</i> Giesbrecht 1889</p> <p><i>Lucena</i> Boeck 1864 s.l. (= <i>M. pacifica</i> Brodsky 1950)*</p> <p><i>Pleuromamma abdominalis</i> (Lubbock 1856)*</p> <p><i>borealis</i> (Dahl 1893)*</p> <p><i>gracilis</i> (Claus 1863)*</p> <p><i>quadrangulata</i> (Dahl 1893)*</p> <p><i>robusta</i> (Dahl 1893)^b</p> <p><i>ziphius</i> (Giesbrecht 1889)*</p>
<p>Family Arietellidae</p> <p><i>Arietellus plumifer</i> Sars 1905</p> <p><i>setosus</i> Giesbrecht 1892</p> <p><i>Phyllopus integer</i> Esterly 1911</p>	<p>Family Paracalanidae</p> <p><i>Acrocalanus gibber</i> Giesbrecht 1888</p> <p><i>gracilis</i> Giesbrecht 1888</p> <p><i>Longicornis</i> Giesbrecht 1888*</p> <p><i>monachus</i> Giesbrecht 1888</p> <p><i>Calocalanus contractus</i> Farran 1926</p> <p><i>pavo</i> Dana 1849</p> <p><i>pavoninus</i> Farran 1936</p> <p><i>styliremis</i> Giesbrecht 1888</p> <p><i>Ischnocalanus gracilis</i> (Tanaka 1953)</p> <p><i>plumulosus</i> (Claus 1863)</p> <p><i>ternis</i> (Farran 1926)</p> <p><i>Paracalanus aculeatus</i> Giesbrecht 1888*</p> <p><i>denudatus</i> Sewell 1929*</p> <p><i>nanus</i> Sars 1907*</p> <p><i>nudus</i> Sewell 1929*</p> <p><i>parvus</i> (Claus 1863)*</p>
<p>Family Augaptilidae</p> <p><i>Augaptilus lamellifer</i> Esterly 1911 (? = <i>anceps</i> Farran 1908)</p> <p><i>longicaudatus</i> (Claus 1863)</p> <p><i>megalurus</i> Giesbrecht 1892</p> <p><i>Euaugaptilus hecticus</i> (Giesbrecht 1889)</p> <p><i>palumboi</i> (Giesbrecht 1889)</p> <p><i>Haloptilus acutifrons</i> (Giesbrecht 1892)</p> <p><i>austini</i> Grice 1959</p> <p><i>longicornis</i> (Claus 1863)</p> <p><i>micromatus</i> (Claus 1863)</p> <p><i>ornatus</i> (Giesbrecht 1892)</p> <p><i>spiniceps</i> (Giesbrecht 1892)</p>	<p>Family Phaennidae</p> <p><i>Amalophora vorax</i> (Esterly 1911) (= <i>Scolecithrix</i> _)</p> <p><i>Phaenna latus</i> (Esterly 1911) (= <i>Onchocalanus</i> _)</p> <p><i>spinifera</i> Claus 1863</p>
<p>Family Calanidae</p> <p><i>Calanus cristatus</i> Kroyer 1848*</p> <p><i>helgolandiicus</i> (Claus 1863) s.l.* (= <i>pacificus</i> Brodsky 1948)</p> <p><i>lighti</i> Bowman 1955*</p> <p><i>plumulosus</i> Marukawa 1921*</p> <p><i>tenuicornis</i> Dana 1849*</p> <p>(<i>Hamocalanus</i>) <i>minor</i> (Claus 1863)*</p> <p>(<i>Neocalanus</i>) <i>gracilis</i> Dana 1849*</p> <p>(<i>Neocalanus</i>) <i>robustus</i> Giesbrecht 1888*</p> <p><i>Canthocalanus pauper</i> (Giesbrecht 1888)</p> <p><i>Undinula darwini</i> (Lubbock 1860)</p> <p><i>vulgaris</i> (Dana 1849)</p>	<p>Family Pontellidae</p> <p><i>Eptalabidocera longipedata</i> (Sato 1913) [= <i>amphitrites</i> (McMurrich 1916)]</p> <p><i>Labidocera acuta</i> (Dana 1849)</p> <p><i>acutifrons</i> (Dana 1849)</p> <p><i>destruata</i> (Dana 1849)</p> <p><i>jollae</i> Esterly 1906</p> <p><i>trispinosa</i> Esterly 1905</p> <p><i>Pontella danae</i> Giesbrecht 1889</p> <p><i>securifer</i> Brady 1883</p> <p><i>tenutremis</i> Giesbrecht 1889</p> <p><i>Pontellina plumata</i> (Dana 1849)</p> <p><i>Pontellopsis occidentalis</i> Esterly 1906</p> <p><i>regalis</i> (Dana 1849)</p>
<p>Family Candaciidae</p> <p><i>Candacia aethiopica</i> (Dana 1849)*</p> <p><i>bipinnata</i> (Giesbrecht 1889)*</p> <p><i>catula</i> (Giesbrecht 1889)*</p> <p><i>curta</i> (Dana 1849)*</p> <p><i>longimana</i> (Claus 1863)*</p> <p><i>poft</i> Grice and Jones 1960</p> <p><i>tenutrema</i> (Giesbrecht 1889)*</p> <p><i>varicosa</i> (Giesbrecht 1892)*</p> <p><i>Paracandacia bipinnosa</i> (Claus 1863)*</p> <p><i>simplex</i> (Giesbrecht 1889)*</p> <p><i>truncata</i> (Dana 1849)*</p>	<p>Family Pseudocalanidae</p> <p><i>Clausocalanus arcuicornis</i> (Dana 1849) (In Part I = <i>arcuicornis</i> 3)*</p> <p><i>farrani</i> Sewell 1929 (In Part I = <i>farrani</i> 2)</p> <p><i>furcatus</i> (Brady 1883)</p> <p><i>metastigophorus</i> (Claus 1863) (In Part I = <i>arcuicornis</i> 1)</p> <p><i>minor</i> Sewell 1929 (In Part I = <i>arcuicornis</i> 4)</p> <p><i>paululus</i> Farran 1926</p> <p><i>pergens</i> Farran 1926</p> <p>sp. (In Part I = <i>arcuicornis</i> 2)^c</p> <p>sp. (In Part I = <i>farrani</i> 1)^c</p> <p>sp. (In Part I = <i>pergens</i> 1)^c</p> <p><i>Ctenocalanus varius</i> Giesbrecht 1888</p> <p><i>Microcalanus pusillus</i> Sars 1903</p>
<p>Family Centropagidae</p> <p><i>Centropages bradyi</i> Wheeler 1900*</p> <p><i>calaninus</i> (Dana 1849)*</p> <p><i>elegans</i> Giesbrecht 1895*</p> <p><i>elongatus</i> Giesbrecht 1896*</p> <p><i>furcatus</i> (Dana 1849)*</p> <p><i>gracilis</i> (Dana 1849)*</p> <p><i>violaceus</i> (Claus 1863) s.l.*</p>	<p>Family Scolecithricidae</p> <p><i>Lophothrix frontalis</i> Giesbrecht 1895</p> <p><i>Latipes</i> (T. Scott 1894)</p> <p><i>Racovitzanus antarcticus</i> Giesbrecht 1902</p> <p><i>Scaphocalanus curtus</i> (Farran 1926)*</p> <p><i>ochinatus</i> (Farran 1905)*</p> <p><i>magnus</i> (T. Scott 1894)</p> <p><i>medius</i> (Sars 1907)</p> <p><i>Scolecithricella abyssalis</i> (Giesbrecht 1892)*</p> <p><i>auropetiti</i> (Giesbrecht 1892)</p> <p><i>ctenopus</i> (Giesbrecht 1892)*</p> <p><i>dentata</i> (Giesbrecht 1892)*</p> <p><i>minor</i> (Brady 1883)</p> <p><i>nicobarica</i> (Sewell 1929)*</p> <p><i>ovata</i> (Farran 1905)*</p> <p><i>tenuiserrata</i> (Giesbrecht 1892)*</p> <p><i>vittata</i> (Giesbrecht 1892)</p> <p><i>Scolecithrix bradyi</i> Giesbrecht 1888*</p> <p><i>danae</i> (Lubbock 1856)*</p> <p><i>Scottocalanus helena</i> (Lubbock 1856)</p> <p><i>persecans</i> (Giesbrecht 1892)</p> <p><i>securifrons</i> (T. Scott 1894)</p>
<p>Family Eucalanidae</p> <p><i>Eucalanus attenuatus</i> (Dana 1849)</p> <p><i>burgii californicus</i> Johnson 1938</p> <p><i>crassus</i> Giesbrecht 1888</p> <p><i>elongatus hyalinus</i> Claus 1866</p> <p><i>inermis</i> Giesbrecht 1892</p> <p><i>pileatus</i> Giesbrecht 1888</p> <p><i>subcrassus</i> Giesbrecht 1888</p> <p><i>subtennis</i> Giesbrecht 1888</p> <p><i>Meocynoera clausi</i> Thompson 1888</p> <p><i>Rhinoalanus nasutus</i> Giesbrecht 1888</p>	<p>Family Spinocalanidae</p> <p><i>Mimocalanus cultrifer</i> Farran 1908</p> <p><i>Spinocalanus abyssalis</i> Giesbrecht 1888</p> <p><i>magnus</i> Wolfenden 1904</p>
<p>Family Euchaetidae</p> <p><i>Euchaeta acuta</i> Giesbrecht 1892*</p> <p><i>californica</i> Esterly 1906*</p> <p><i>elongata</i> Esterly 1913*</p> <p><i>longicornis</i> Giesbrecht 1888*</p> <p><i>marina</i> (Prestandrea 1853)*</p> <p><i>media</i> Giesbrecht 1888*</p> <p><i>pubera</i> Sars 1925*</p> <p><i>spinosa</i> Giesbrecht 1892*</p> <p><i>ternis</i> Esterly 1906*</p> <p><i>tonsa</i> Giesbrecht 1895*</p> <p><i>wolfendini</i> A. Scott 1909*</p>	<p>Family Temoridaae</p> <p><i>Temora discaudata</i> Giesbrecht 1889*</p> <p><i>Temoropia myumbiensis</i> T. Scott 1894</p>
<p>Family Heterorhabdidae</p> <p><i>Heterorhabdus clausi</i> (Giesbrecht 1889)</p> <p><i>papilliger</i> (Claus 1863)</p> <p><i>spinifrons</i> (Claus 1863)</p> <p><i>tanneri</i> (Giesbrecht 1895)</p> <p><i>Heterostylites longicornis</i> (Giesbrecht 1889)</p>	<p>Family Tharybidae</p> <p><i>Undinella brevipes</i> Farran 1908</p>
	<p>Family Tortanidae</p> <p><i>Tortanus discaudatus</i> Thompson and Scott 1897</p>

* Species appearing in Part I (CalCOFI Atlas No. 2)

^a Including *L. gemina* Farran 1926

^b Given as *Pleuromamma indica* in Part I (CalCOFI Atlas No. 2), pp. xiii, 262, 264, 265

^c Descriptions in preparation with B. Frost

Table II. Occurrence (%) and Relative Abundance (No./1000m³) of Common Species (Adults Only)

Species	Occurrence (%) All Cruises, 154 Stations	5804	5807	5810	5901
		Occurrence (%) 43 Stations (Abundance Median; Range 0 to)	Occurrence (%) 35 Stations (Abundance Median; Range 0 to)	Occurrence (%) 37 Stations (Abundance Median; Range 0 to)	Occurrence (%) 39 Stations (Abundance Median; Range 0 to)
1. <i>Calanus tenuicornis</i>	94	100 (210; 1048**)	94 (200; 1289)	92 (62; 815)	87 (53; 491)
2. <i>Ctenocalanus vanus</i> *	92	95 (137; 1170)	97 (170; 2469)	89 (79; 677)	85 (105; 1792)
3. <i>Calanus minor</i>	78	88 (135; 1761)	54 (124; 1656)	92 (365; 1279)	77 (224; 3362)
4. <i>Acartia danae</i> *	78	86 (68; 2419)	74 (201; 899)	84 (61; 582)	67 (27; 135)
5. <i>Clausocalanus furcatus</i> *	77	81 (264; 3797)	54 (304; 2506)	81 (348; 1289)	87 (319; 1646)
6. <i>Heterorhabdus papilliger</i>	74	84 (71; 390)	63 (43; 394)	73 (62; 512)	74 (75; 268)
7. <i>Pleuromamma gracilis</i>	74	74 (107; 1605)	49 (115; 686)	89 (77; 627)	82 (102; 528)
8. <i>Candacia bipinnata</i>	71	84 (48; 595)	66 (22; 602)	78 (63; 368)	54 (1; 213)
9. <i>Pleuromamma abdominalis</i>	70	65 (141; 1156)	54 (194; 1723)	76 (245; 1721)	85 (72; 2354)
10. <i>Pleuromamma borealis</i>	70	74 (279; 8404)	63 (399; 3780)	62 (360; 3733)	77 (421; 10164)
11. <i>Mecynocera clausi</i> *	68	72 (48; 428)	49 (17; 245)	76 (69; 262)	74 (58; 216)
12. <i>Calanus helgolandicus</i>	67	70 (388; 29891)	63 (206; 97483)	62 (161; 4209)	72 (349; 5552)
13. <i>Paracalanus parvus</i> *	67	56 (68; 1599)	74 (485; 17260)	60 (68; 1504)	80 (192; 2361)
14. <i>Candacia curta</i>	66	67 (54; 1476)	46 (38; 1642)	76 (36; 1351)	74 (36; 376)
15. <i>Clausocalanus pergens</i> 1*	64	81 (107; 1558)	71 (118; 2991)	57 (44; 1053)	46 (40; 1419)
16. <i>Lucicutia flavicornis</i>	62	84 (54; 378)	51 (42; 309)	54 (62; 247)	56 (39; 162)
17. <i>Clausocalanus farrani</i> 1*	62	51 (252; 4249)	46 (458; 7551)	73 (603; 9025)	80 (619; 5510)
18. <i>Clausocalanus arcuicornis</i> 1*	59	72 (123; 5400)	31 (259; 825)	65 (191; 1463)	64 (151; 3920)
19. <i>Scolecithrix danae</i>	58	58 (23; 520)	40 (1; 176)	78 (42; 990)	56 (28; 248)
20. <i>Clausocalanus arcuicornis</i> 2*	57	79 (115; 916)	63 (105; 570)	43 (82; 191)	41 (75; 752)
21. <i>Temora discaudata</i>	50	46 (72; 7335)	37 (93; 530)	54 (269; 8903)	62 (45; 1490)
22. <i>Metridia lucens</i>	49	51 (277; 3600)	54 (276; 33499)	54 (285; 44659)	38 (523; 15136)
23. <i>Rhincalanus nasutus</i>	46	74 (95; 11436)	43 (135; 838)	27 (21; 486)	36 (19; 554)
24. <i>Eucalanus bungii californicus</i>	43	63 (137; 6246)	54 (416; 6381)	19 (121; 1389)	33 (41; 587)

* Abundance likely to be underestimated due to small size relative to mesh size of net

** Range 1-1048

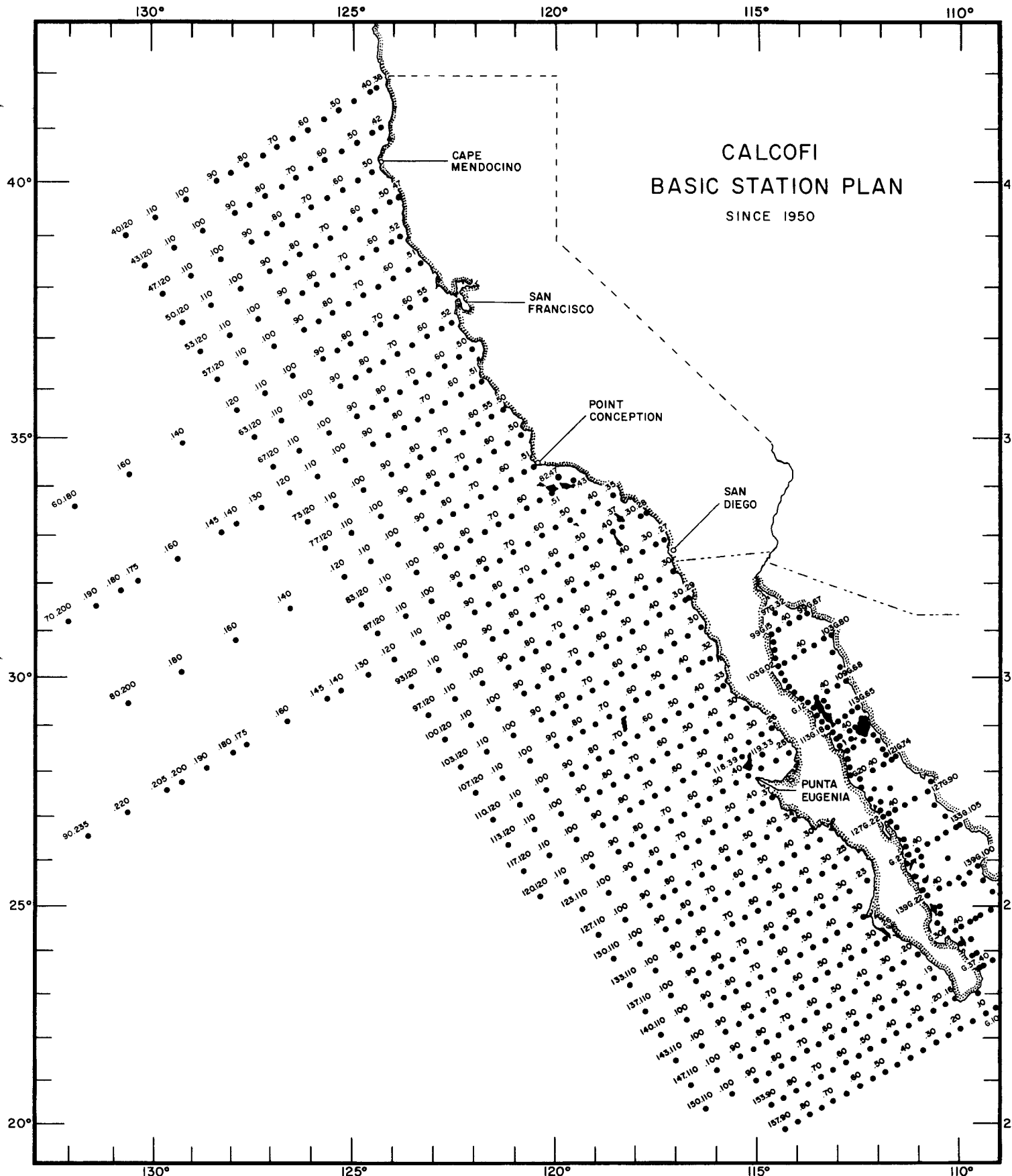
REFERENCES

- Davis, C. C., 1949. The pelagic Copepoda of the northeastern Pacific Ocean. Univ. Washington Publ. Biol., 14: 1-118
- Esterly, C. O., 1906. Additions to the copepod fauna of the San Diego region. Univ. California Publ. Zool., 3(5): 53-92
- _____, 1911. Third report on the Copepoda of the San Diego region. Univ. California Publ. Zool., 6(14): 313-352
- _____, 1913. Fourth taxonomic report on the Copepoda of the San Diego region. Univ. California Publ. Zool., 11(10): 181-196
- Fleminger, A., 1964. Distributional atlas of calanoid copepods in the California Current region, Part I. CalCOFI Atlas No. 2: ix-xvi, 1-313
- _____, 1966. Submergence of certain California Current copepods in a region of advection with Central Pacific Water. Second Internat. Oceanogr. Congr., Moscow, Abstr. of Papers: 118-119
- Grice, G. D. and A. D. Hart, 1962. The abundance, seasonal occurrence and distribution of the epizooplankton between New York and Bermuda. Ecol. Monogr., 32: 287-309
- Johnson, M. W. and E. Brinton, 1963. Biological species, water-masses and currents. In: The Sea. M. N. Hill, Gen. Editor, Interscience Publ. 2: 381-414

List of Charts

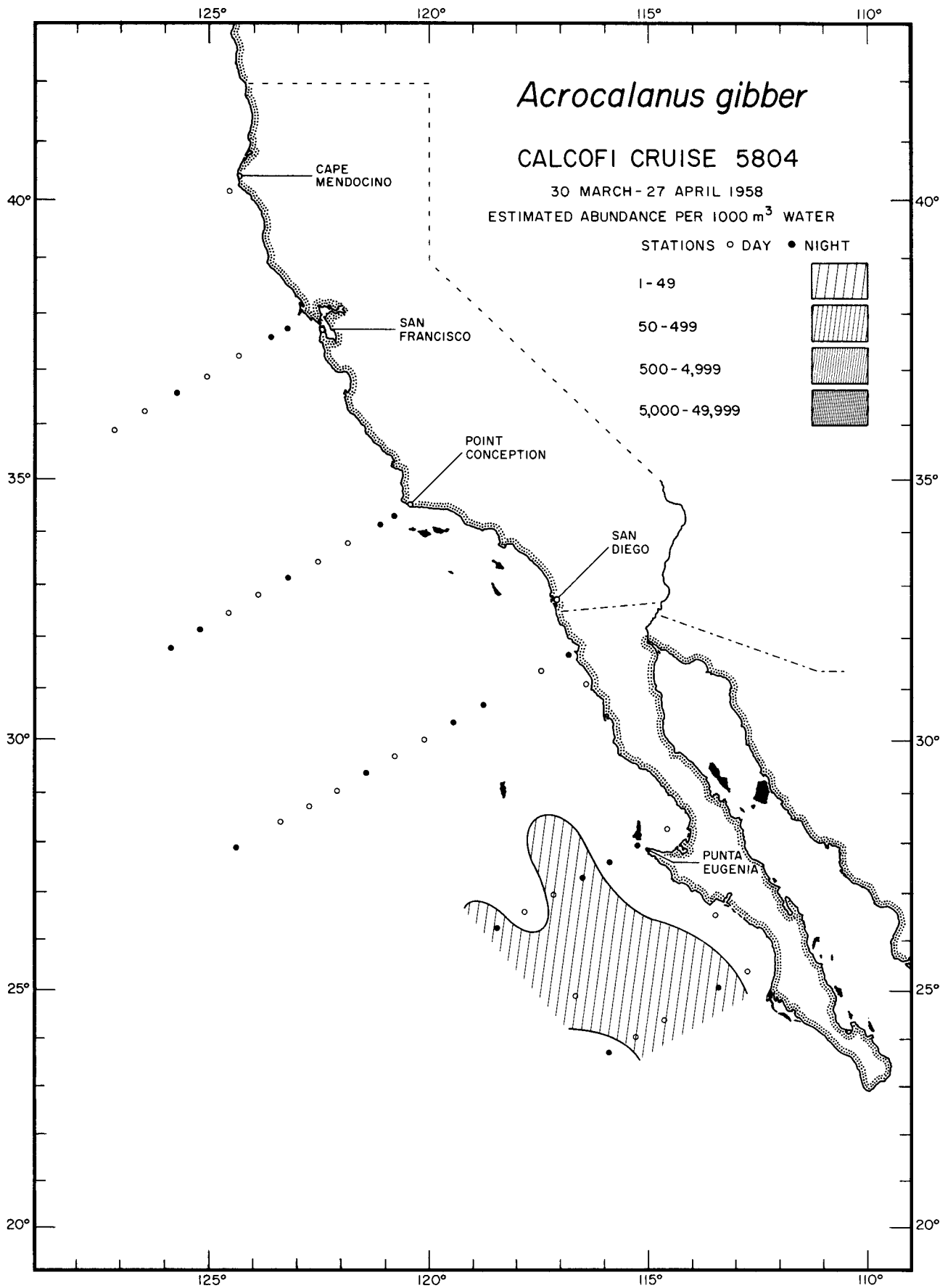
CalCOFI Basic Station Plan	1		
<i>Acrocalanus</i>		<i>Euaugaptilus</i>	
<i>gibber</i>	2 - 5	<i>hecticus</i>	47
<i>gracilis</i>	6 - 7	<i>palumboi</i>	47
<i>Aetideus</i>		<i>Euchirella</i>	
<i>armatus</i>	8 - 11	<i>amoena</i>	48 - 51
<i>Amallophora</i>		<i>curticauda</i>	52 - 54
<i>vorax</i>	12 - 14	<i>formosa</i>	55 - 56
<i>Arietellus</i>		<i>galeata</i>	57 - 60
<i>plumifer</i>	15 - 16	<i>intermedia</i>	61 - 62
<i>setosus</i>	17 - 20	<i>maxima</i>	61
<i>Augaptilus</i>		<i>pulchra</i>	63 - 66
<i>lamellifer</i>	21	<i>rostrata</i>	67 - 68
<i>longicaudatus</i>	22 - 24	<i>sp</i>	69 - 70
<i>megalurus</i>	21	<i>Gaetanus</i>	
<i>Calocalanus</i>		<i>miles</i>	71
<i>contractus</i>	25 - 27	<i>minor</i>	72 - 75
<i>pavo</i>	28 - 31	<i>Gaussia</i>	
<i>pavoninus</i>	32 - 35	<i>princeps</i>	76 - 78
<i>styliremis</i>	36 - 39	<i>Haloptilus</i>	
<i>Canthocalanus</i>		<i>acutifrons</i>	79 - 81
<i>pauper</i>	40 - 41	<i>austini</i>	82
<i>Chirundina</i>		<i>longicornis</i>	83 - 86
<i>streeti</i>	42 - 43	<i>mucronatus</i>	87 - 89
<i>Epilabidocera</i>		<i>ornatus</i>	90 - 92
<i>longipedata</i>	44	<i>spiniceps</i>	93 - 96
<i>Euaetideus</i>		<i>Heterorhabdus</i>	
<i>giesbrechti</i>	45 - 46	<i>clausi</i>	97 - 99
		<i>spiniifrons</i>	100 - 103
		<i>tanneri</i>	104 - 107
		<i>Heterostylites</i>	
		<i>longicornis</i>	108 - 110

<i>Ischnocalanus</i>				
<i>gracilis</i>	111 - 112			
<i>plumulosus</i>	113 - 116			
<i>tenuis</i>	117 - 119			
<i>Labidocera</i>				
<i>acuta</i>	120 - 122			
<i>acutifrons</i>	123 - 124			
<i>detruncata</i>	125			
<i>jollae</i>	126 - 127			
<i>trispinosa</i>	128 - 131			
<i>Lophothrix</i>				
<i>frontalis</i>	132 - 135			
<i>latipes</i>	136 - 138			
<i>Lucicutia</i>				
<i>clausi</i>	139 - 142			
<i>gaussae</i>	143 - 144			
<i>Metridia</i>				
<i>brevicauda</i>	145			
<i>Microcalanus</i>				
<i>pusillus</i>	146			
<i>Mimocalanus</i>				
<i>cultrifer</i>	147 - 150			
<i>Phaenna</i>				
<i>latus</i>	151 - 153			
<i>spinifera</i>	154 - 157			
<i>Phyllopus</i>				
<i>integer</i>	158 - 160			
<i>Pontella</i>				
<i>agassizi</i>	161			
<i>danae</i>	161			
<i>securifer</i>	162 - 164			
<i>tenuiremis</i>	165			
<i>Pontellina</i>				
<i>plumata</i>	166 - 169			
<i>Pontellopsis</i>				
<i>occidentalis</i>	170 - 173			
<i>regalis</i>	174 - 175			
<i>Scaphocalanus</i>				
<i>magnus</i>	176 - 178			
<i>medius</i>	179			
<i>Scolecithricella</i>				
<i>auropectin</i>	180			
<i>minor</i>	180 - 182			
<i>vittata</i>	183 - 185			
<i>Scottocalanus</i>				
<i>helenae</i>	186 - 189			
<i>persecans</i>	190 - 193			
<i>securifrons</i>	194			
<i>Spinocalanus</i>				
<i>abyssalis</i>	195			
<i>magnus</i>	196			
<i>Temoropia</i>				
<i>mayumbaensis</i>	197			
<i>Tortanus</i>				
<i>discaudatus</i>	198 - 200			
<i>Undeuchaeta</i>				
<i>intermedia</i>	201 - 204			
<i>plumosa</i>	205 - 207			
<i>Undinella</i>				
<i>brevipes</i>	208			
<i>Undinula</i>				
<i>darwinii</i>	209 - 211			
<i>vulgaris</i>	212 - 213			

