
23 May 2007

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

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

Triphoturus mexicanus

Stenobrachius leucopsarus

Leuroglossus stilbius

Bathylagus wesethi

Bathylagus ochotensis
CALIFORNIA
COOPERATIVE
OCEANIC
FISHERIES
INVESTIGATIONS

Atlas No. 17

STATE OF CALIFORNIA
MARINE RESEARCH COMMITTEE

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

June, 1972
THE CALCOFI ATLAS SERIES

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

California Academy of Sciences
California Department of Fish and Game
Stanford University, Hopkins Marine Station
National Oceanic and Atmospheric Administration, National Marine Fisheries Service2
University of California, Scripps Institution of Oceanography

CalCOFI atlases3 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 John G. Wyllie, Editors

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

No. 7. Fleminger, A., 1967. Distributional atlas of calanoid copepods in the California Current region, Part II.

1 Usually abbreviated CalCOFI, sometimes CALCOFI or CCOFI.
2 Formerly called U. S. Fish and Wildlife Service, Bureau of Commercial Fisheries.
3 For citation this issue in the series should be referred to as CalCOFI Atlas No. 17.

Library of Congress Catalog Card Number 67-4238
The impressive role played by Hans T. Klein during two decades in support of physical oceanography at Scripps Institution of Oceanography was in fact paradoxically obscured by its effectiveness. The more successful his efforts, the more credit was gained by the physical oceanographers he so faithfully served. Klein's most memorable contribution was the development and management of procedures to produce uniformly high quality hydrographic data on a large scale. This in effect permitted the imaginative ideas of the research staff to be transformed into practical hydrographic programs.

He died suddenly on 7 September 1972 after appearing to be recovering from a heart ailment that incapacitated him earlier in the year.

Klein was born on 25 August 1902 in the small central European city of Hohenelbe, about 50 miles northeast of Prague. He studied in Prague and Vienna and throughout his life retained a strong sentimental attachment to the pre-war image of these two great cities. Mere mention of either city during periods of administrative stress was usually sufficient for the tensions to be replaced by "gemütlichkeit." He emigrated to the United States in 1938 and came to La Jolla in 1941.

Klein was a man of dignity and loyalty, intensely proud of his association with Scripps Institution of Oceanography and strongly aware of his responsibilities to his colleagues and the community. His deep concern for the well-being of his co-workers was always in evidence; his sources of enjoyment included the rare ability to experience genuine pleasure from the happiness of others.

His association with Scripps Institution of Oceanography began in February 1947 when he joined Prof. Harald U. Sverdrup's laboratory to assist in a study on forecasting wave and surf conditions. Sverdrup was quick to recognize Klein's innovative talent for methodology and quality control in handling quantitative data. In the course of this proj-
ect he also began his close associations with Profs. John D. Isaacs and Robert S. Arthur. In subsequent years he added other distinguished La Jollan scientists and guests of the Institution to his list of friends and colleagues, including Elbert H. Ahlstrom, Maurice Blackburn, Albert Defant, Joseph L. Ried, Warren Wooster and Kozo Yoshida, to mention a few.

Klein entered the Marine Life Research Program near the end of 1948. He took charge of the Data Collection and Processing Group in 1958, the team of marine technicians responsible for obtaining and standardizing hydrographic field measurements. His search for accuracy and precision led to a refining of procedures for data collecting at sea and the development of a training program for marine technicians that has been admired and adopted by institutions in the U.S. and abroad. Former members of his training program may be found in various oceanographic laboratories, university laboratories, government agencies and the oceanographic industry. Visiting scientists and technical personnel from the Americas, Europe and Asia have come to Scripps Institution of Oceanography to study the training procedures that yield the admirable quality of oceanographic data for which Scripps Institution is so justly famous.

Klein developed the graphic method commonly referred to as Form 4.5 to simplify the processing of physical oceanographic data. Later he used the concept underlying this method as the basis for computerizing the processing procedures. The technique is significant both for processing and for analyzing hydrographic data and it has been adopted for use by a number of other institutions. Despite the rapidity of technological developments and the shifting emphasis in ocean science the system Klein established for data processing at Scripps Institution of Oceanography is still essentially as he developed it, its durability mute testimony of his skill in program development and administration.

Hand-in-hand with the processing of the data, he established standards of measurement which are as rigorous as his processing system. He was a main force behind efforts that led to the improved quality of reversing thermometers manufactured in the United States. His method of calibrating reversing thermometers has been widely adopted.