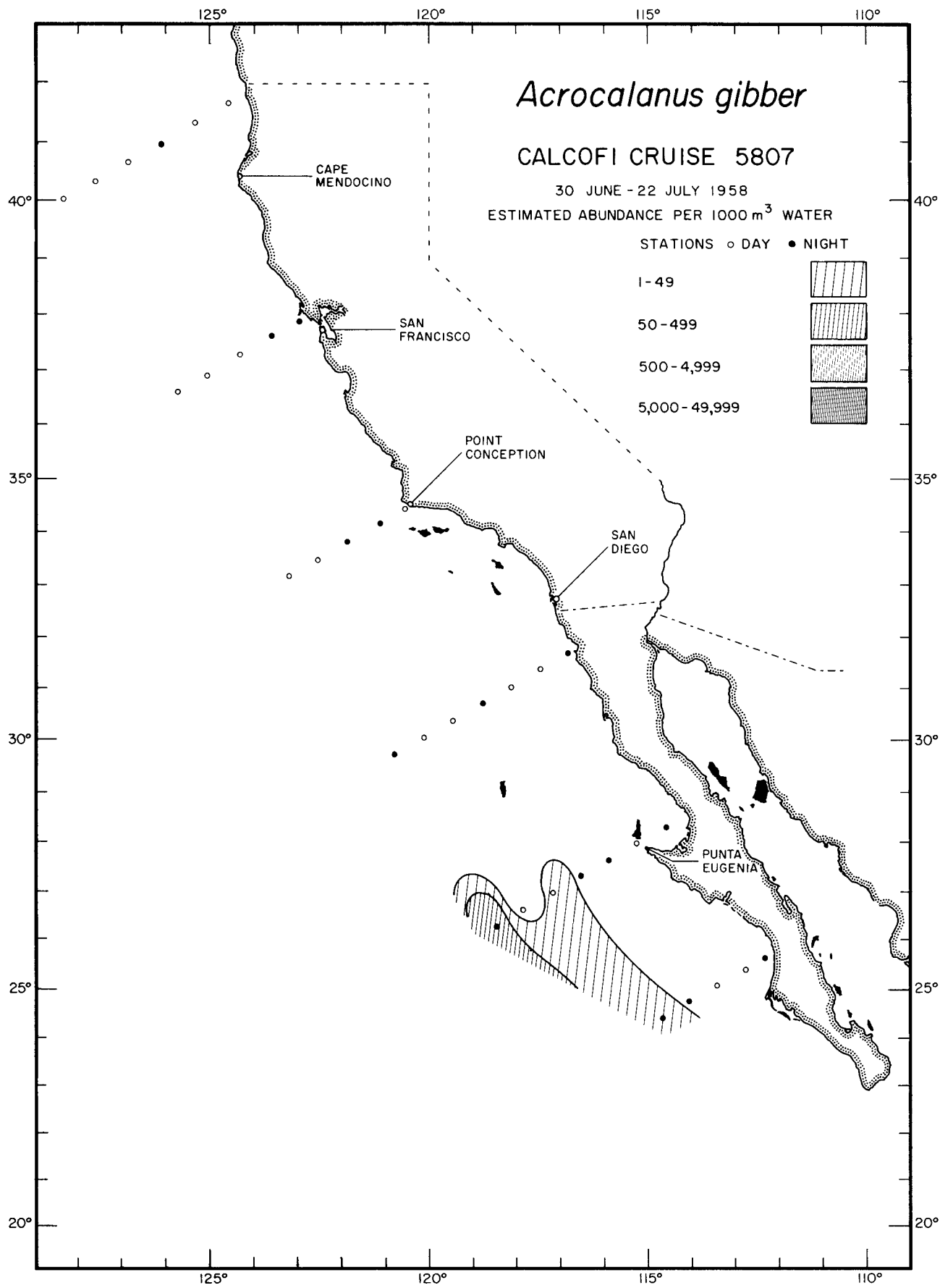


CALCOFI

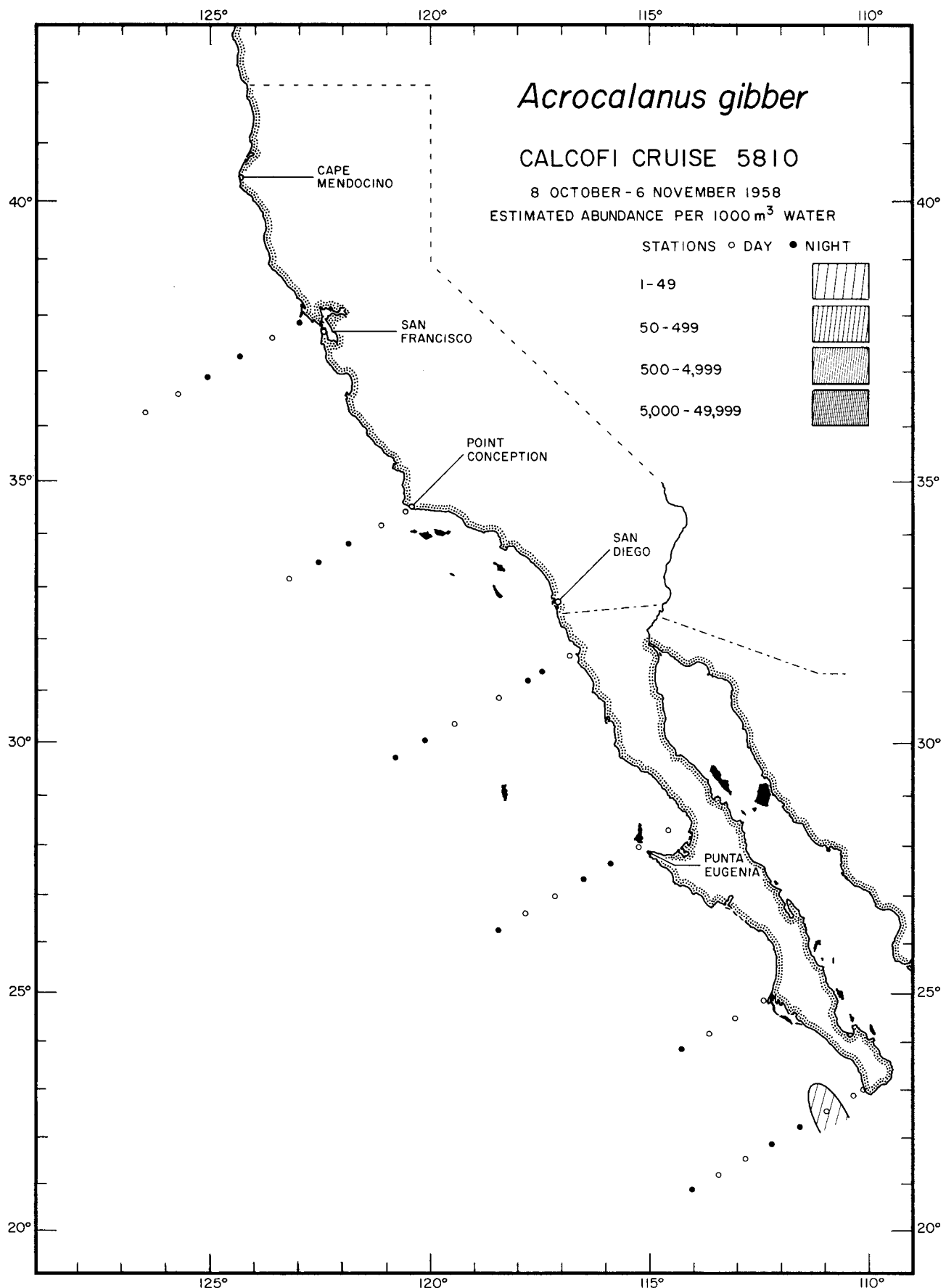
BASIC STATION PLAN
SINCE 1950



Calanoida
Acrocalanus gibber
5804



Calanoida
Acrocalanus gibber
5807



Acrocalanus gibber

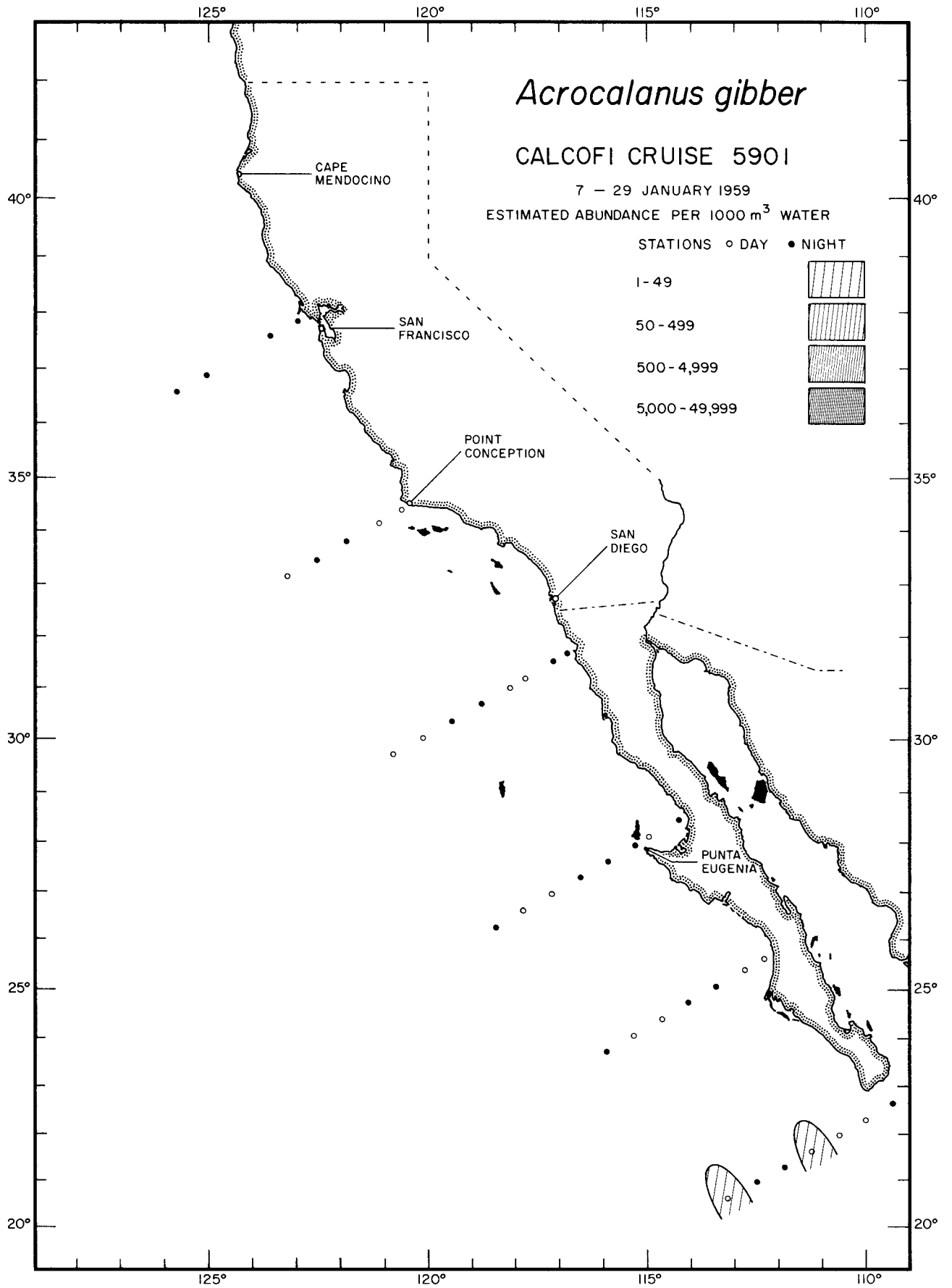
CALCOFI CRUISE 5810

8 OCTOBER - 6 NOVEMBER 1958
ESTIMATED ABUNDANCE PER 1000 m³ WATER

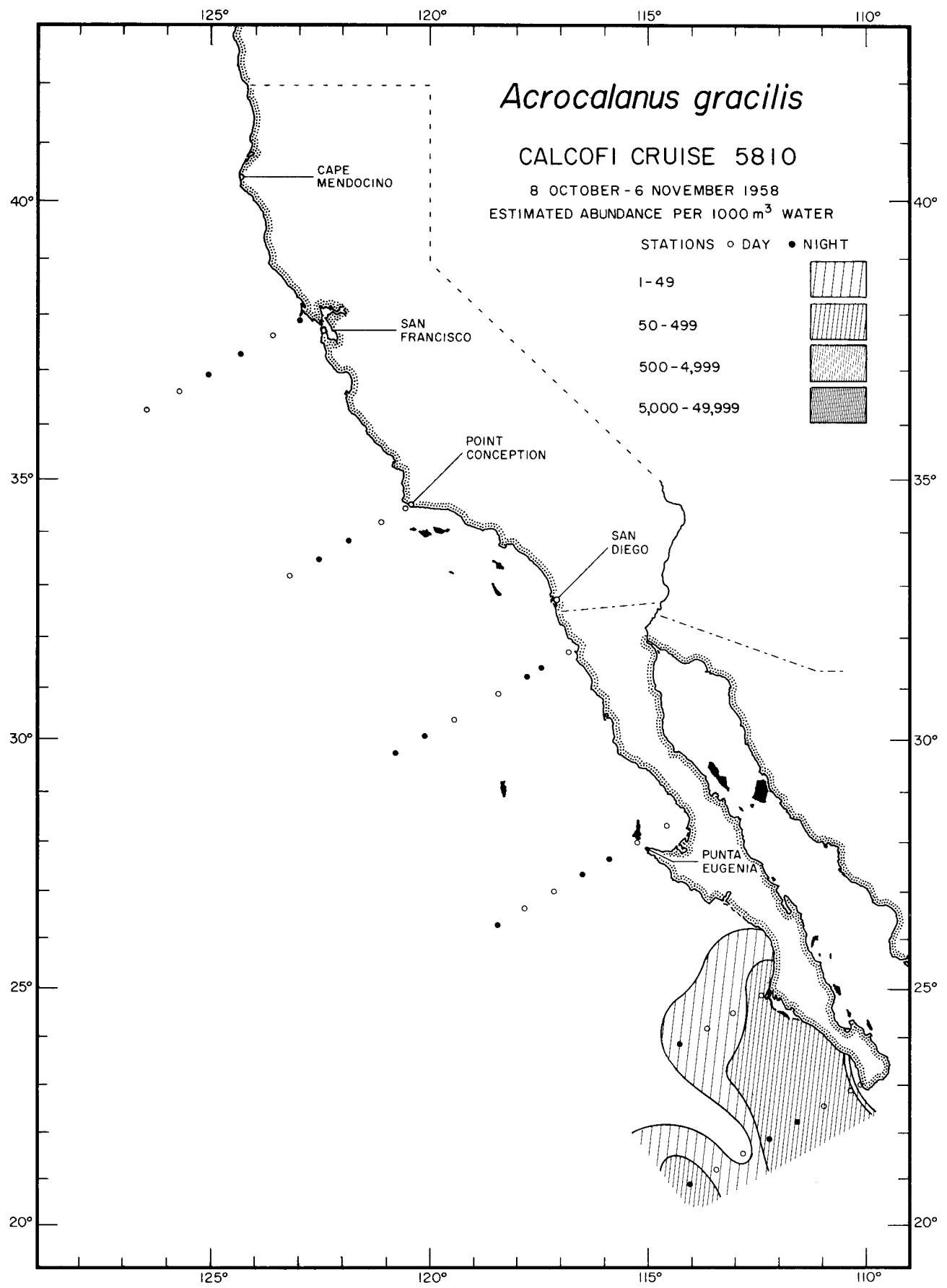
STATIONS ○ DAY ● NIGHT

1-49	
50-499	
500-4,999	
5,000-49,999	

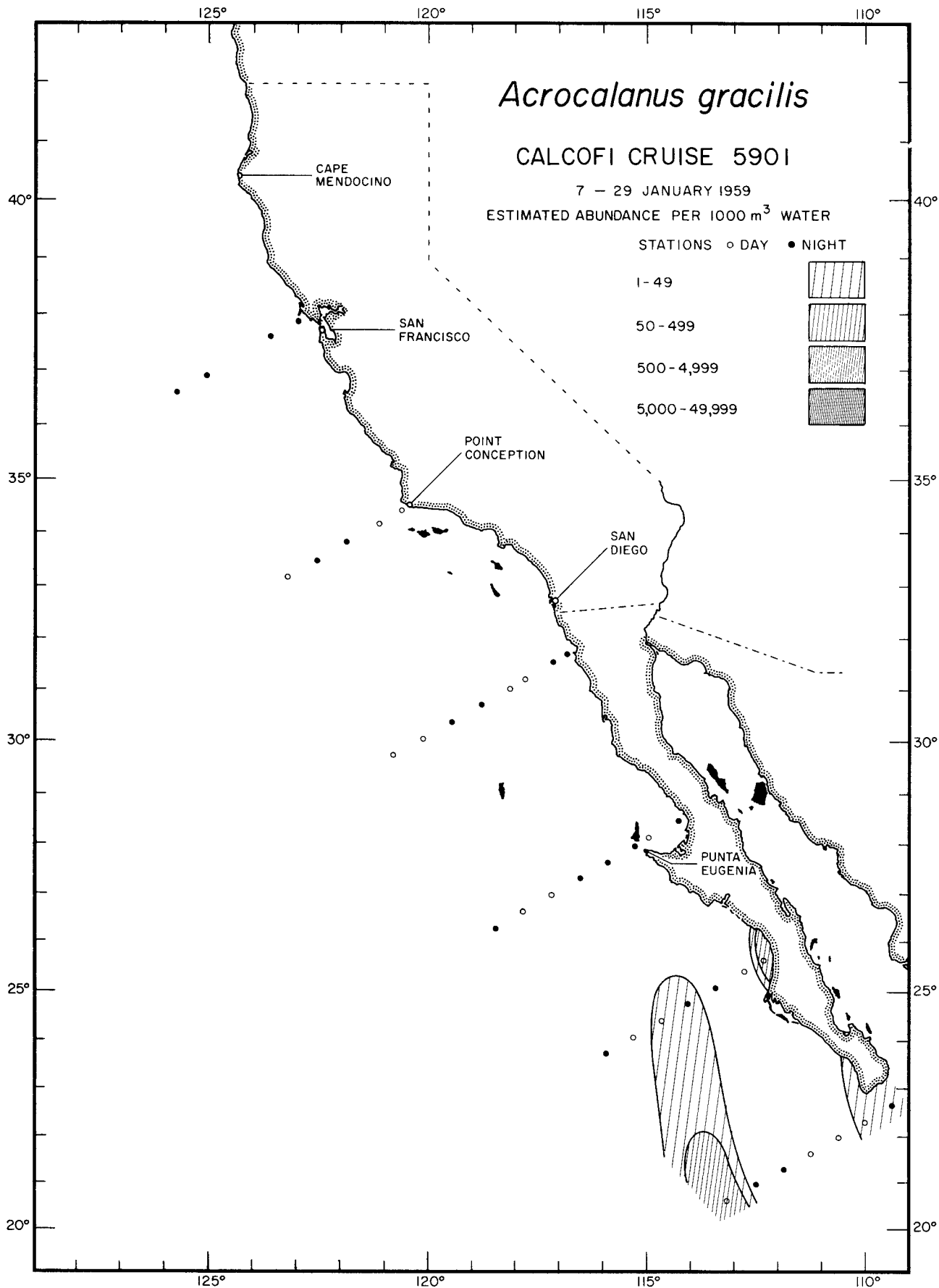
Calanoida
Acrocalanus gibber
5810



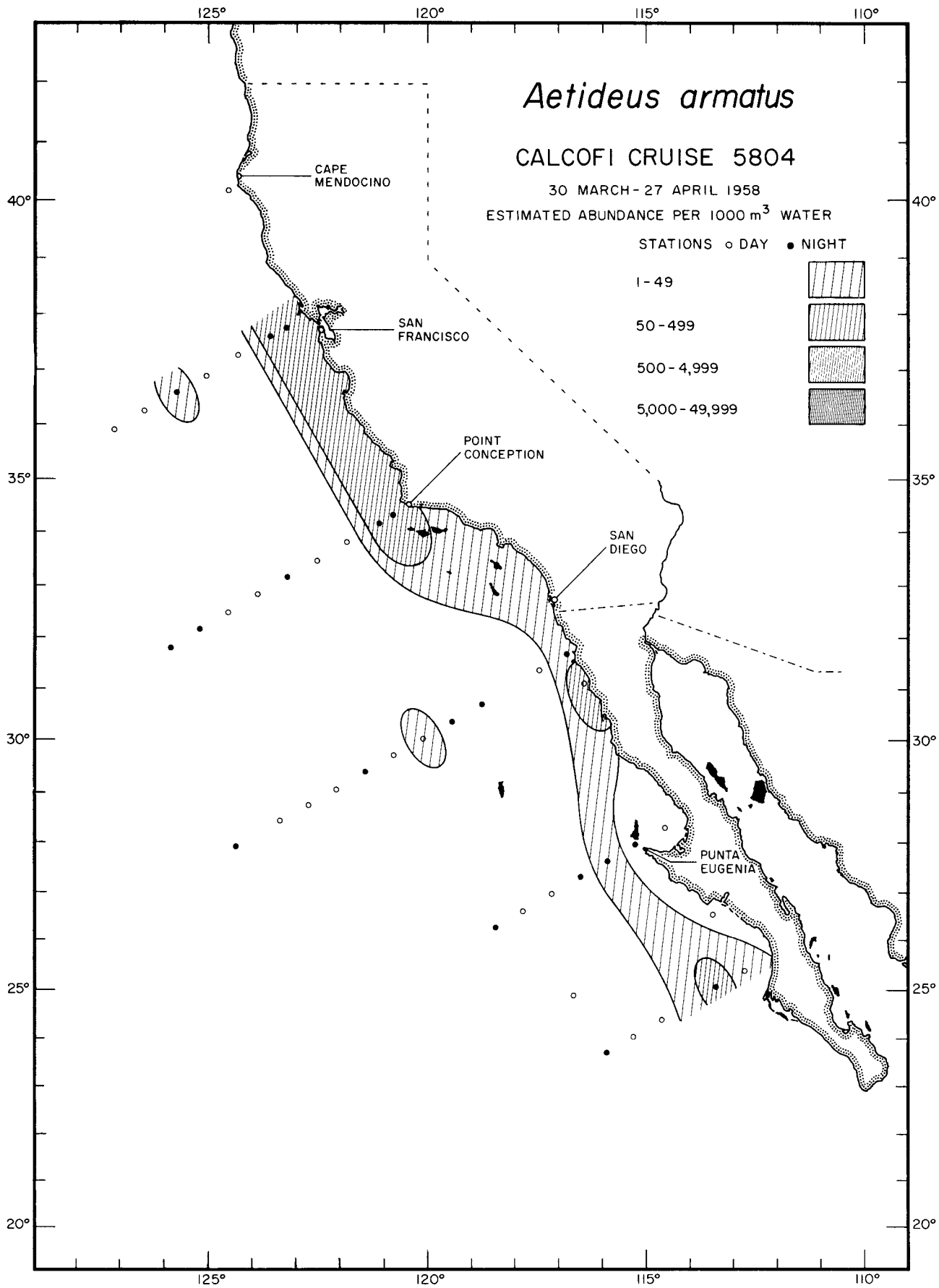
Calanoida
Acrocalanus gibber
5901



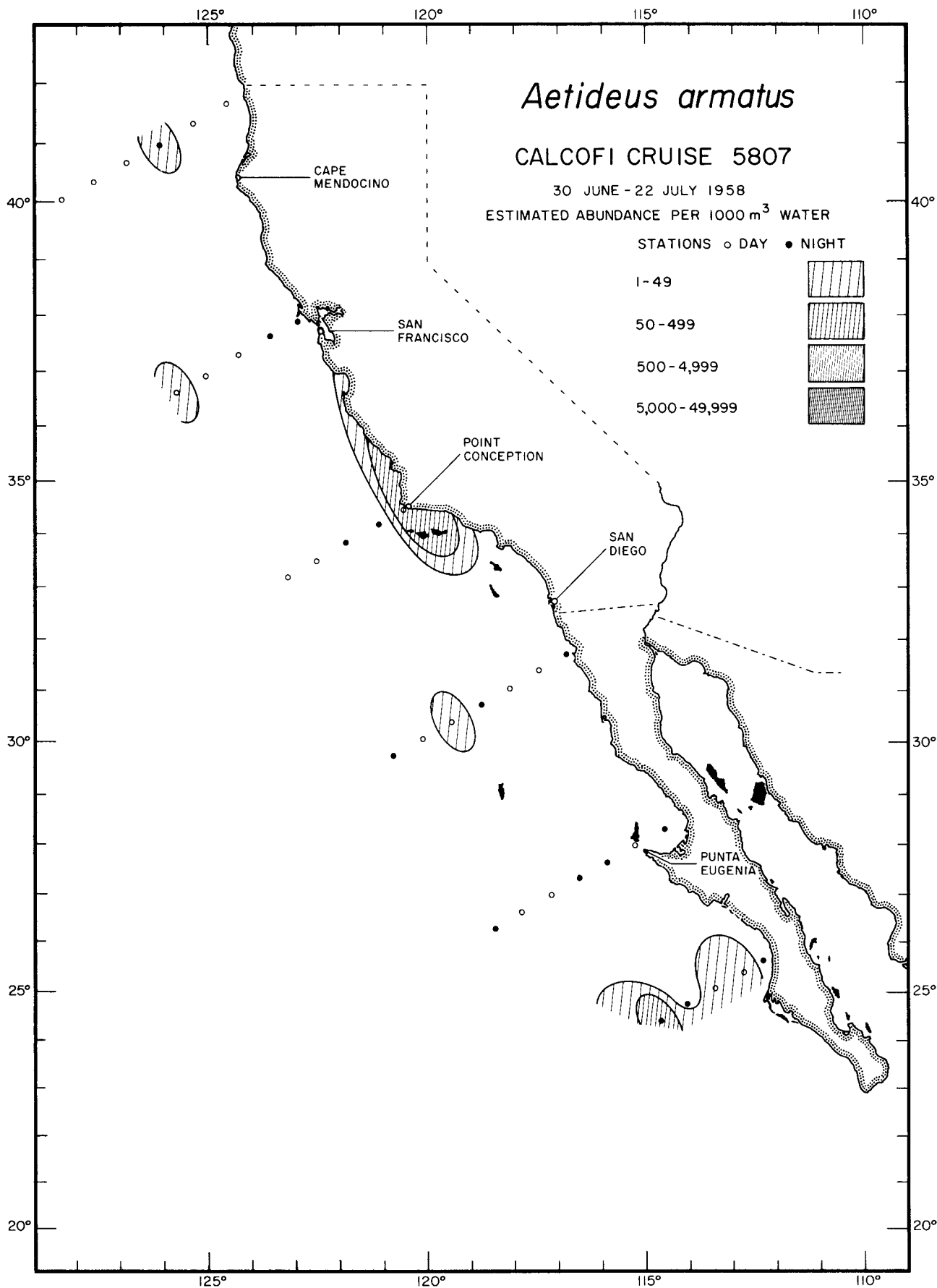
Calanoida
Acrocalanus gracilis
5810



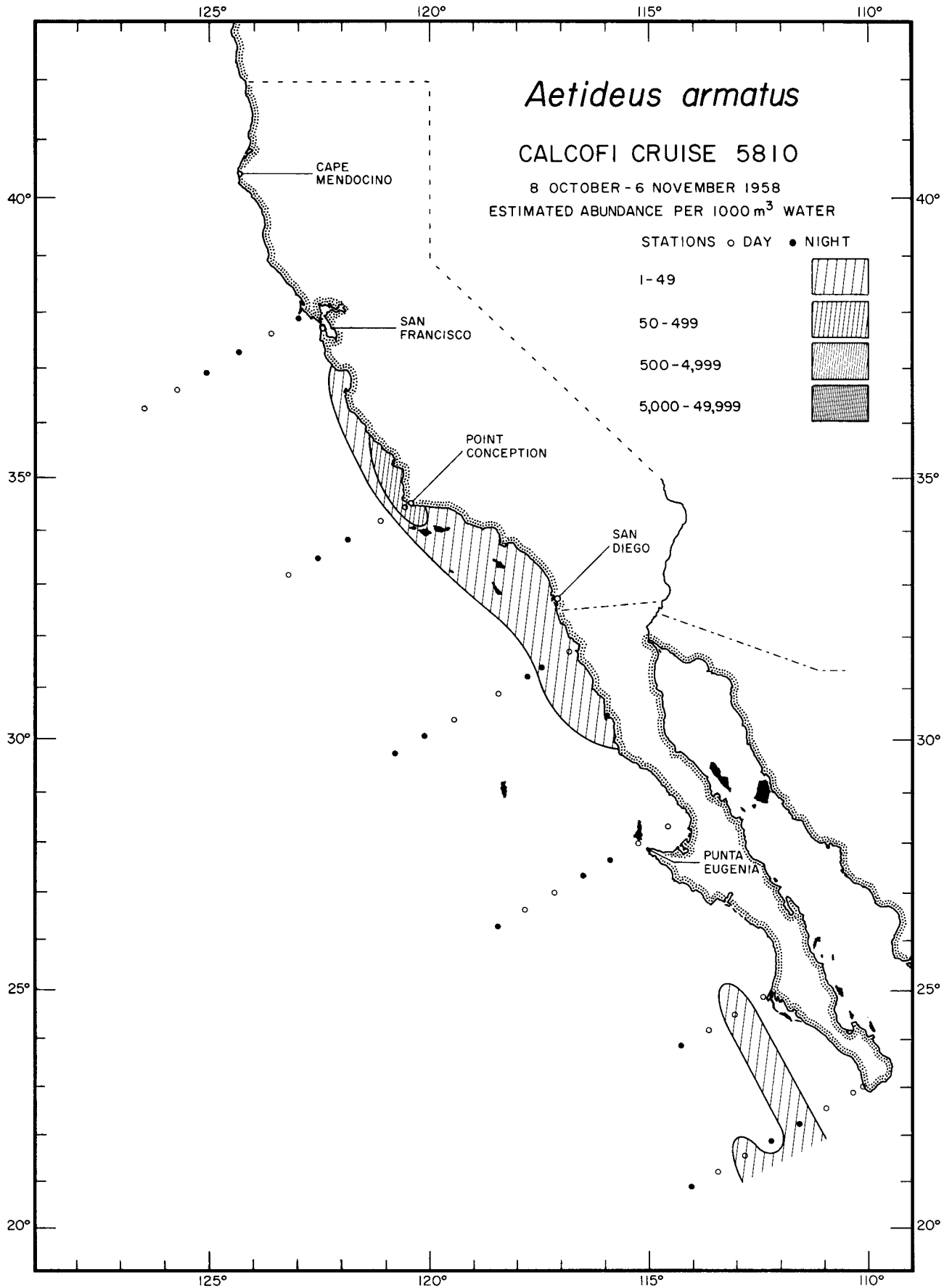
Calanoida
Acrocalanus gracilis
5901



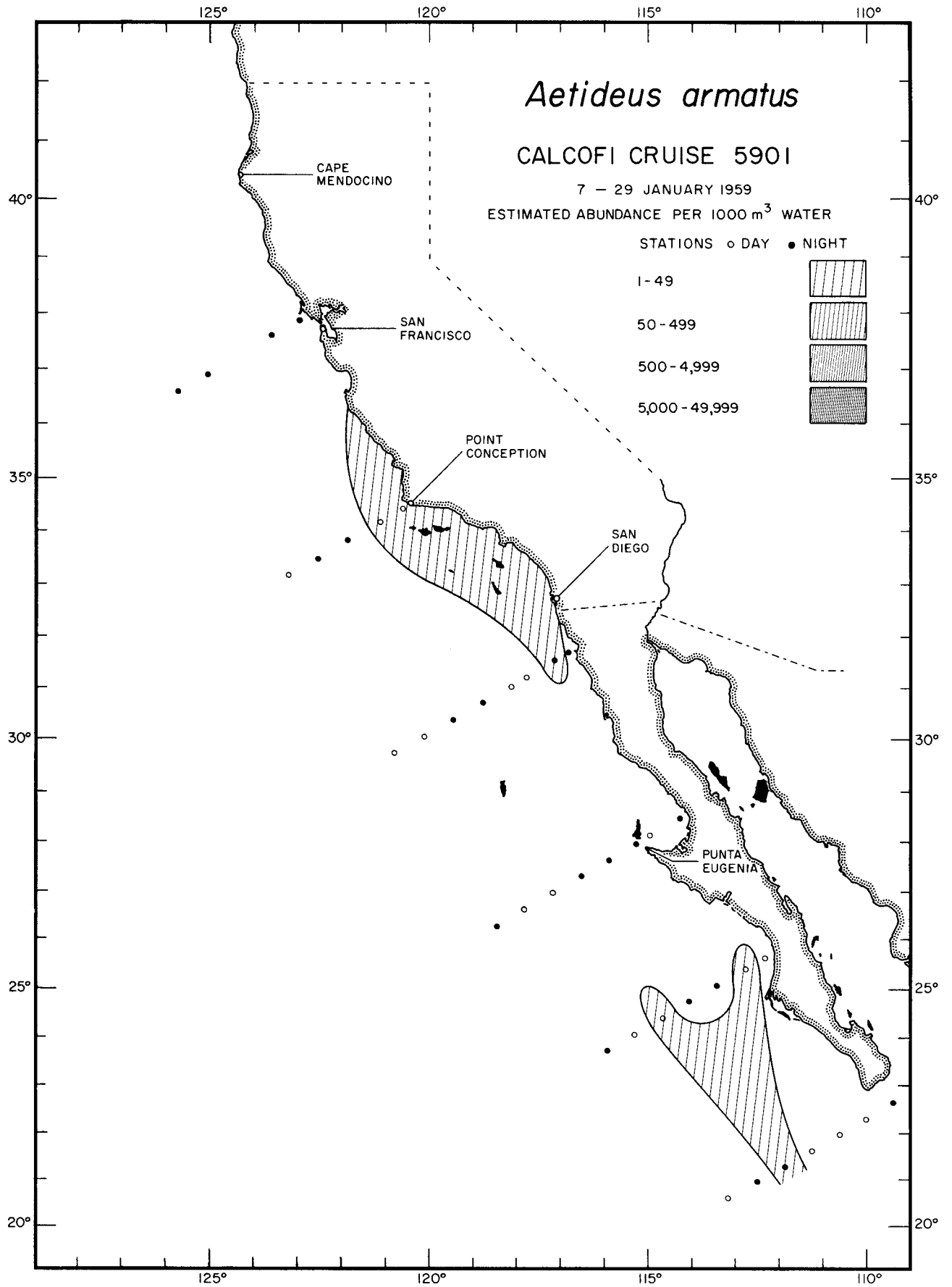
Calanoida
Aetideus armatus
 5804



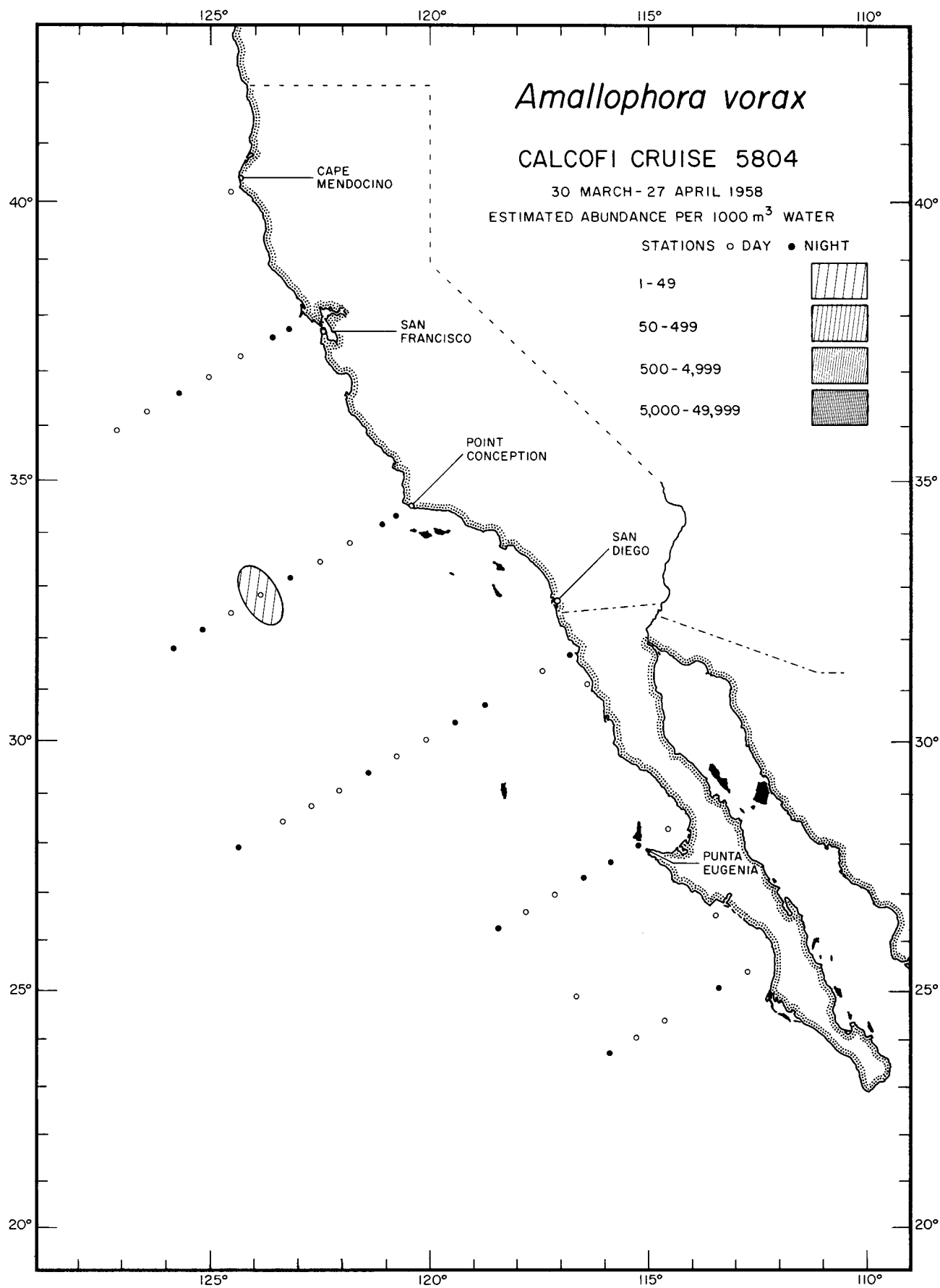
Calanoida
Aetideus armatus
5807



Calanoida
Aetideus armatus
 5810



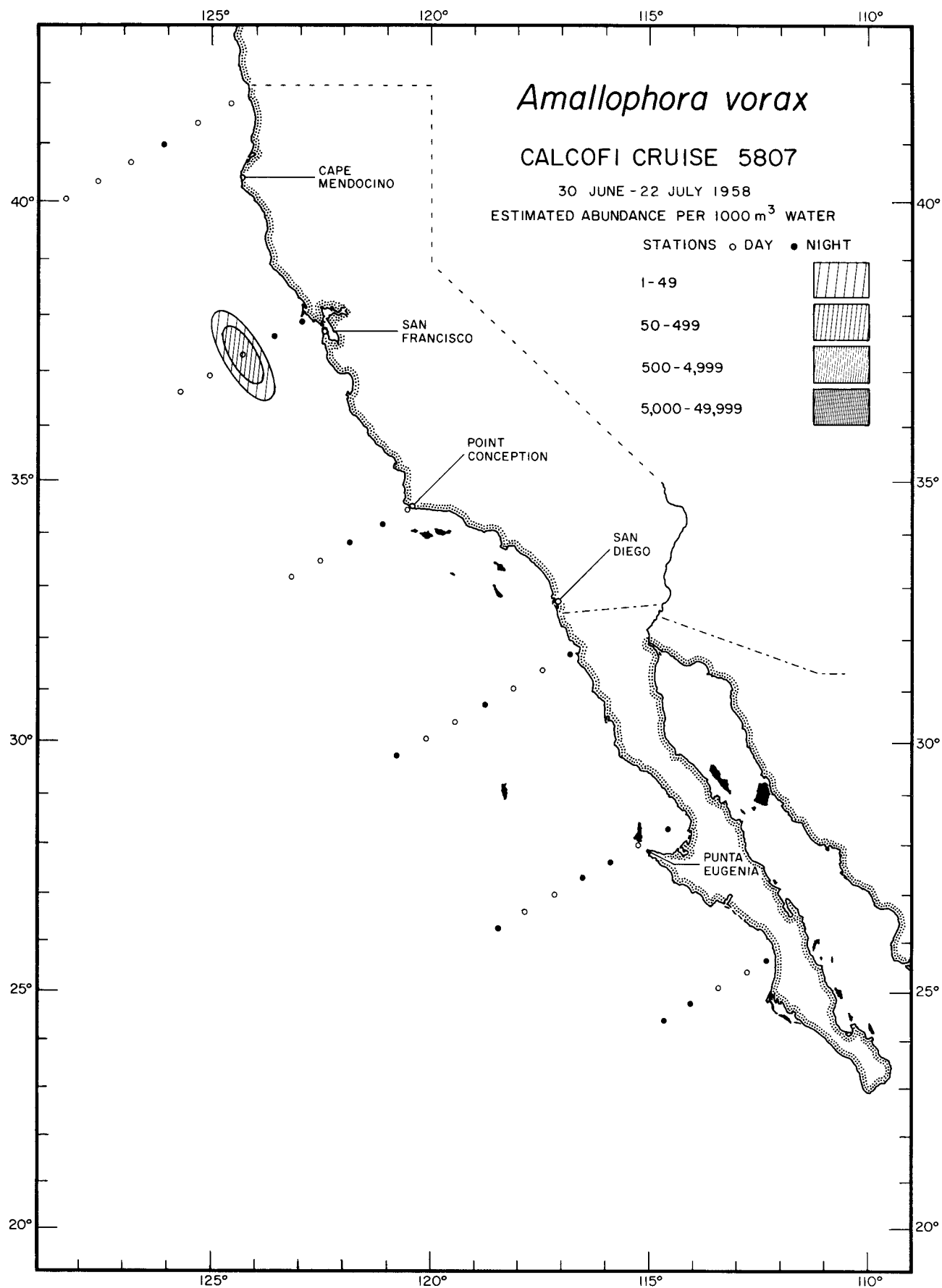
Calanoida
Aetideus armatus
5901



Calanoida

Amallophora vorax

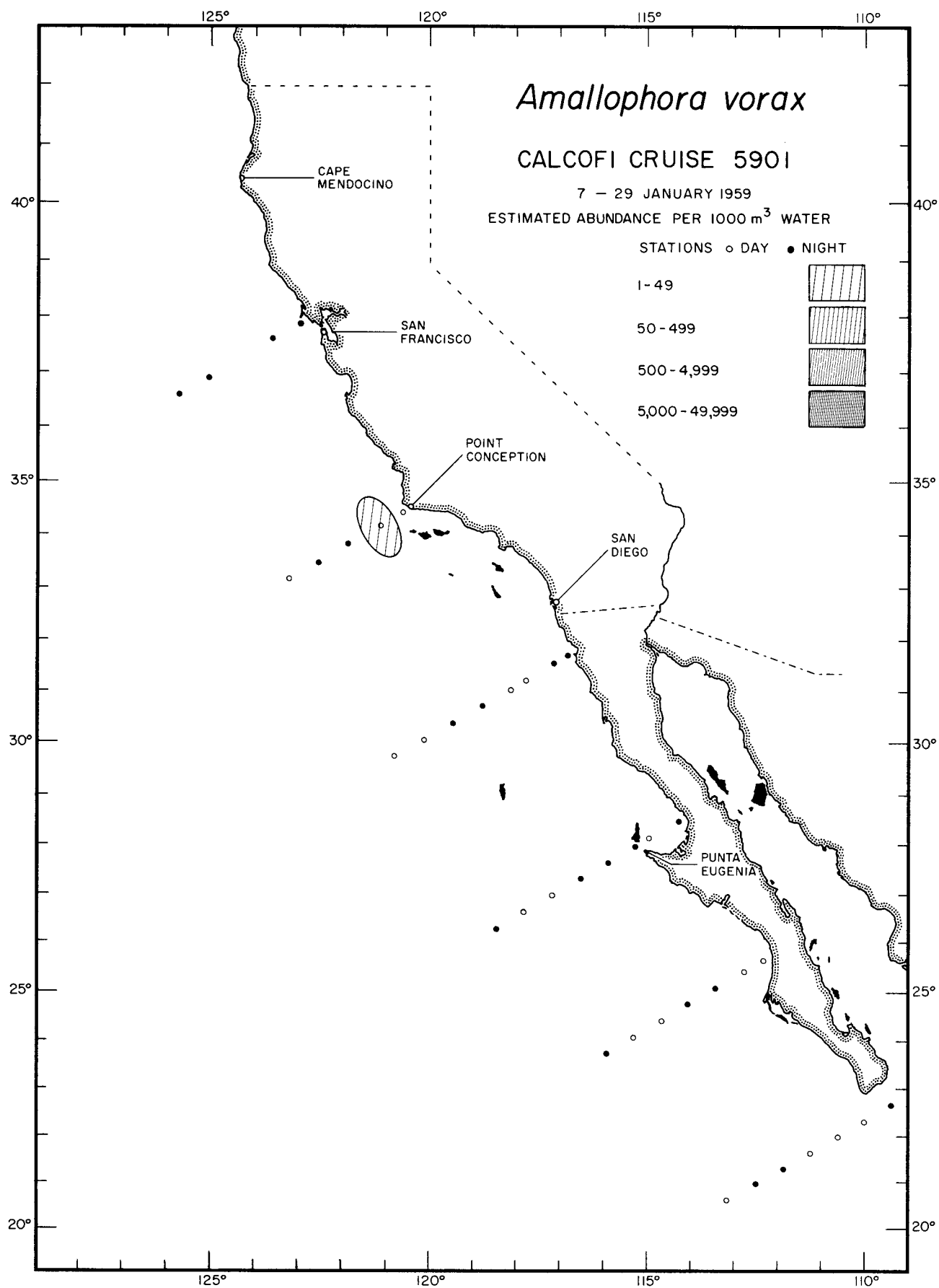
5804



Calanoida

Amallophora vorax

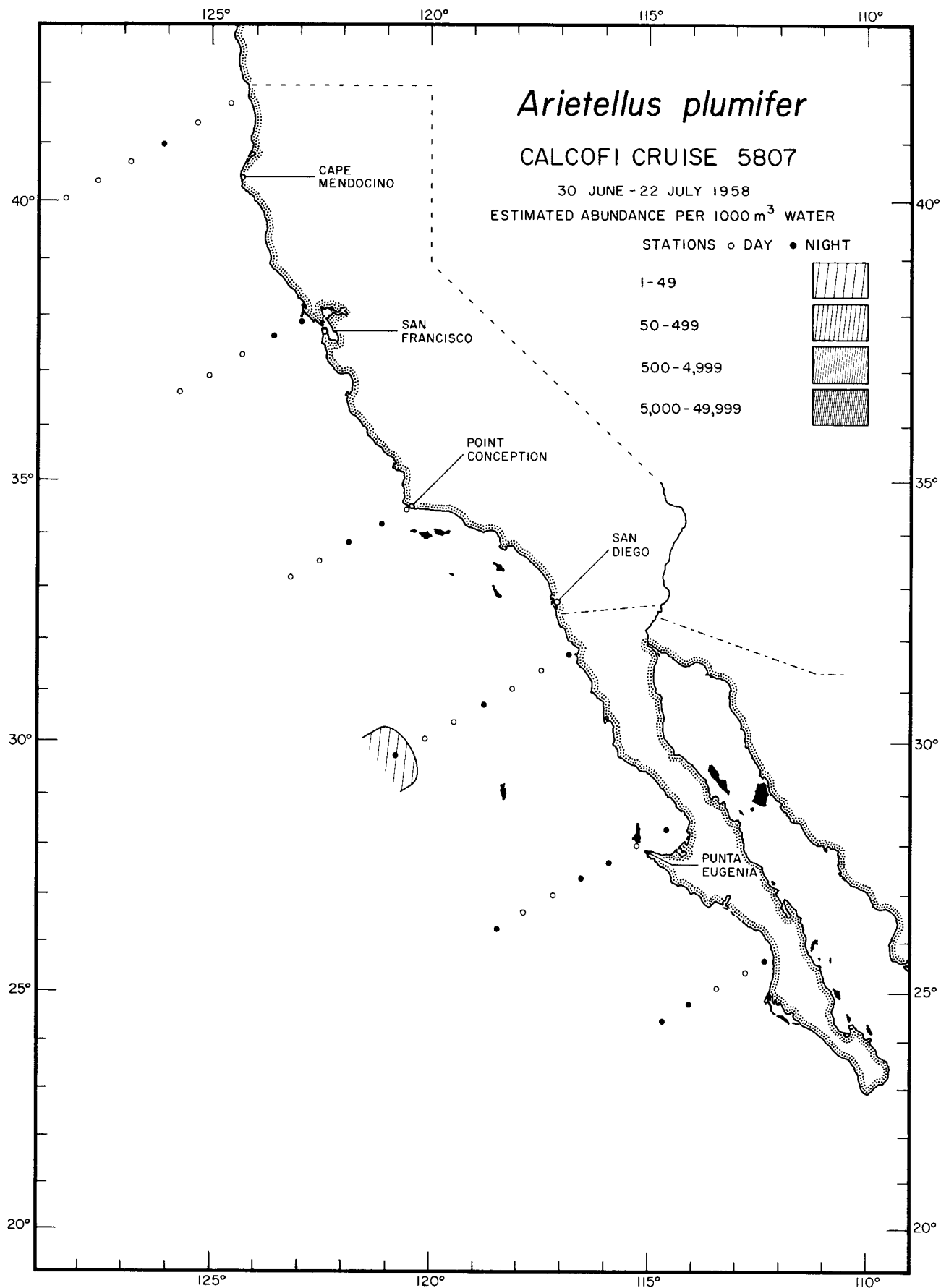
5807



Calanoida

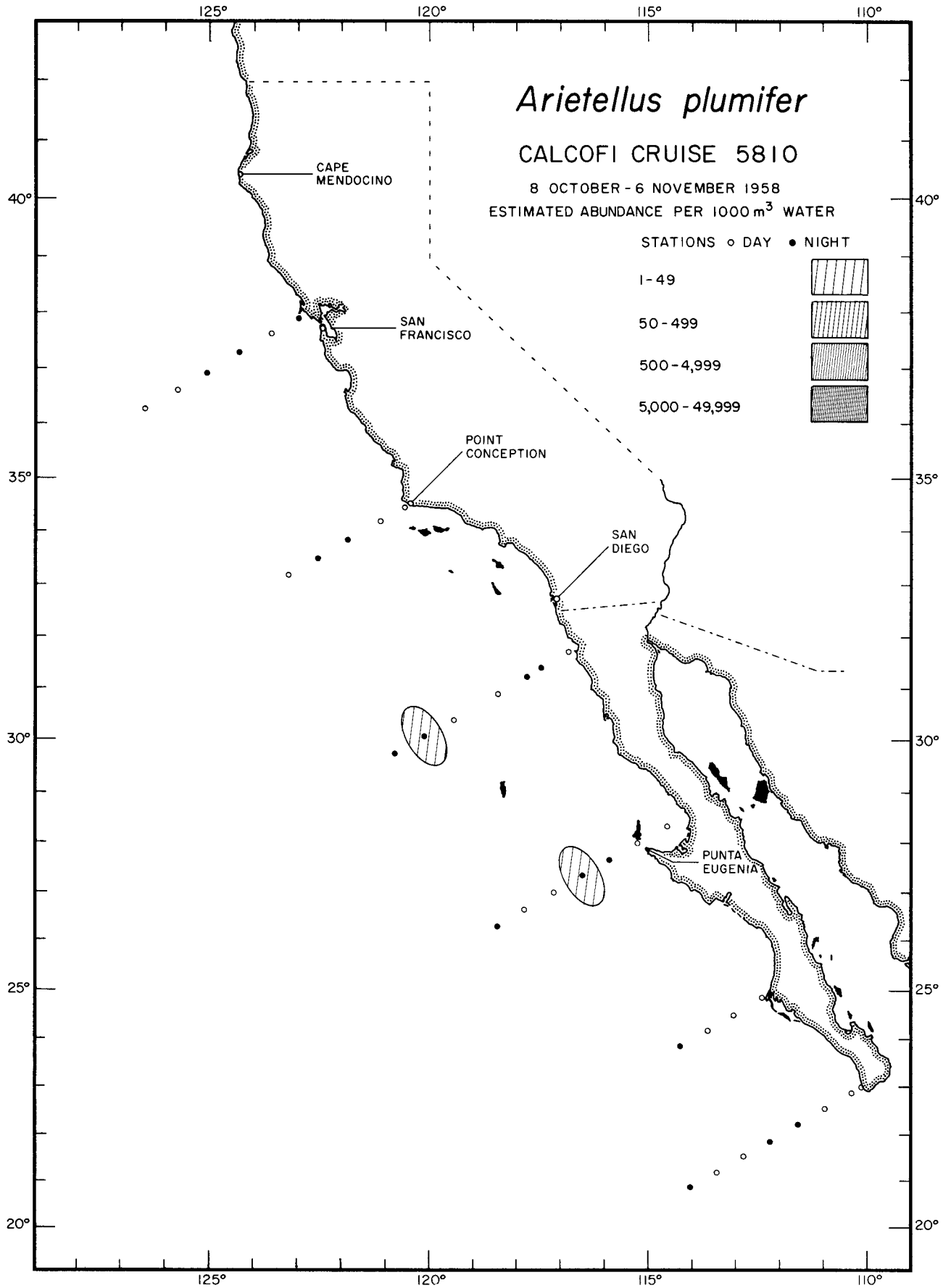
Amalophora vorax

5901

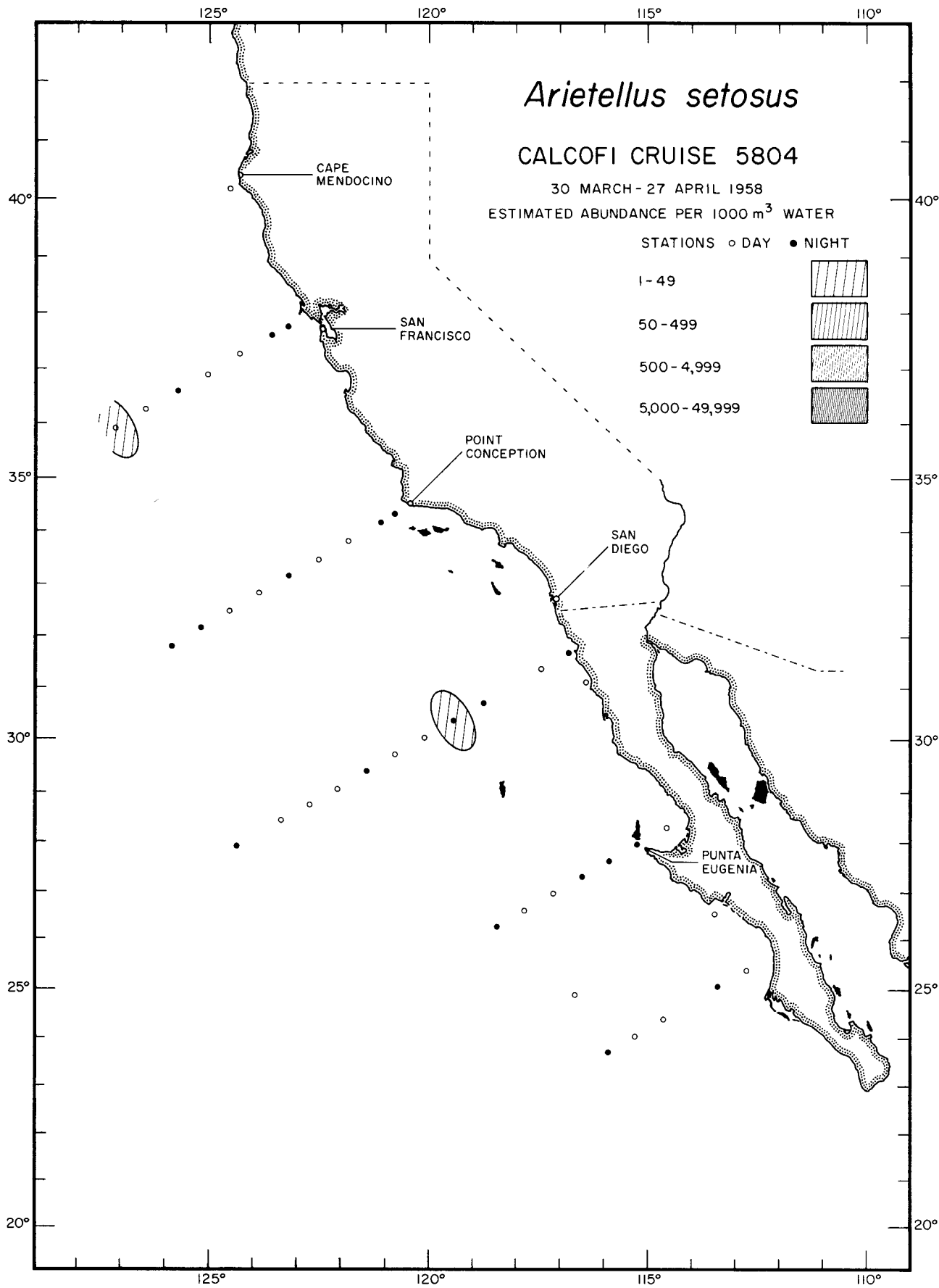


Calanoida

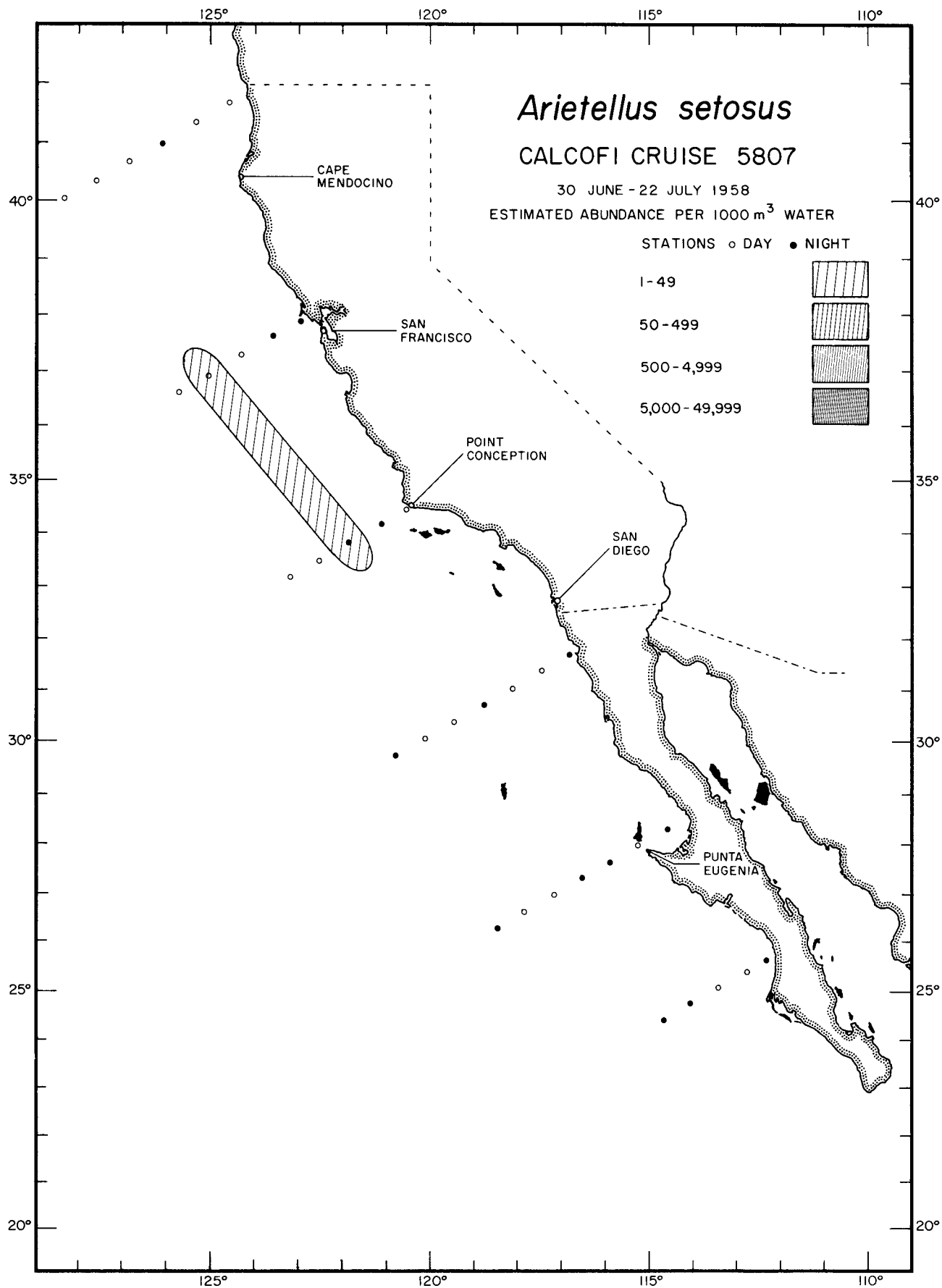
Arietellus plumifer
 5807



Calanoida
Arietellus plumifer
 5810



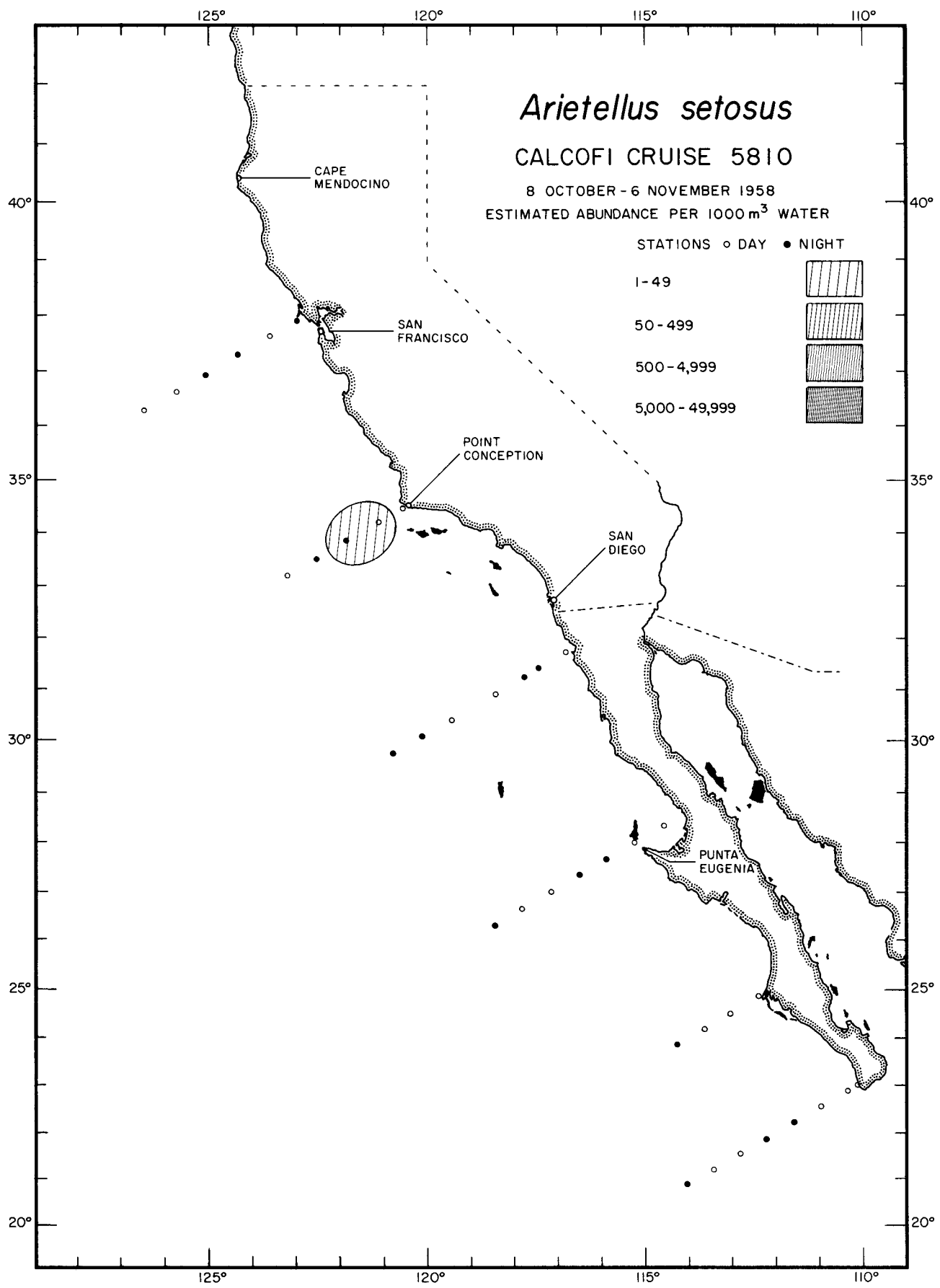
Calanoida
Arietellus setosus
 5804



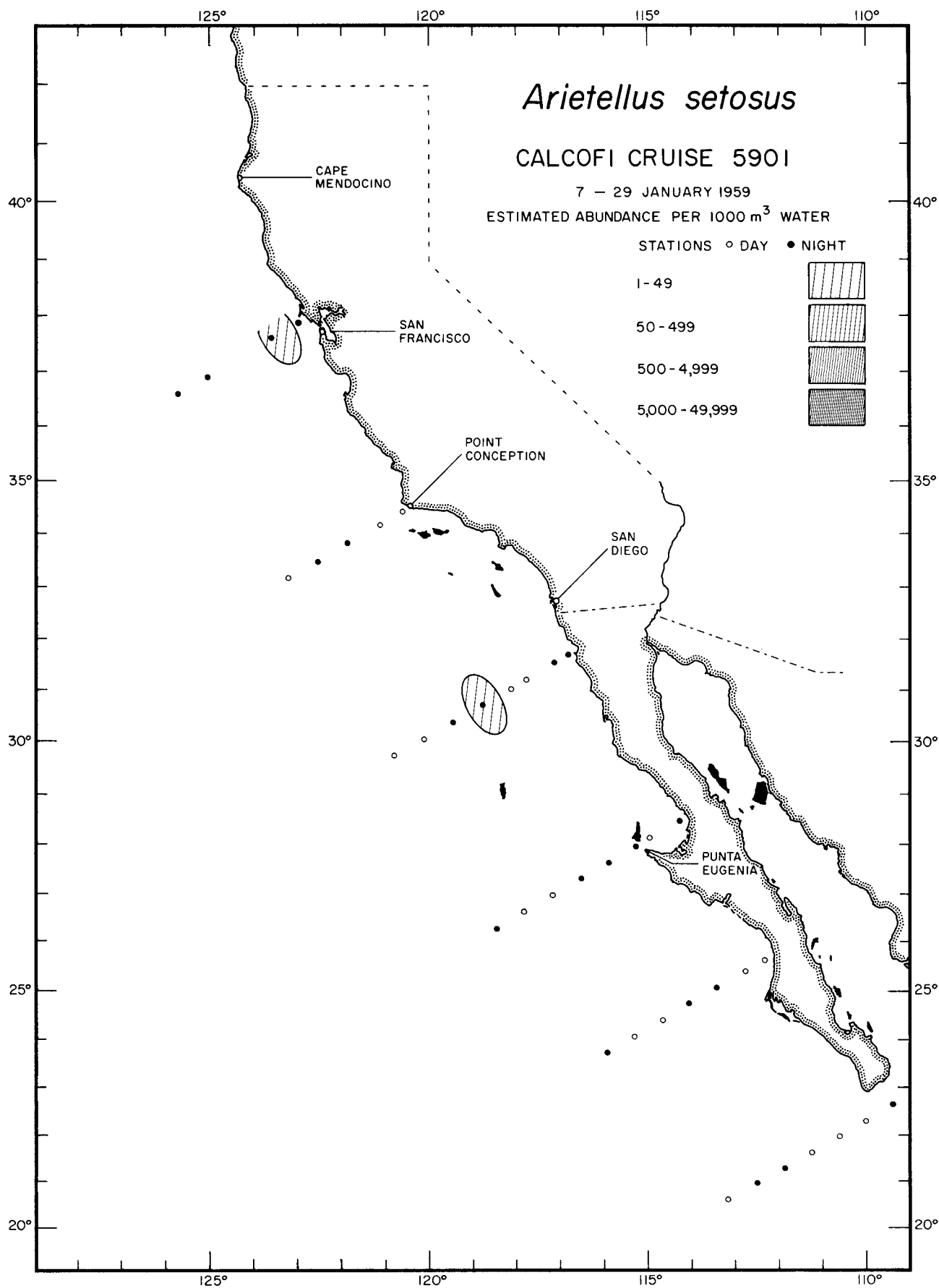
Calanoida

Arietellus setosus

5807



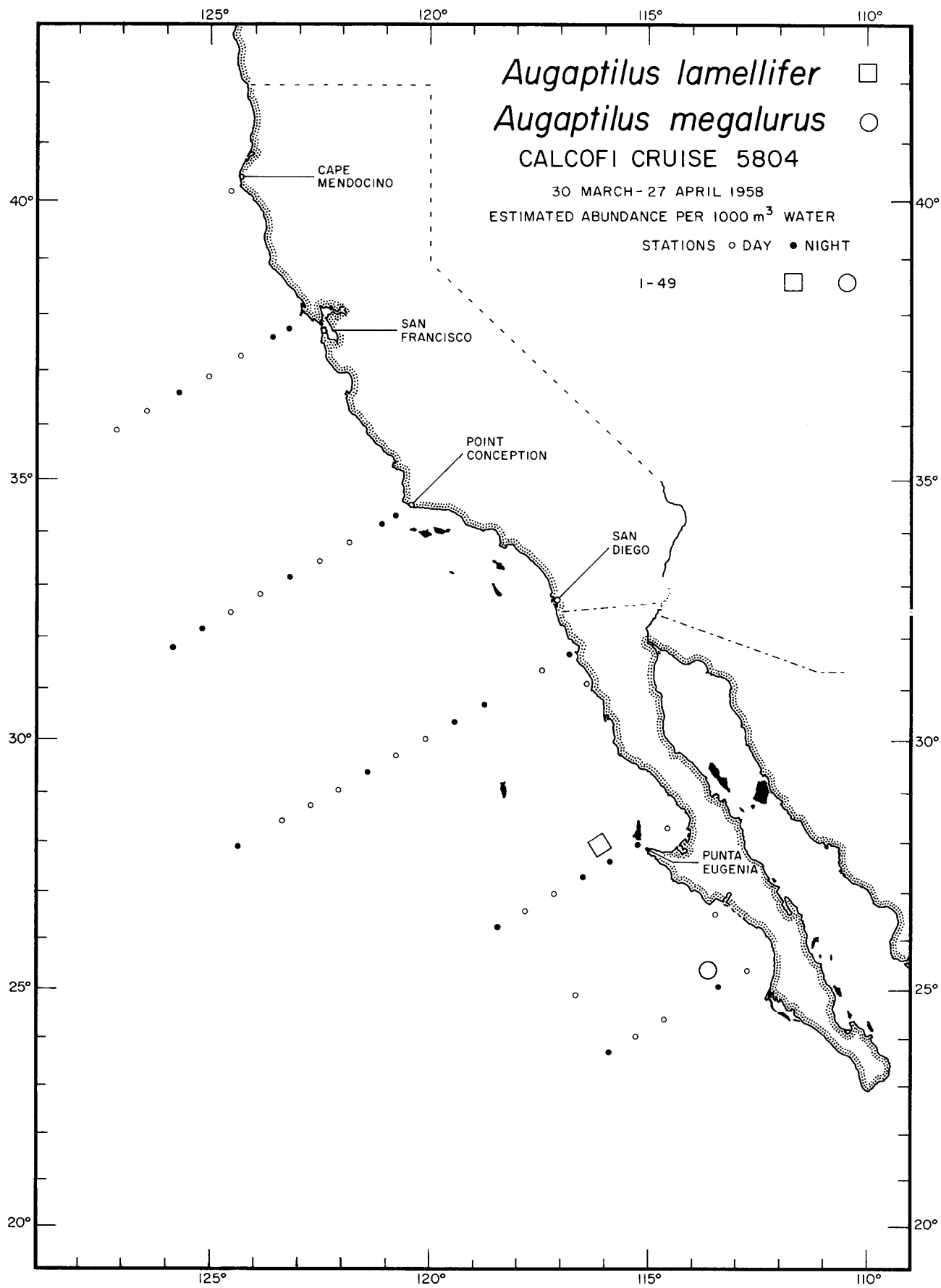
Calanoida
Arietellus setosus
5810



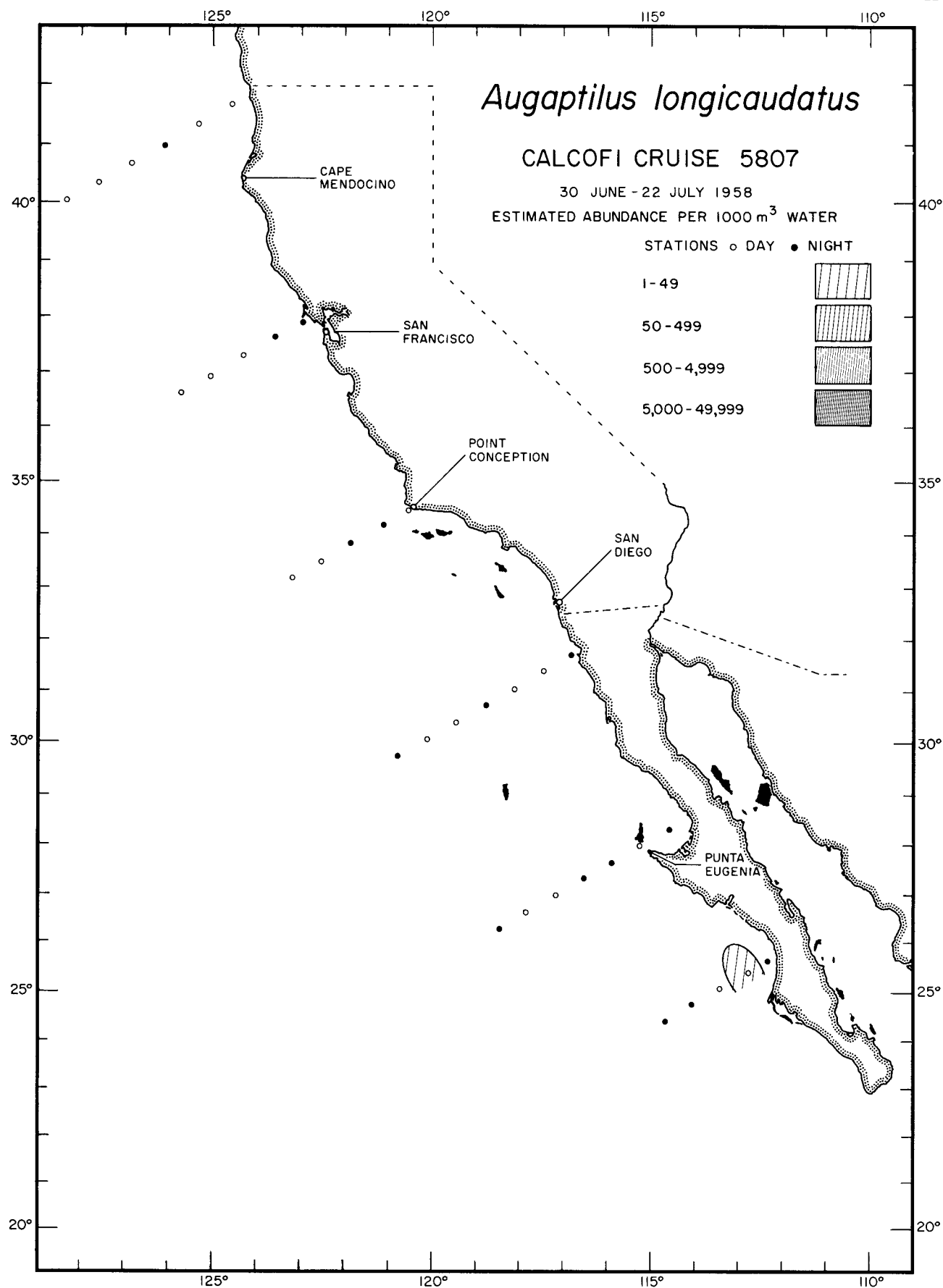
Calanoida

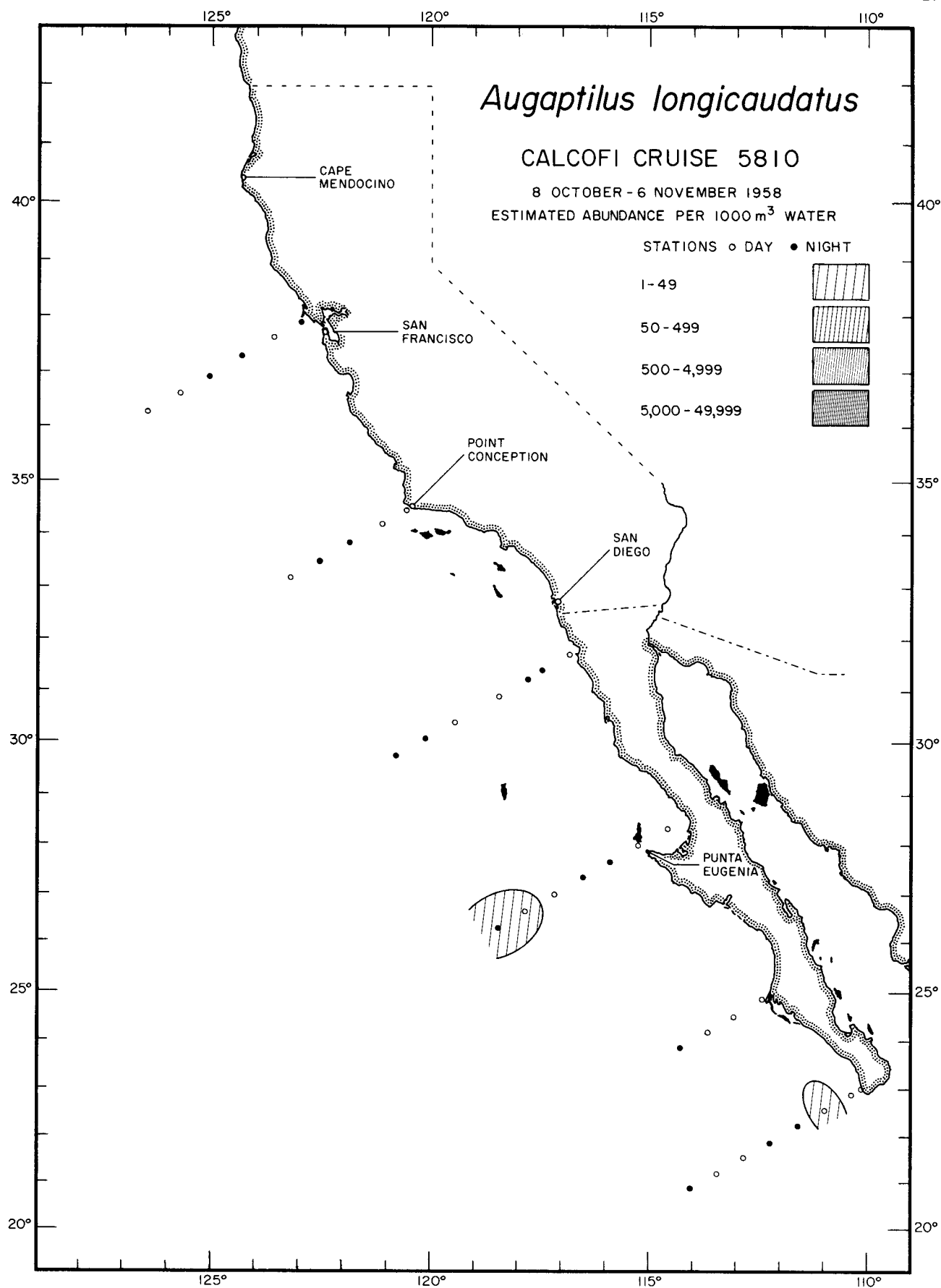
Arietellus setosus

5901



Calanoida
Augaptilus lamellifer
Augaptilus megalurus
 5804

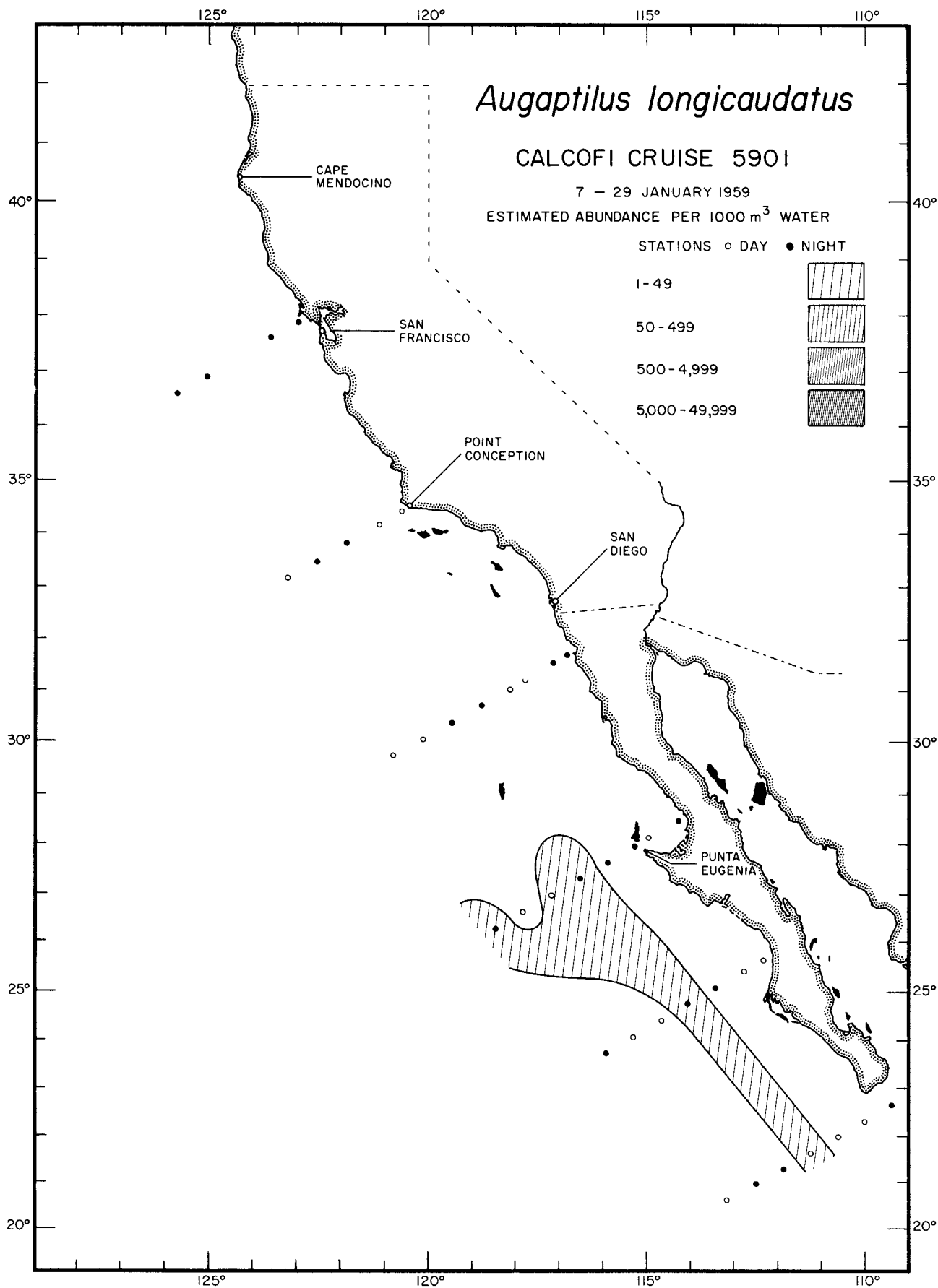




Calanoida

Augaptilus longicaudatus

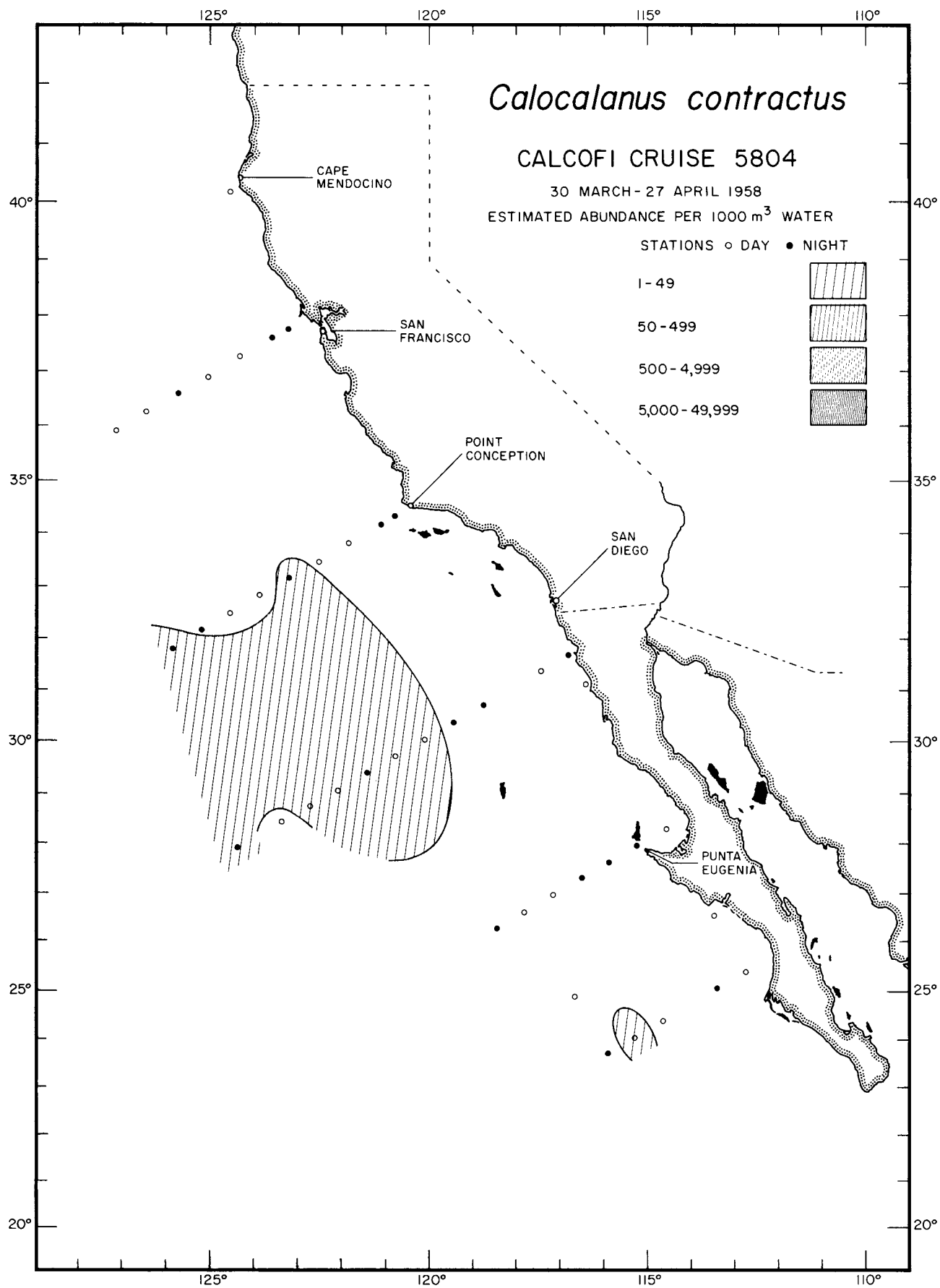
5810



Calanoida

Augaptilus longicaudatus

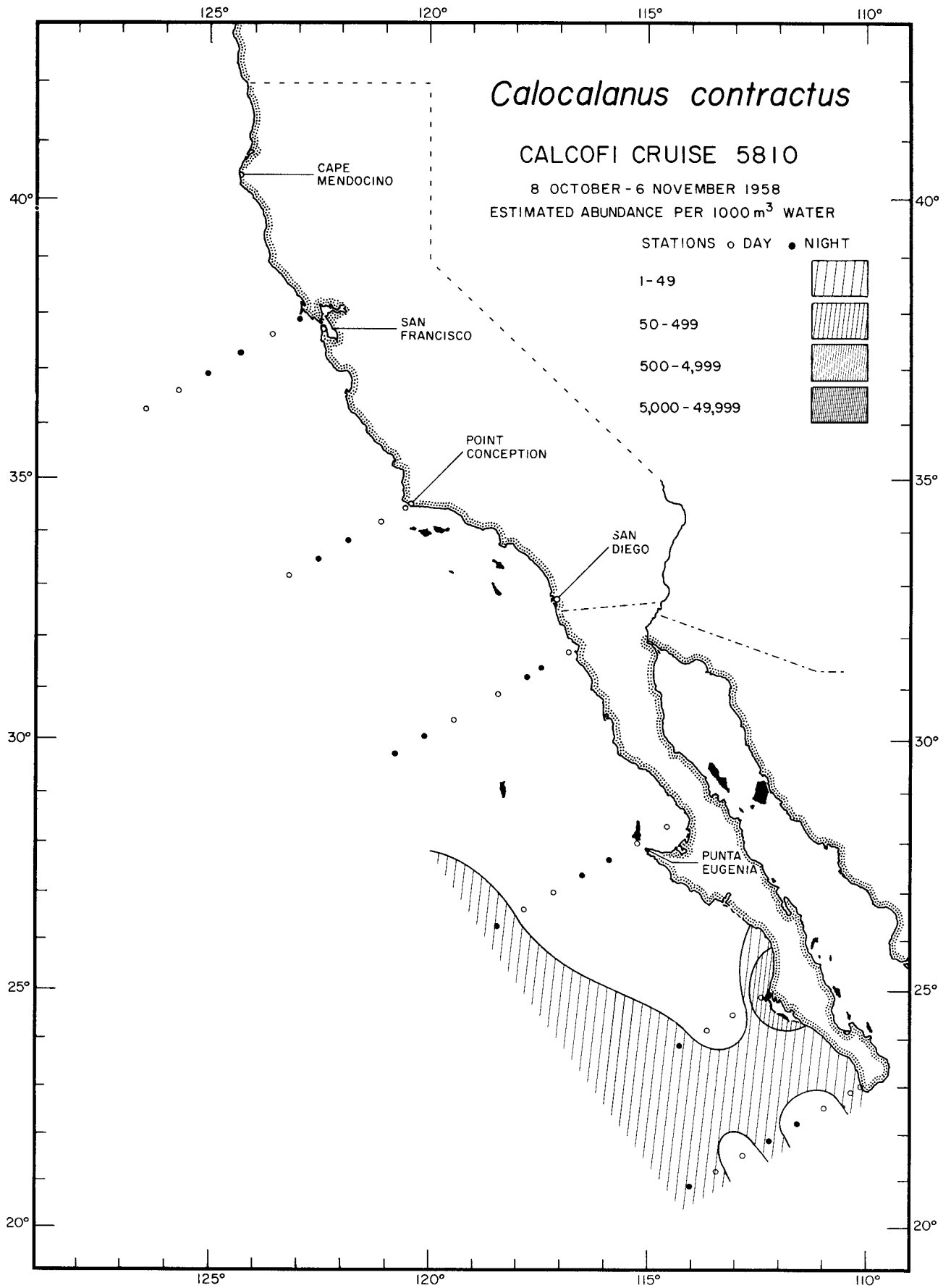
5901



Calanoida

Calocalanus contractus

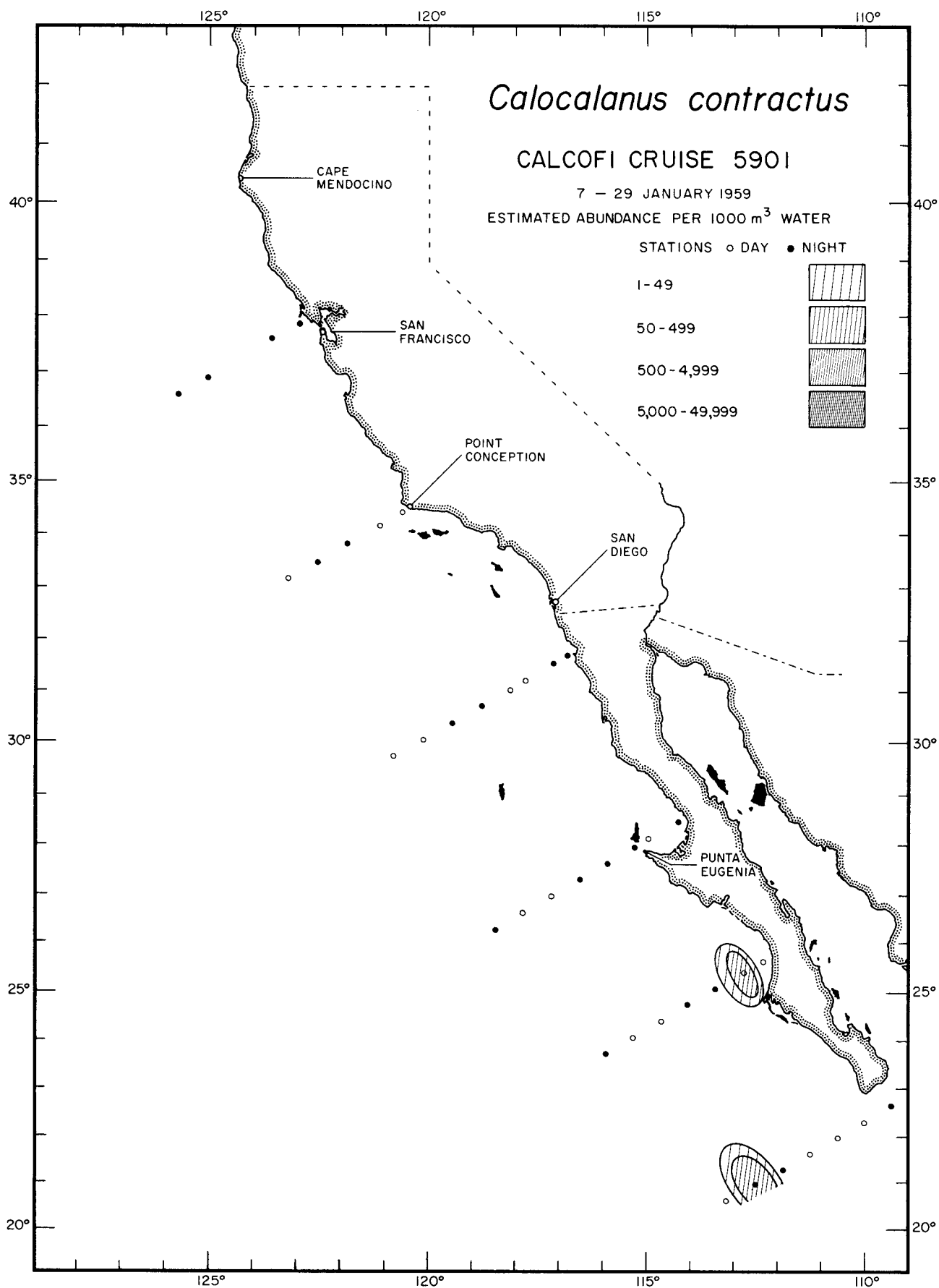
5804



Calanoida

Calocalanus contractus

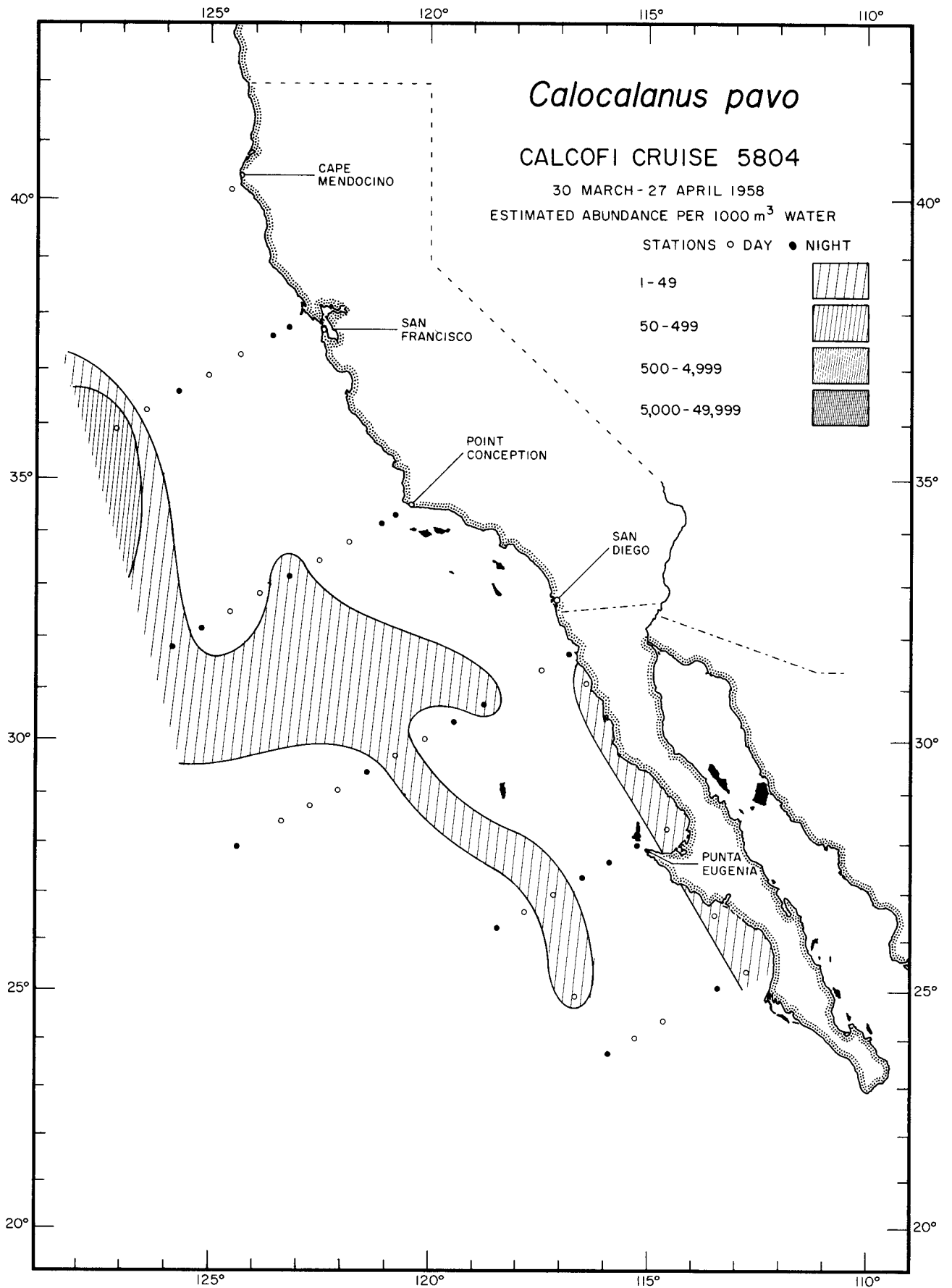
5810



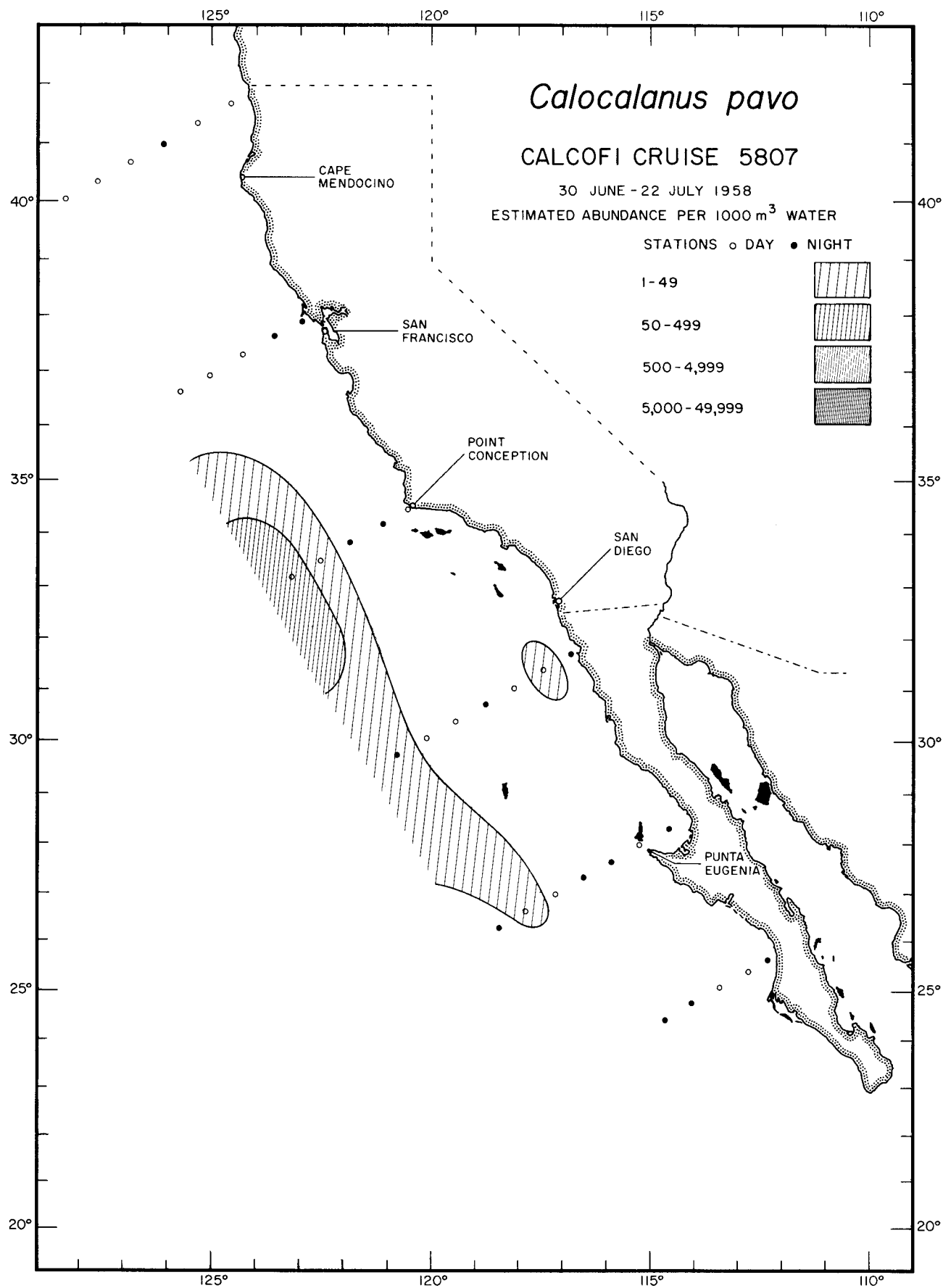
Calanoida

Calocalanus contractus

5901



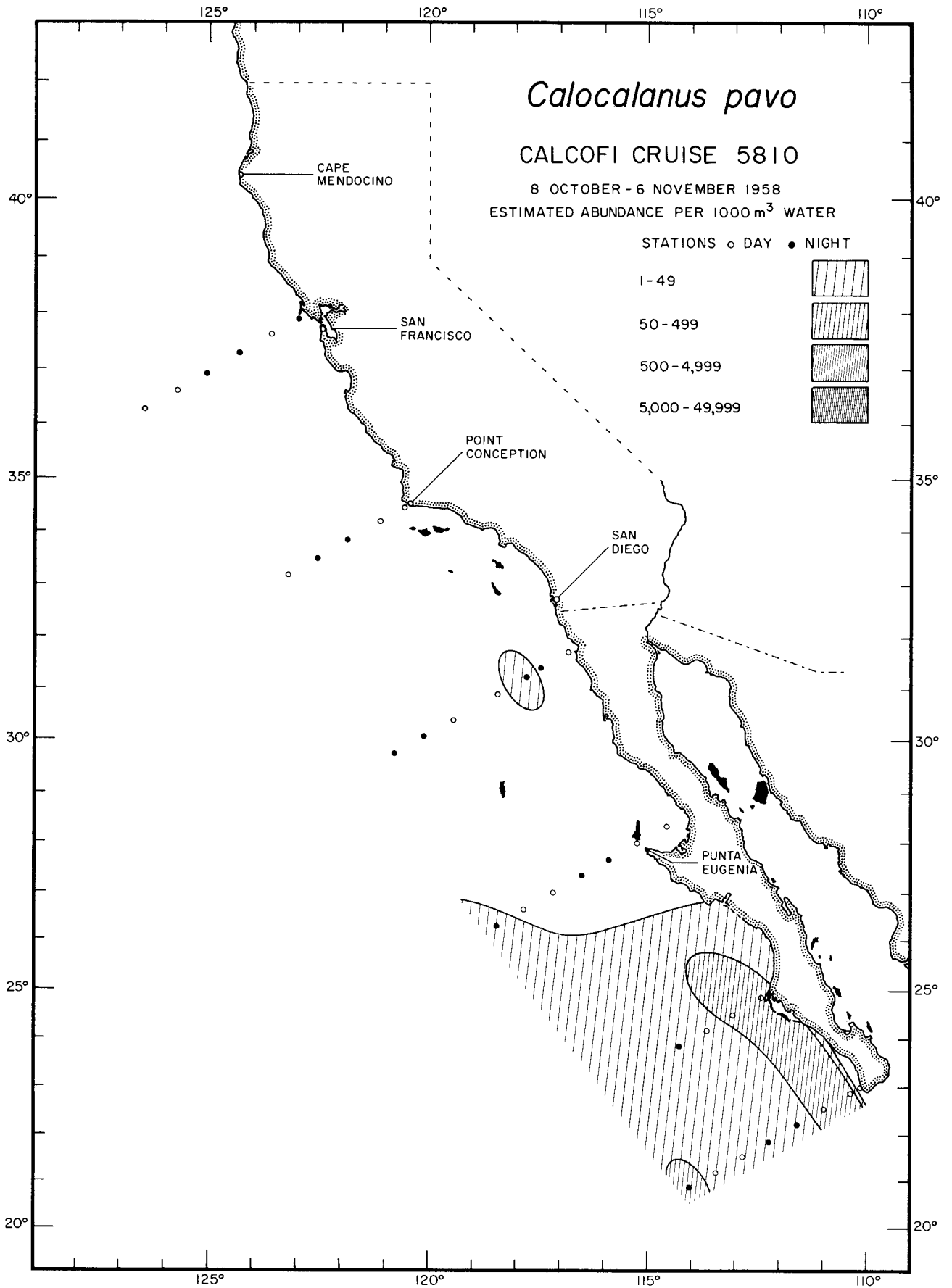
Calanoida
Calocalanus pavo
 5804



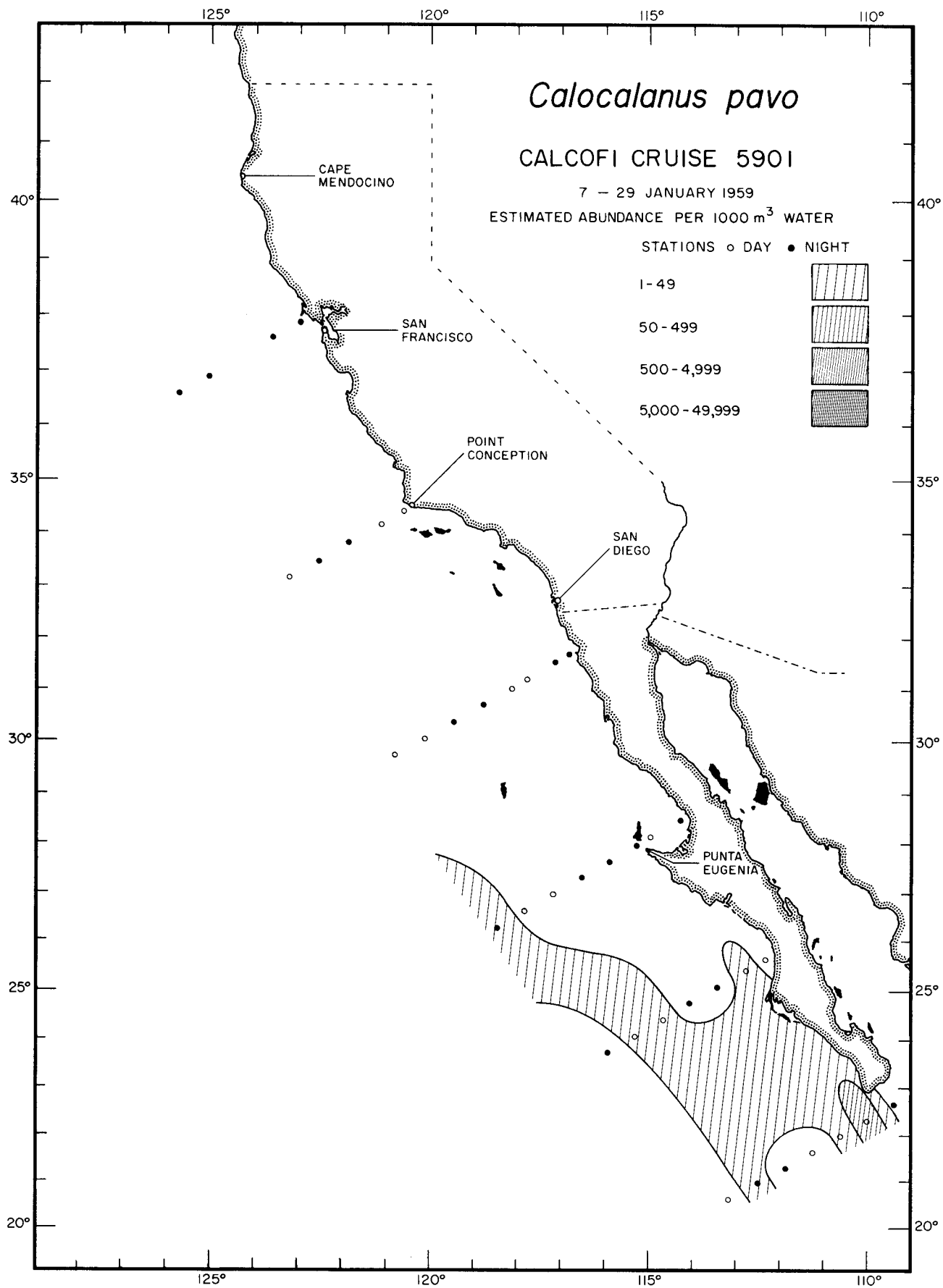
Calanoida

Calocalanus pavo

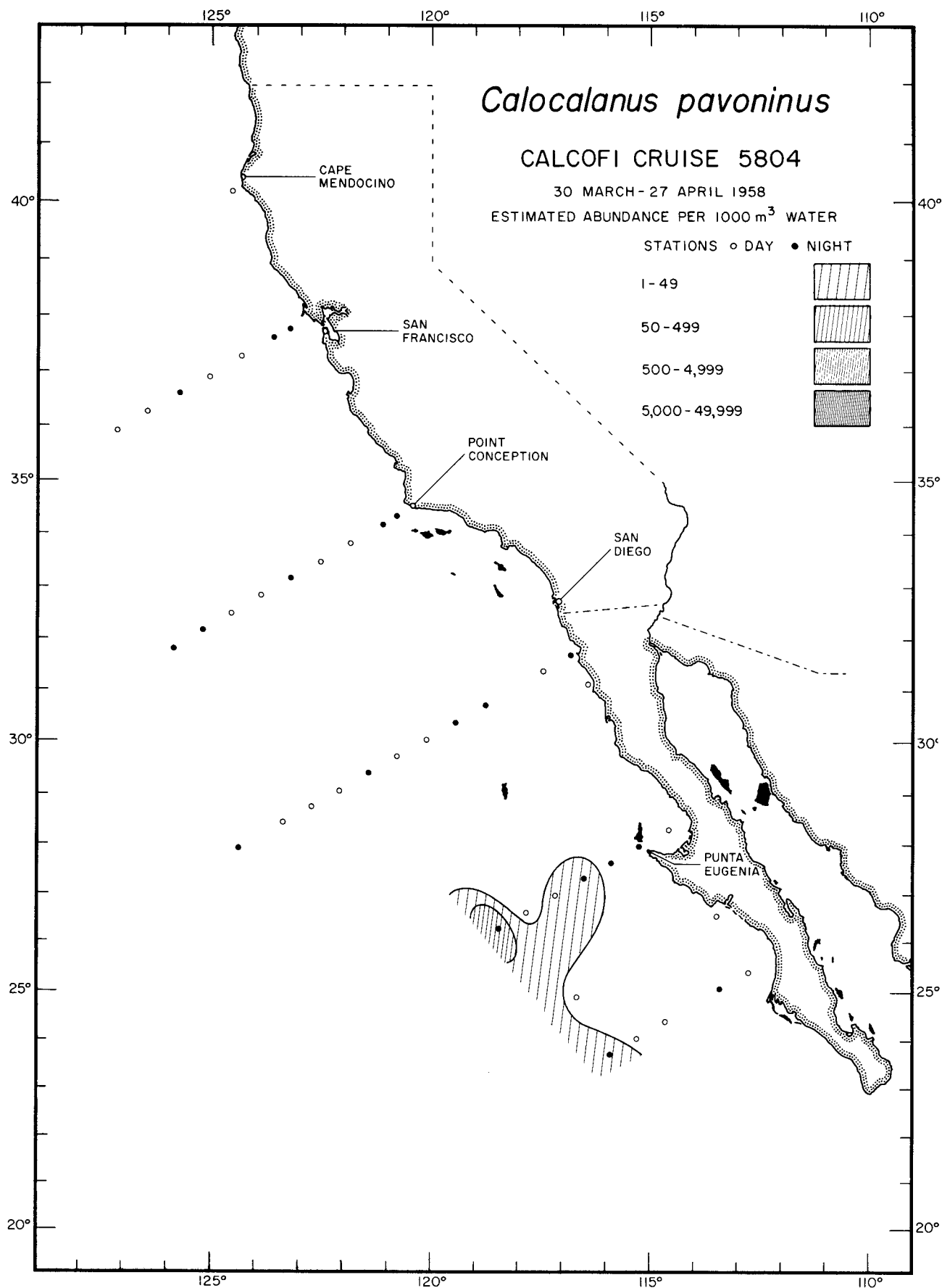
5807



Calanoida
Calocalanus pavo
5810



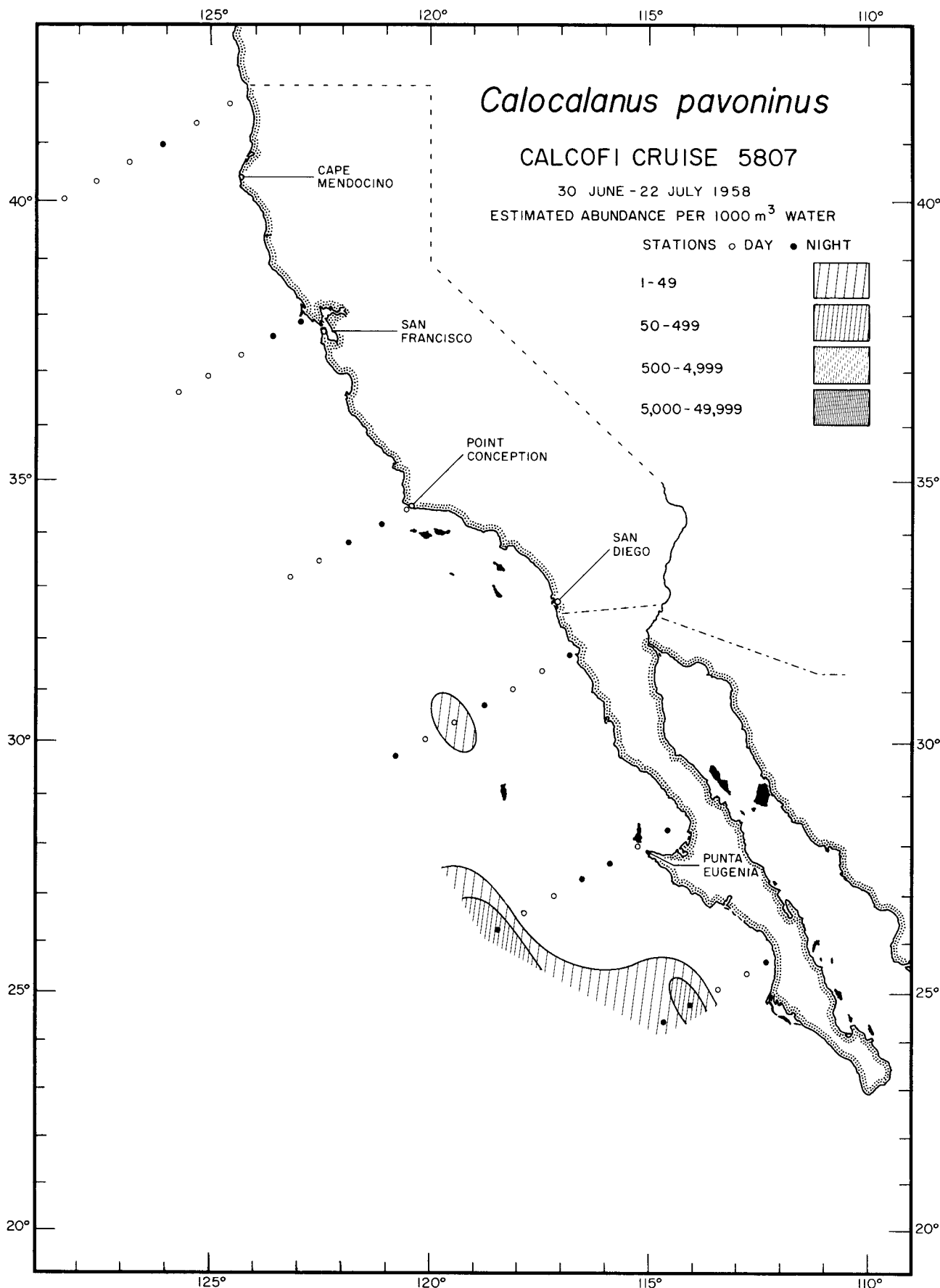
Calanoida
Calocalanus pavo
5901



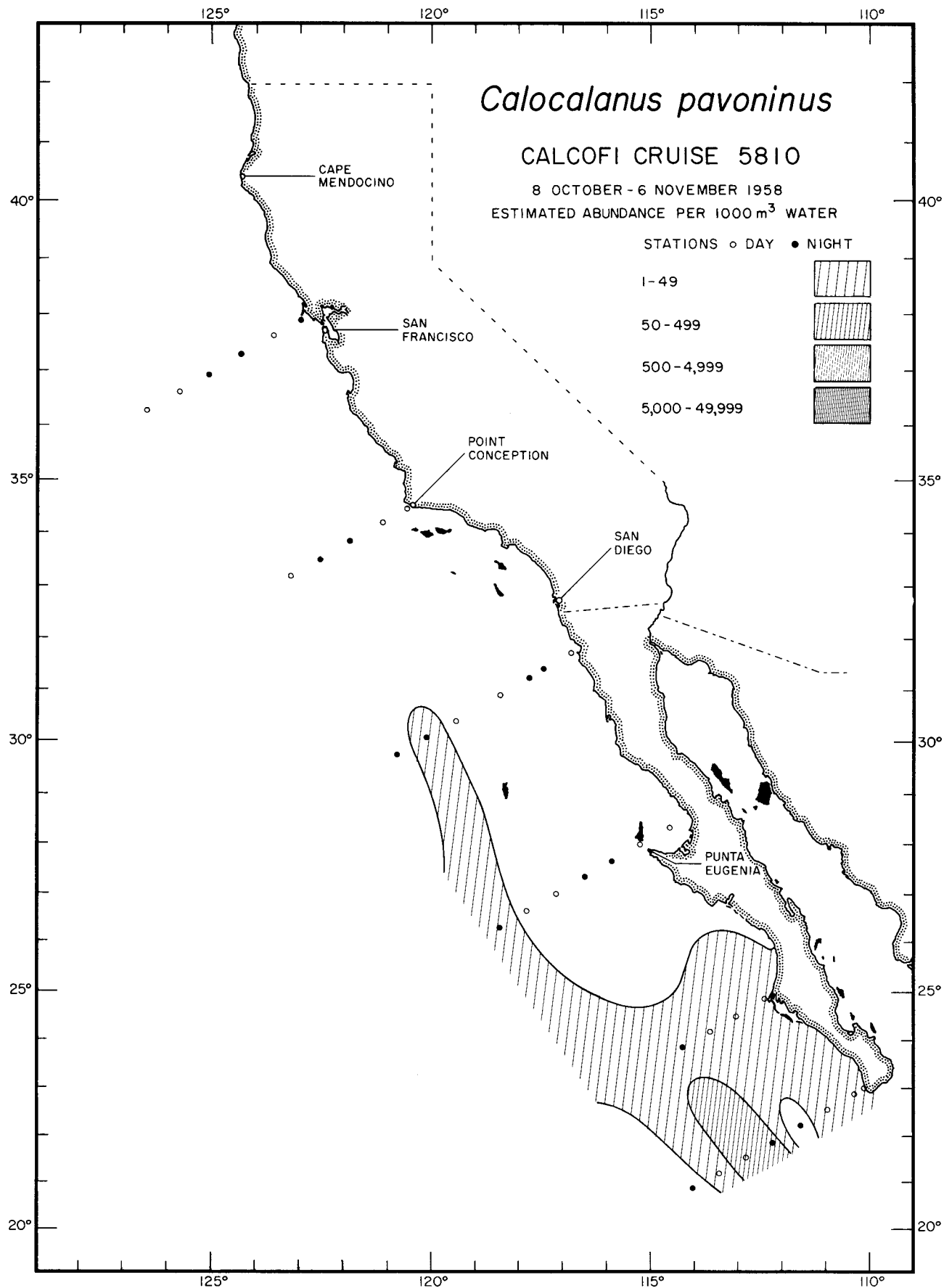
Calanoida

Calocalanus pavoninus

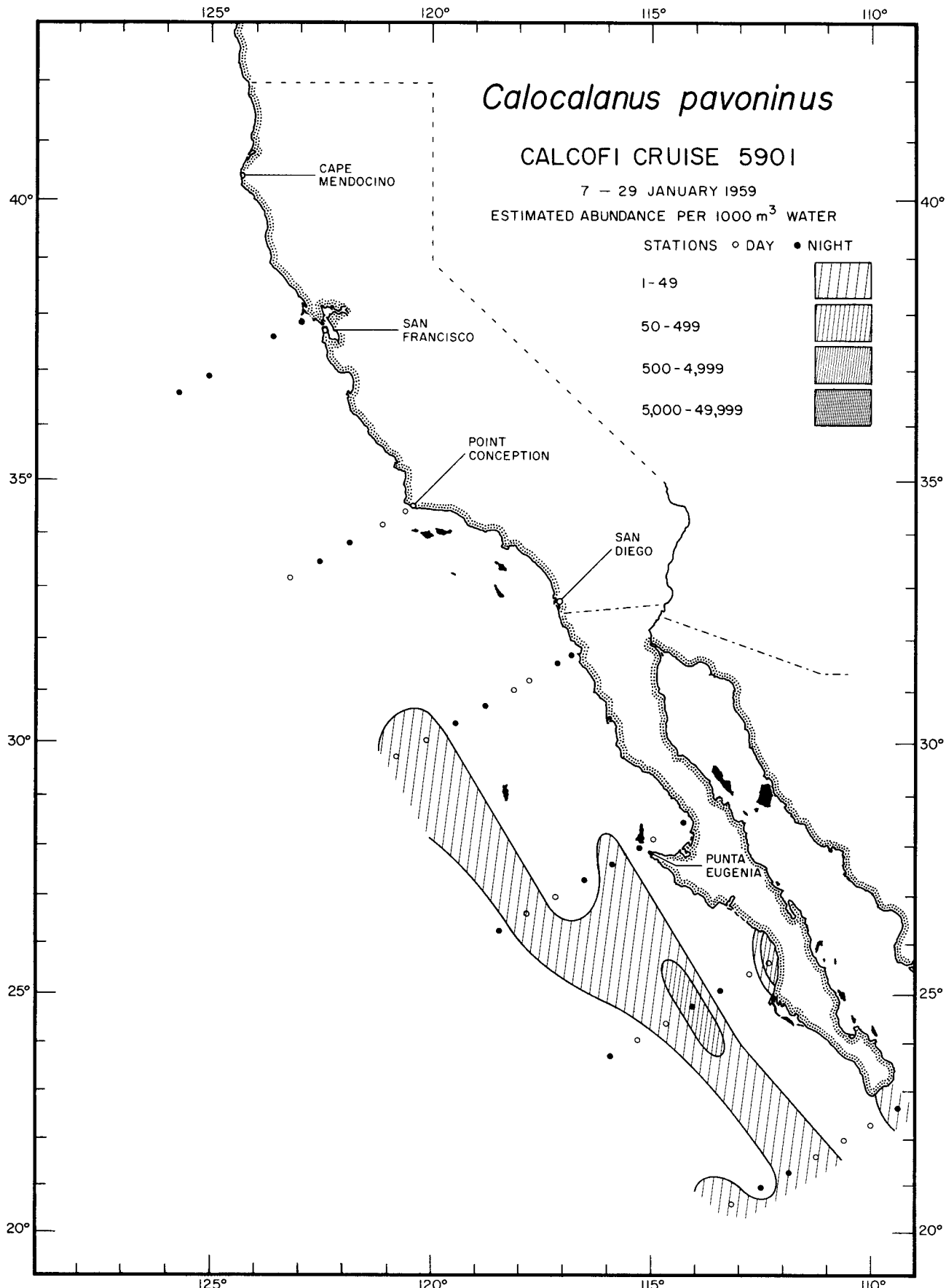
5804



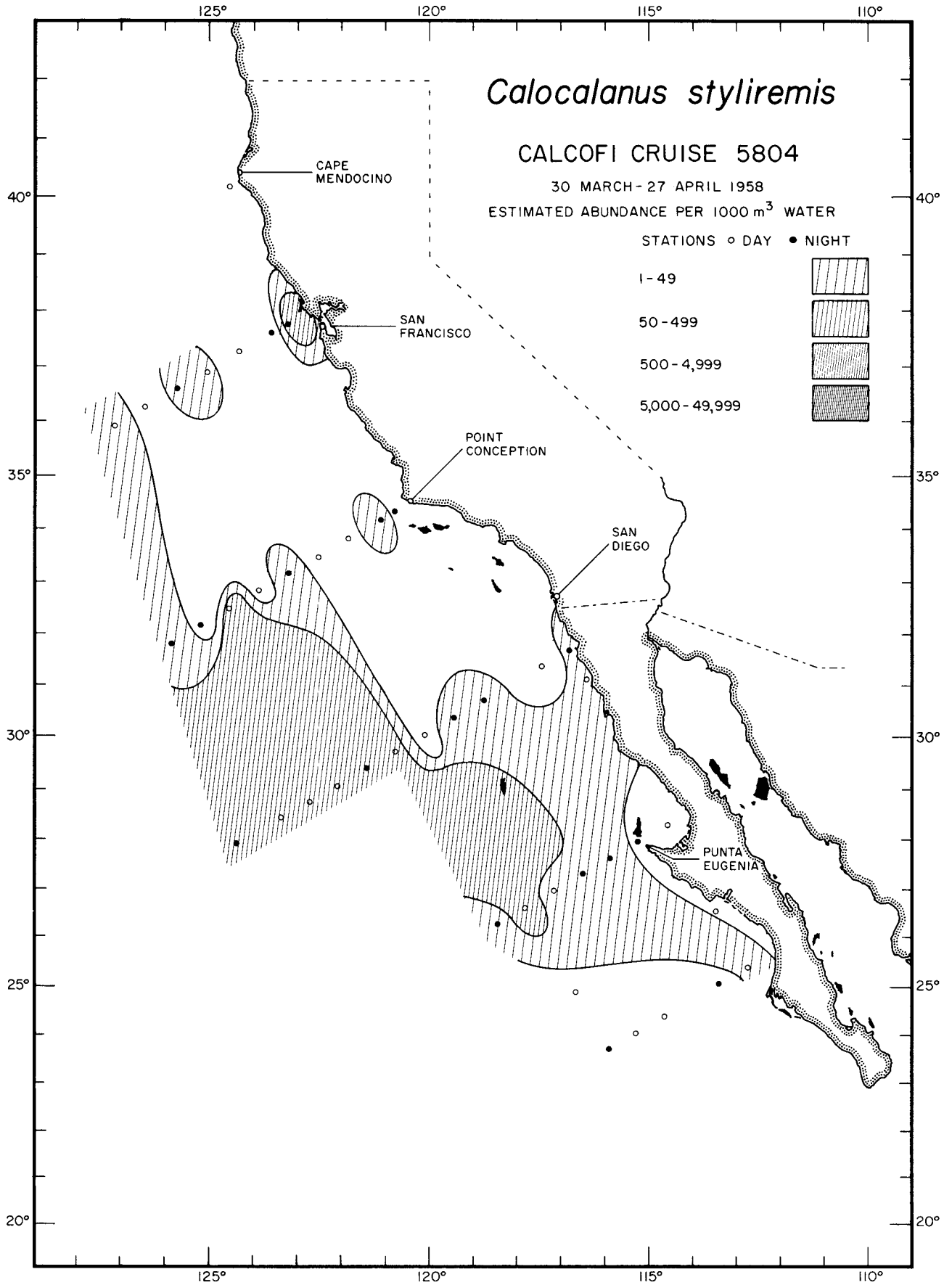
Calanoida
Calocalanus pavoninus
5807



Calanoida
Calocalanus pavoninus
5810



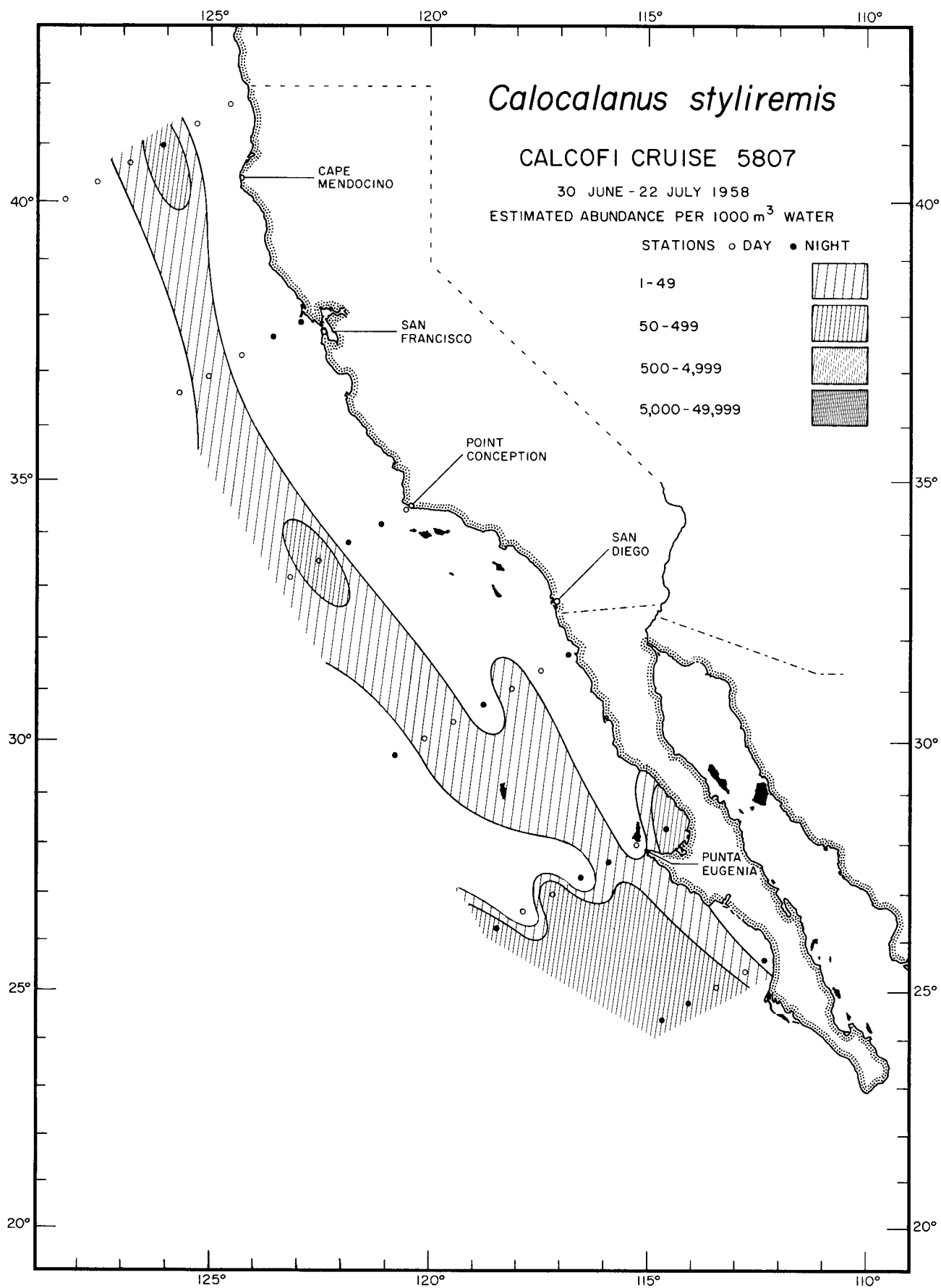
Calanoida
Calocalanus pavoninus
5901



Calanoida

Calocalanus styliremis

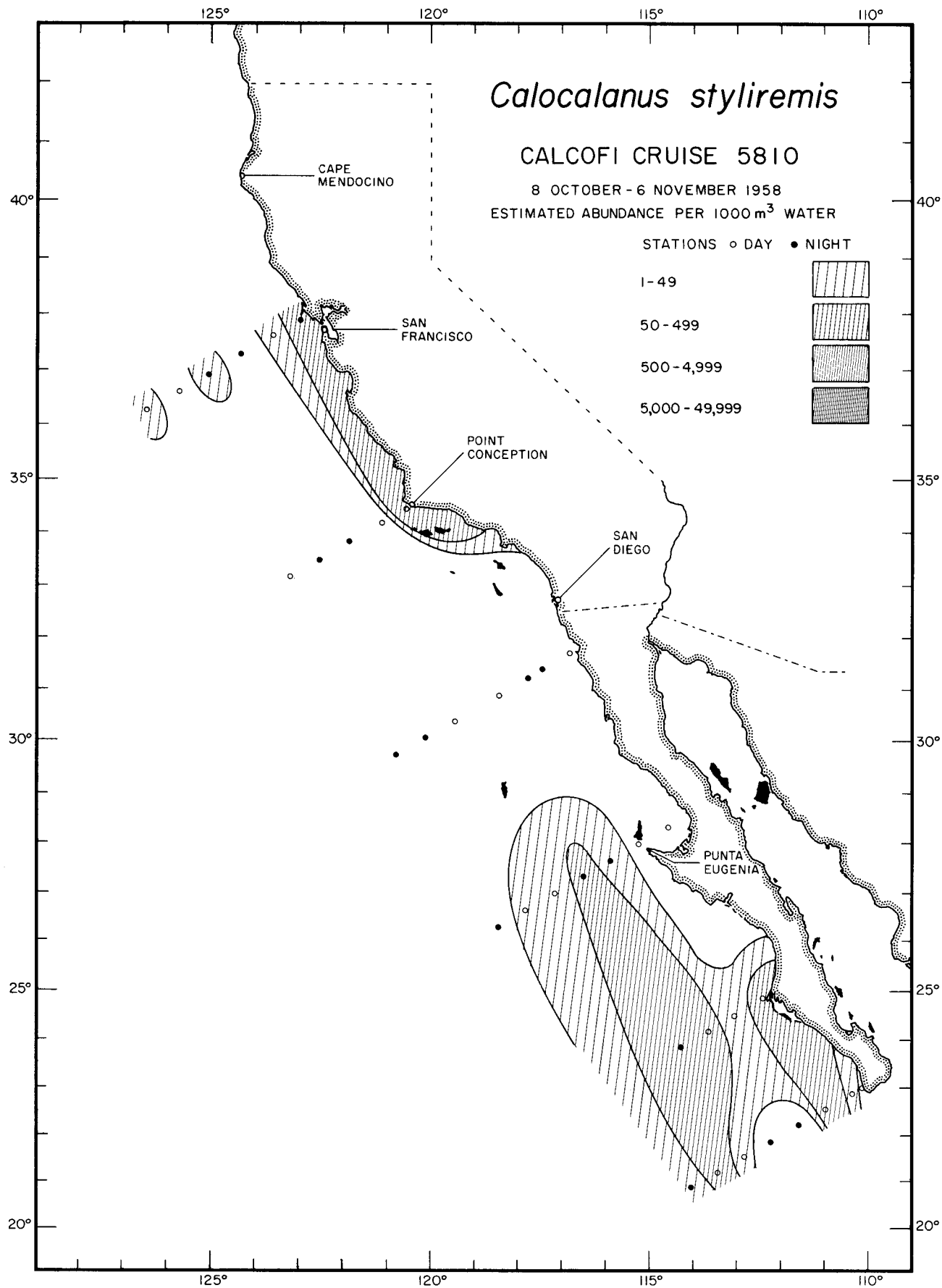
5804



Calanoida

Calocalanus styliremis

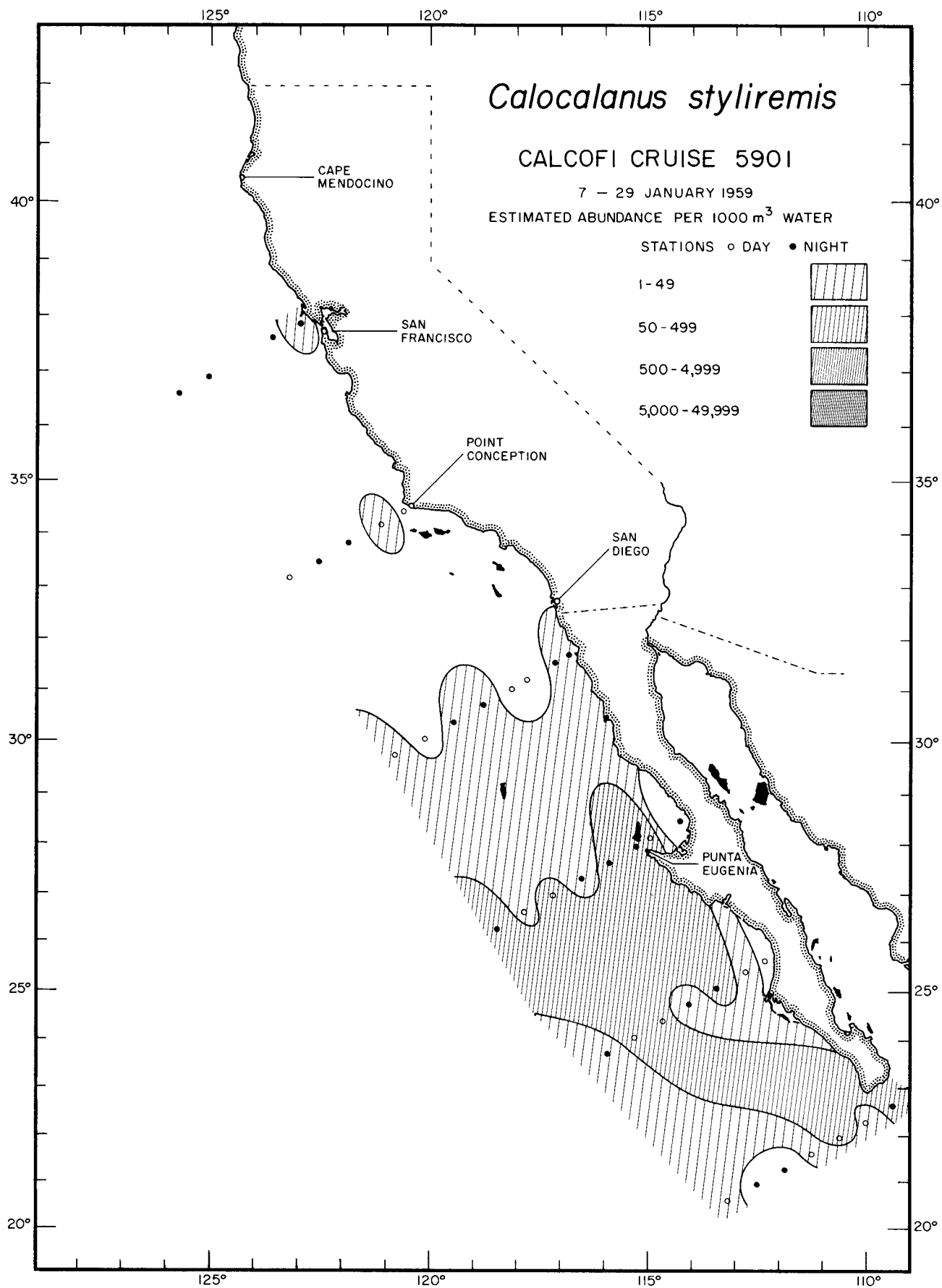
5807



Calanoida

Calocalanus styliremis

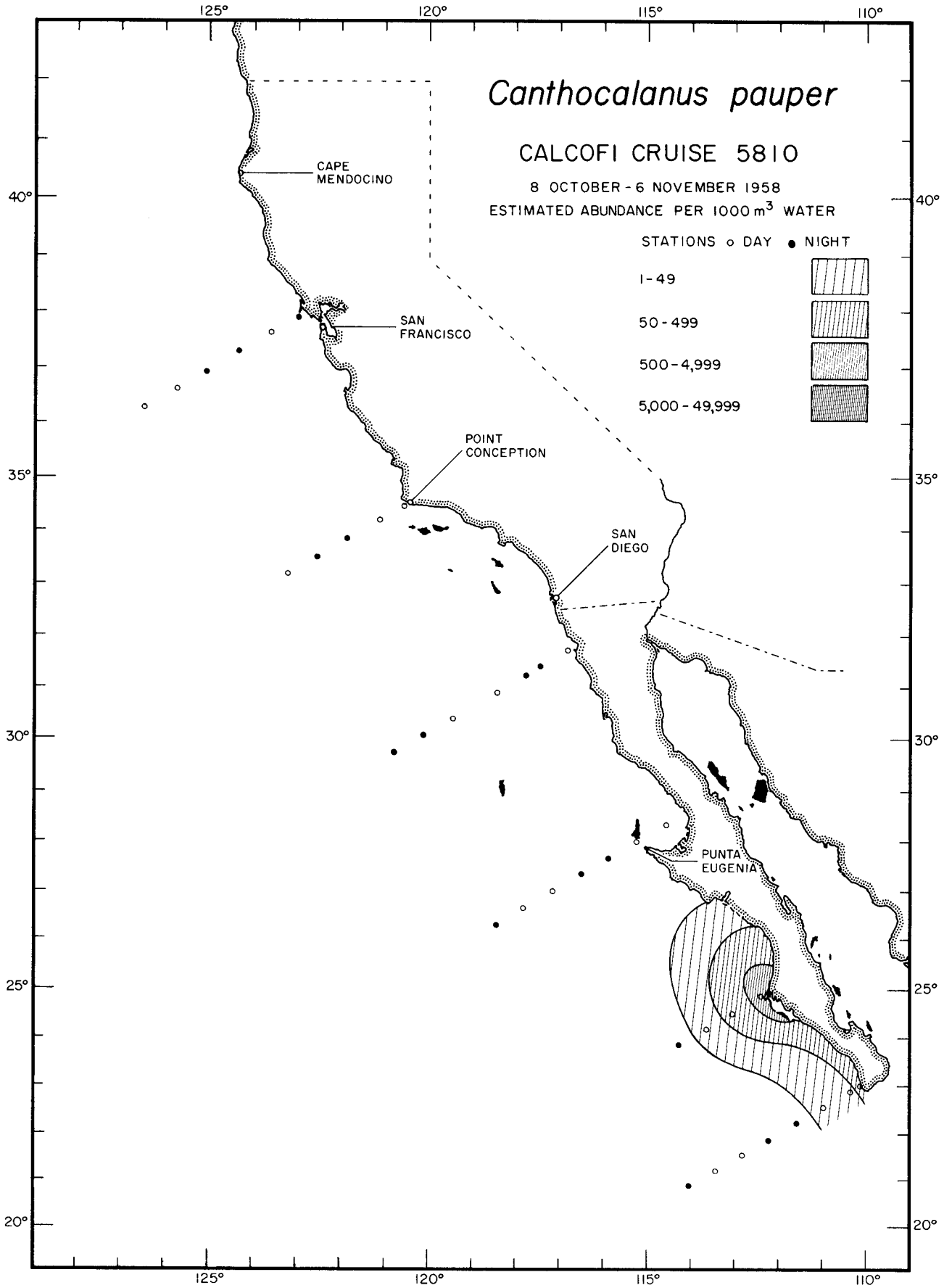
5810



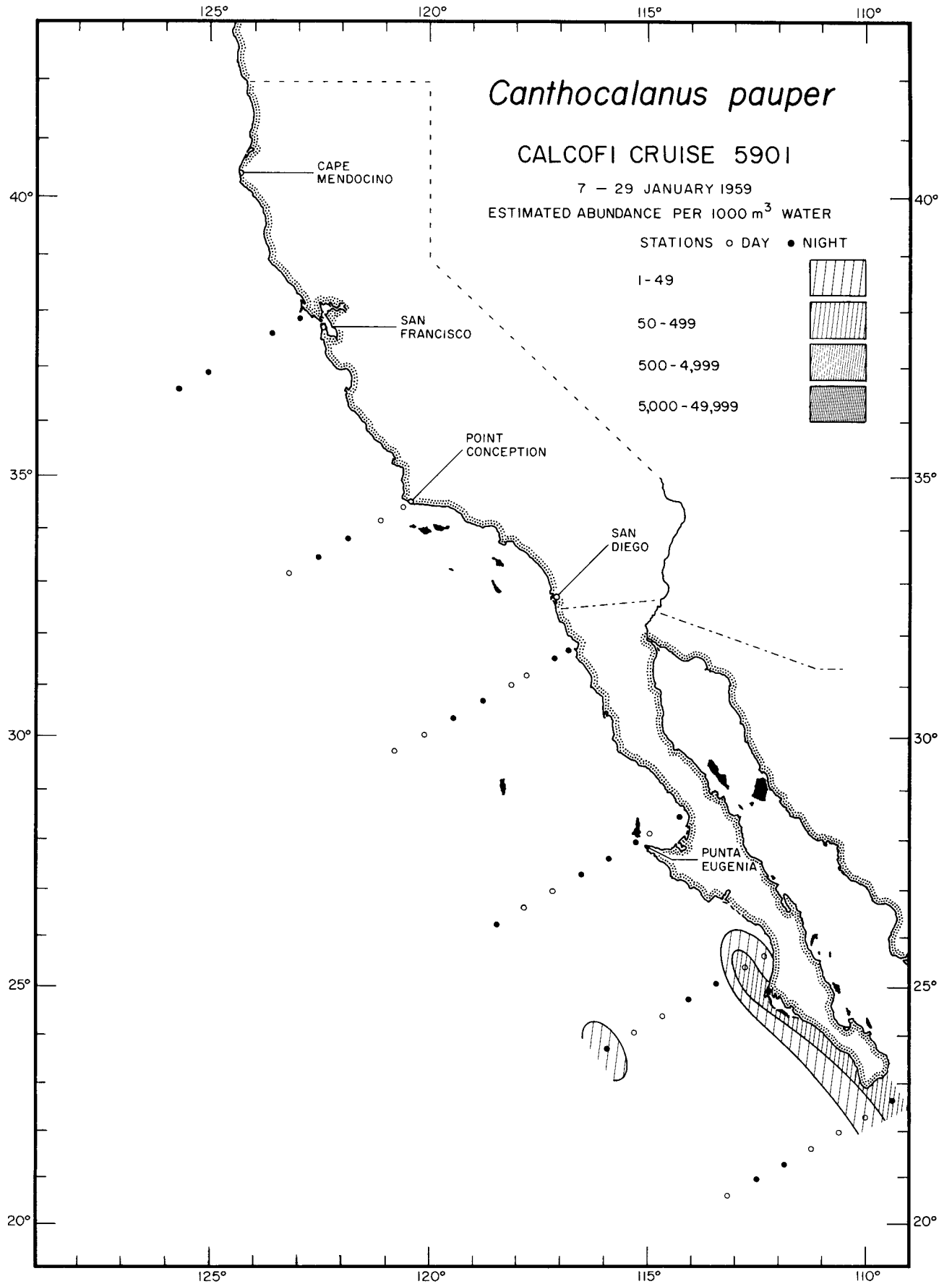
Calanoida

Calocalanus styliremis

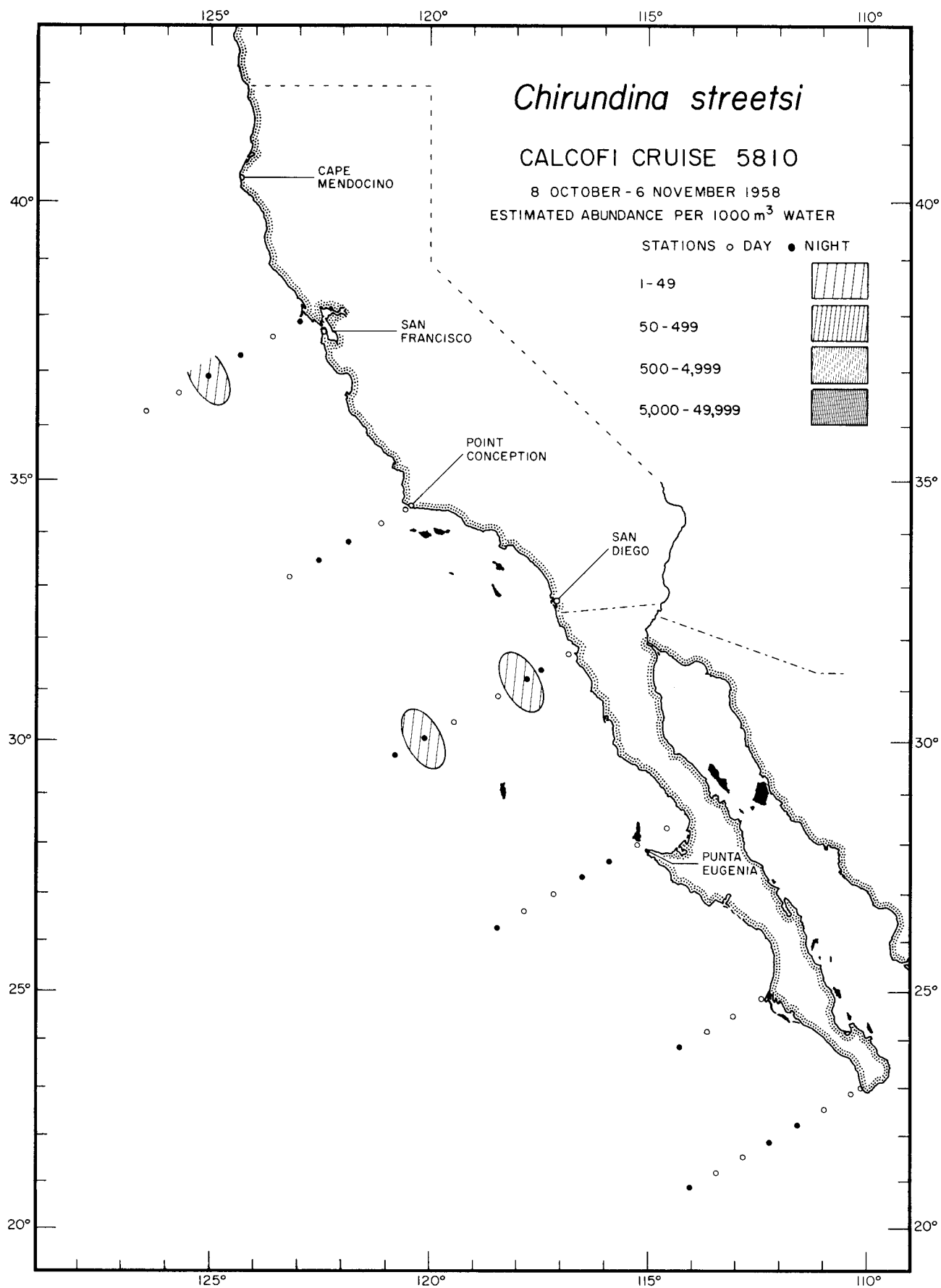
5901



Calanoida
Canthocalanus pauper
 5810



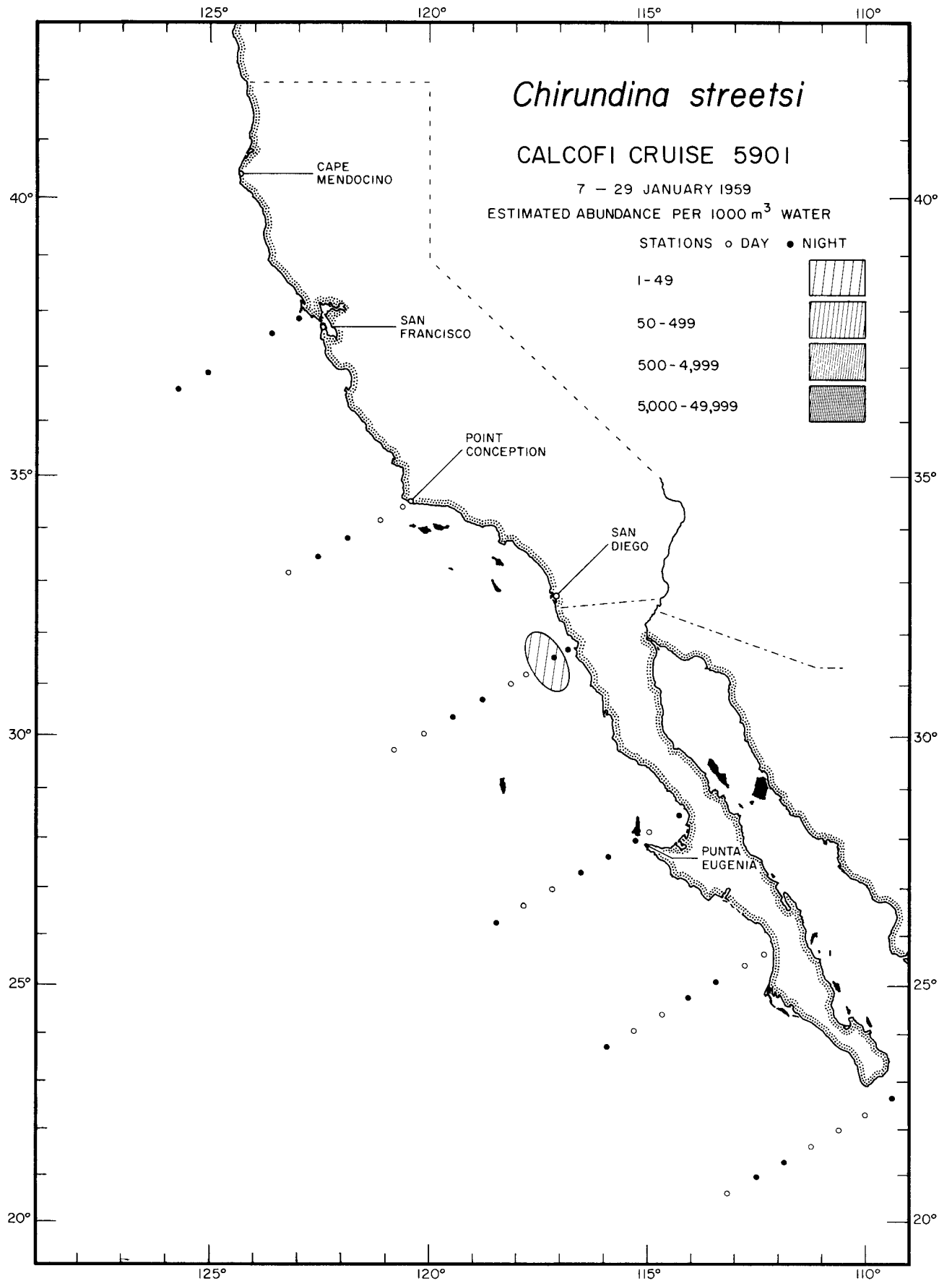
Calanoida
Canthocalanus pauper
5901



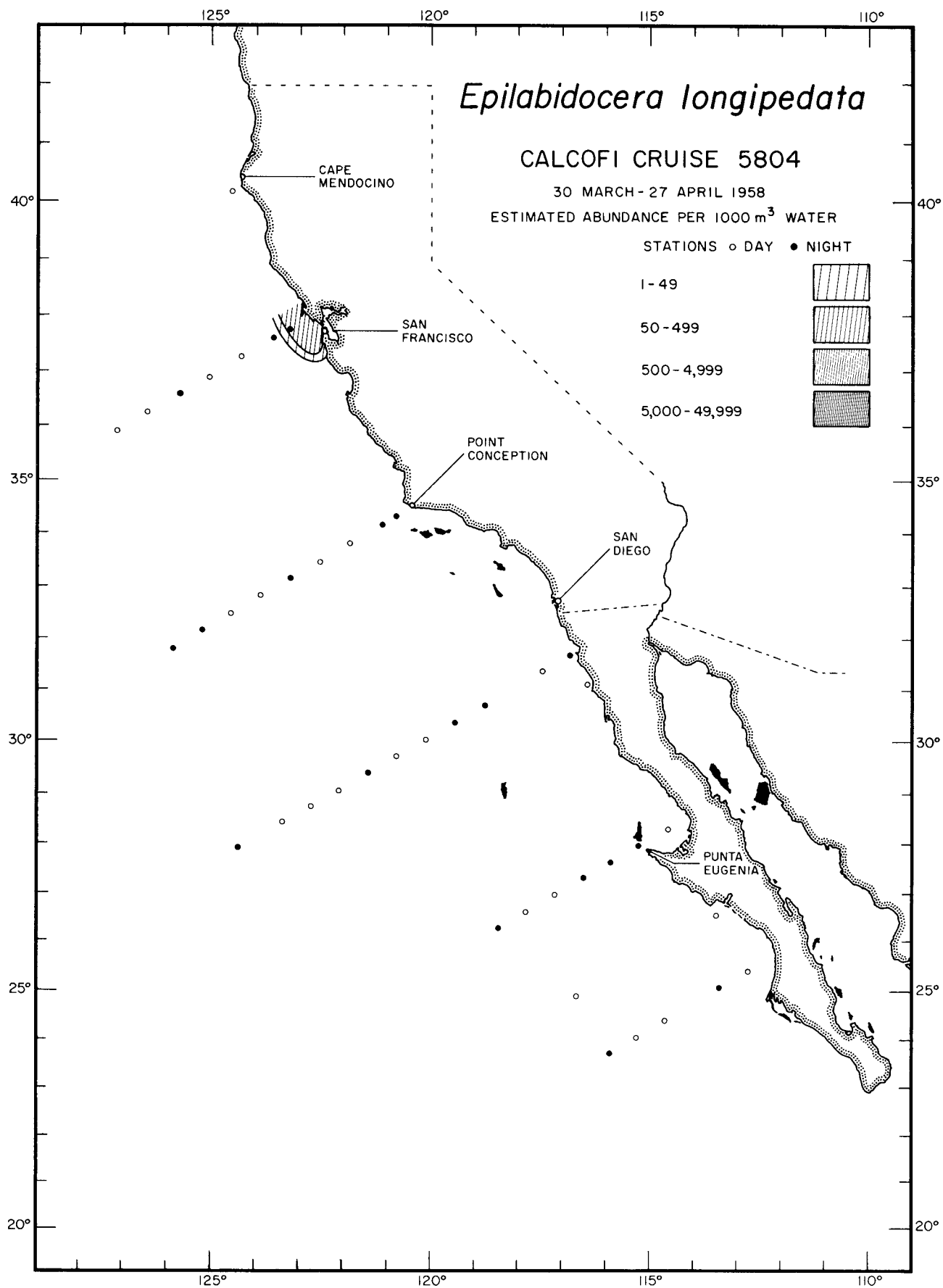
Calanoida

Chirundina streetsi

5810



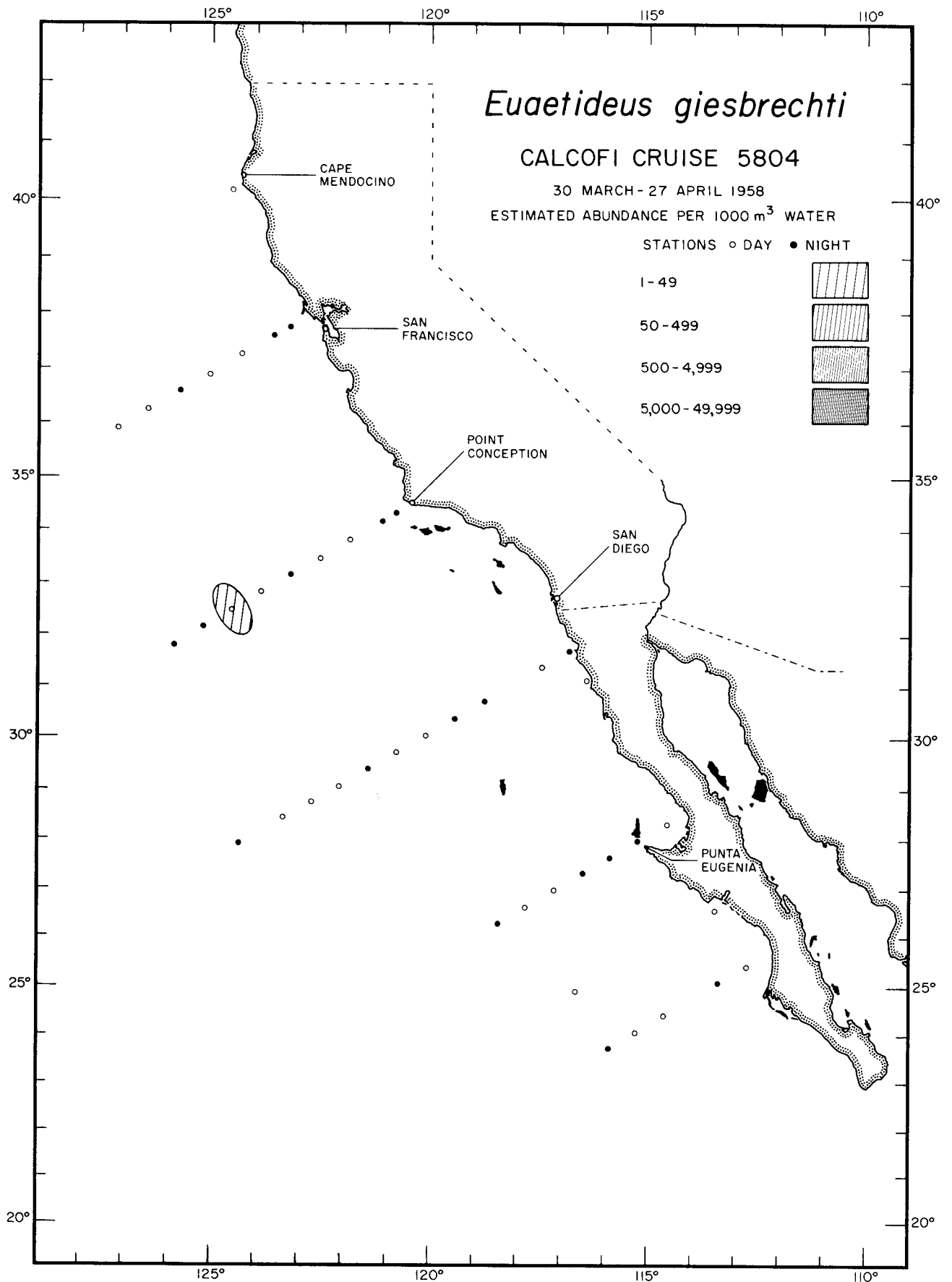
Calanoida
Chirundina streetsi
5901



Calanoida

Epilabidocera longipedata

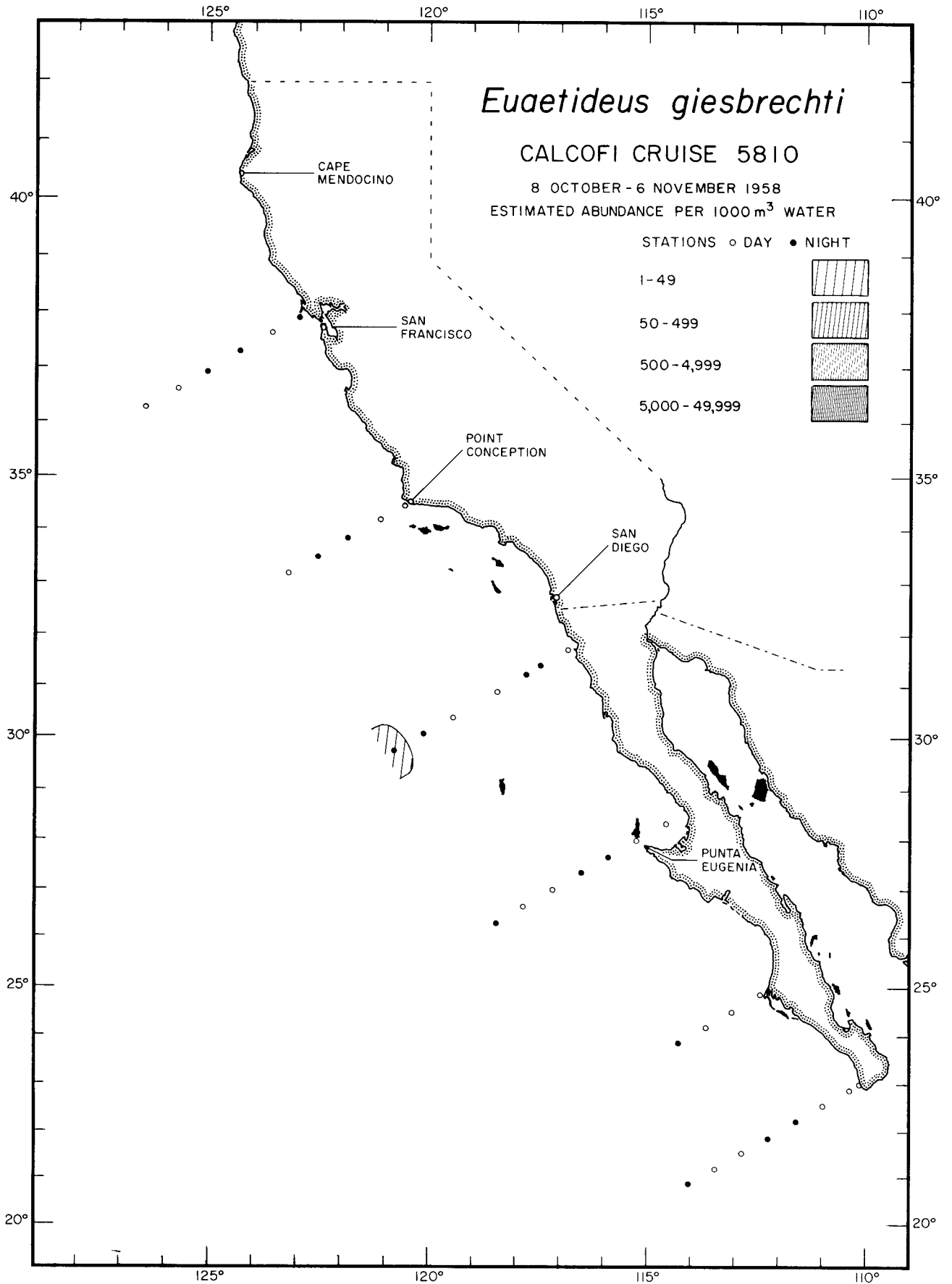
5804



Calanoida

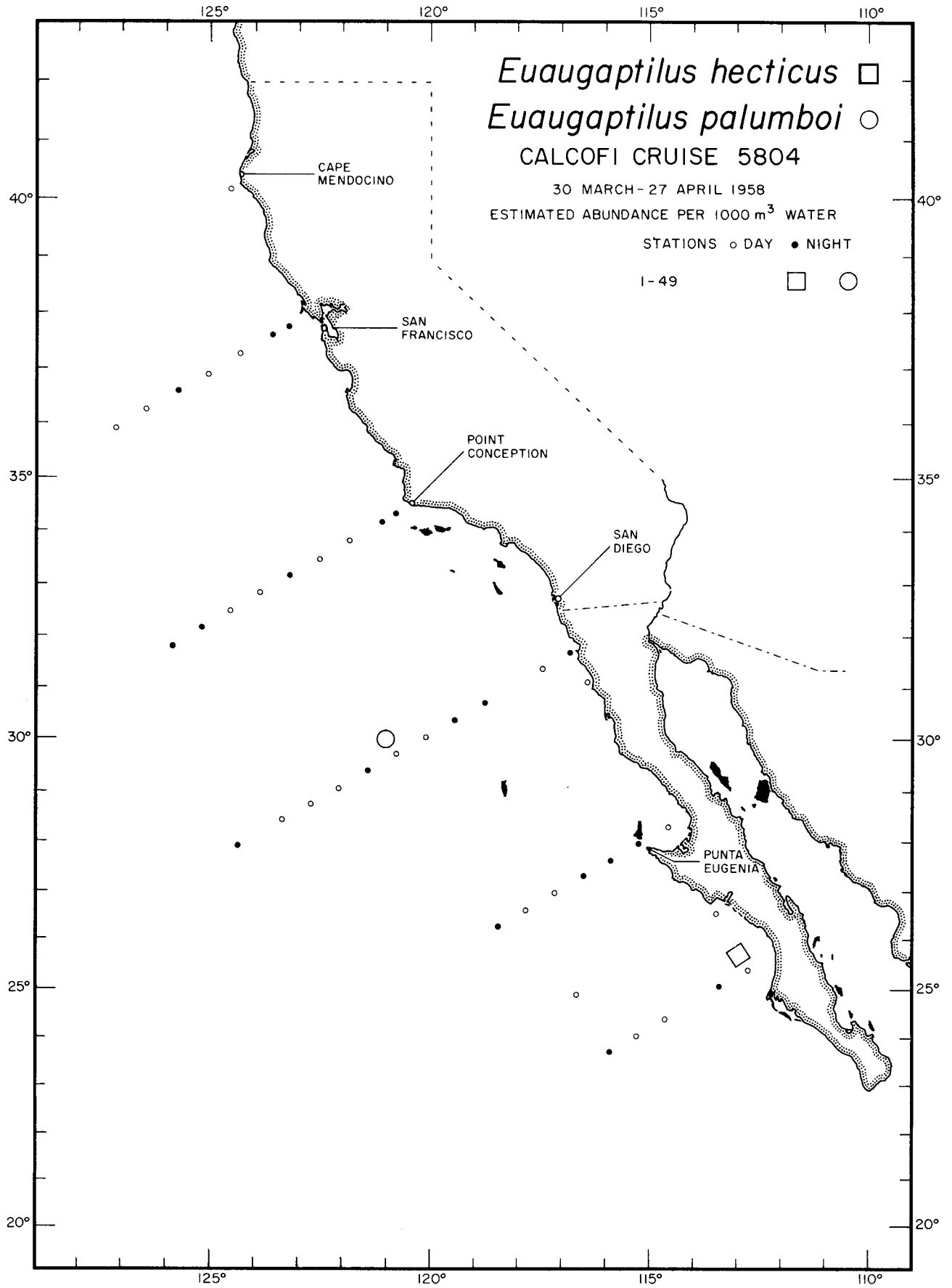
Euaetideus giesbrechti

5804

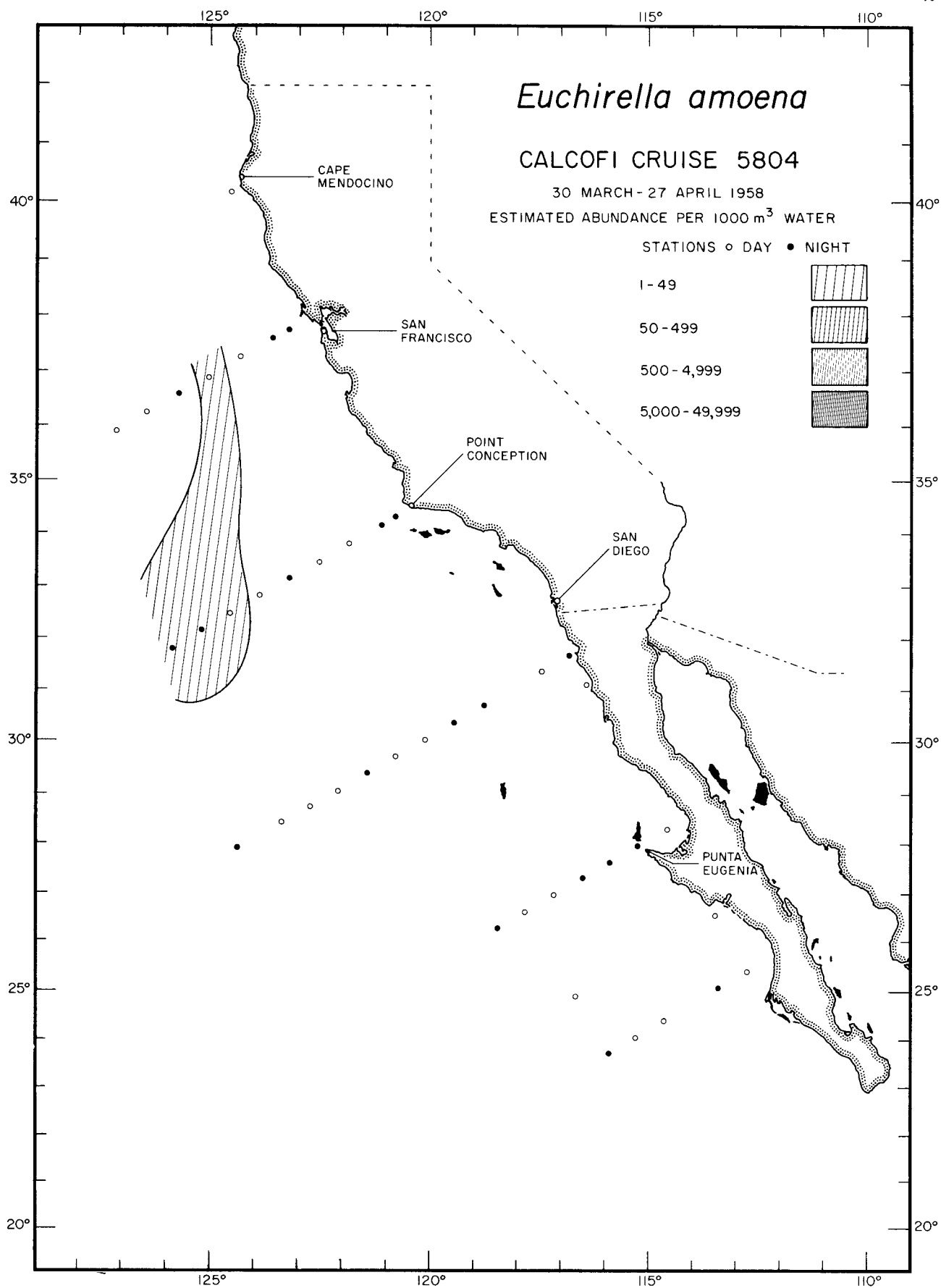


Calanoida

Euaetideus giesbrechti
5810



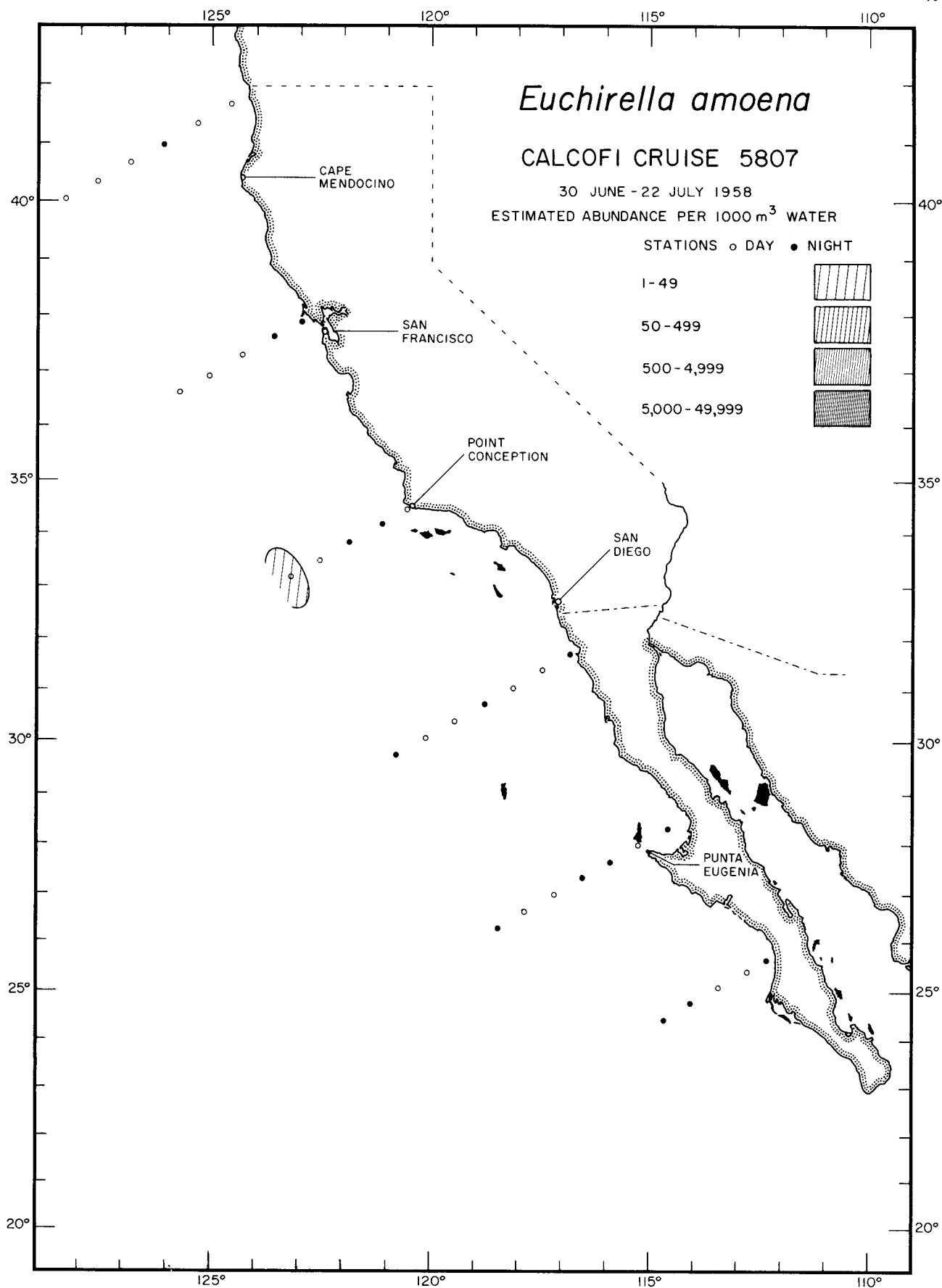
Calanoida
Eucaerata *hecticus*
Eucaerata *palumboi*
 5804



Calanoida

Euchirella amoena

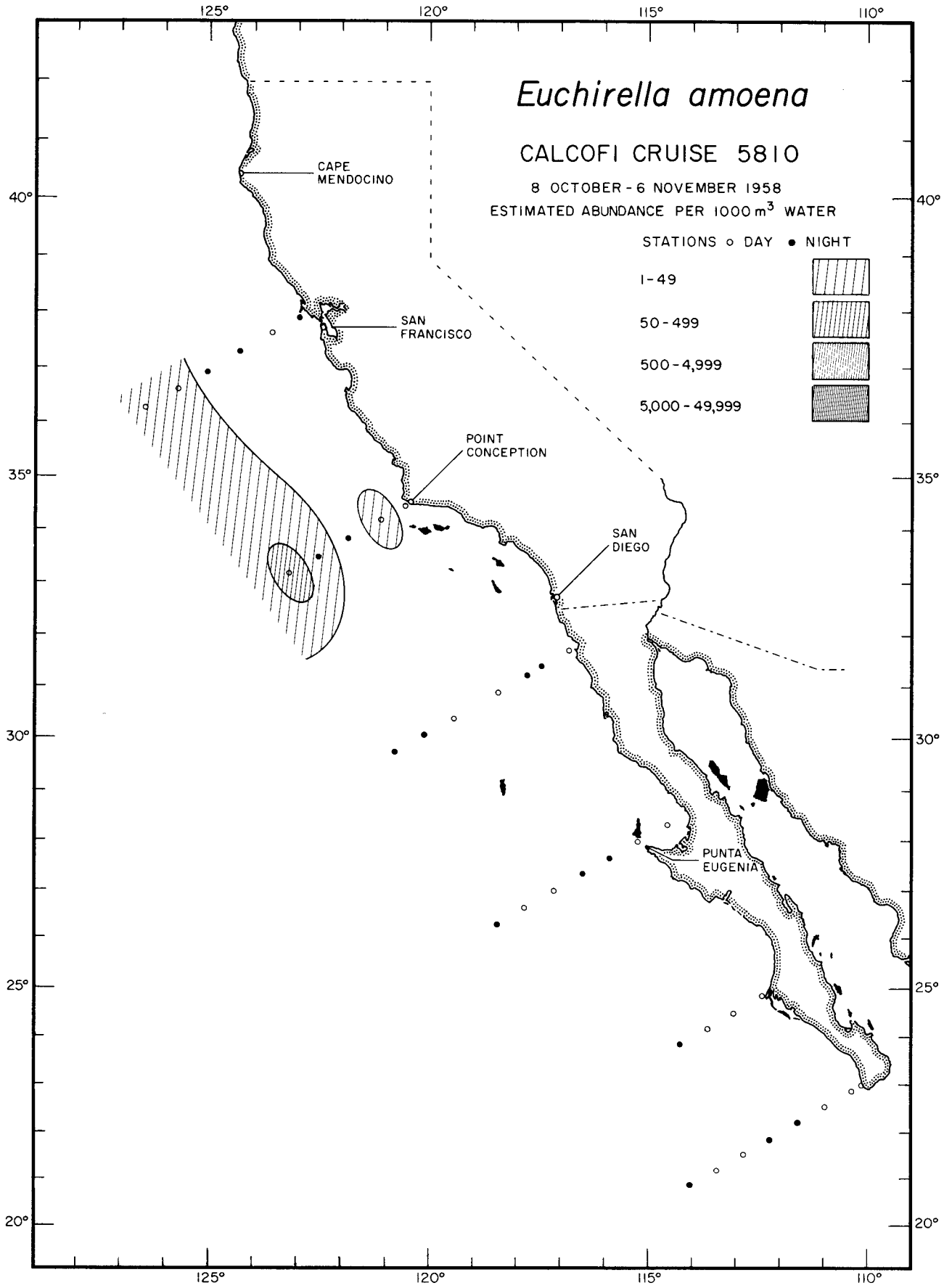
5804



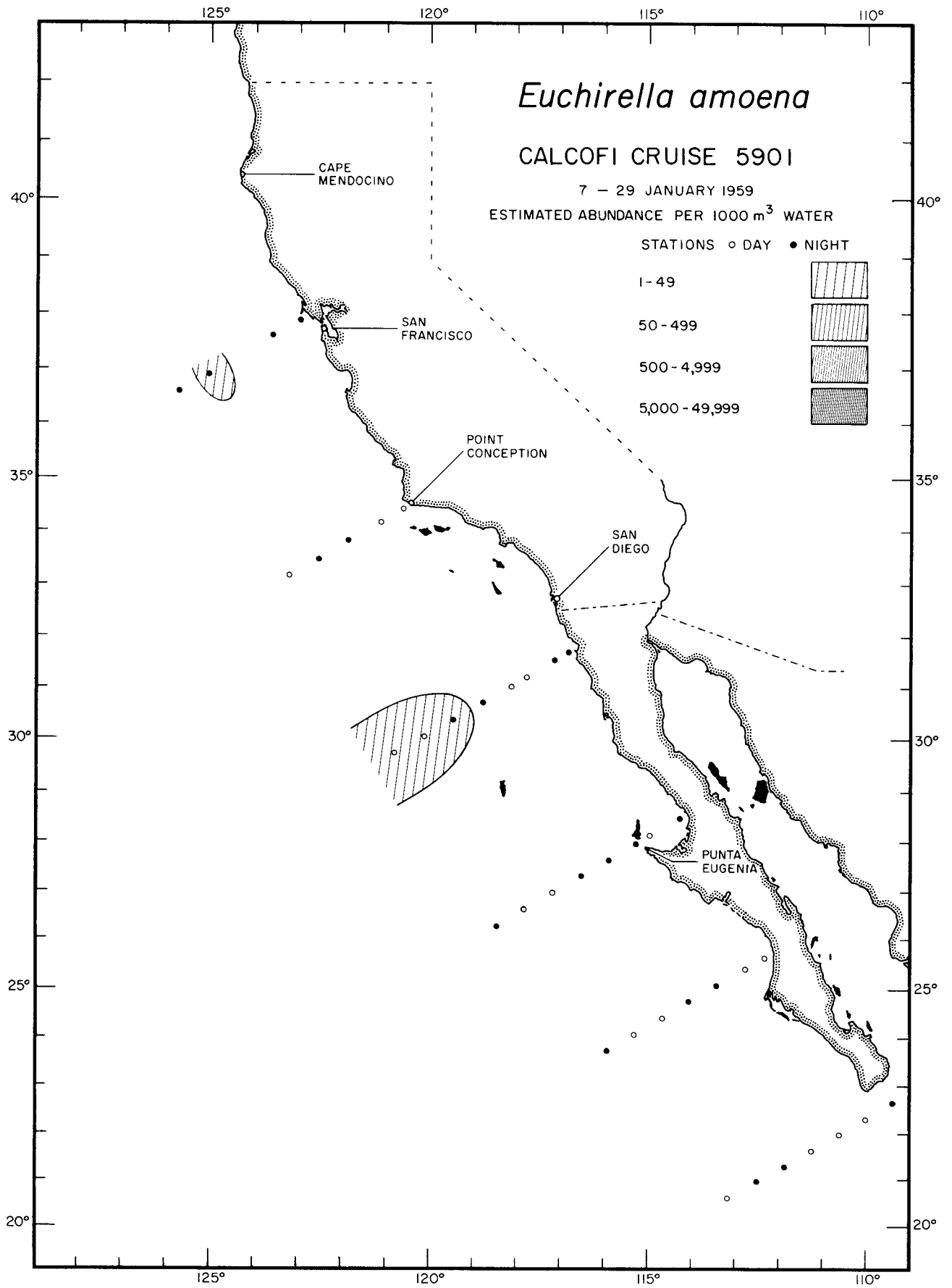
Calanoida

Euchirella amoena

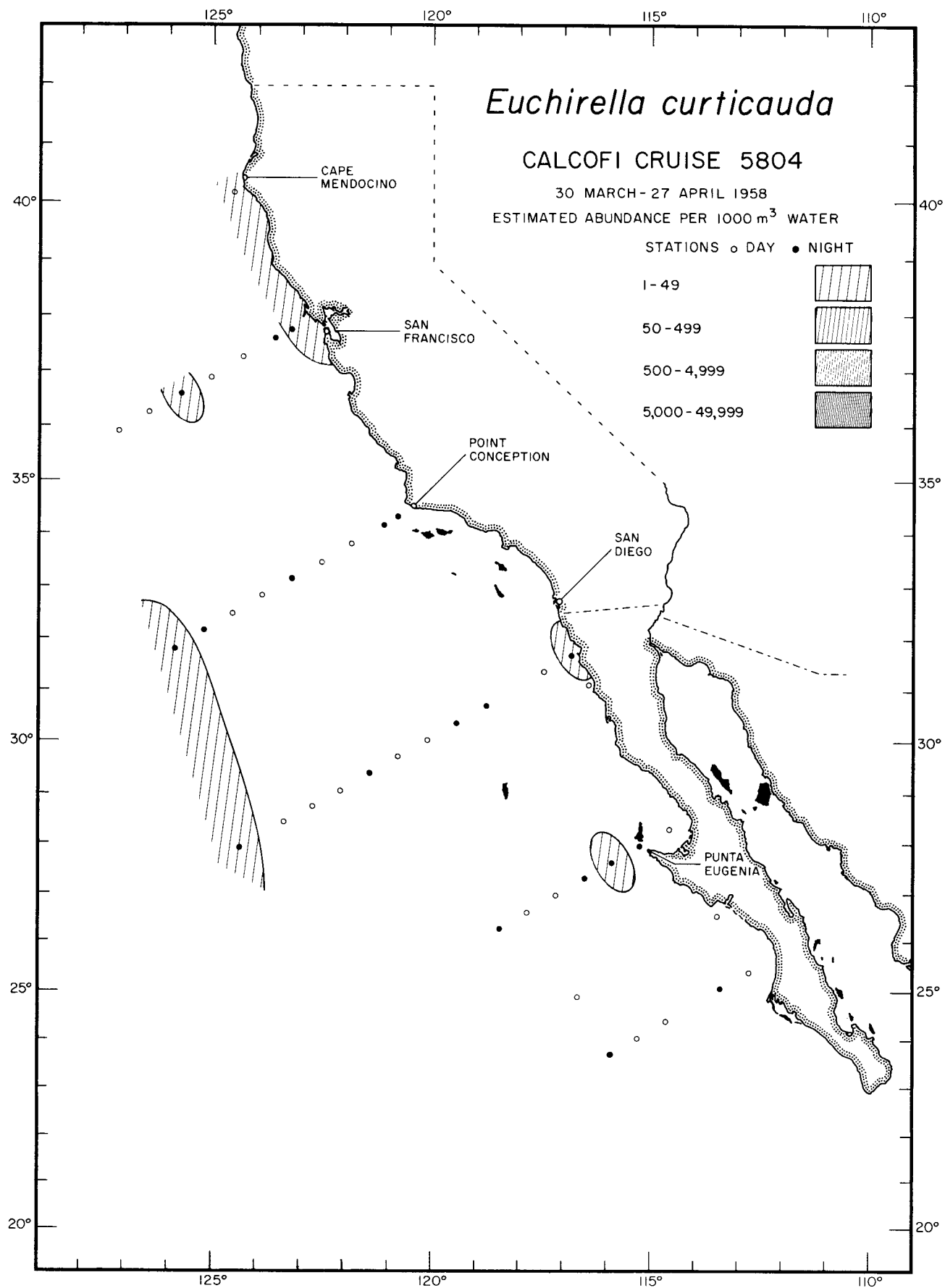
5807



Calanoida
Euchirella amoena
5810



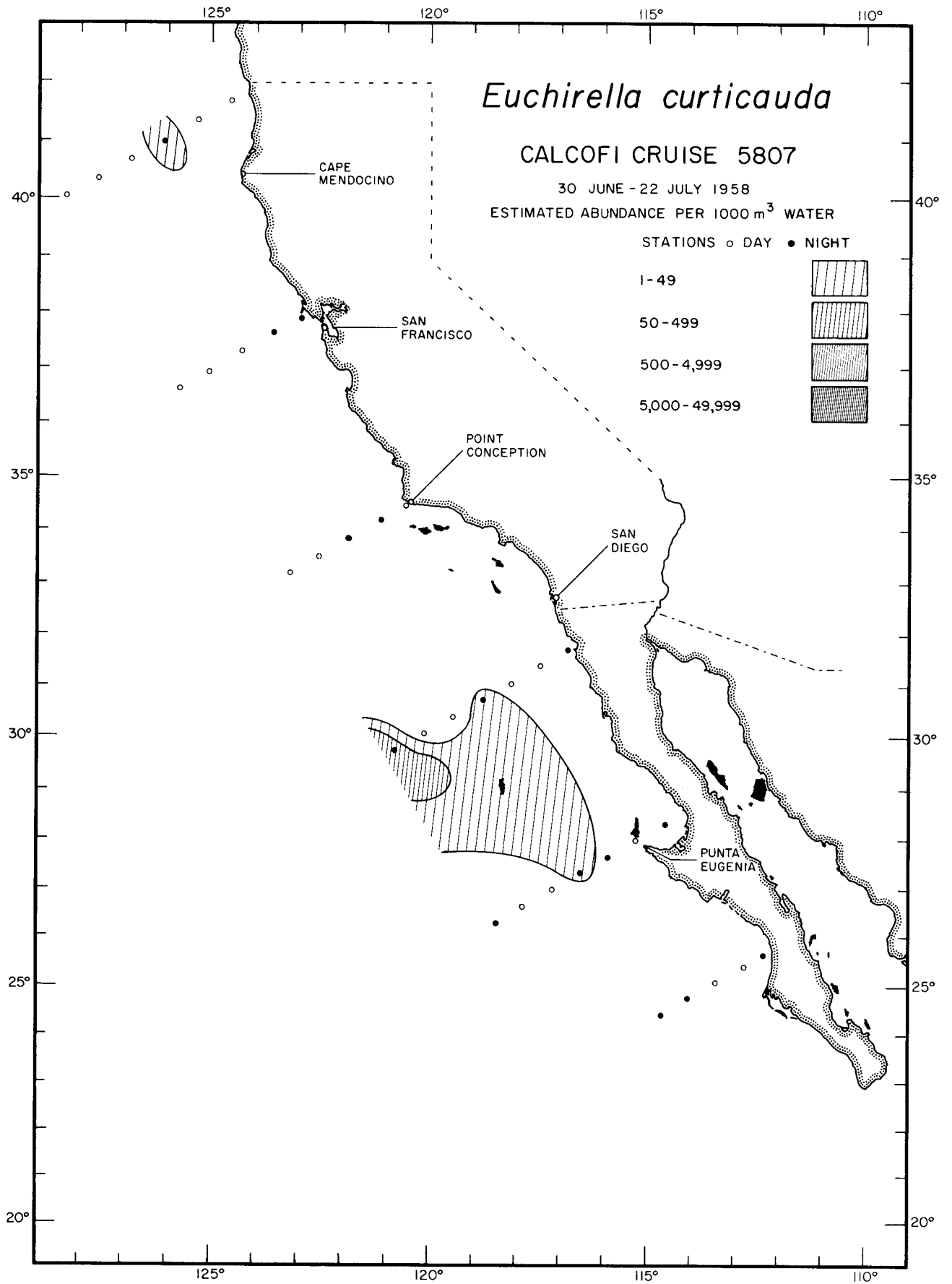
Calanoida
Eucheirella amoena
5901



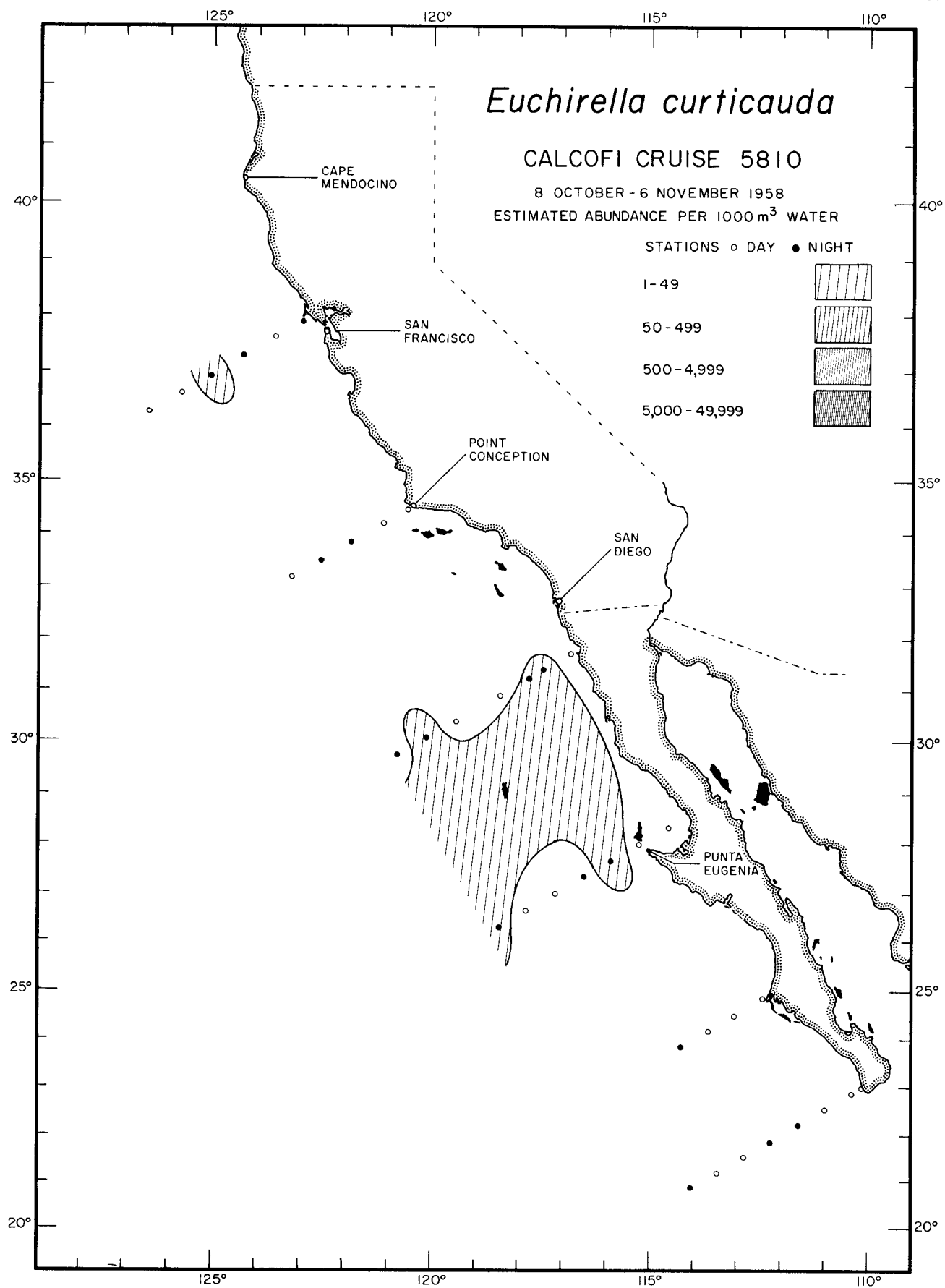
Calanoida

Euchirella curticauda

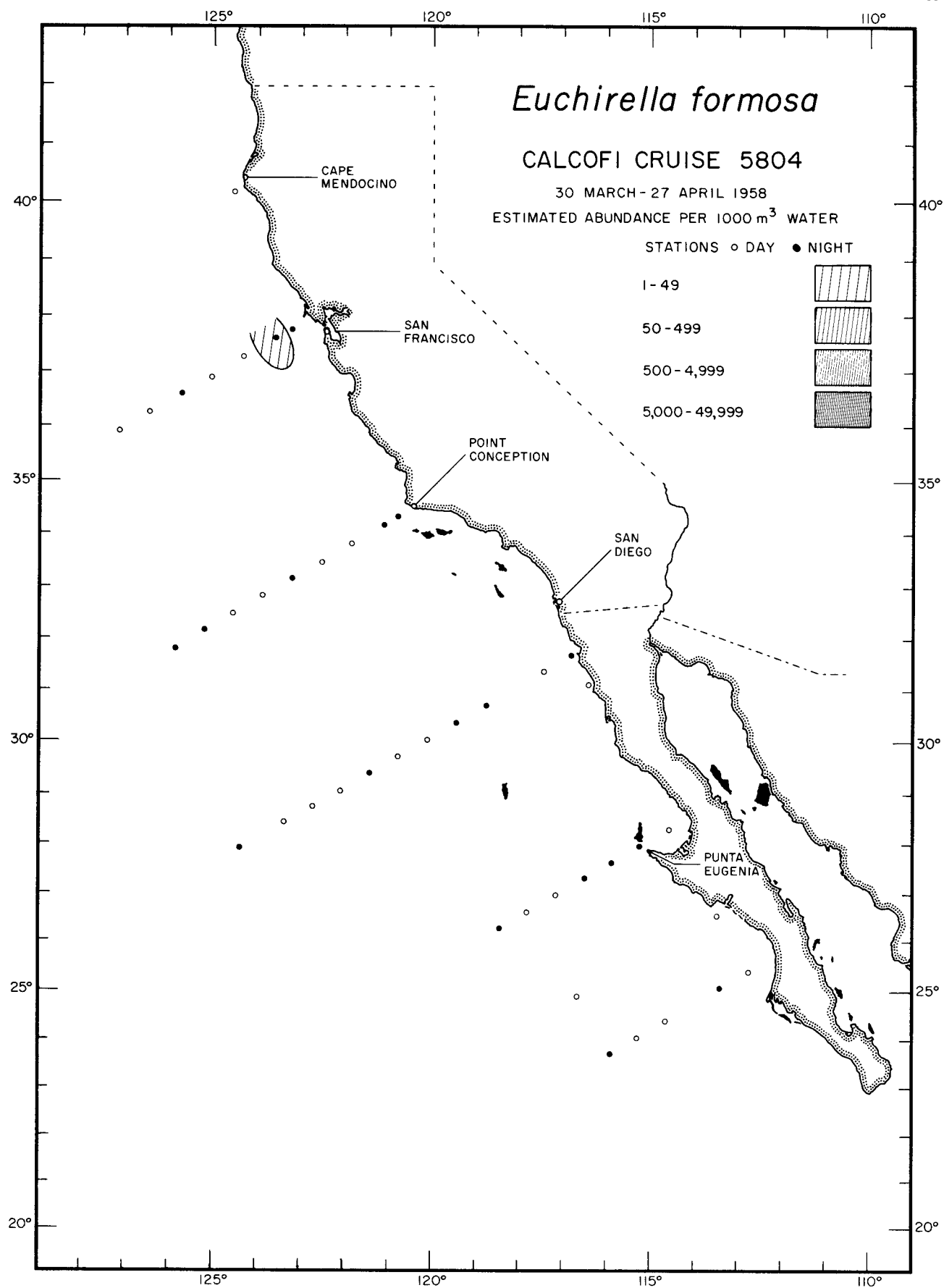
5804



Calanoida
Eucheirella curticauda
5807



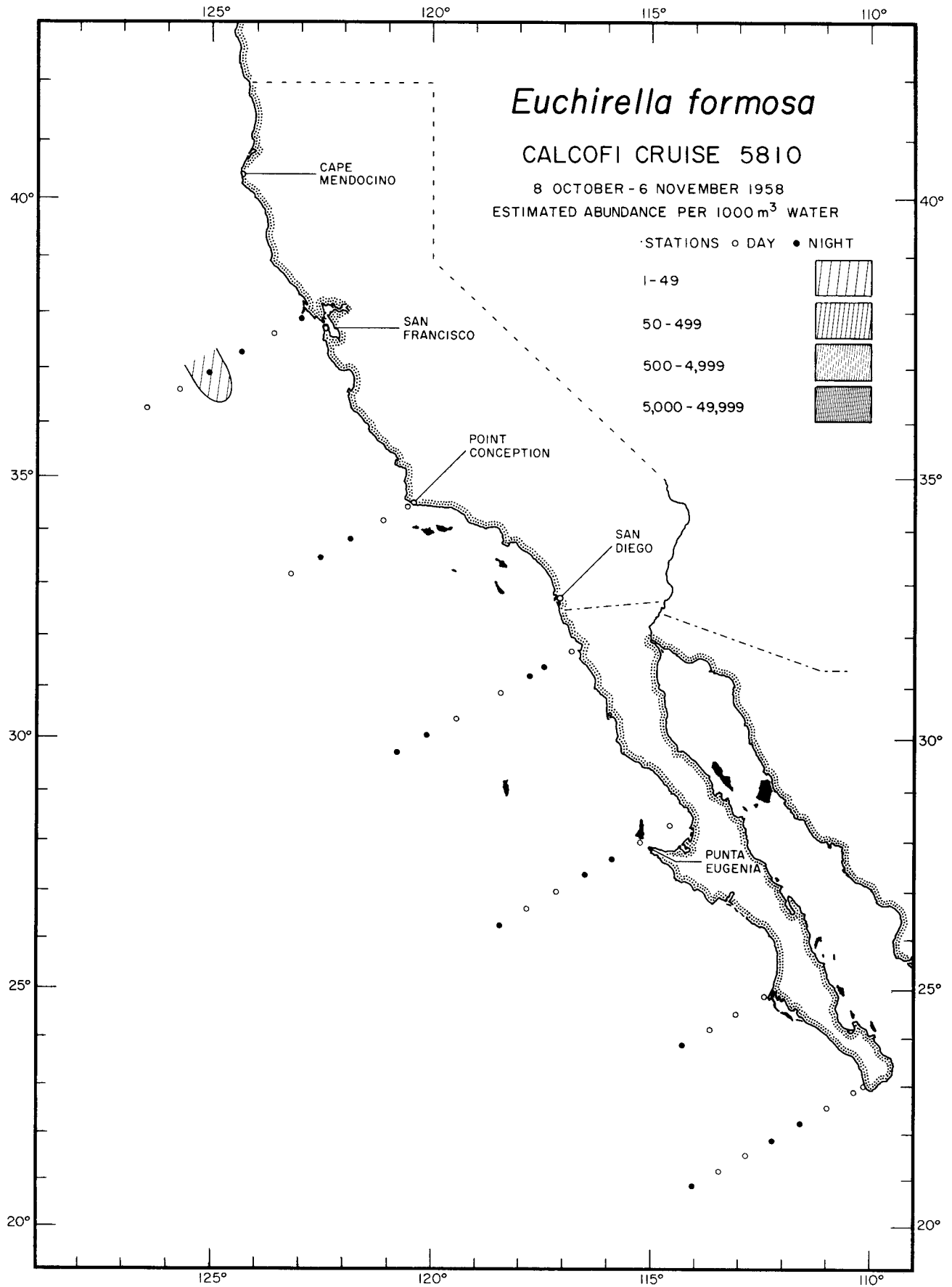
Calanoida
Euchirella curticauda
5810



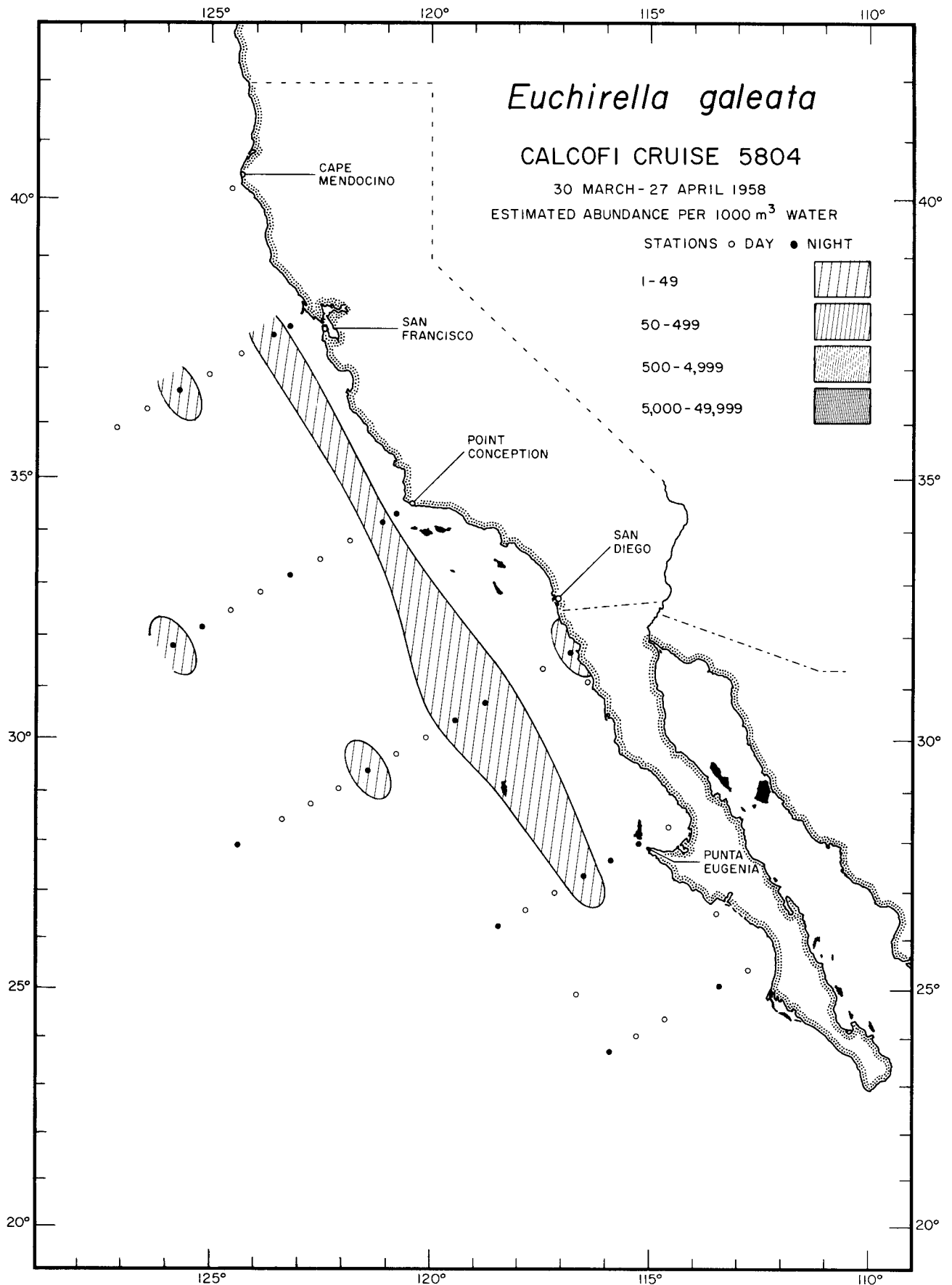
Catanoidea

Euchirella formosa

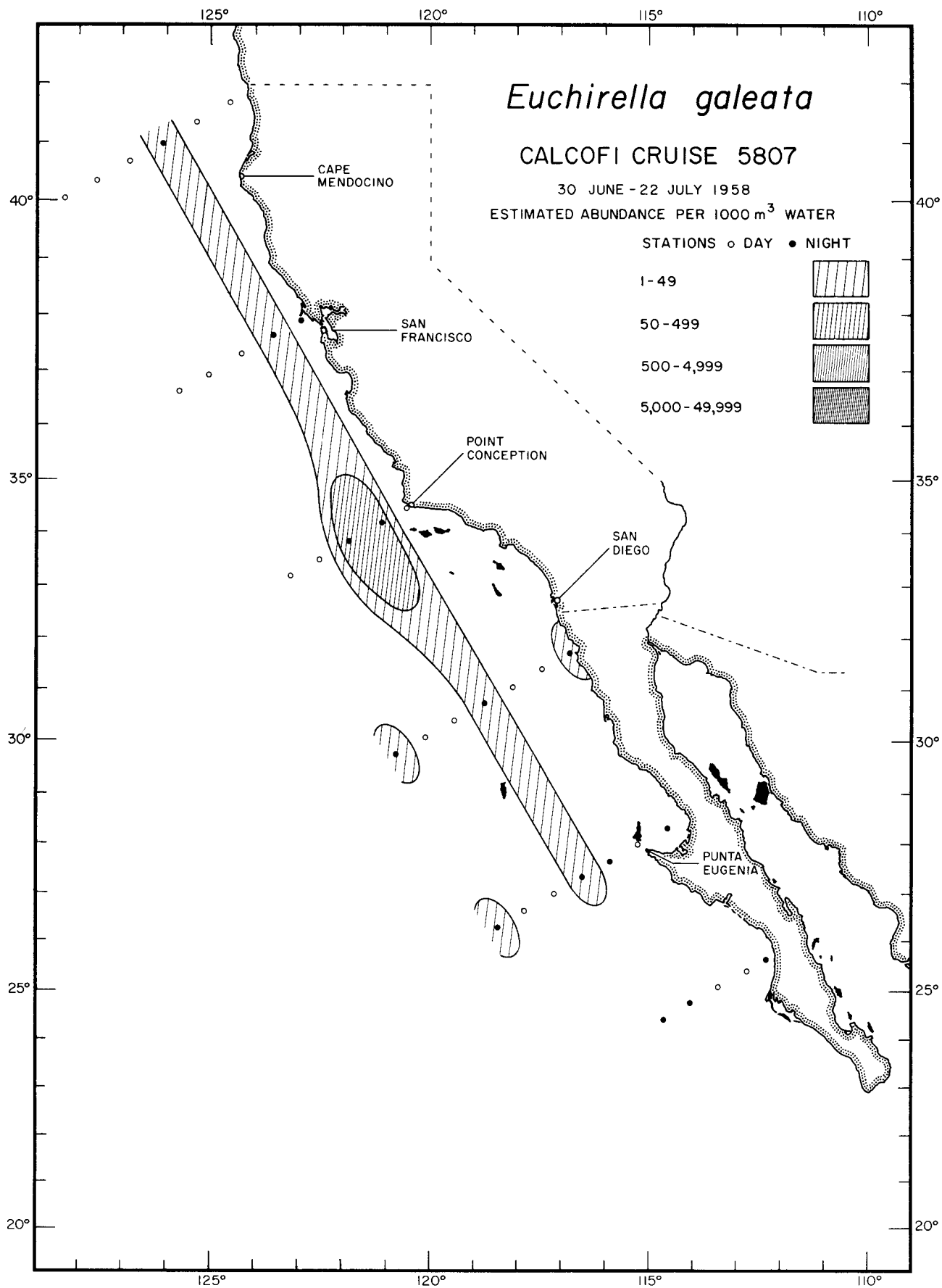
5804



Calanoida
Euchirella formosa
5810



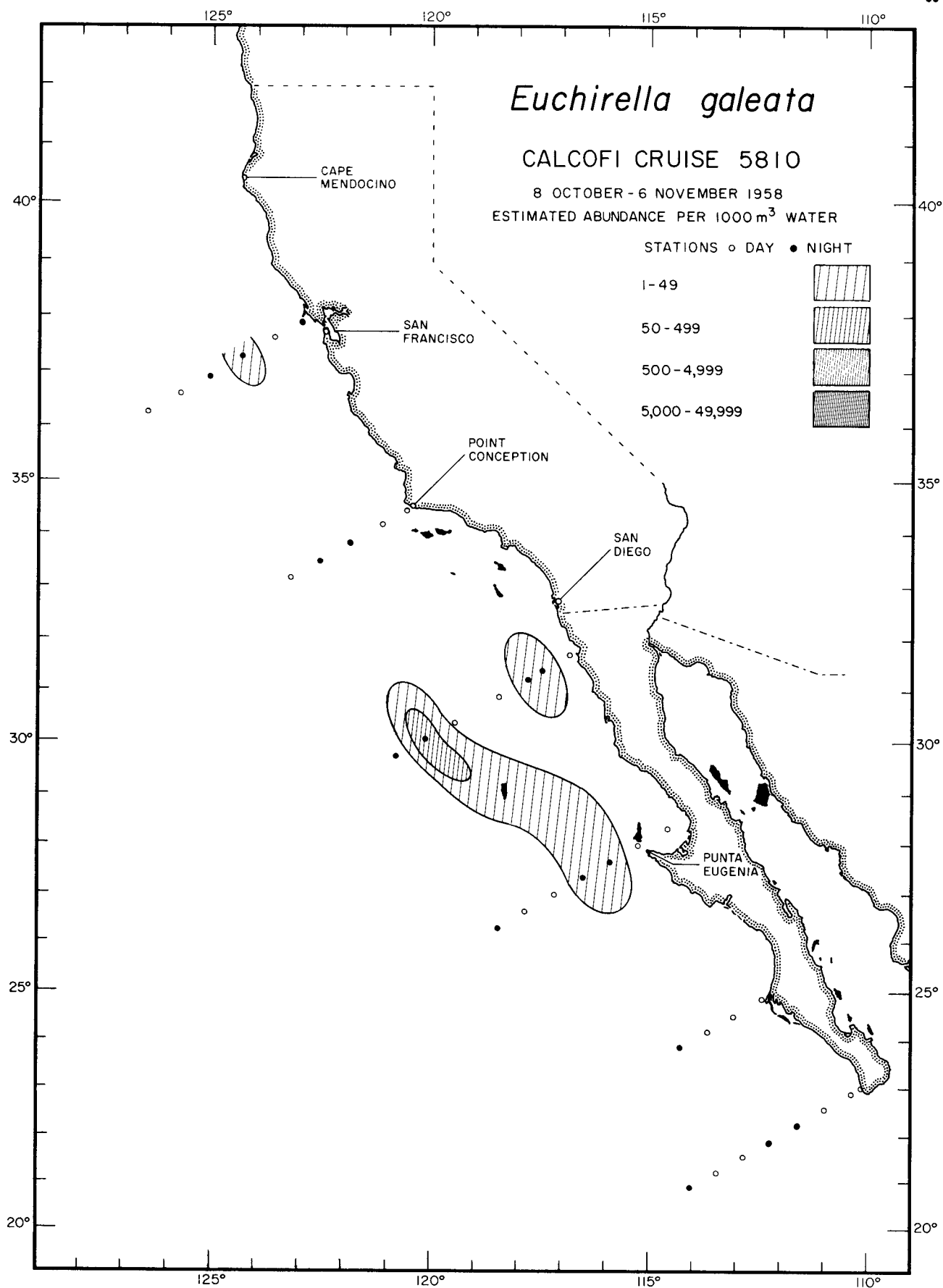
Calanoida
Eucheirella galeata
5804



Calanoida

Eucheirella galeata

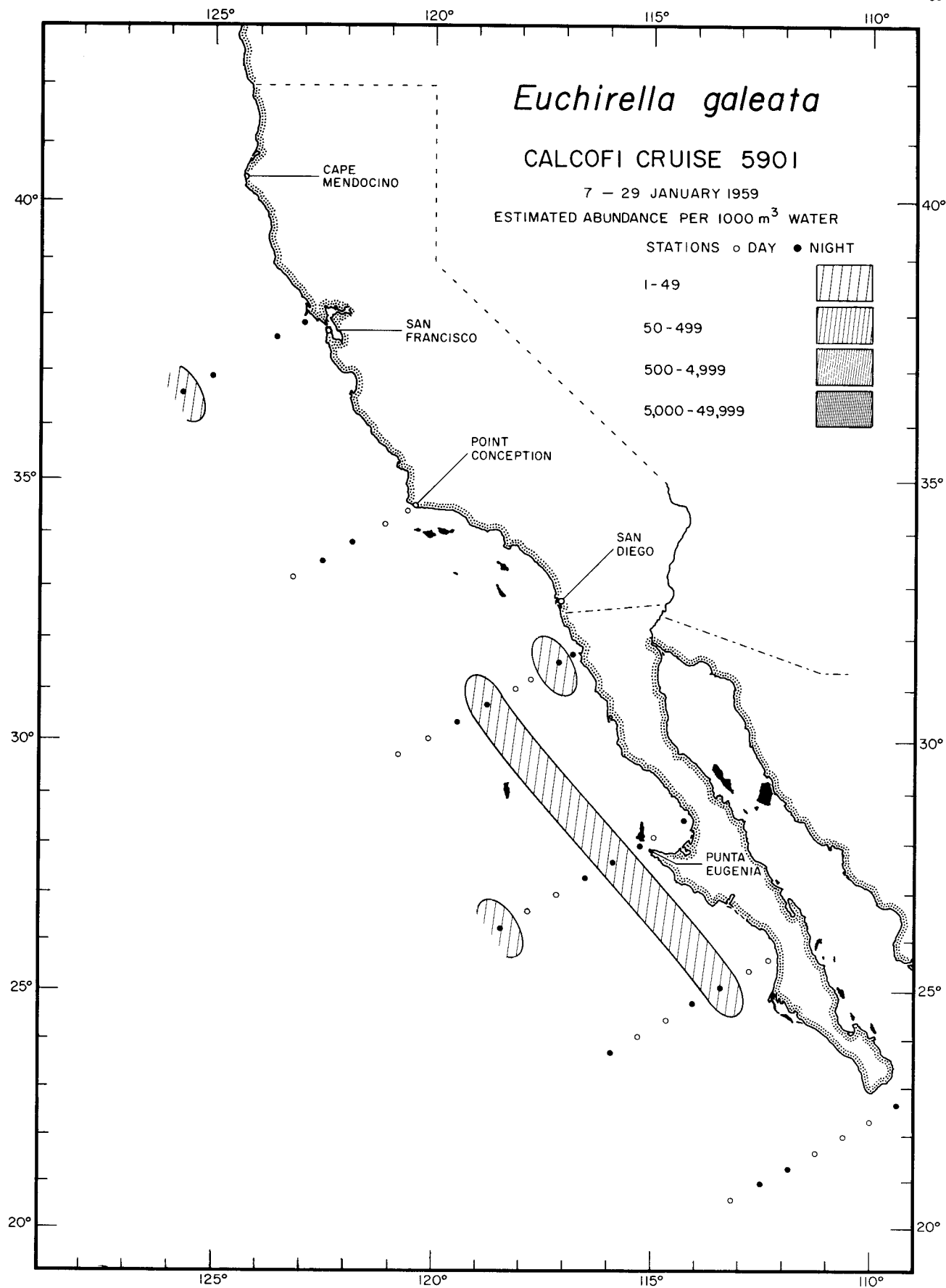
5807



Calanoida

Euchirella galeata

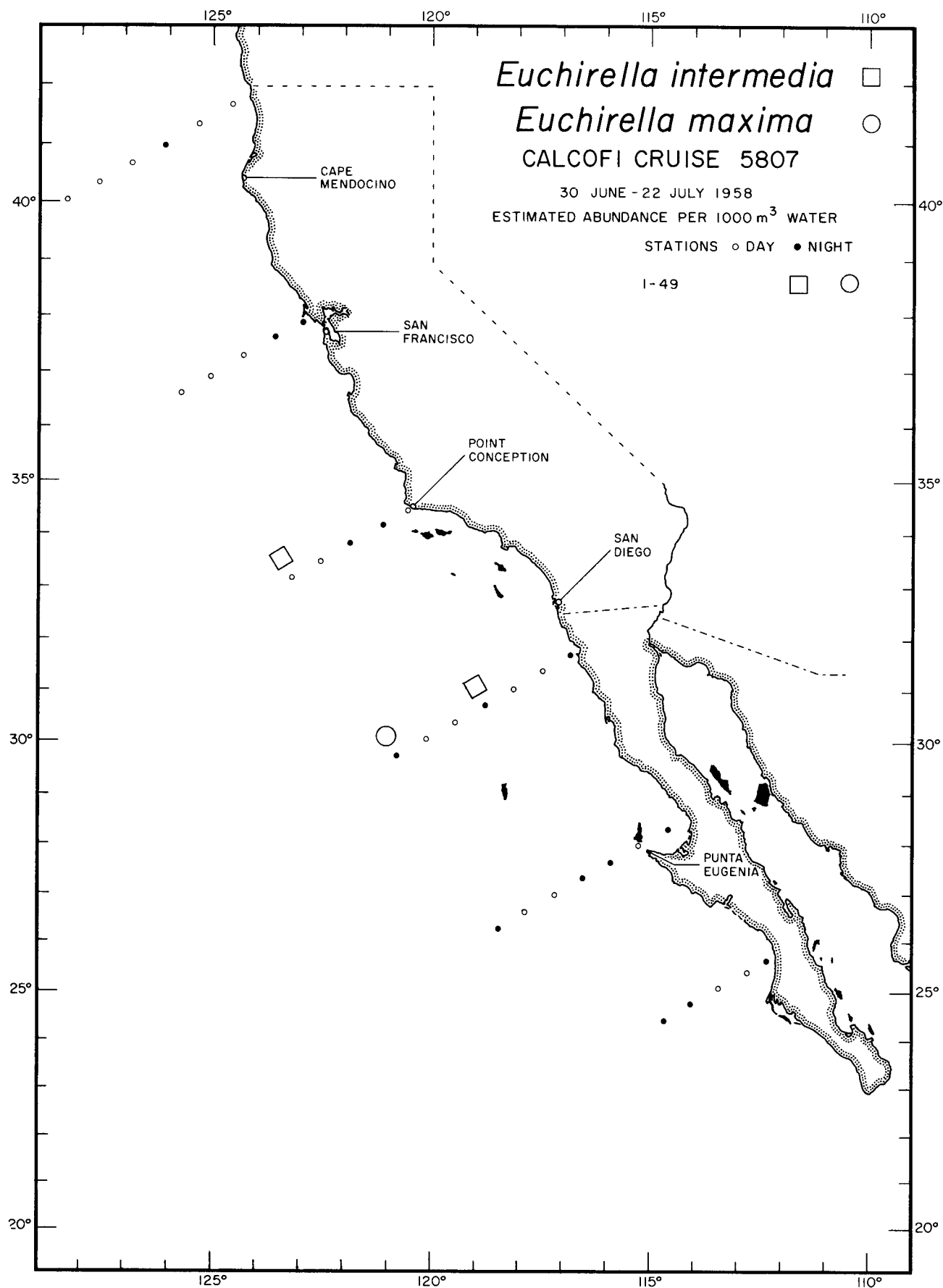
5810



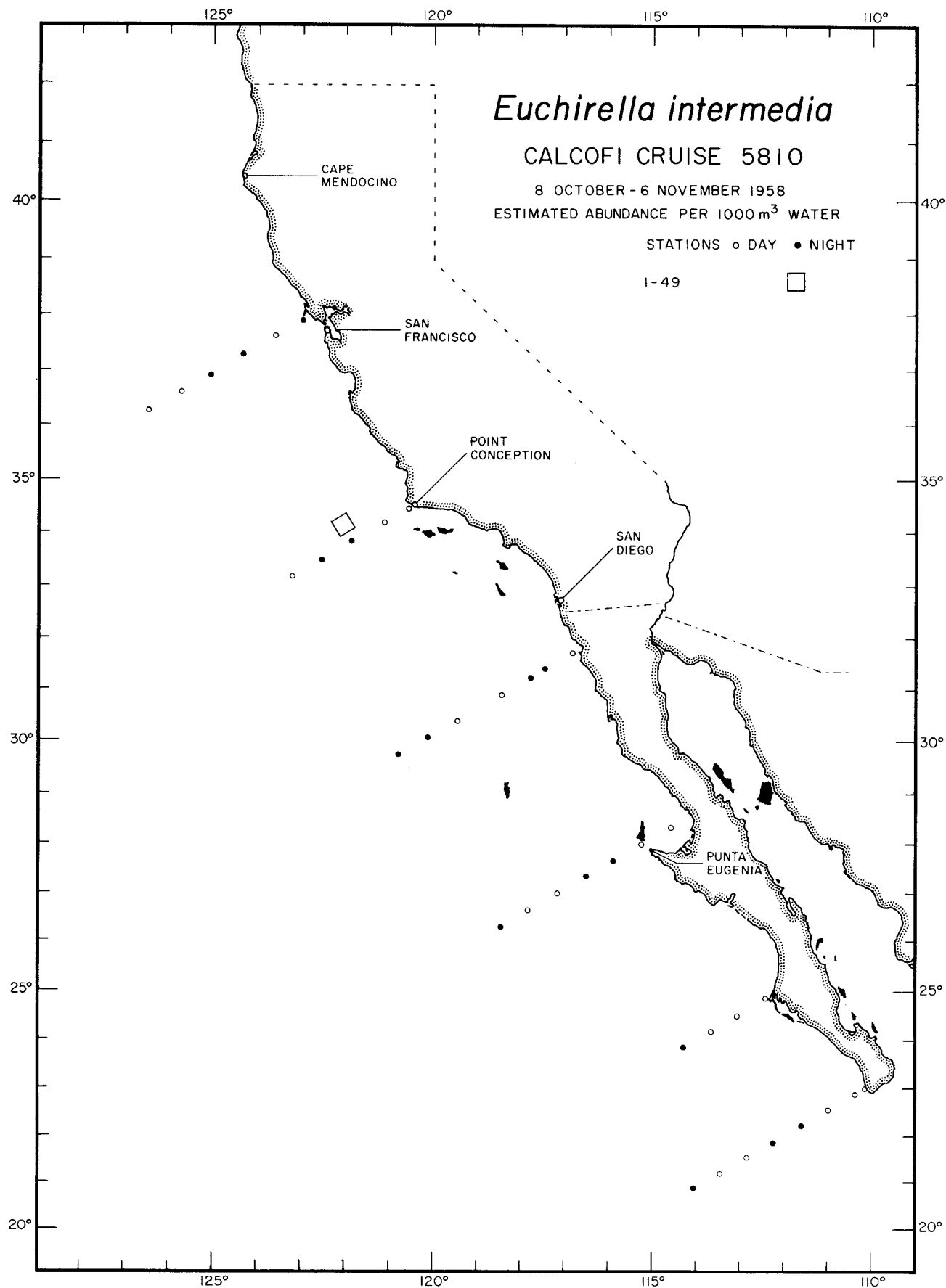
Calanoida

Euchirella galeata

5901



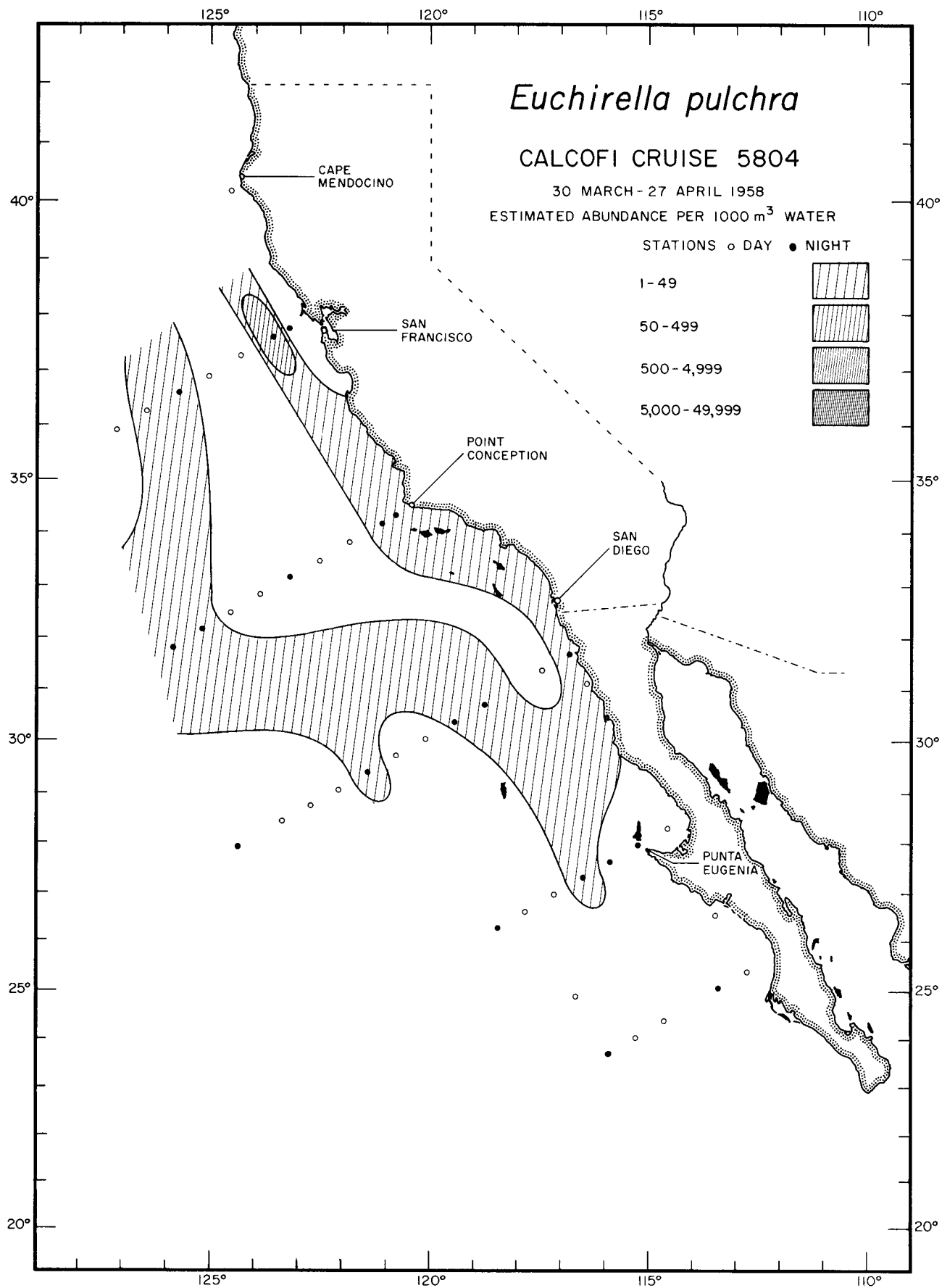
Calanoida
Euchirella intermedia
Euchirella maxima
 5807



Calanoida

Euchirella intermedia

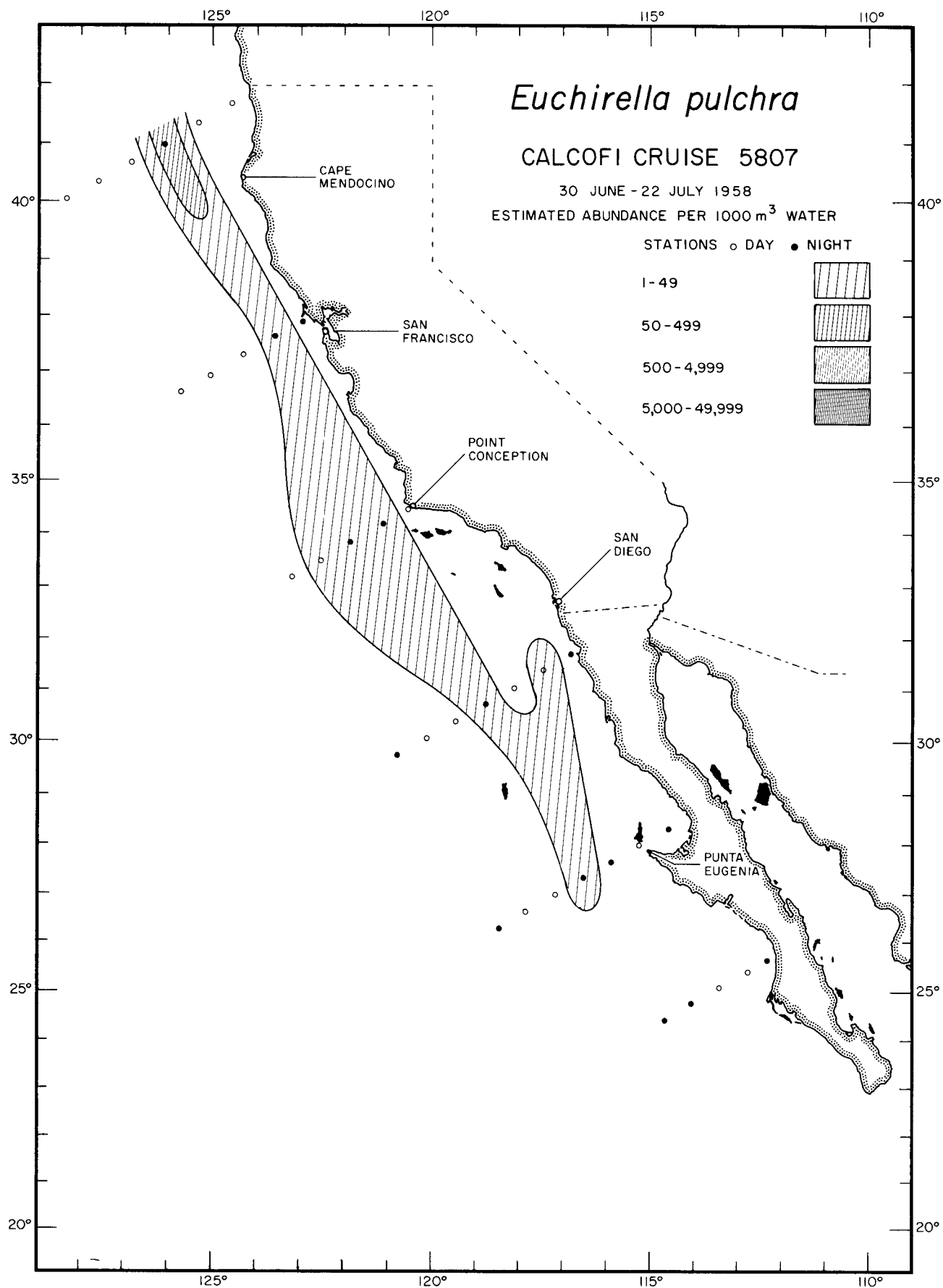
5810



Calanoida

Euchirella pulchra

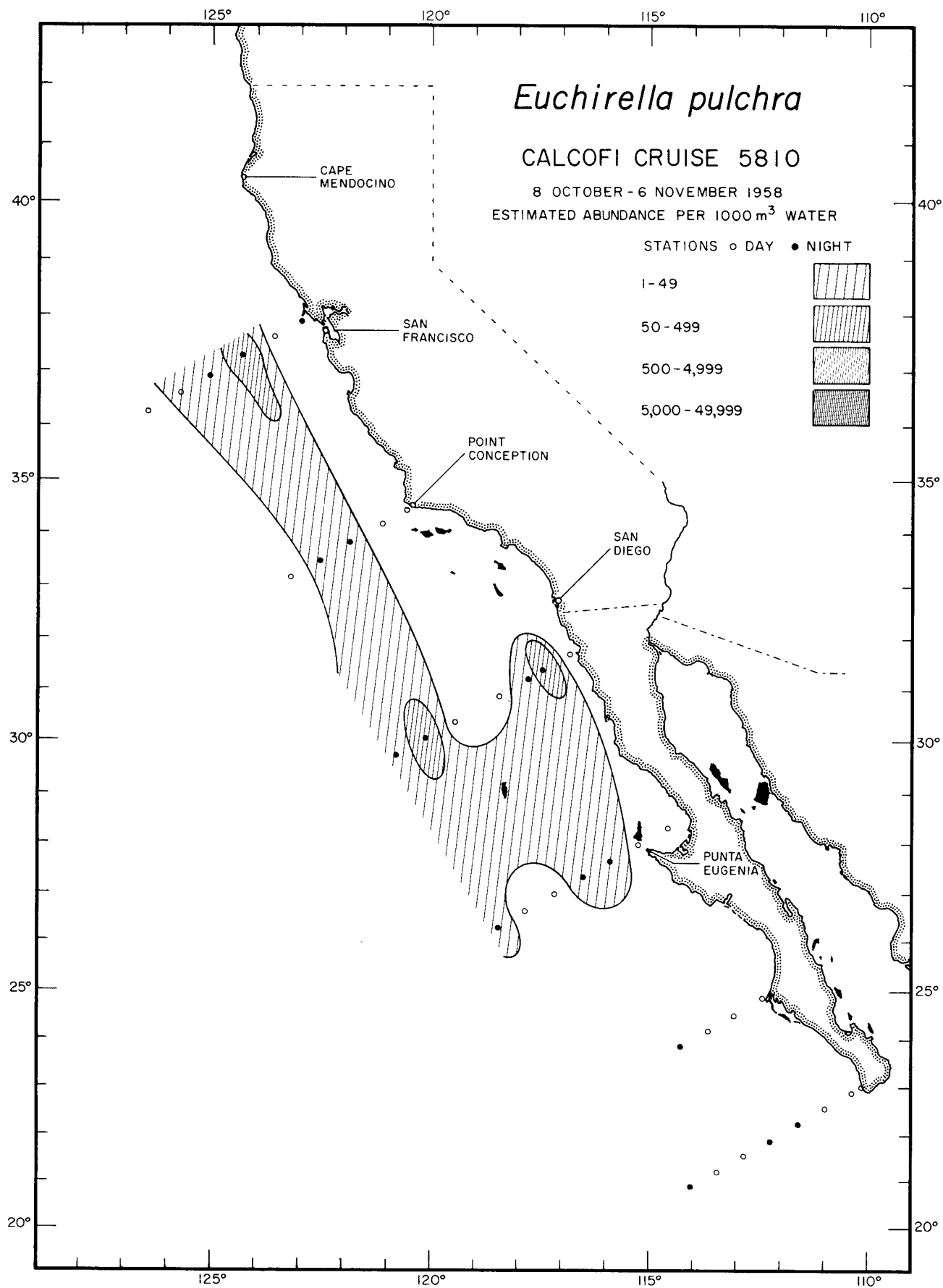
5804



Calanoida

Euchirella pulchra

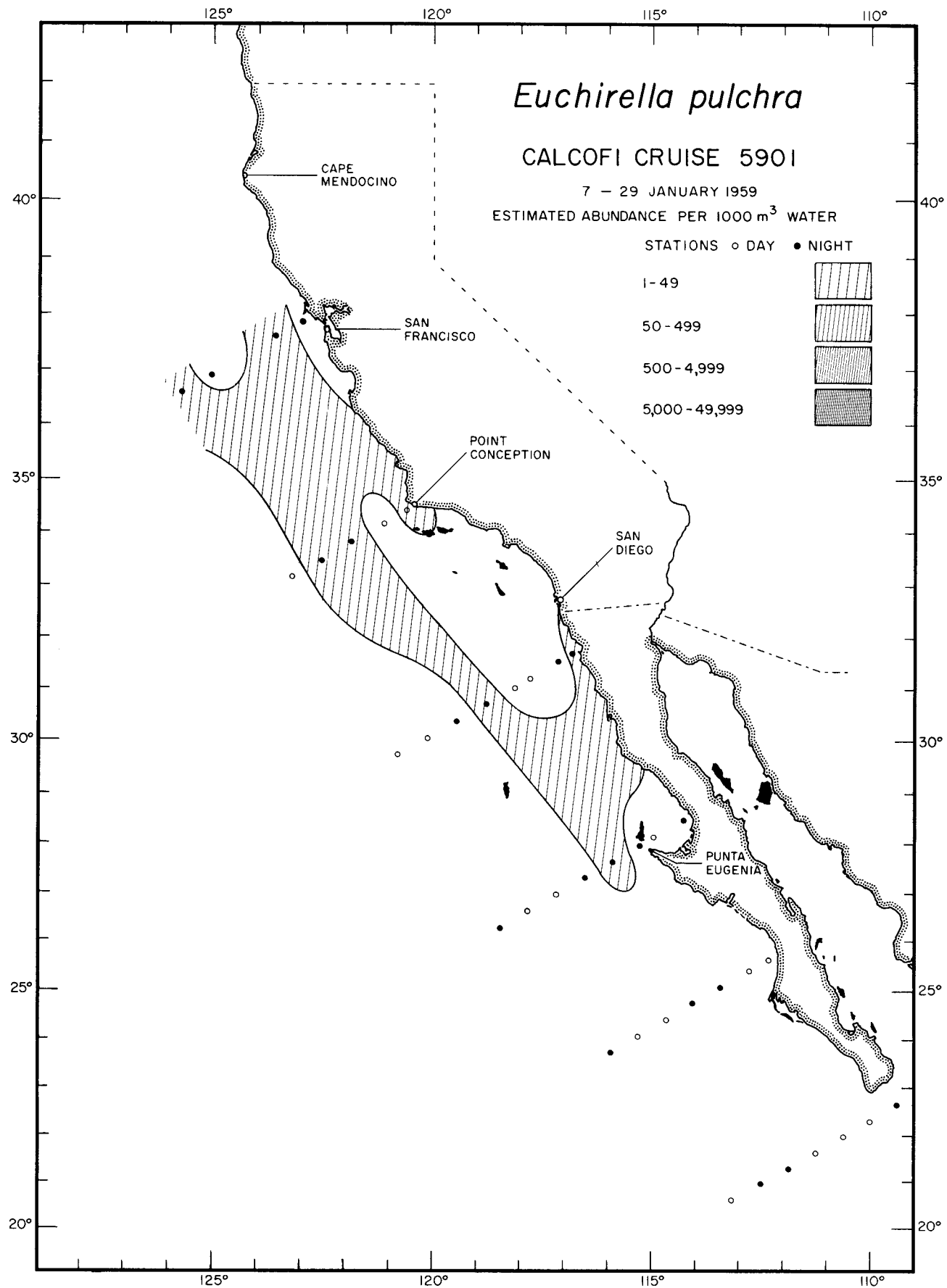
5807



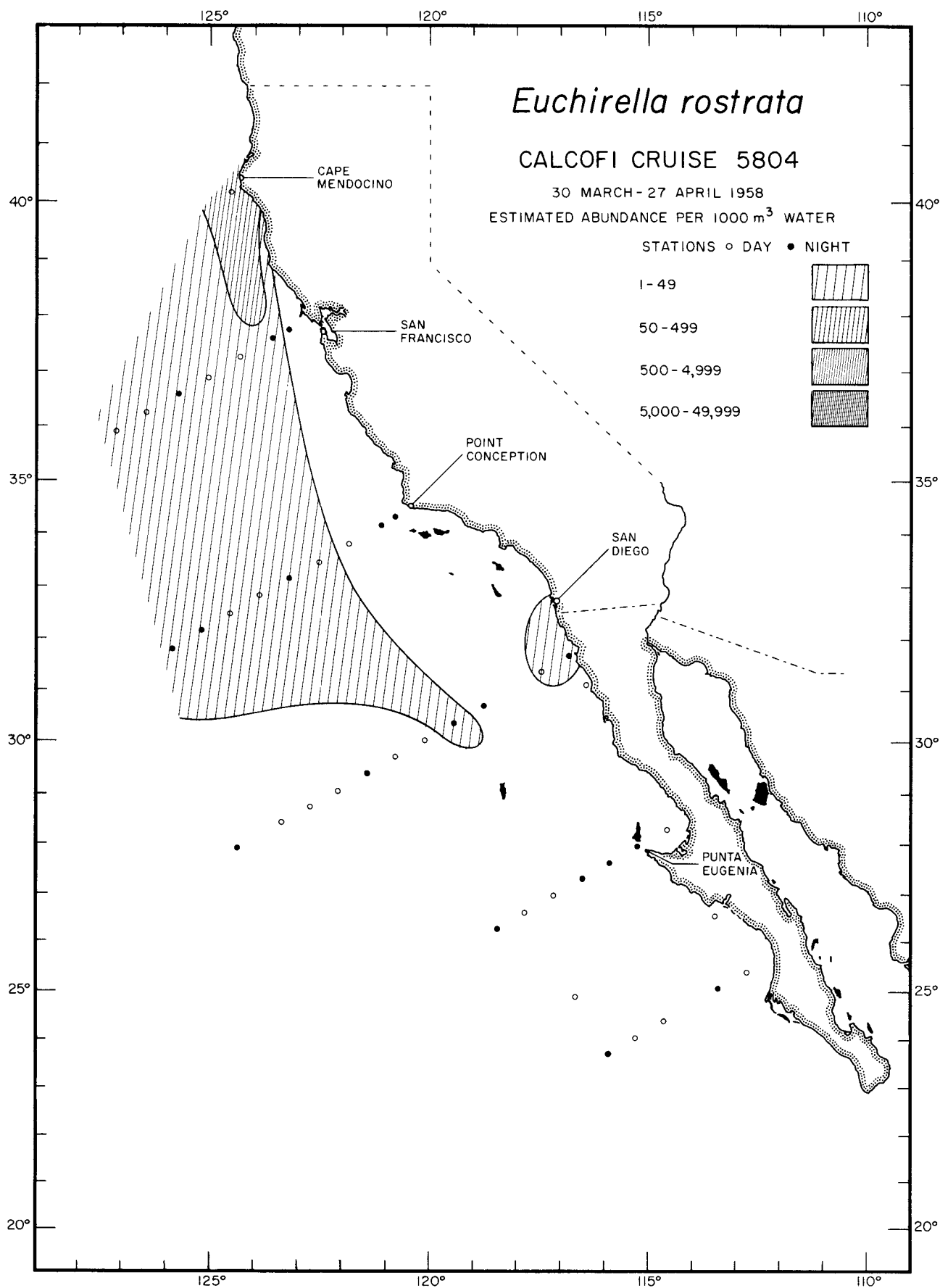
Calanoida

Euchirella pulchra

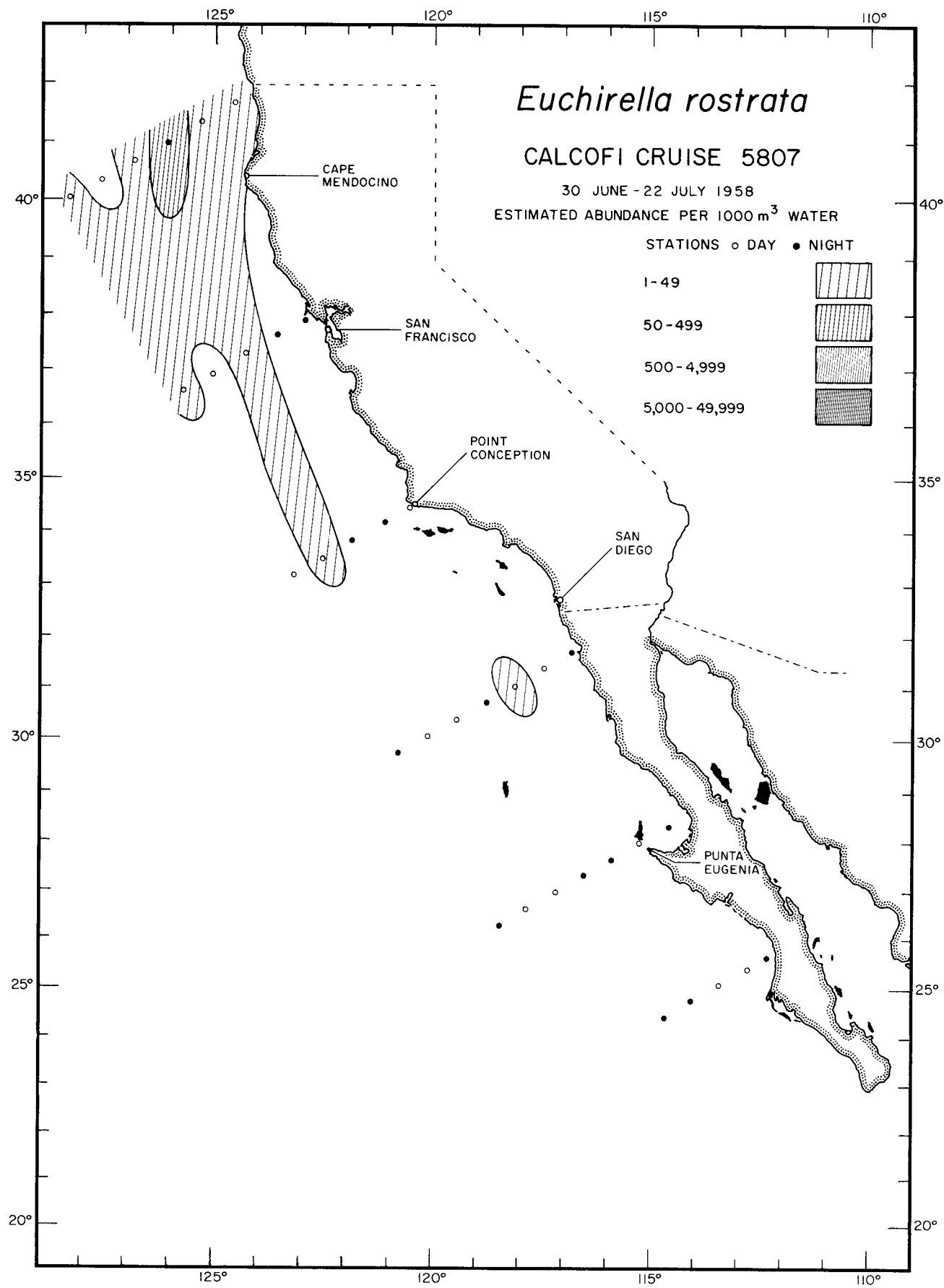
5810



Calanoida
Eucheirella pulchra
 5901



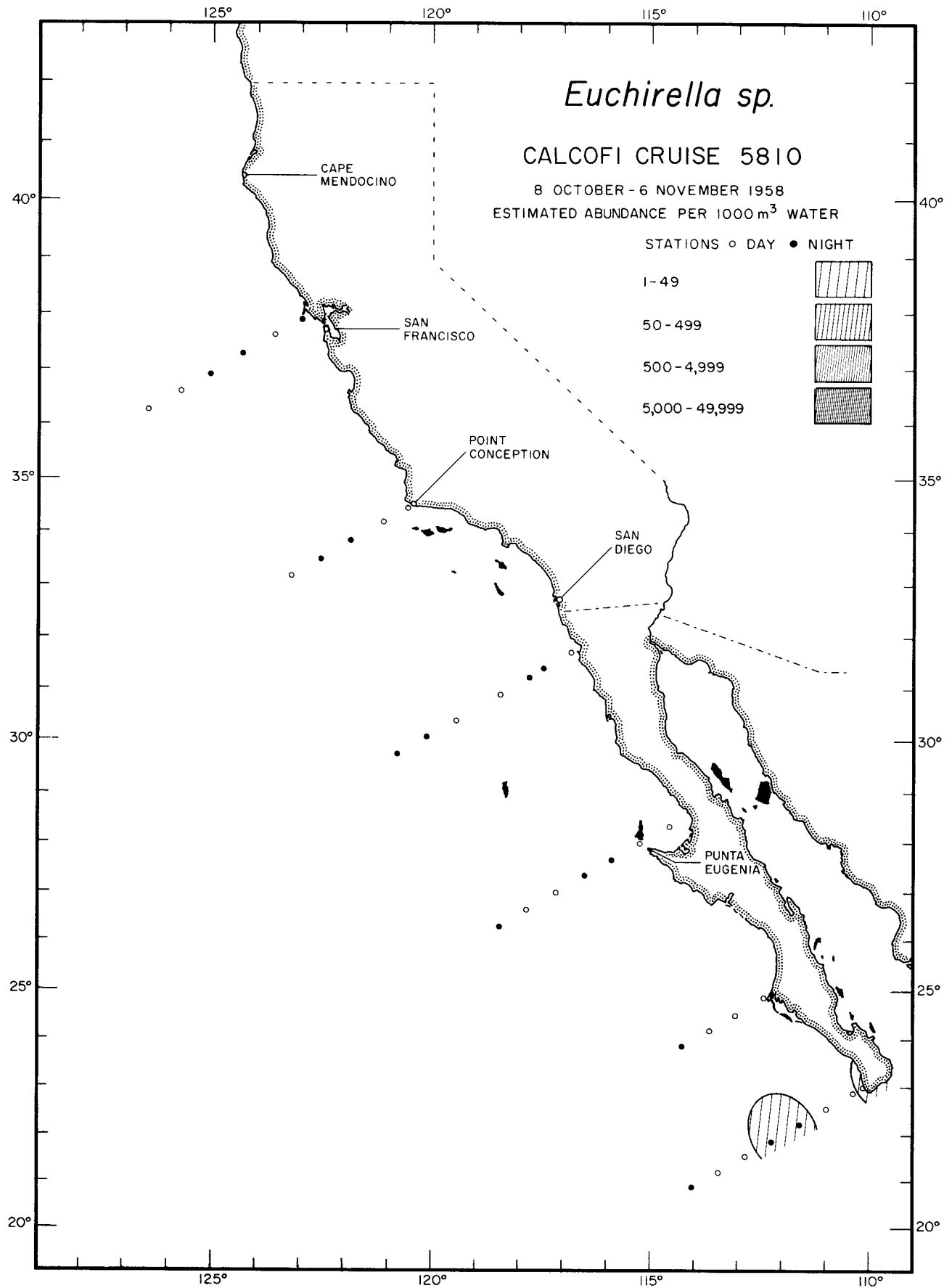
Calanoida
Euchirella rostrata
5804



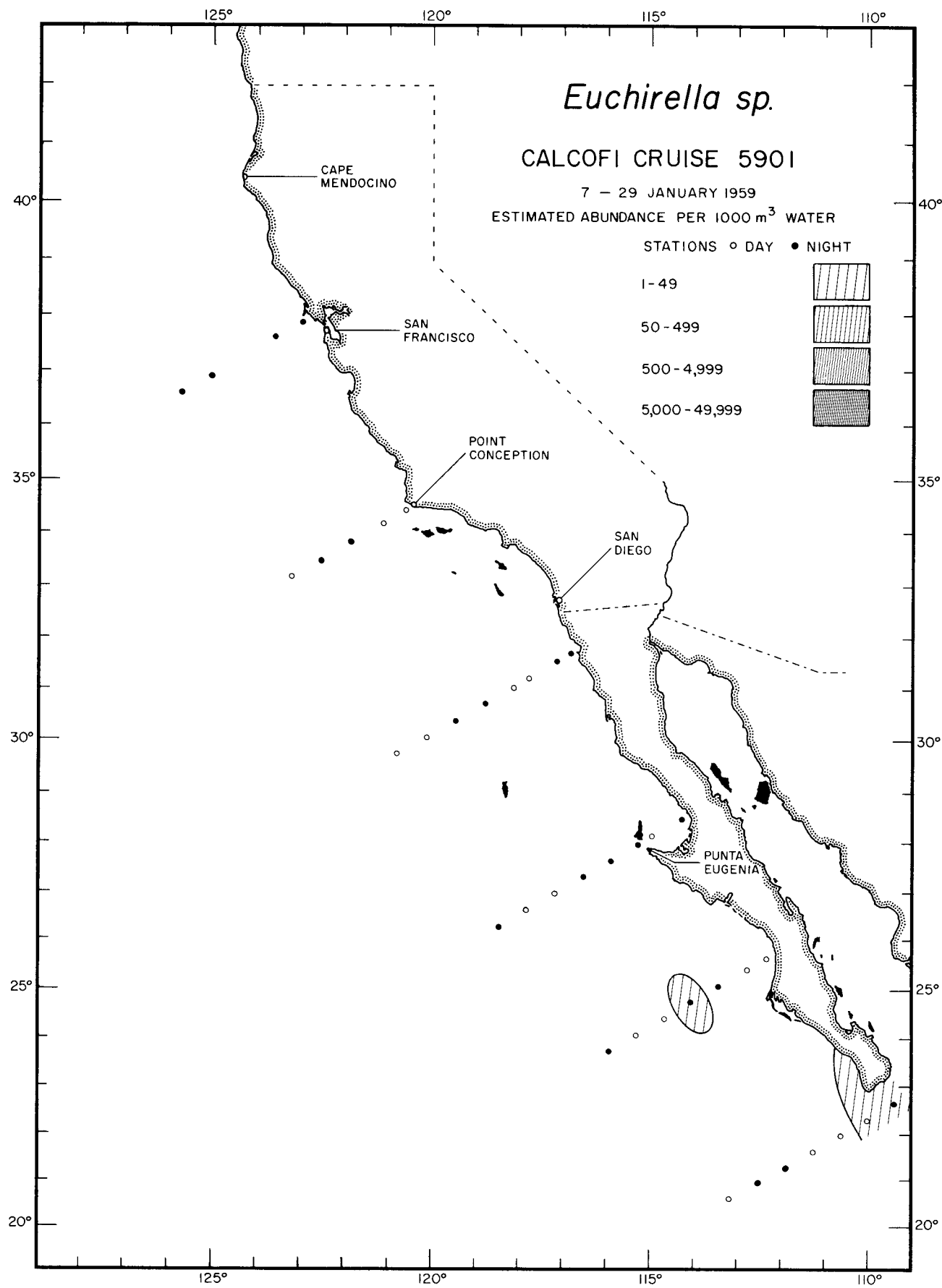
Calanoida

Euchirella rostrata

5807



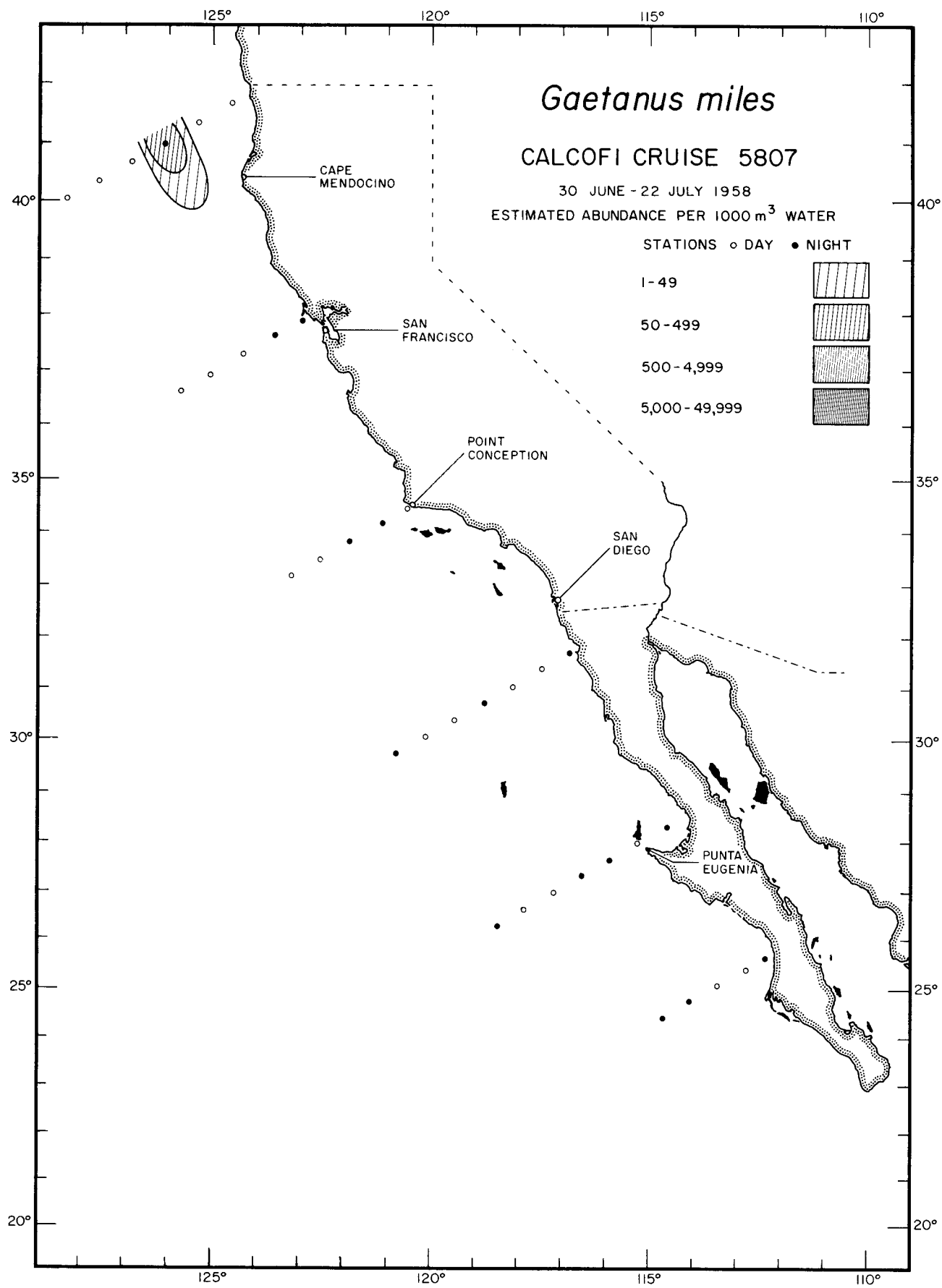
Calanoida
Euchiella sp.
 5810



Calanoida

Euchirella sp.