The CalCOFI program greatly benefited from his counsel. For example, his persuasive arguments convinced the CalCOFI Committee to continue systematic monitoring of hydrographically distinctive stations within the CalCOFI survey region irrespective of subsequent program modifications. This decision made possible the existence of a unique time series of temperature, salinity and zooplankton collections representative of the various water masses contributing to the California Current region, a wealth of data that will serve present and future studies concerned with Earth's environmental record. He was among the first at Scripps to advocate preparation of visual summaries of temporal hydrographic data that led to the development of the CalCOFI Atlas series. Until illness precluded activity, he served the Atlas series from its inception officially as an editor but privately as its everwatchful sage.

Other facets of Hans Klein may be envisioned from his personal interests and activities outside of oceanography. He read avidly, especially in German literature, particular favorites being Goethe, Mann, Schiller and Heine. He wrote humorous poetry often to commemorate notable events affecting his associates and he particularly enjoyed presenting it to the recipient without warning. His pleasure in meter found another little-known outlet — enjoyment of percussion instruments which he attacked with enthusiasm.

One of Klein's special interests was in the organization, the physical arrangement and the historical development of cities, a reflection of his pleasure and concern for people and their activities in producing the human community.

His enjoyment of art was widespread, but his strong attachments to classical Gothic and the Bauhaus school is in keeping with the underlying qualities of his professional activities: accuracy, precision and order.

Elbert H. Ahlstrom

CALCOFI ATLAS NO. 17

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

June, 1972
DISTRIBUTIONAL ATLAS OF FISH LARVAE IN THE CALIFORNIA CURRENT REGION:
SIX COMMON MESOPELAGIC FISHES—
VINCIGUERRIA LUCETIA, TRIPHOSTURUS MEXICANUS,
STENOBRACHIUS LEUCOPSARUS,
LEUROGLOSSUS STILBIUS, BATHYLAGUS WESETHI,
AND BATHYLAGUS OCHOTENISI, 1955 THROUGH 1960

Elbert H. Ahlstrom

The group includes three members of the family Bathylagidae (Leuroglossus stilbius, Bathylagus ochotensis, Bathylagus wesethi), two species of Myctophidae (Stenobrachius leucopsarus, Triphoturus mexicanus), and one representative of the family Gonostomatidae (Vinciguerria lucetia).

Sixty-nine cruises are considered in this atlas, all monthly CalCOFI cruises between 1955 and 1960 except the unique wide ranging NORPAC expedition of August 1955; no monthly cruises were made in November and December of 1960.

Distribution charts were prepared for a species when it was obtained in five or more collections during a cruise. At least one distribution chart is included for 69 of the 69 CalCOFI cruises made during 1955 to 1960. The exception is Cruise 5611 (Table 1). Coverage was normally more extensive on cruises made in January through July, and October. Coverage was usually limited on cruises made during the remaining 4 months.

The larvae of the six species were obtained in plankton collections made with a standard CalCOFI net, 1-meter in diameter at the mouth. Details of the net and of its deployment during the haul are given in Fleminger (1964) and Ahlstrom (1966). Depth of water permitting, the net was lowered by paying out 200 meters of cable at the rate of 50 meters of wire per minute, and retrieved at a uniform rate of 20 meters per minute while maintaining a wire angle of 45 degrees. The usual depth reached...
by the net was about 140 meters. The tow was taken at a vessel speed of 1½ to 2 knots. A flow meter in the mouth of the net permitted calculation of the volume of water strained during a haul.

As pointed out in previous distributional atlases for fish eggs and larvae, standardized values for fish eggs and larvae are not directly comparable with standardized values used by authors of some other CalCOFI atlases. Estimates of abundance of fish larvae were made comparable between samples by standardizing the counts to the number under 10 square meters of sea surface. Details for deriving standardization factors are given in Kramer and Ahlstrom (1968).

Information concerning the depth distribution of the larvae of the six species dealt with in this atlas is given in Ahlstrom (1959). Larvae of *Vinciguerria lucetia*, *Triphoturus mexicanus* and *Stenobrachius leucopsarus* occurred mostly in the upper mixed layer above the thermocline and were seldom taken below 100 meters depth. Larvae of the three bathylagid smelts occurred mostly below the thermocline, but were commonly taken between circa 70 to 125 meters, although a portion of the larvae occurred deeper than the level routinely sampled on standard CalCOFI hauls, i.e., below 140 meters depth. Hence, the standard haul values for three species are minimal estimates of their relative abundance.

TABLE 1. Number of distribution charts included in this atlas for monthly cruises made in 1955 through 1960. A distribution chart is included for each species having five or more collections of larvae on a particular cruise.