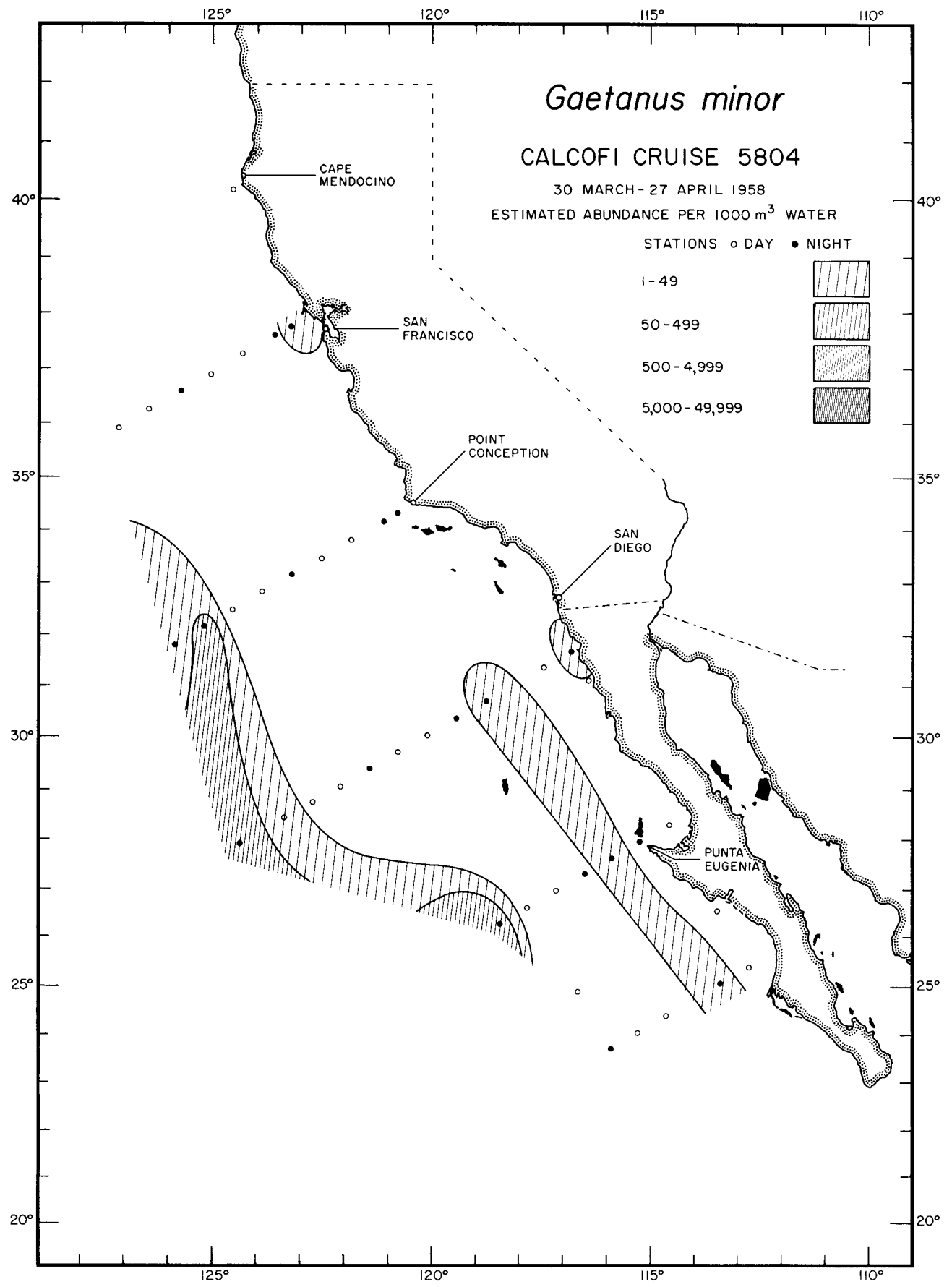
5901



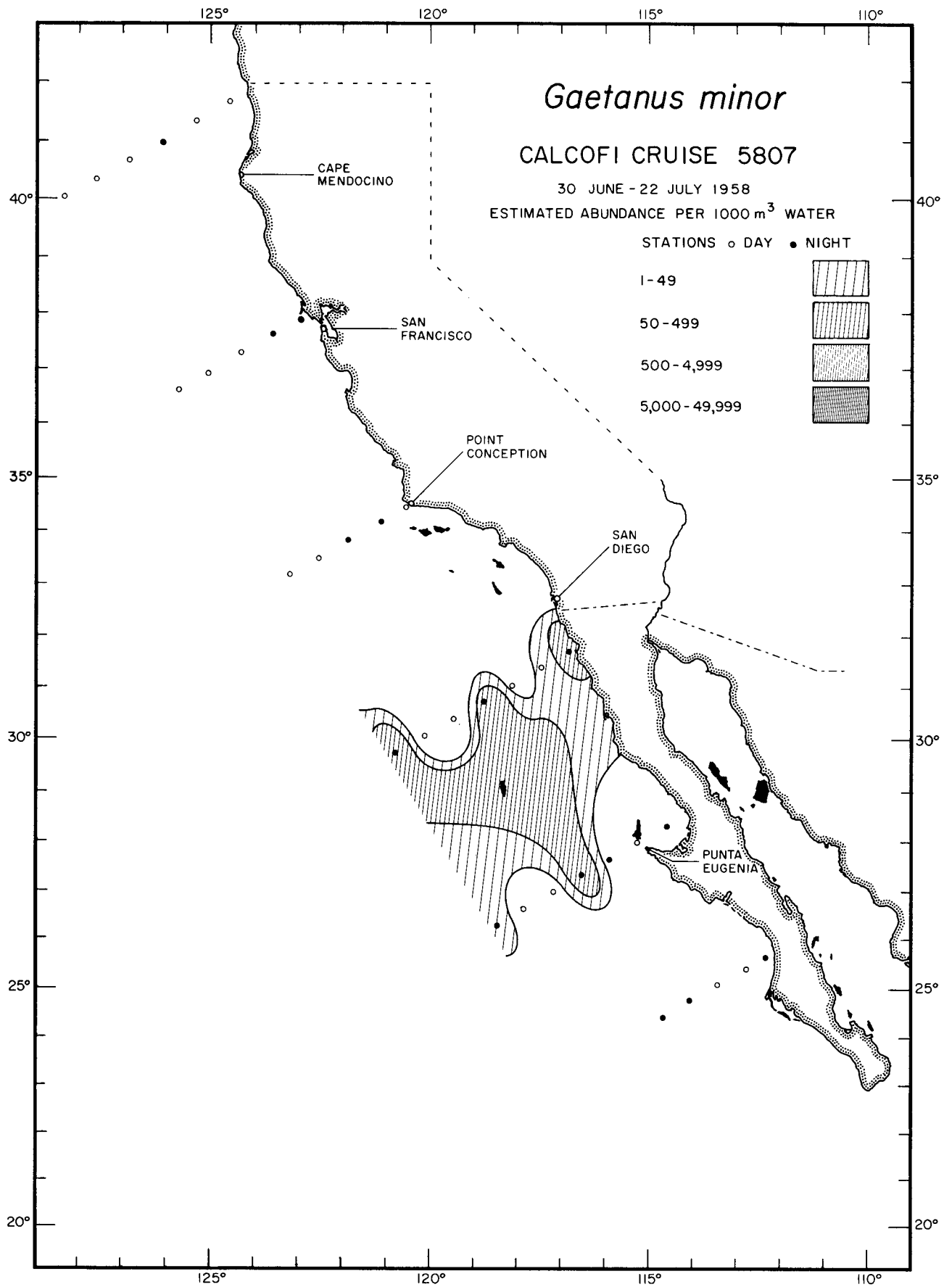
Calanoida

Gaetanus miles

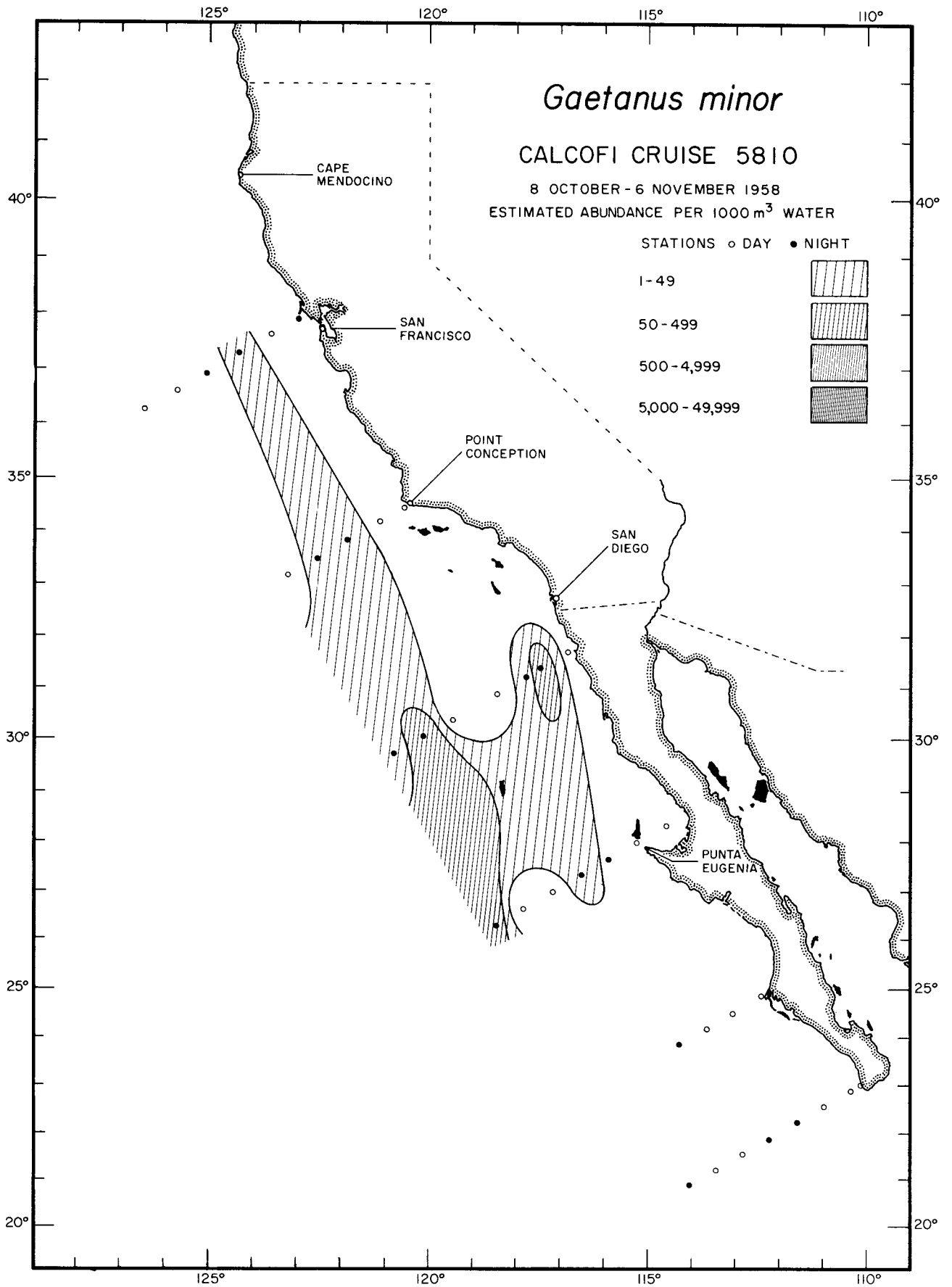
5807



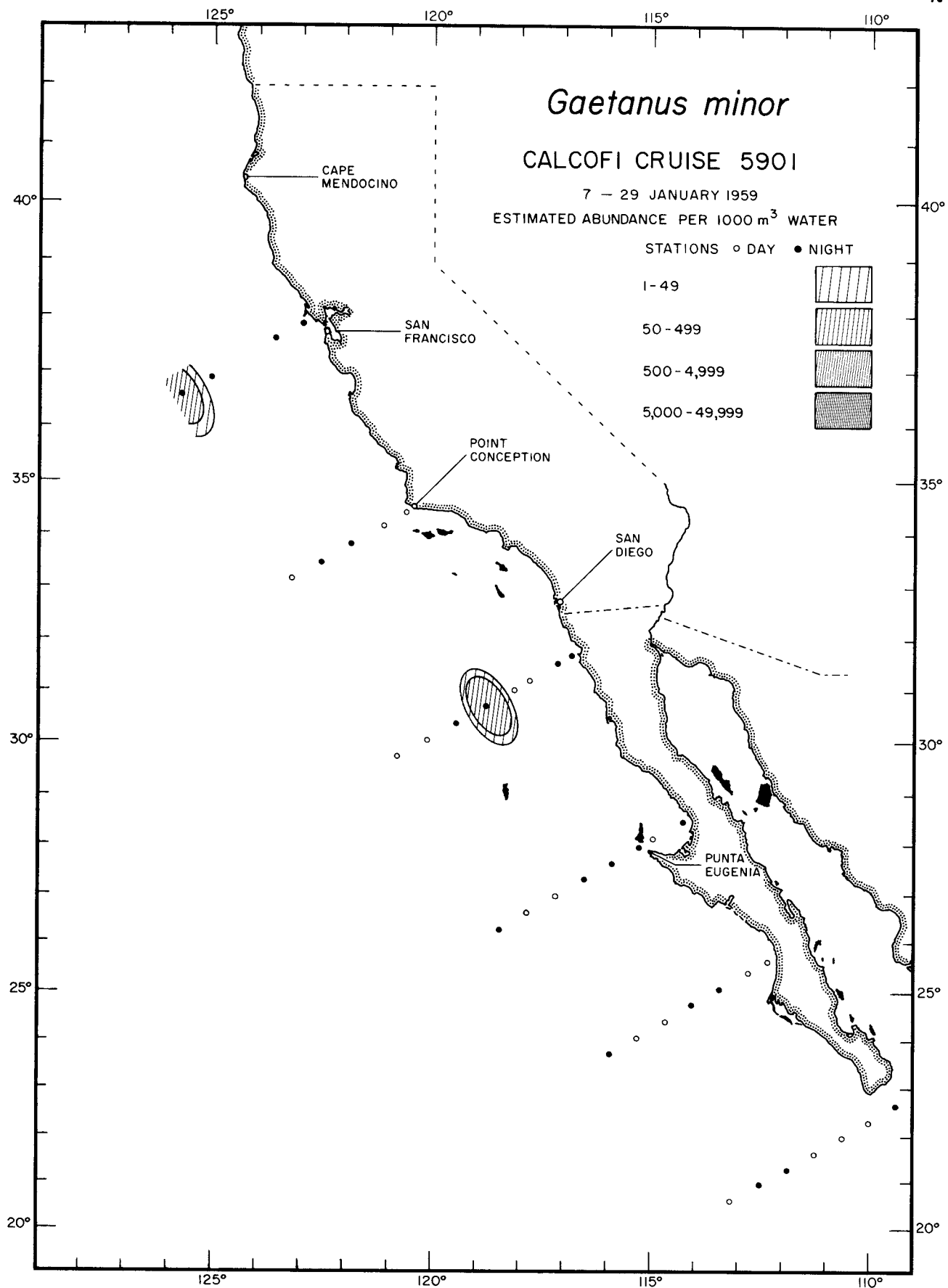
Calanoida
Gaetanus minor
5804



Calanoida
Gaetanus minor
5807



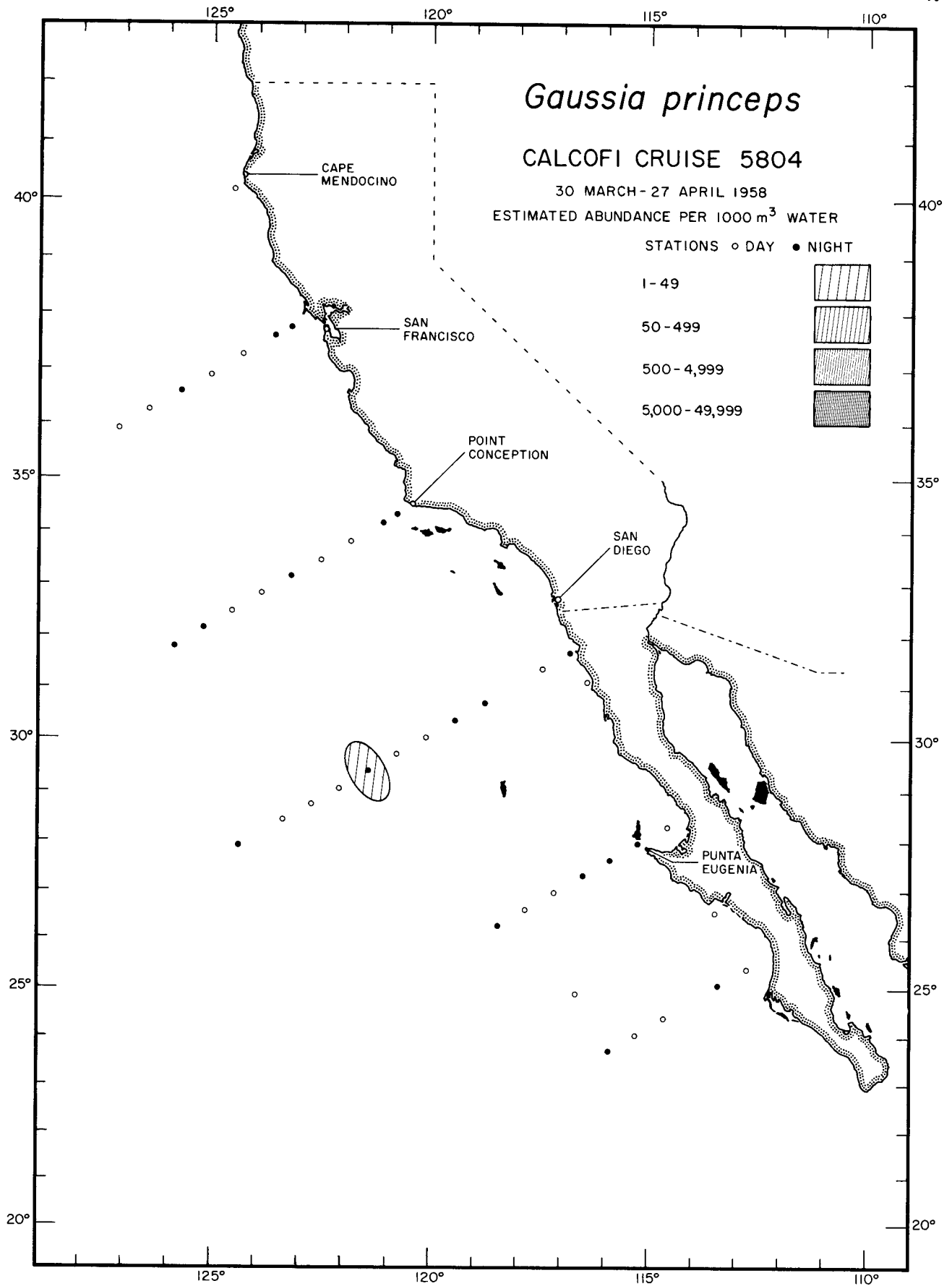
Calanoida
Gaetanus minor
5810



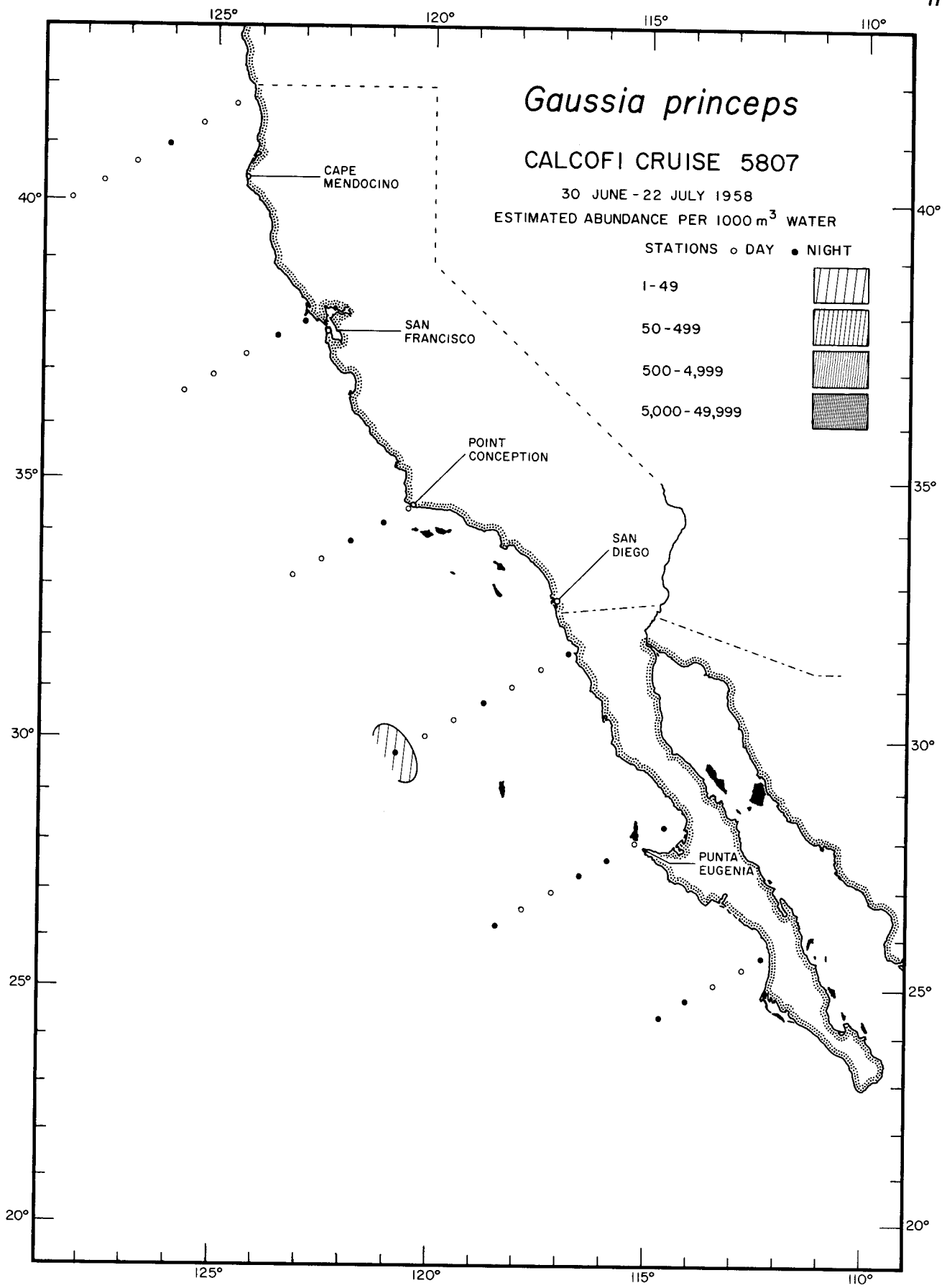
Calanoida

Gaetanus minor

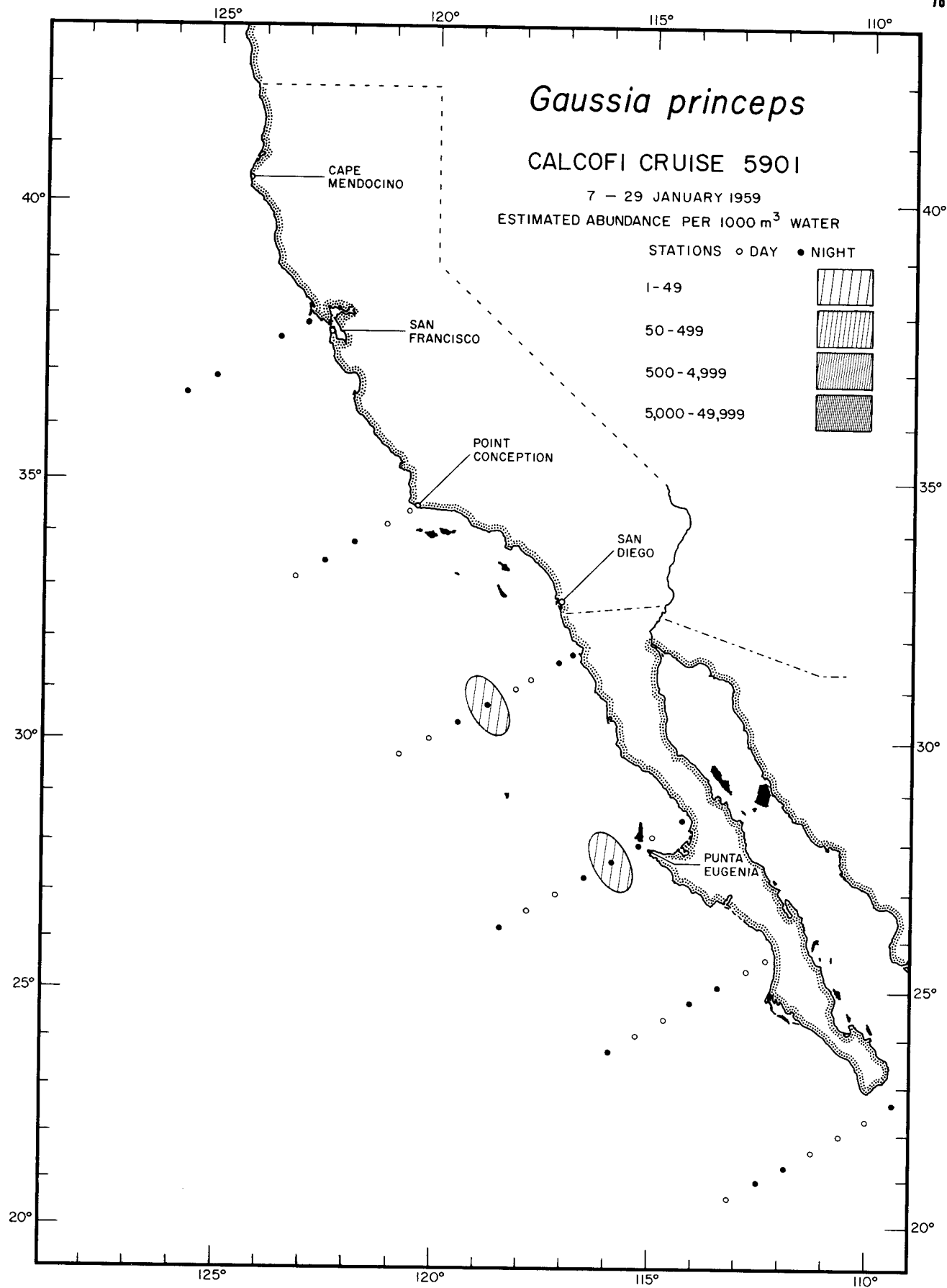
5901



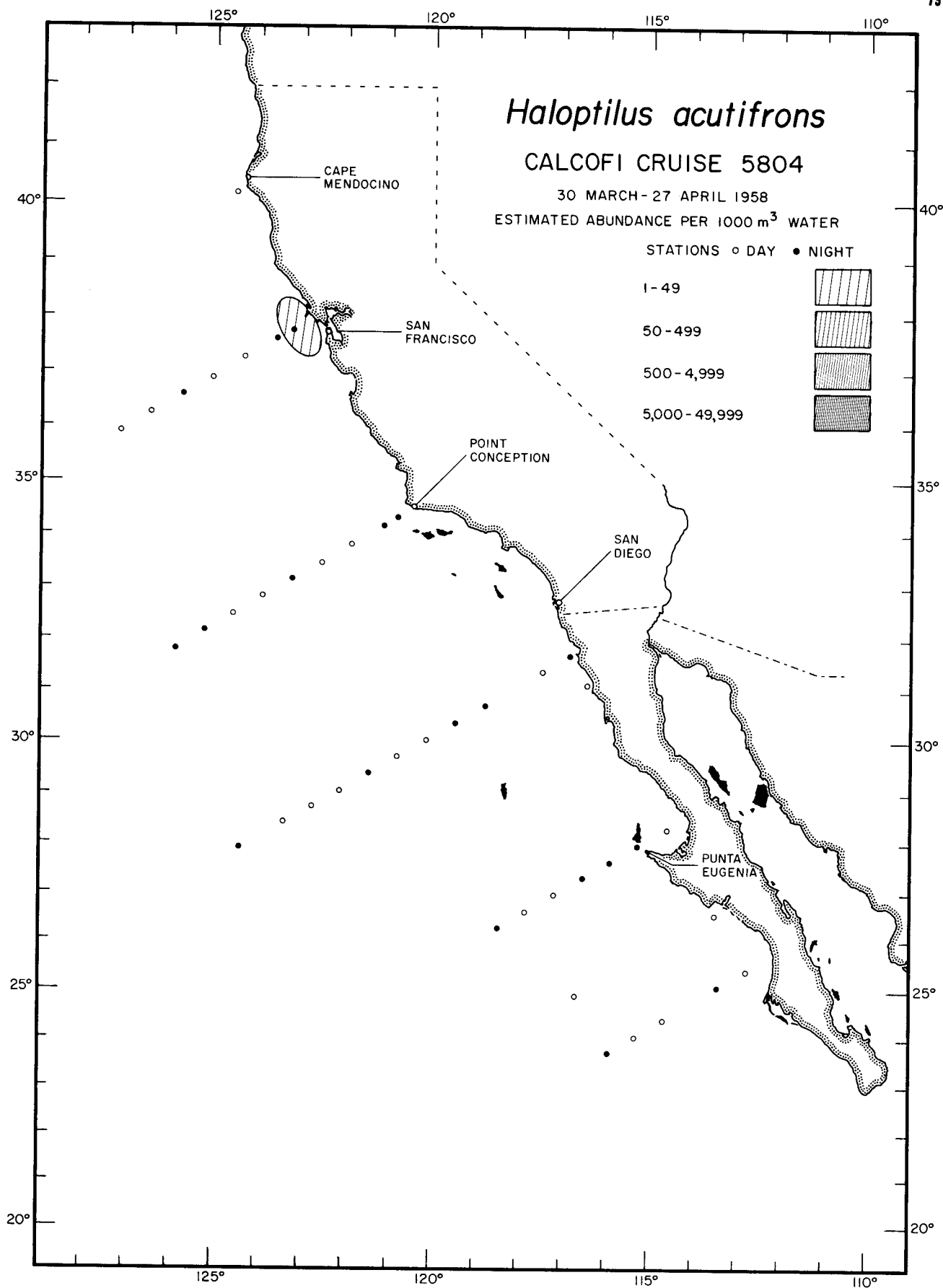
Calanoida
Gaussia princeps
5804



Calanoida
Gaussia princeps
 5807



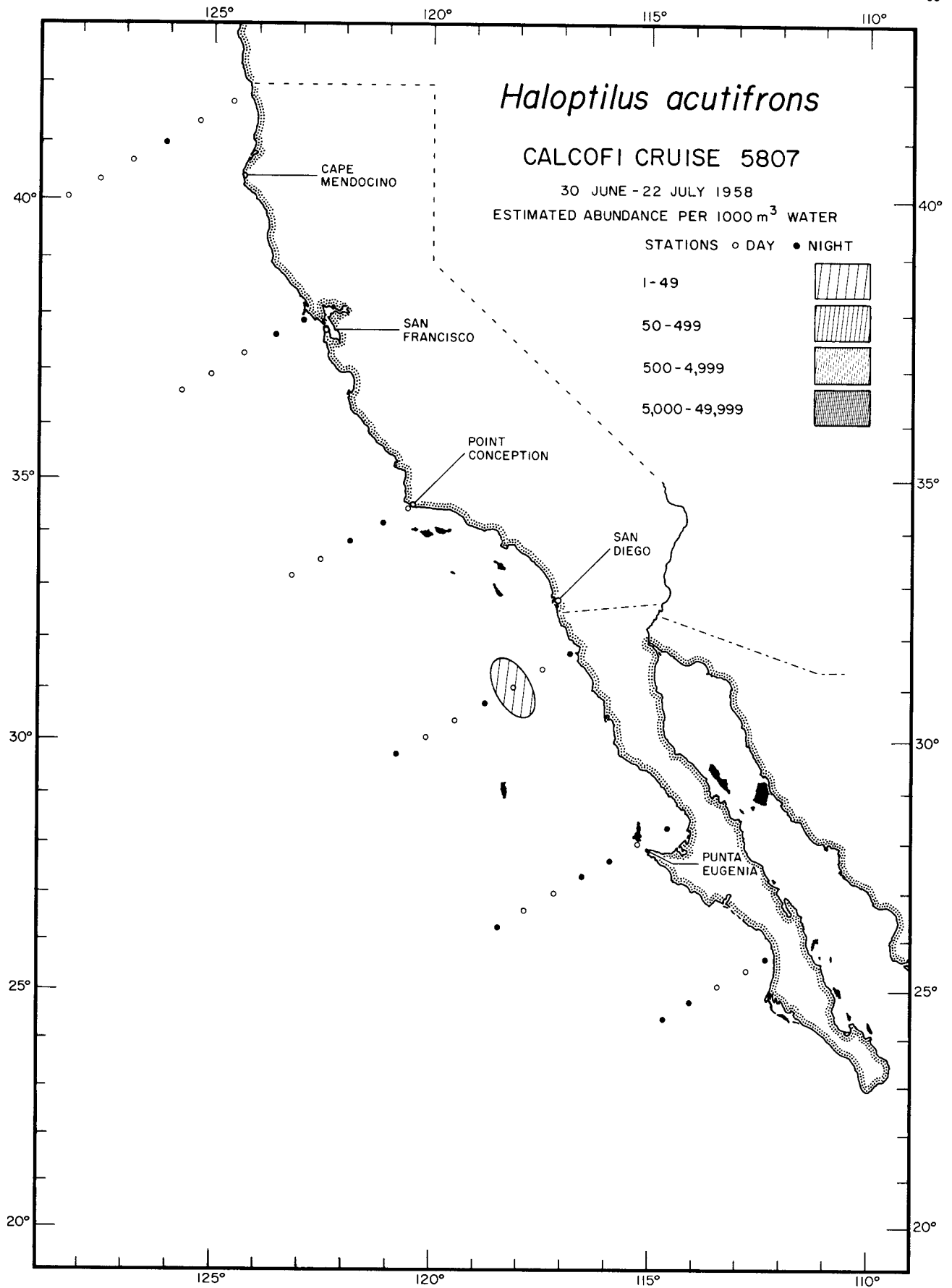
Calanoida
Gausia princeps
 5901



Calanoida

Haloptilus acutifrons

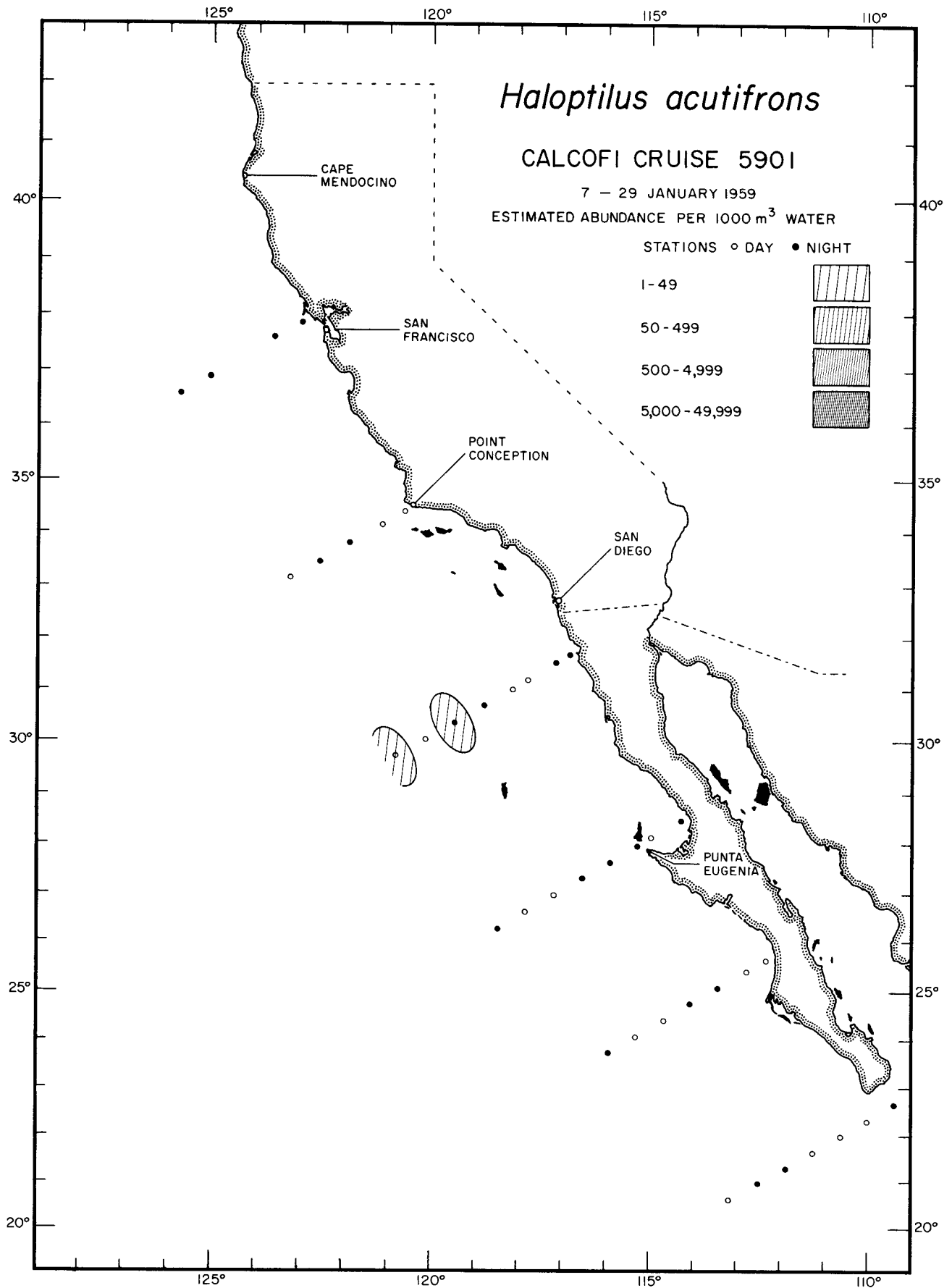
5804



Calanoida

Haloptilus acutifrons

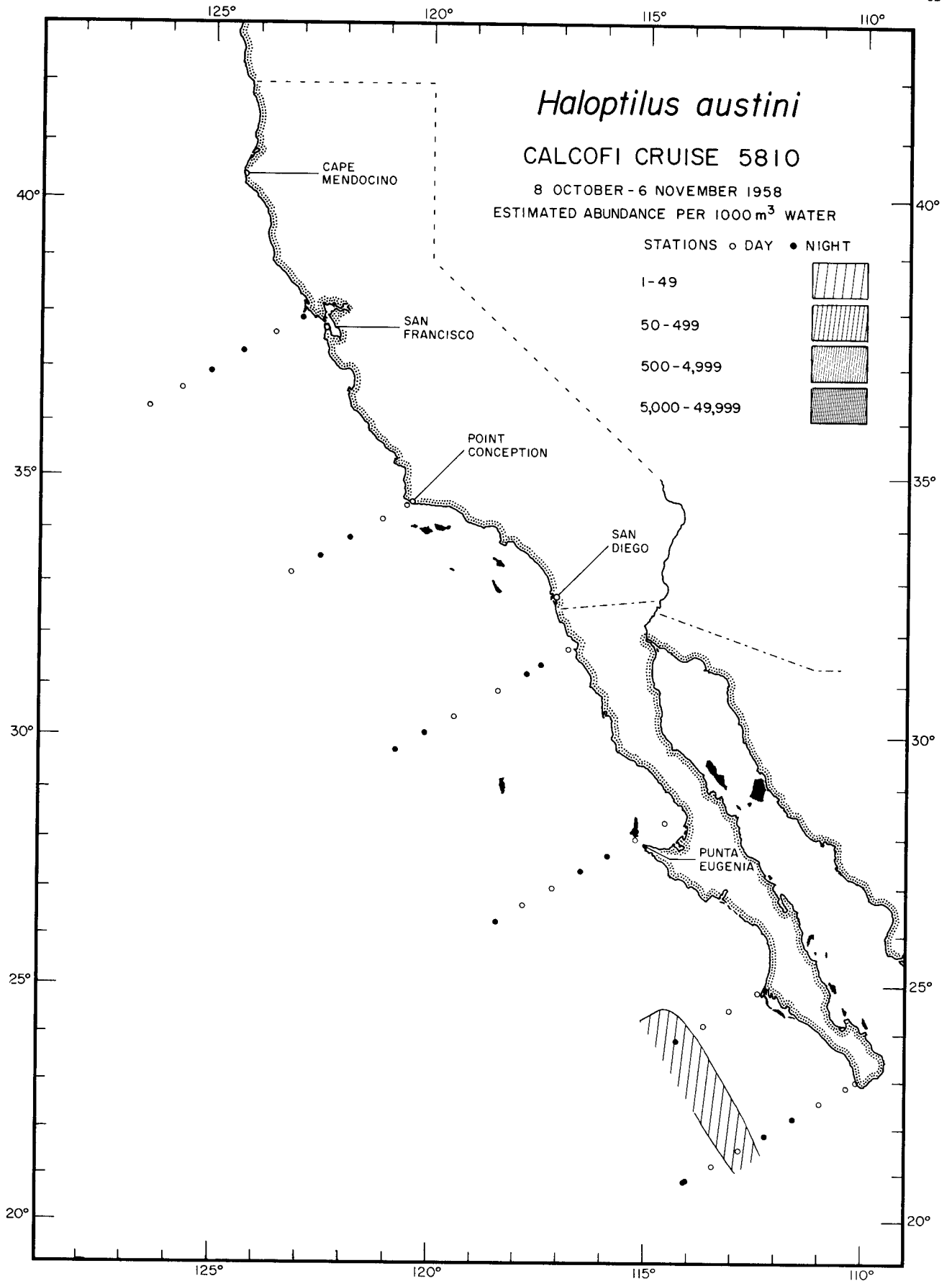
5807



Calanoida

Haloptilus acutifrons

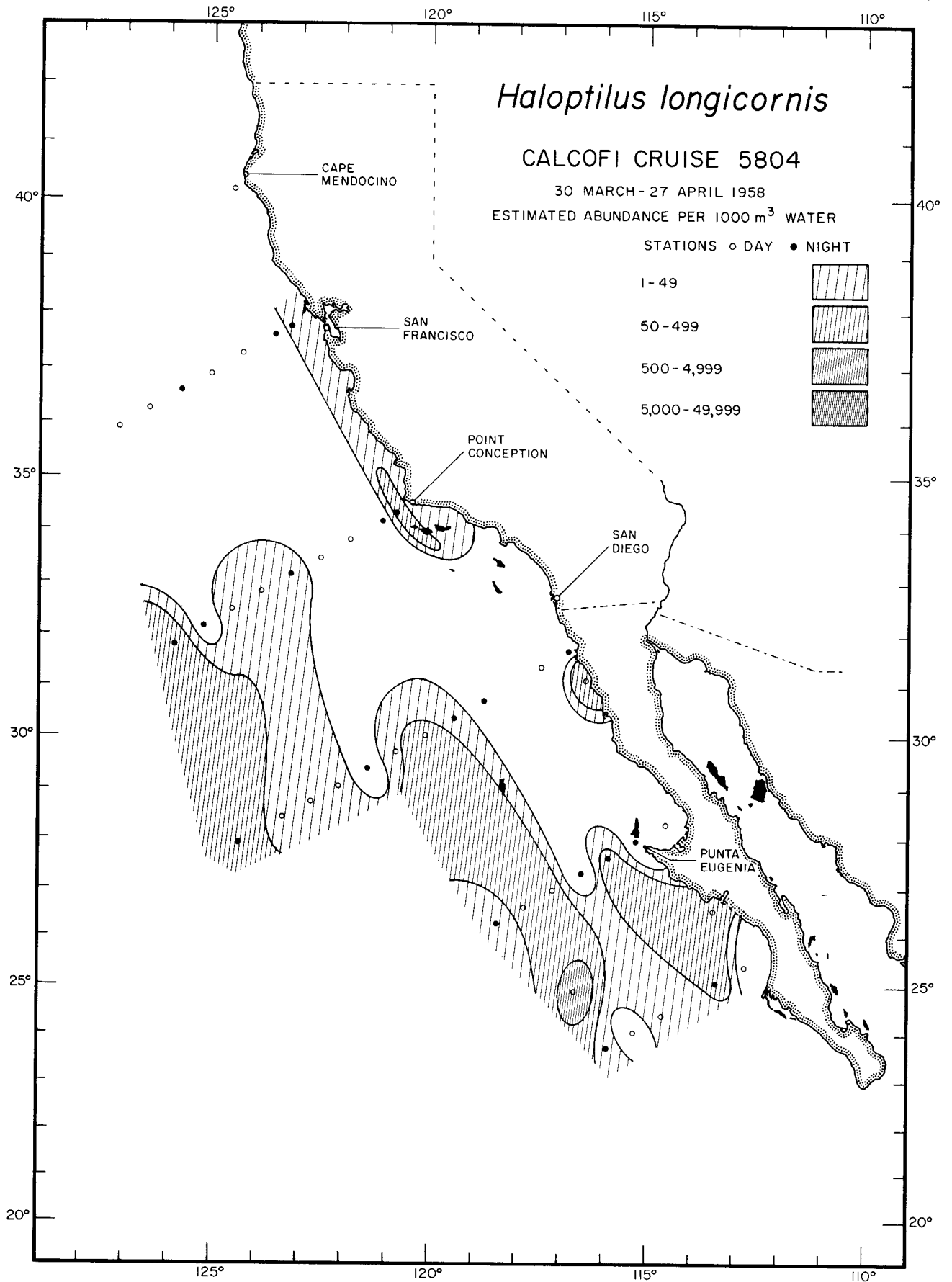
5901



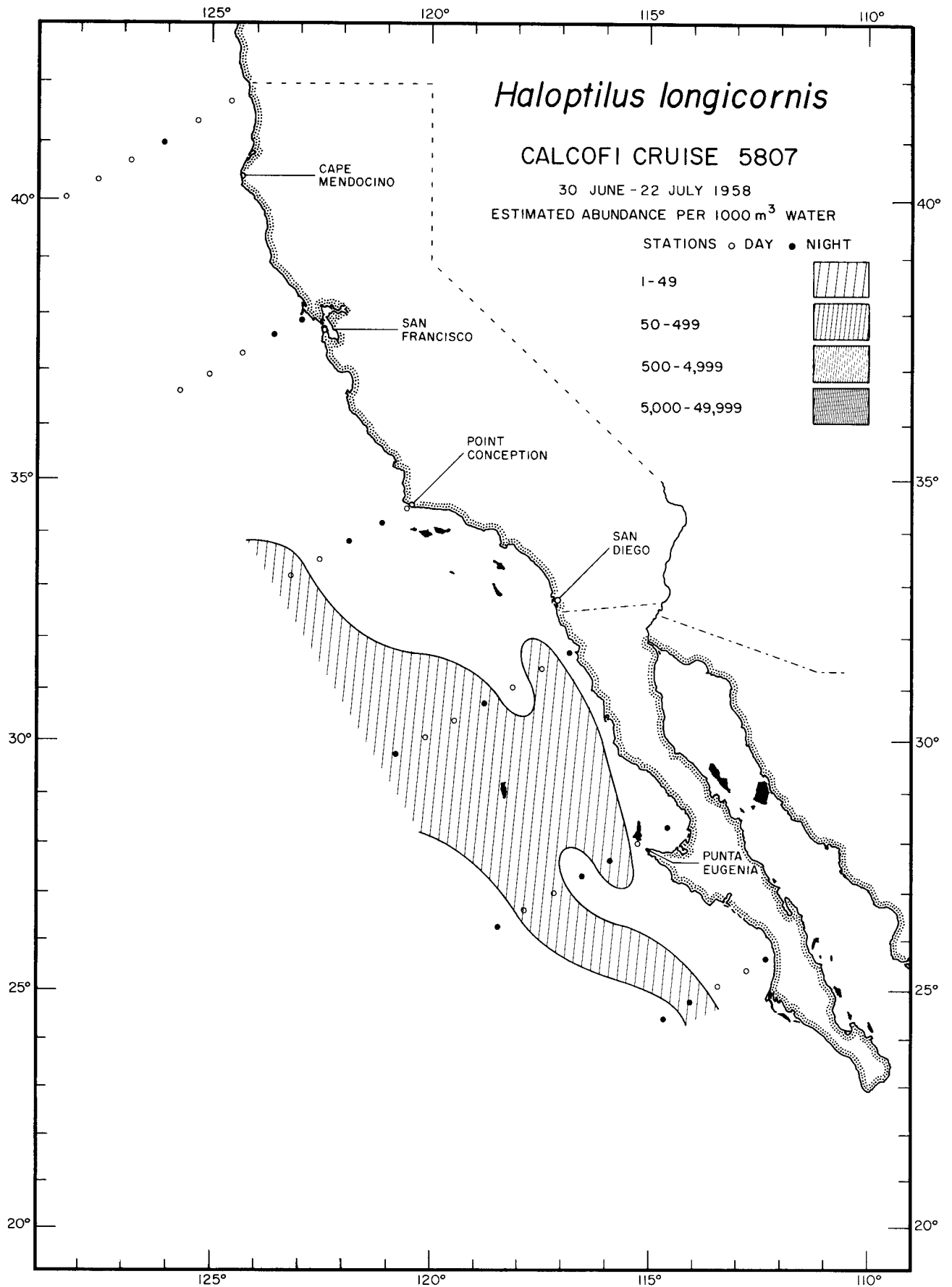
Calanoida

Haloptilus austini

5810



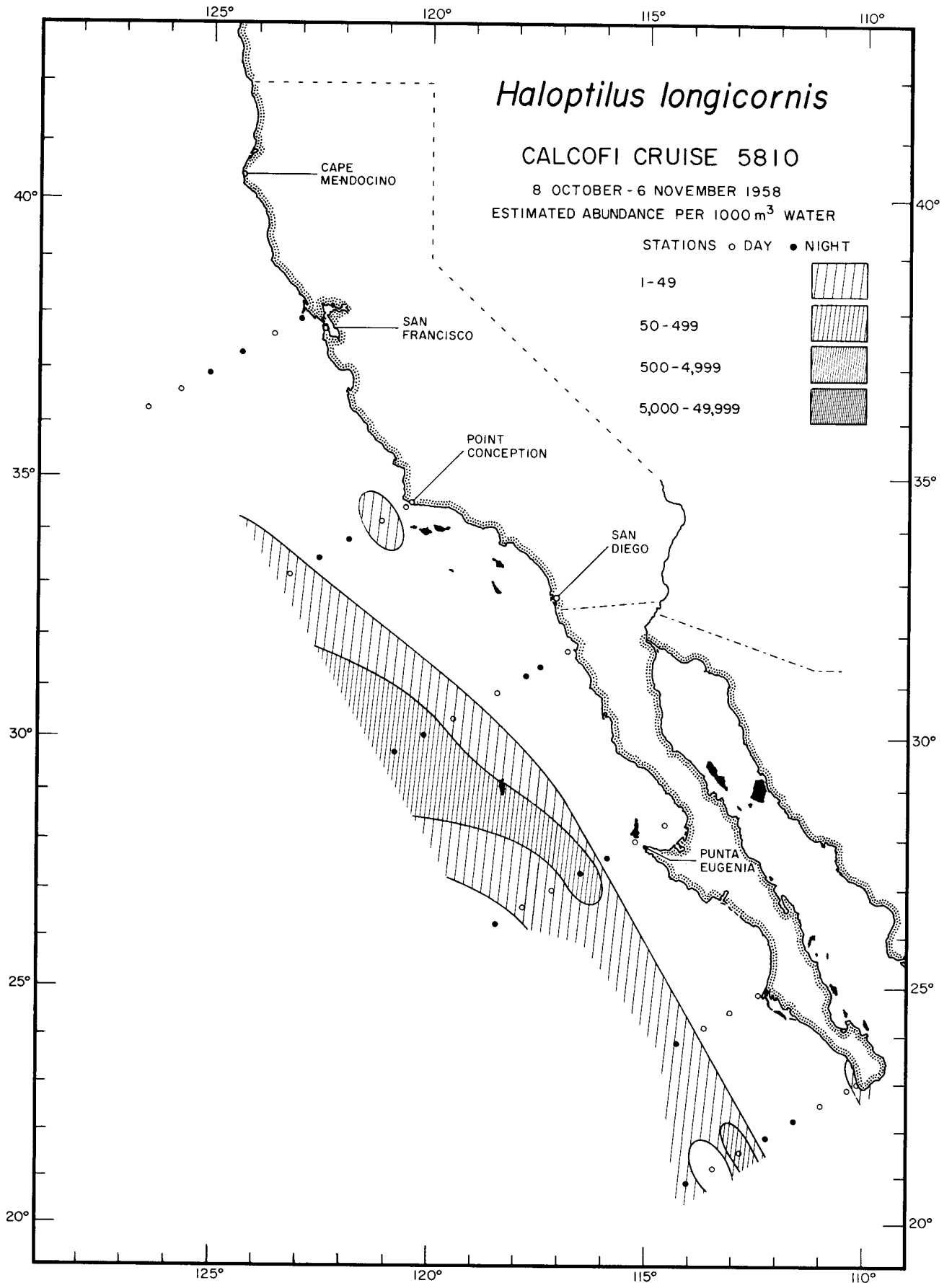
Calanoida
Haloptilus longicornis
5804



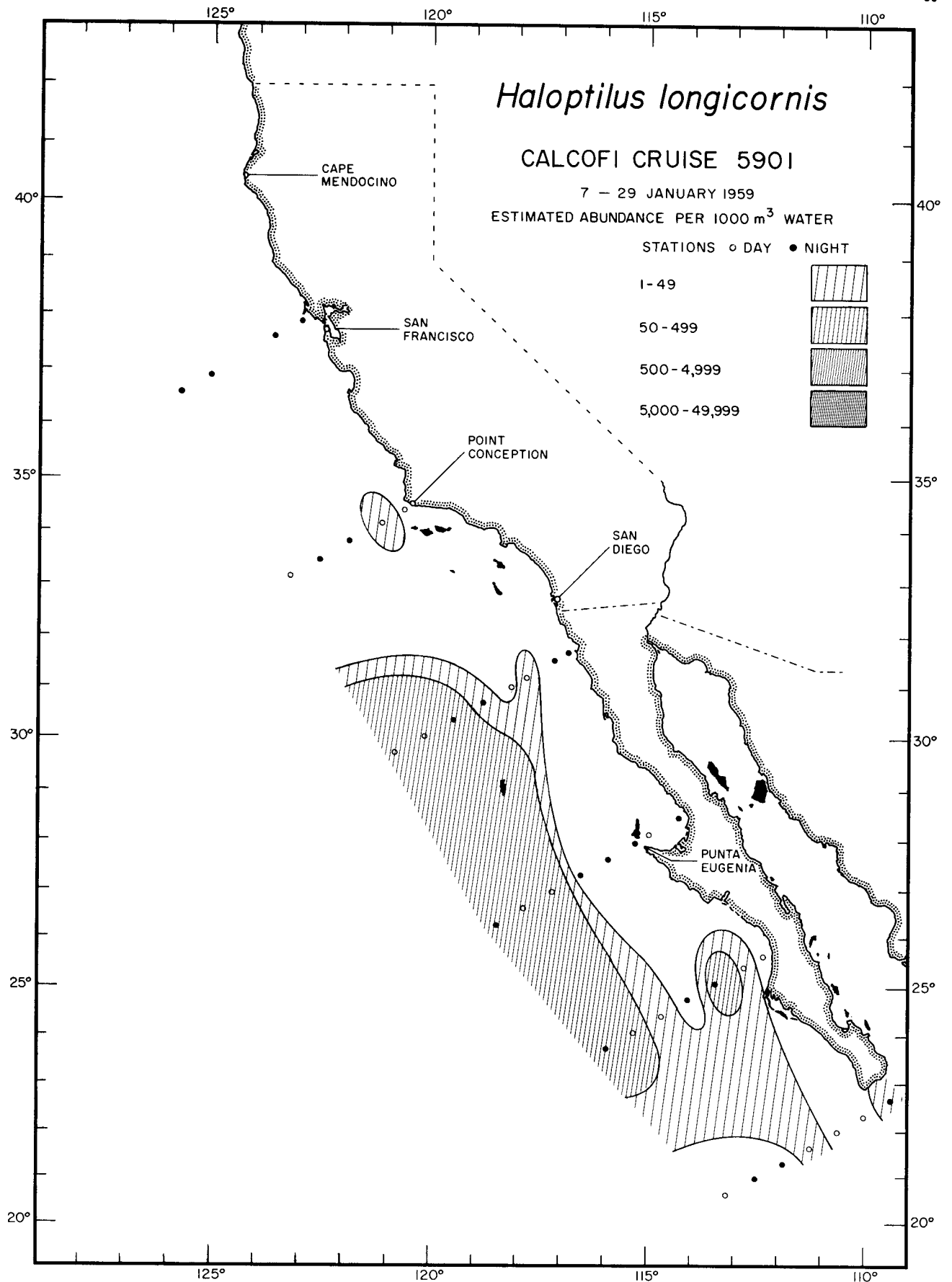
Calanoida

Haloptilus longicornis

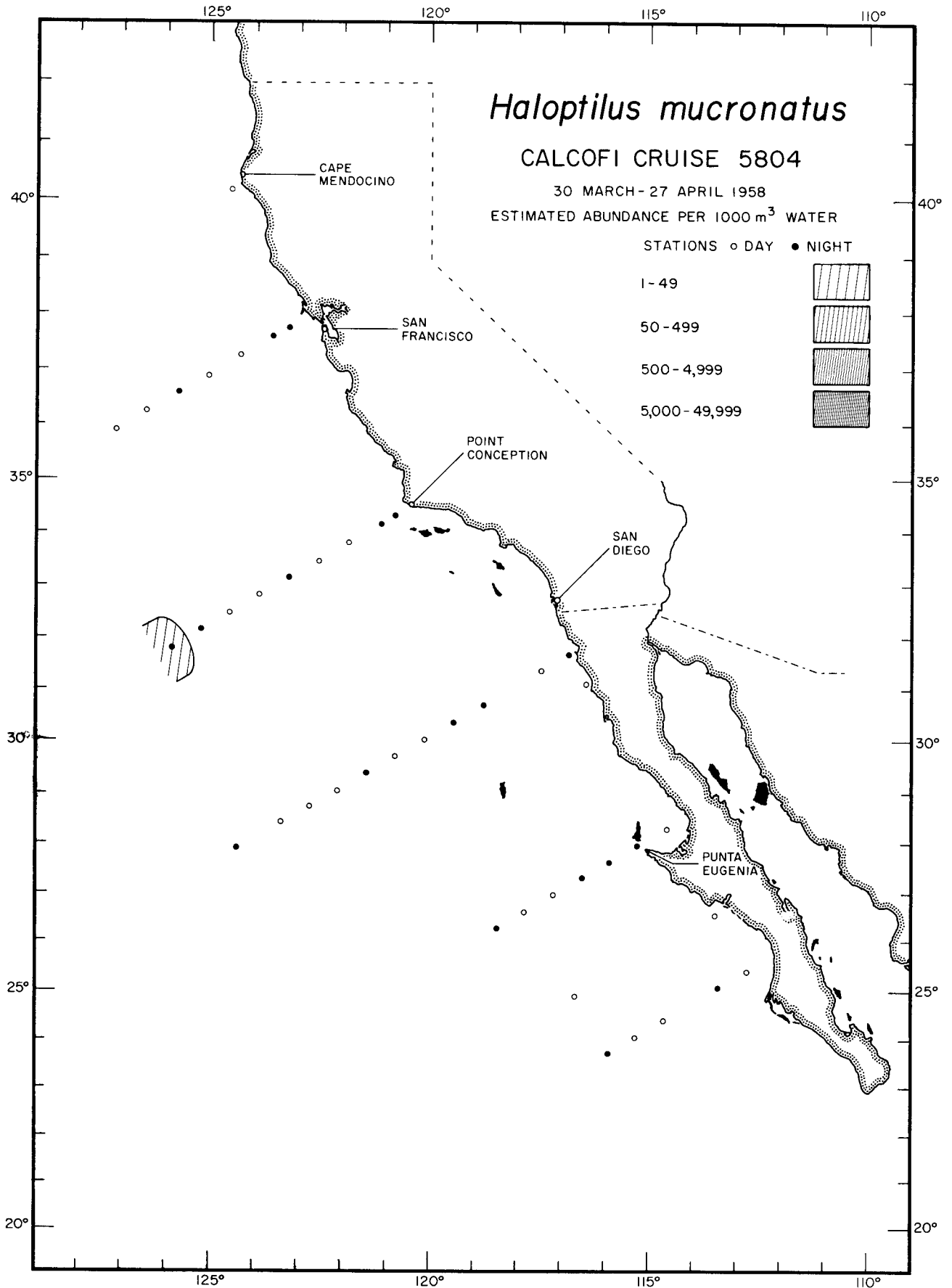
5807



Calanoida
Haloptilus longicornis
5810



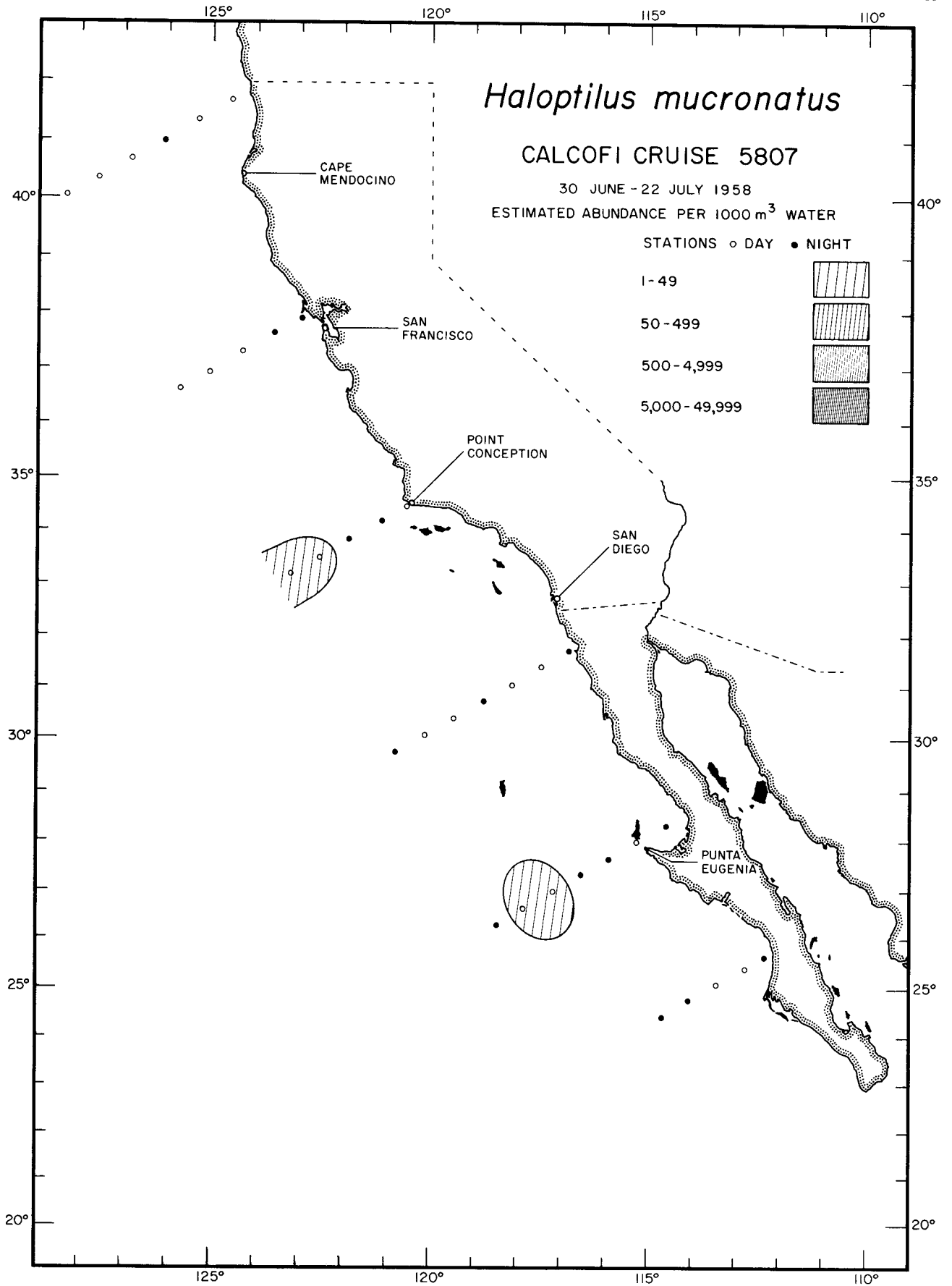
Calanoida
Haloptilus longicornis
5901



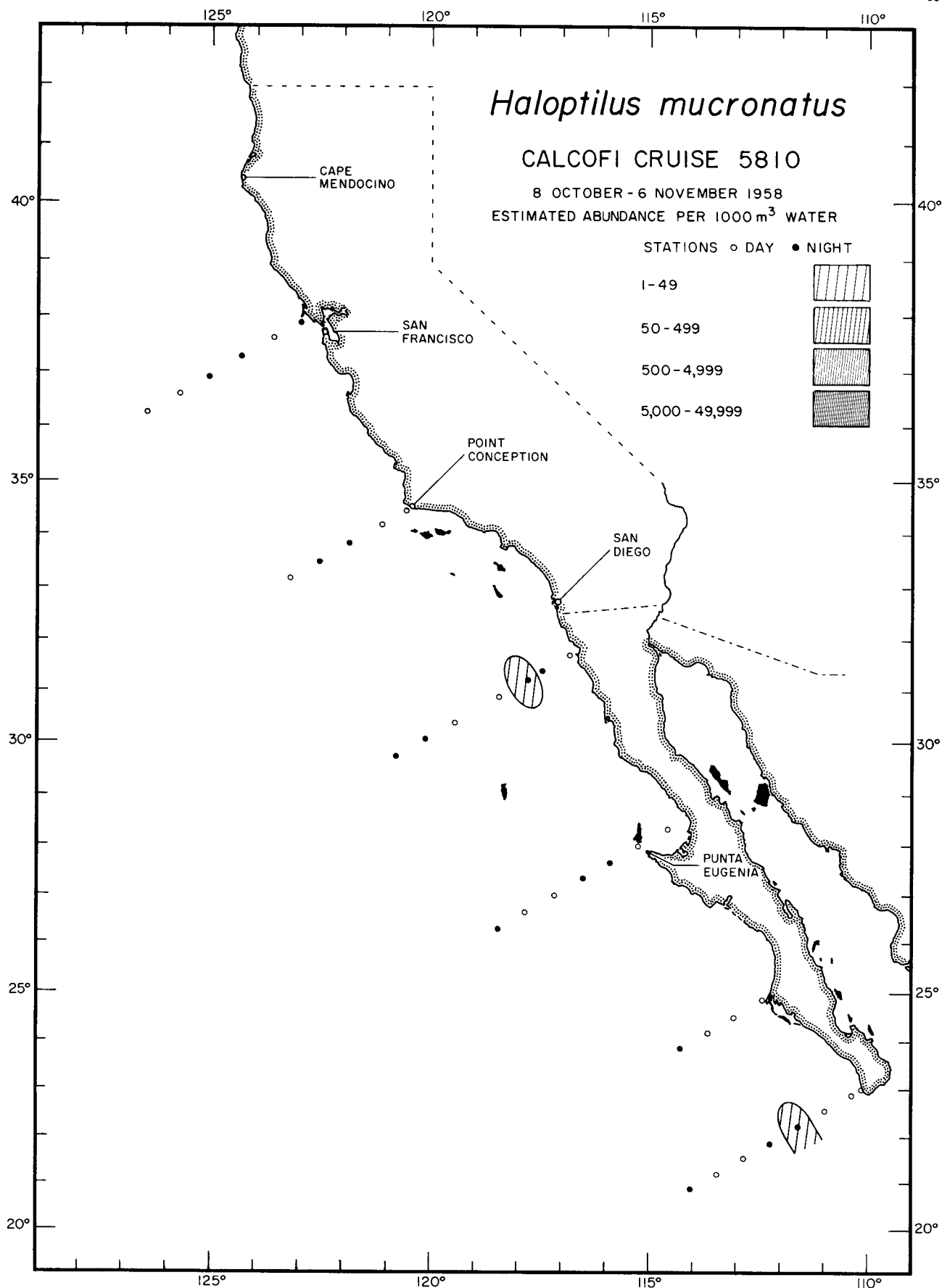
Calanoida

Haloptilus mucronatus

5804



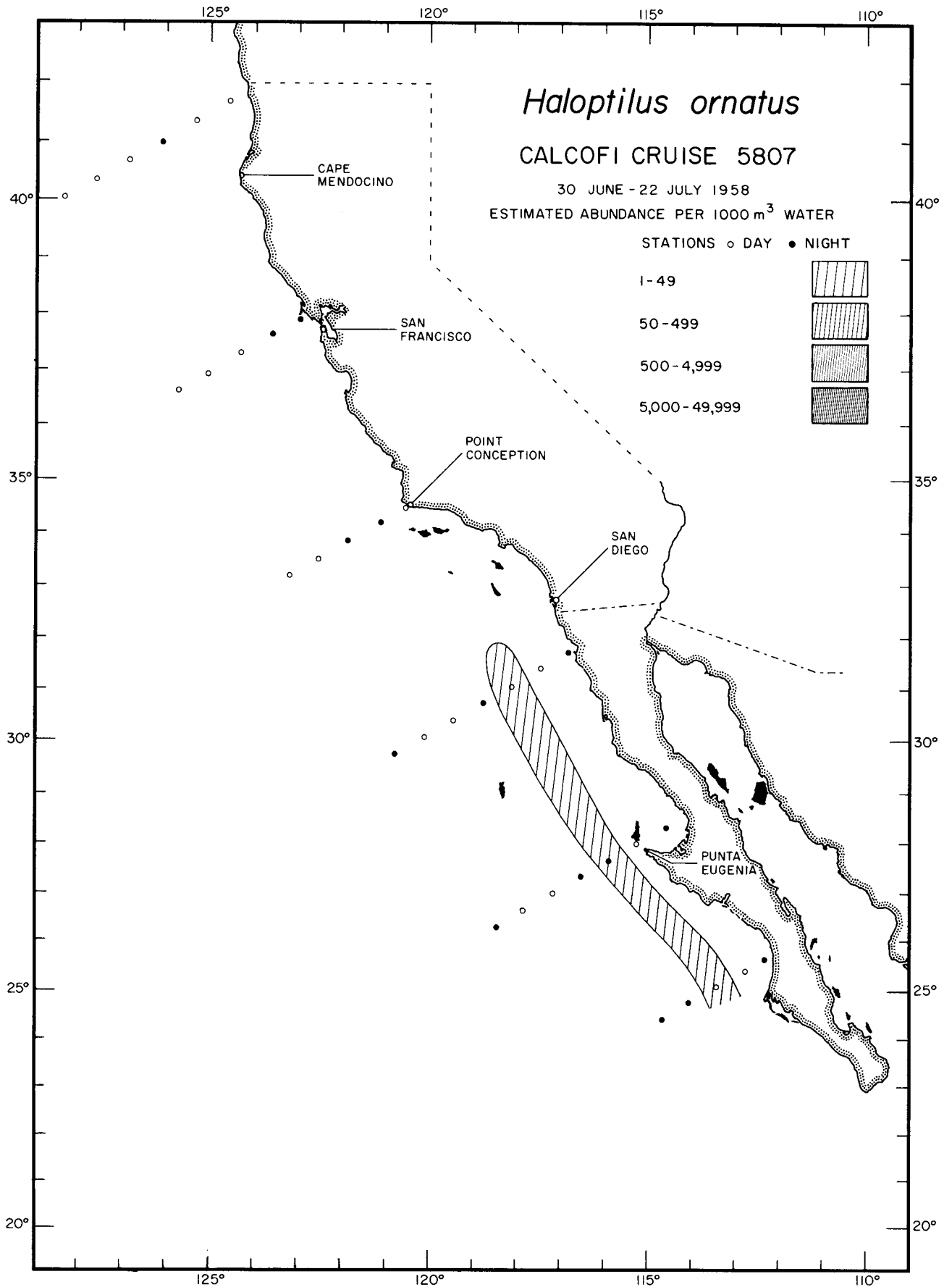
Calanoida
Haloptilus mucronatus
 5807



Calanoida

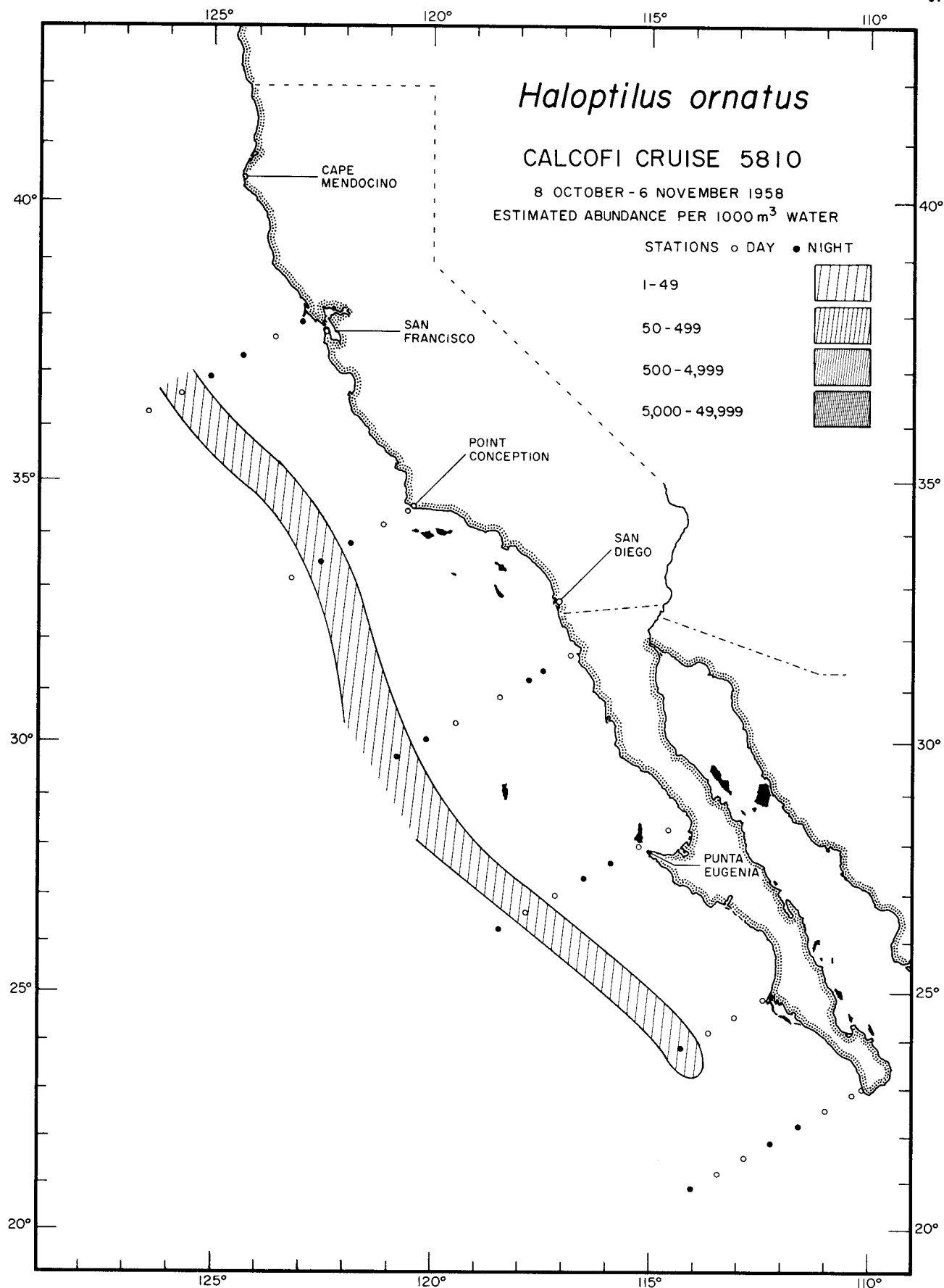
Haloptilus mucronatus

5810



Calanoida

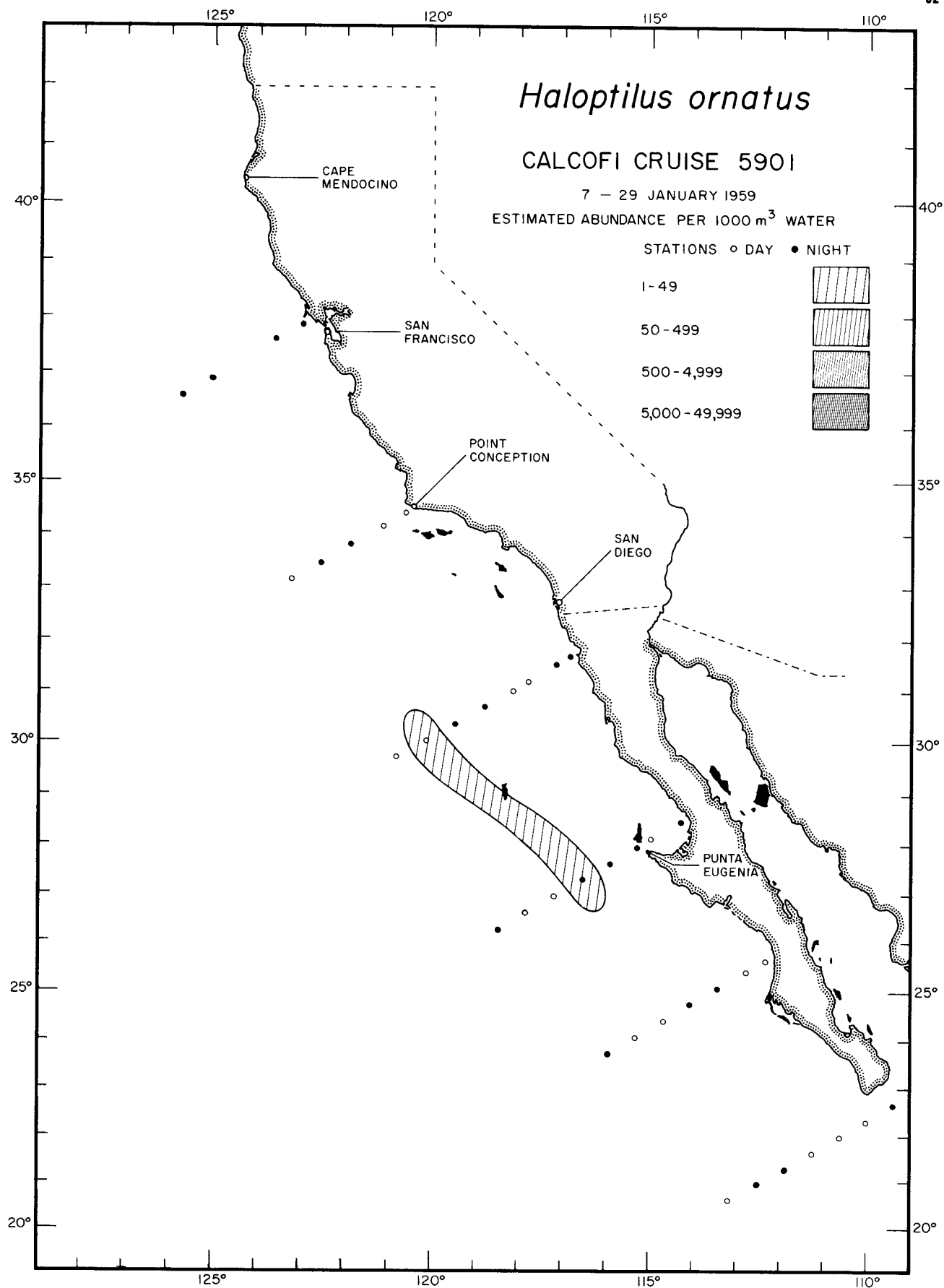
Haloptilus ornatus
5807



Calanoida

Haloptilus ornatus

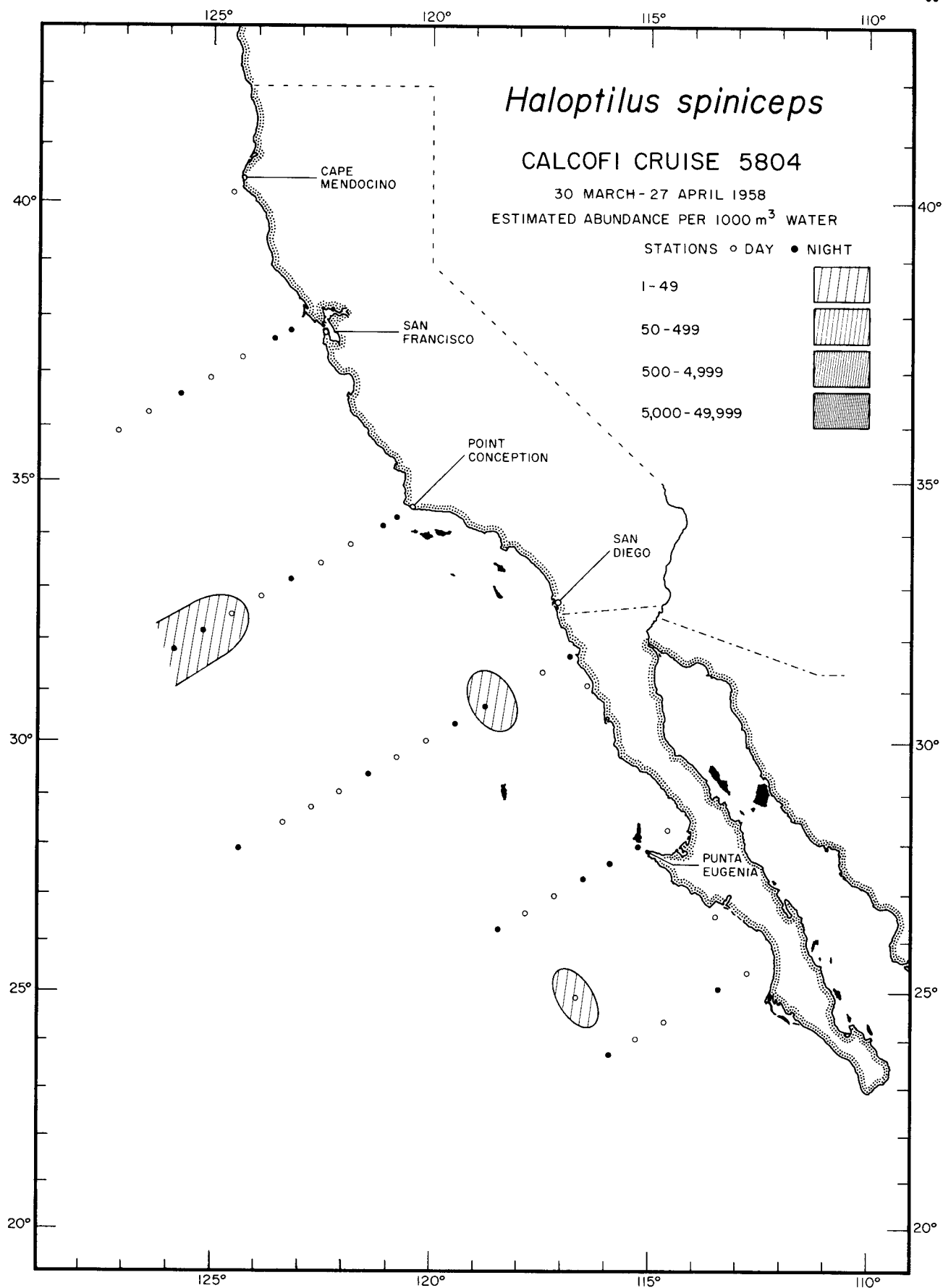
5810



Calanoida

Haloptilus ornatus

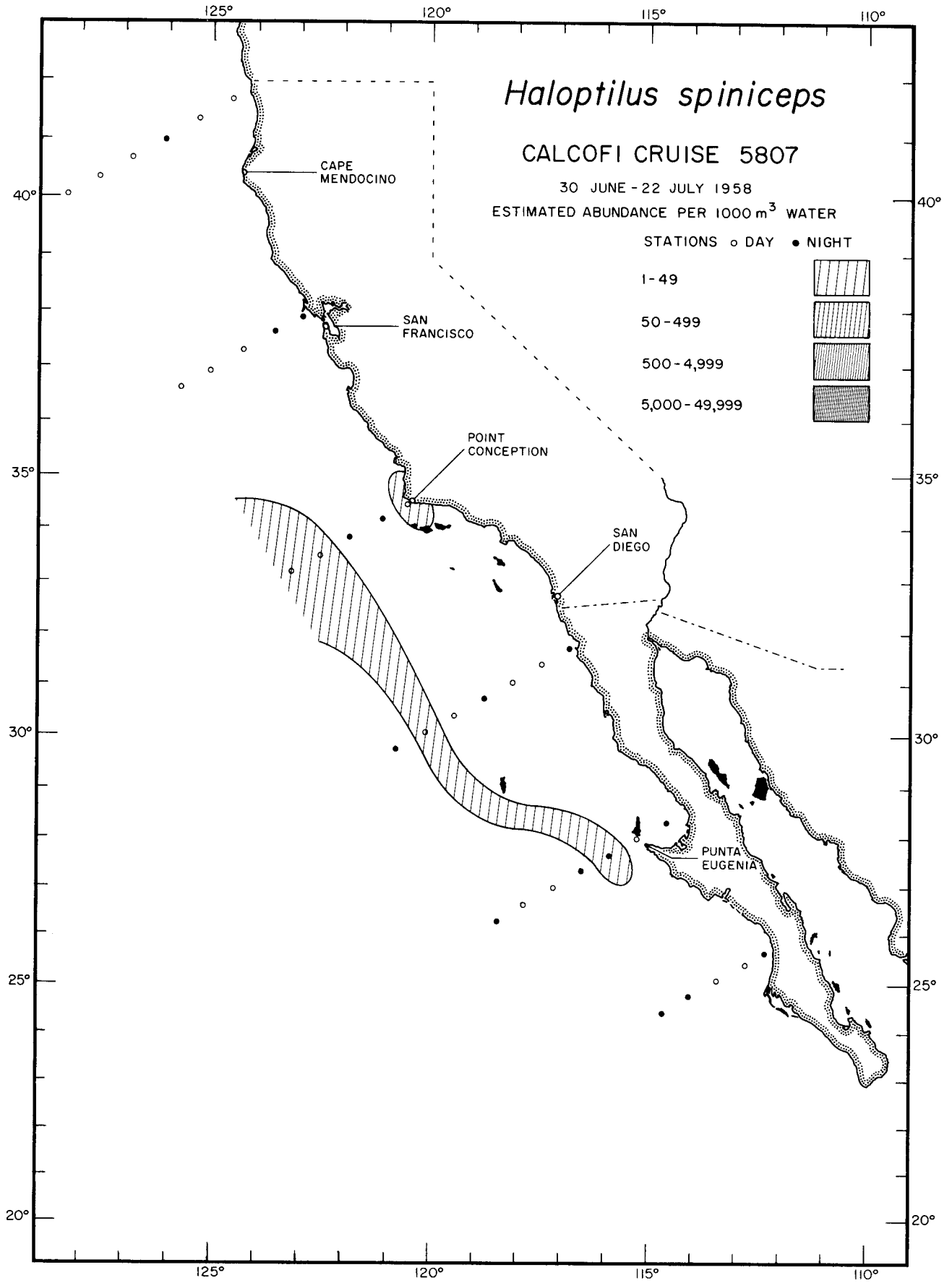
5901



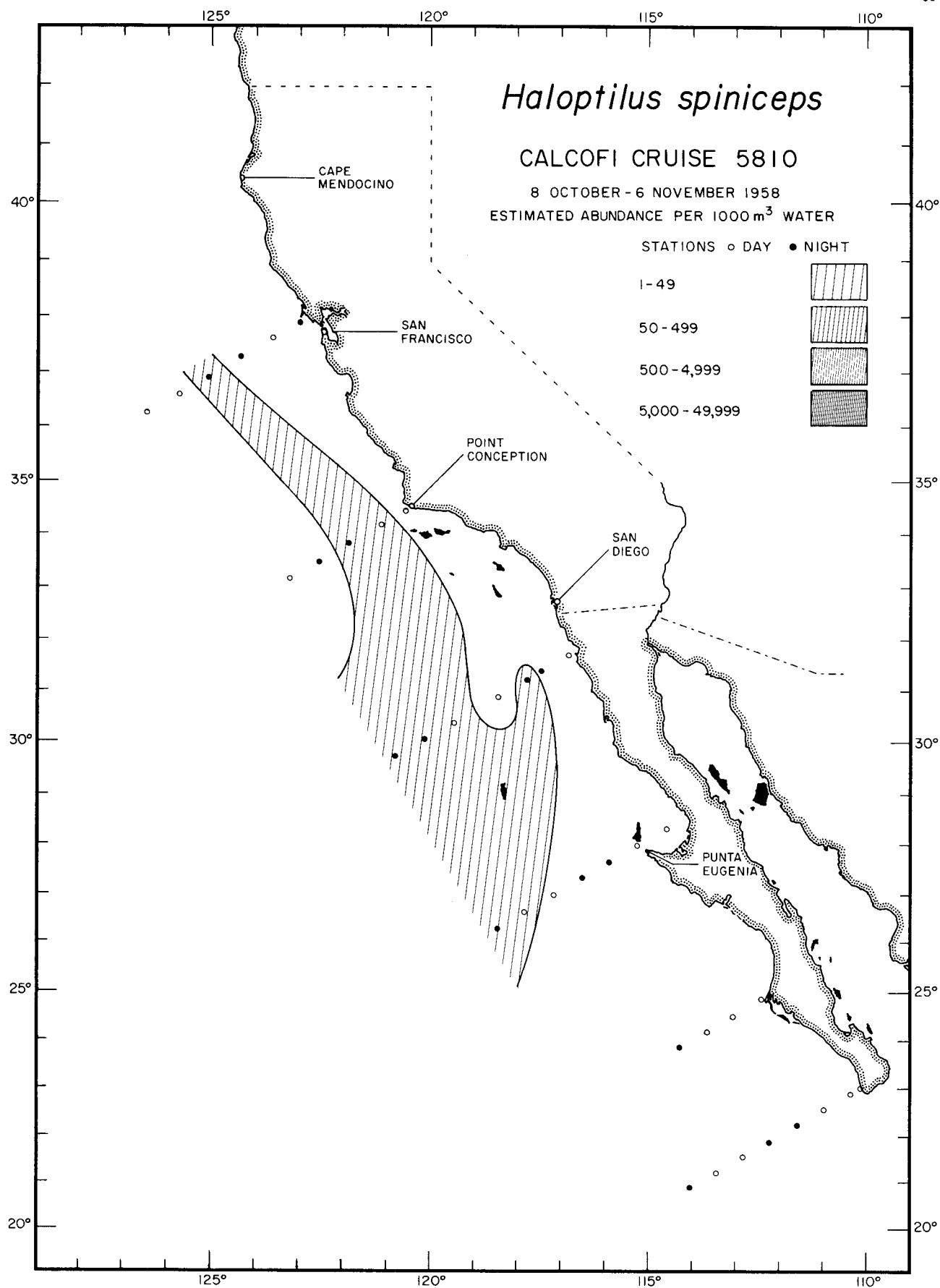
Calanoida

Haloptilus spiniceps

5804



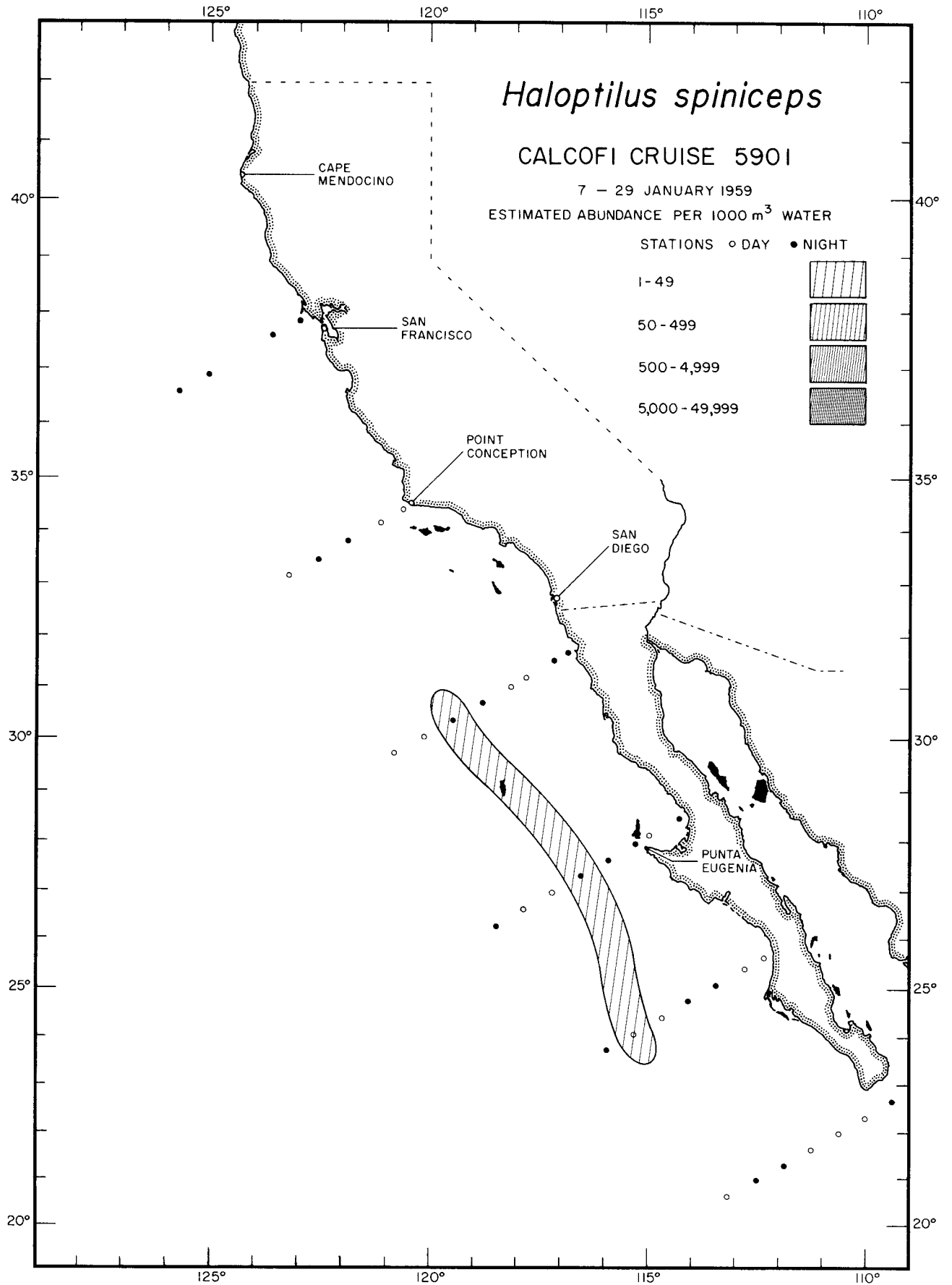
Calanoida
Haloptilus spiniceps
5807



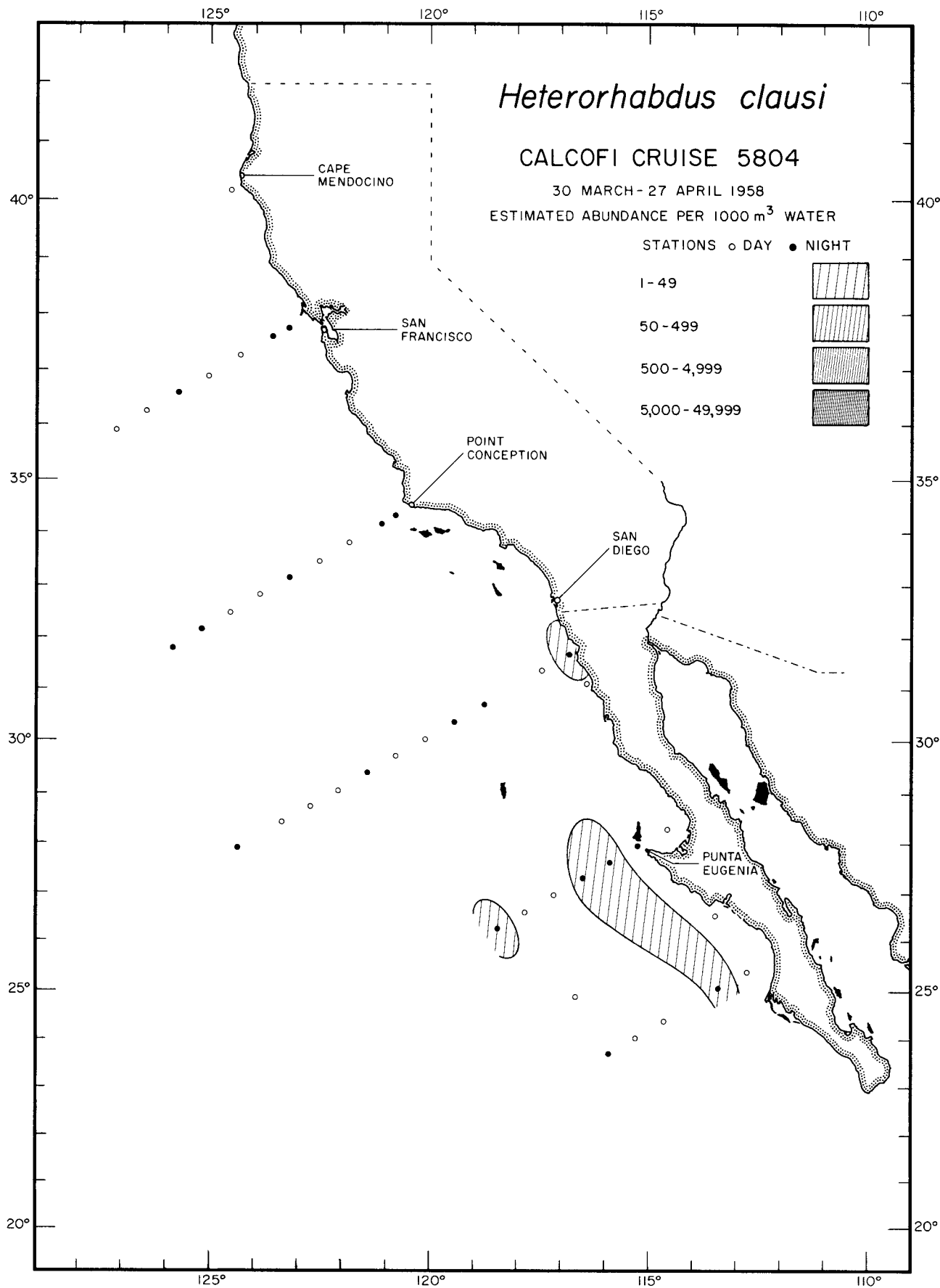
Calanoida

Haloptilus spiniceps

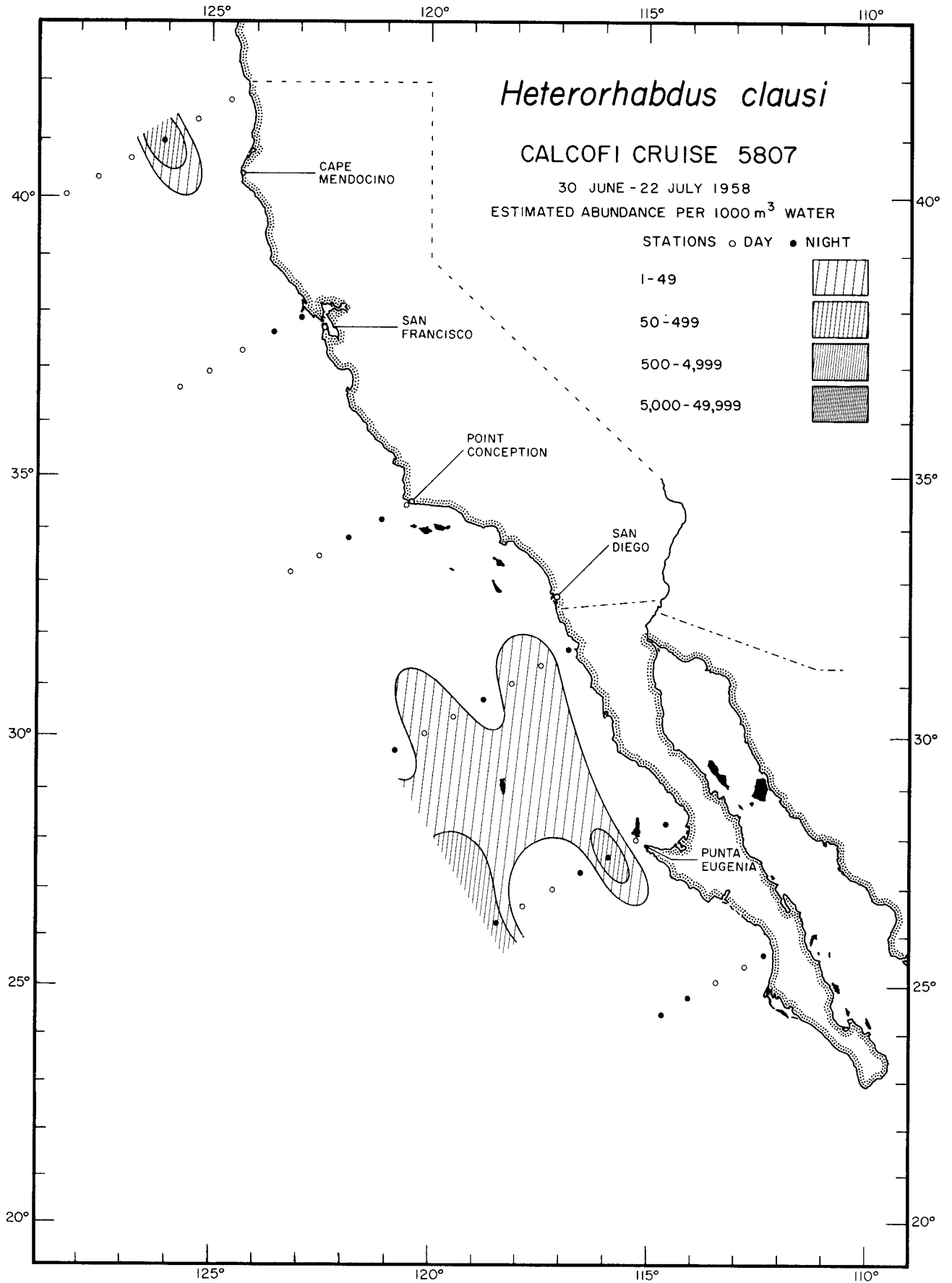
5810



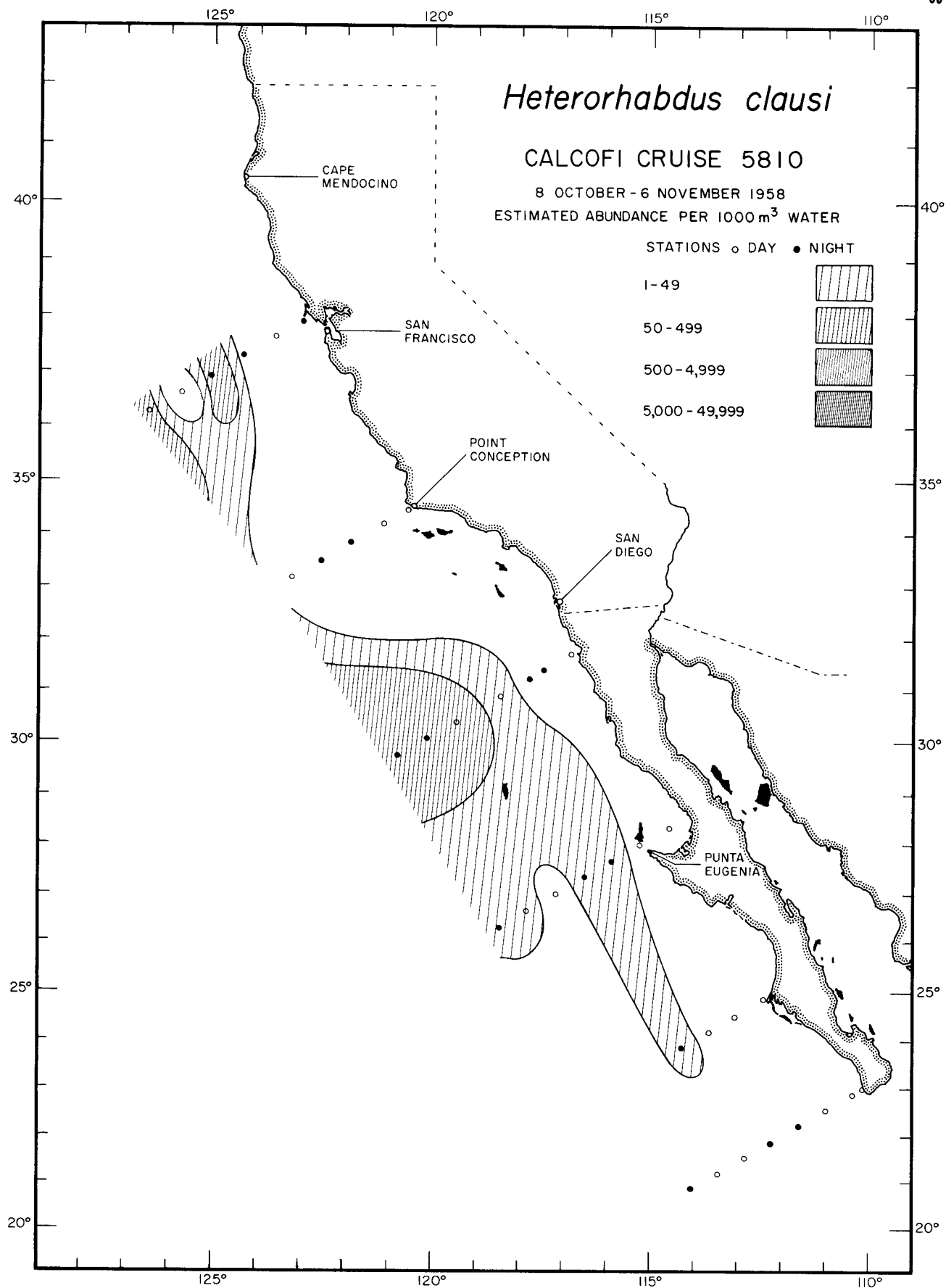
Calanoida
Haloptilus spiniceps
5901



Calanoida
Heterorhabdus clausi
 5804



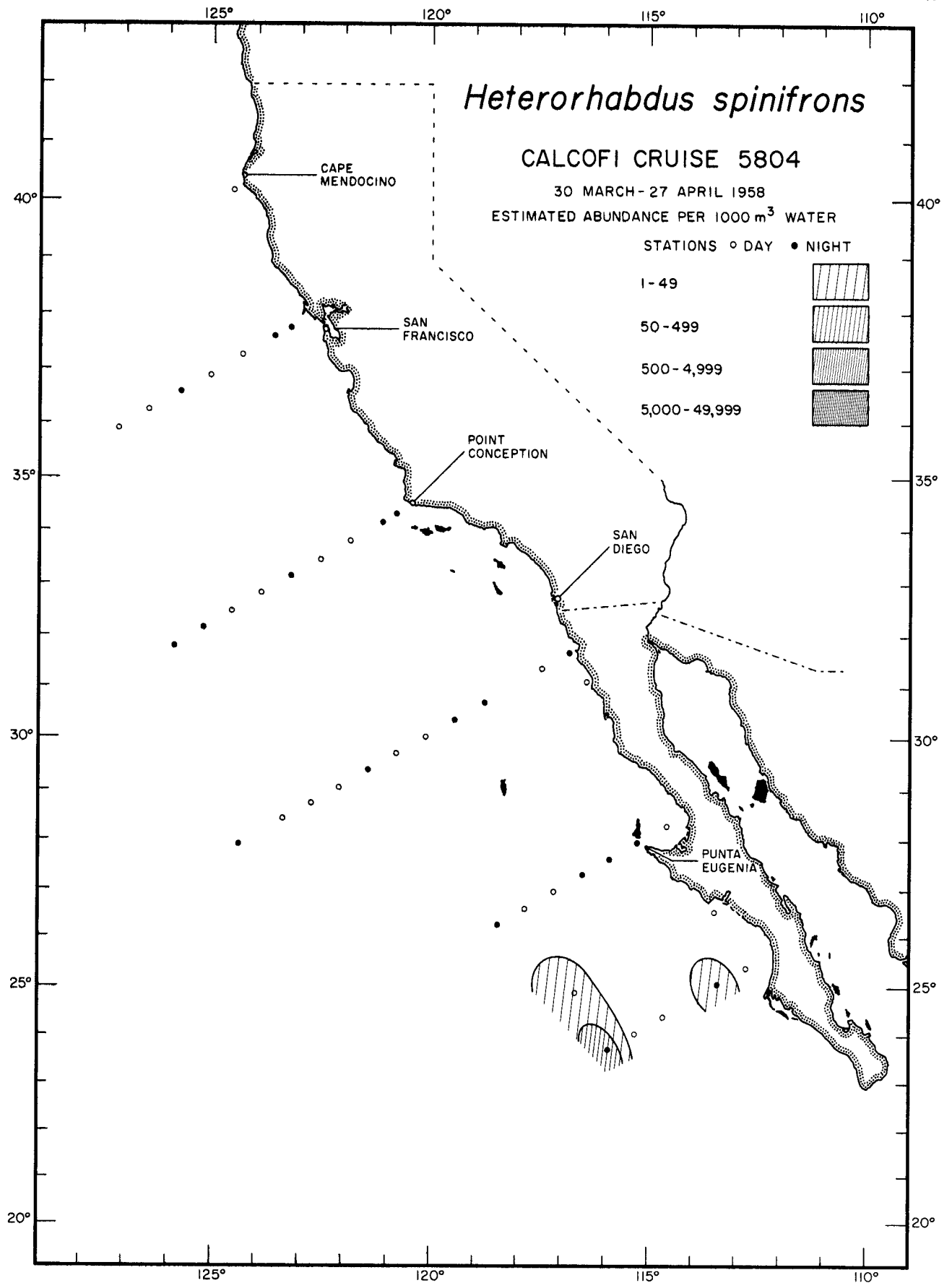
Calanoida
Heterorhabdus clausi
5807



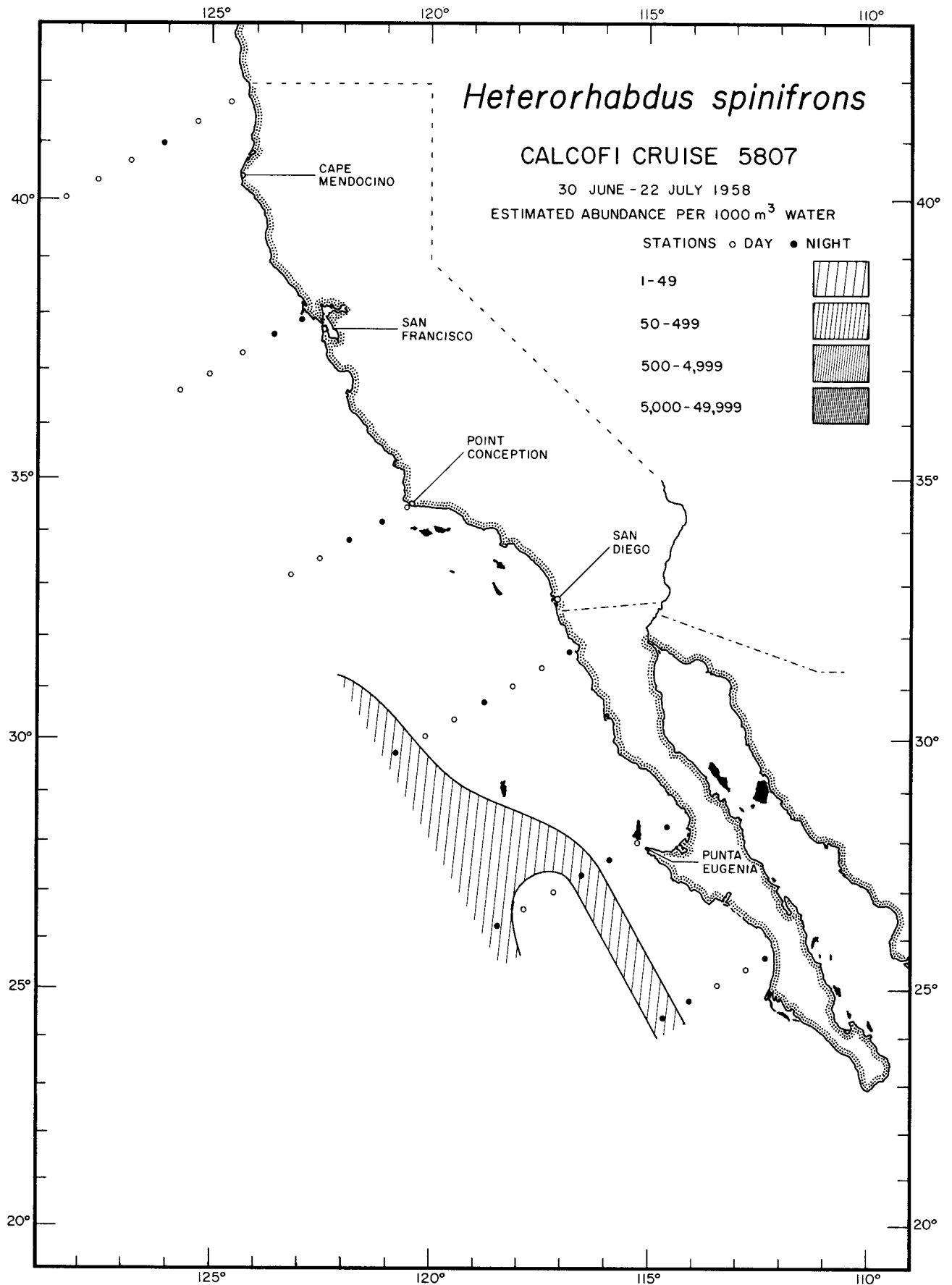
Calanoida

Heterorhabdus clausi

5810



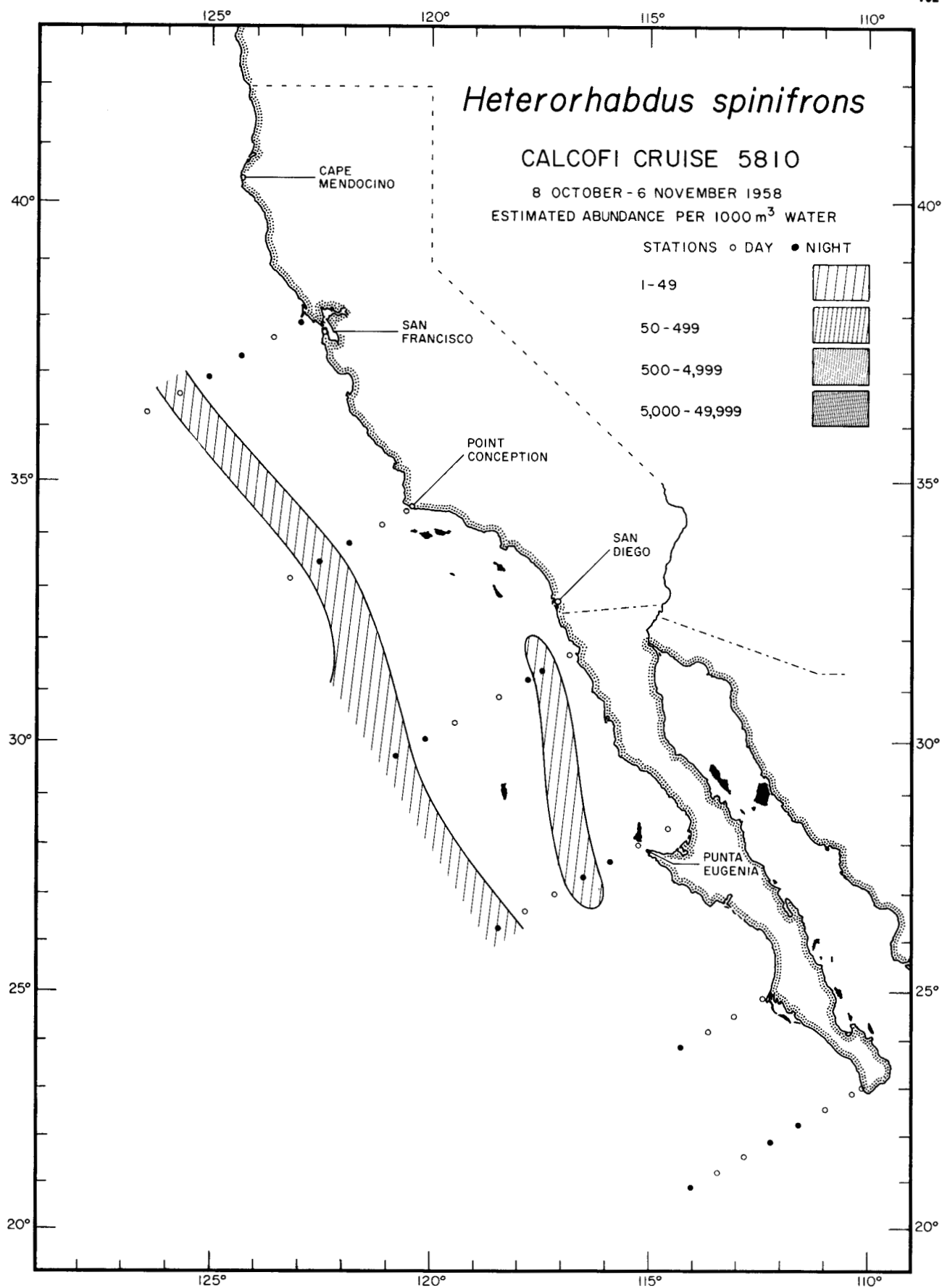
Calanoida
Heterorhabdus spinifrons
 5804



Calanoida

Heterorhabdus spinifrons

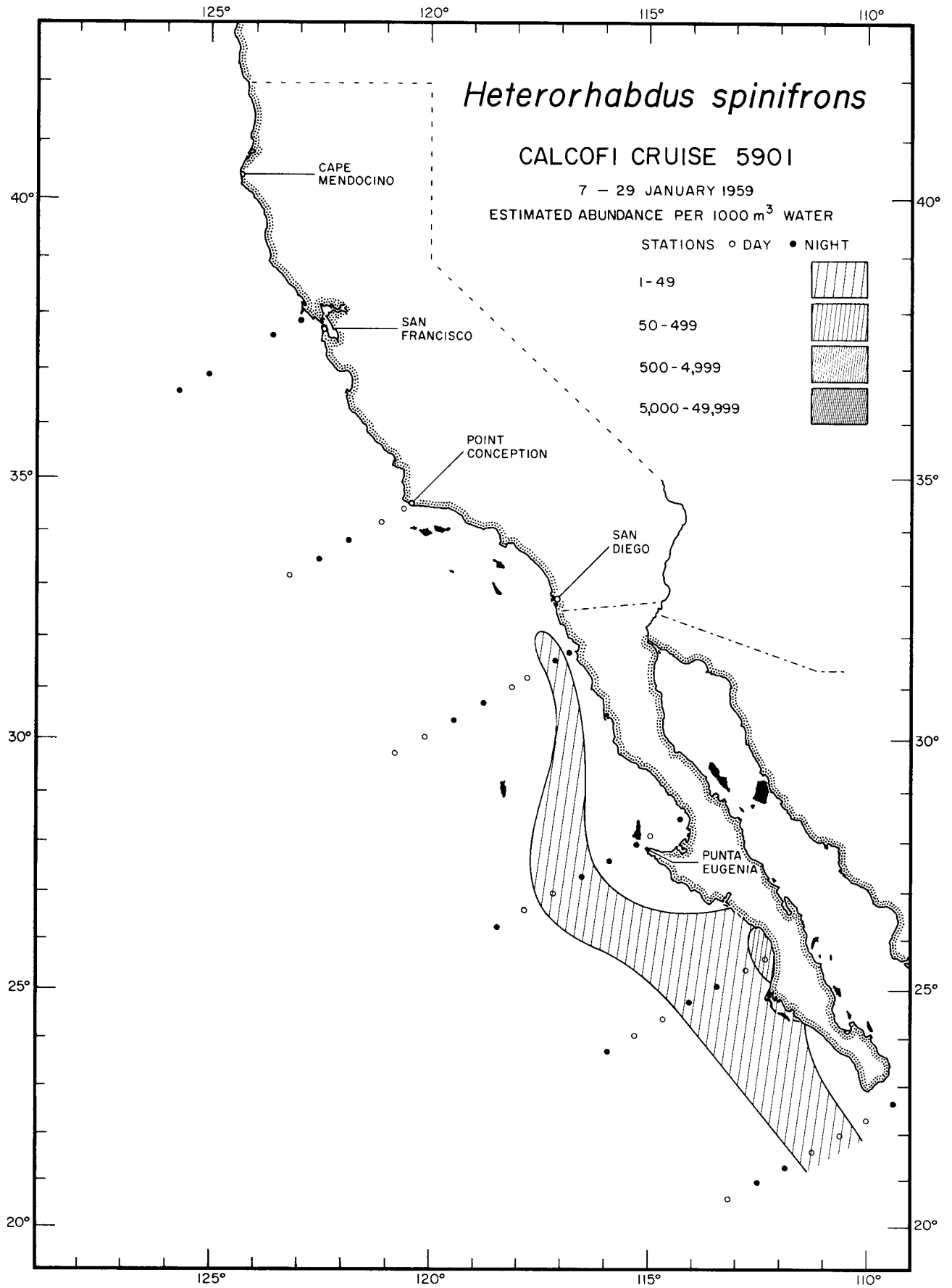
5807



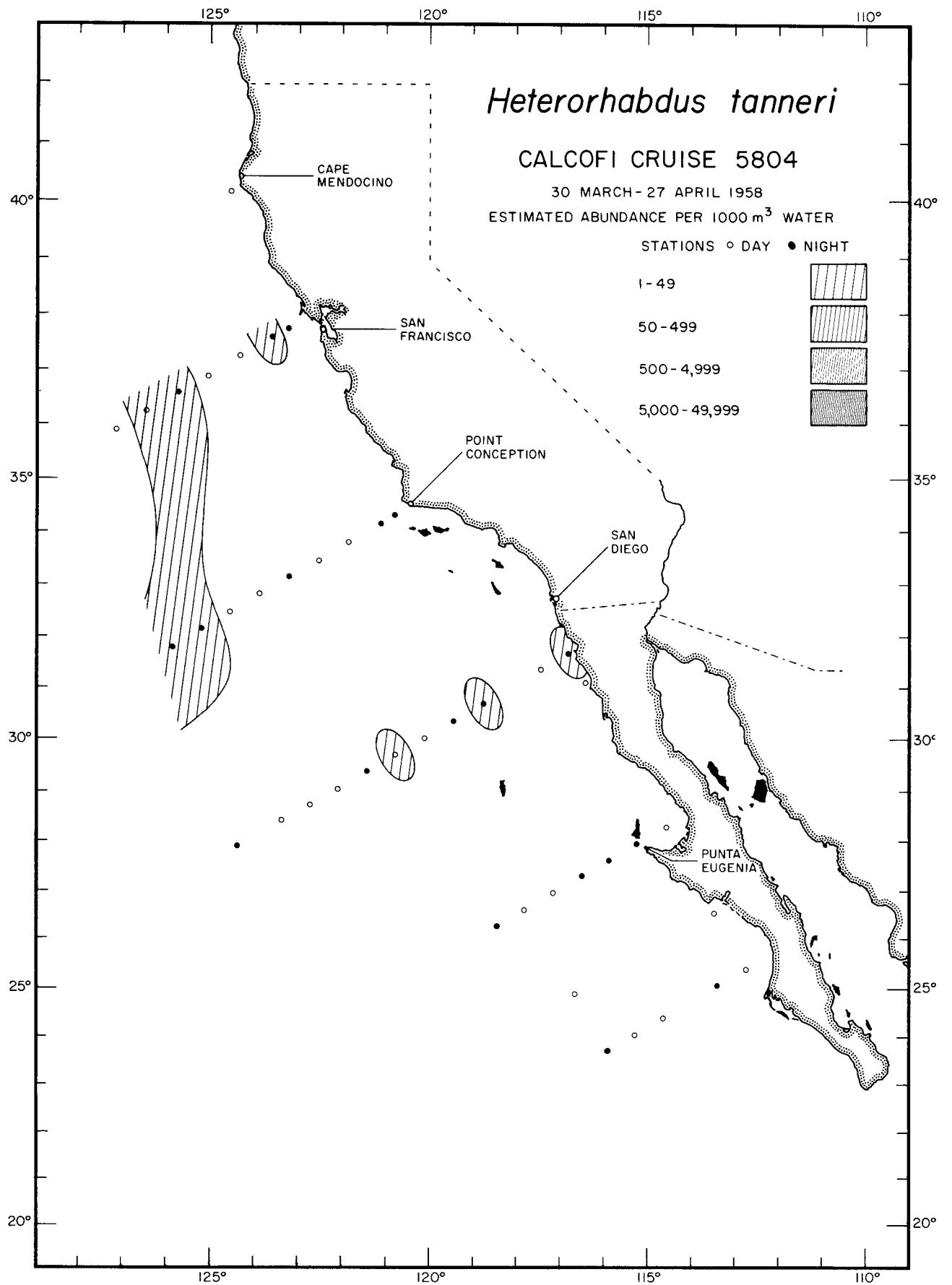
Calanoida

Heterorhabdus spinifrons

5810

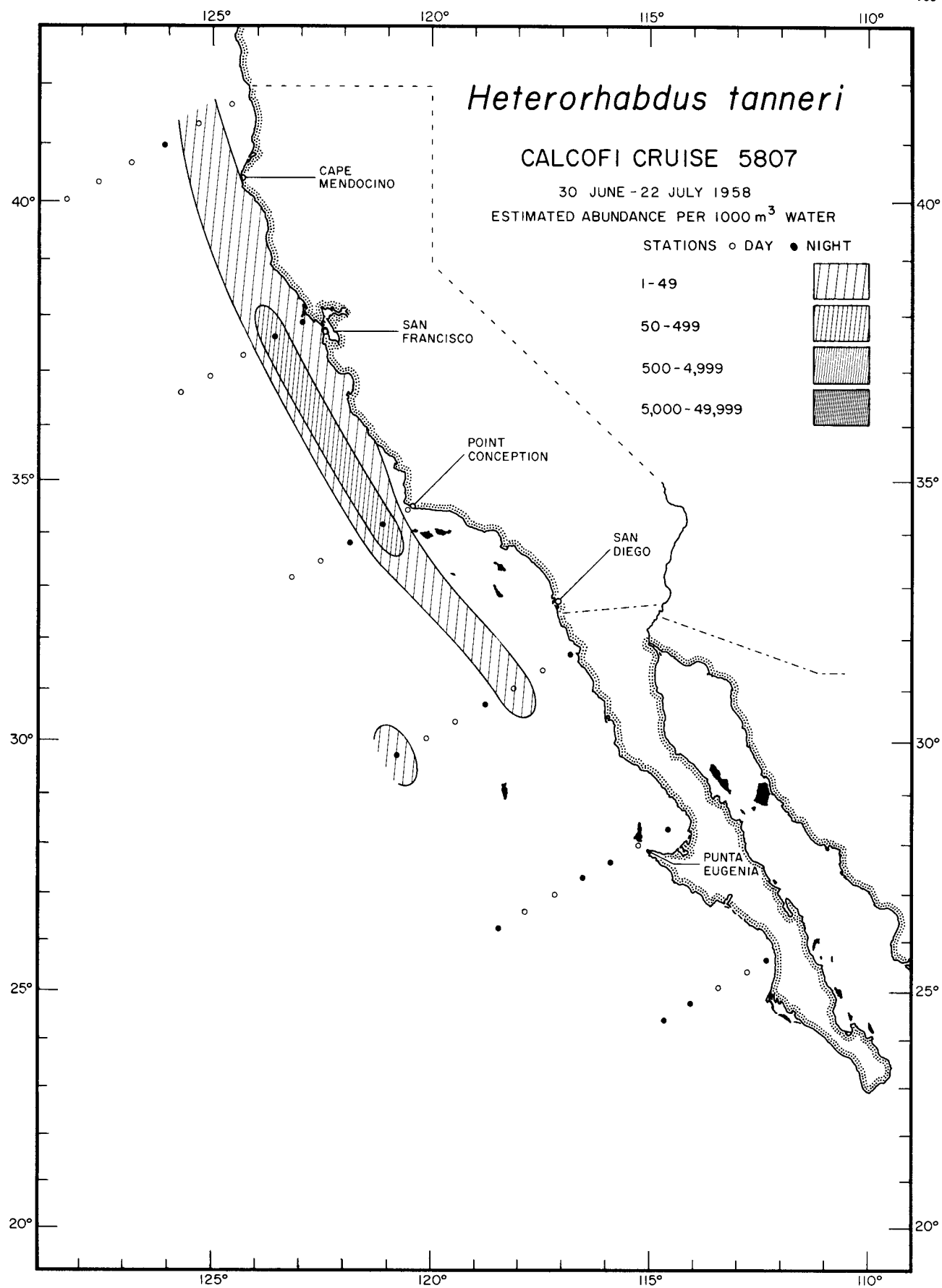


Calanoida
Heterorhabdus spinifrons
5901



Calanoida

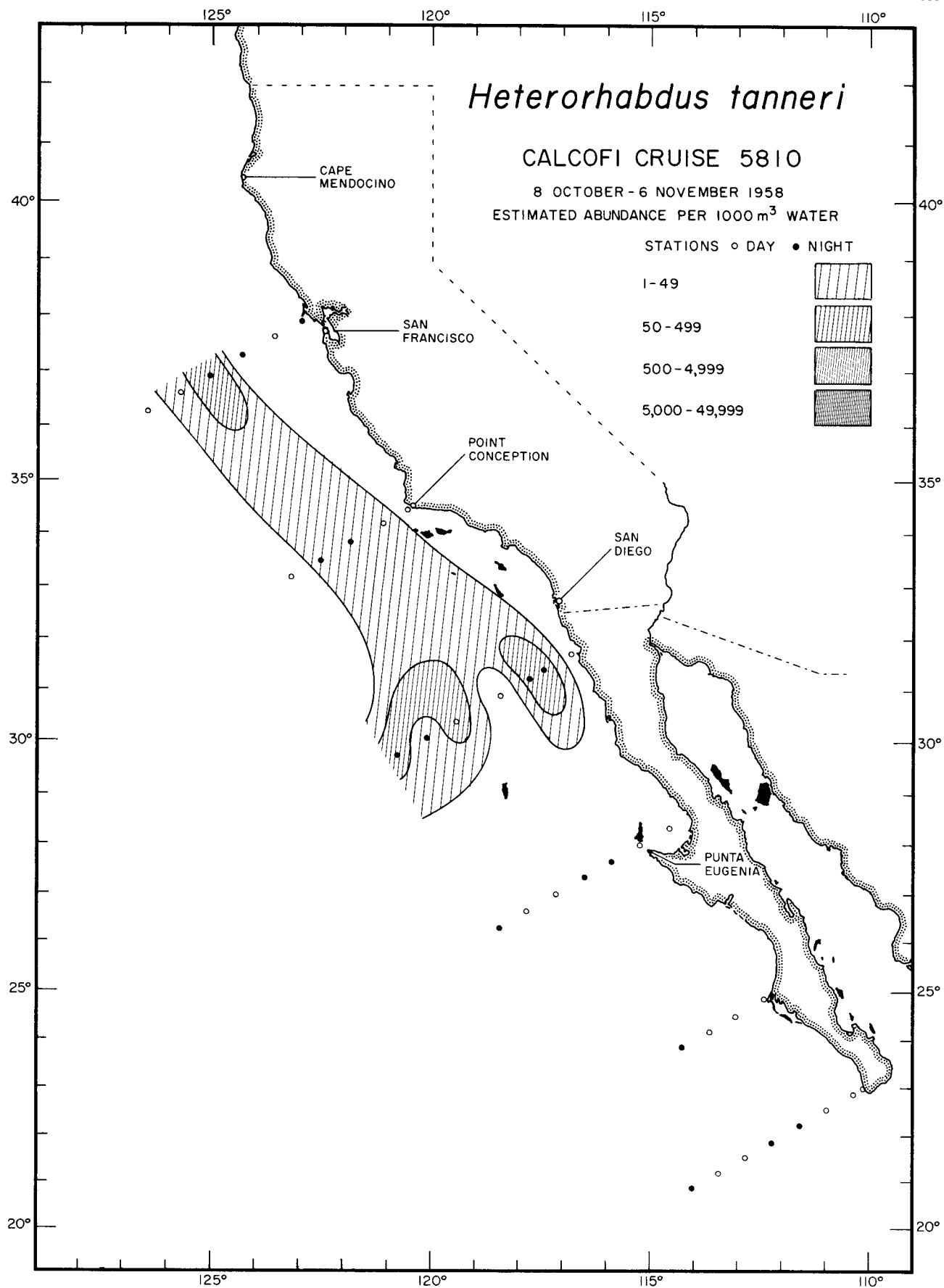
Heterorhabdus tanneri
 5804



Calanoida

Heterorhabdus tanneri

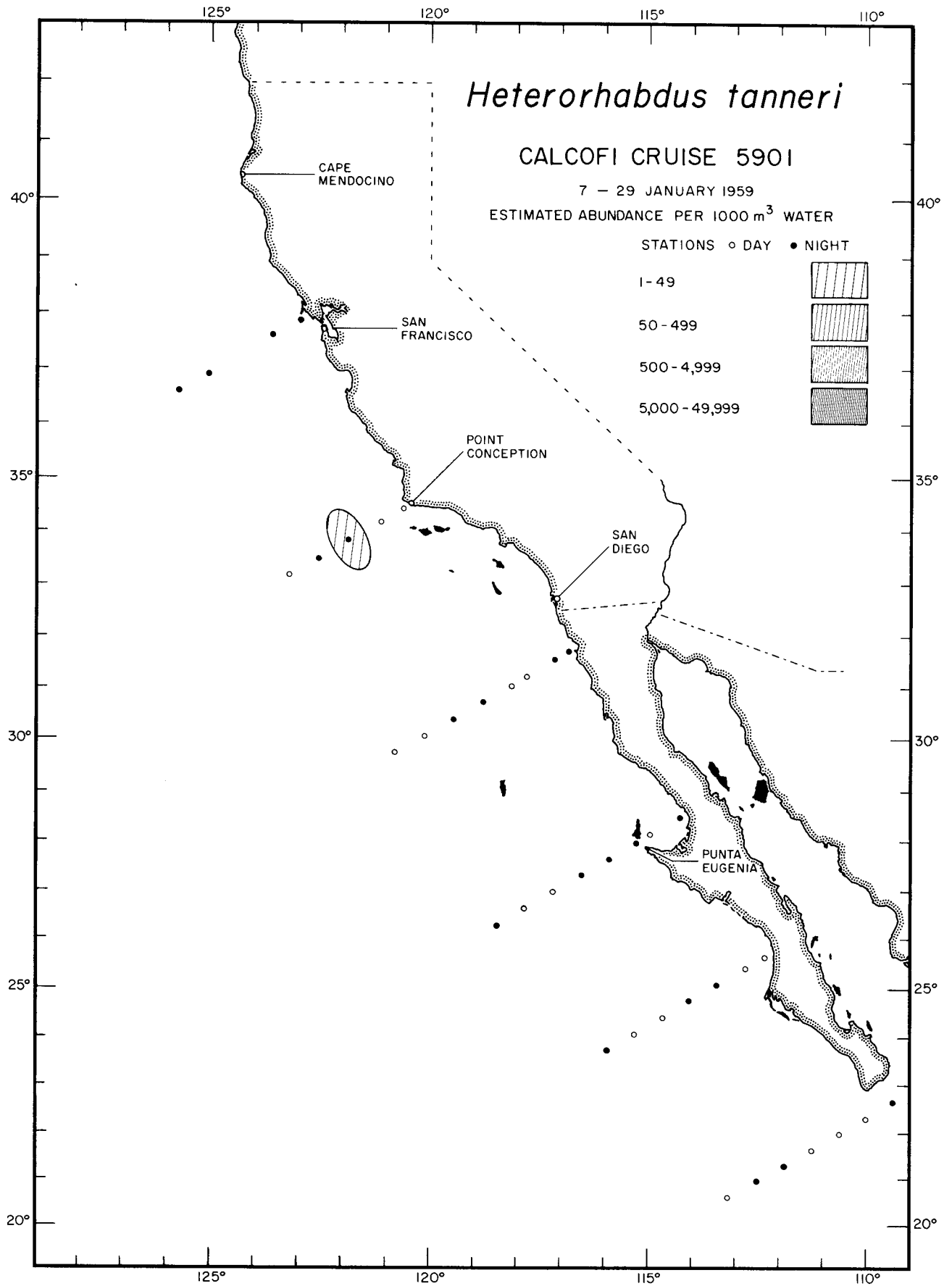
5807



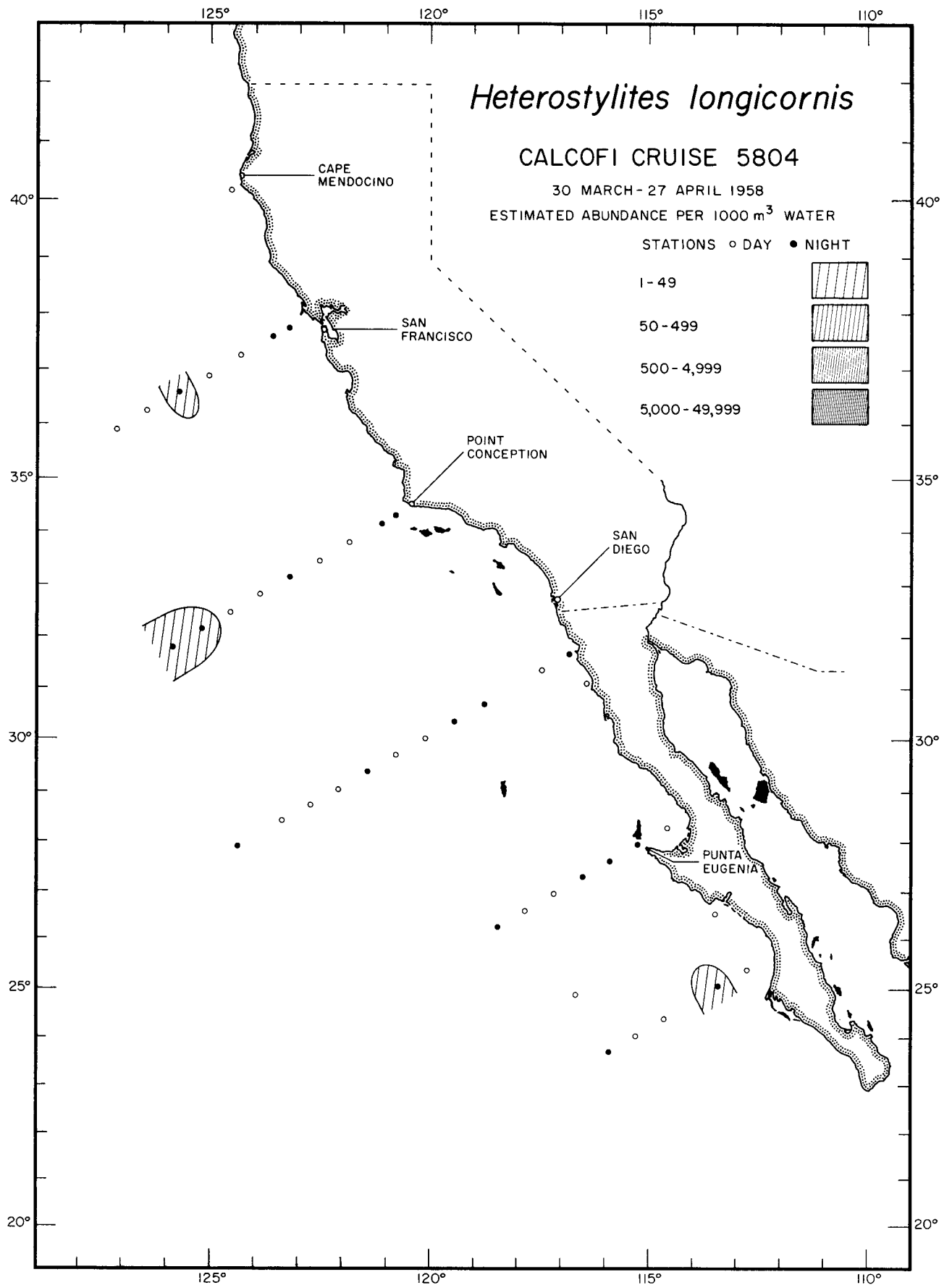
Calanoida

Heterorhabdus tanneri

5810



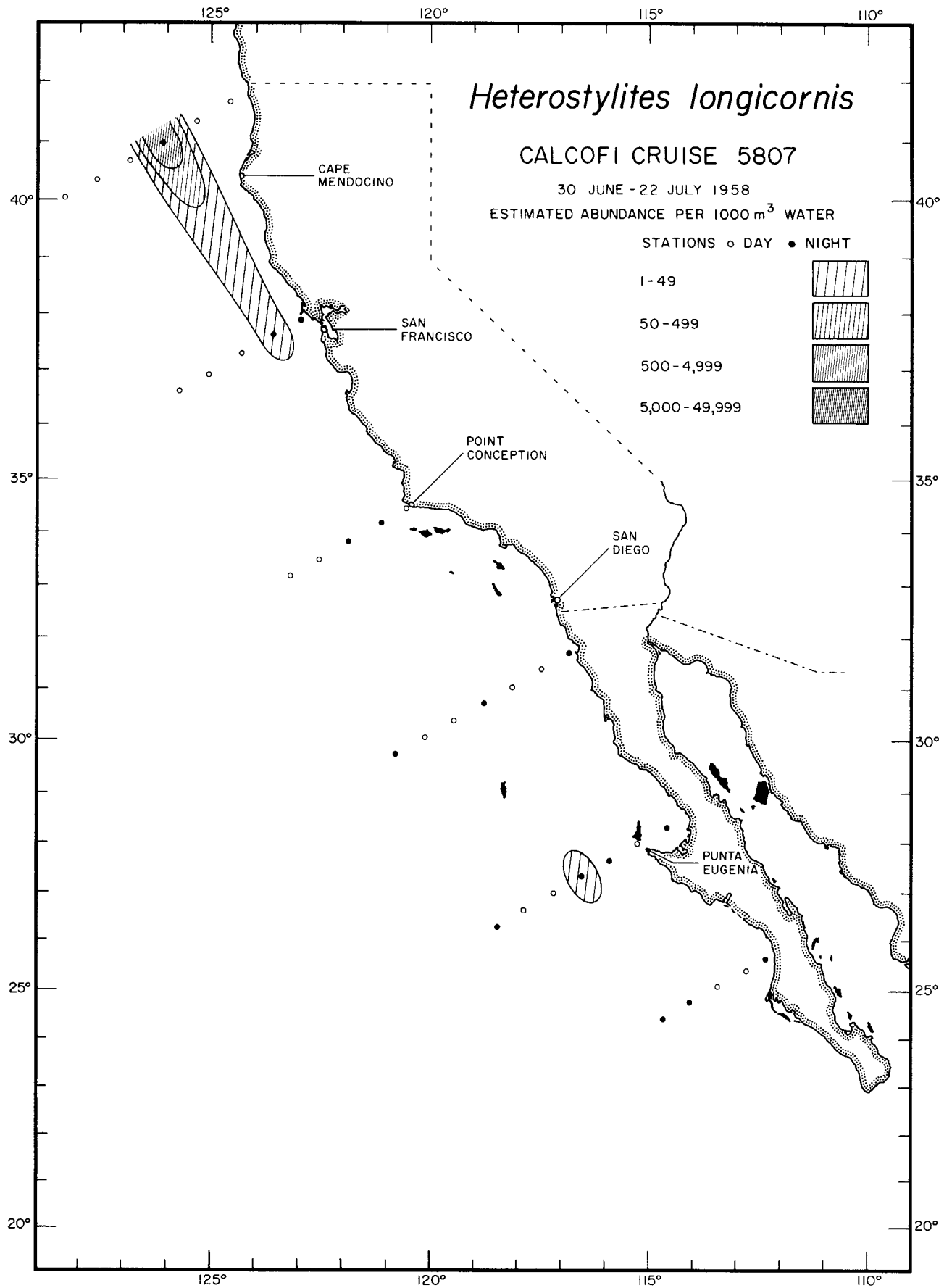
Calanoida
Heterorhabdus tanneri
 5901



Calanoida

Heterostylites longicornis

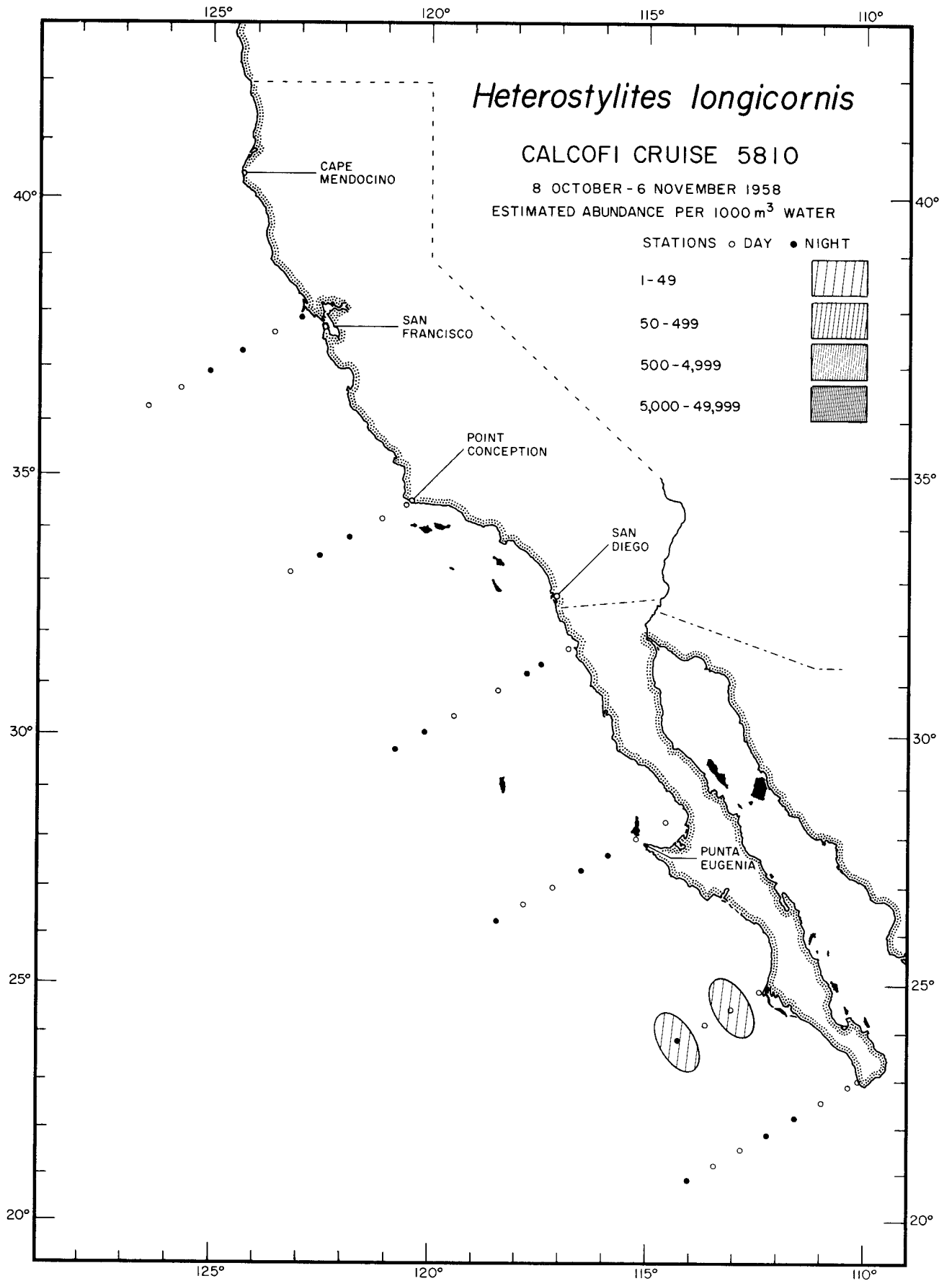
5804



Calanoida

Heterostylites longicornis

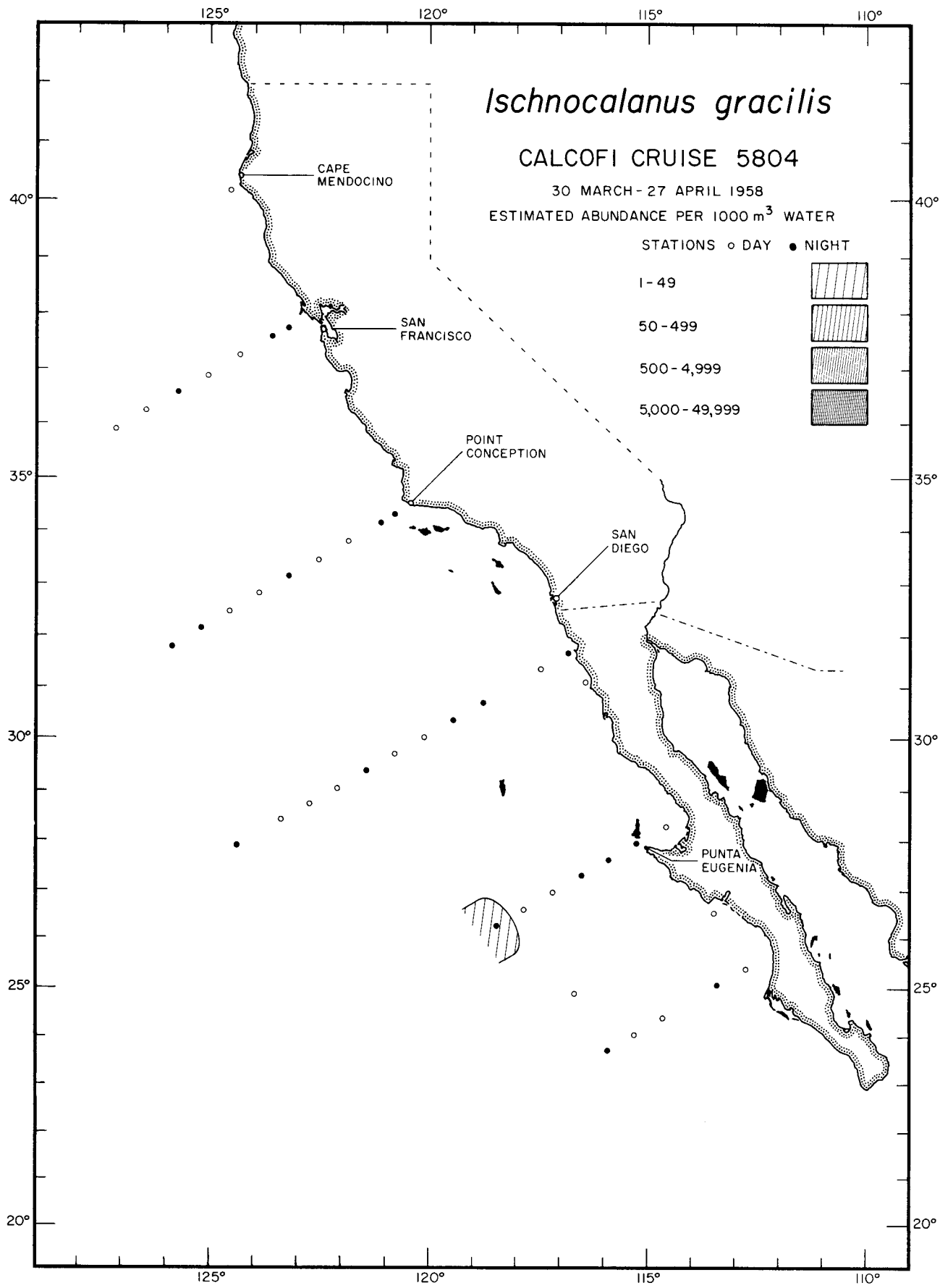
5807



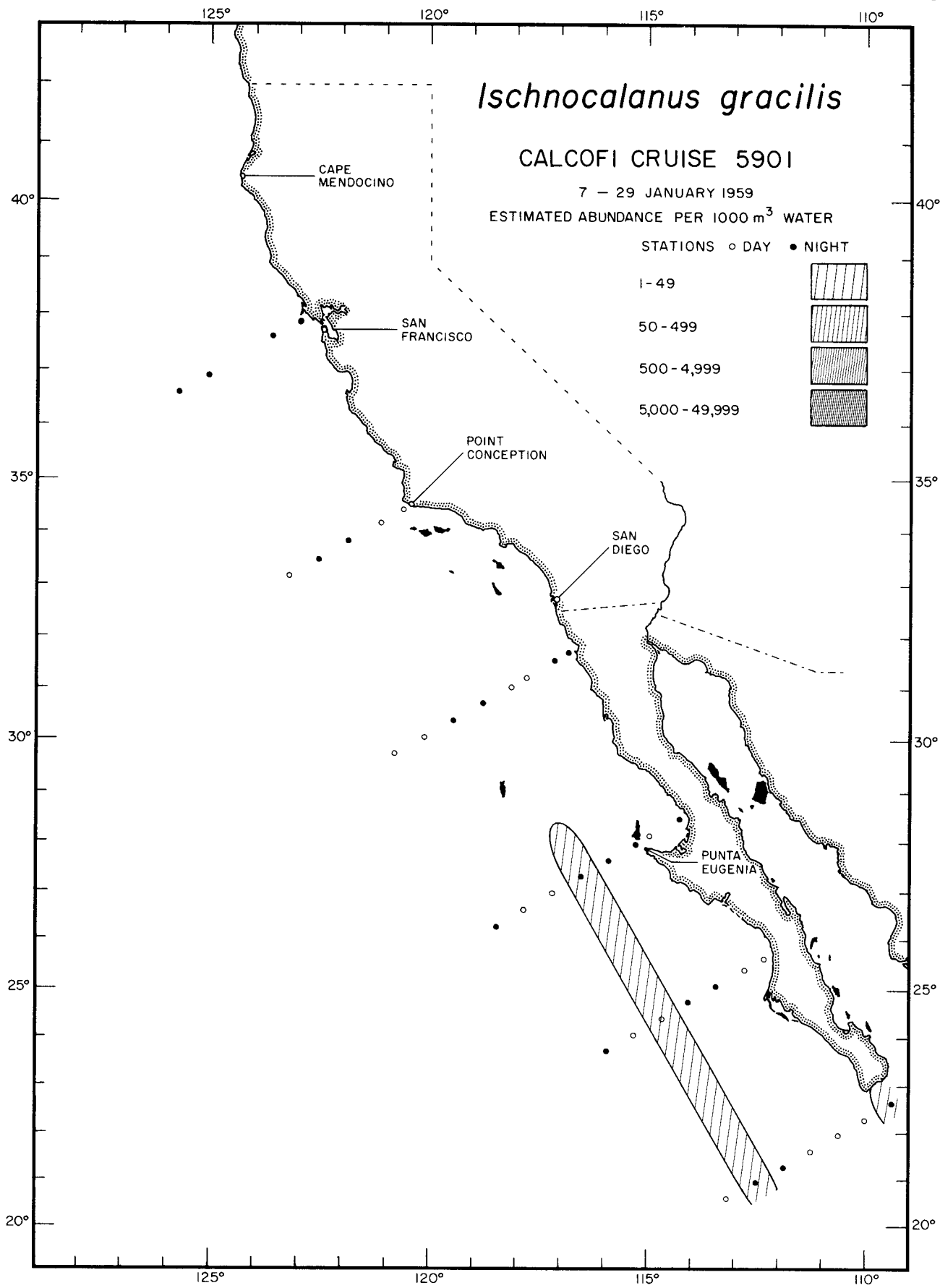
Calanoida

Heterostylites longicornis

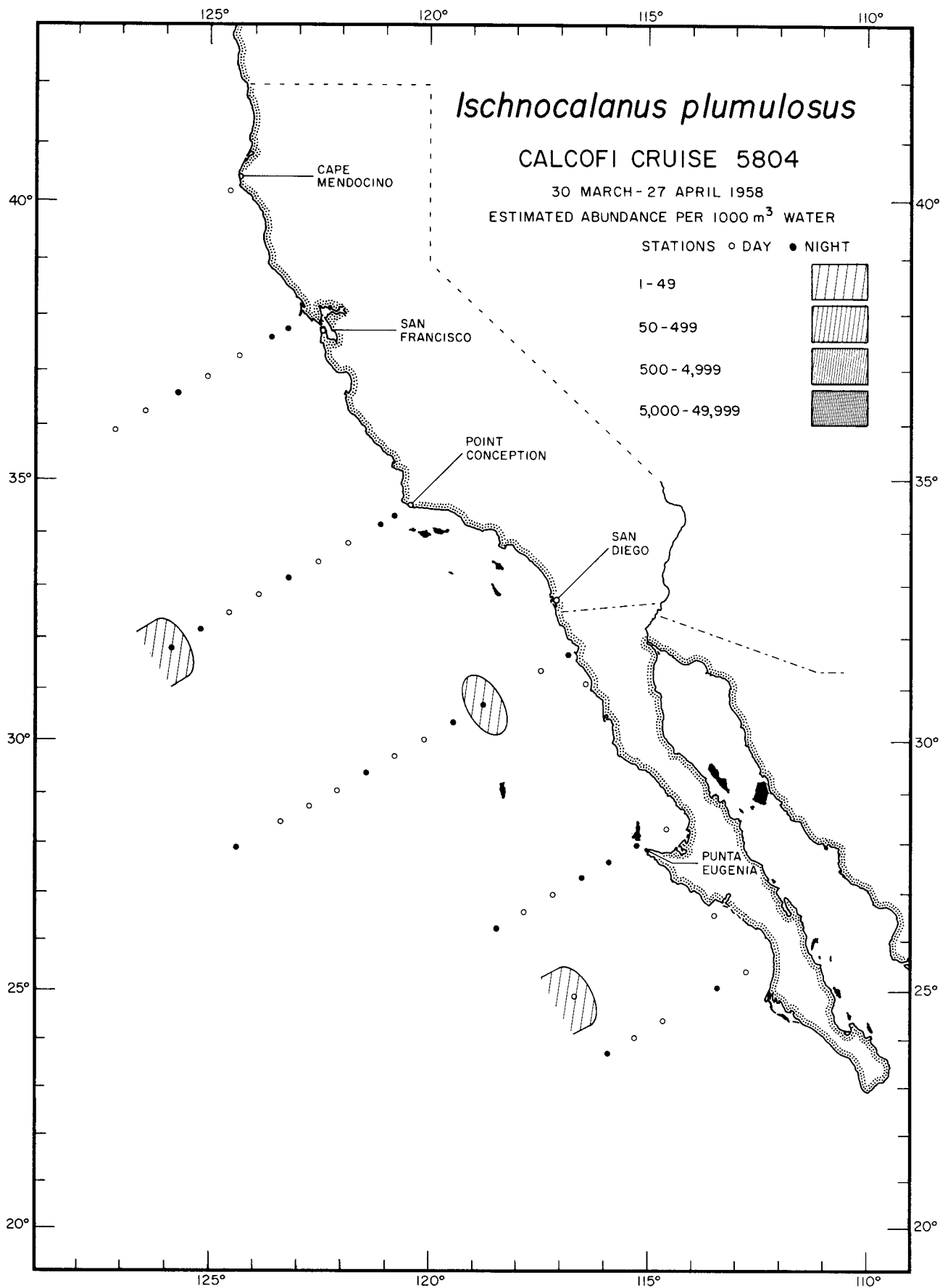
5810



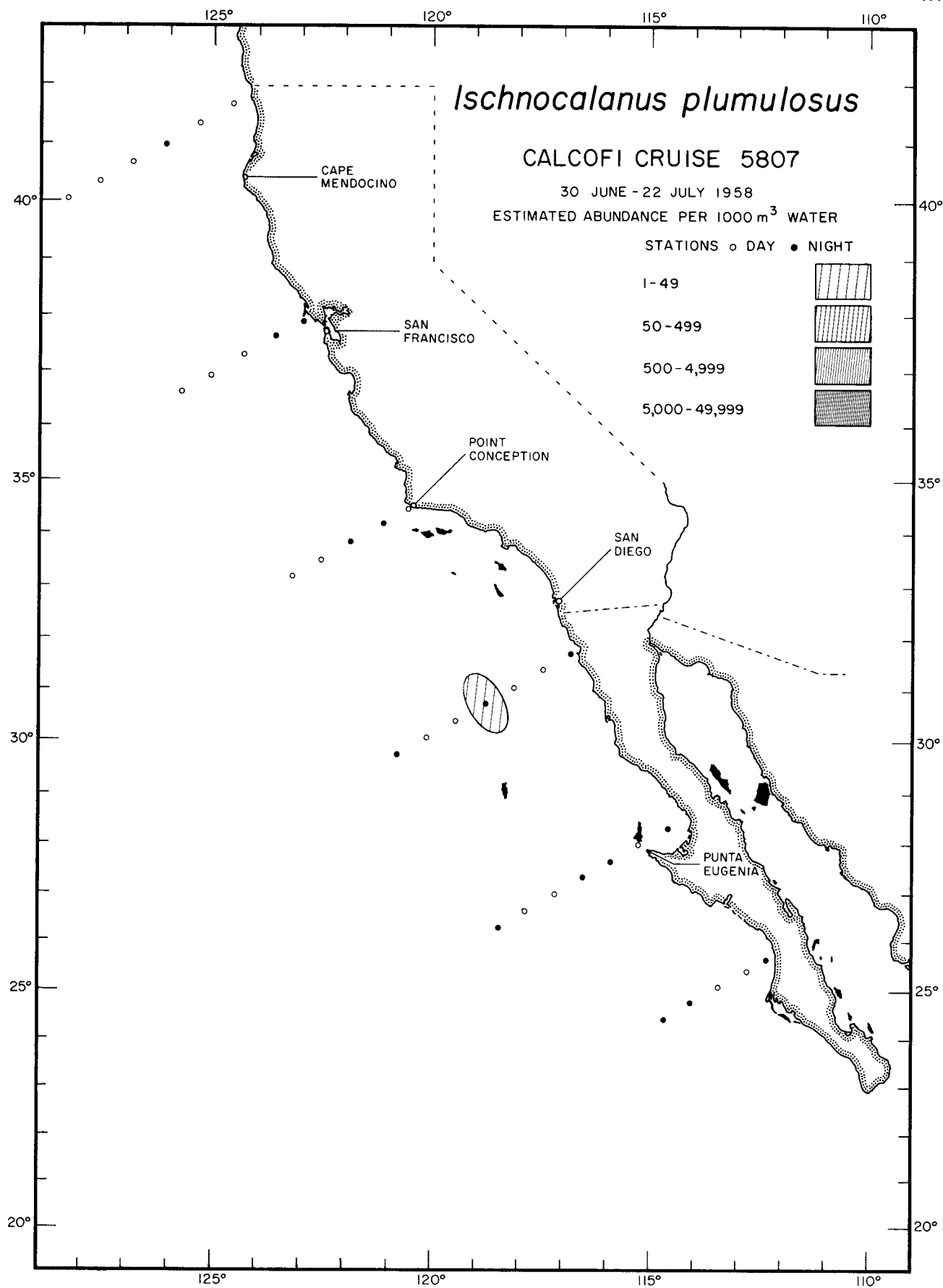
Calanoida
Ischnocalanus gracilis
 5804



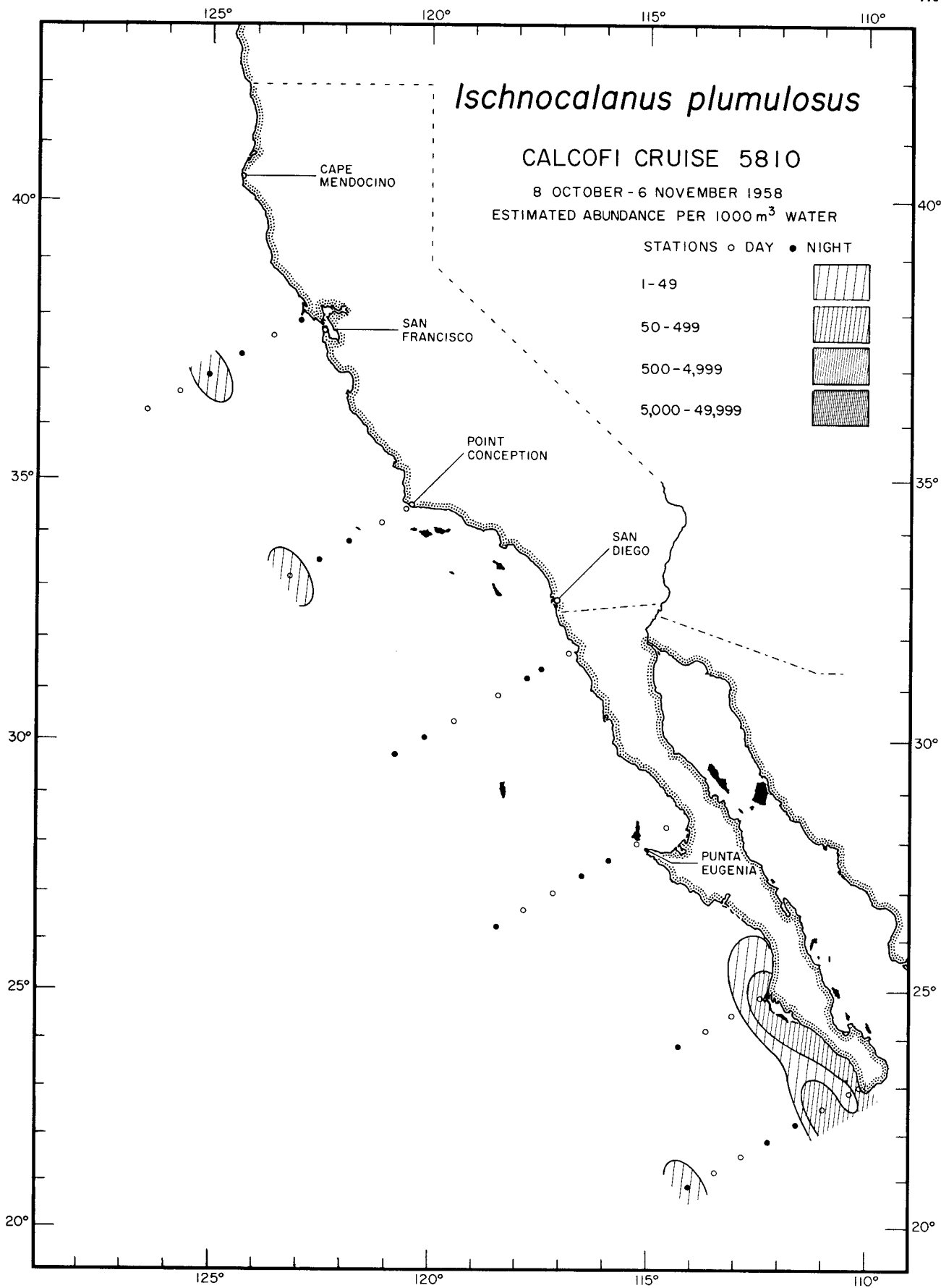
Calanoida
Ischnocalanus gracilis
5901



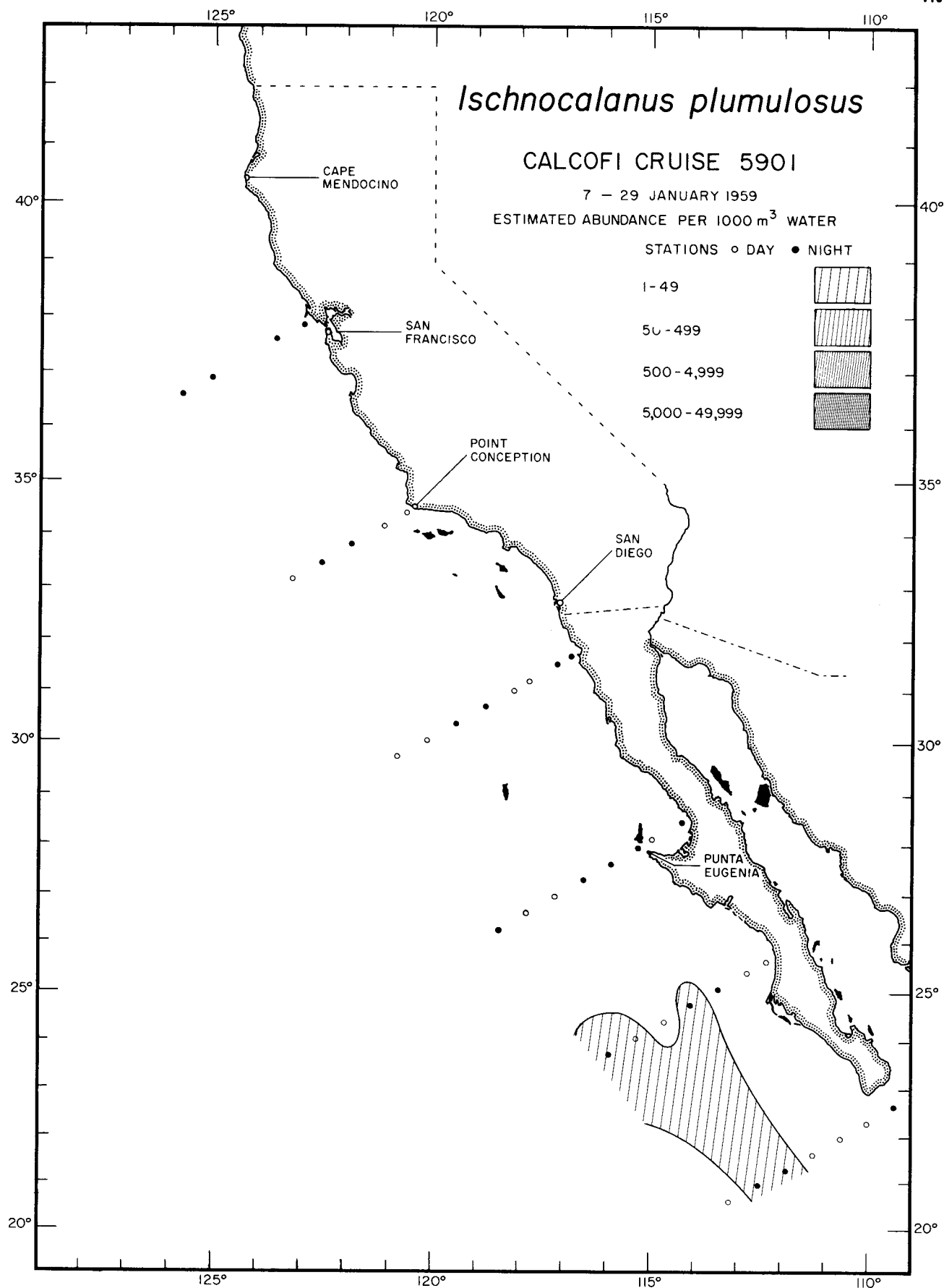
Calanoida
Ischnocalanus plumulosus
 5804



Calanoida
Ischnocalanus plumulosus
5807



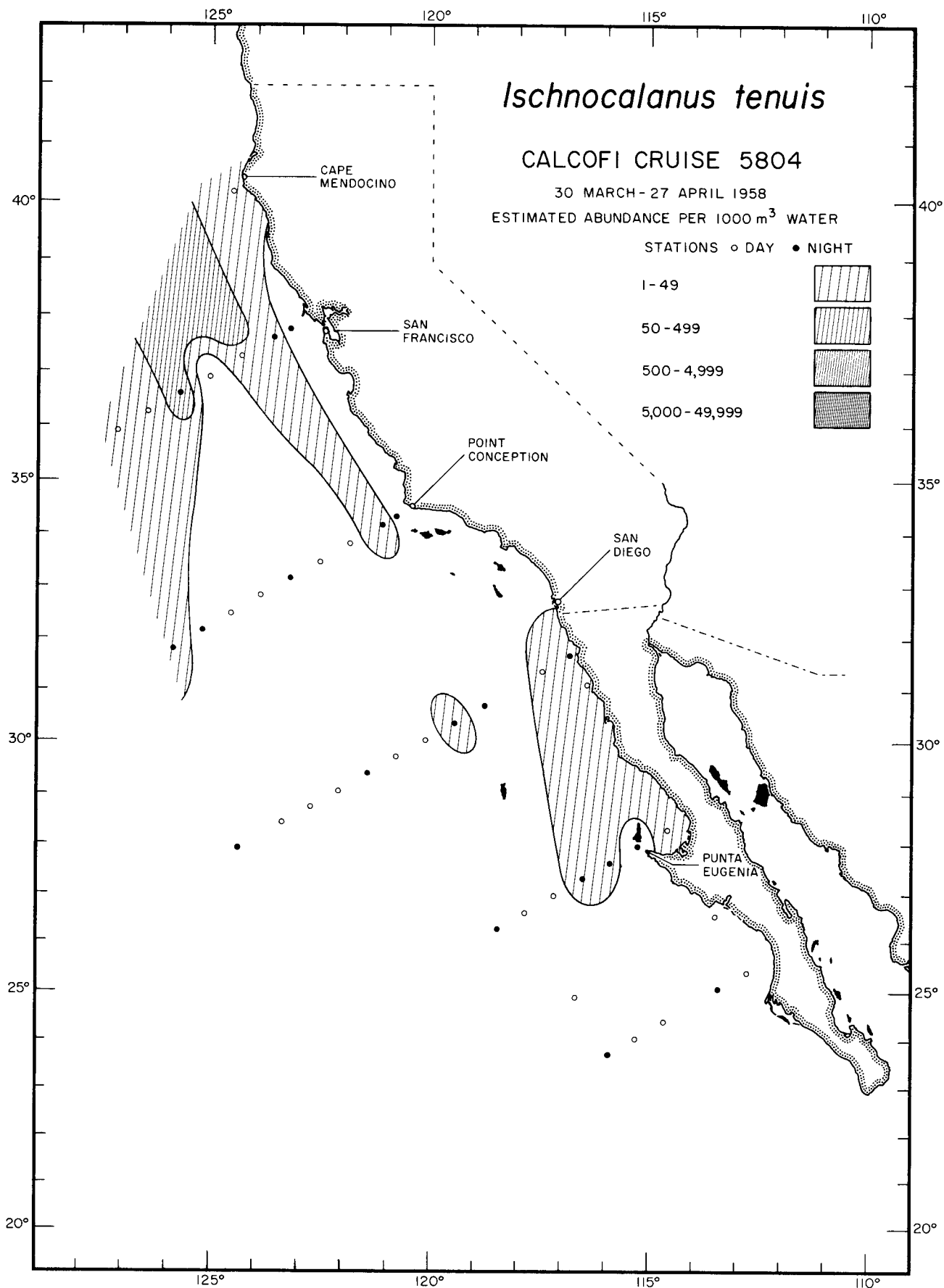
Calanoida
Ischnocalanus plumulosus
5810



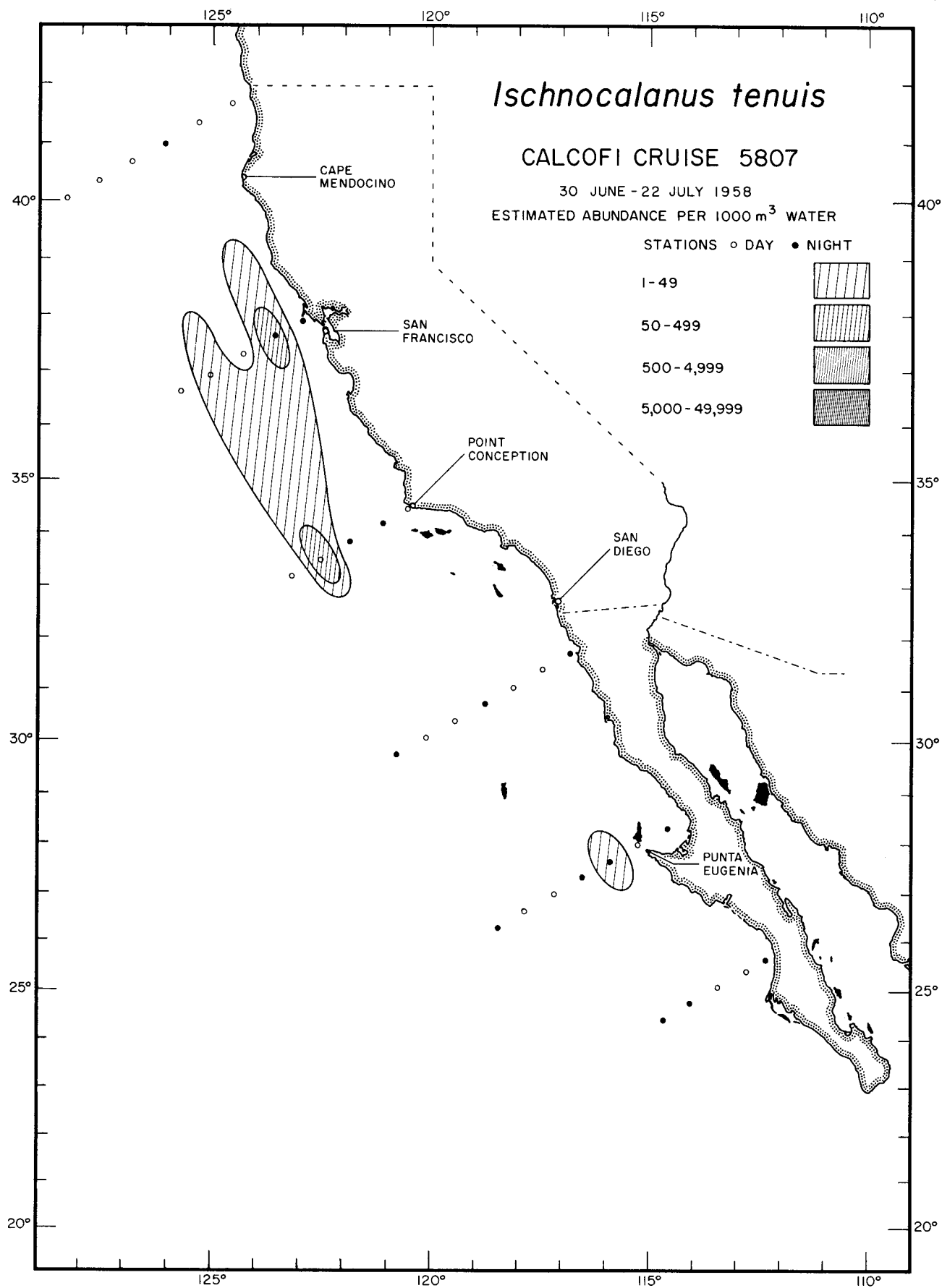
Calanoida

Ischnocalanus plumulosus

5901



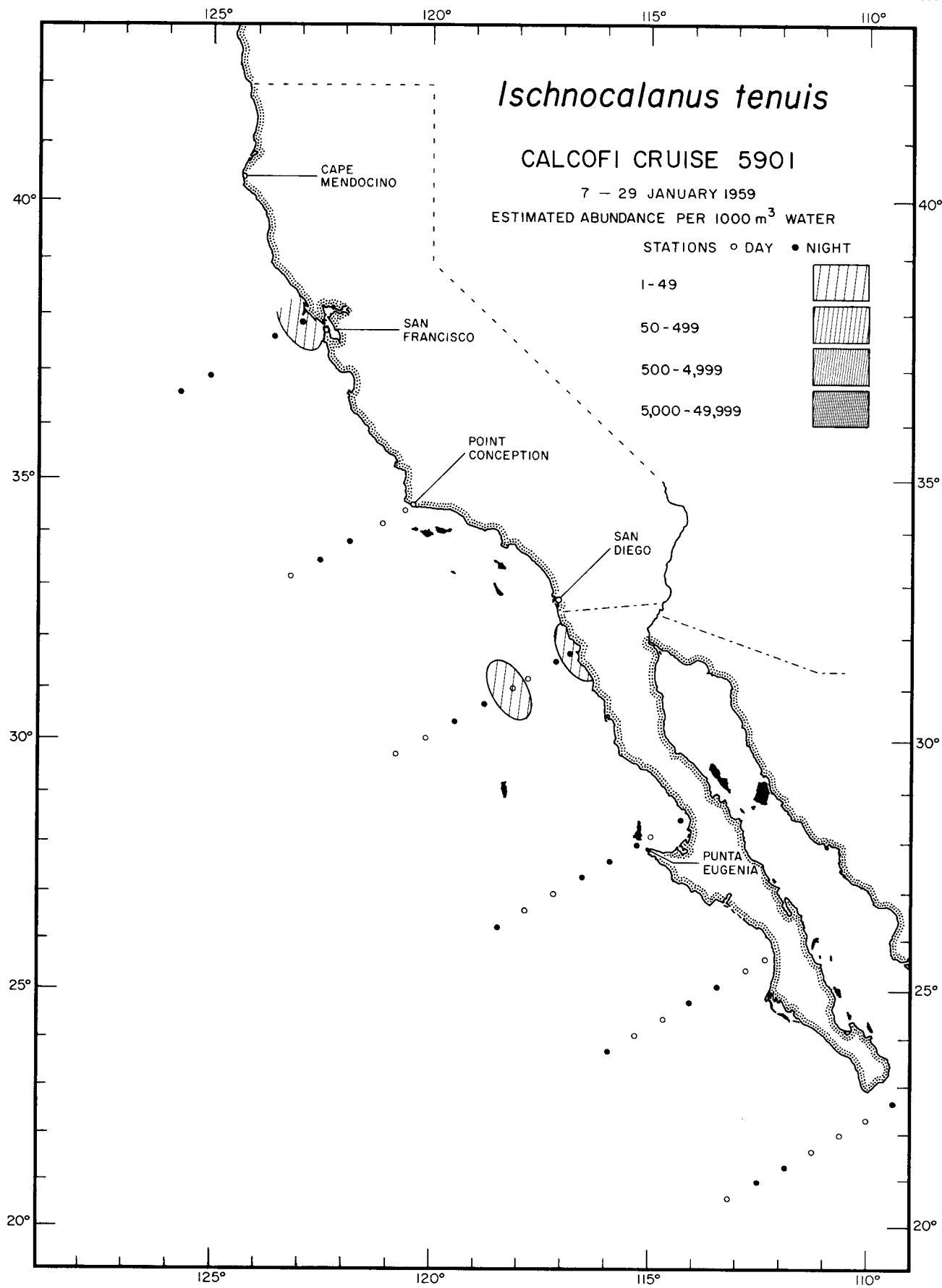
Calanoida
Ischnocalanus tenuis
 5804



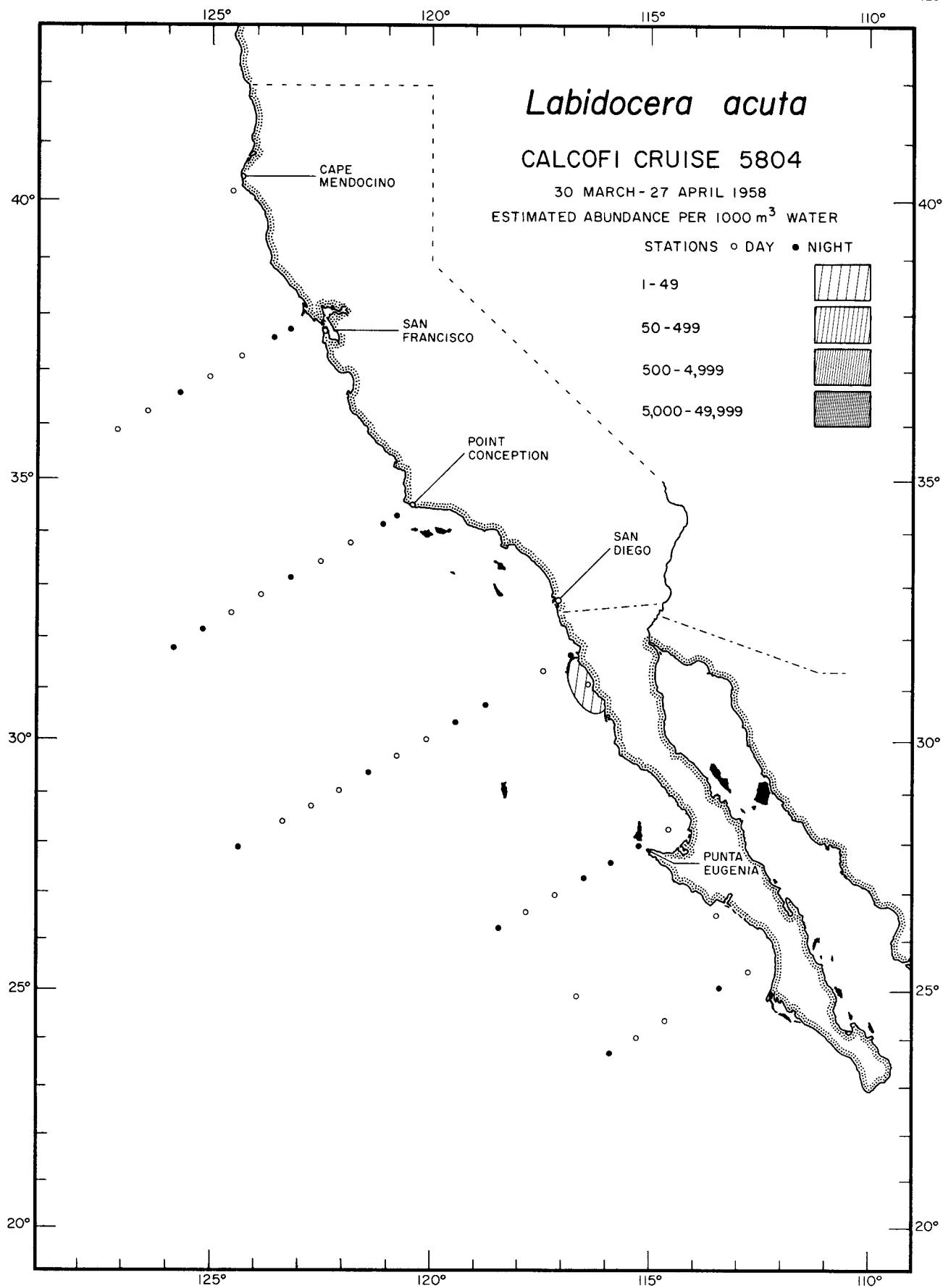
Calanoida

Ischnocalanus tenuis

5807



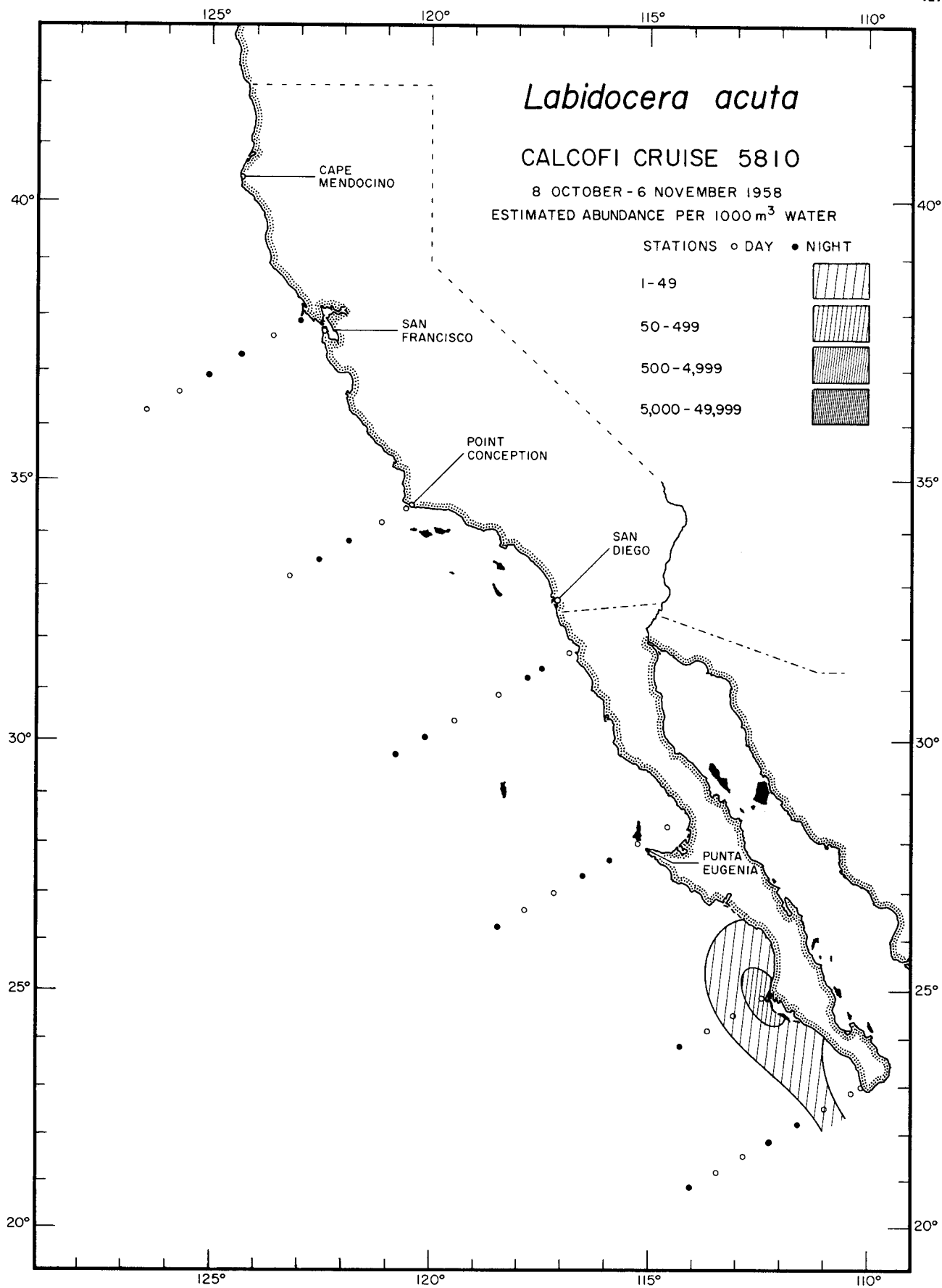
Calanoida
Ischnocalanus tenuis
5901



Calanoida

Labidocera acuta

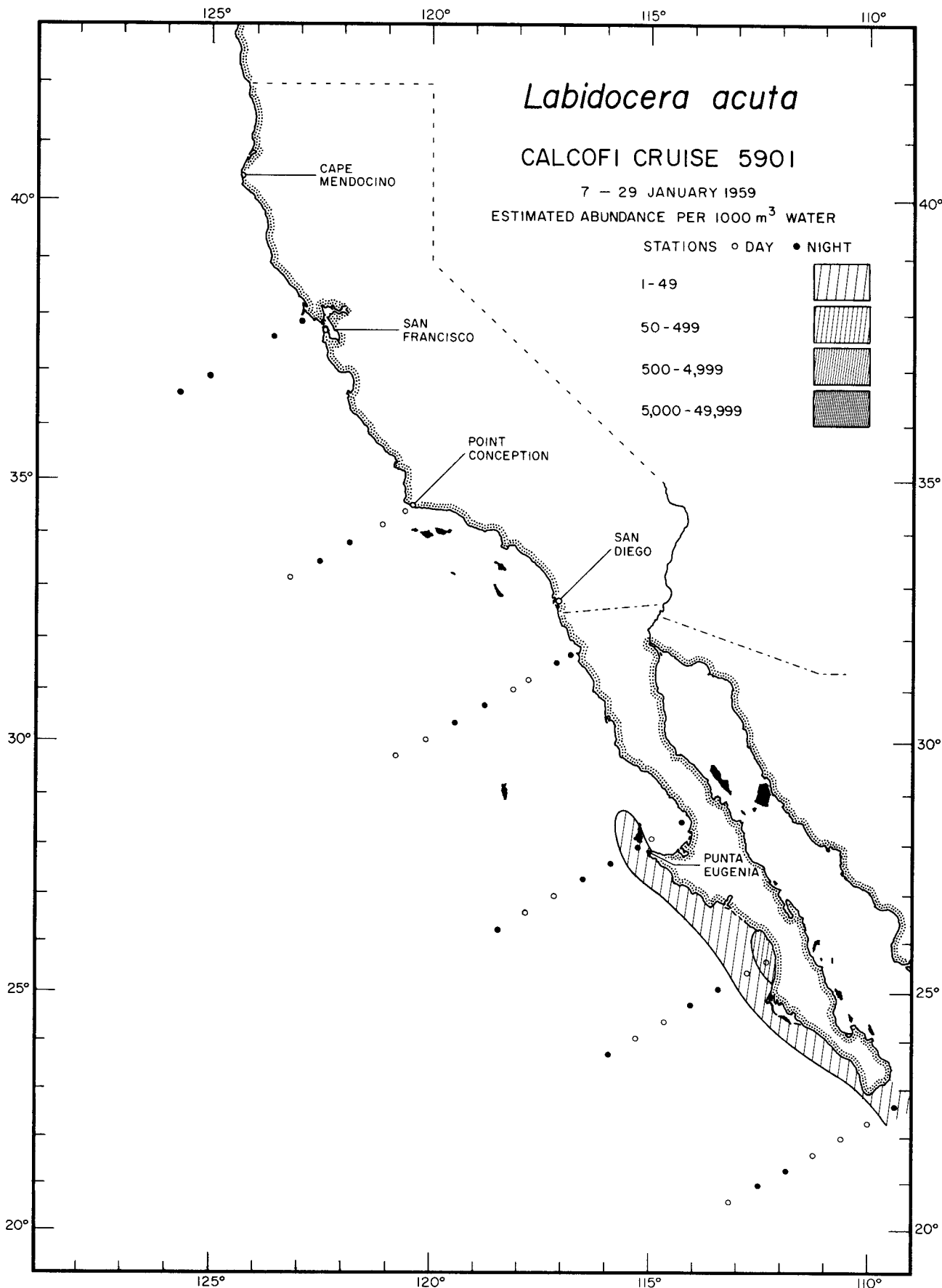
5804



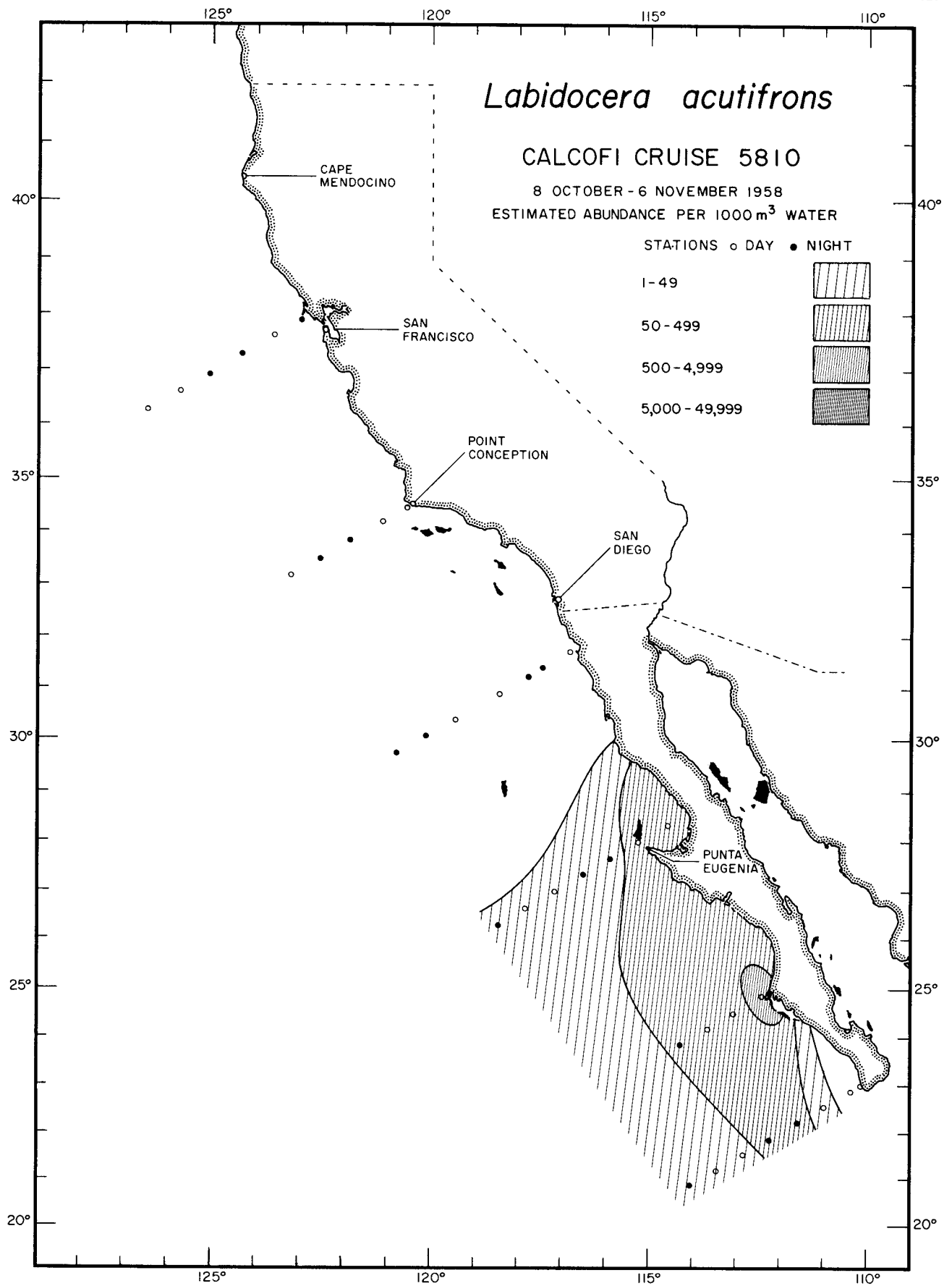
Calanoida

Labidocera acuta

5810



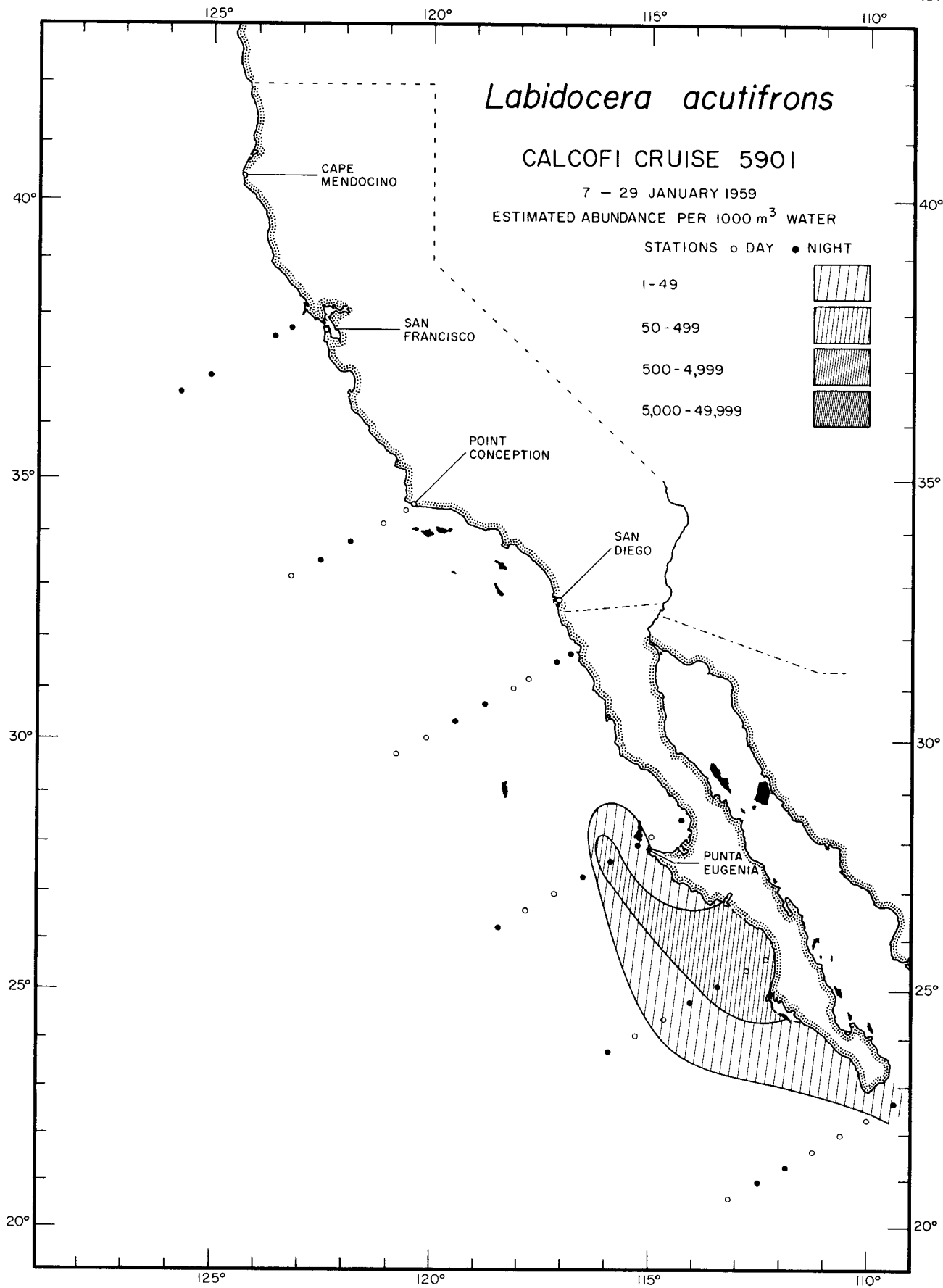
Calanoida
Labidocera acuta
5901



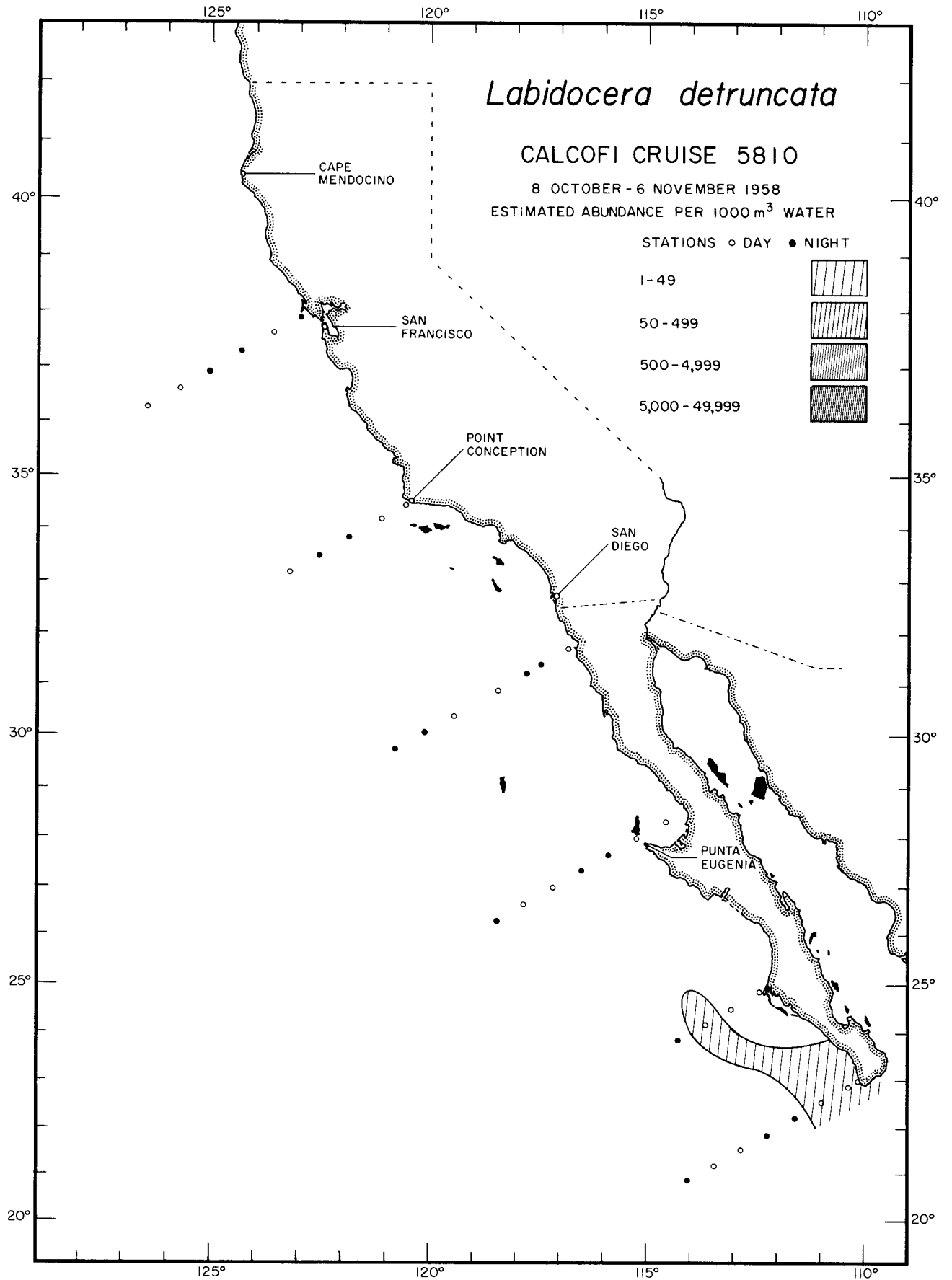
Calanoida

Labidocera acutifrons

5810



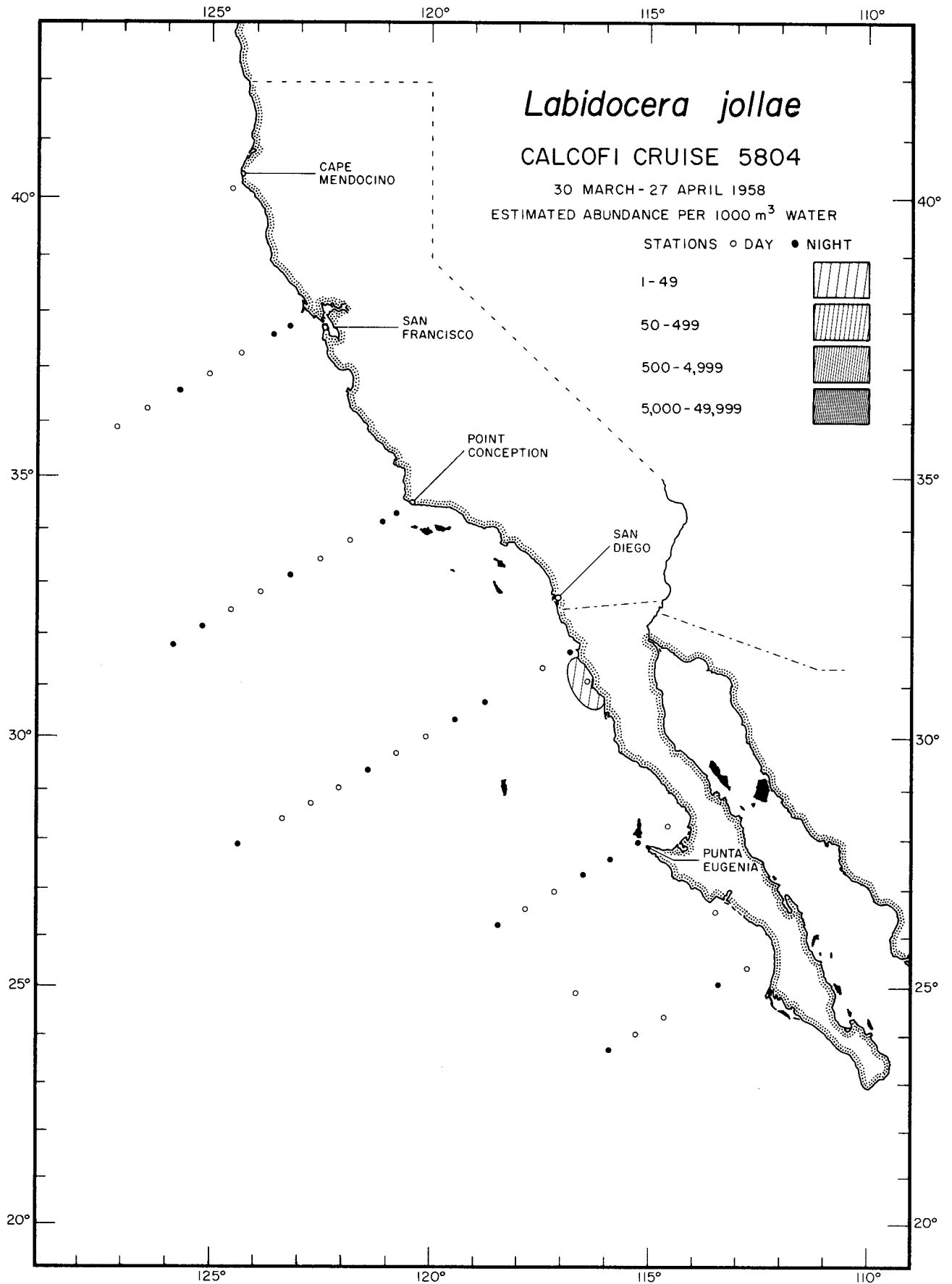
Calanoida
Labidocera acutifrons
 5901



Calanoida

Labidocera detruncata

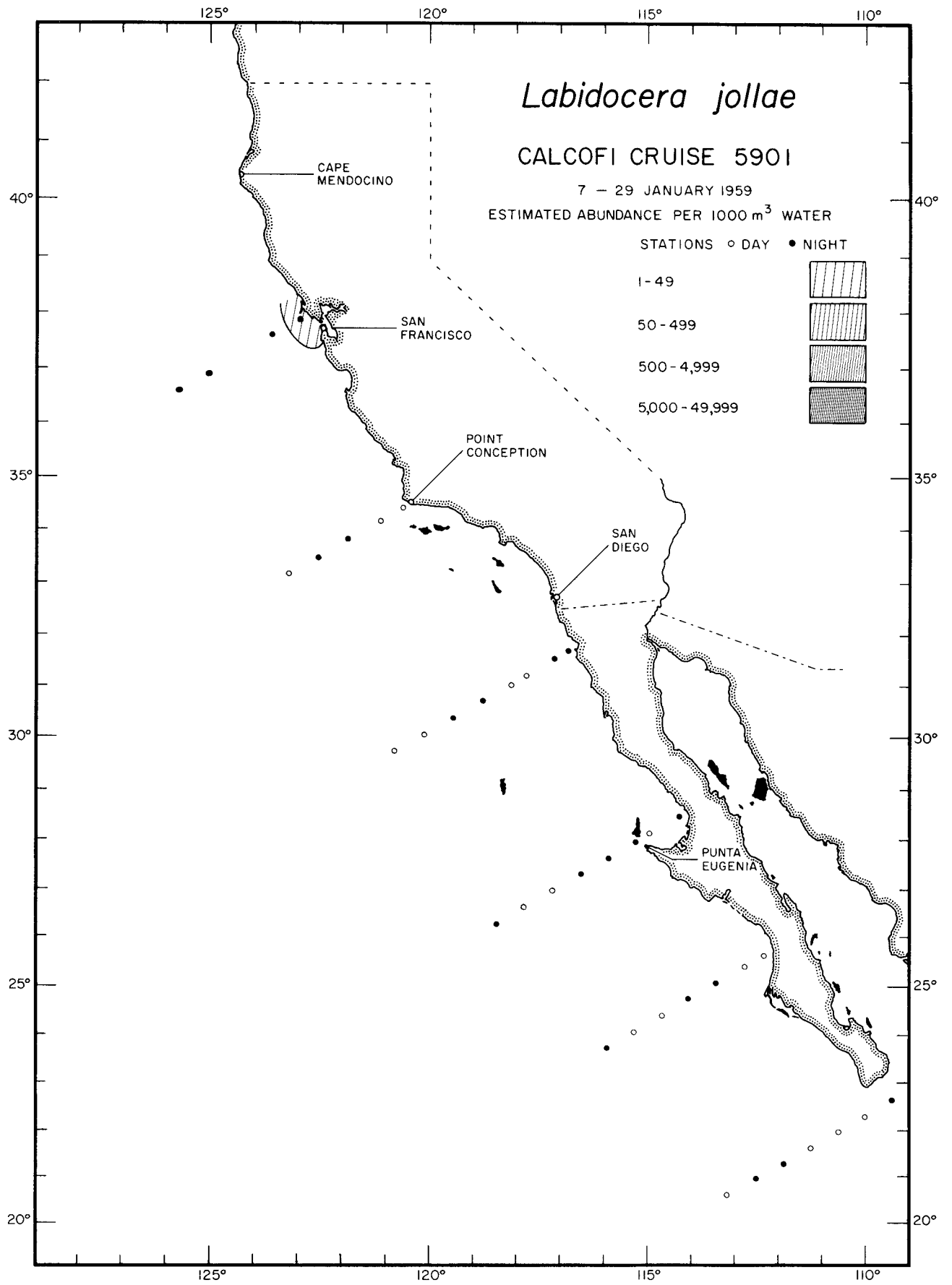
5810



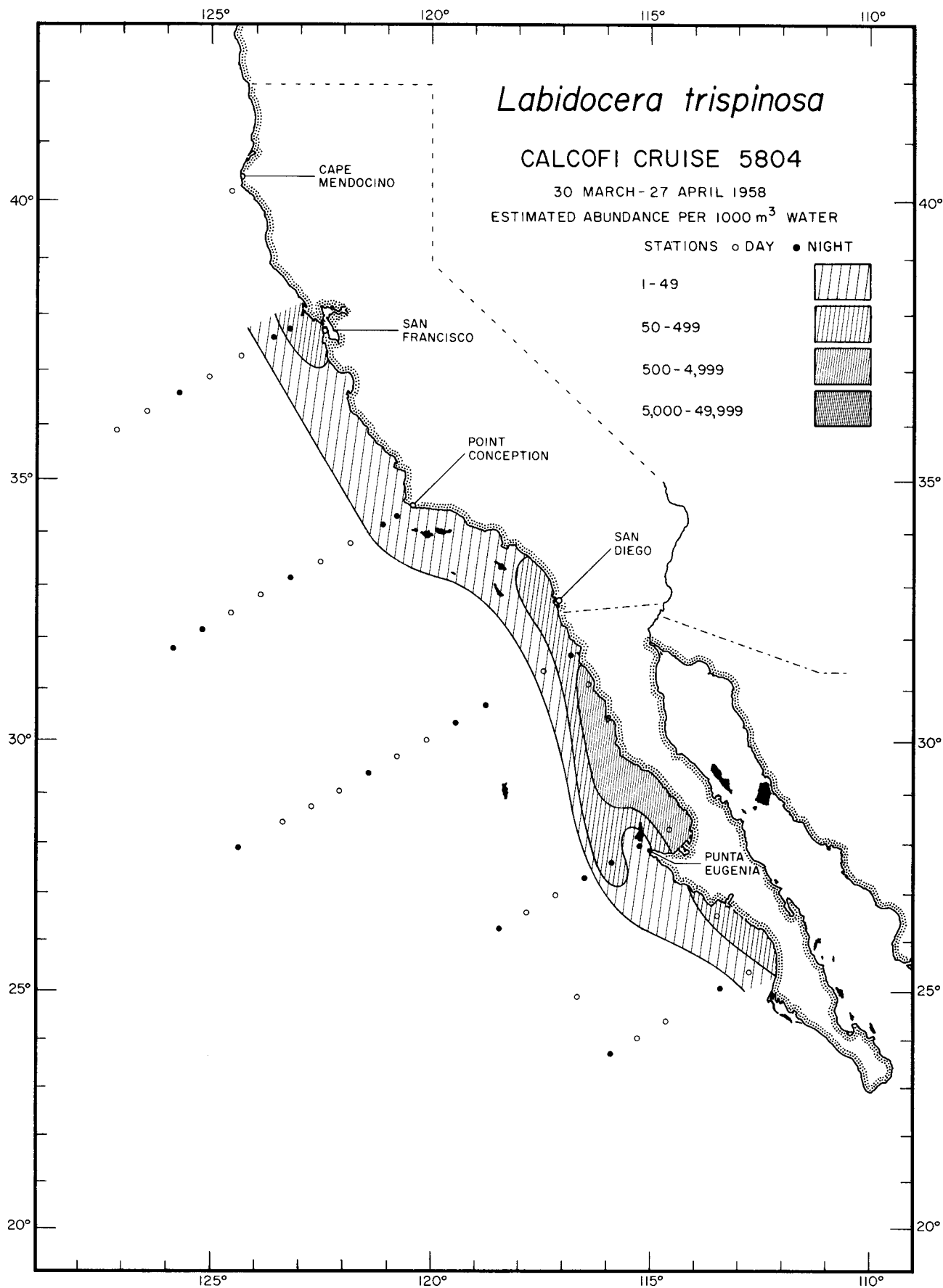
Calanoida

Labidocera jollae

5804



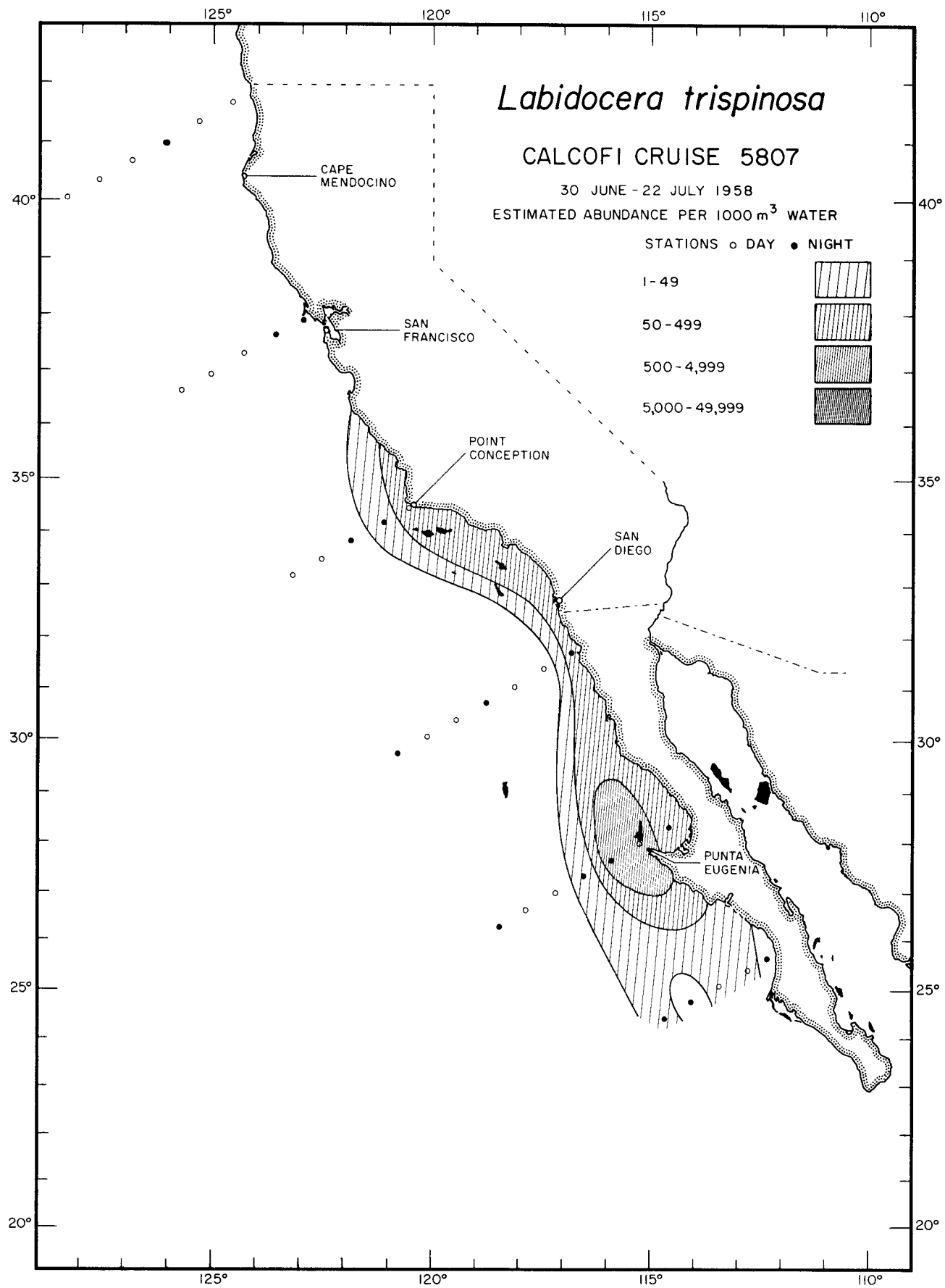
Calanoida
Labidocera jollae
5901



Calanoida

Labidocera trispinosa

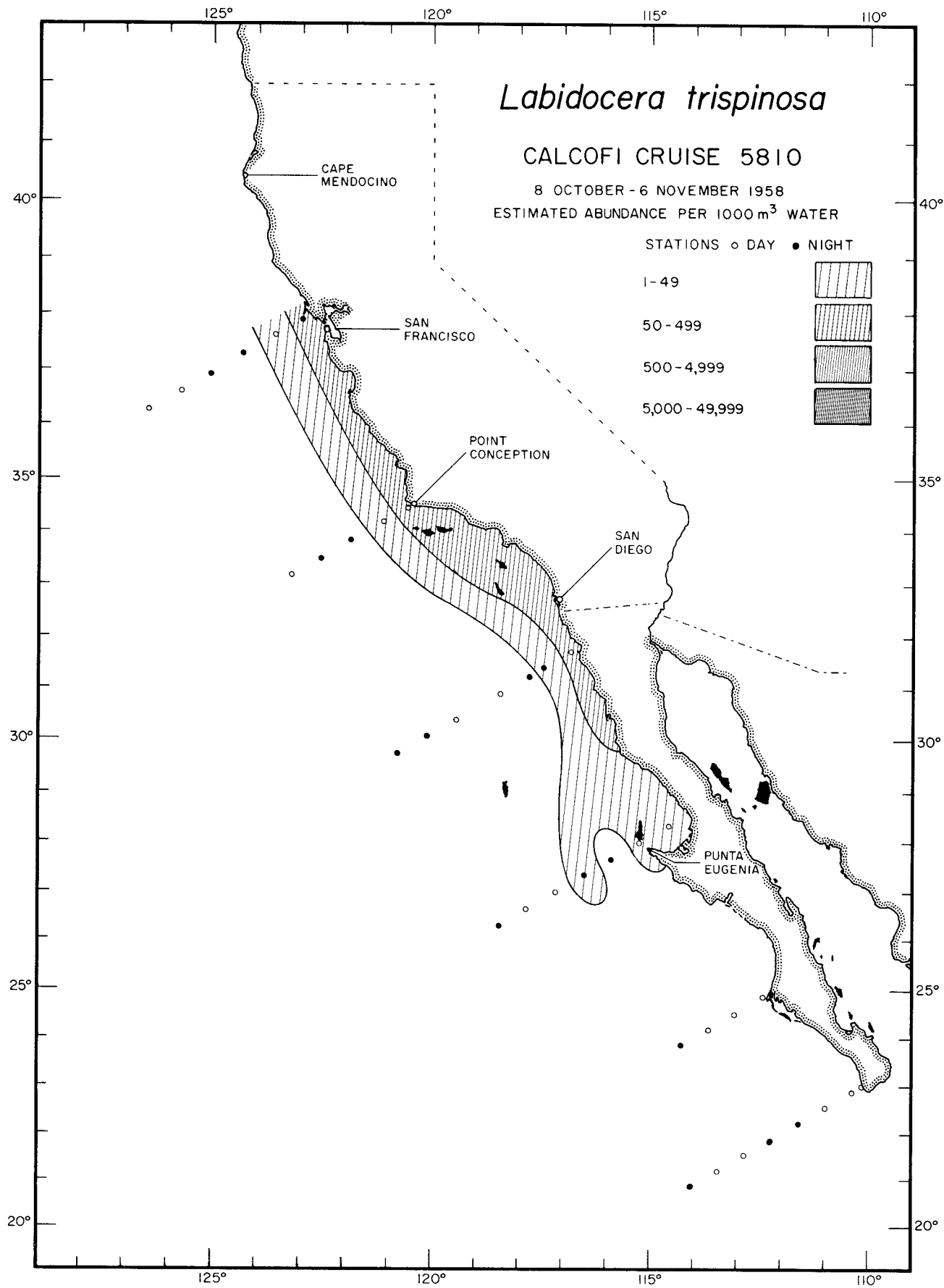
5804



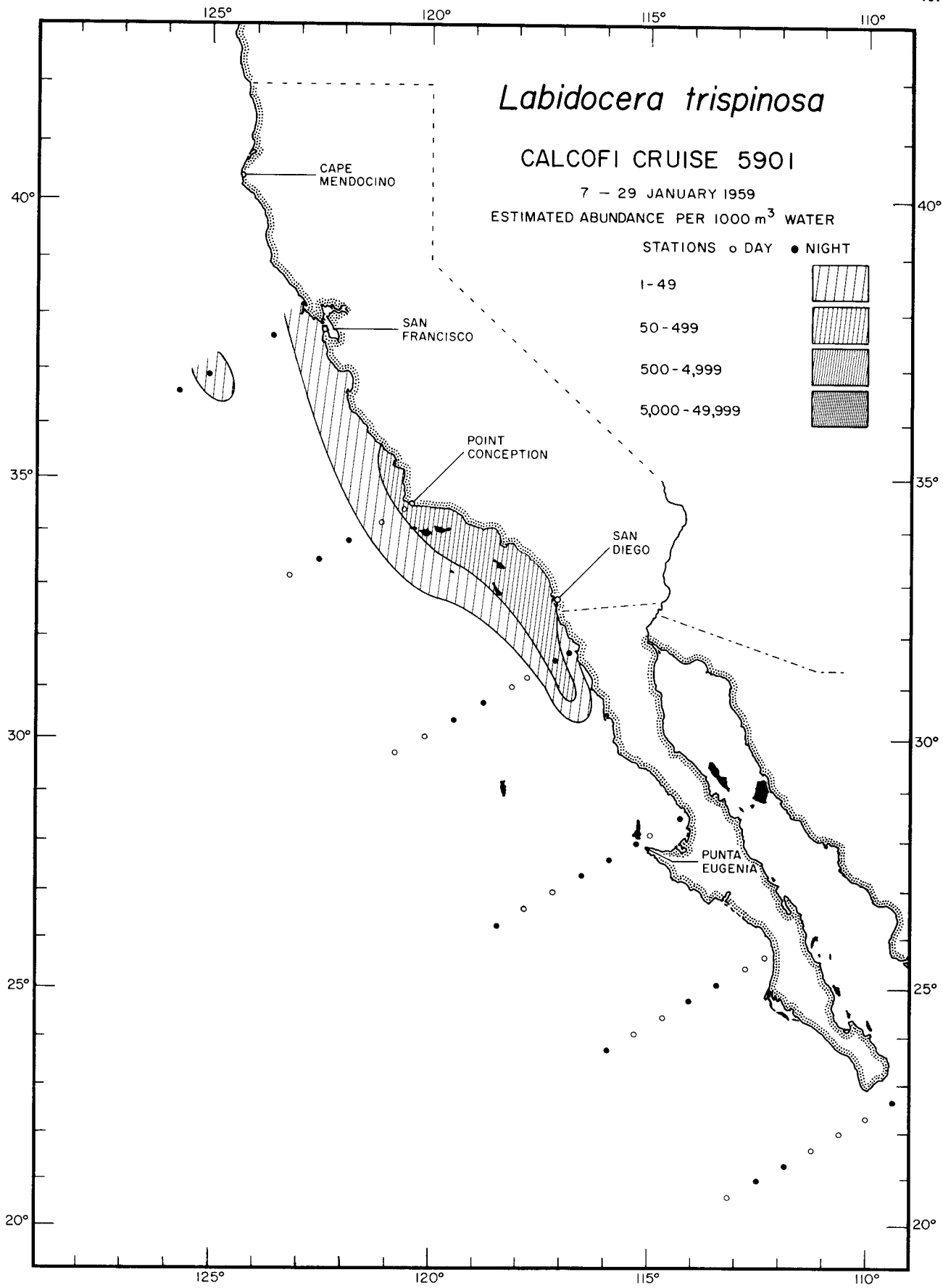
Calanoida

Labidocera trispinosa

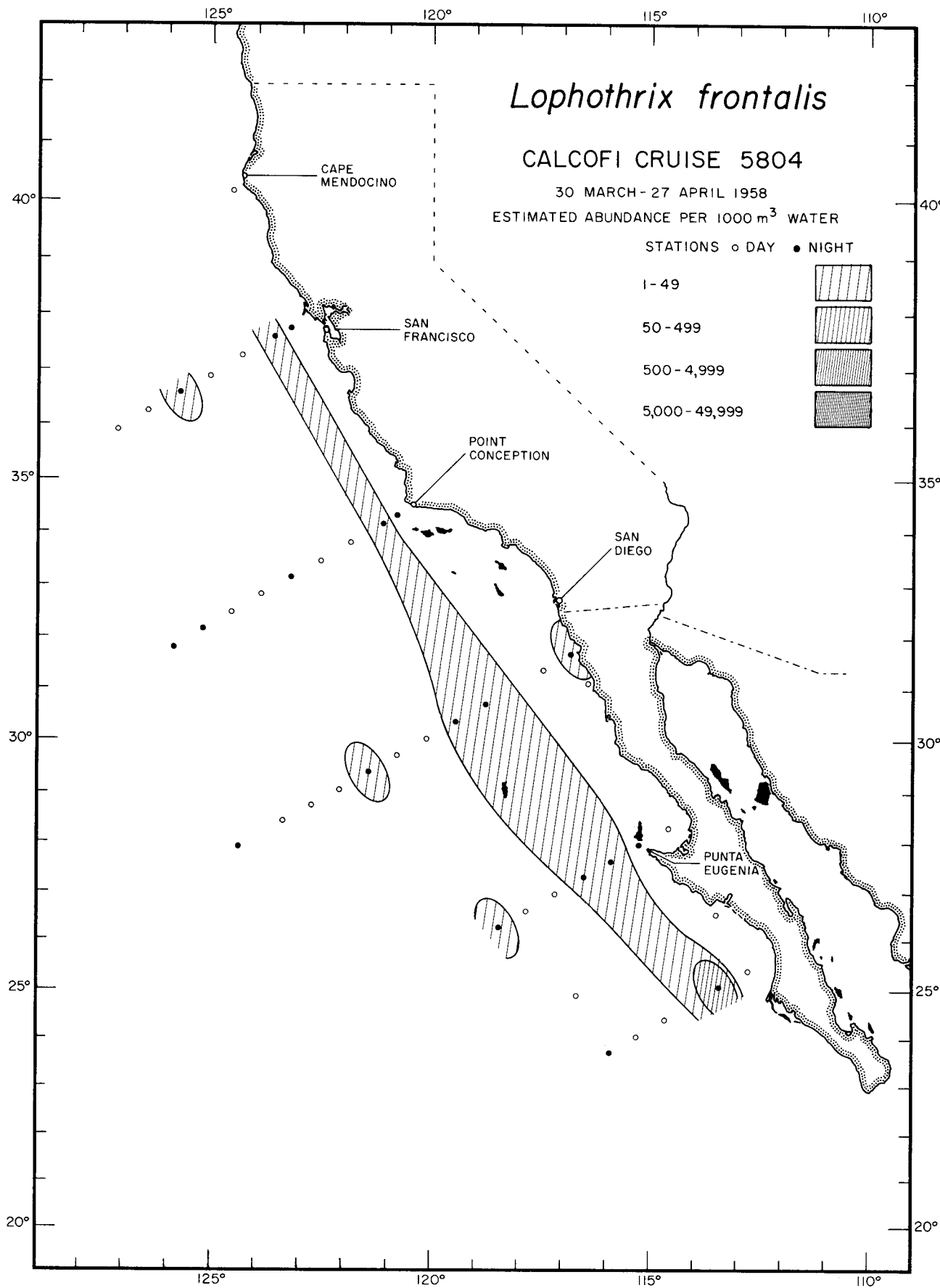
5807



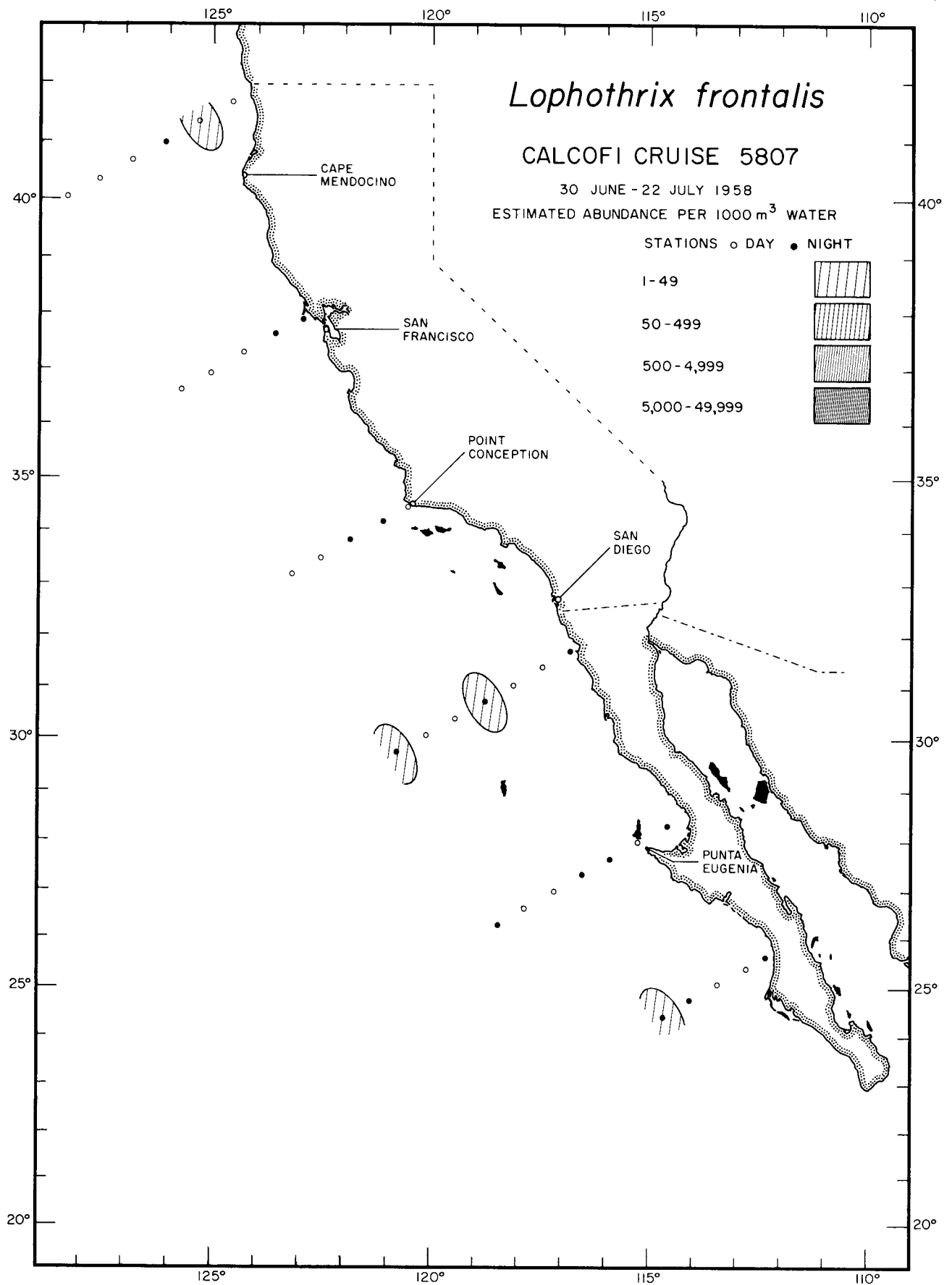
Calanoida
Labidocera trispinosa
5810



Calanoida
Labidocera trispinosa
 5901



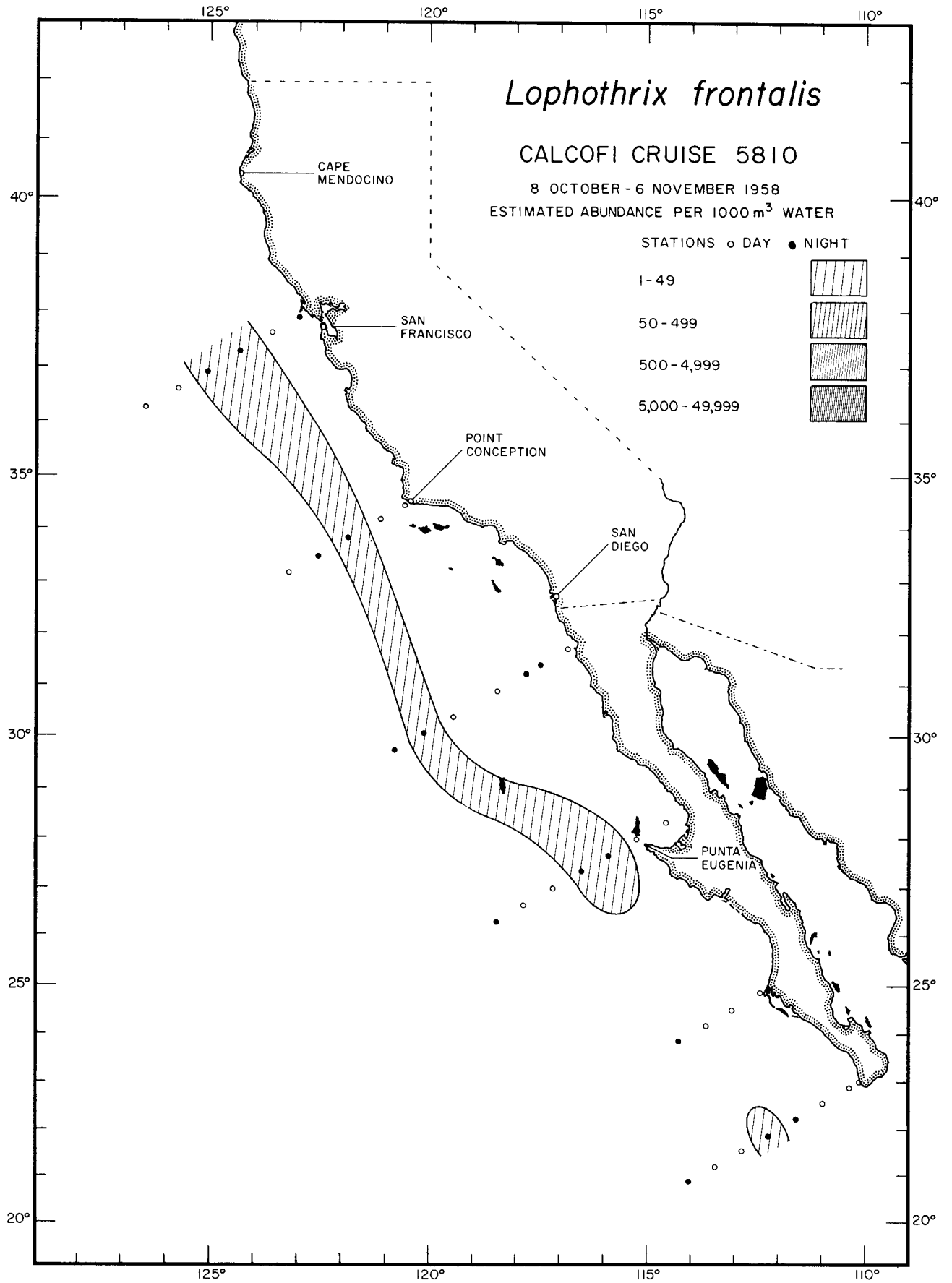
Calanoida
Lophothrix frontalis
5804



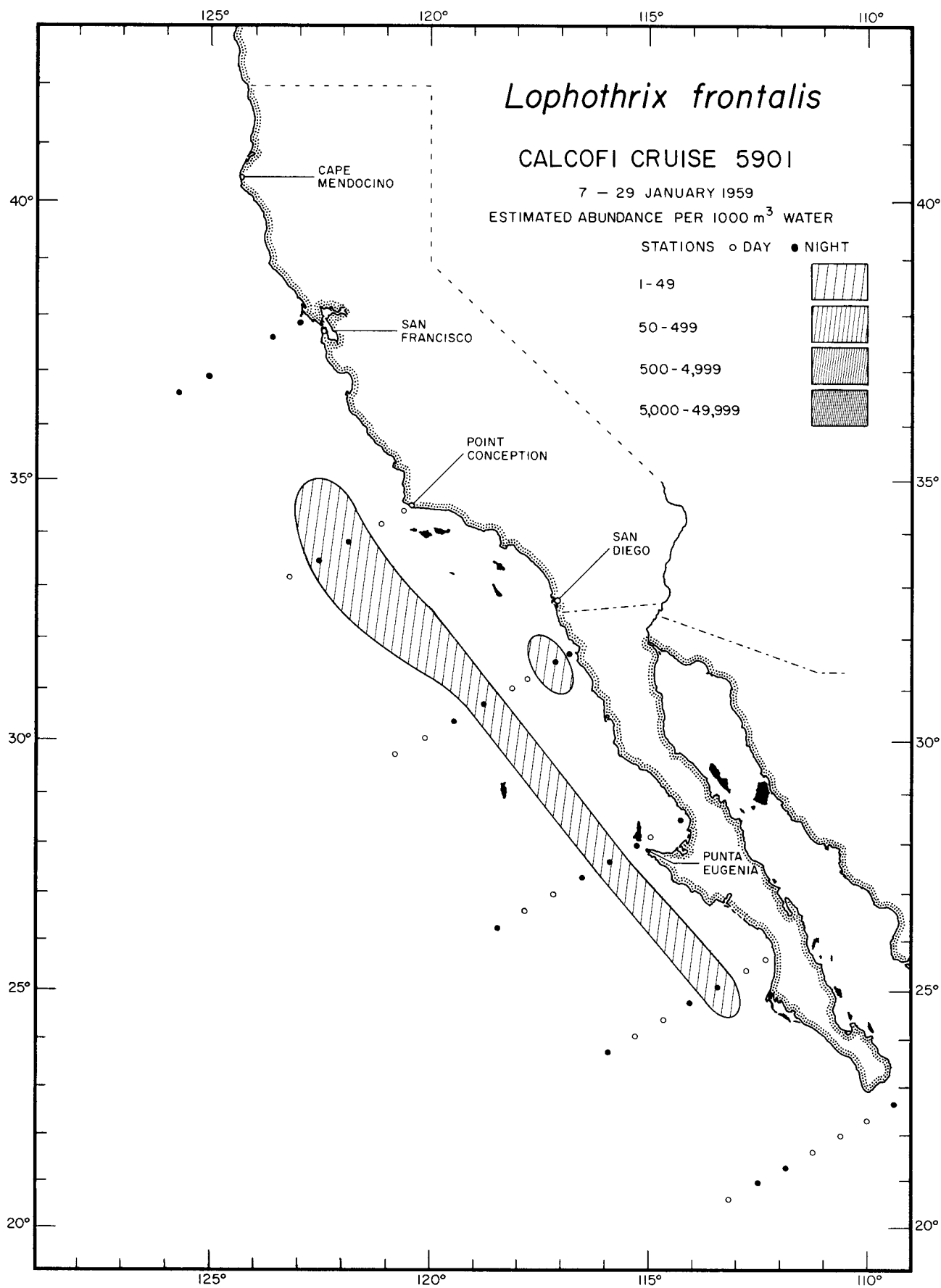
Calanoida

Lophothrix frontalis

5807



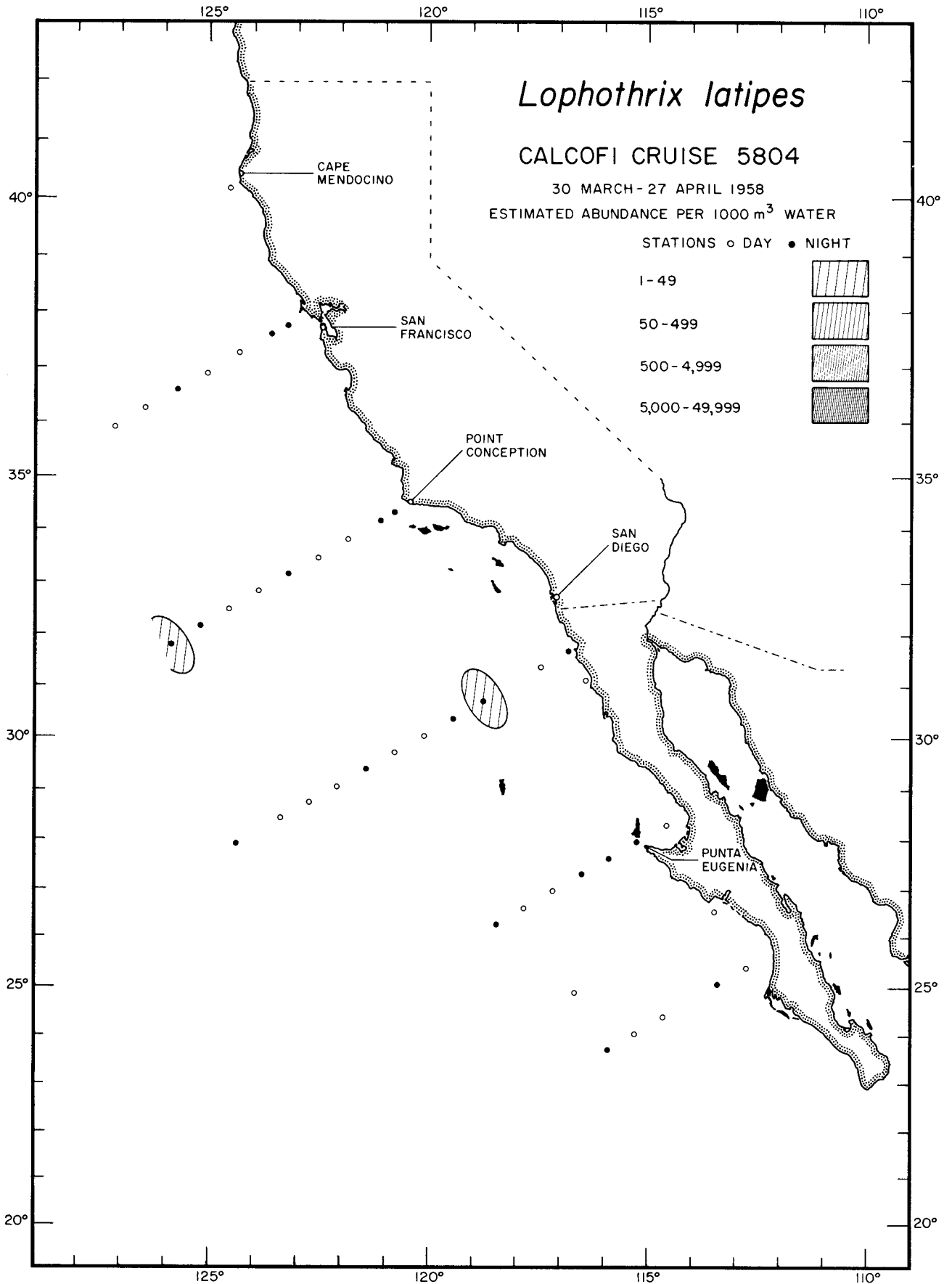
Calanoida
Lophothrix frontalis
5810



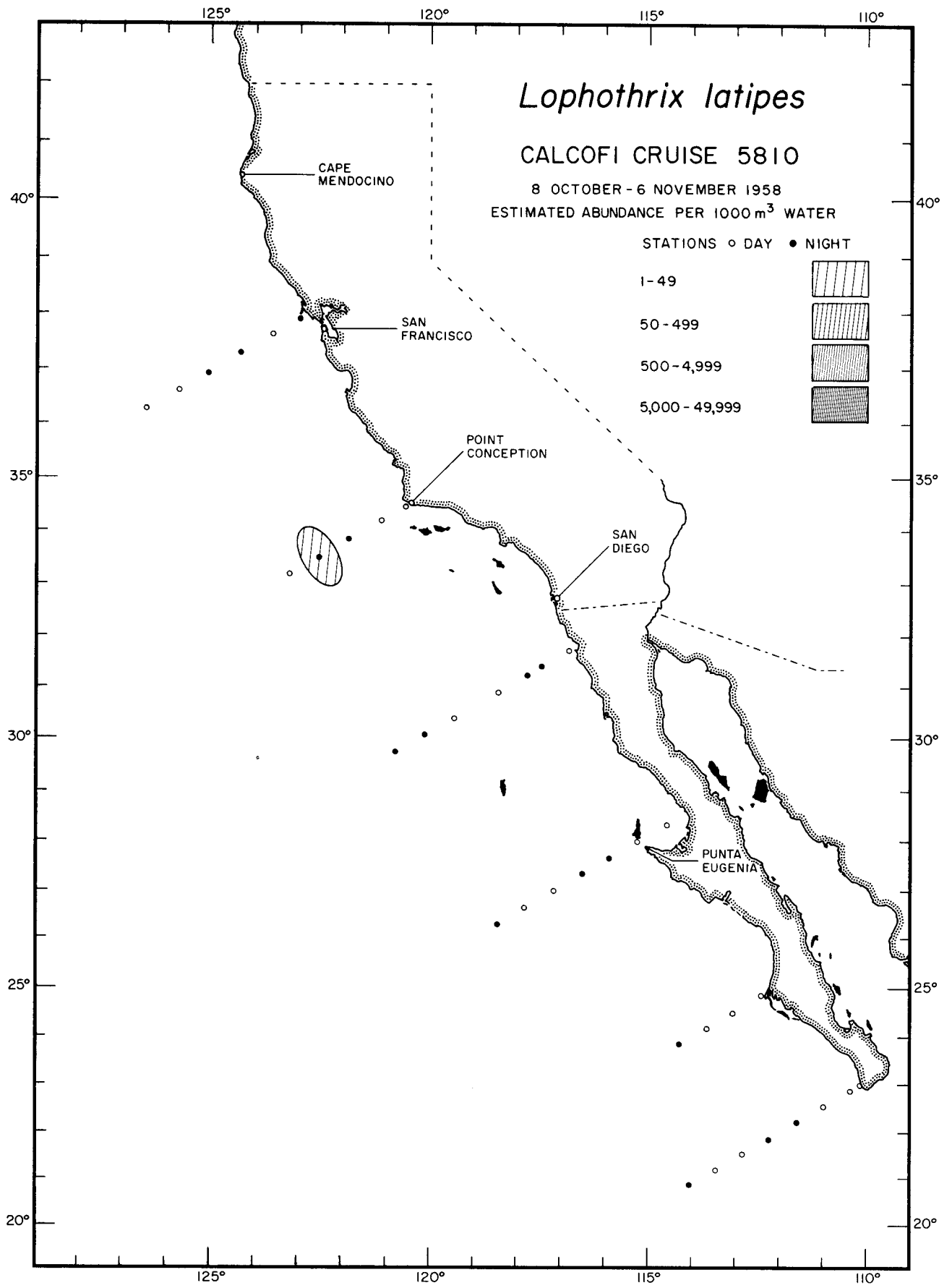
Calanoida

Lophothrix frontalis

5901



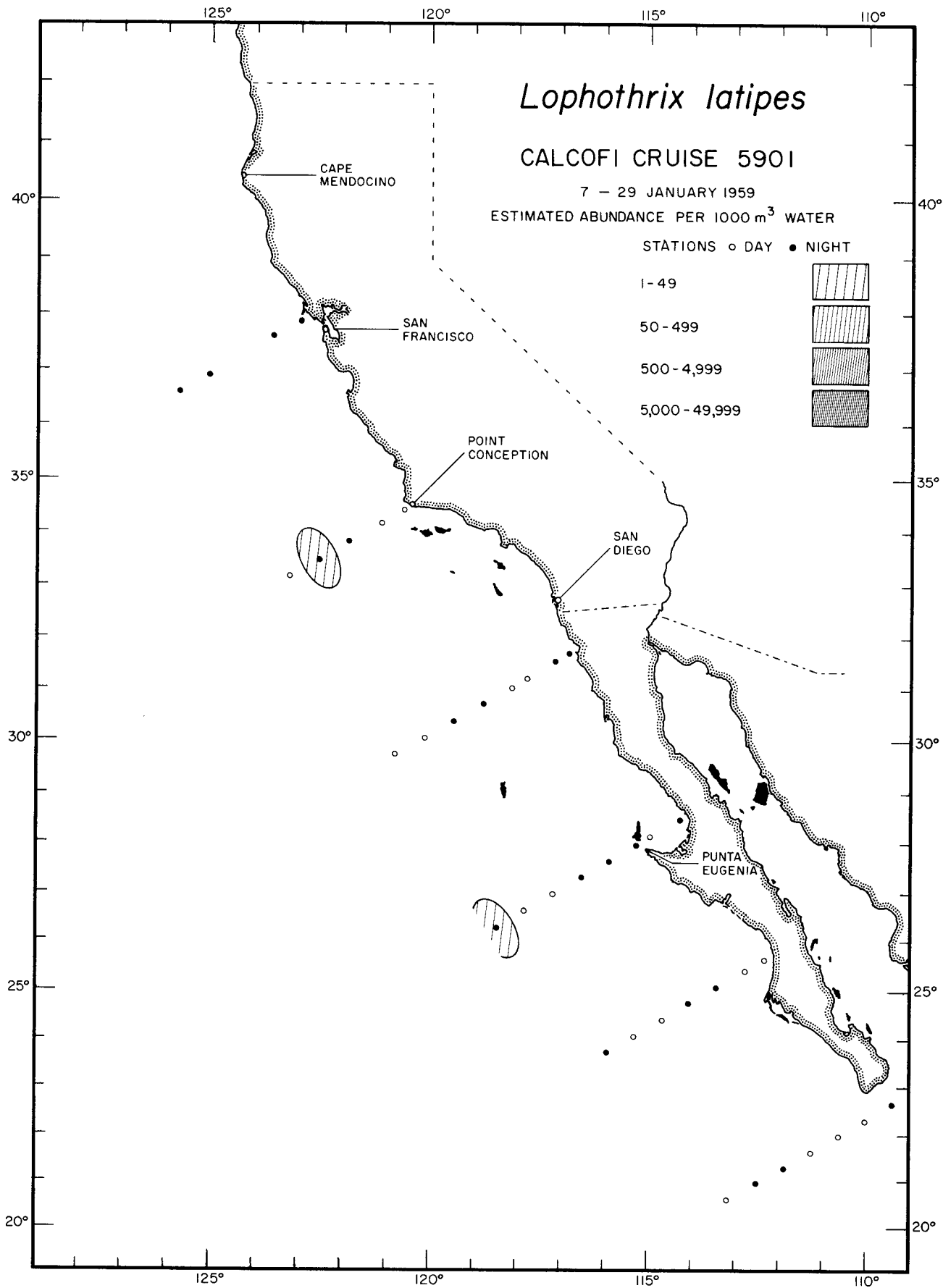
Calanoida
Lophothrix latipes
5804



Calanoida

Lophothrix latipes

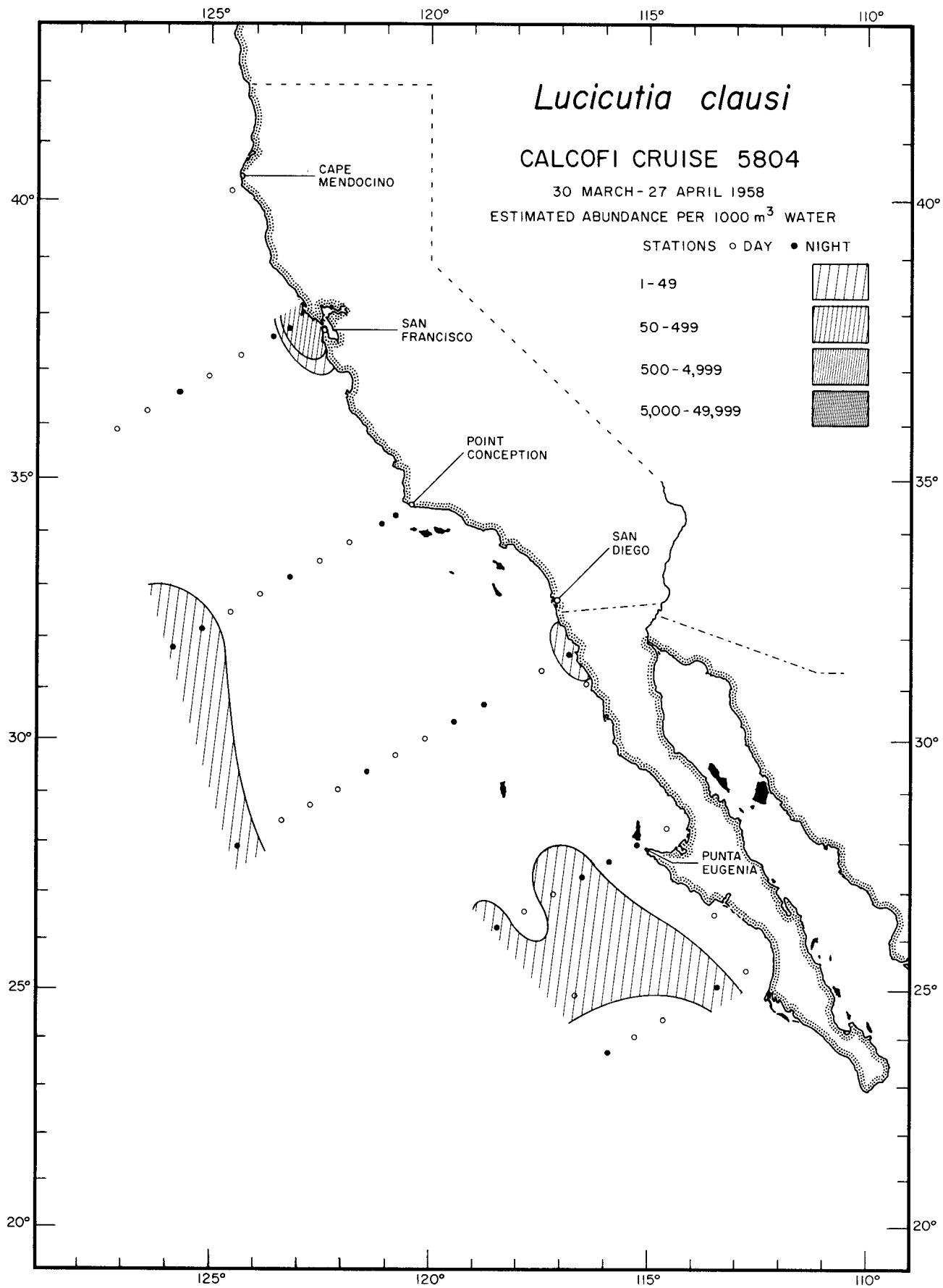
5810



Calanoida

Lophothrix latipes

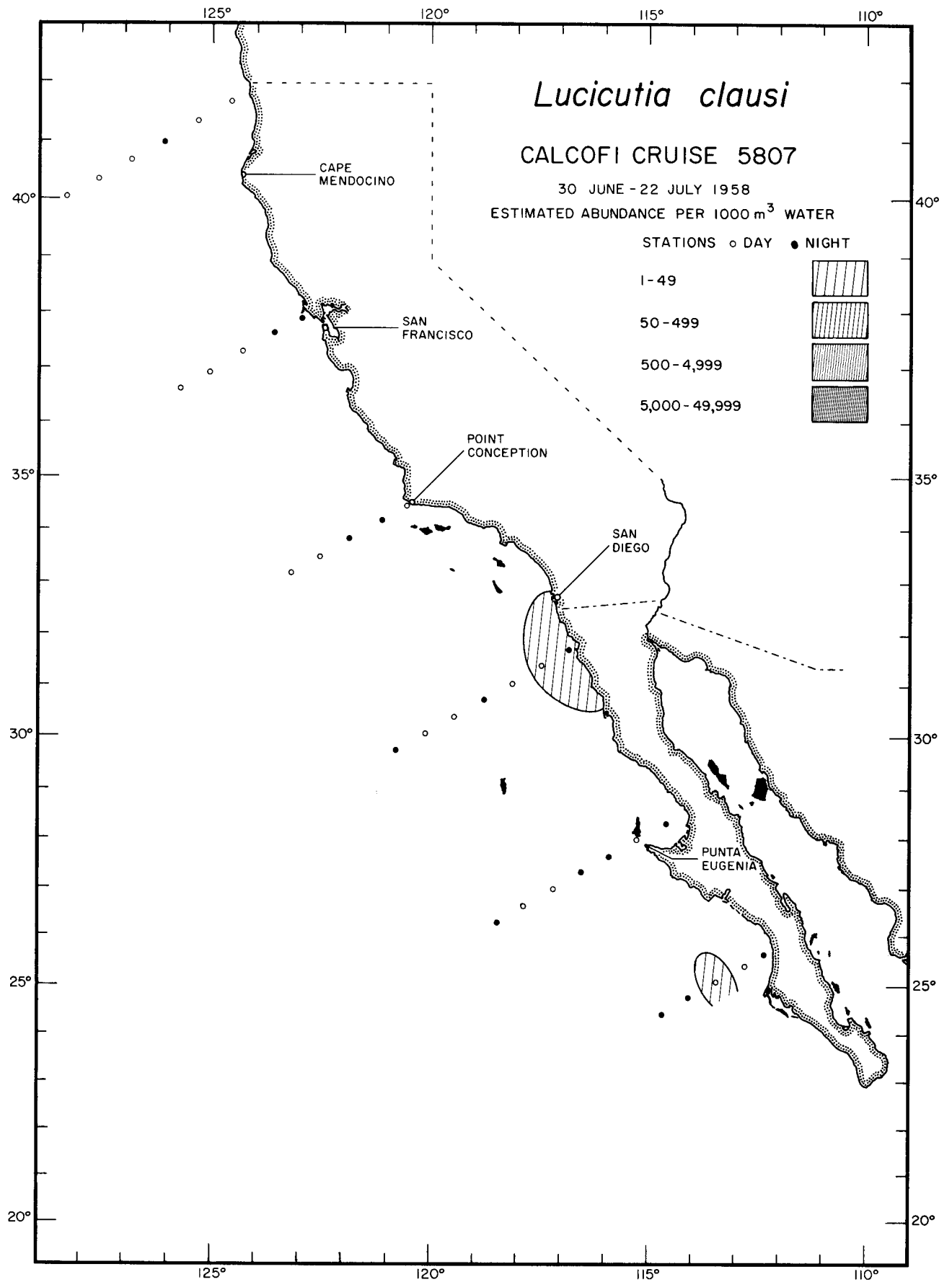
5901



Calanoida

Lucicutia clausi

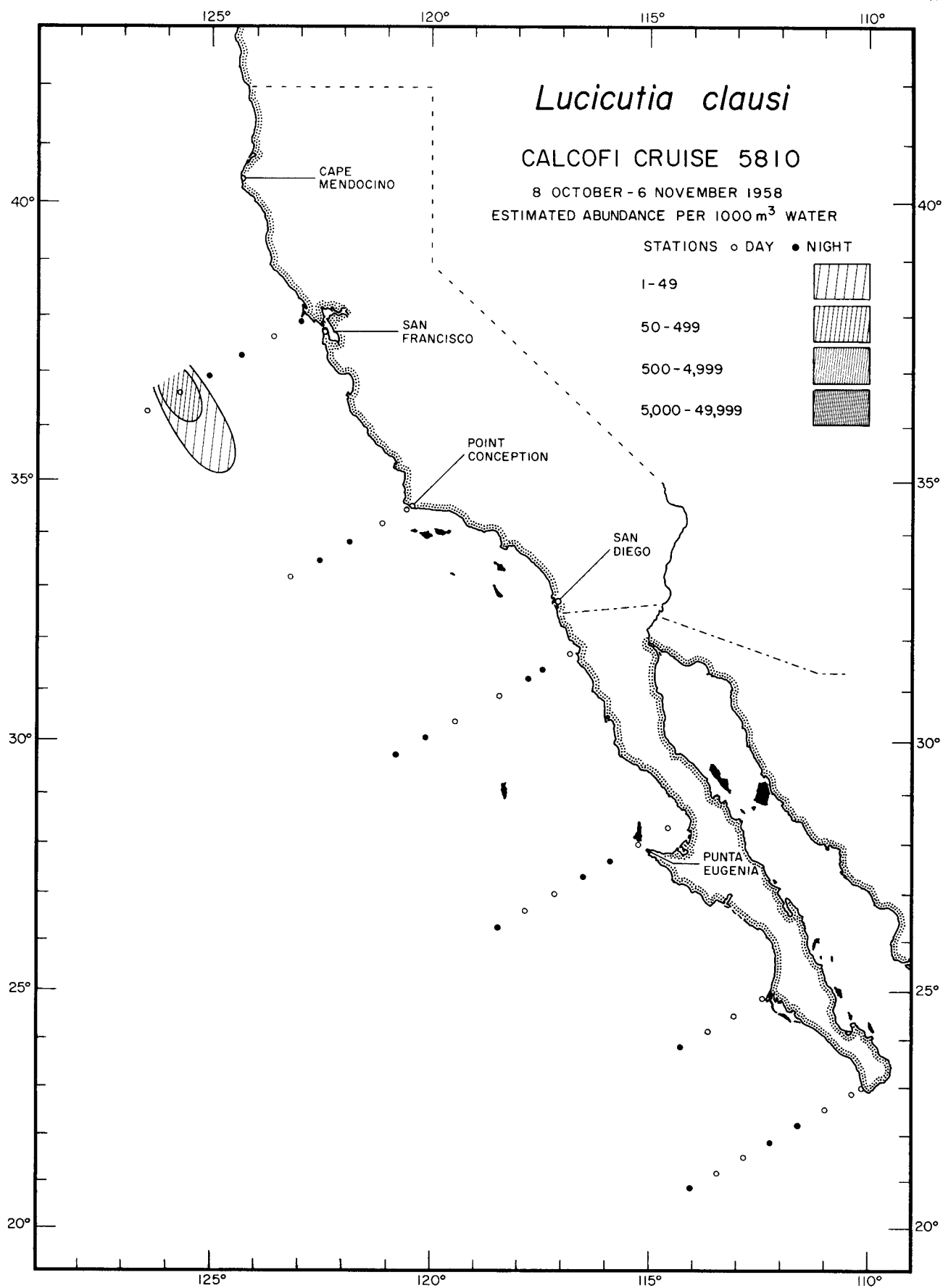
5804



Calanoida

Lucicutia clausi

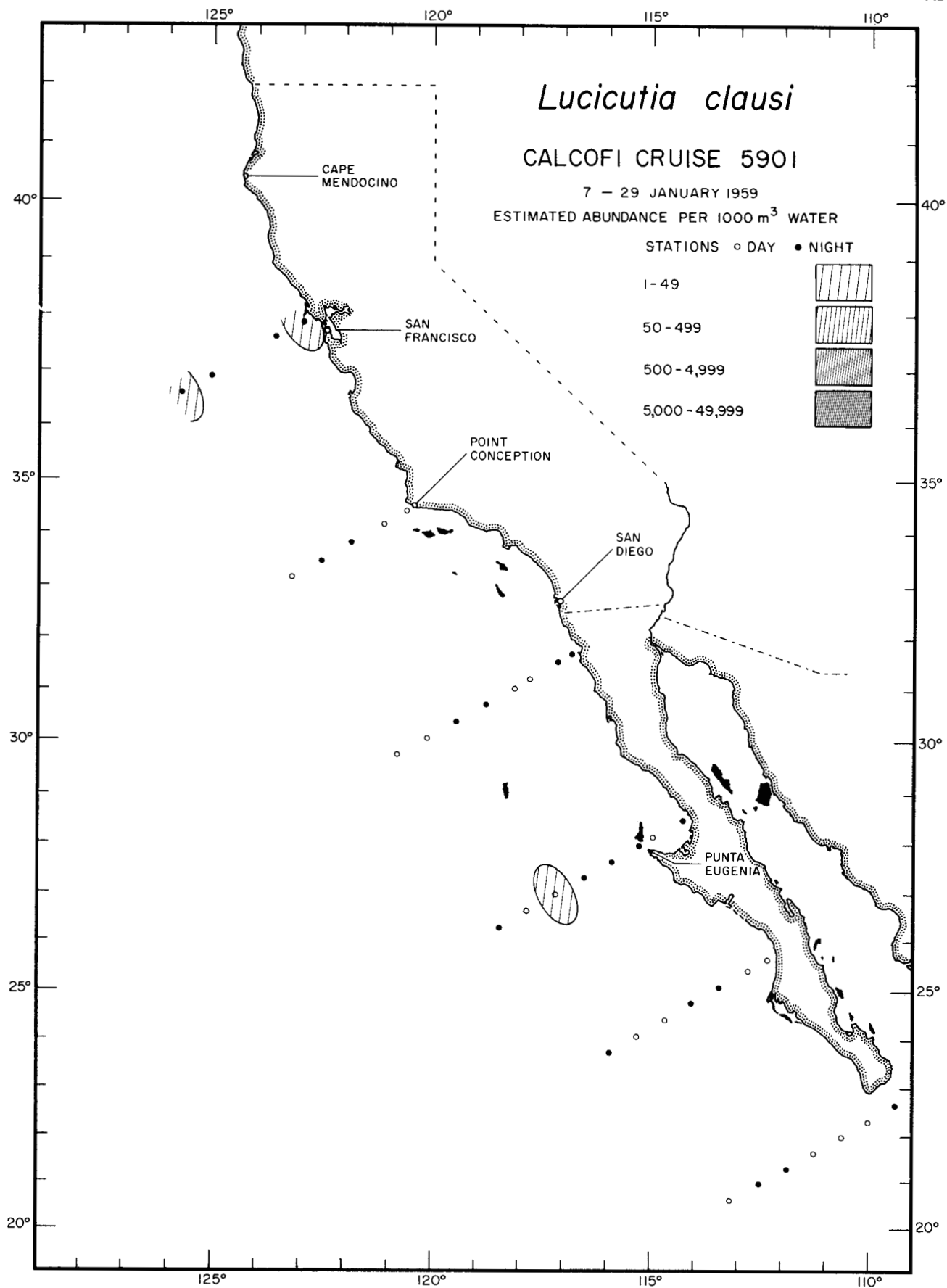
5807



Calanoida

Lucicutia clausi

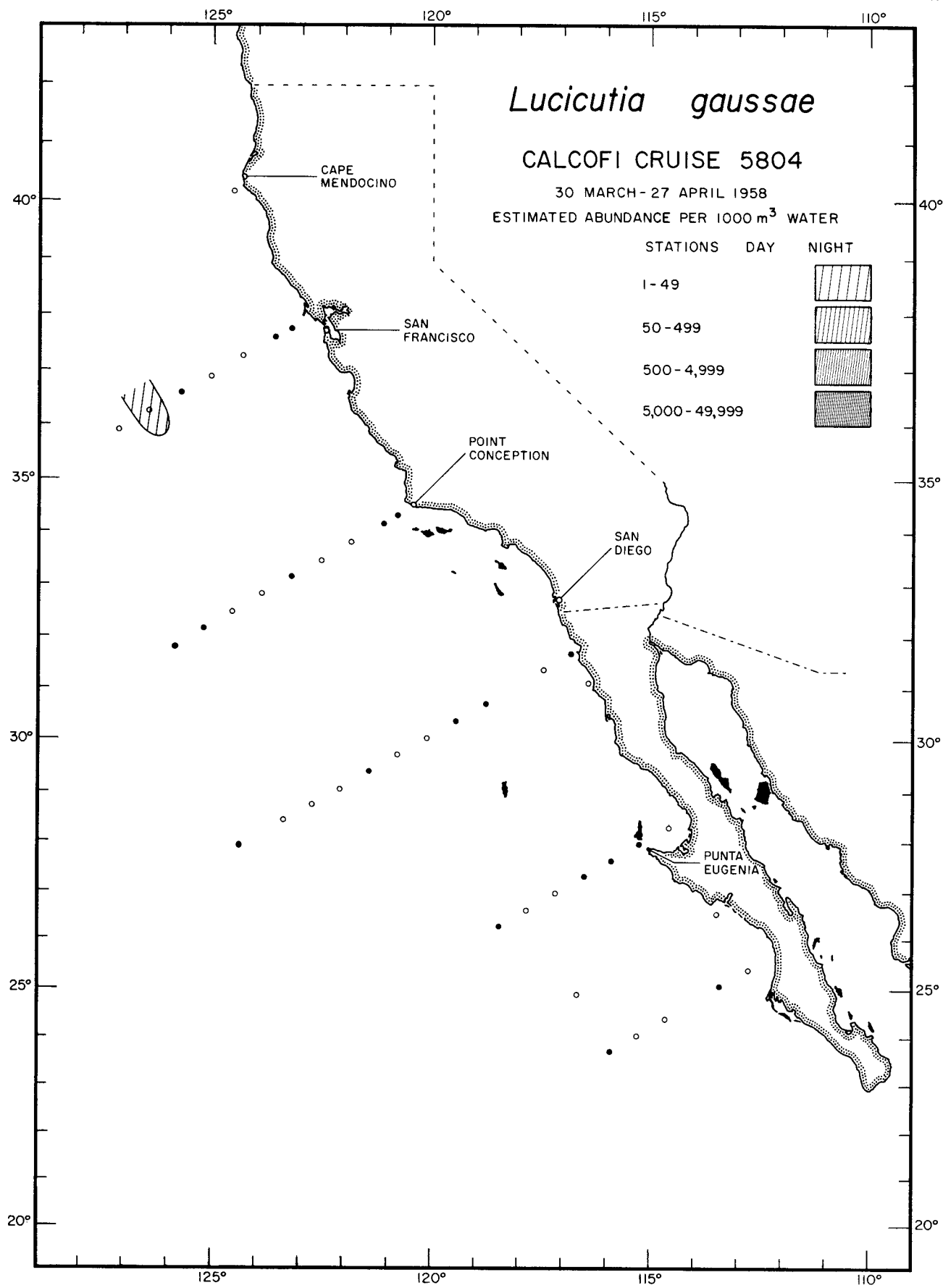
5810



Calanoida

Lucicutia clausi

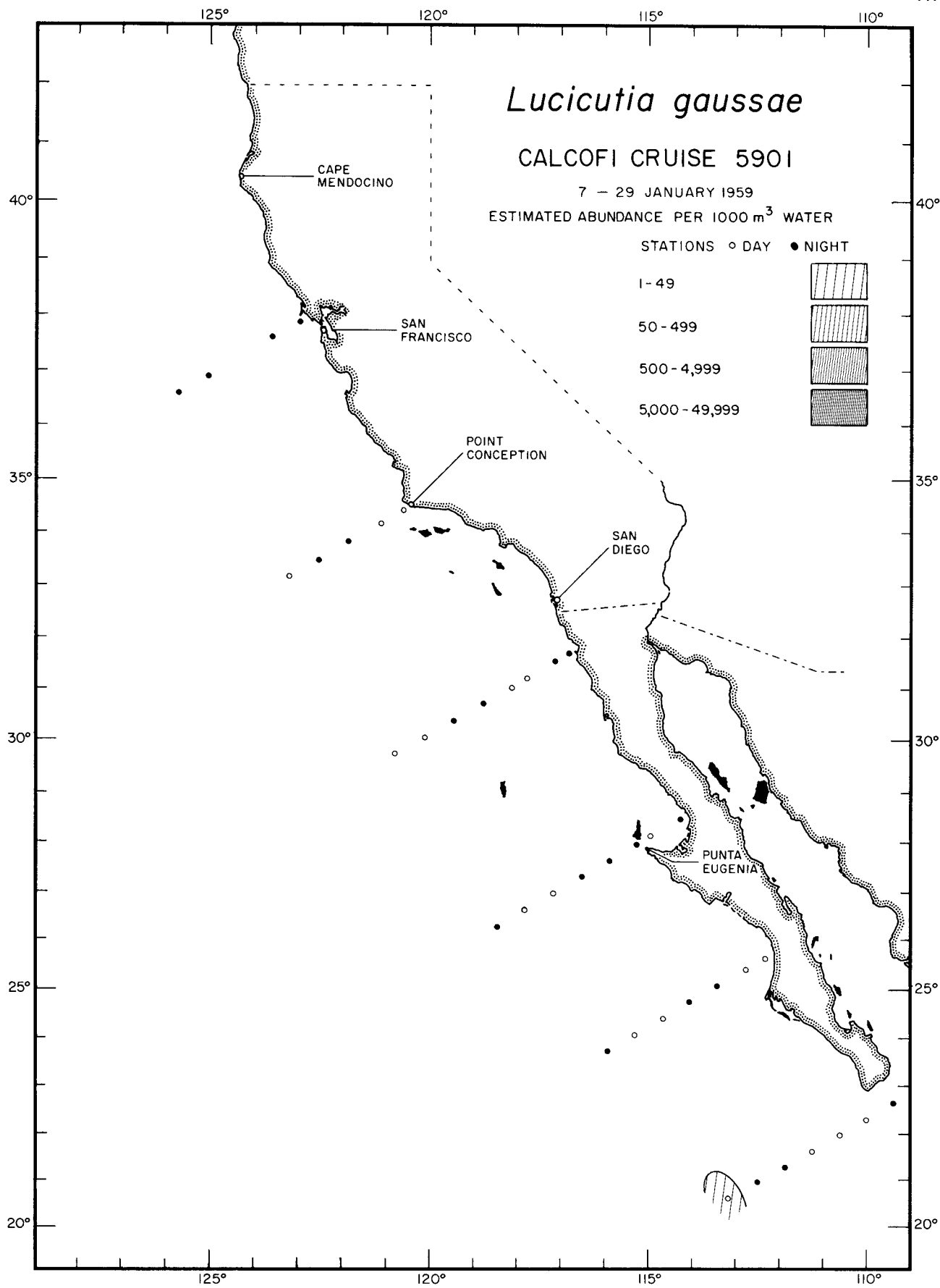
5901



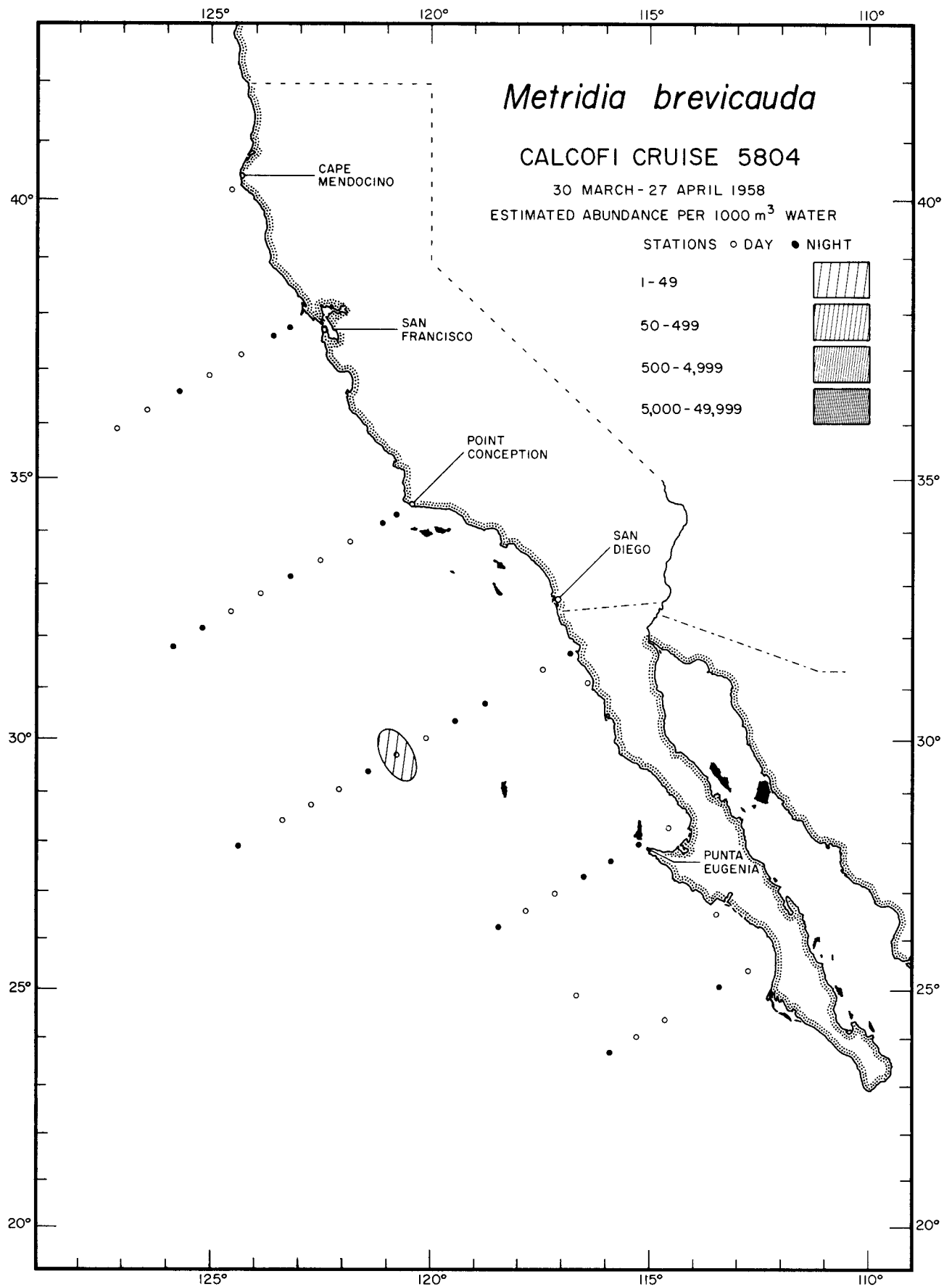
Calanoida

Lucicutia gaussae

5804



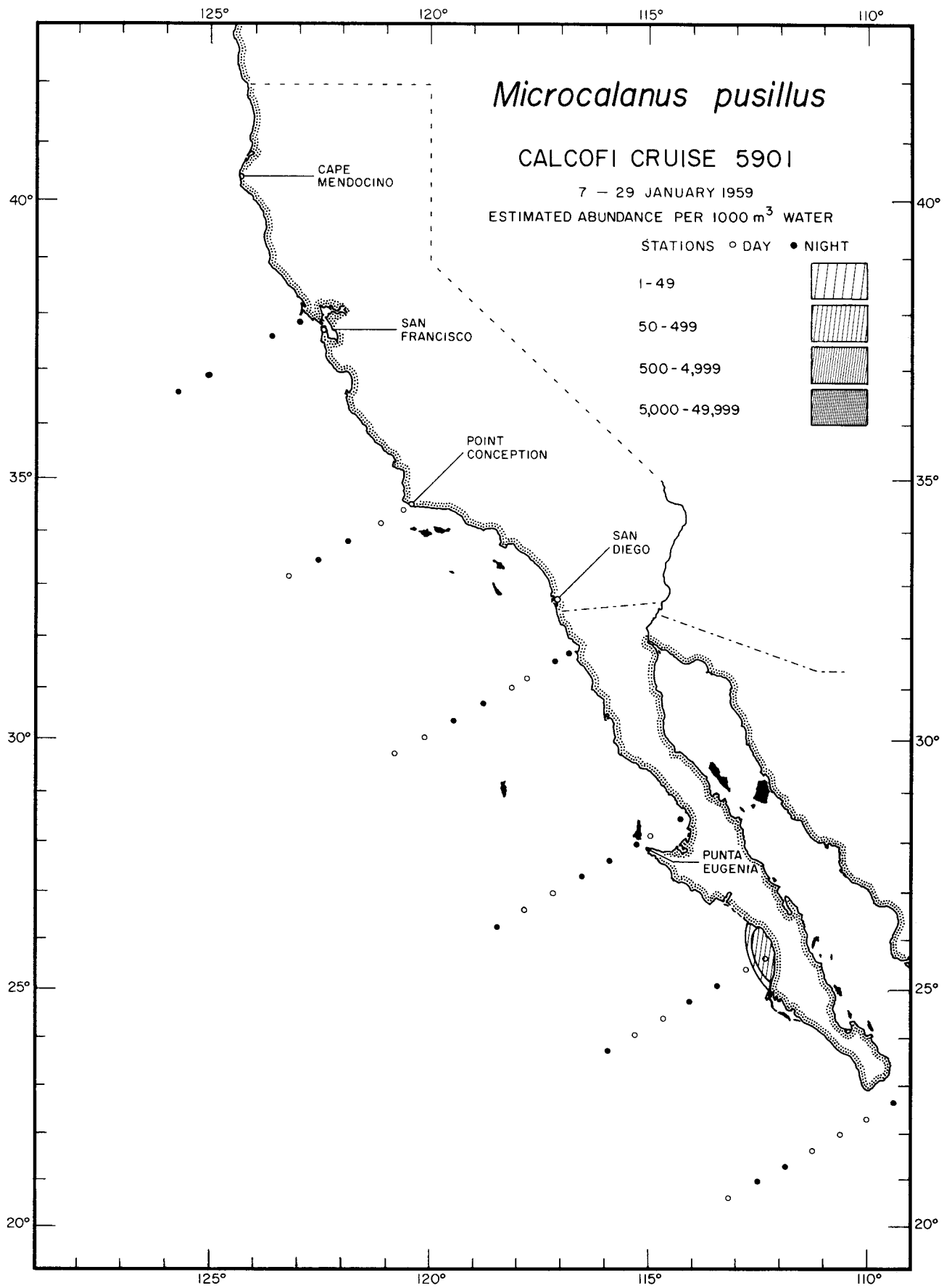
Calanoida
Lucicutia gaussea
5901



Calanoida

Metridia brevicauda

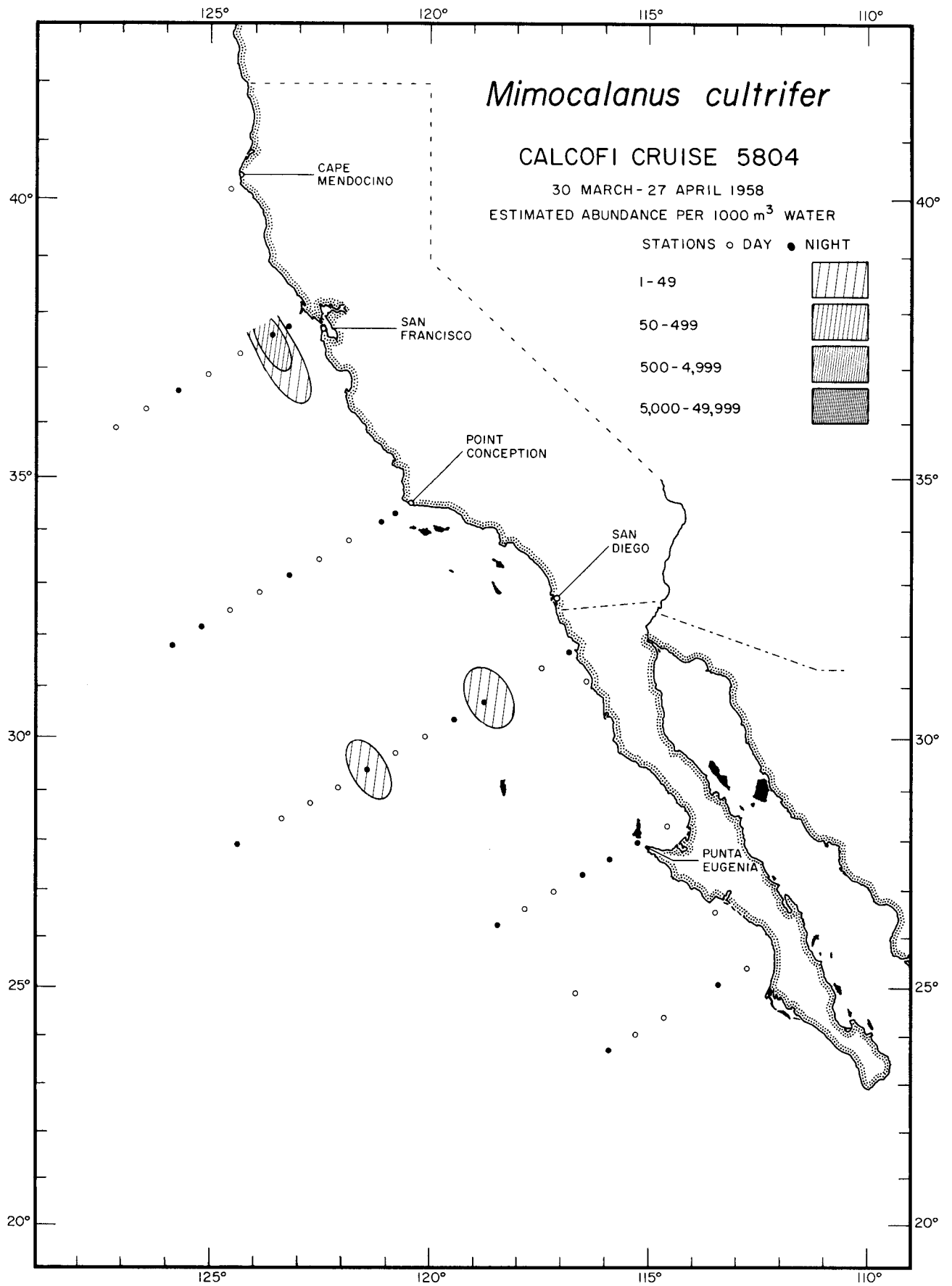
5804



Calanoida

Microcalanus pusillus

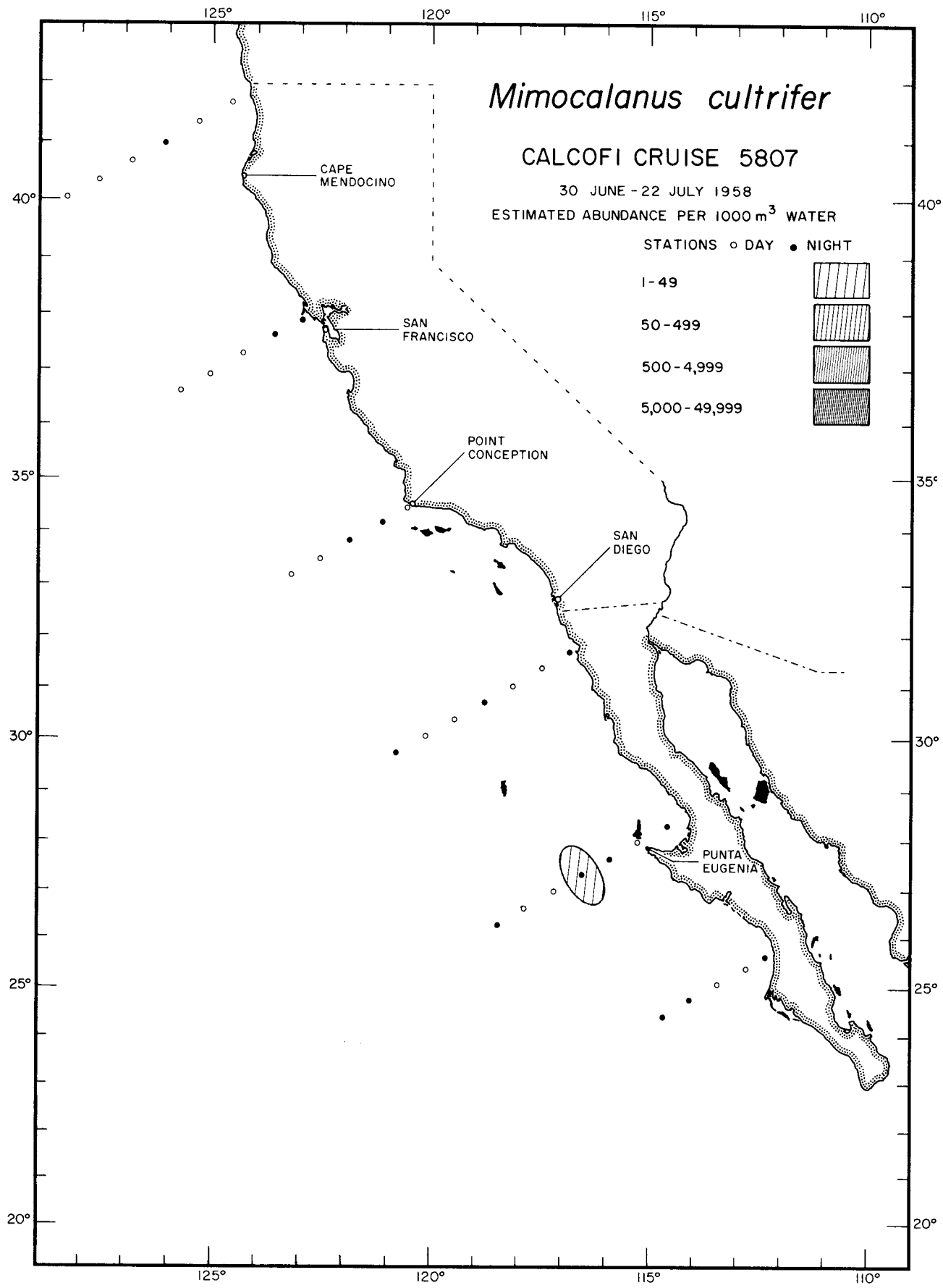
5901



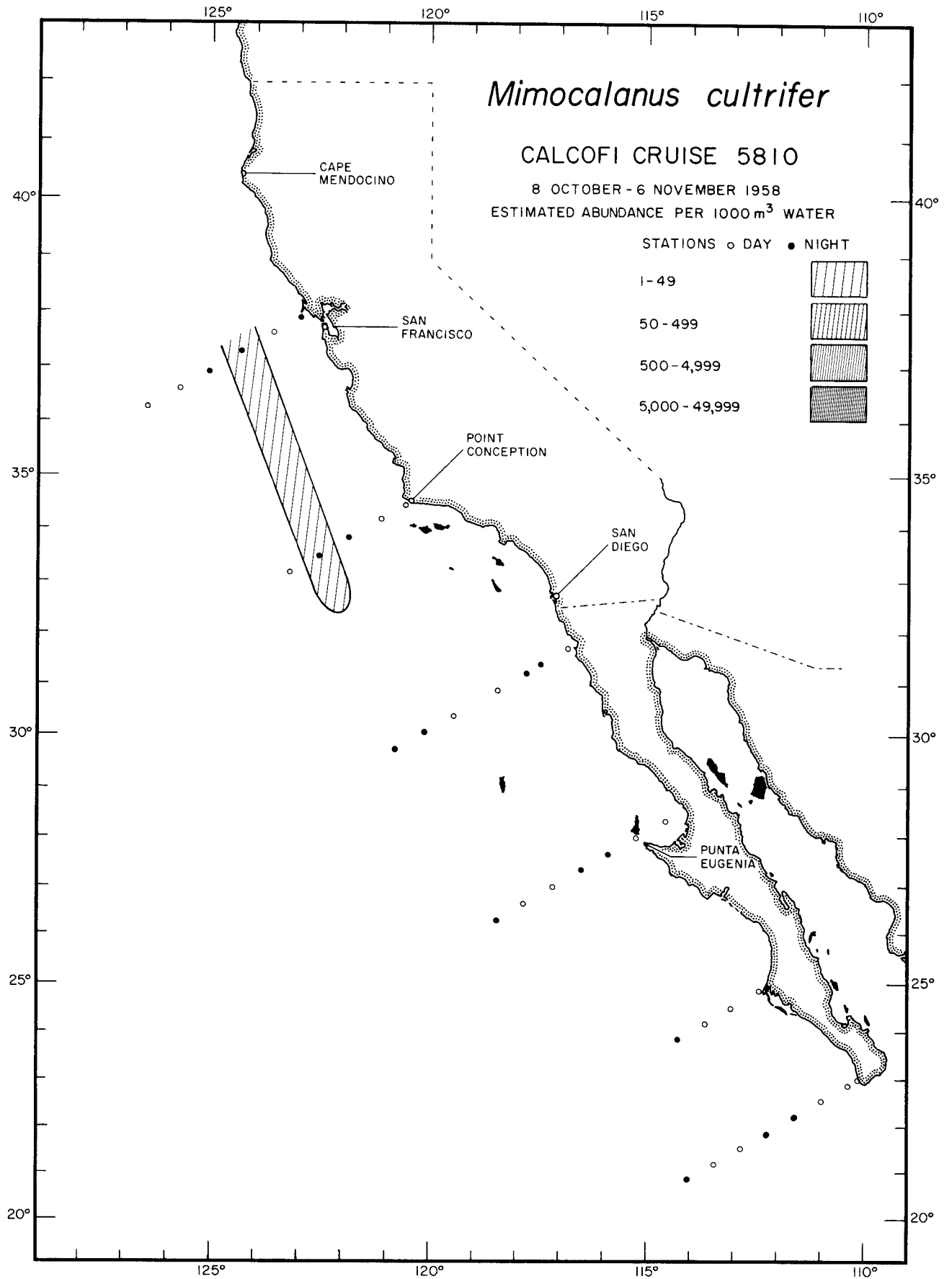
Calanoida

Mimocalanus cultrifer

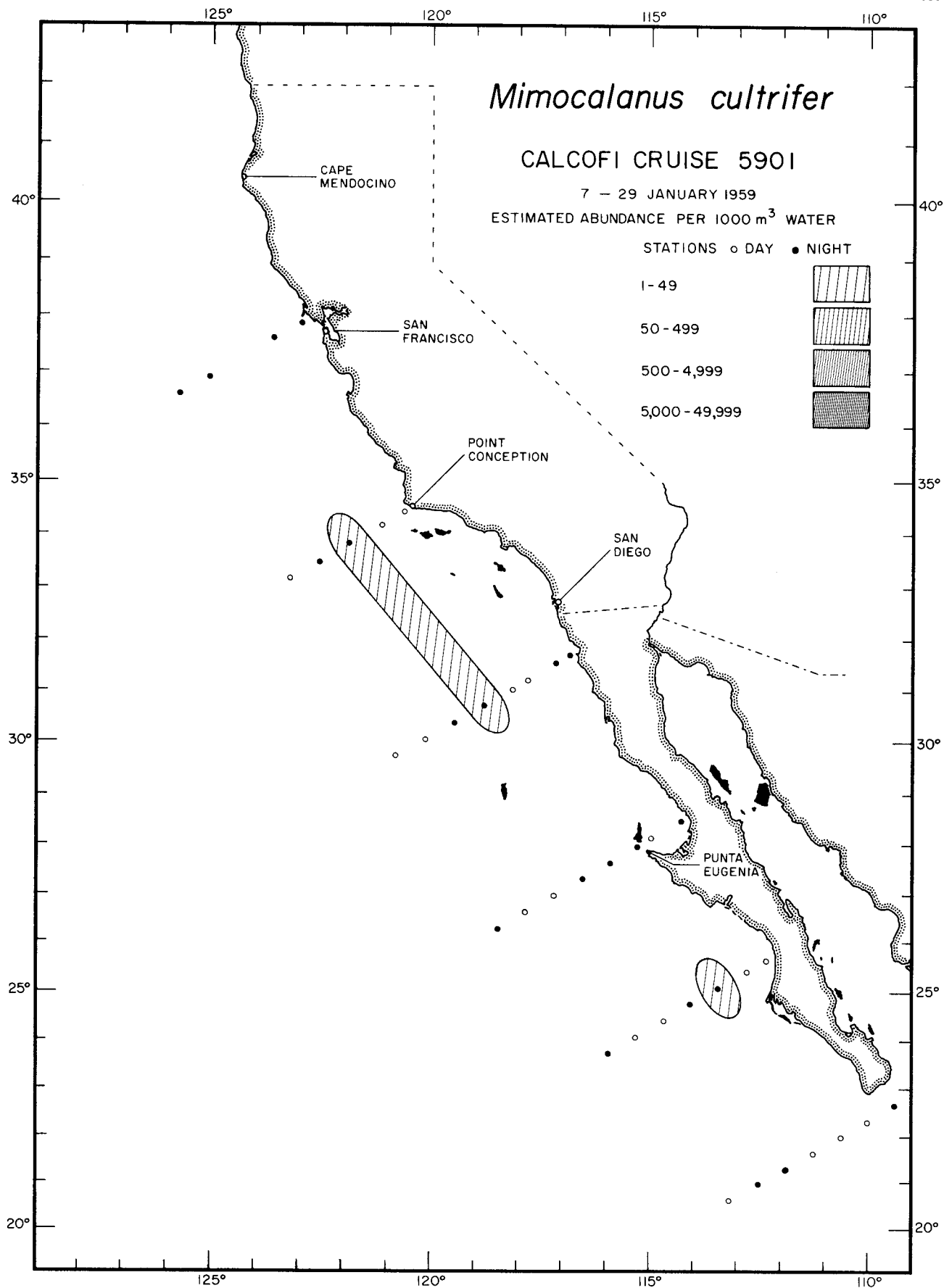
5804



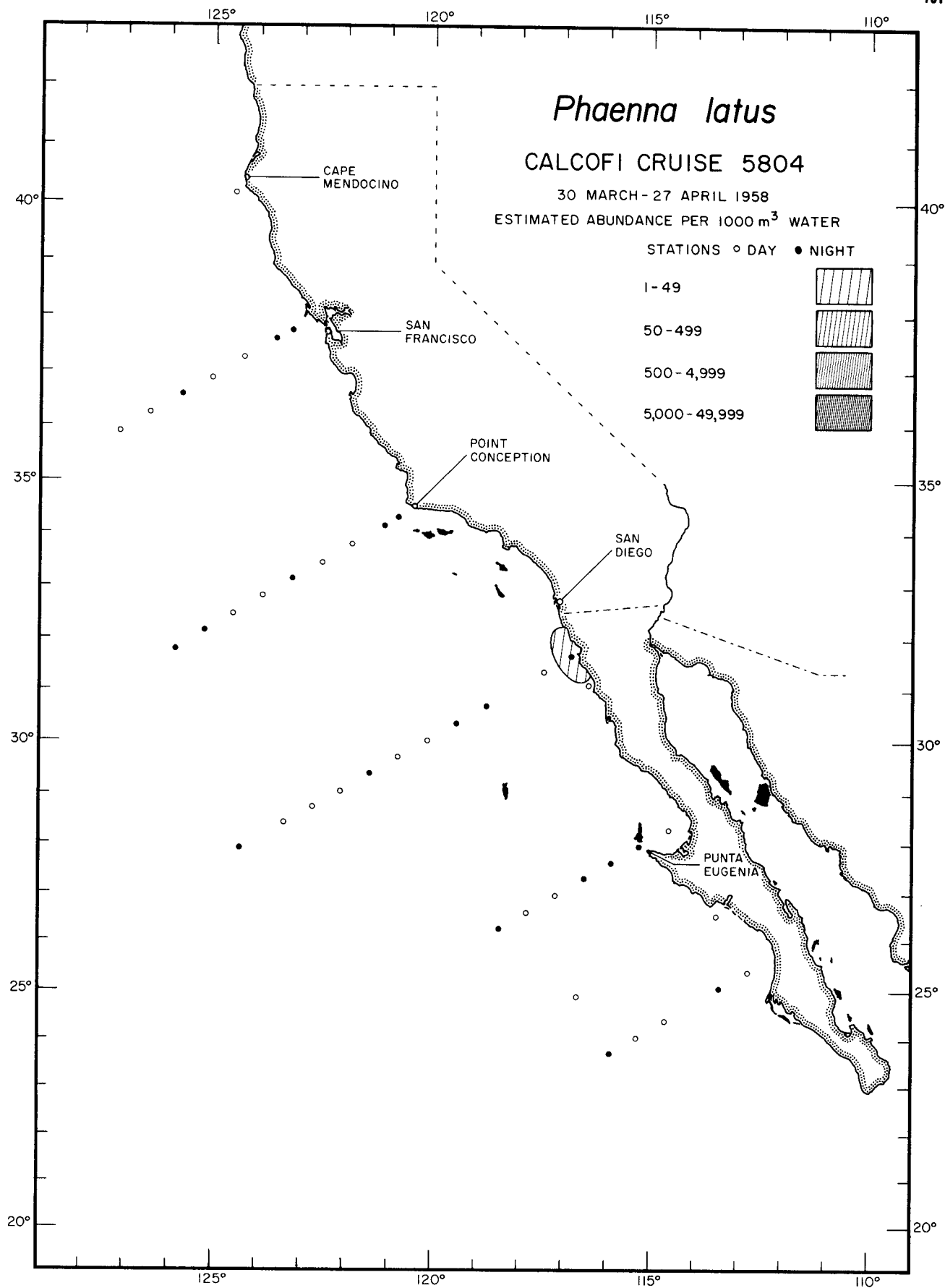
Calanoida
Mimocalanus cultrifer
 5807



Calanoida
Mimocalanus cultrifer
 5810

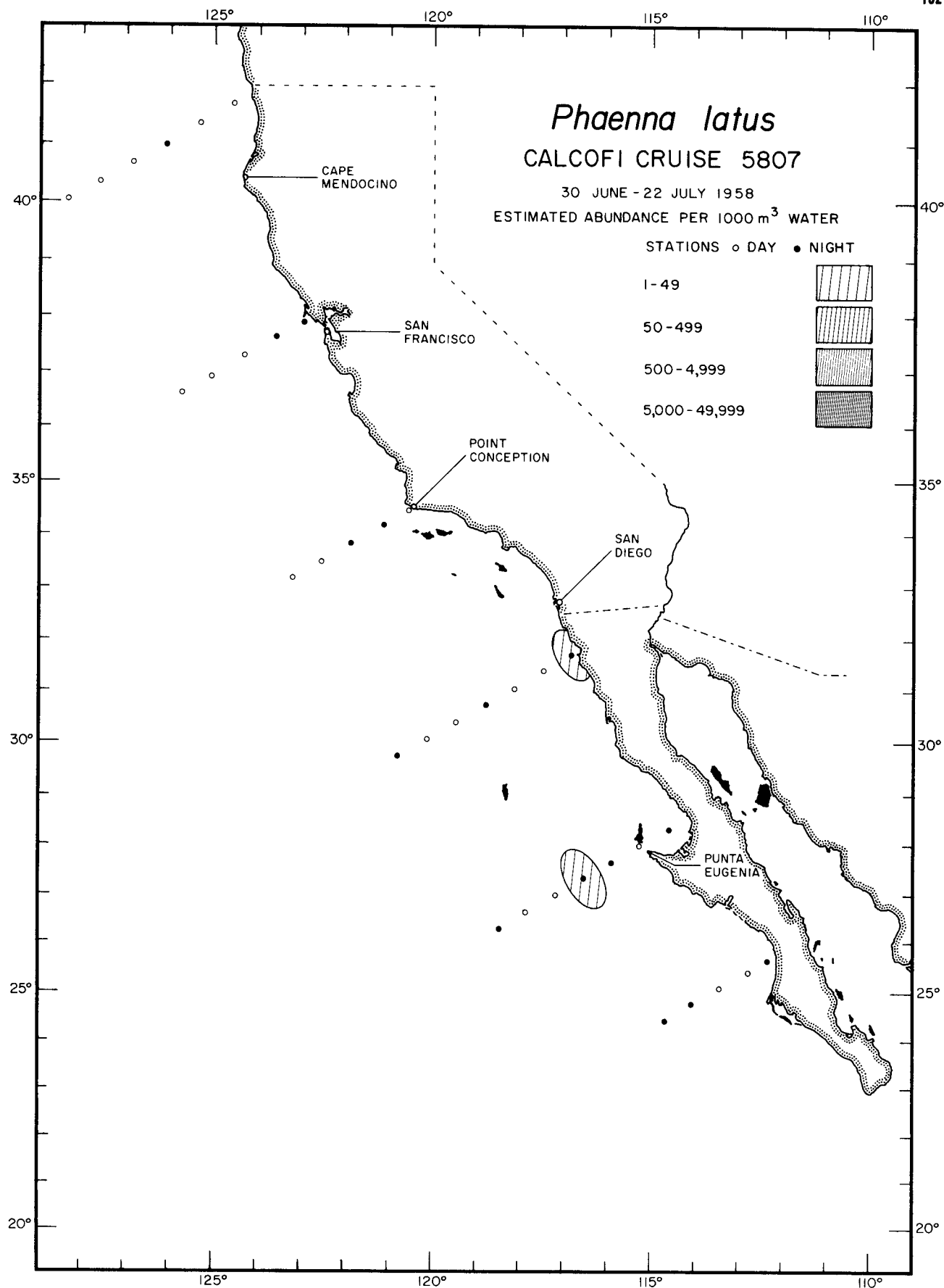


Calanoida
Mimocalanus cultrifer
5901



Calanoida

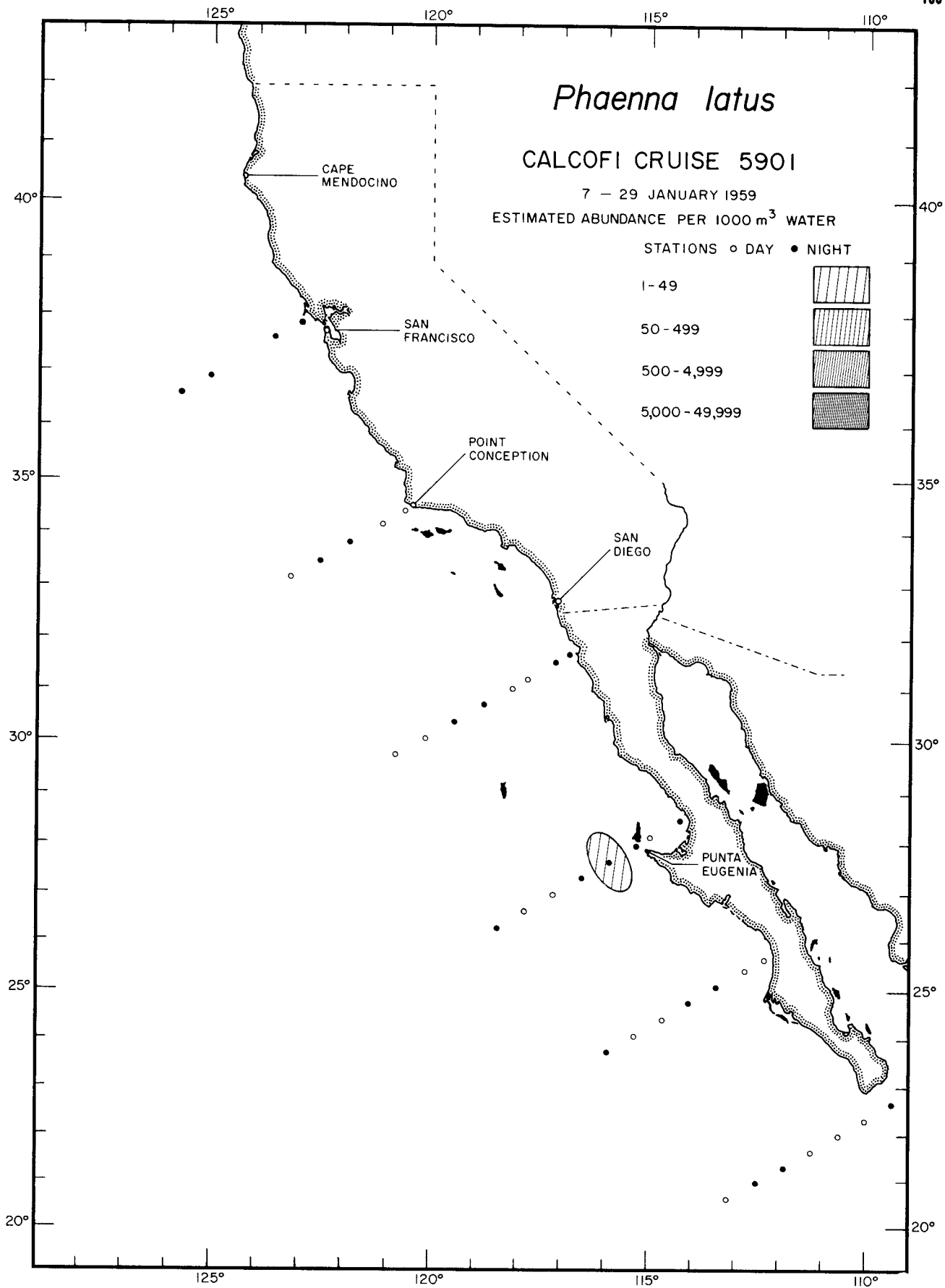
Phaenna latus
5804



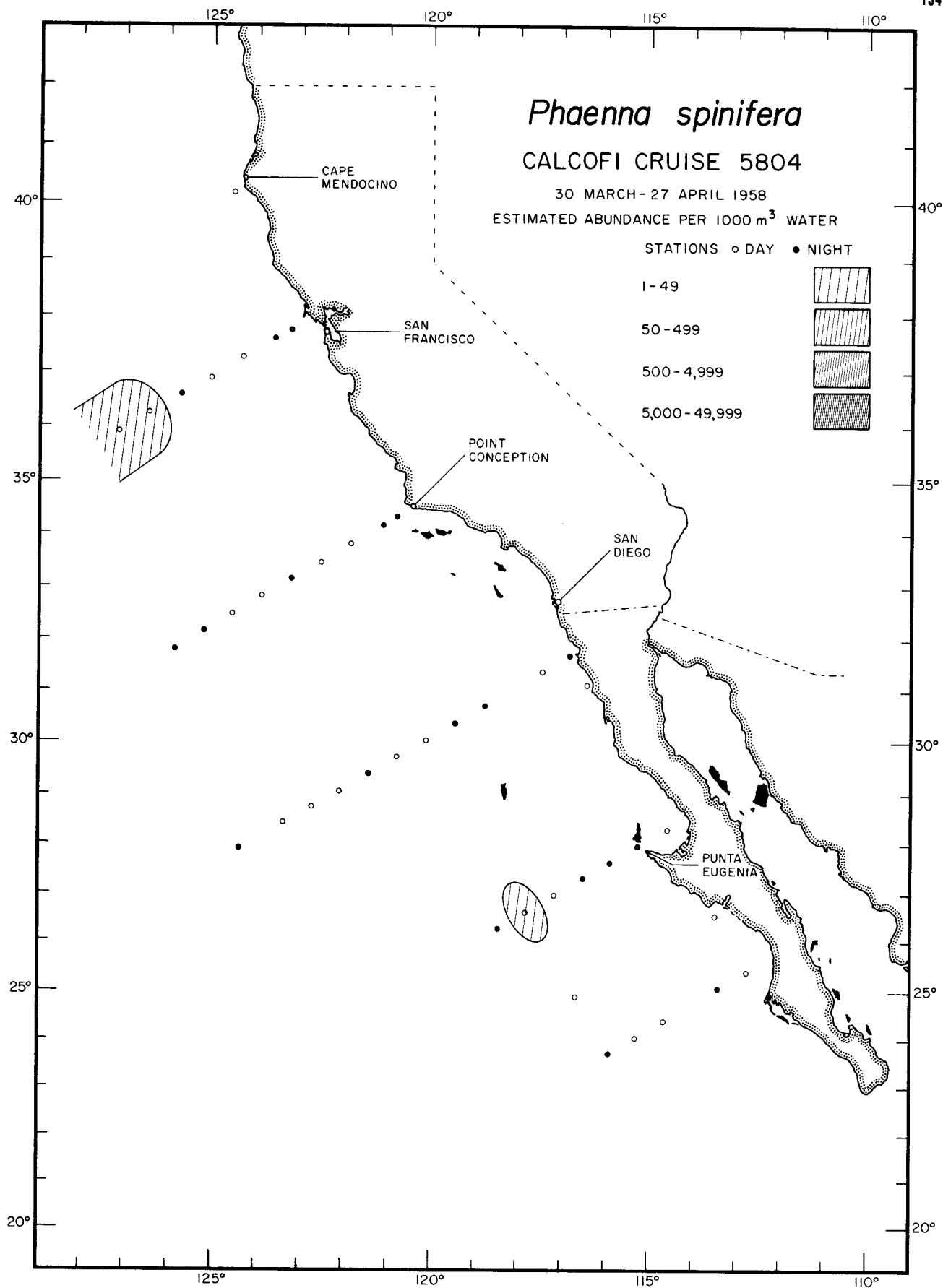
Calanoida

Phaenna latus

5807



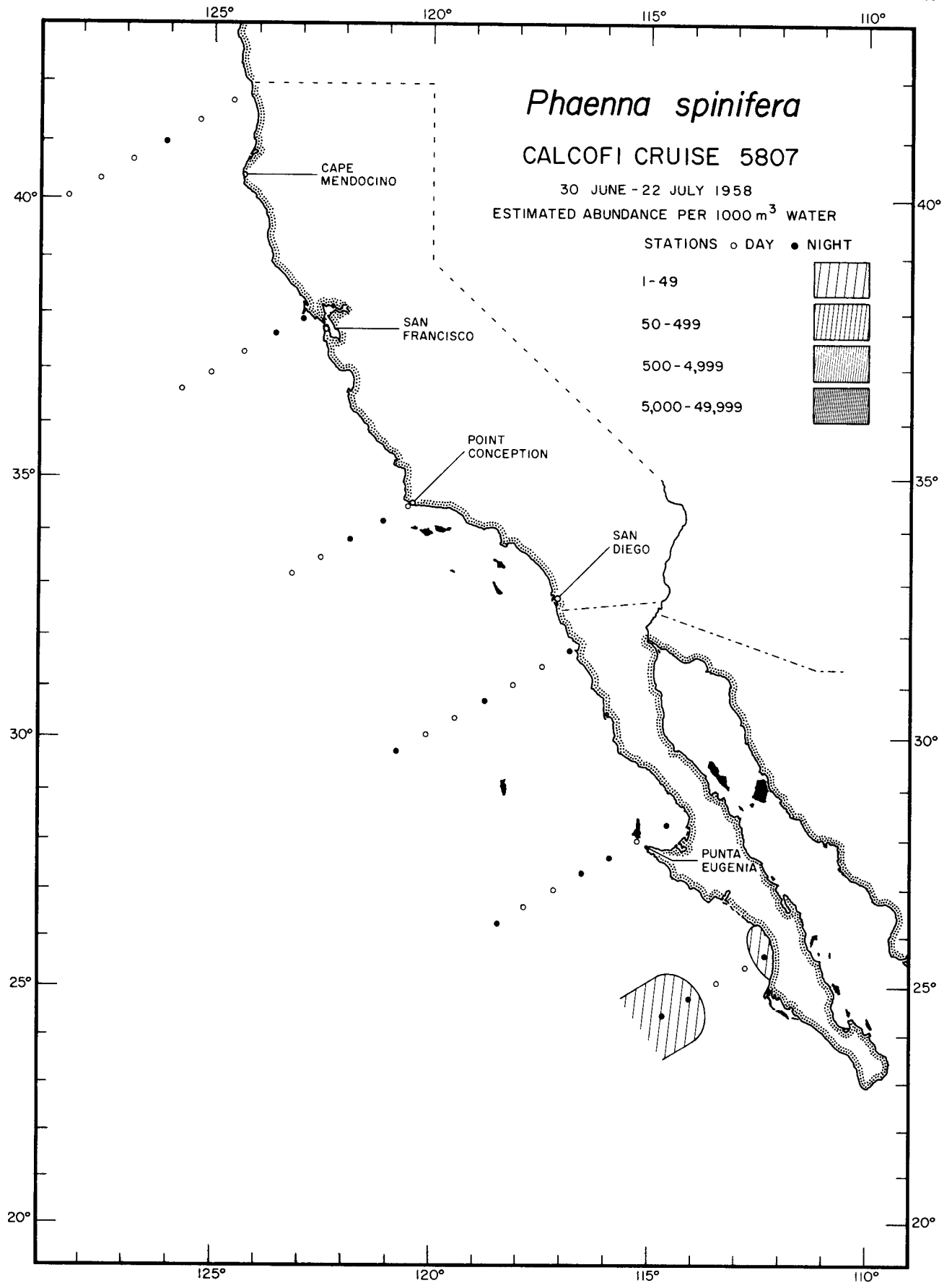
Calanoida
Phaenna latus
5901



Calanoida

Phaenna spinifera

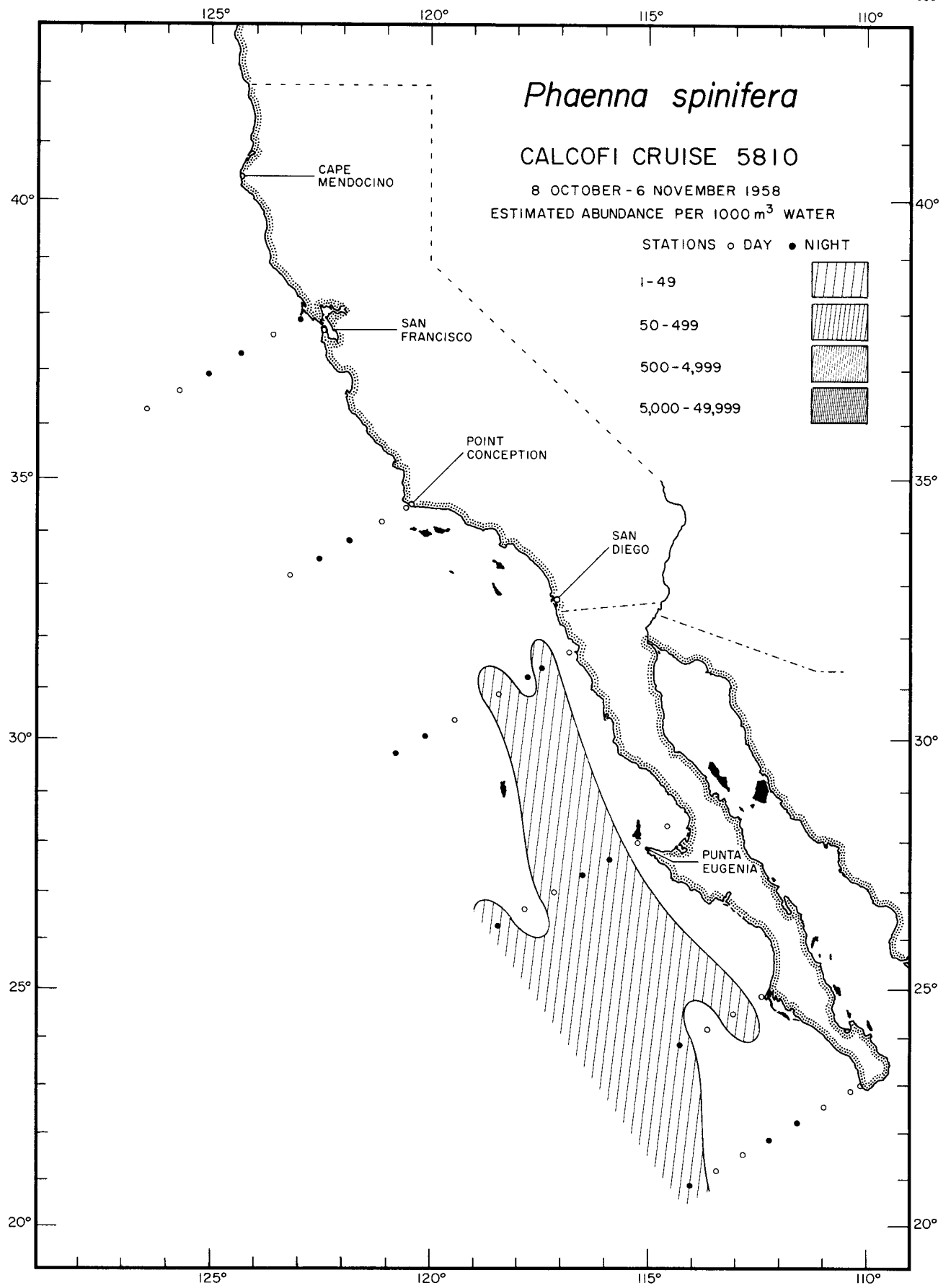
5804



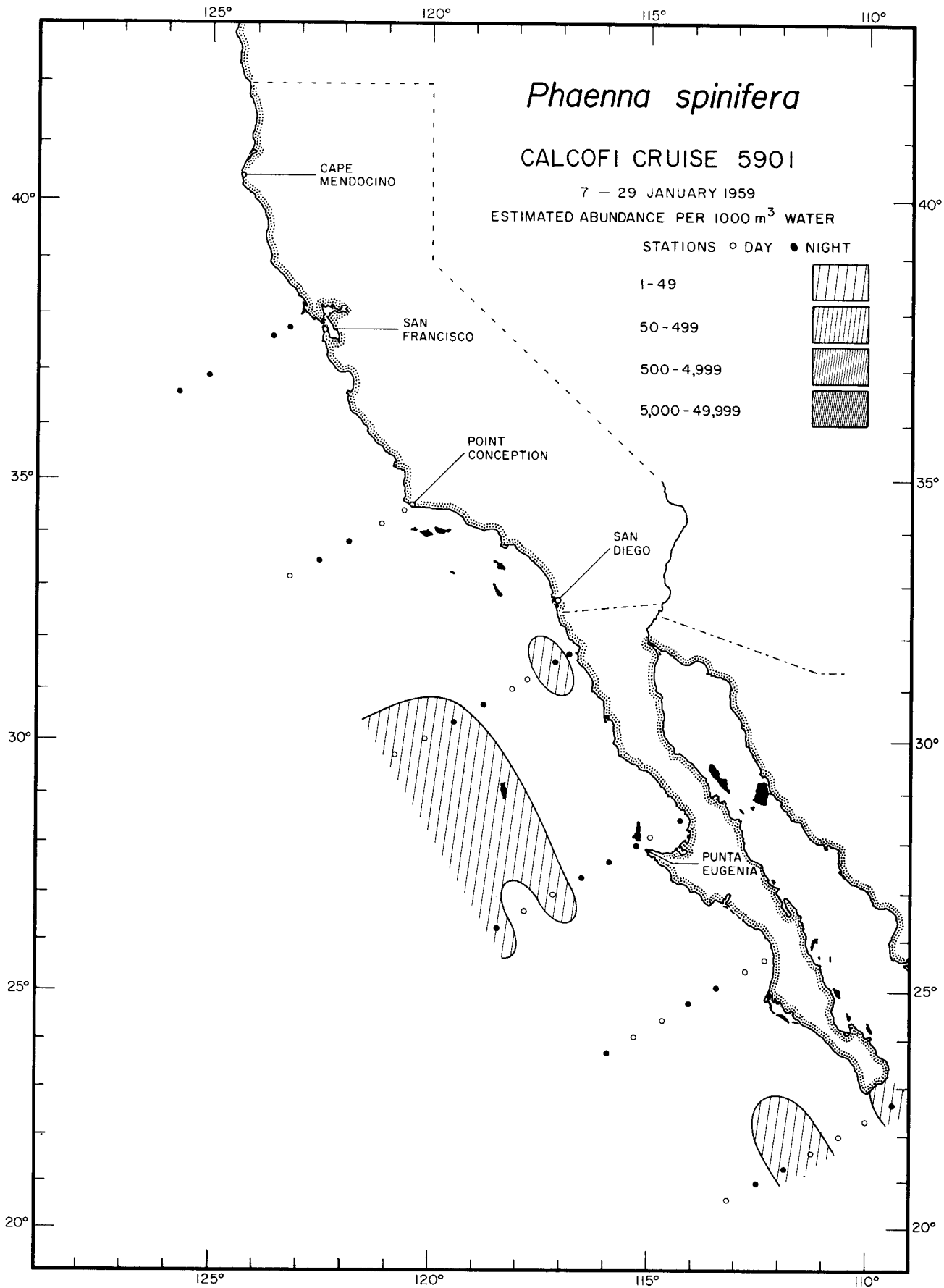
Calanoida

Phaenna spinifera

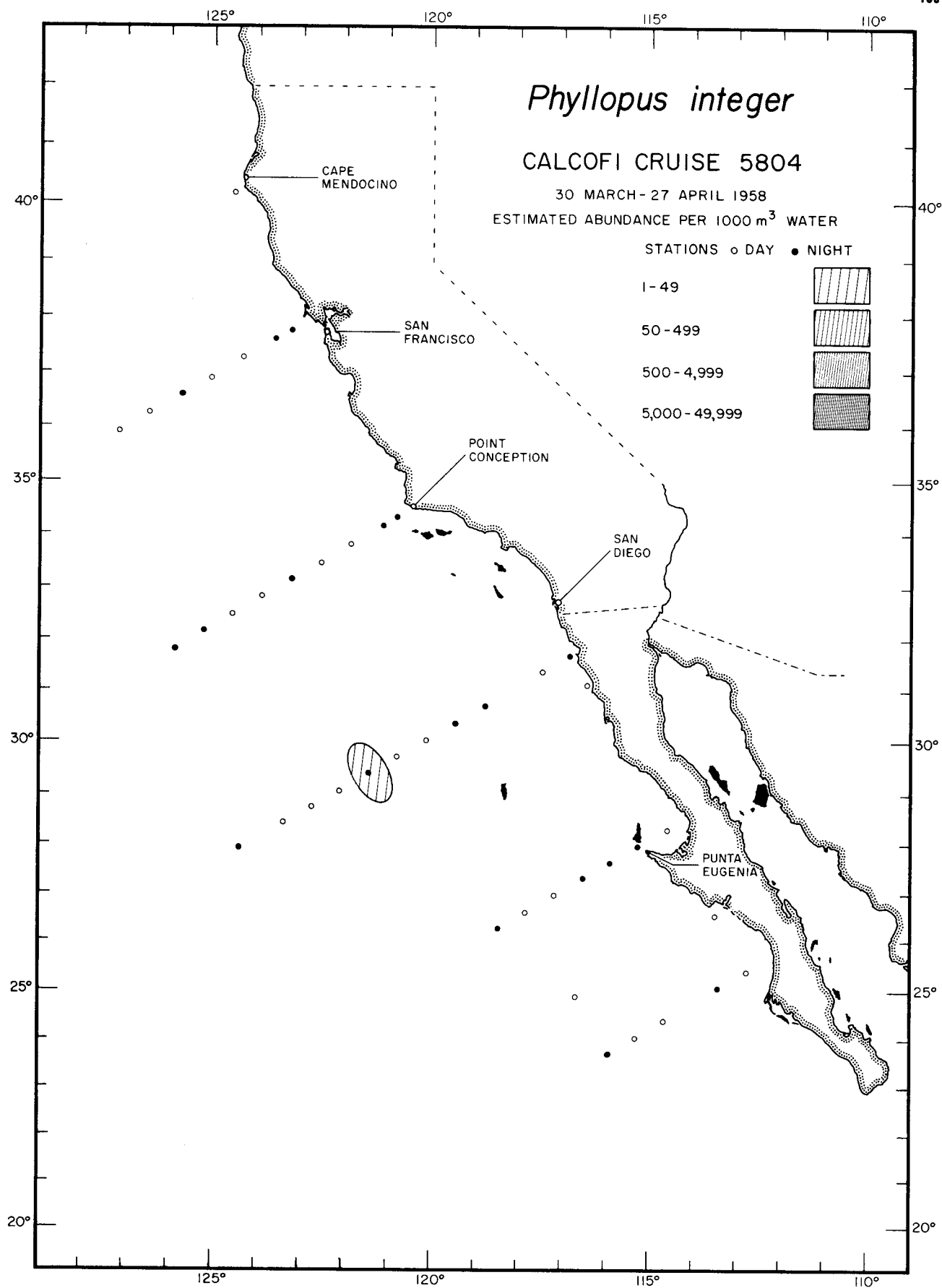
5807



Calanoida
Phaenna spinifera
5810



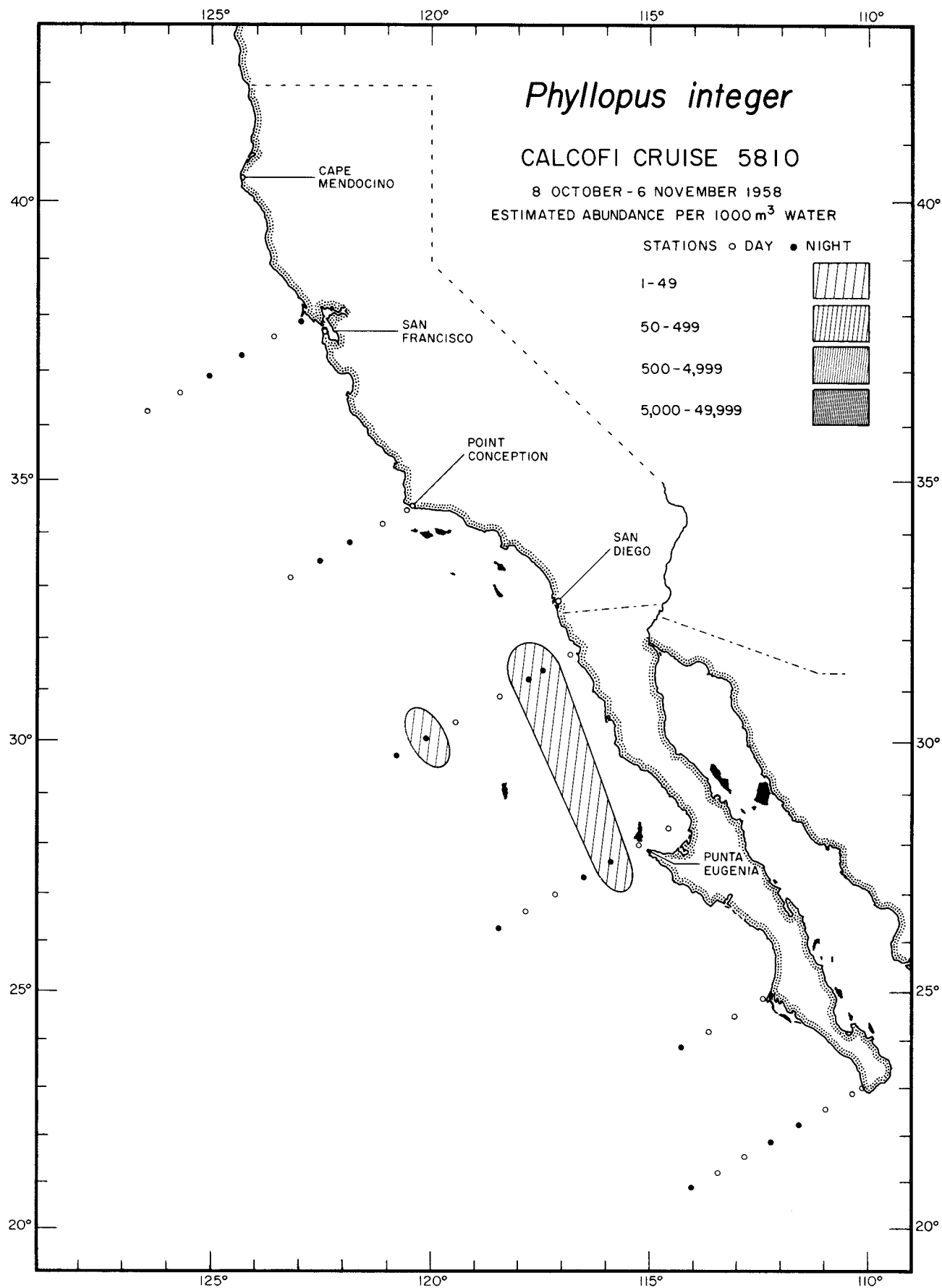
Calanoida
Phaenna spinifera
5901



Calanoida

Phyllopus integer

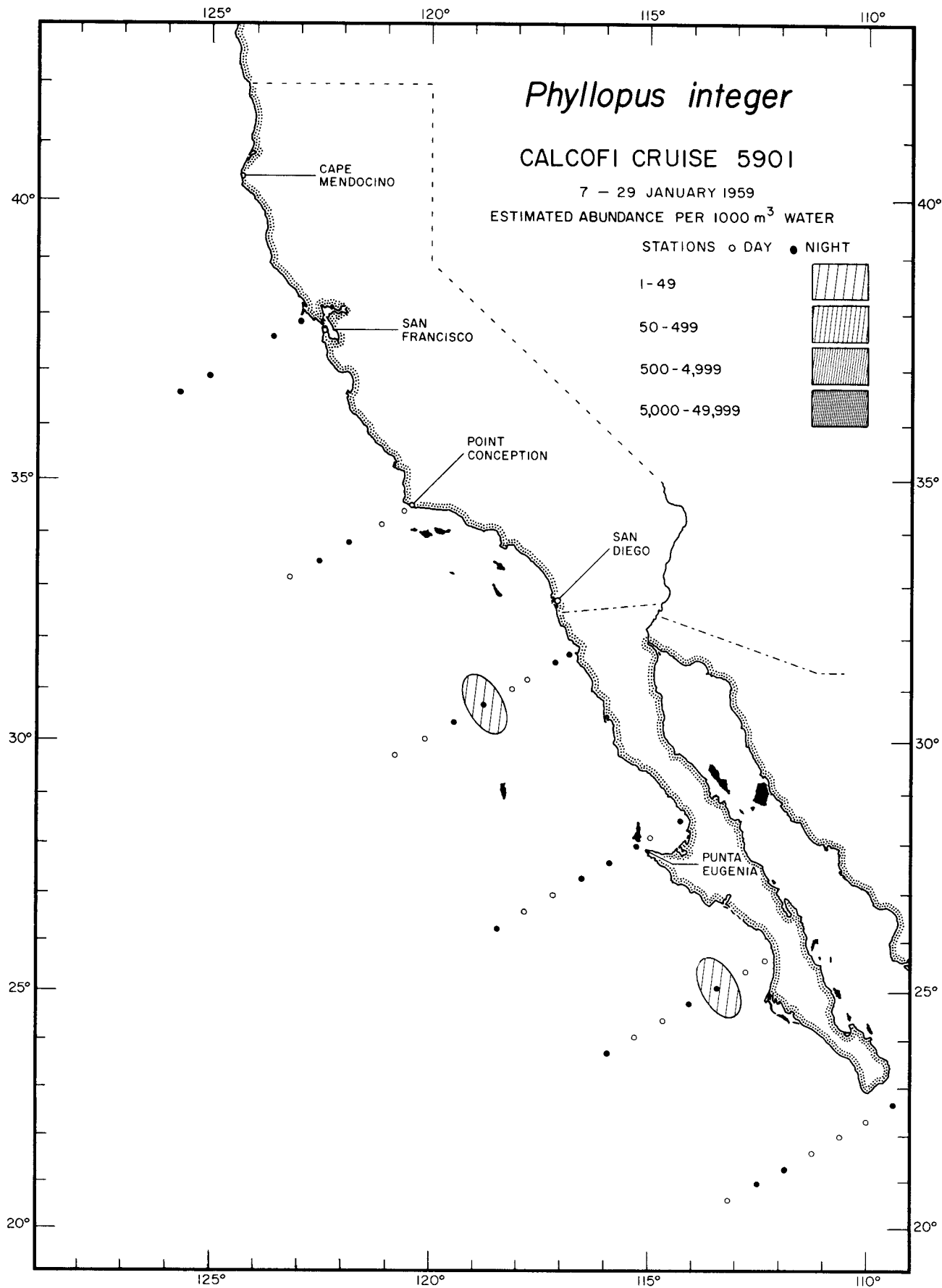
5804



Calanoida

Phyllopus integer

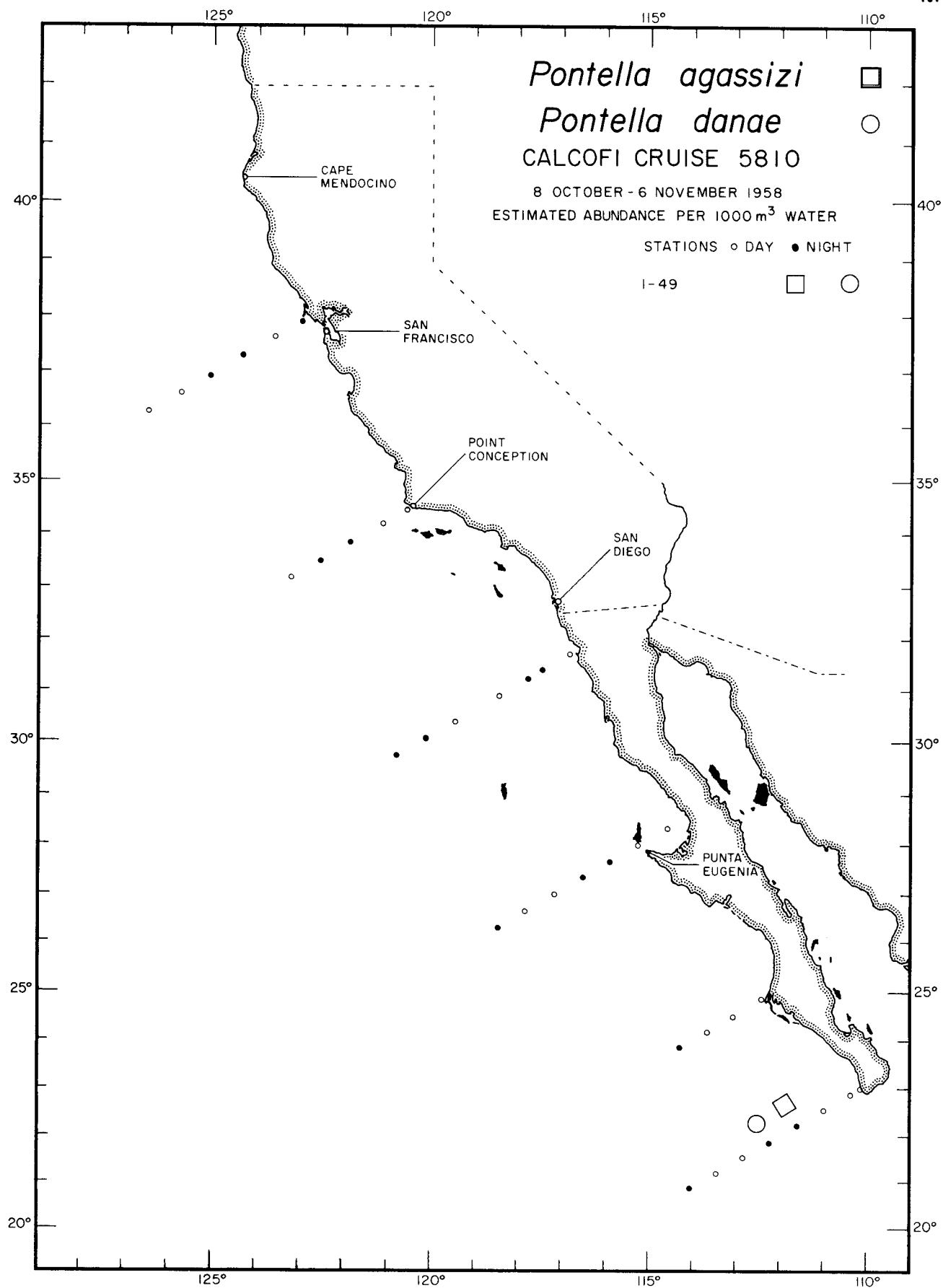
5810



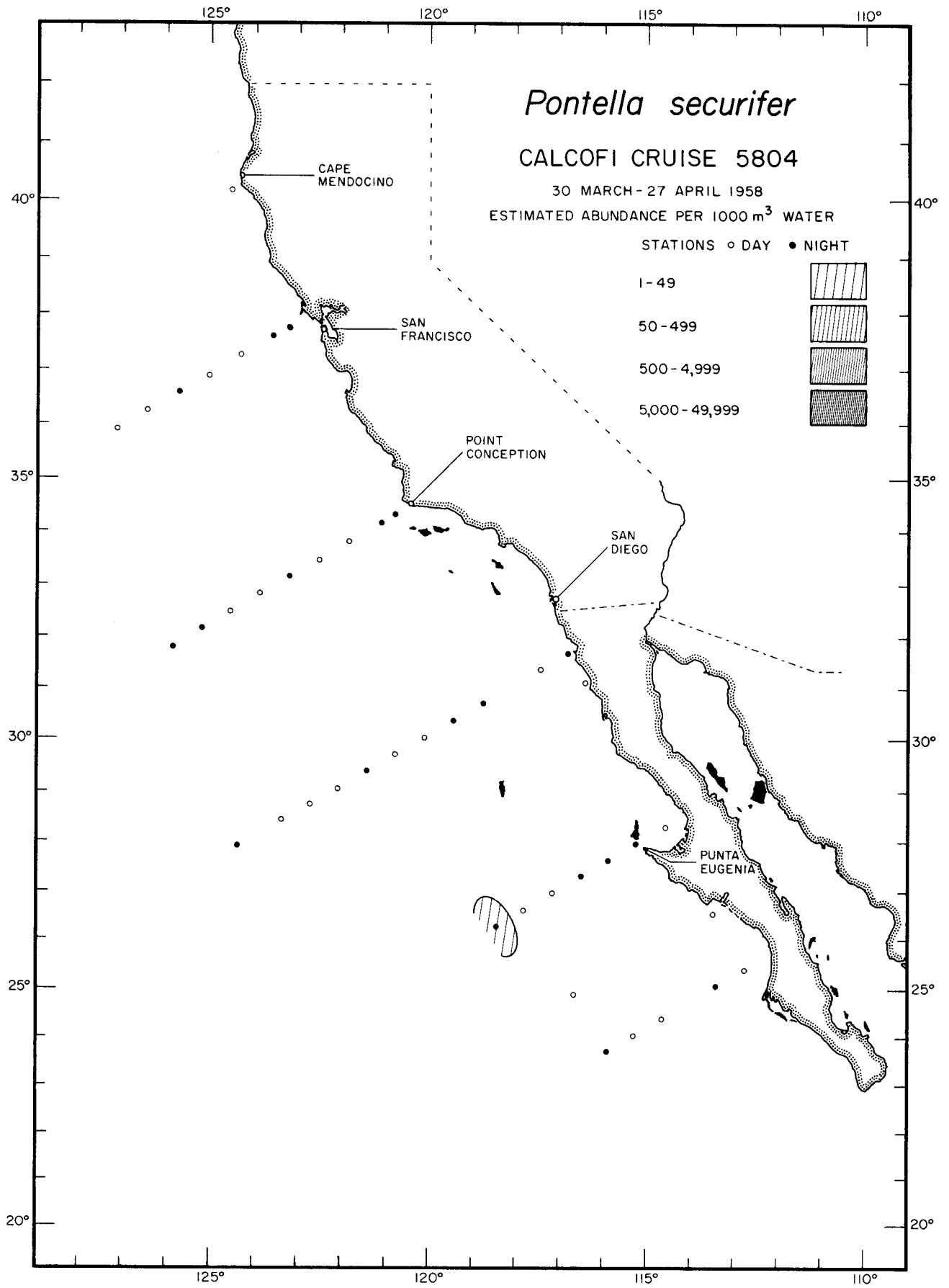
Calanoida

Phyllopus integer

5901



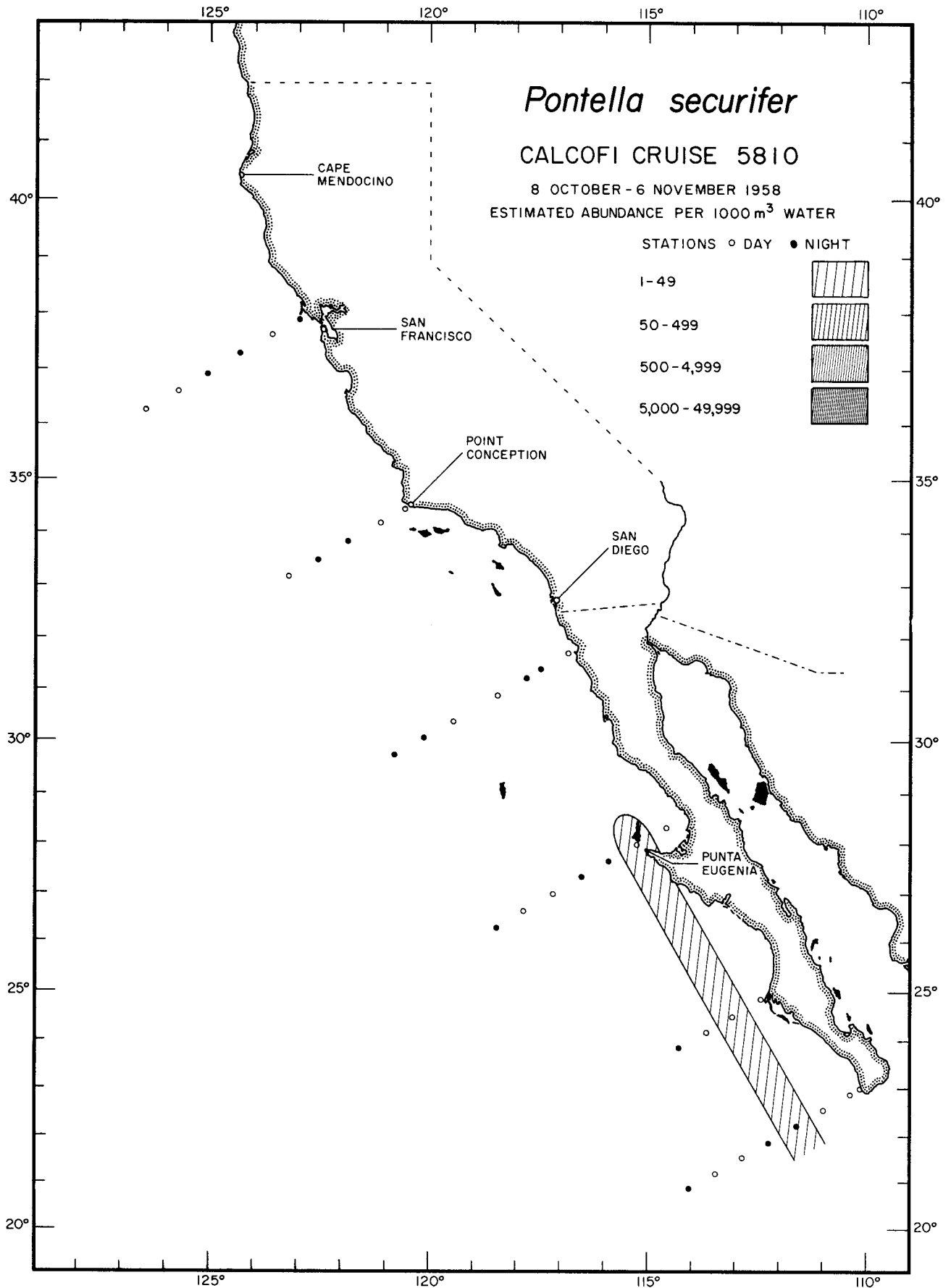
Calanoida
Pontella agassizi
Pontella danae
 5810



Calanoida

Pontella securifer

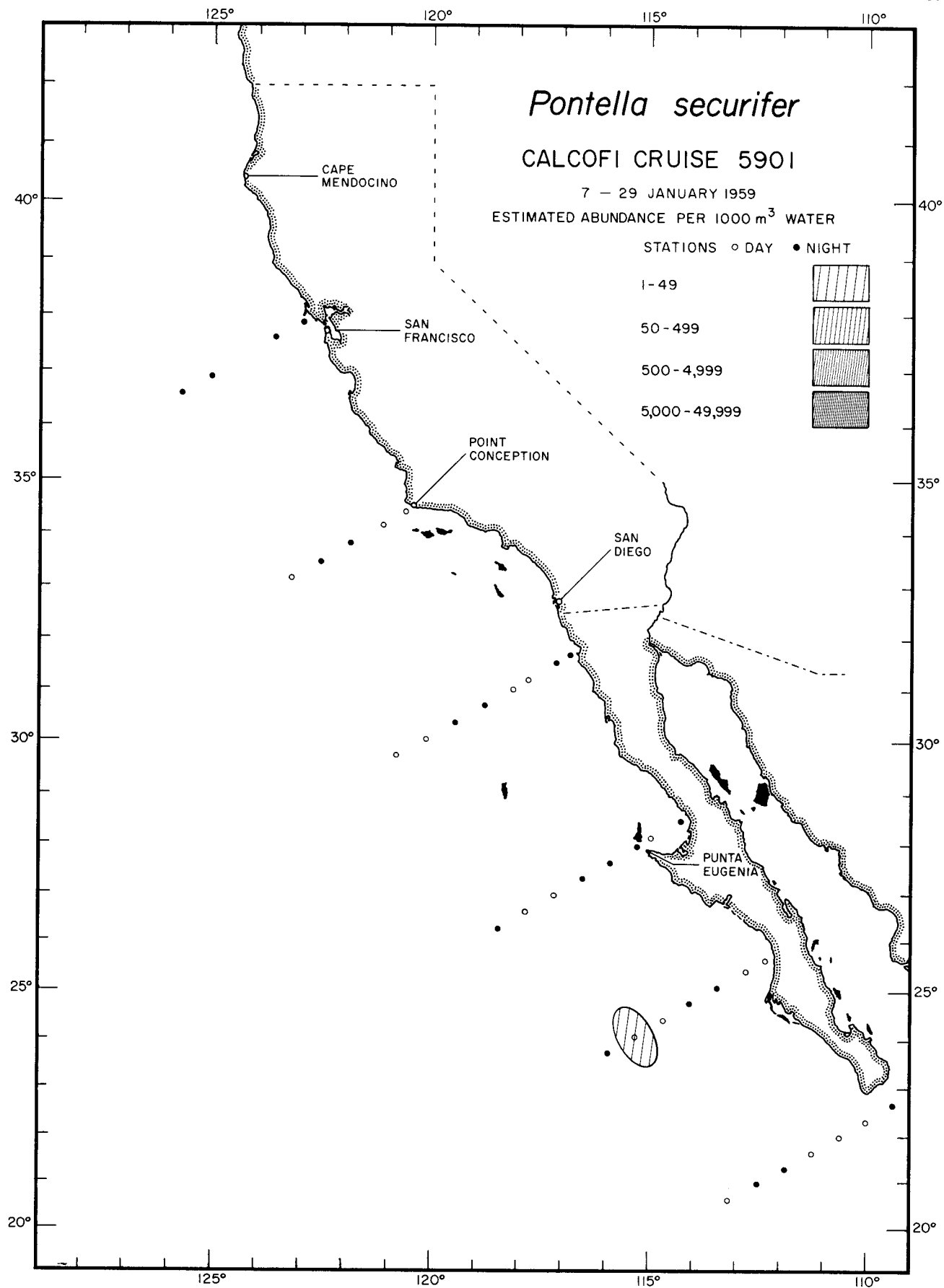
5804



Calanoida

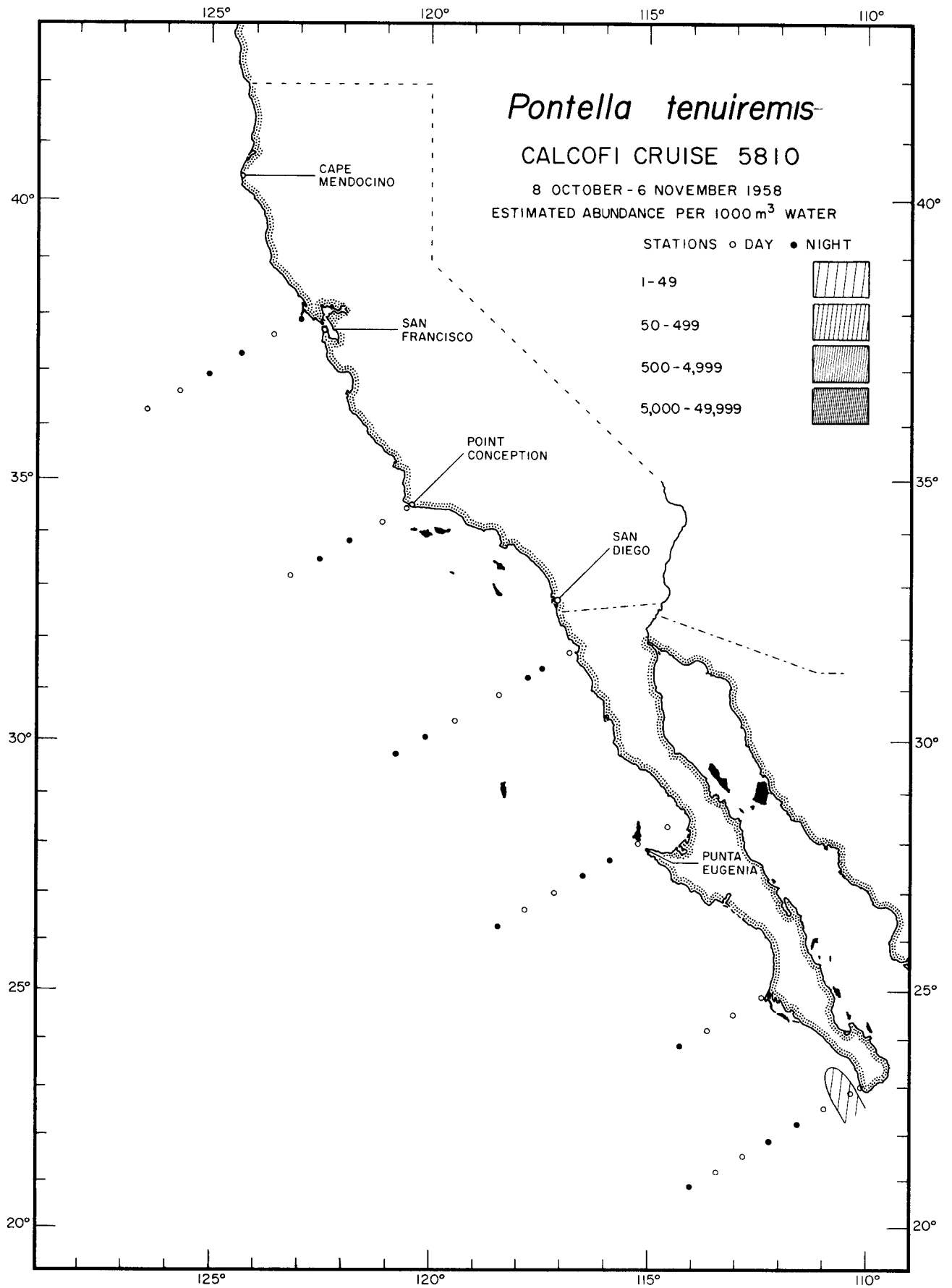
Pontella securifer

5810



Calanoida

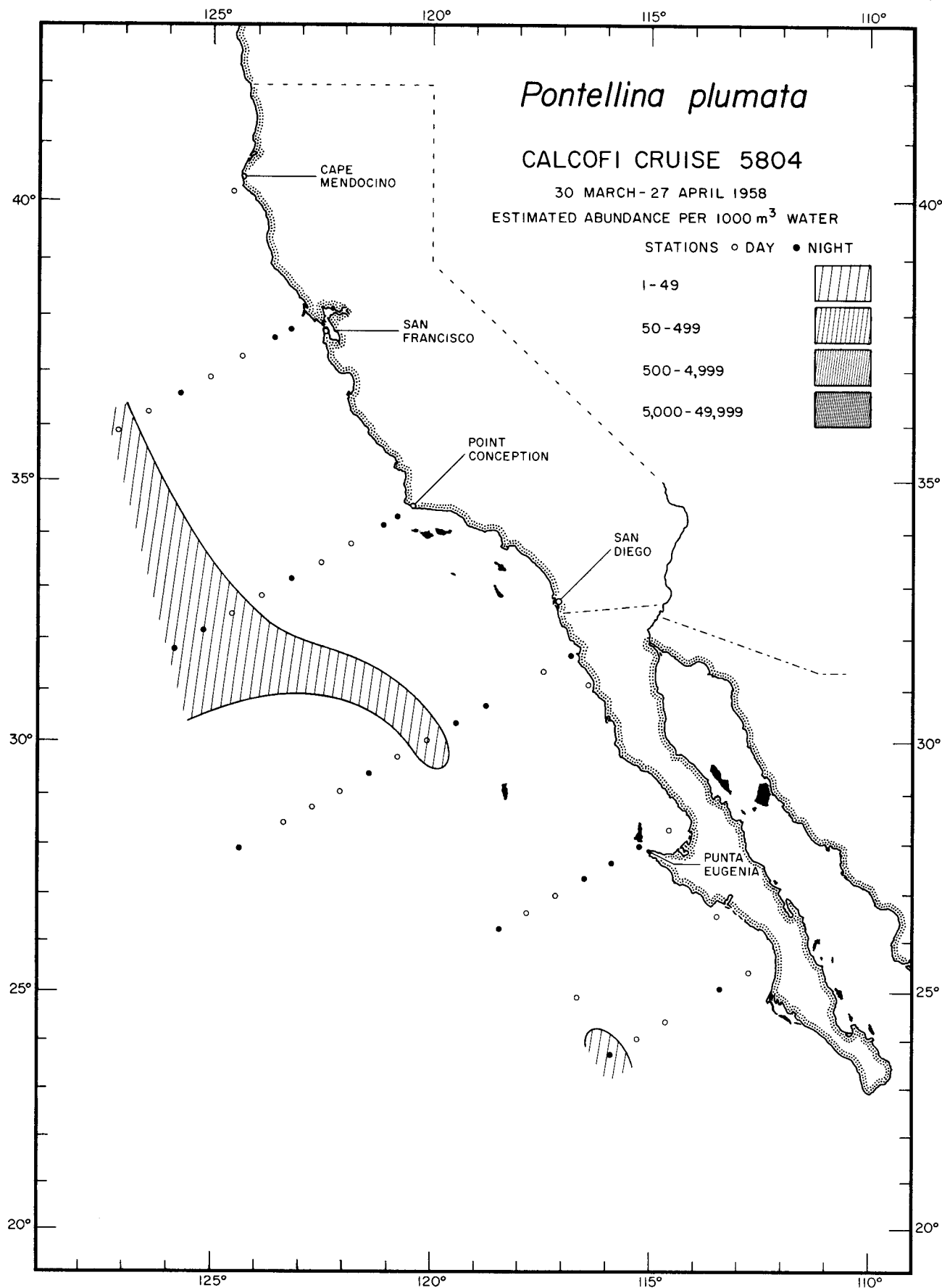
Pontella securifer
5901



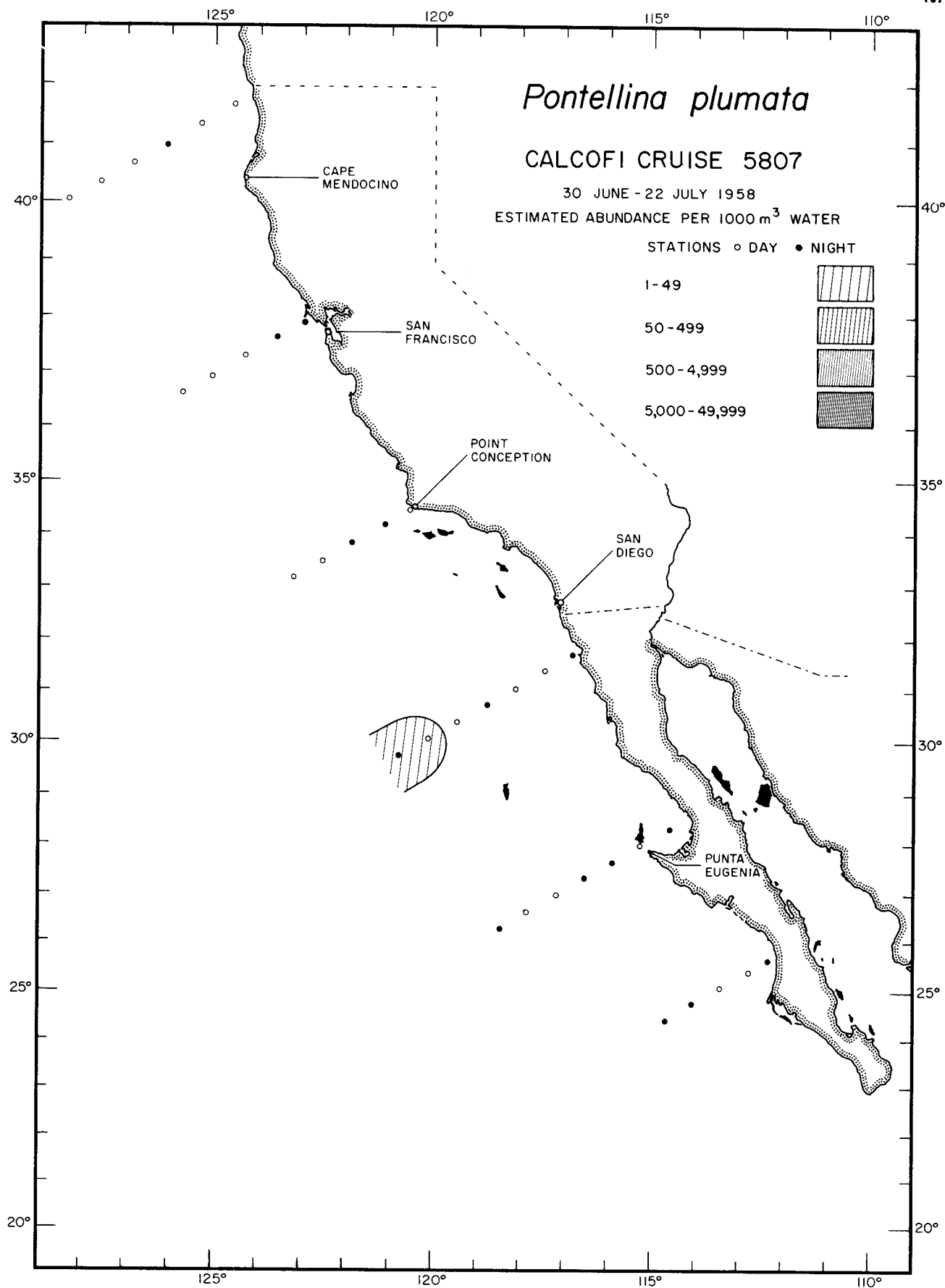
Calanoida

Pontella tenuiremis

5810



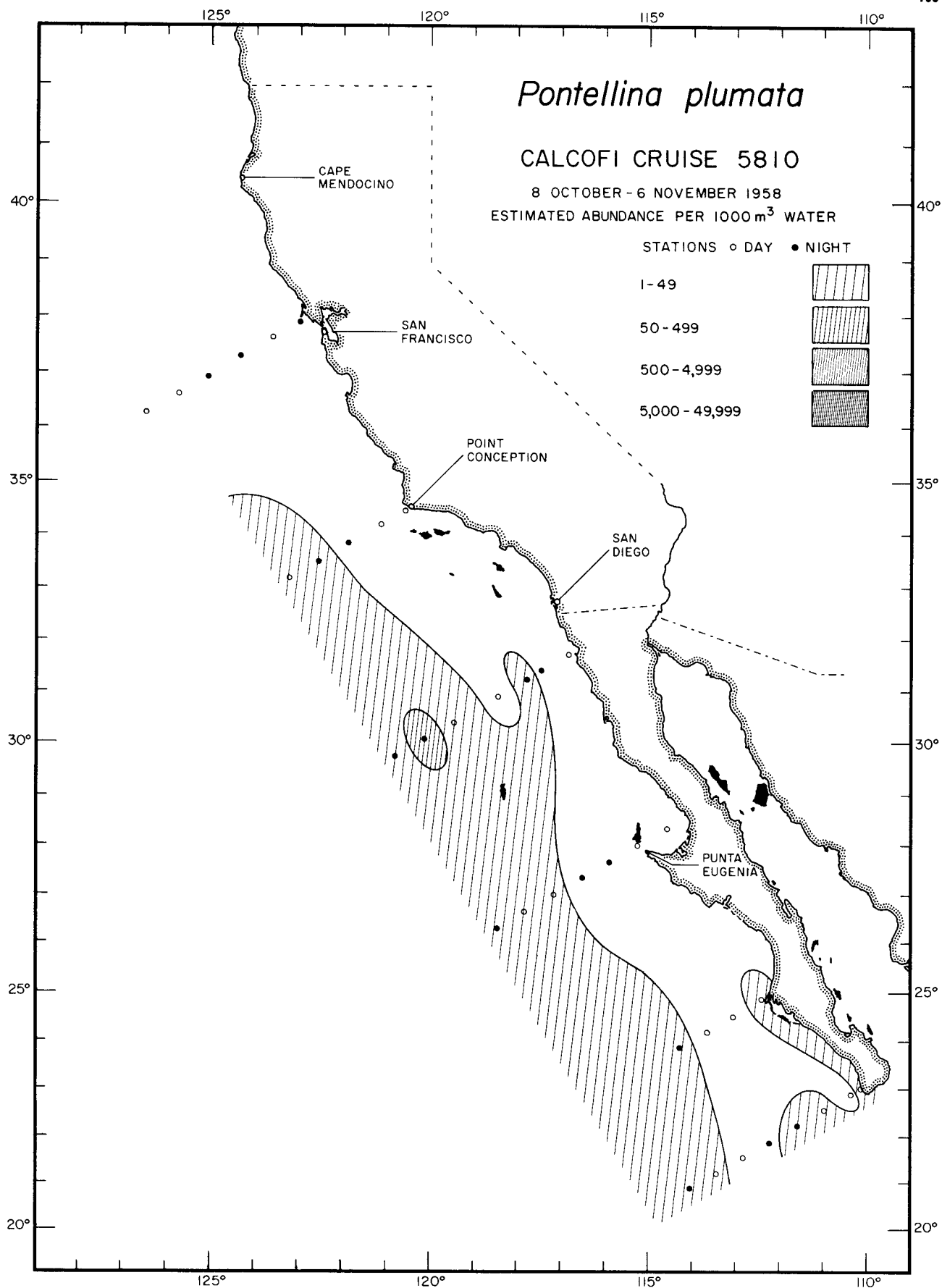
Calanoida
Pontellina plumata
5804



Calanoida

Pontellina plumata

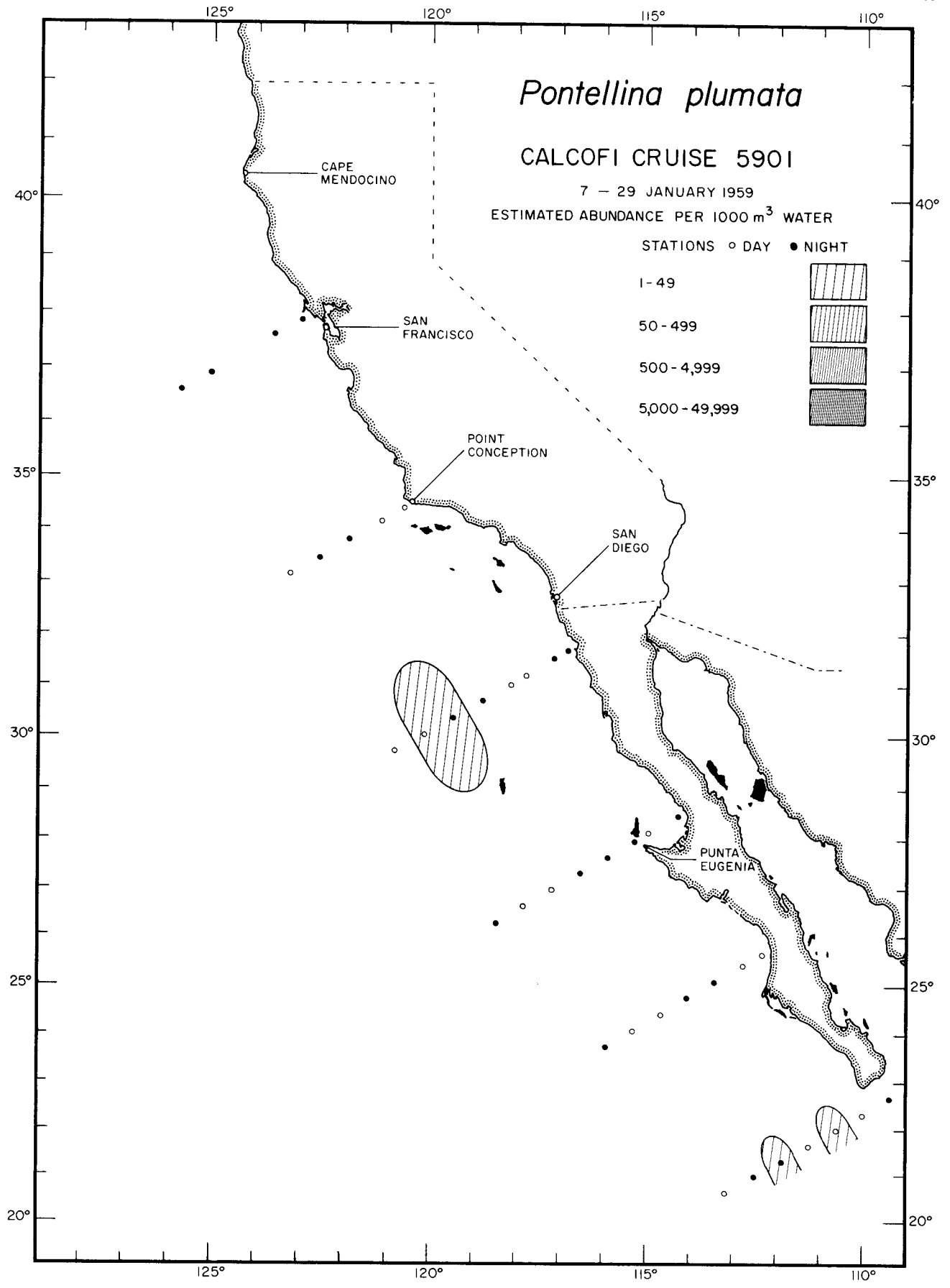
5807



Calanoida

Pontellina plumata

5810



Pontellina plumata

CALCOFI CRUISE 5901

7 - 29 JANUARY 1959

ESTIMATED ABUNDANCE PER 1000 m³ WATER

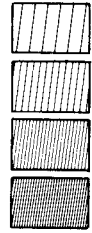
STATIONS ○ DAY ● NIGHT

1 - 49

50 - 499

500 - 4,999

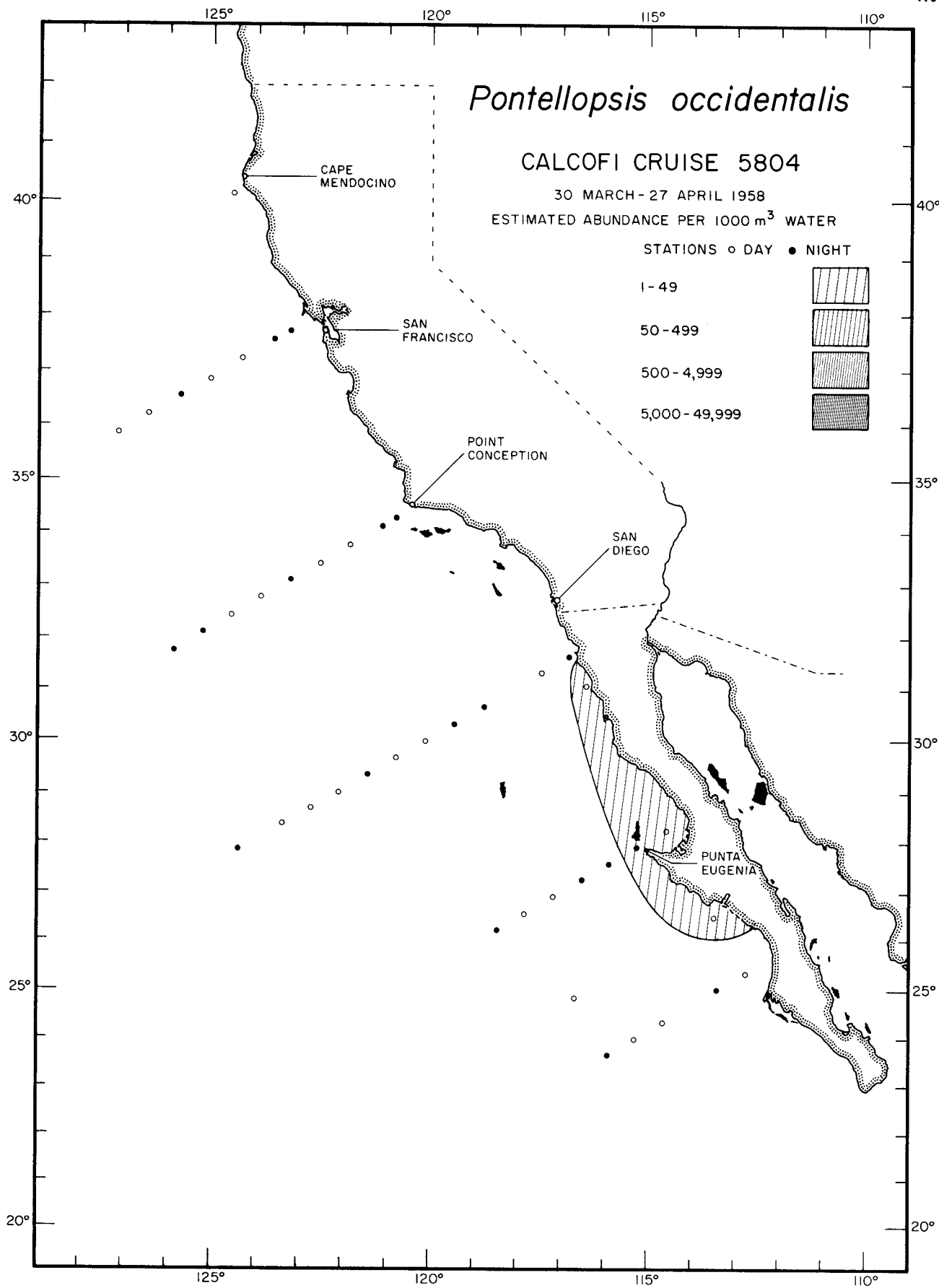
5,000 - 49,999



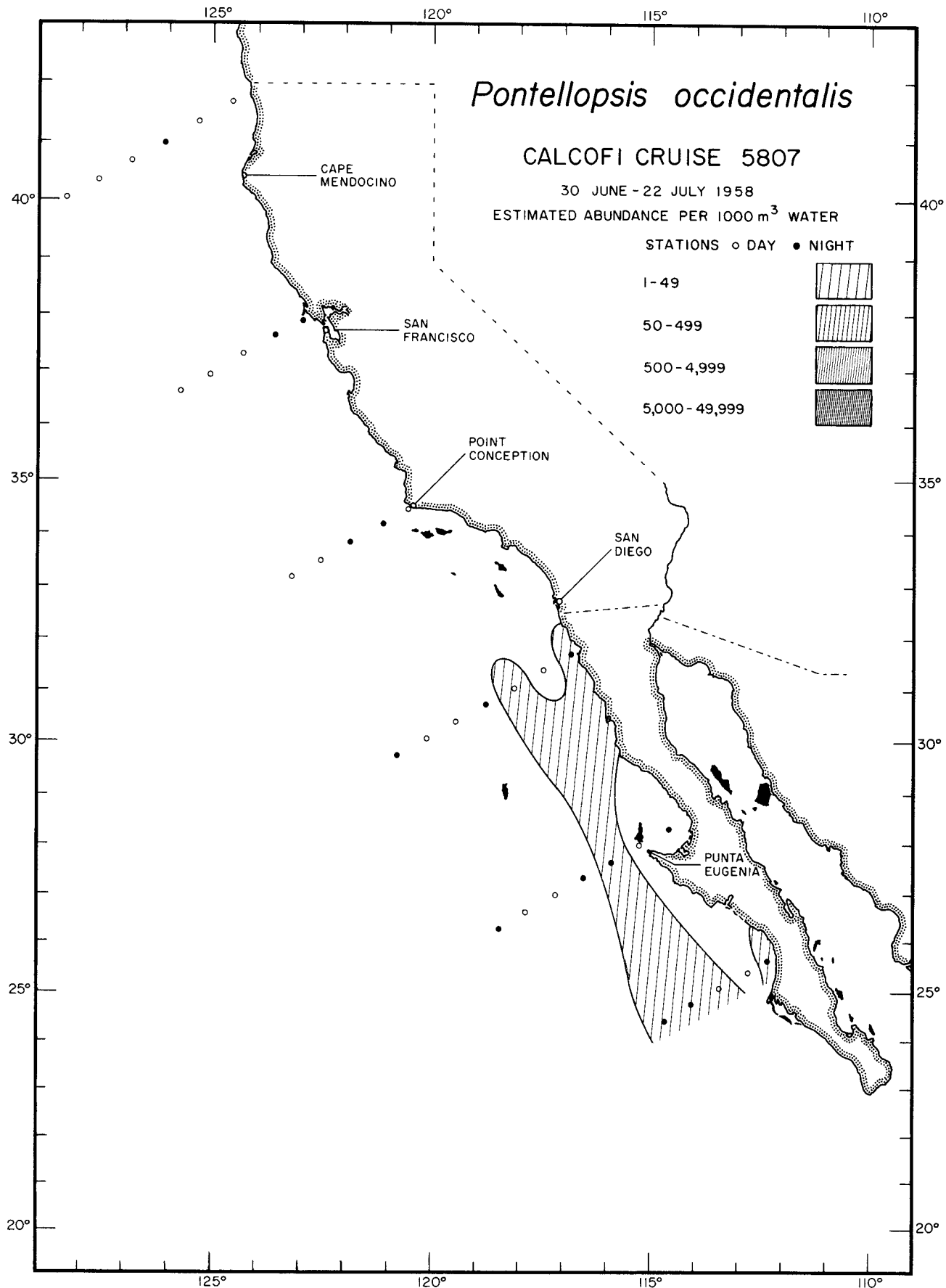
Calanoida

Pontellina plumata

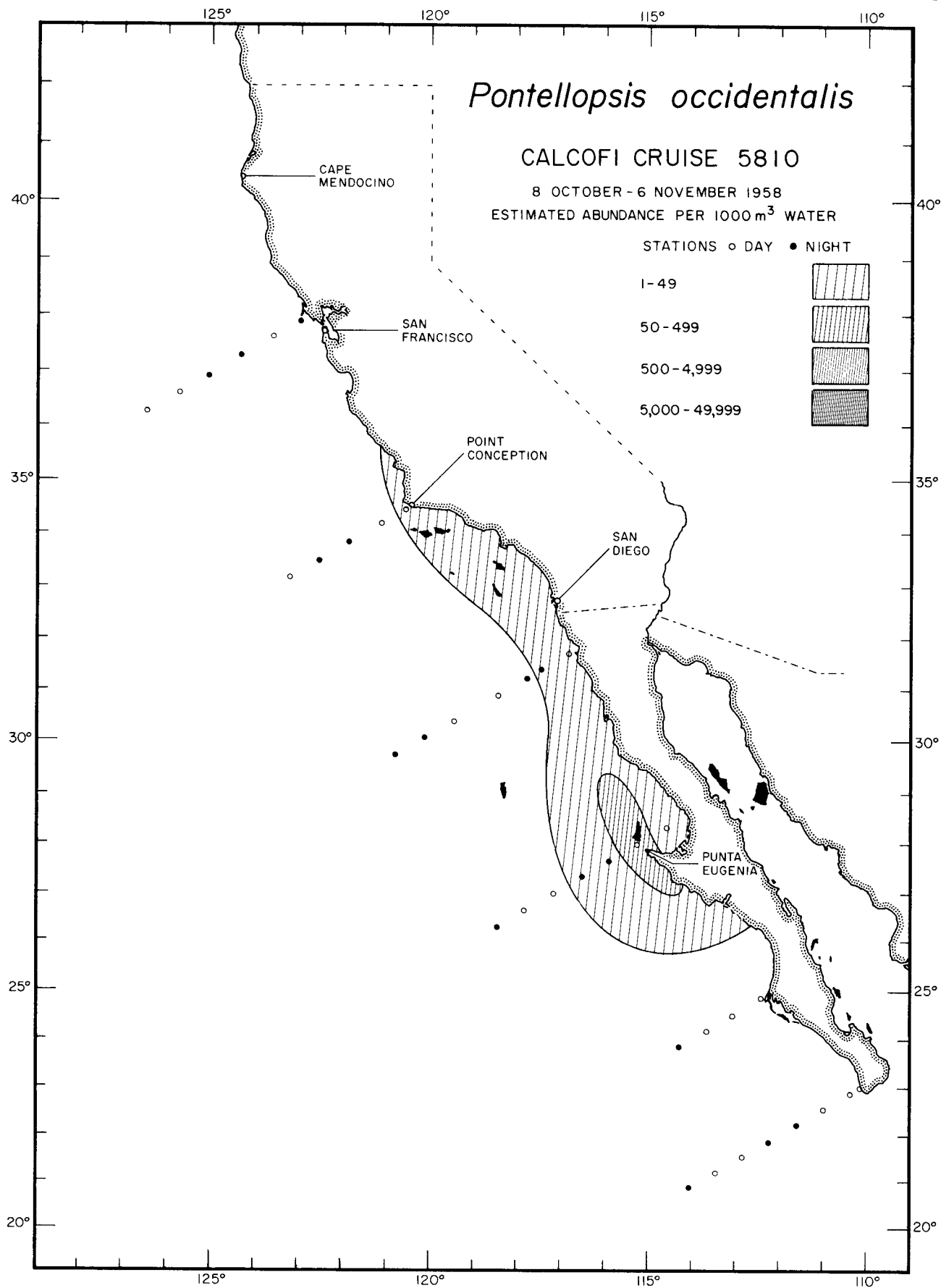
5901



Calanoida
Pontellopsis occidentalis
5804



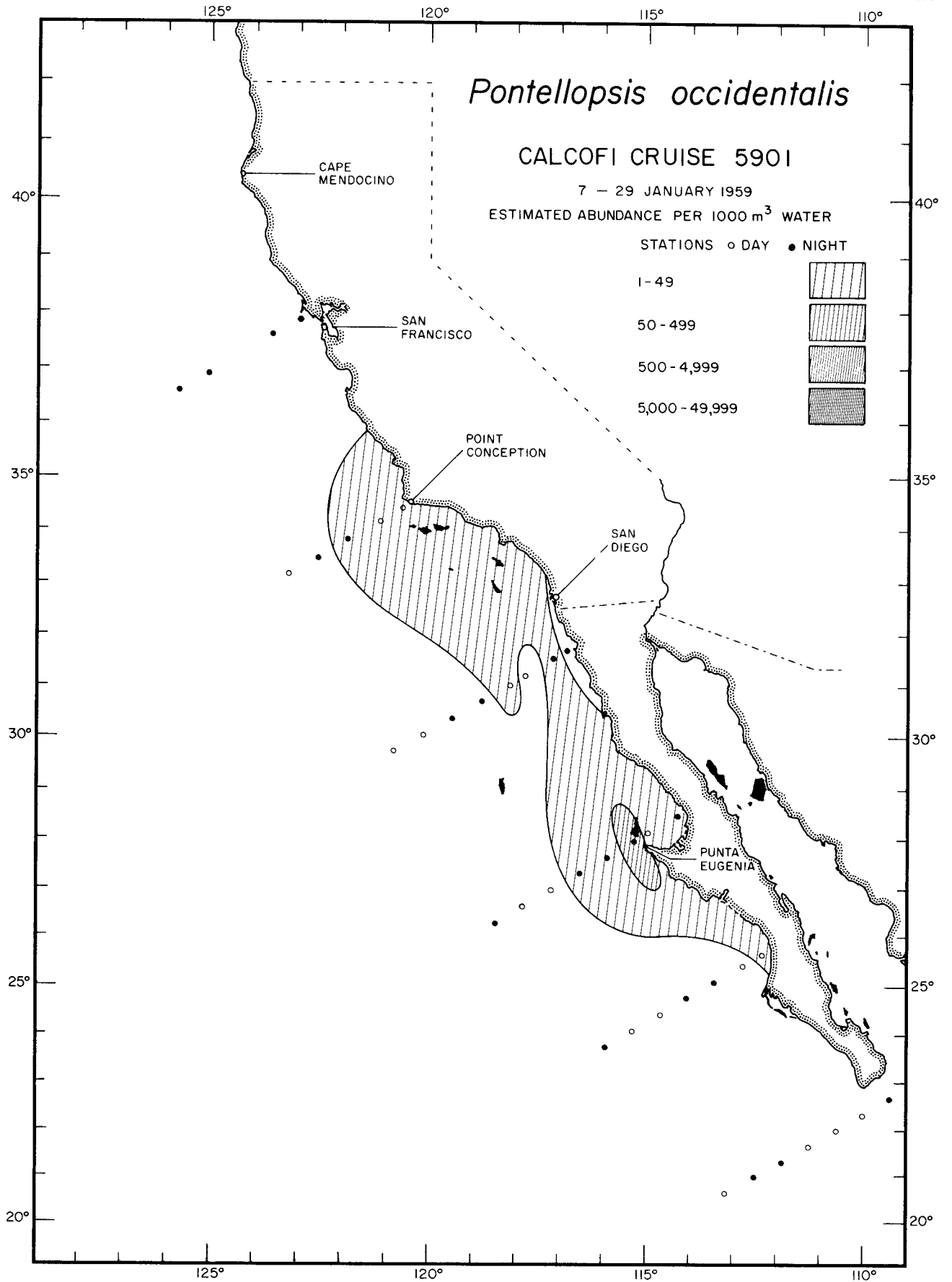
Calanoida
Pontellopsis occidentalis
5807



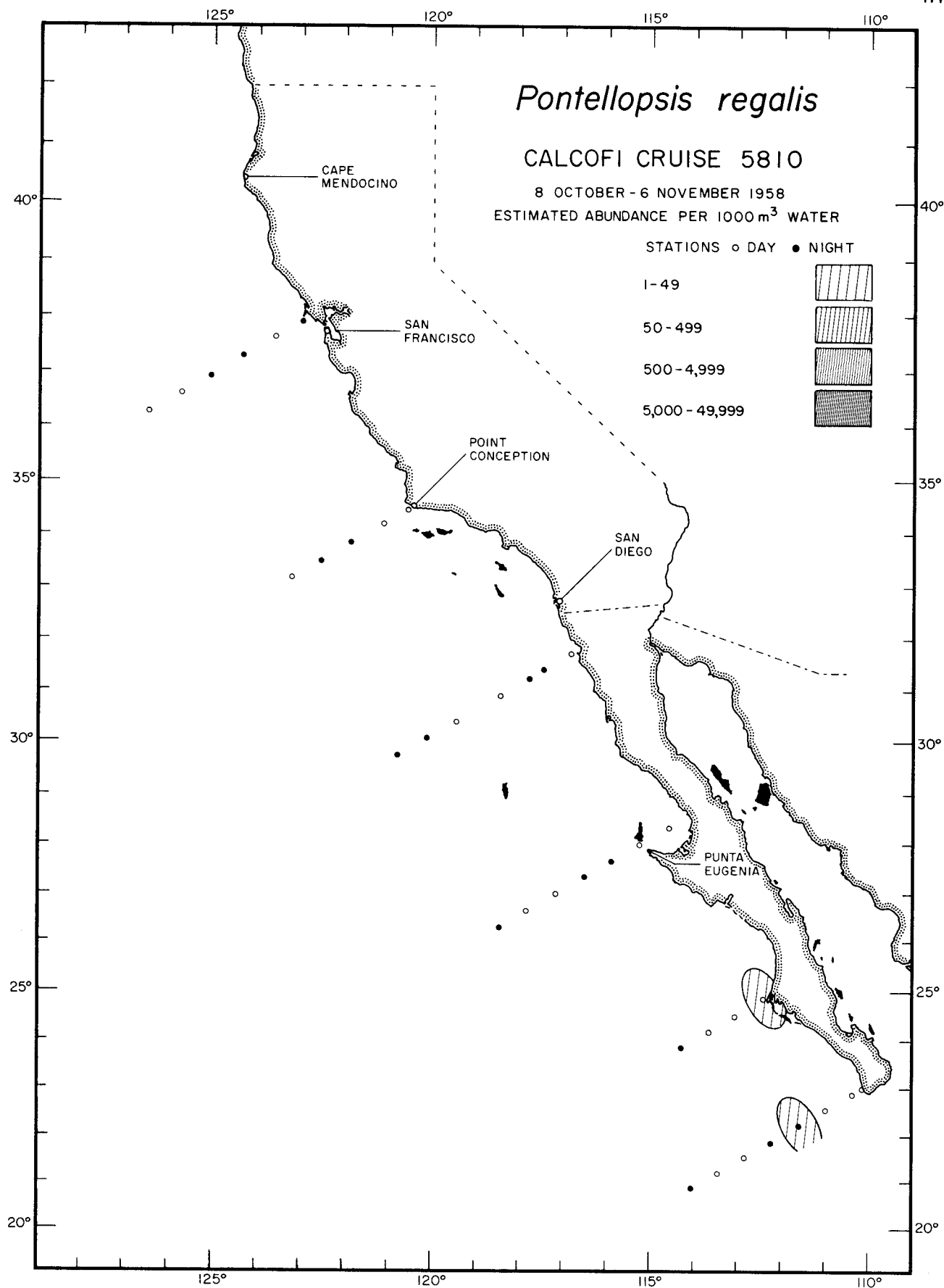
Calanoida

Pontellopsis occidentalis

5810



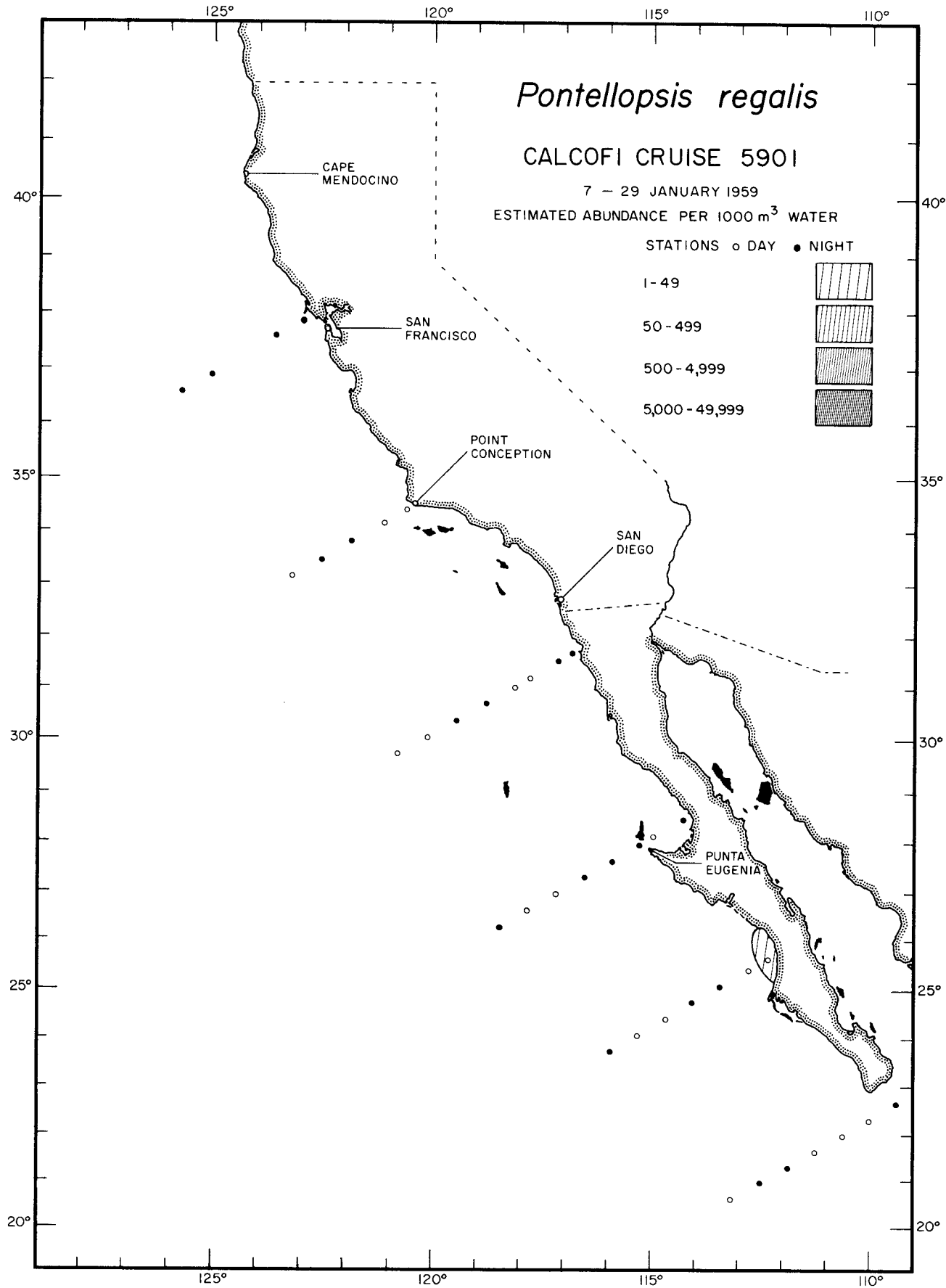
Calanoida
Pontellopsis occidentalis
5901



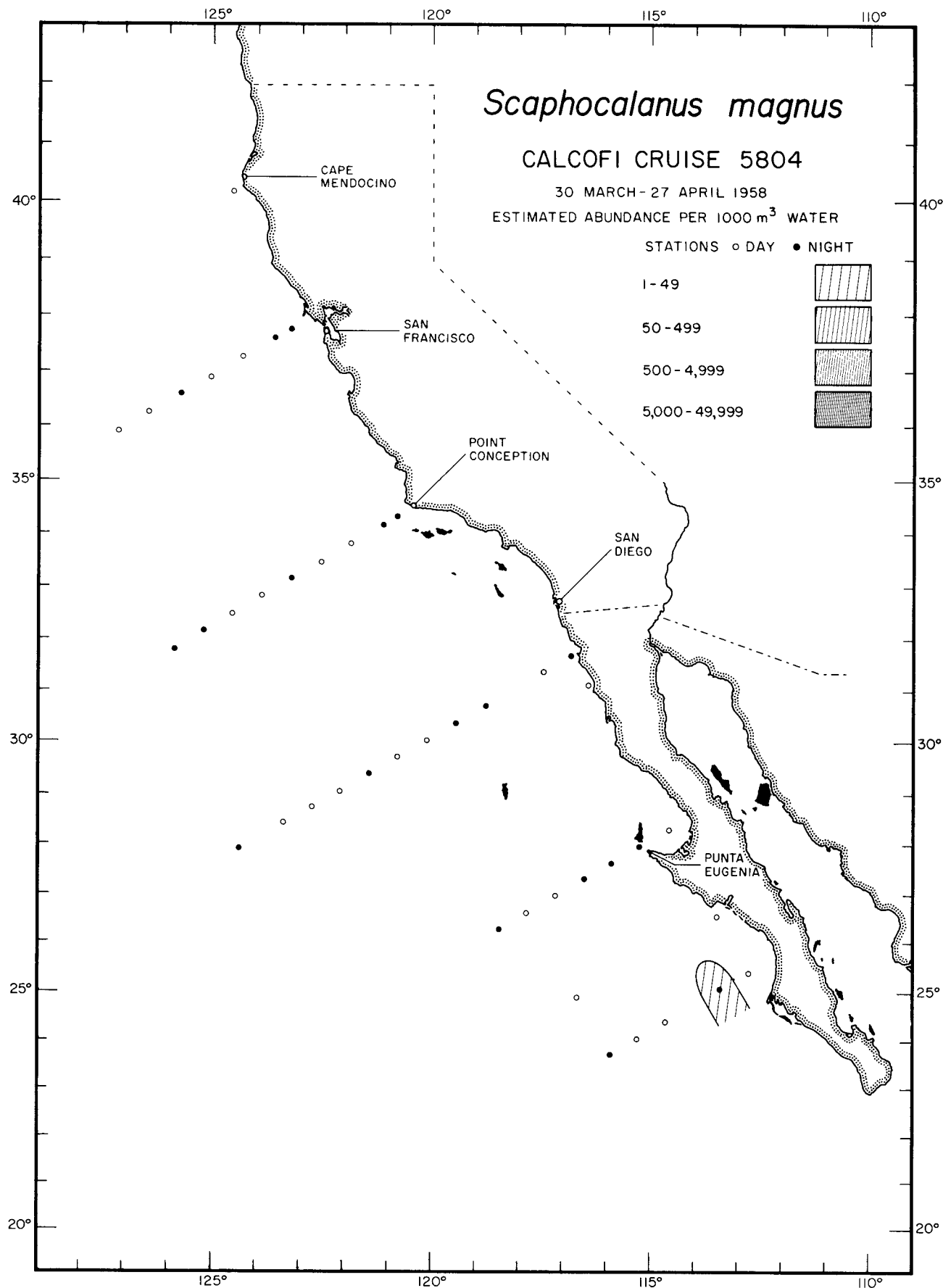
Calanoida

Pontellopsis regalis

5810



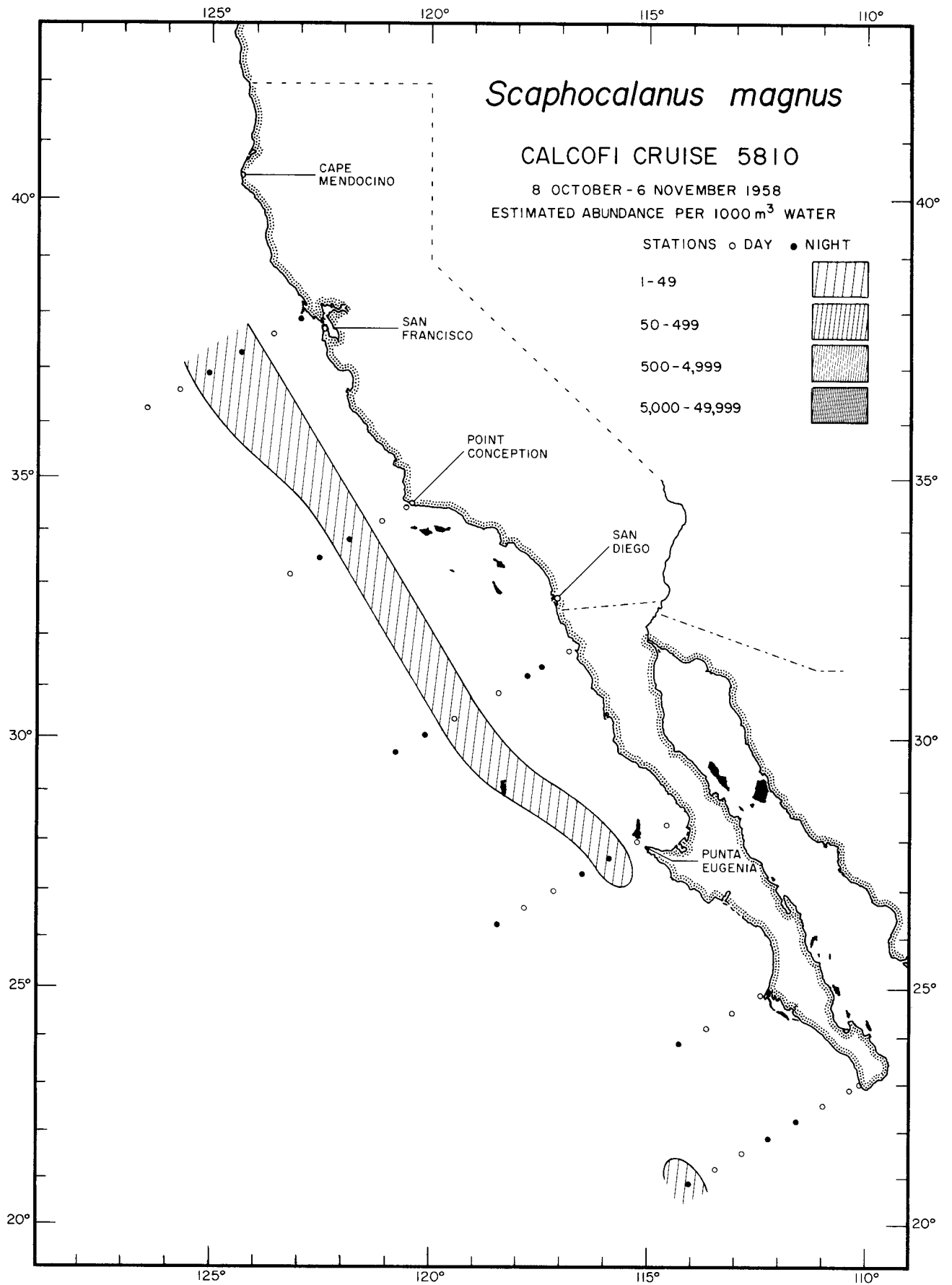
Calanoida
Pontellopsis regalis
5901



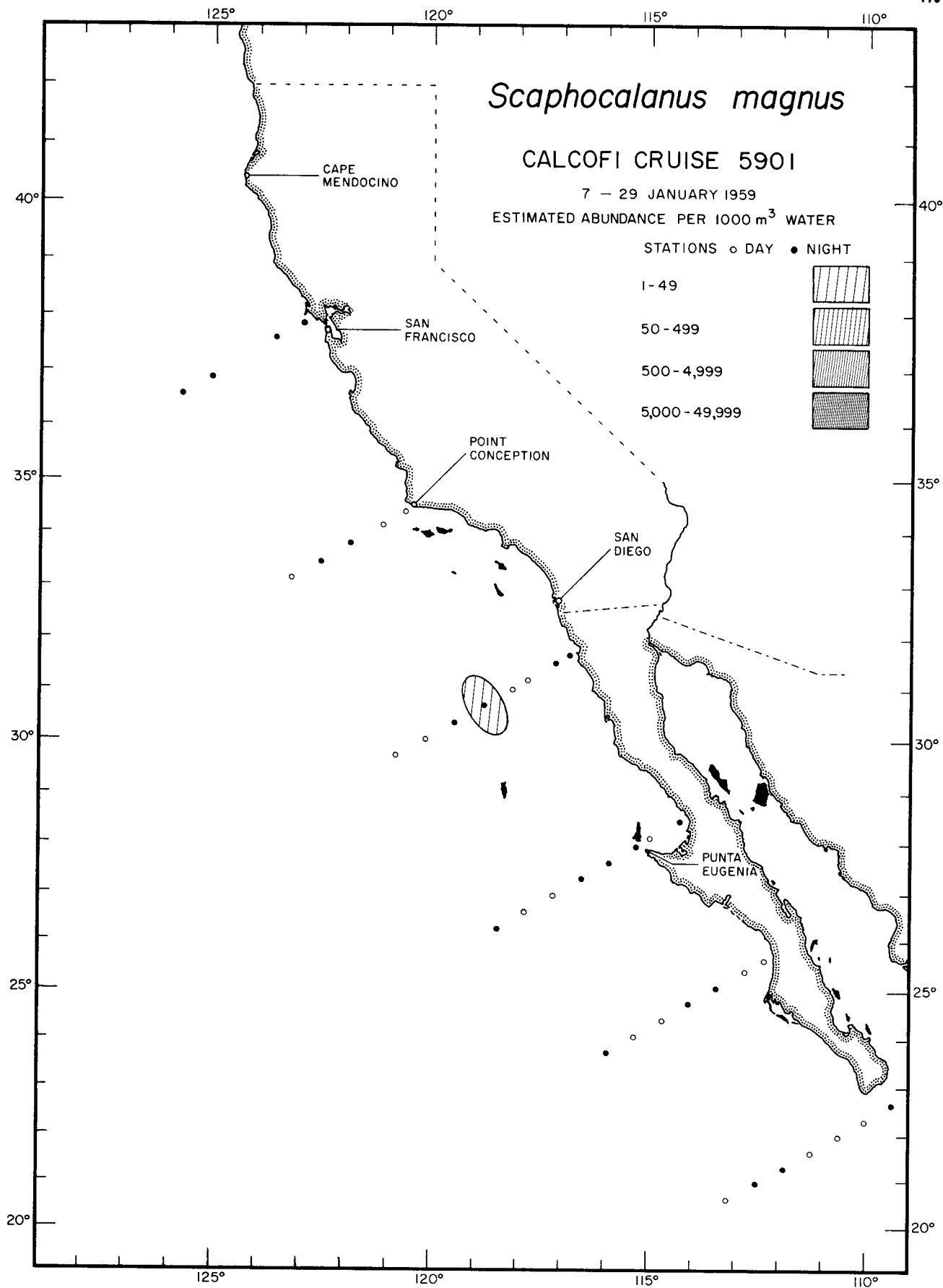
Calanoida

Scaphocalanus magnus

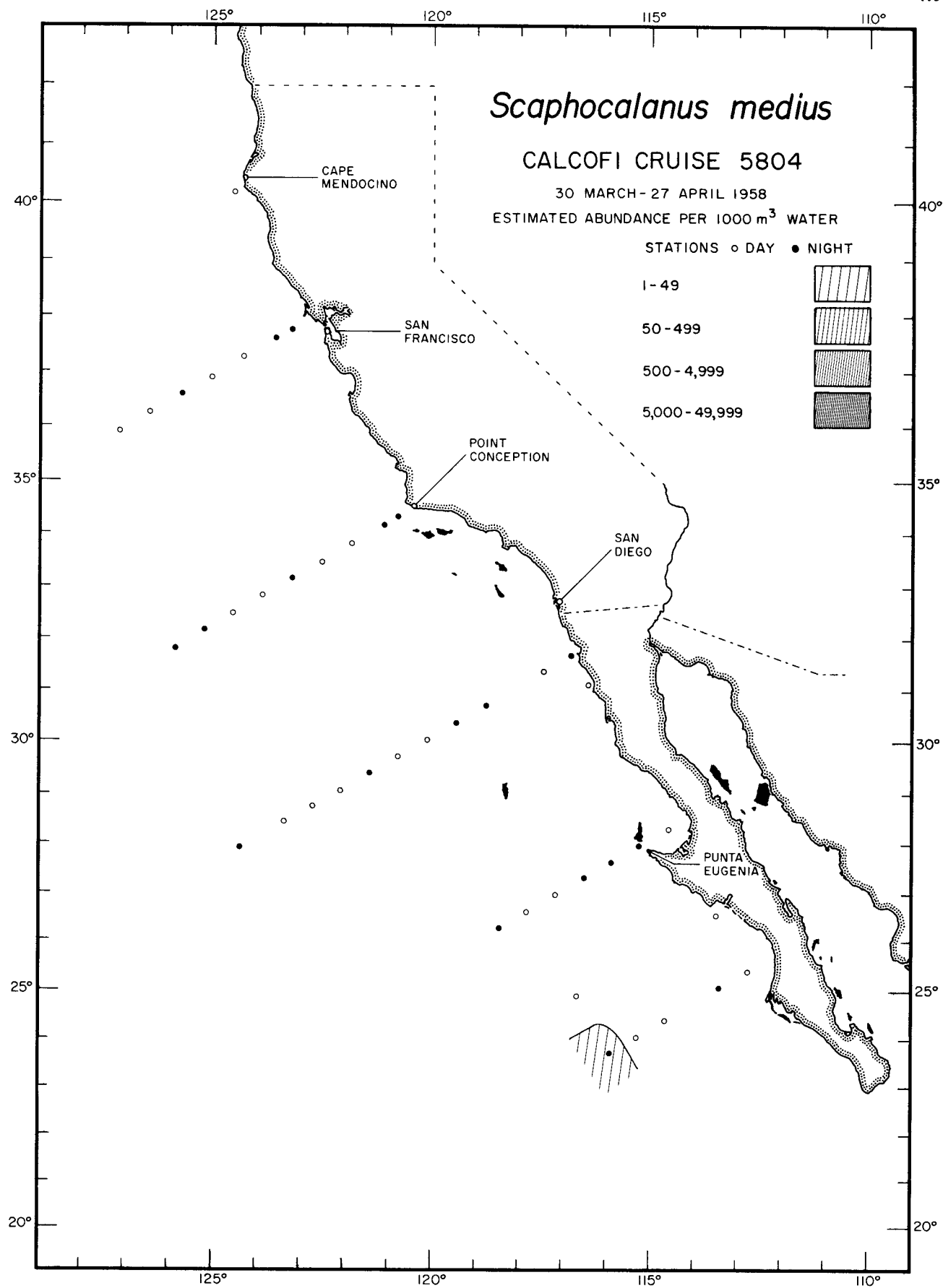
5804



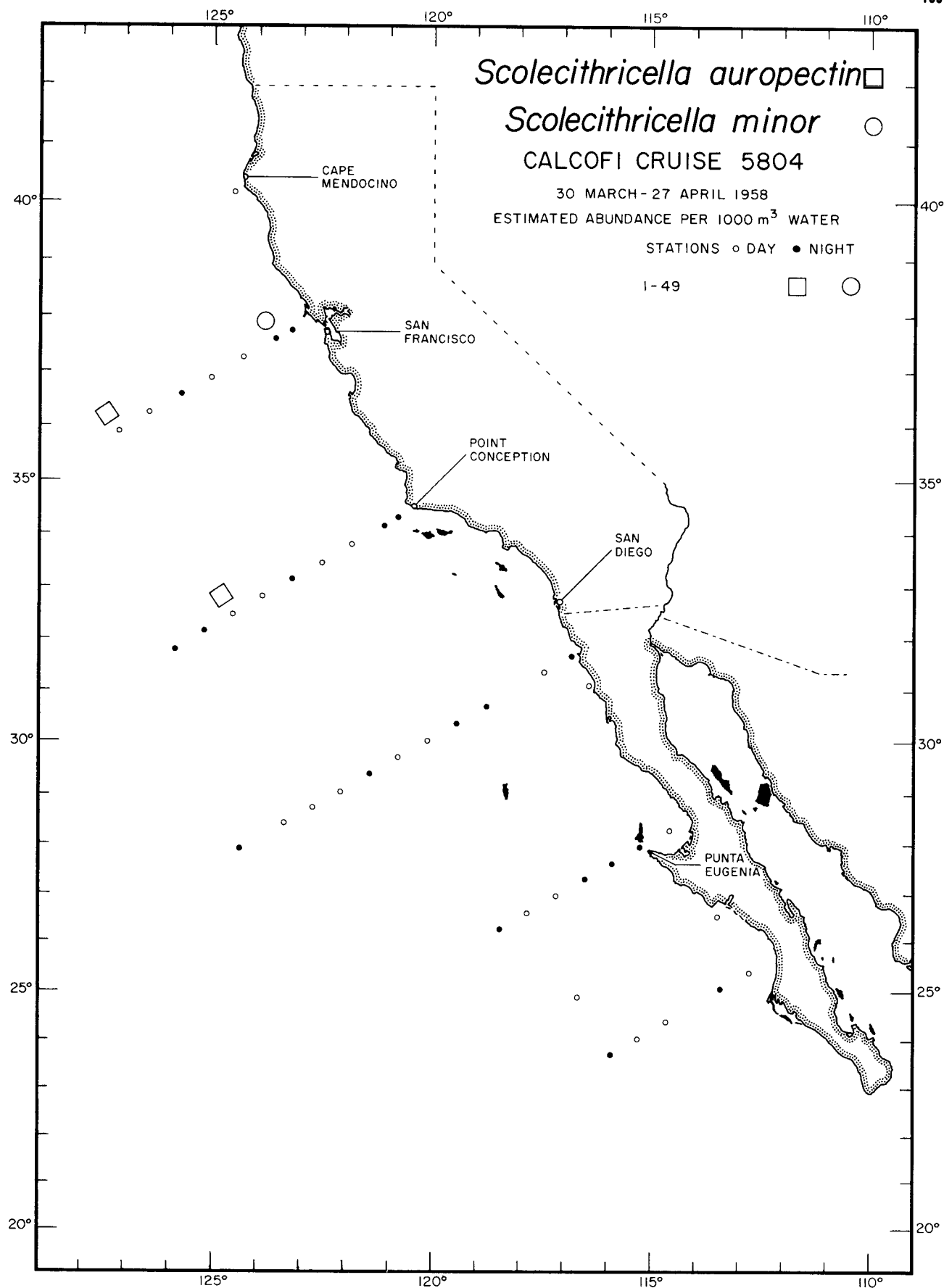
Calanoida
Scaphocalanus magnus
5810



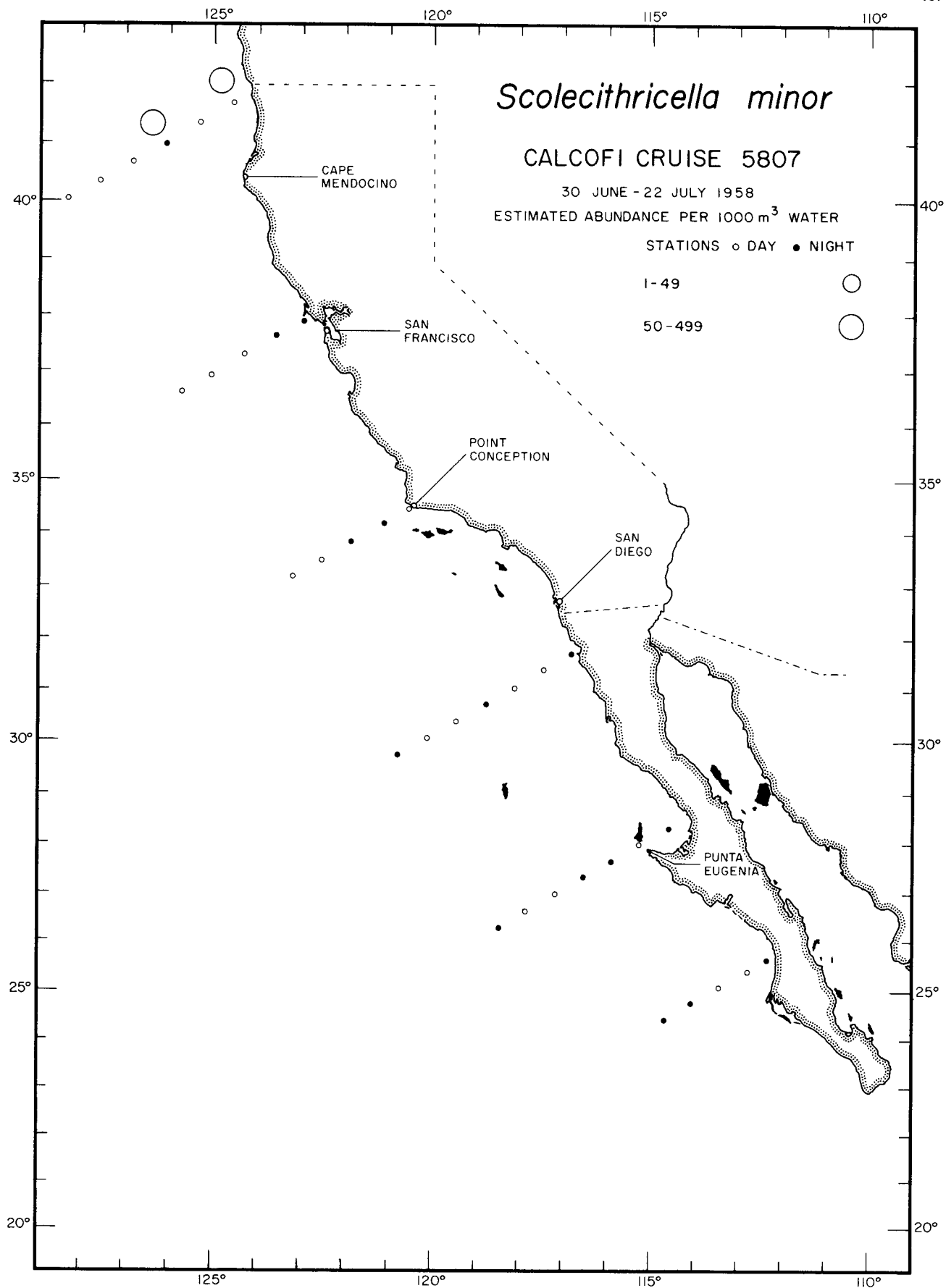
Calanoida
Scaphocalanus magnus
5901



Calanoida
Scaphocalanus medius
5804



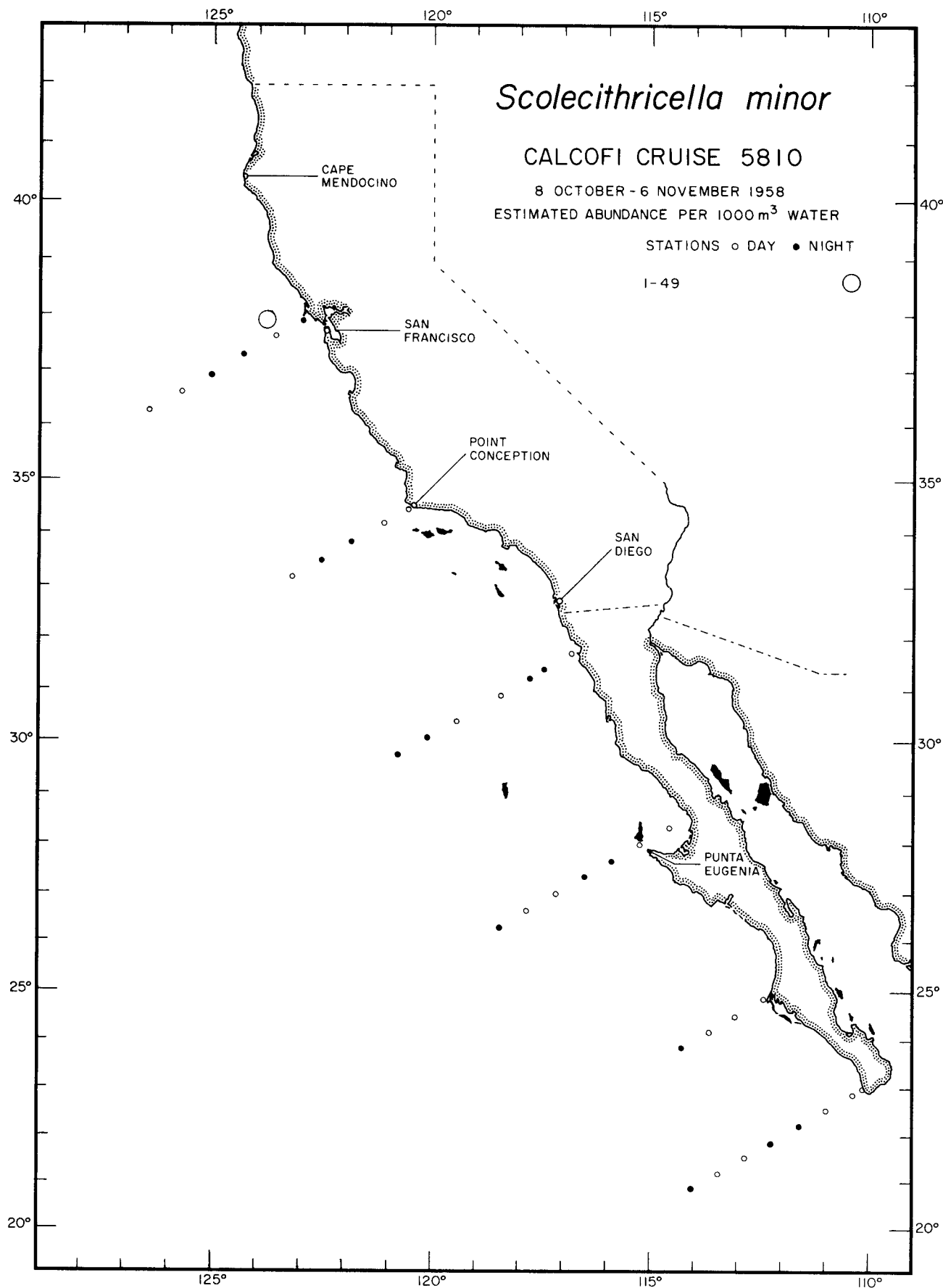
Calanoida
Scolecithricella auropectin
Scolecithricella minor
 5804



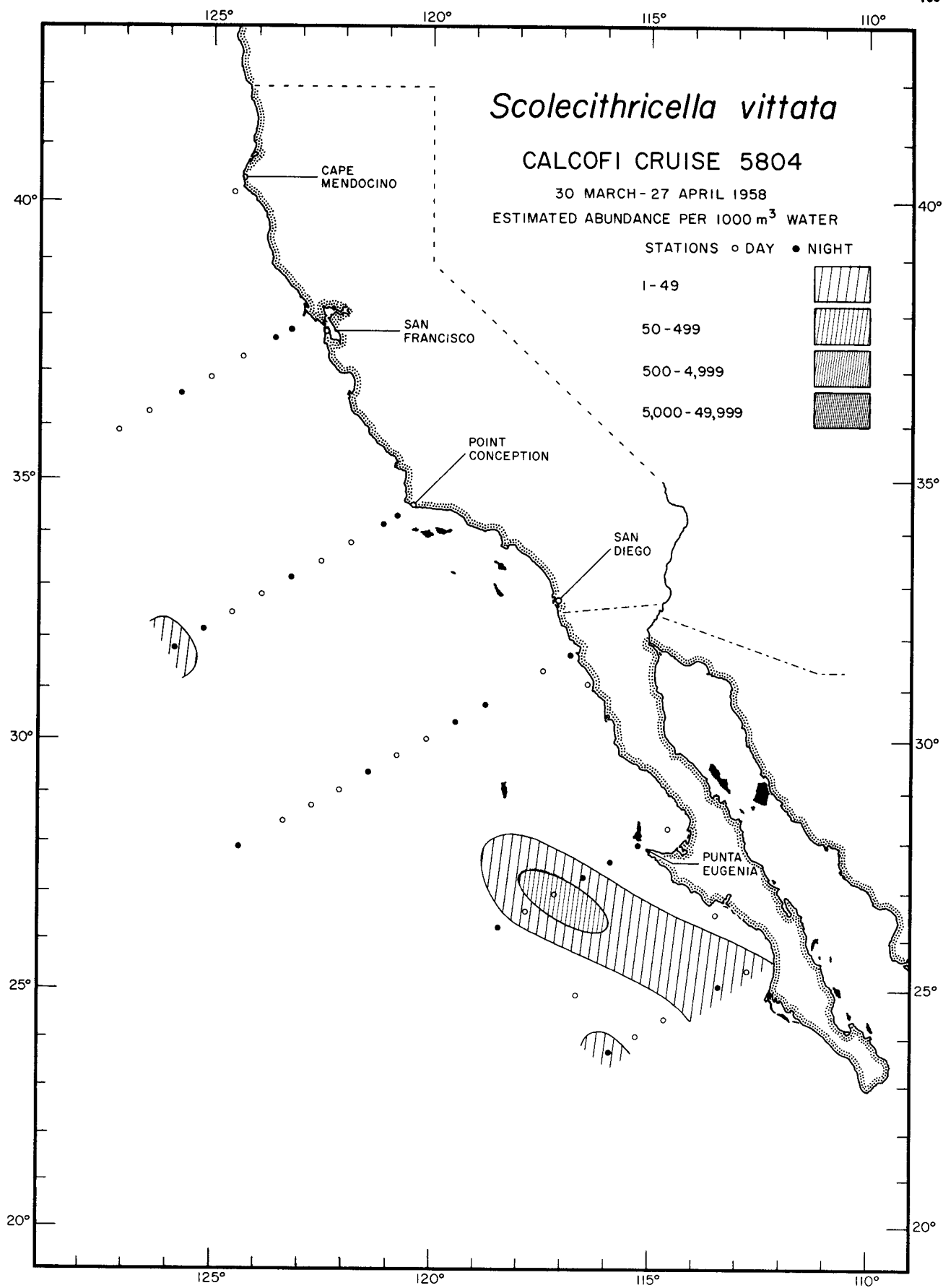
Calanoida

Scolecithricella minor

5807



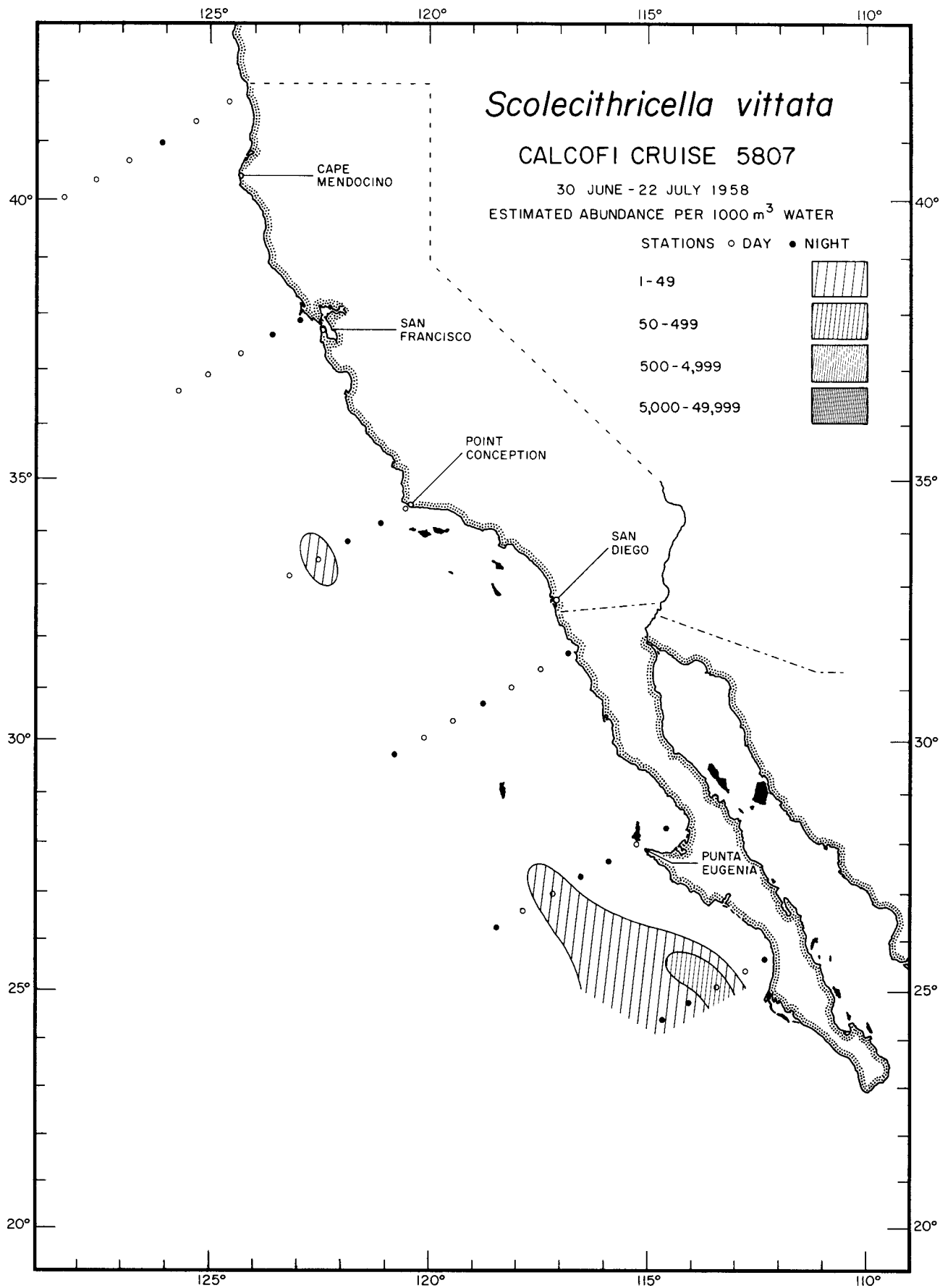
Calanoida
Scolecithricella minor
5810



Calanoida

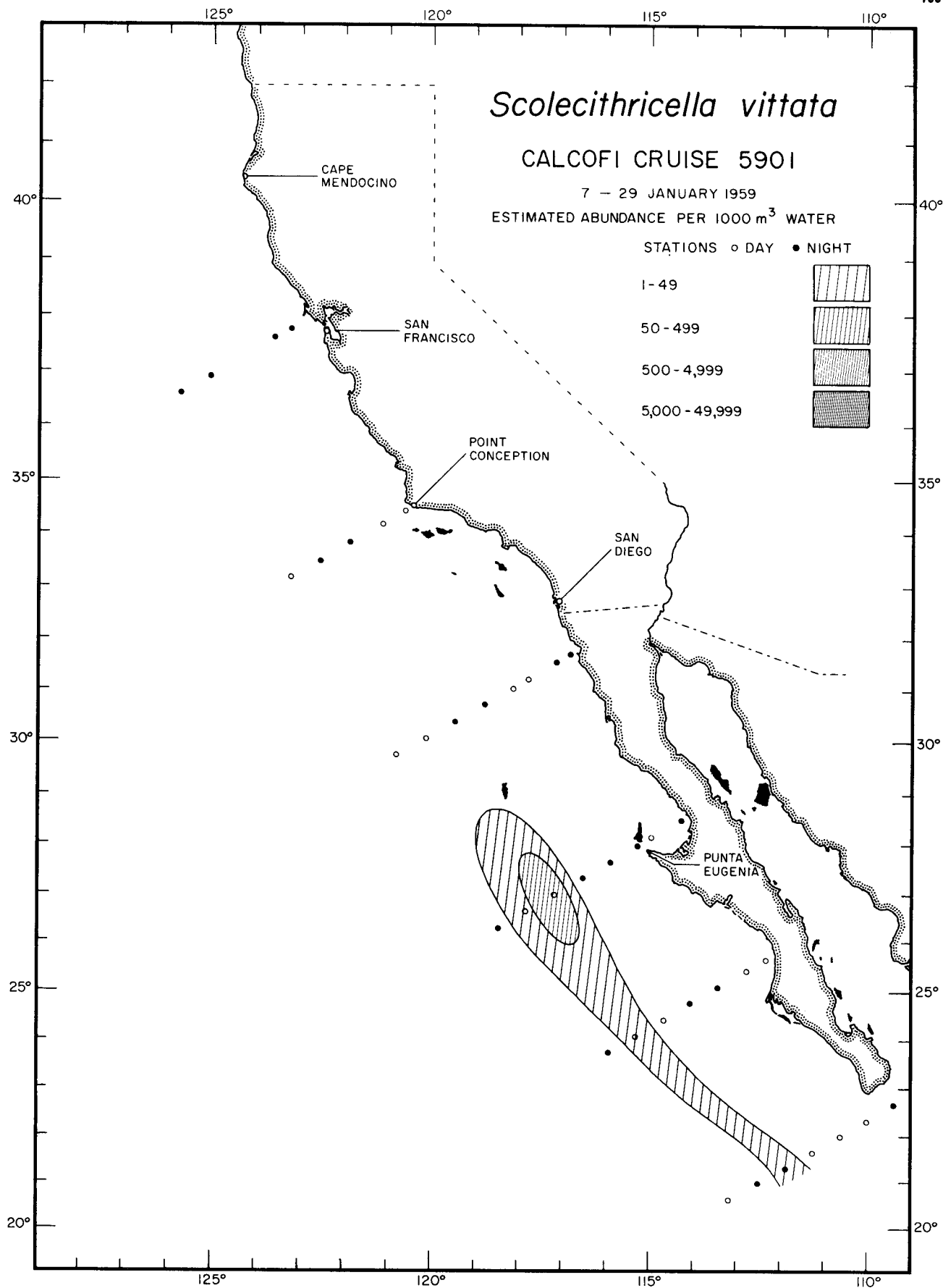
Scolecithricella vittata

5804



Calanoida

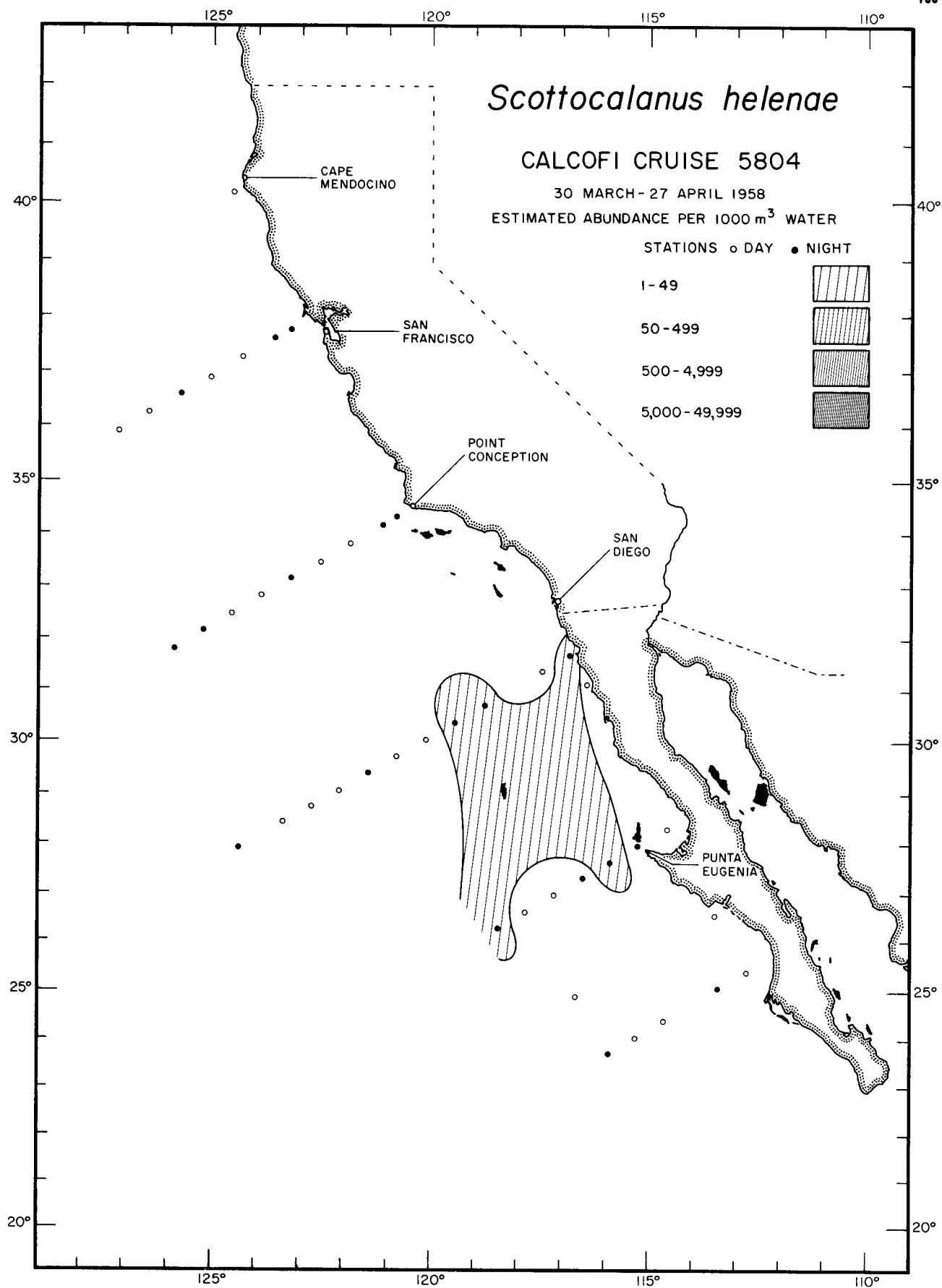
Scolecithricella vittata
5807



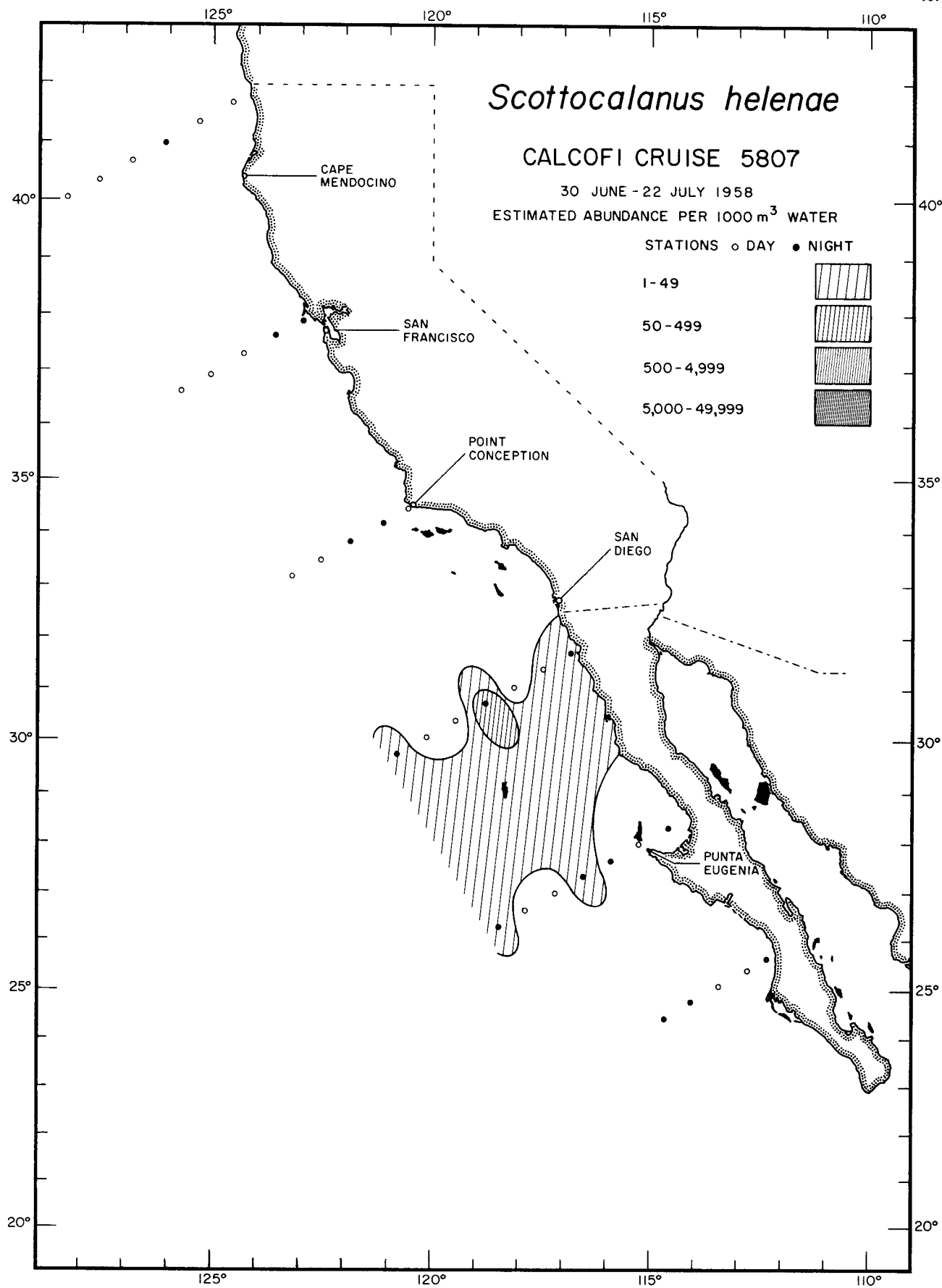
Calanoida

Scolecithricella vittata

5901



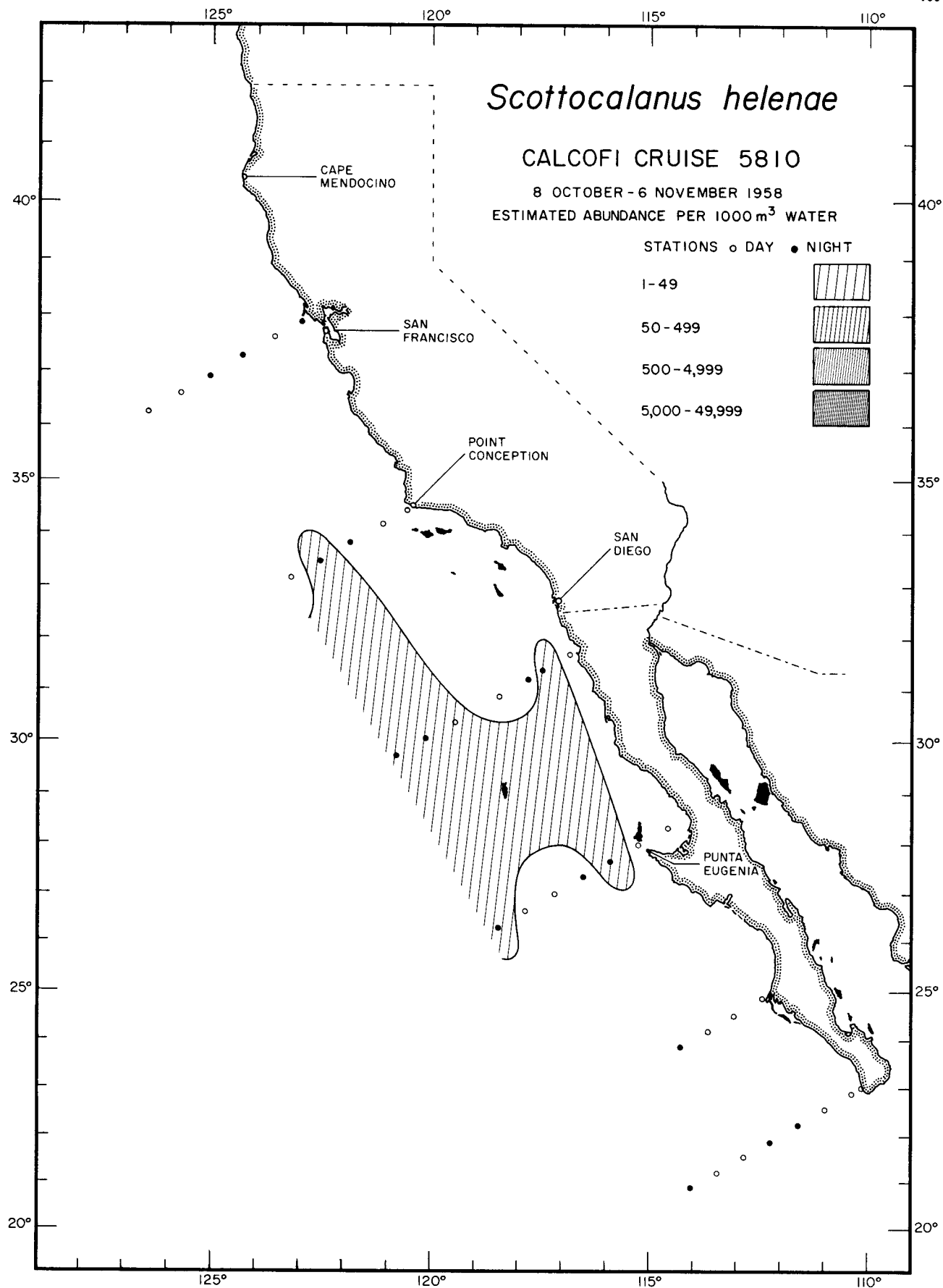
Calanoida
Scottocalanus helenae
5804



Calanoida

Scottocalanus helenae

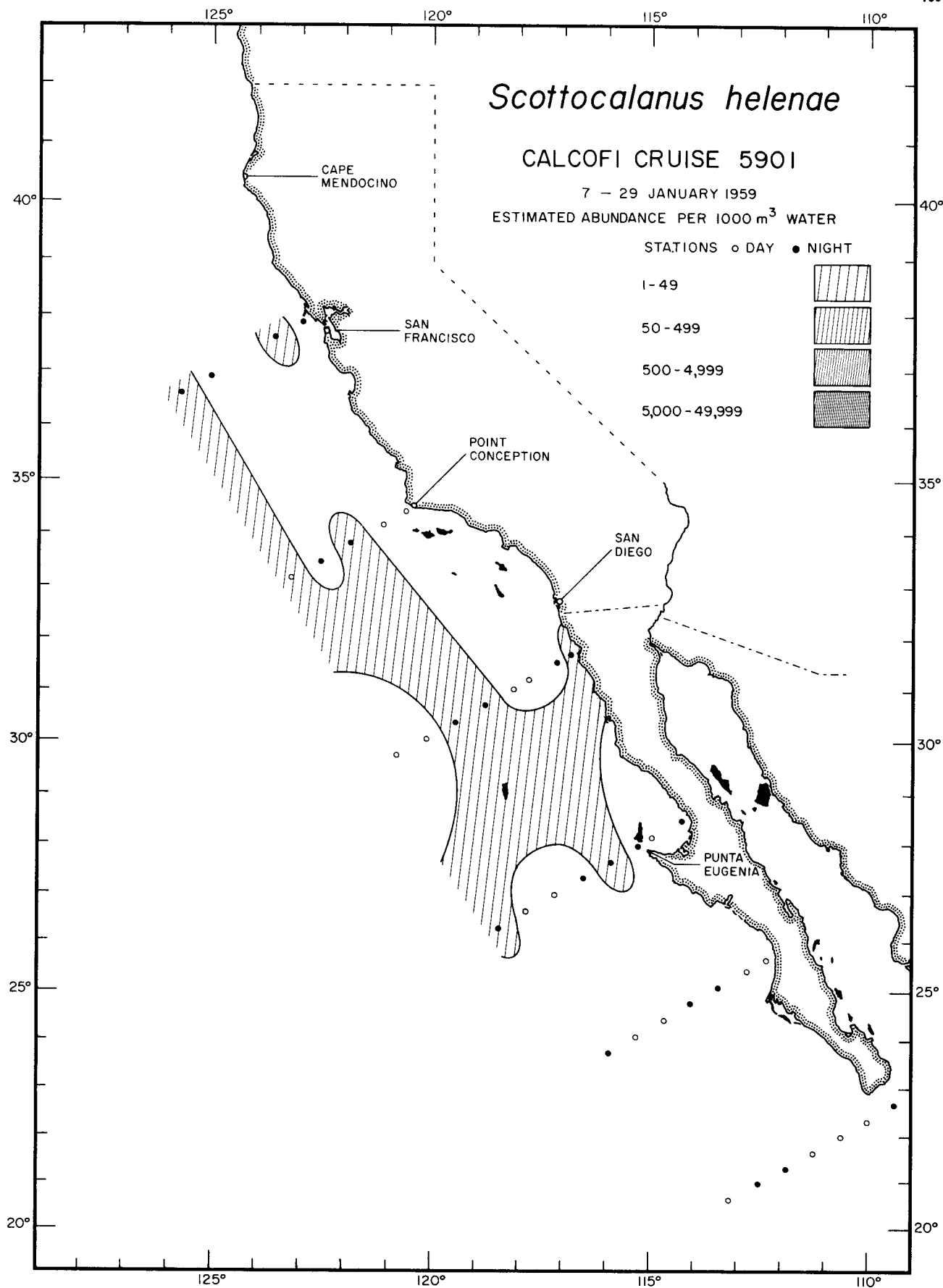
5807



Calanoida

Scottocalanus helenae

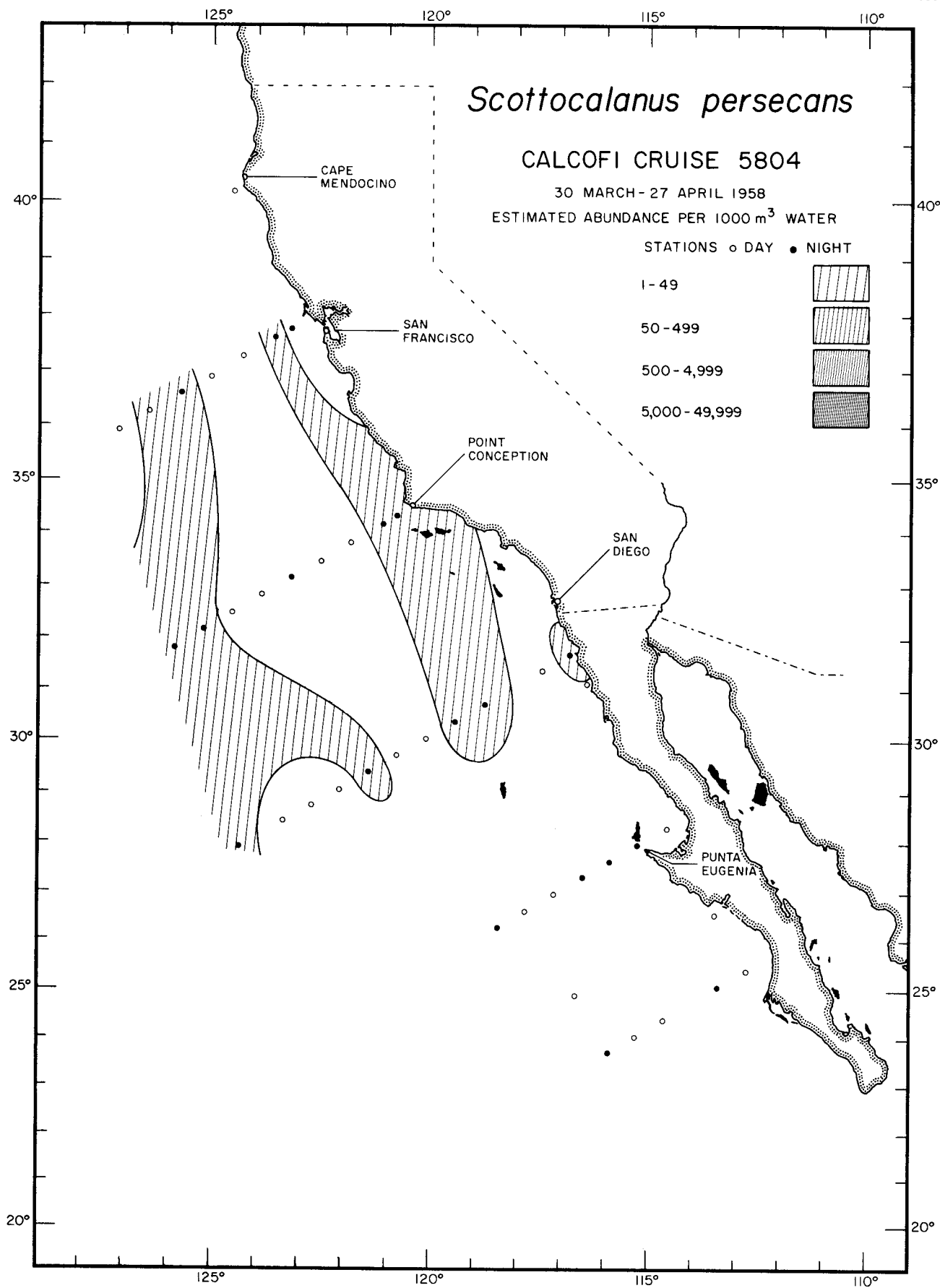
5810



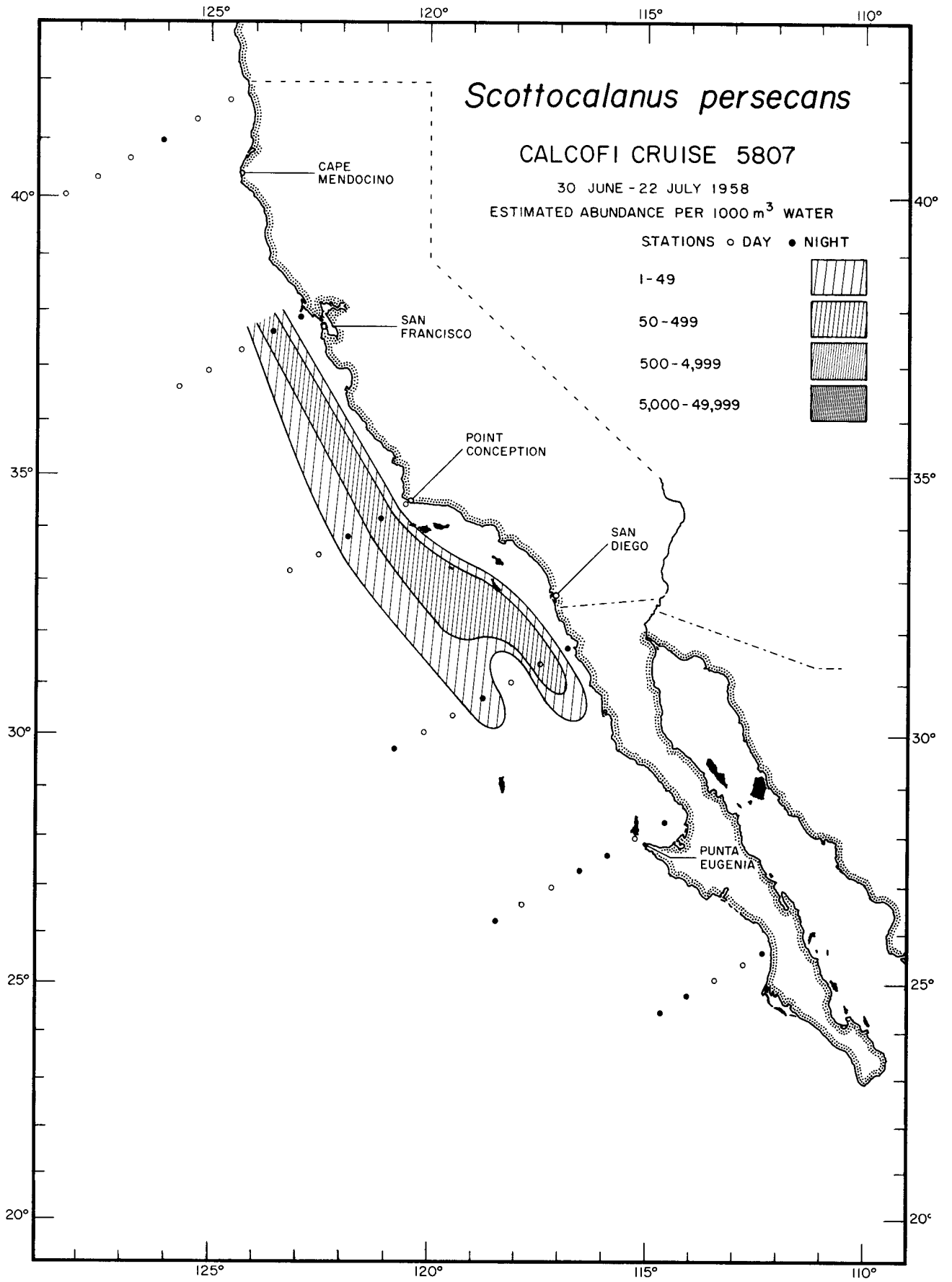
Calanoida

Scottocalanus helenae

5901



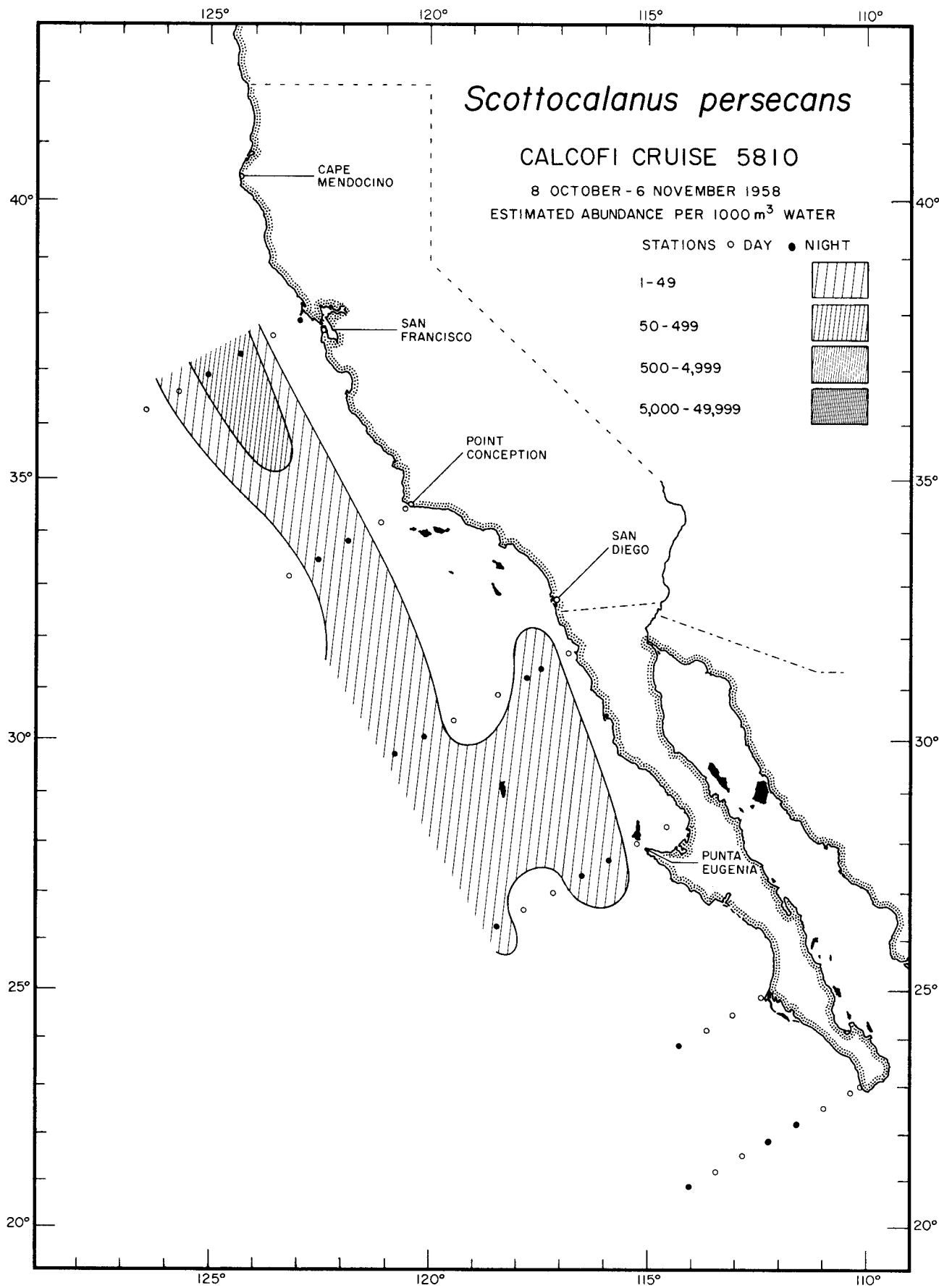
Calanoida
Scottocalanus persekans
5804



Calanoida

Scottocalanus persekans

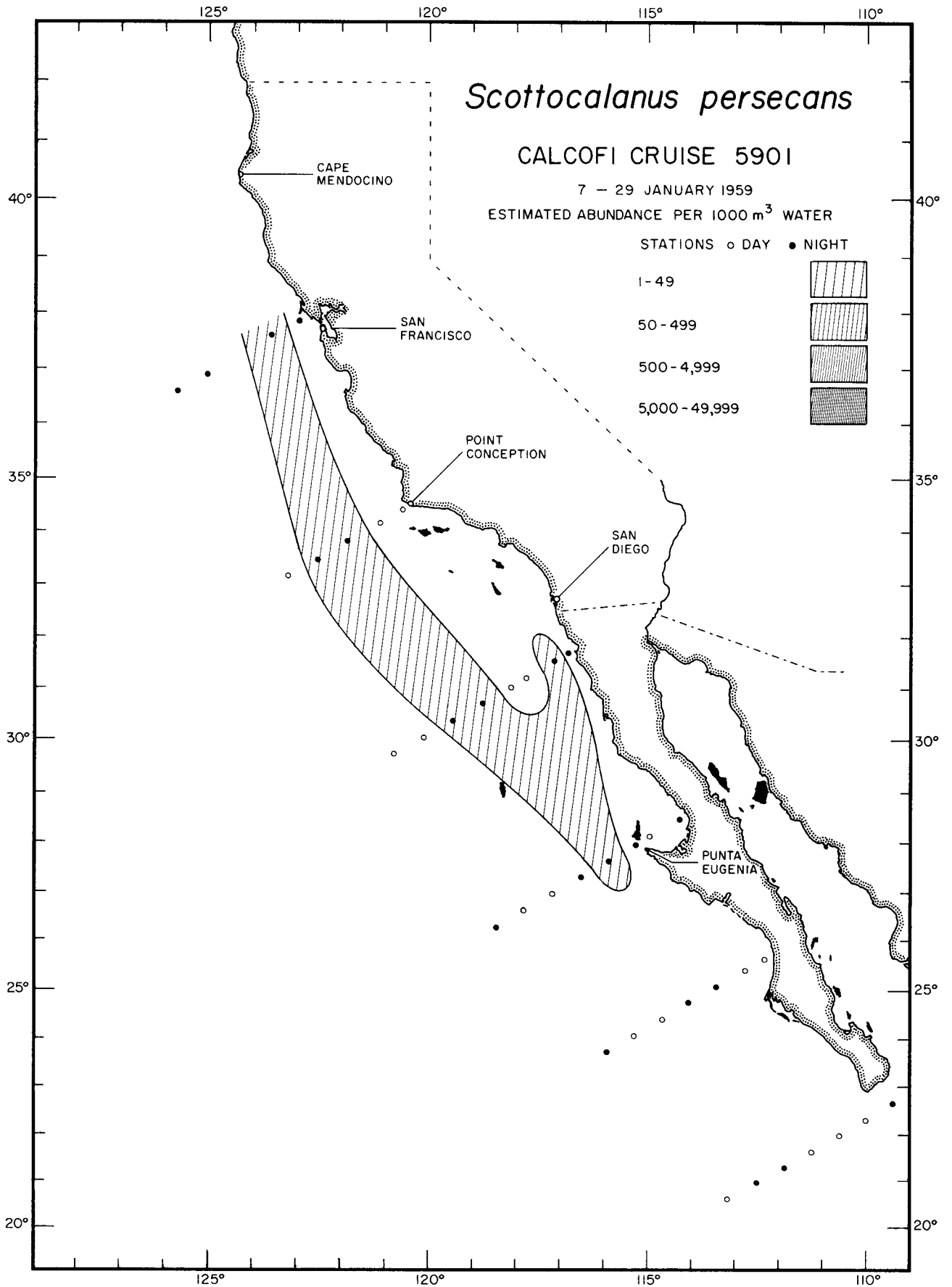
5807



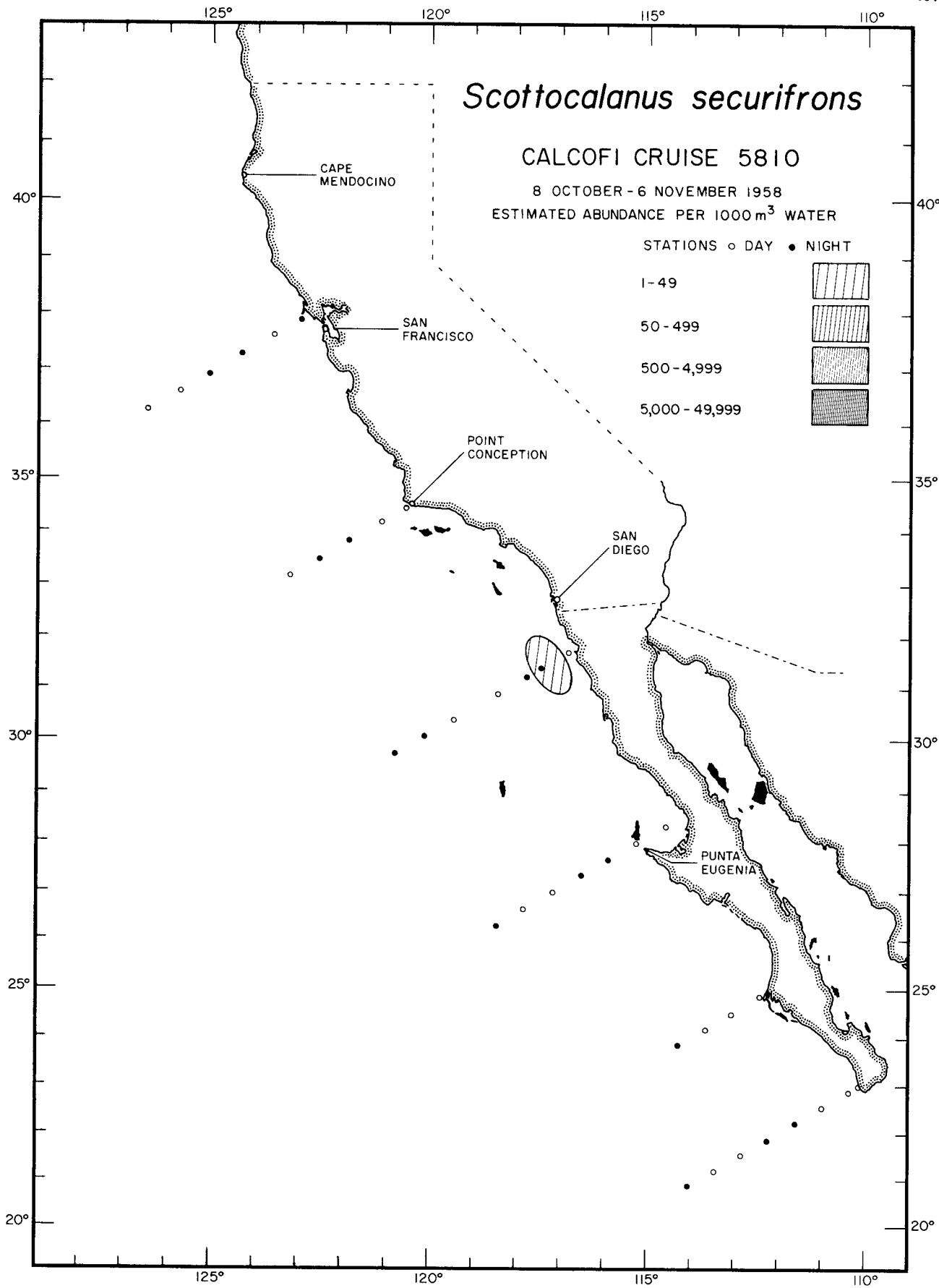
Calanoida

Scottocalanus persecans

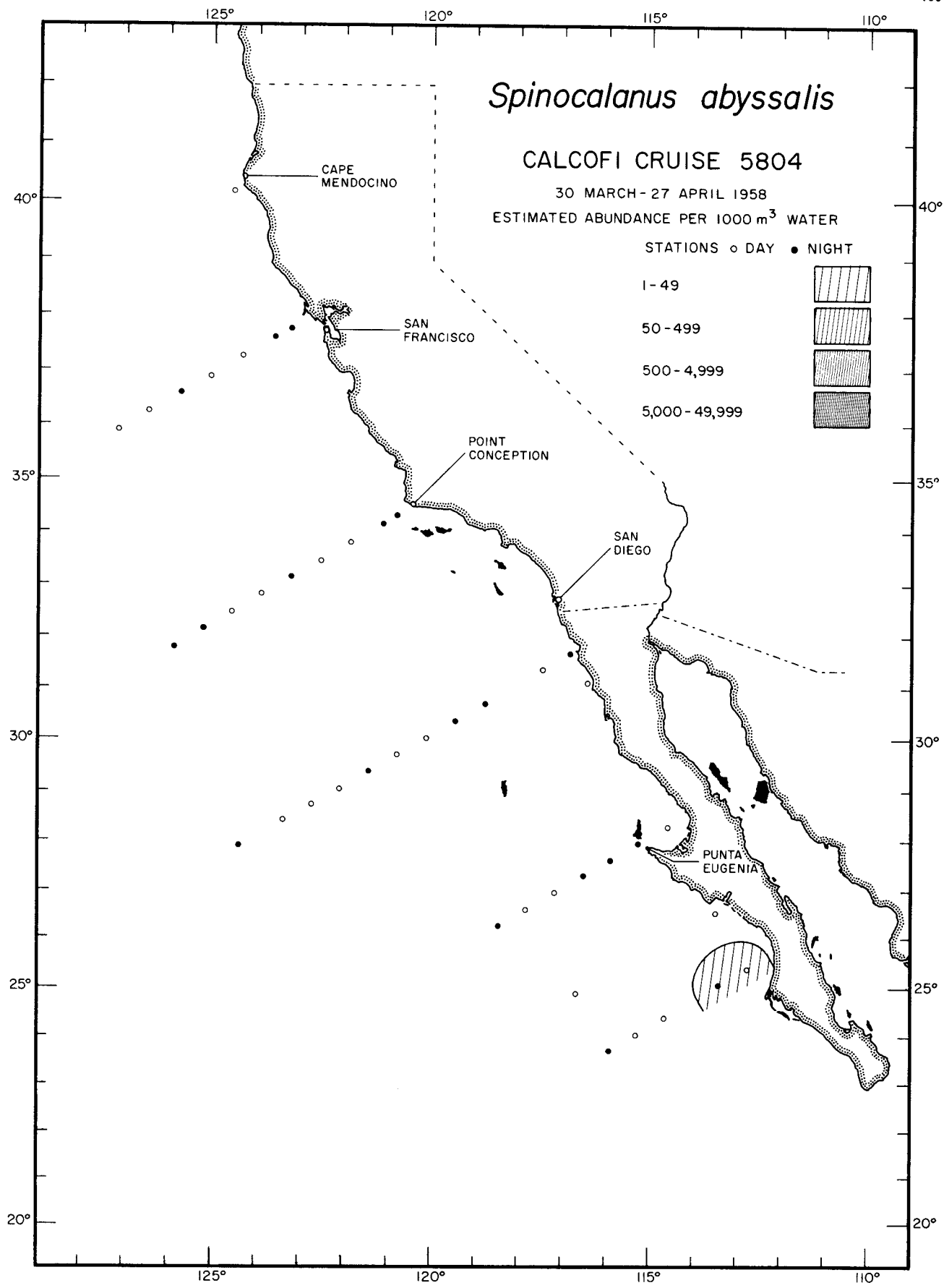
5810



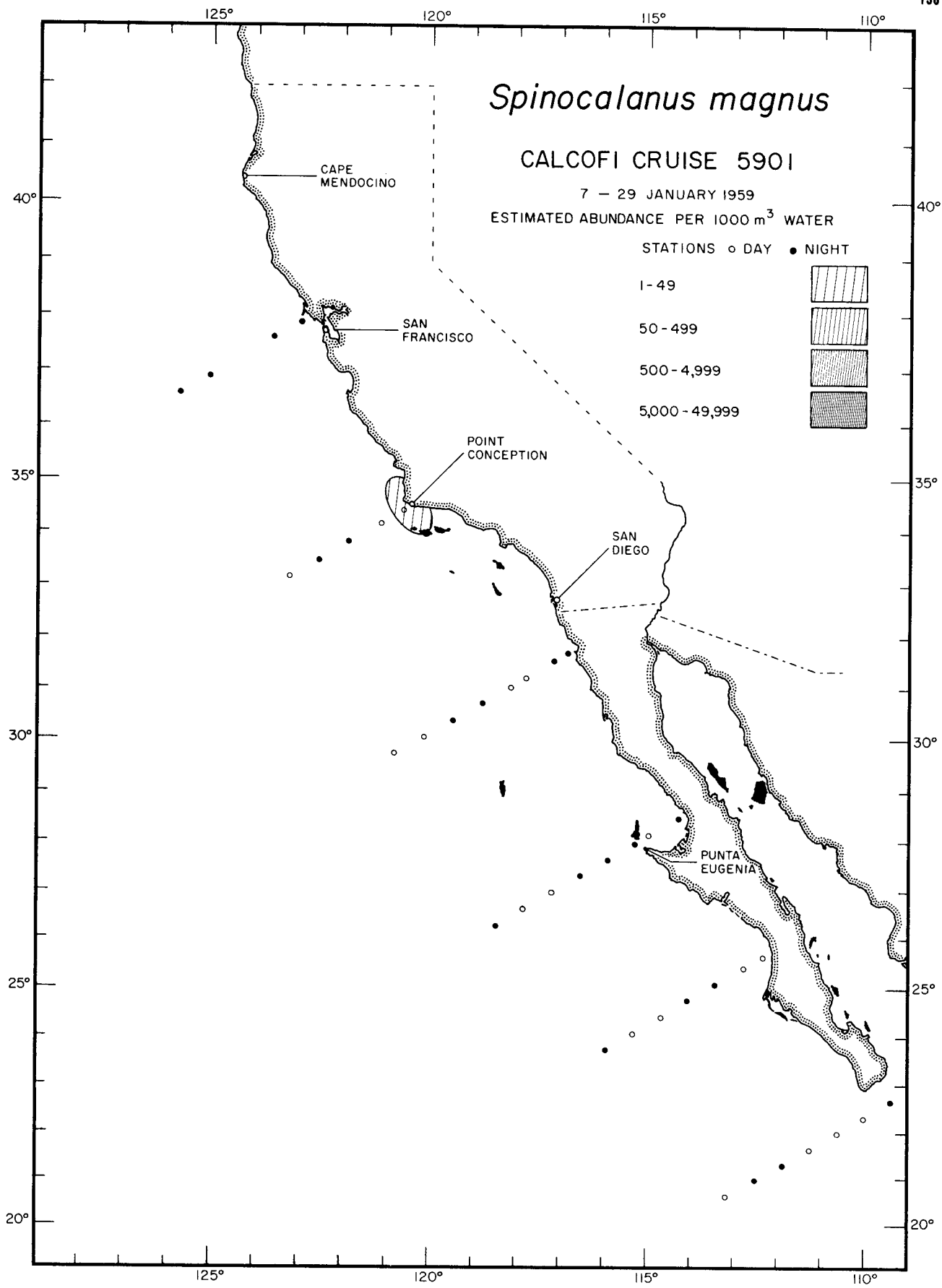
Calanoida
Scottocalanus persecans
5901



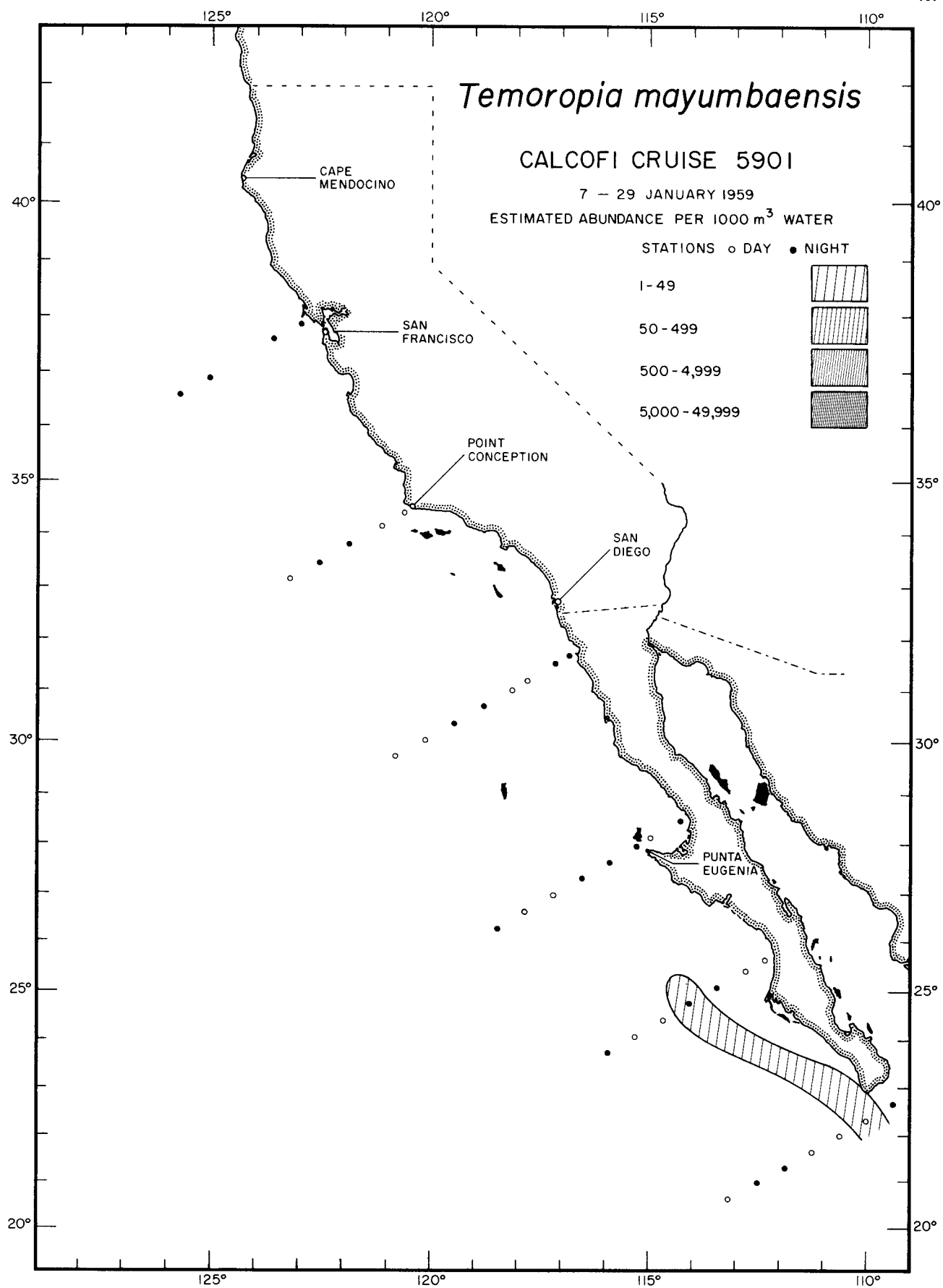
Calanoida
Scottocalanus securifrons
5810



Calanoida
Spinocalanus abyssalis
 5804



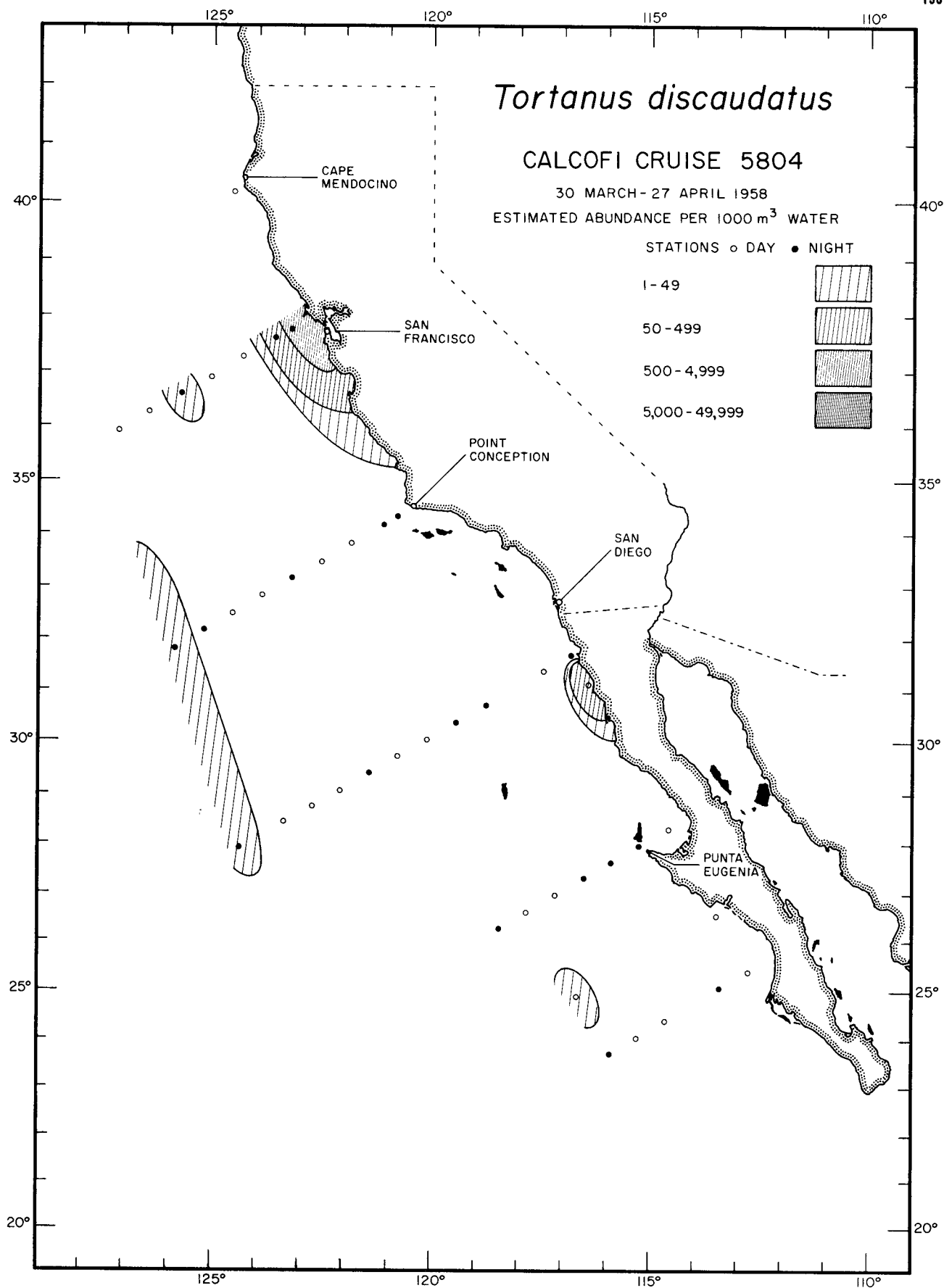
Calanoida
Spinocalanus magnus
5901



Calanoida

Temoropia mayumbaensis

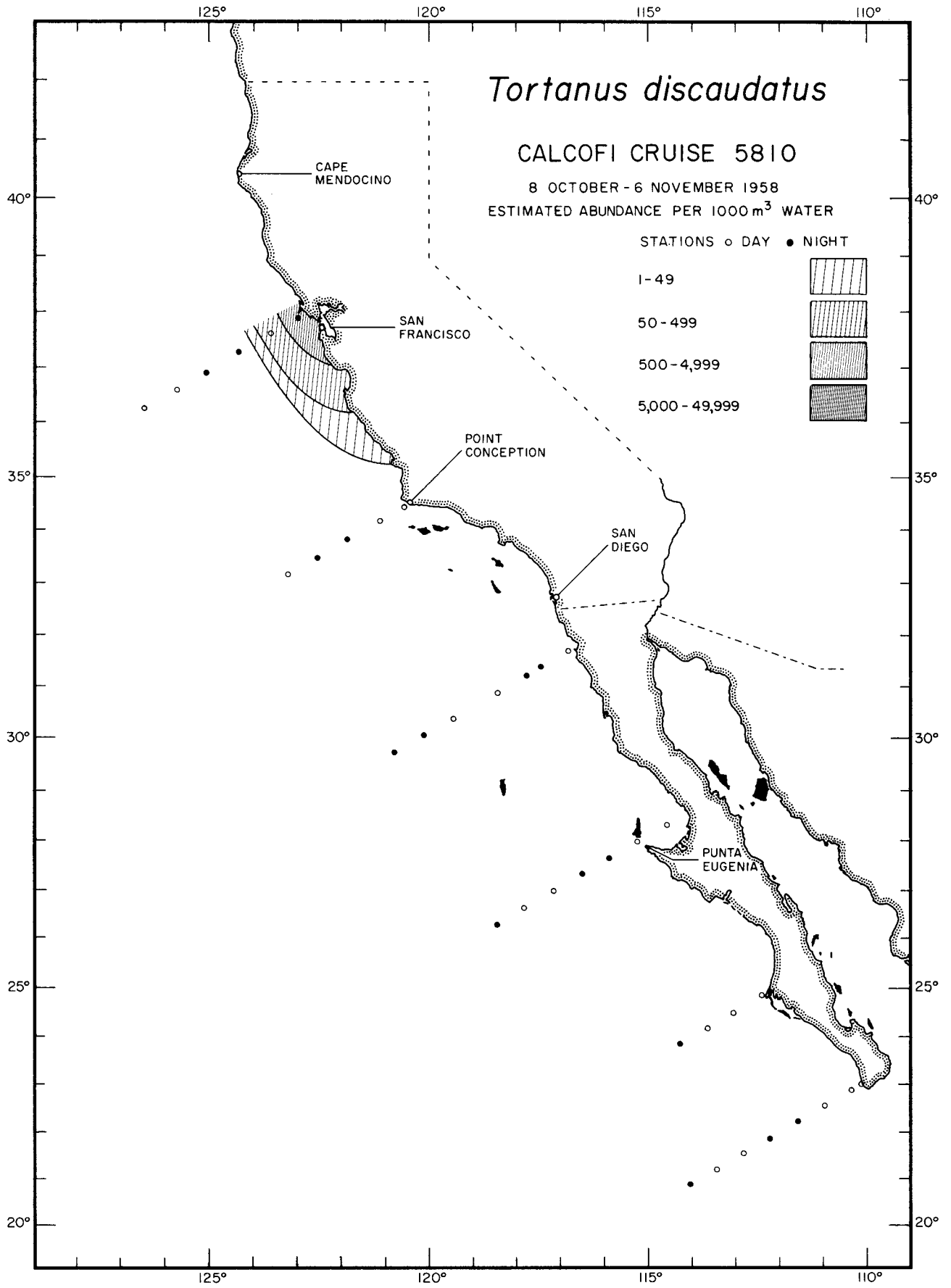
5901



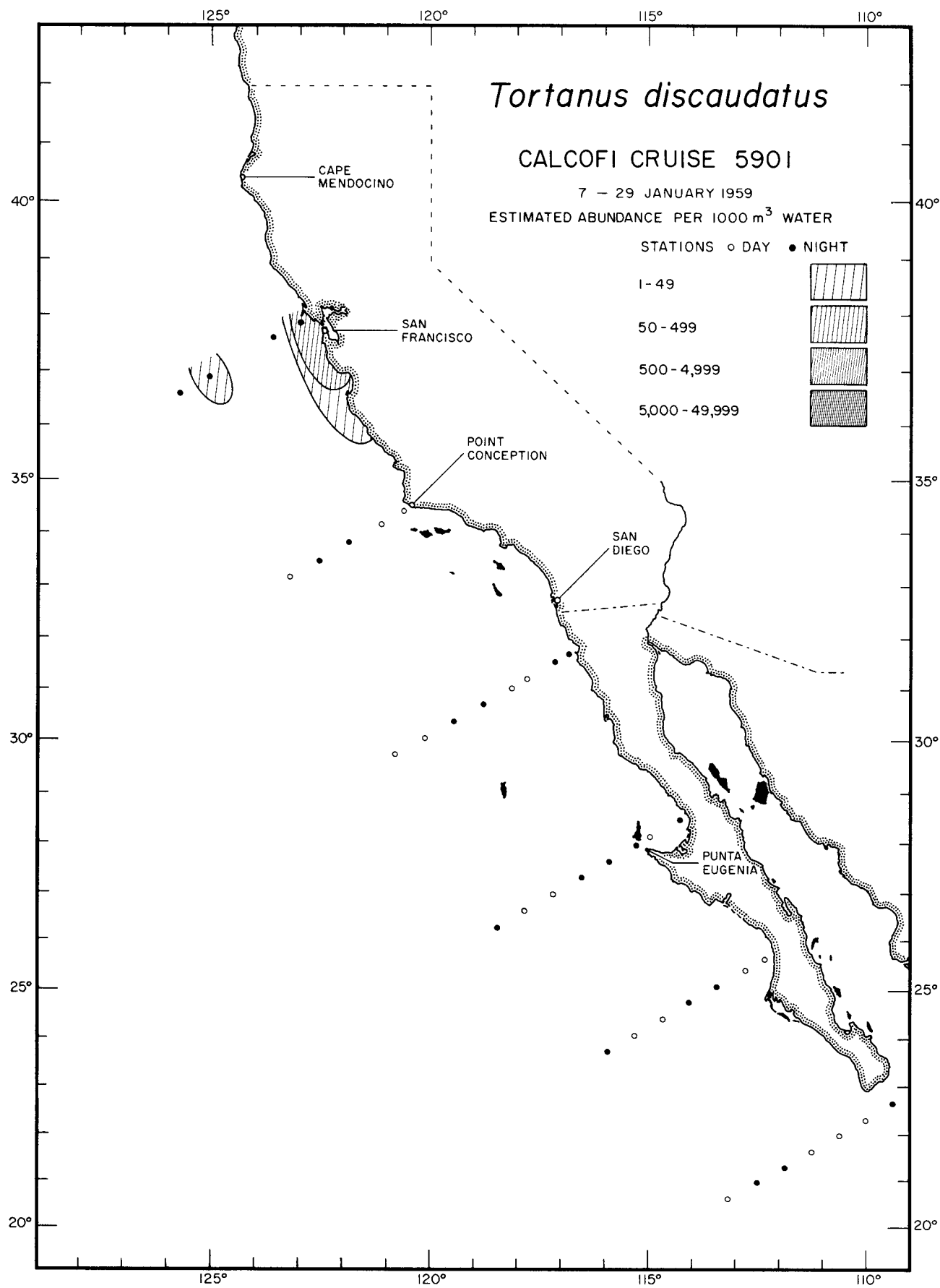
Calanoida

Tortanus discaudatus

5804



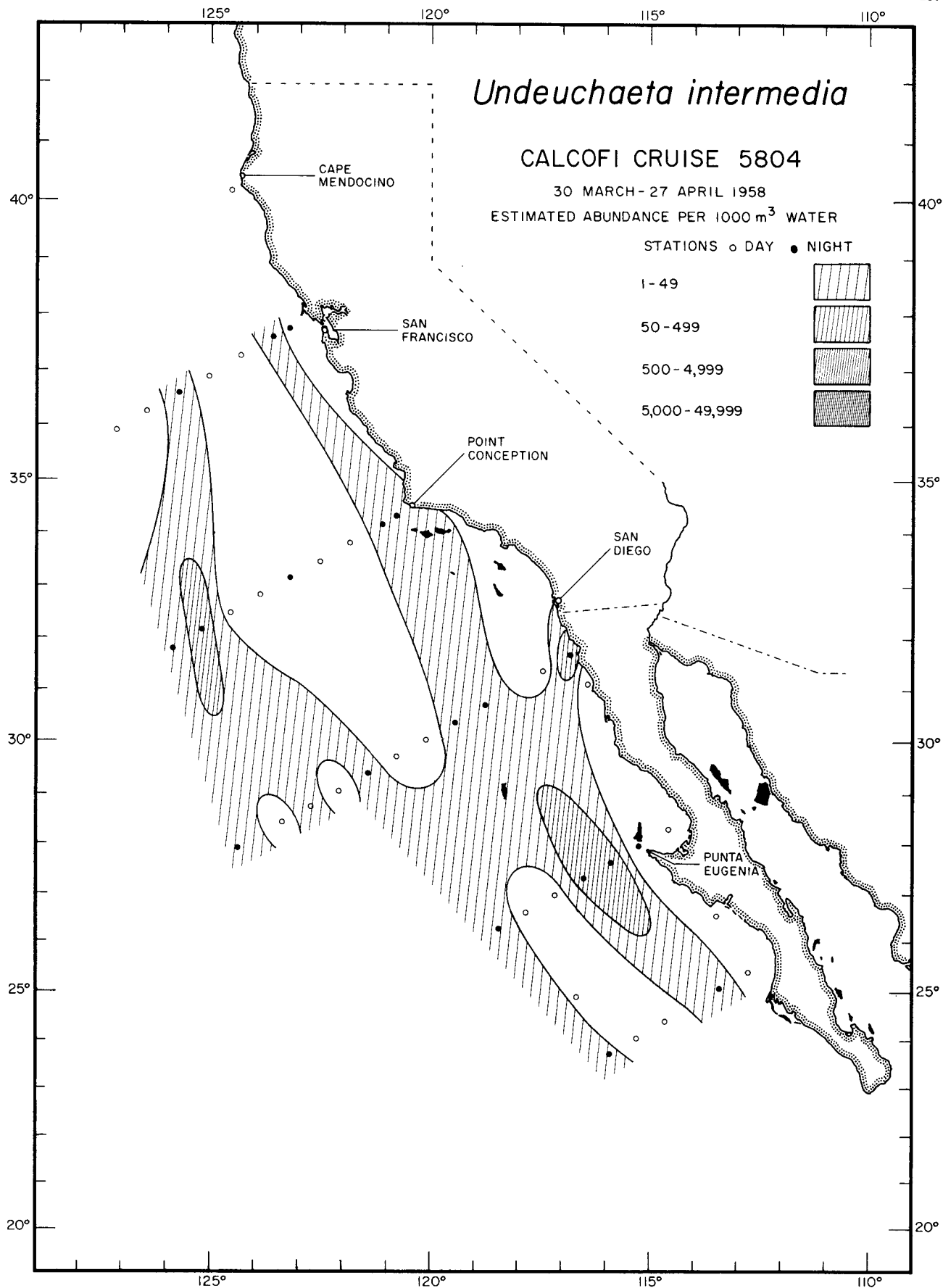
Calanoida
Tortanus discaudatus
5810



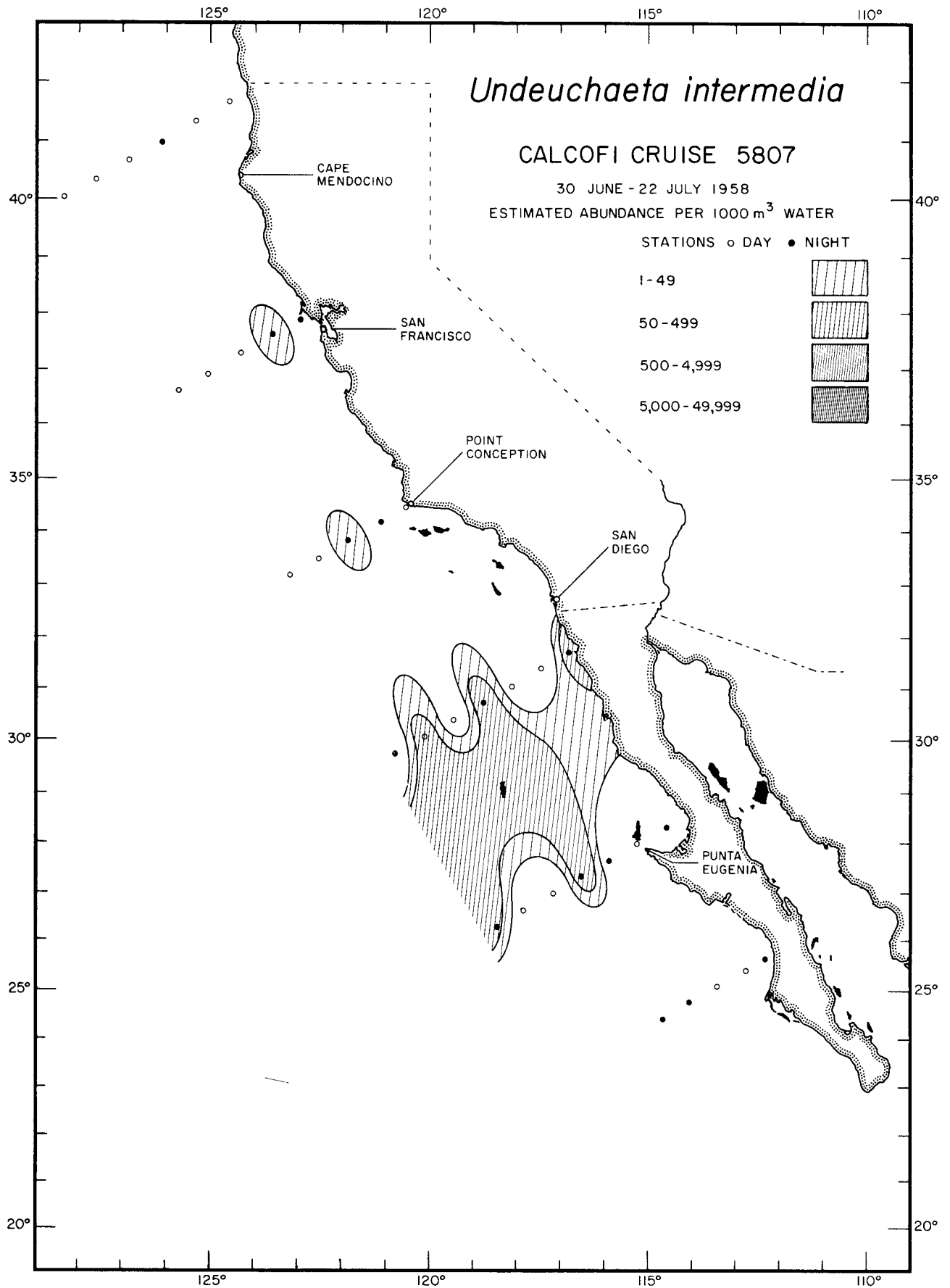
Calanoida

Tortanus discaudatus

5901



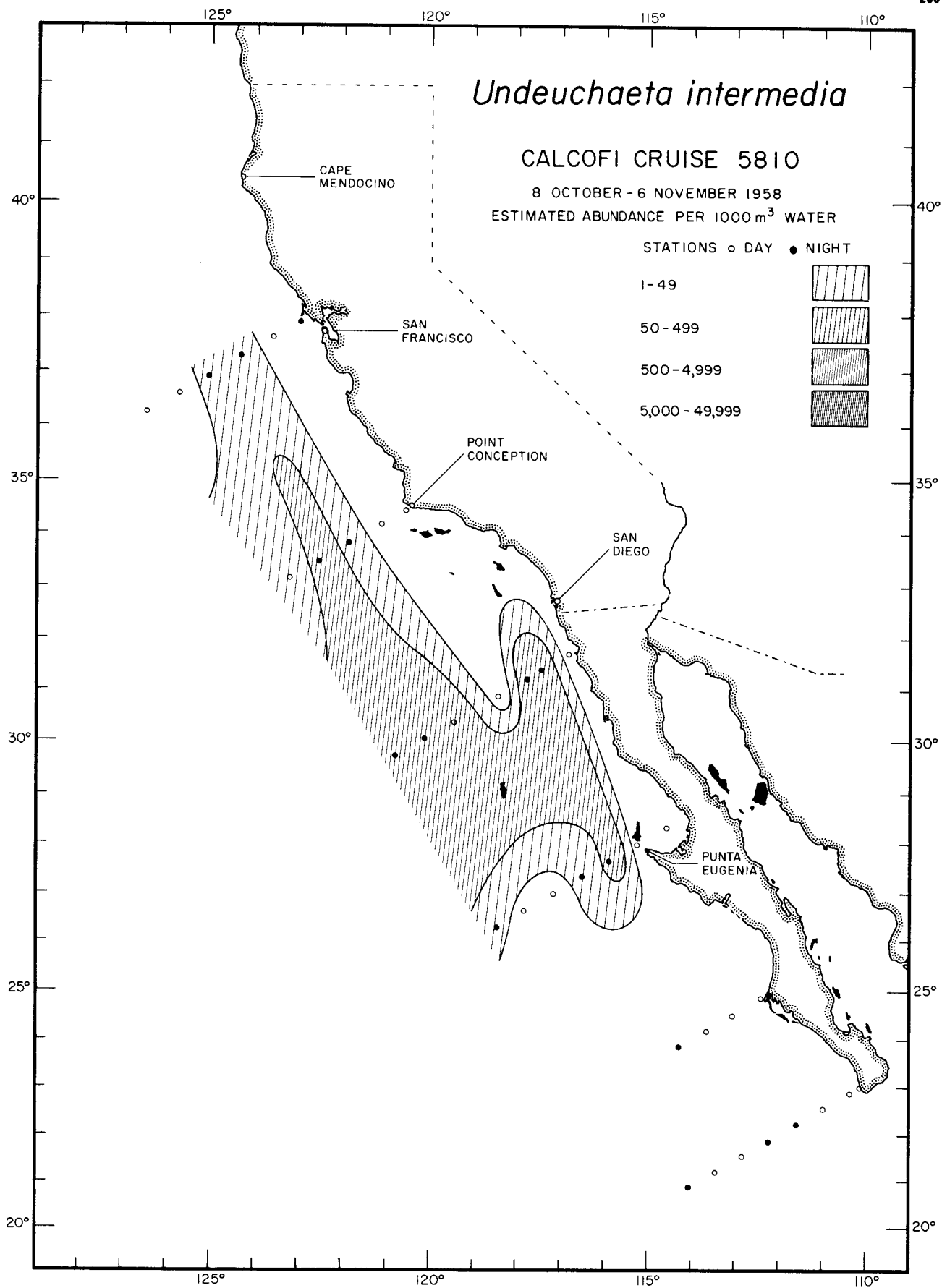
Calanoida
Undeuchaeta intermedia
5804



Calanoida

Undeuchaeta intermedia

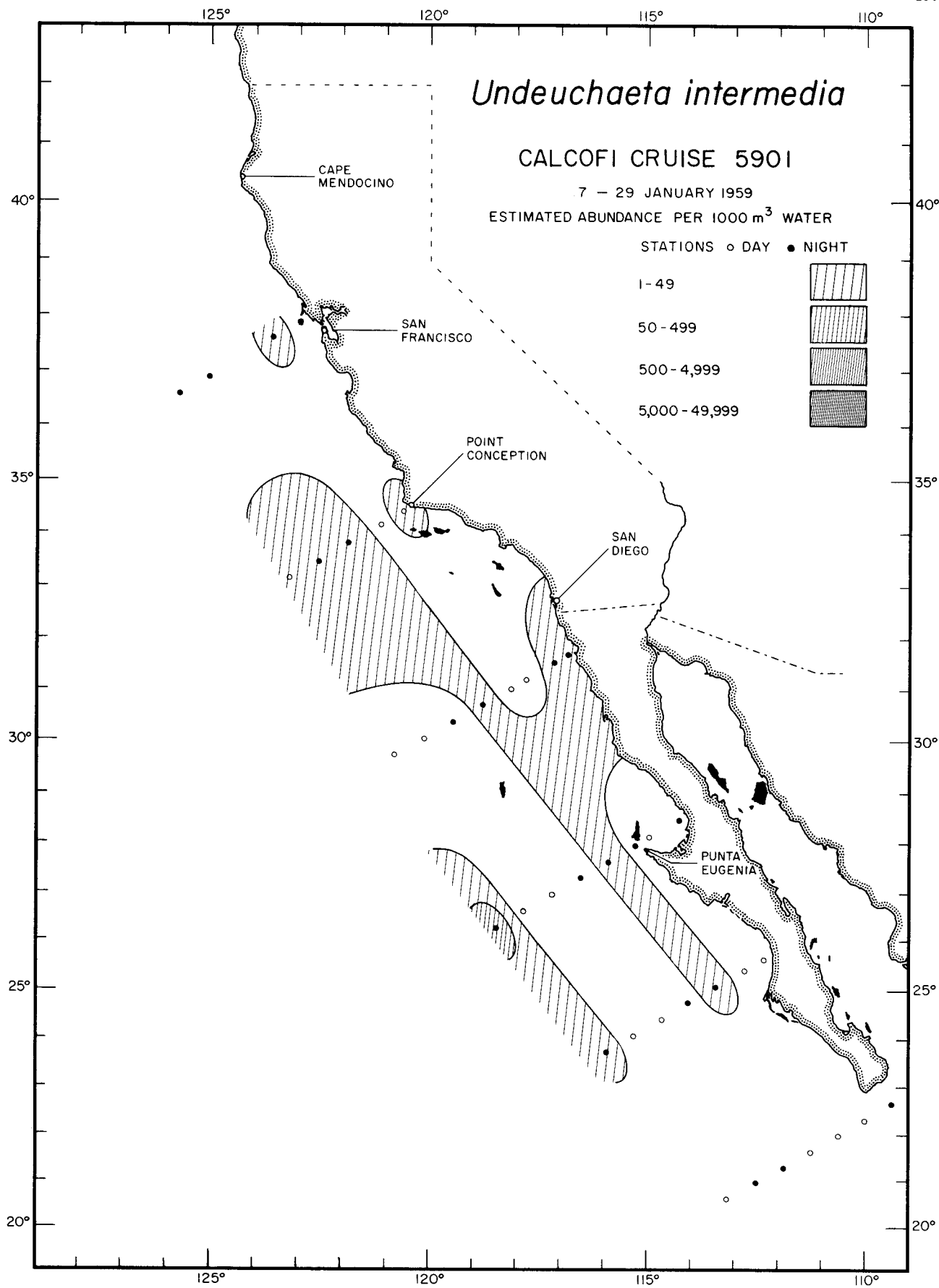
5807



Calanoida

Undeuchaeta intermedia

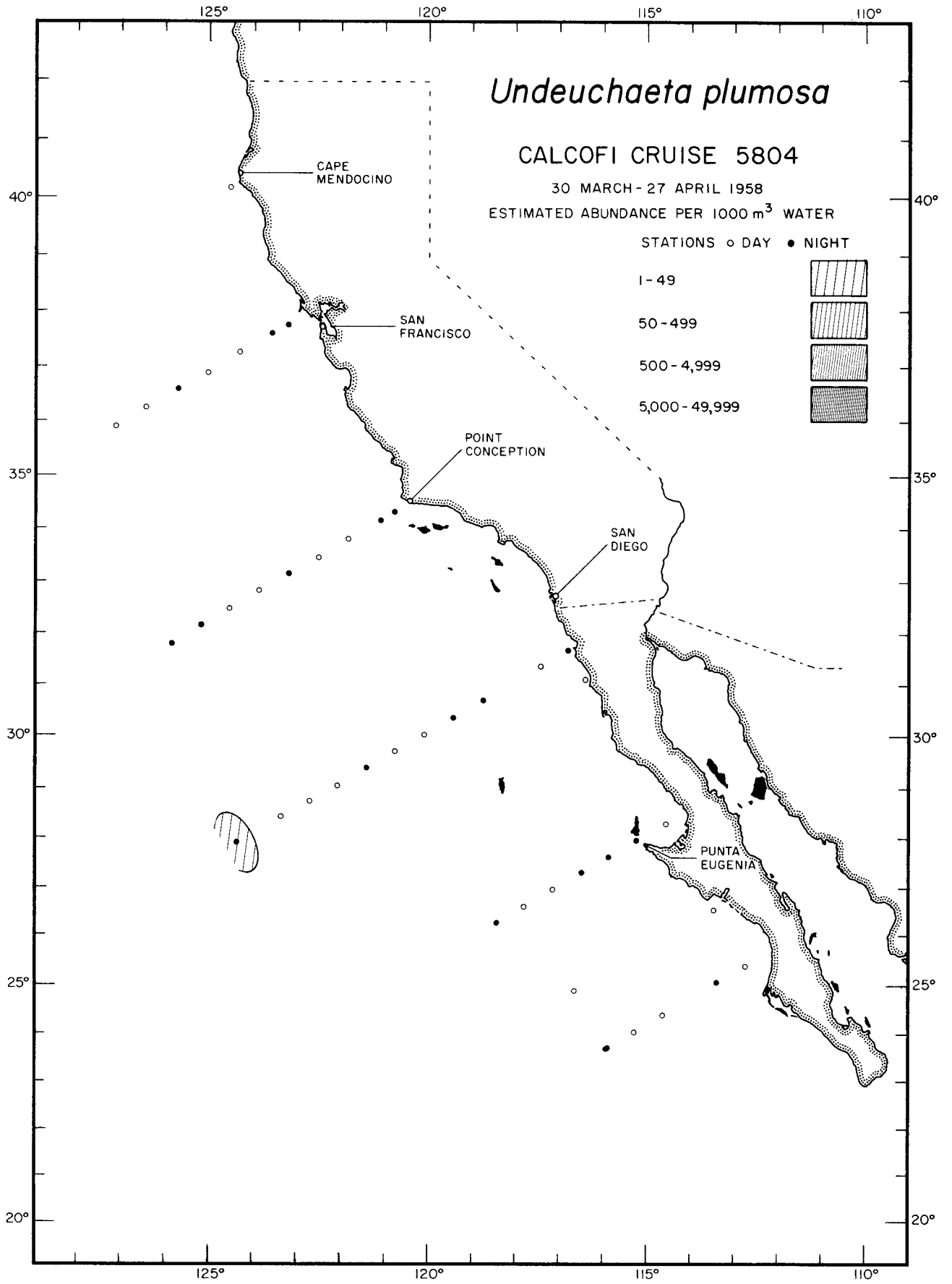
5810



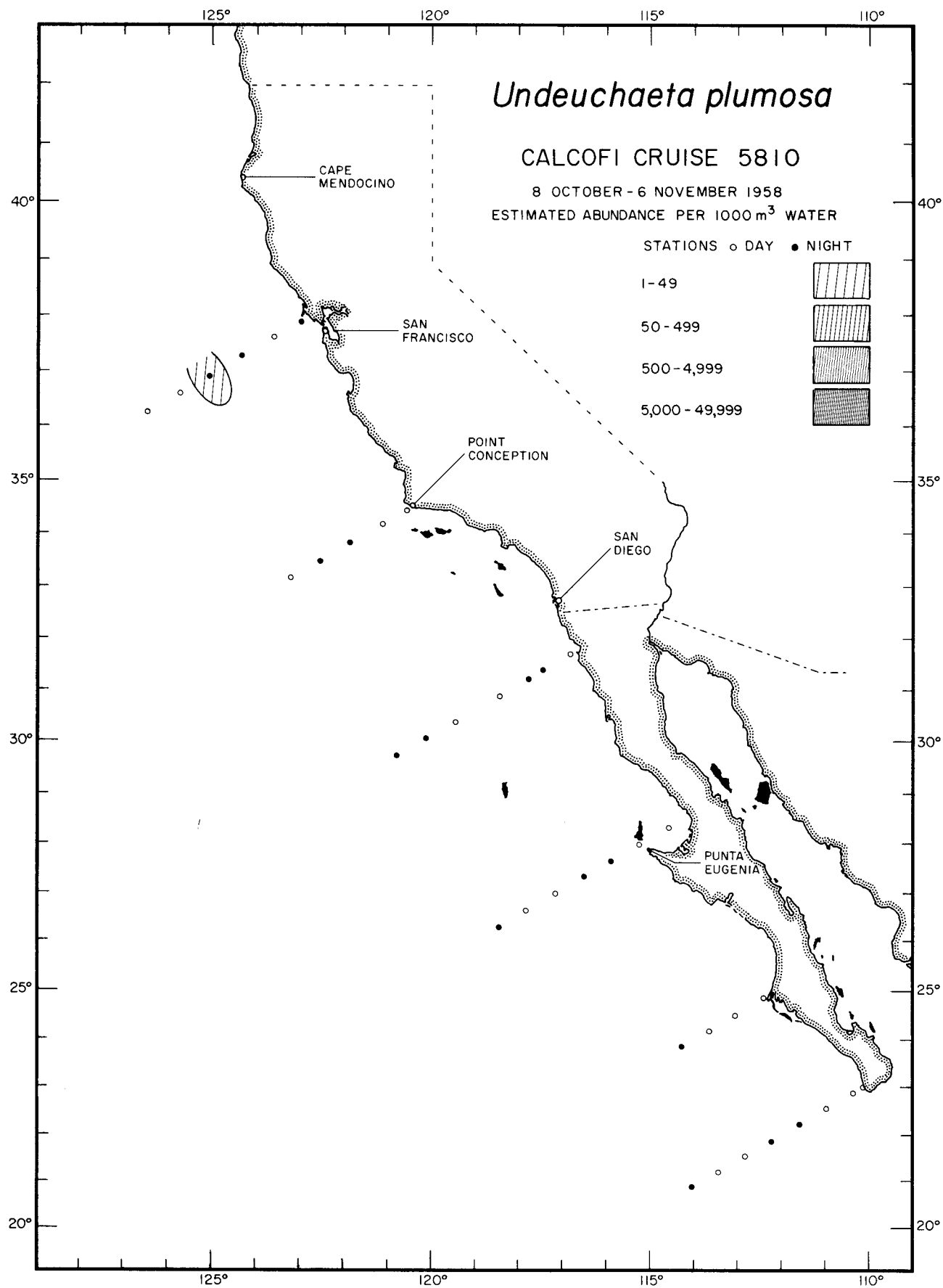
Calanoida

Undeuchaeta intermedia

5901



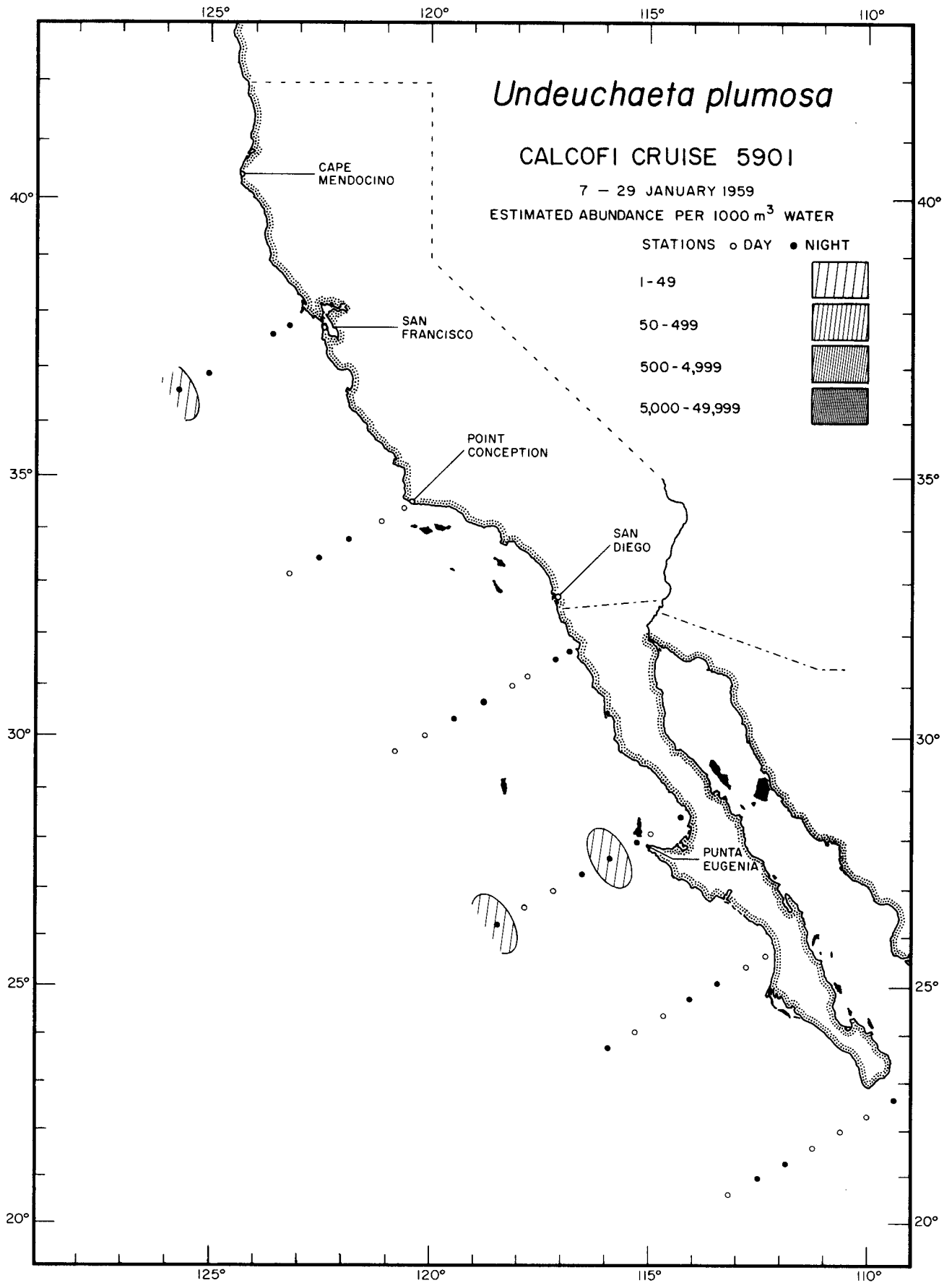
Calanoida
Undeuchaeta plumosa
 5804



Calanoida

Undeuchaeta plumosa

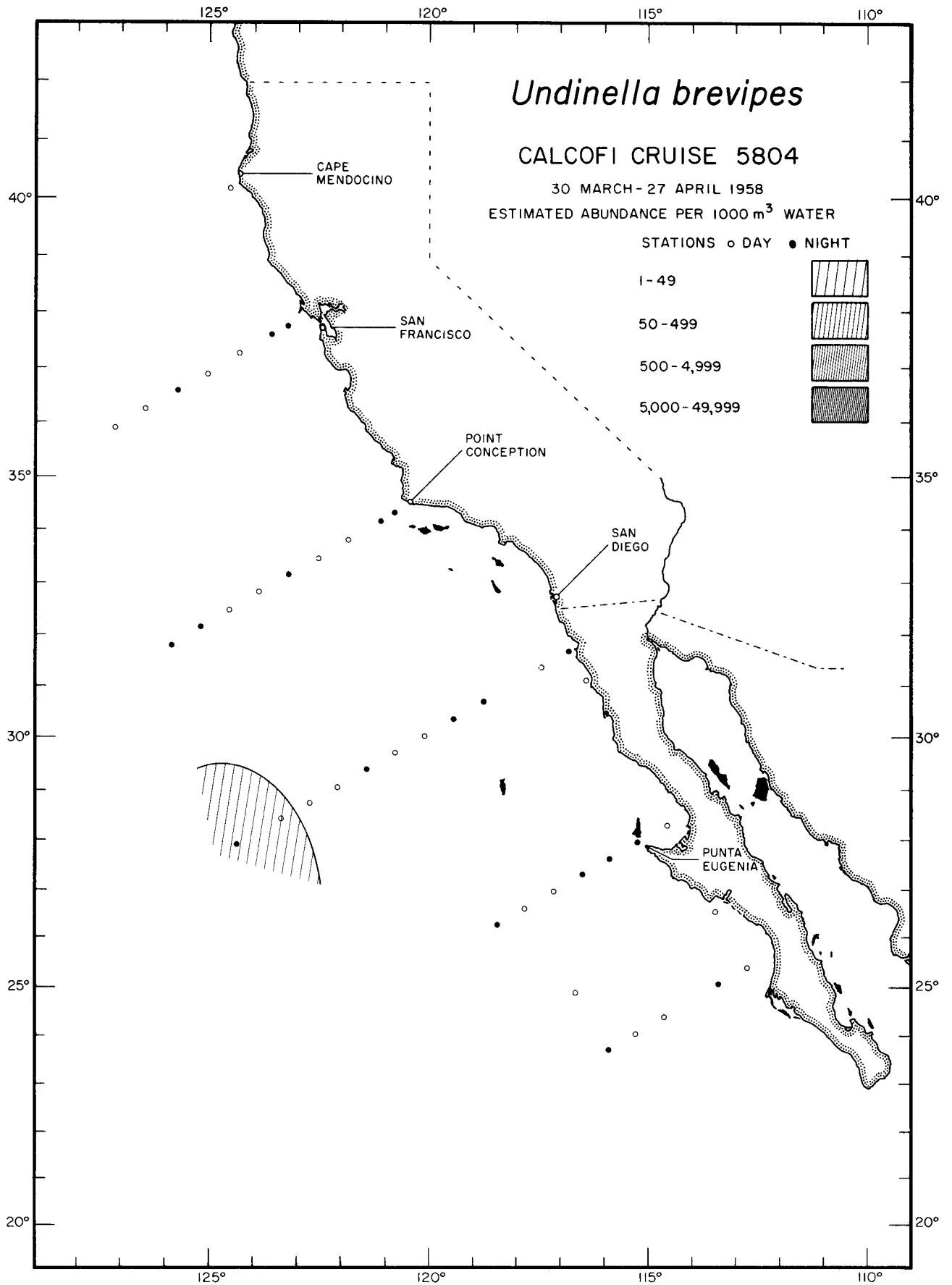
5810



Calanoida

Undeuchaeta plumosa

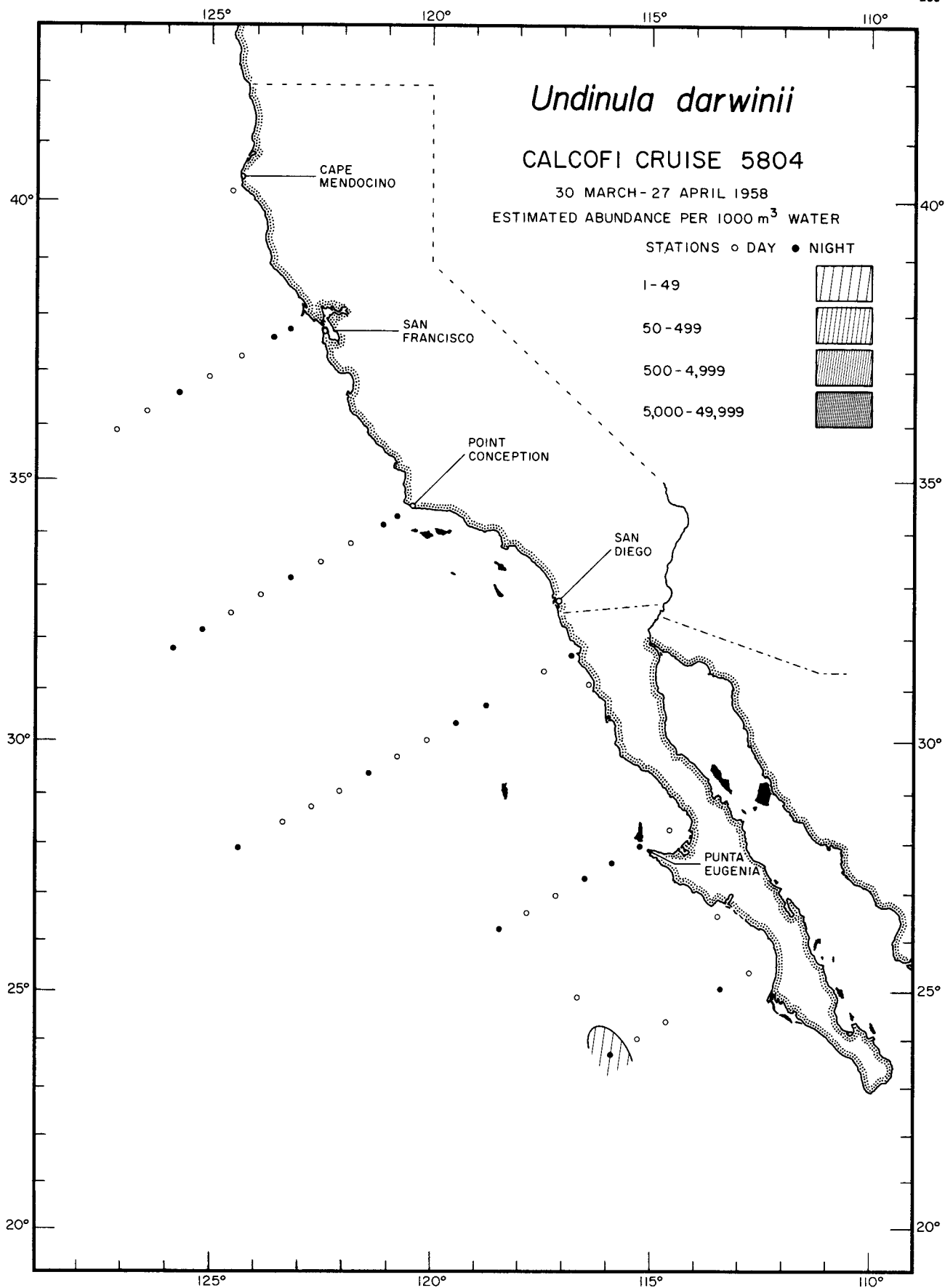
5901



Calanoida

Undinella brevipes

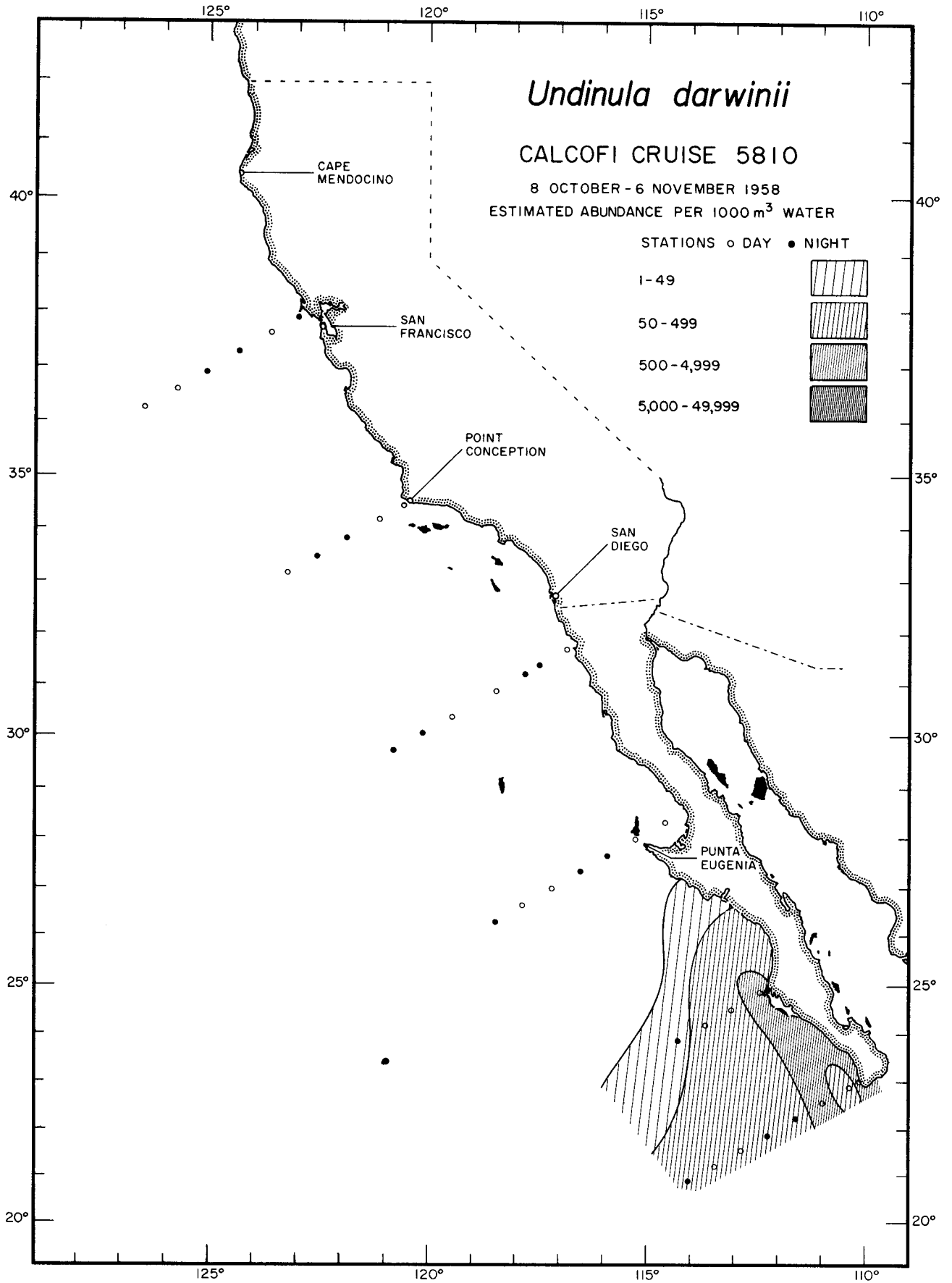
5804



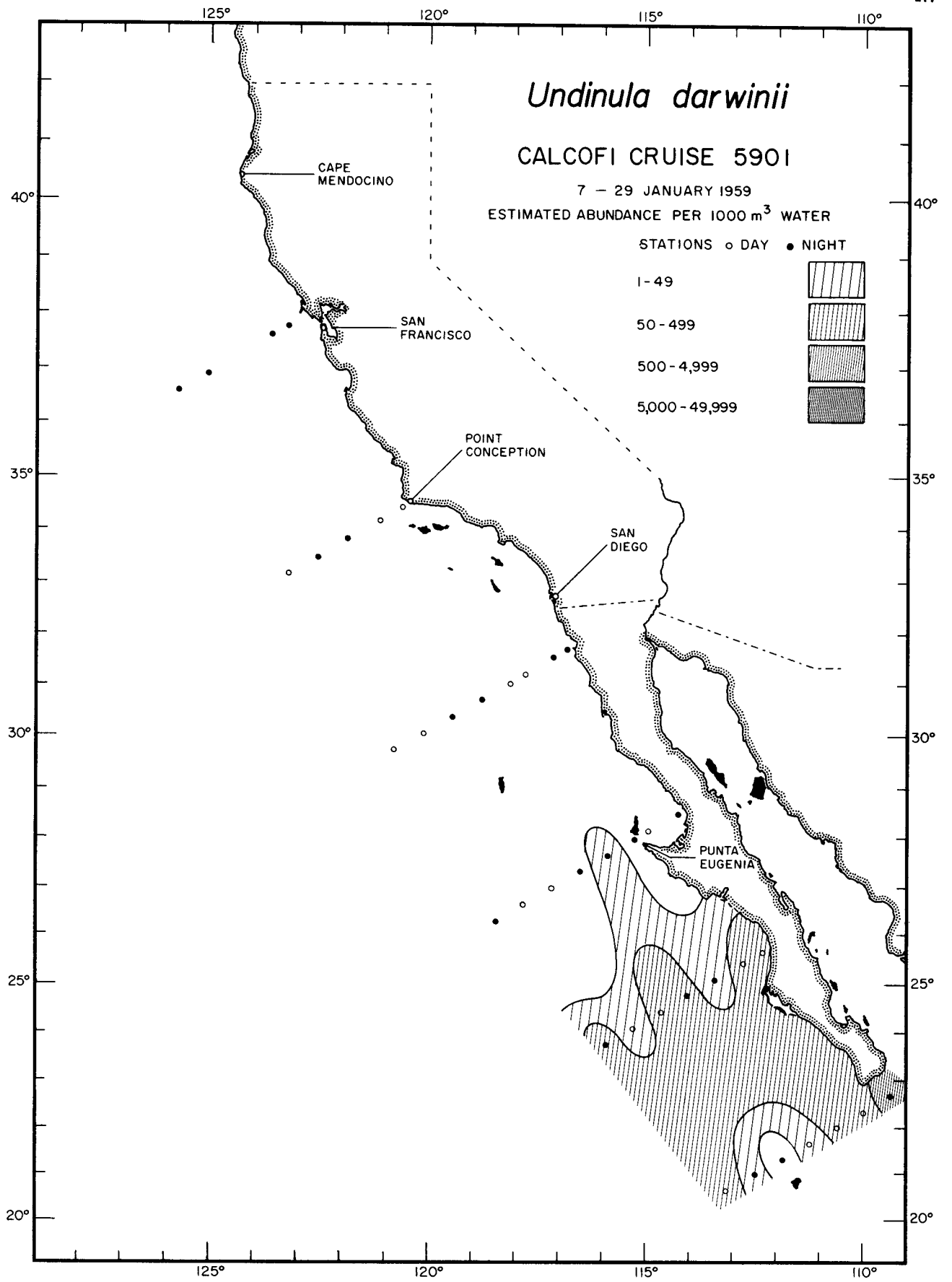
Calanoida

Undinula darwinii

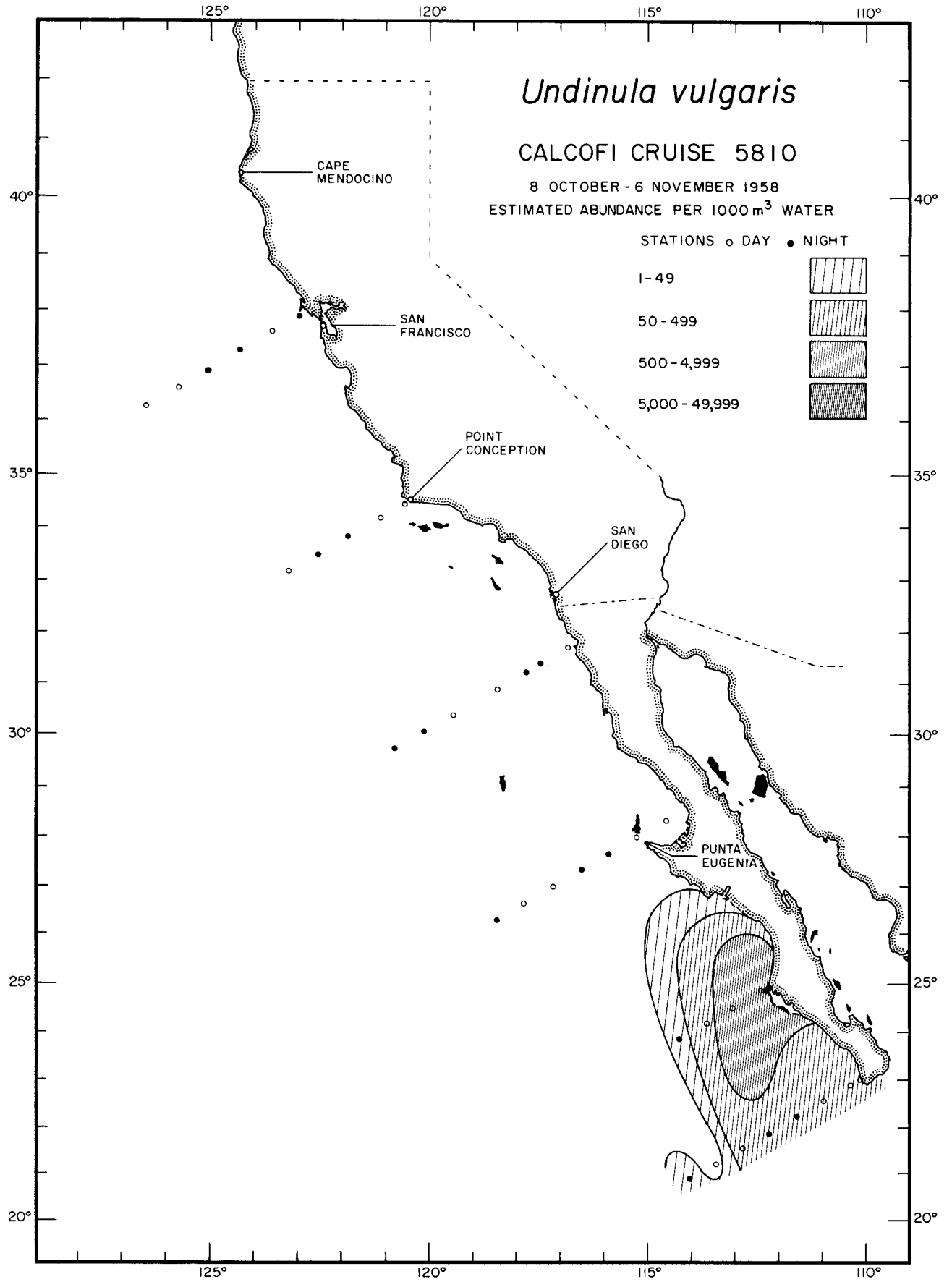
5804



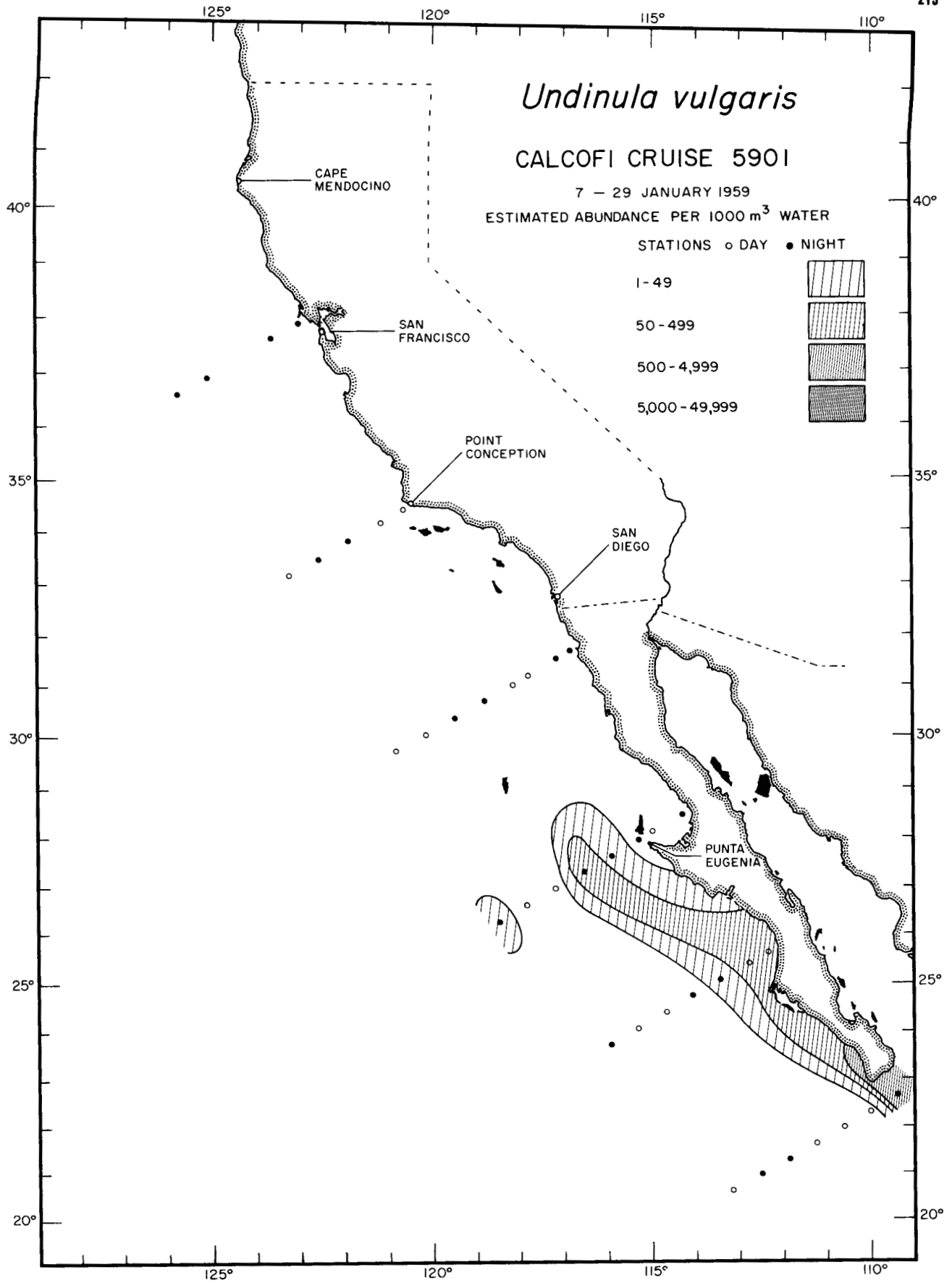
Calanoida
Undinula darwinii
5810



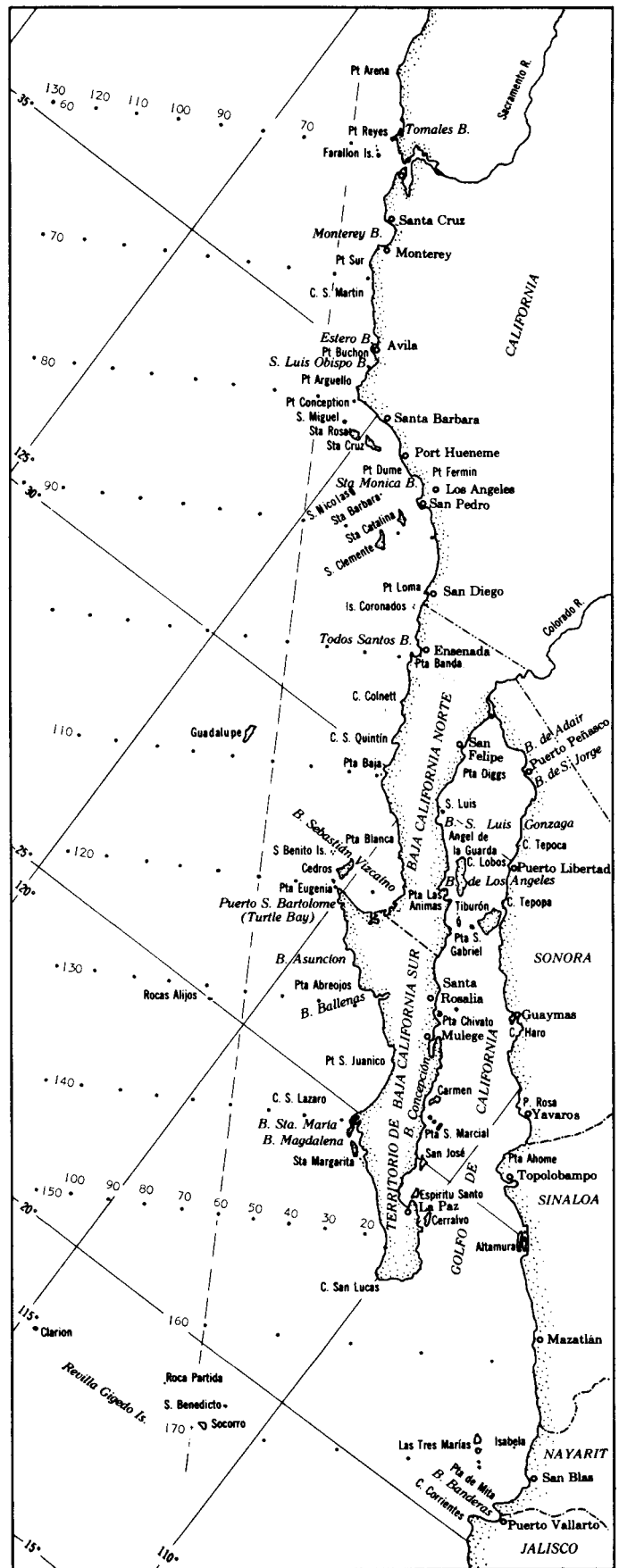
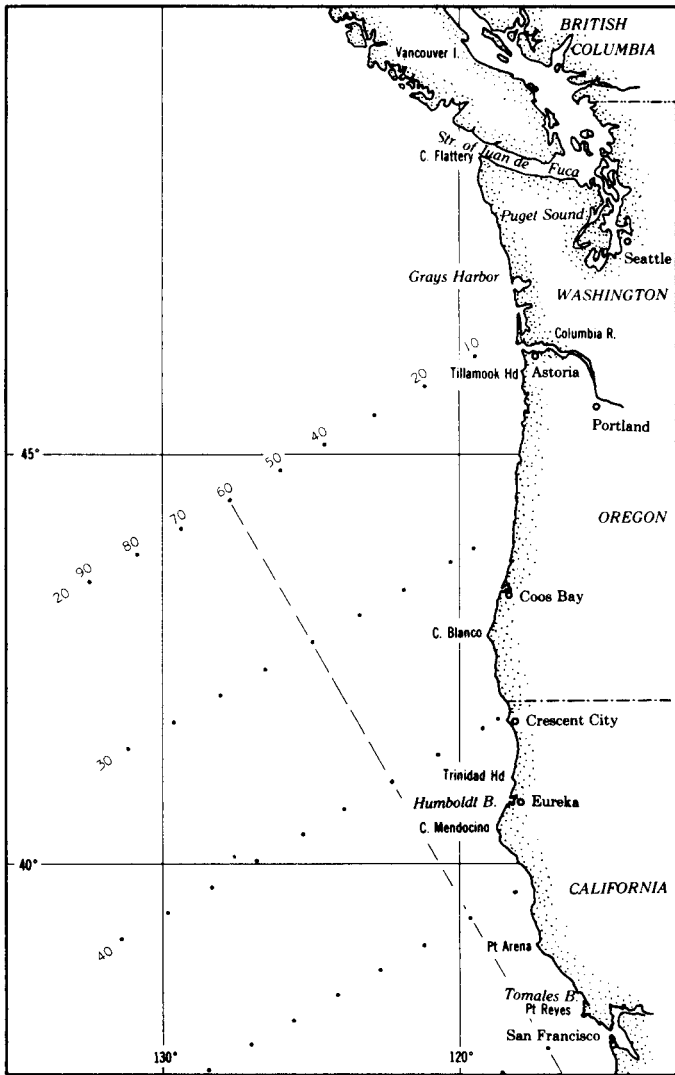
Calanoida
Undinula darwinii
5901



Calanoida
Undinula vulgaris
5810



Calanoida
Undinula vulgaris
5901



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.

CONTENTS

A. Fleminger

Distributional atlas of calanoid copepods in
the California Current region, Part II

vii

Charts

1-213