<table>
<thead>
<tr>
<th>Month</th>
<th>1955</th>
<th>1956</th>
<th>1957</th>
<th>1958</th>
<th>1959</th>
<th>1960</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>5</td>
<td>5</td>
<td>1</td>
<td>6</td>
<td>6</td>
<td>5</td>
<td>28</td>
</tr>
<tr>
<td>02</td>
<td>6</td>
<td>5</td>
<td>5</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>36</td>
</tr>
<tr>
<td>03</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>36</td>
</tr>
<tr>
<td>04</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>36</td>
</tr>
<tr>
<td>05</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>36</td>
</tr>
<tr>
<td>06</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>5</td>
<td>6</td>
<td>35</td>
</tr>
<tr>
<td>07</td>
<td>6</td>
<td>6</td>
<td>5</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>34</td>
</tr>
<tr>
<td>08</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>14</td>
</tr>
<tr>
<td>09</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>16</td>
</tr>
<tr>
<td>10</td>
<td>4</td>
<td>1</td>
<td>3</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>18</td>
</tr>
<tr>
<td>11</td>
<td>3</td>
<td>0</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>—</td>
<td>10</td>
</tr>
<tr>
<td>12</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>—</td>
<td>9</td>
</tr>
<tr>
<td>Total</td>
<td>55</td>
<td>47</td>
<td>47</td>
<td>52</td>
<td>55</td>
<td>49</td>
<td>305</td>
</tr>
</tbody>
</table>

* nor included

Larvae of *Vinciguerria lucetia* (Figure 1; Distribution Charts 2-63)

*V. lucetia* is the only species among the six featured in this atlas, whose early life history stages have been described in detail (Ahlstrom and Counts, 1958). It is a tropical-subtropical species that is widely distributed in the eastern Pacific between California and Chile. It does not occur in the central water mass of either the North or South Pacific—being replaced there by *V. nimbaria*. Its larvae are second in abundance in the eastern tropical Pacific to those of the myctophid, *Diogenichthys lattenu tus* (Ahlstrom, 1971a). Its abundance in the CalCOFI pattern is strongly influenced by water temperatures. It occurred in relatively low abundance during colder-than-average years, such as 1956, and in markedly higher numbers during warmer-than-average years, such as 1957 through 1959 (Table 2). Even so, it was taken
on 67 of the 69 cruises included in this atlas, and in sufficient numbers for inclusion in distribution charts for 62 cruises. For pagination of these charts, refer to Table 3; for information on the five cruises with one to four occurrences, refer to Table 4.

**TABLE 2.** Relative abundance of larvae of six mesopelagic fishes in the California Current region off California and Baja California during 1955-60. (Standard haul summations.)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Family Bathylagidae</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bathylagus achatinnis</td>
<td>1,301</td>
<td>2,231</td>
<td>1,078</td>
<td>1,550</td>
<td>545</td>
<td>1,671</td>
<td>Ahlstrom, 1969</td>
</tr>
<tr>
<td>Bathylagus wesethi</td>
<td>3,245</td>
<td>2,146</td>
<td>6,347</td>
<td>7,033</td>
<td>2,386</td>
<td>1,207</td>
<td>Ibid</td>
</tr>
<tr>
<td>Family Myctophidae</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Staurobrachius leptopterus</td>
<td>7,453</td>
<td>15,120</td>
<td>16,803</td>
<td>11,876</td>
<td>7,228</td>
<td>11,977</td>
<td>Moser &amp; Ahlstrom, 1970</td>
</tr>
<tr>
<td>Family Gonostomatidae</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vinciguerria lucetia</td>
<td>12,658</td>
<td>9,832</td>
<td>55,114</td>
<td>57,424</td>
<td>117,959</td>
<td>35,041</td>
<td>Ahlstrom, 1969</td>
</tr>
<tr>
<td>Total — six categories</td>
<td>52,931</td>
<td>58,751</td>
<td>125,054</td>
<td>99,347</td>
<td>169,587</td>
<td>101,810</td>
<td></td>
</tr>
<tr>
<td>Total — all fish larvae</td>
<td>378,898</td>
<td>408,140</td>
<td>493,549</td>
<td>456,018</td>
<td>470,456</td>
<td>504,780</td>
<td>Ahlstrom, 1969</td>
</tr>
</tbody>
</table>

1Includes multiple occupancies of stations on Cruises 5509 and 5511 and excludes NORPAC.
2Totals for 1955 from Ahlstrom, 1969, for comparability, inasmuch as totals in Moser and Ahlstrom (1970) included NORPAC and excluded multiple occupancies on Cruises 5509 and 5511.
TABLE 3. Pagination of distribution charts for larvae of six mesopelagic fishes. Distribution charts limited to cruises with five or more occurrences of a species. Fewer occurrences (1 to 4) indicated by T (see Table 4 for data) and no occurrences by 0.

<table>
<thead>
<tr>
<th>Cruise</th>
<th>Vampyrenia lutea</th>
<th>Trachurus mexicanus</th>
<th>Scomberomorus laticlavius</th>
<th>Bathypterois owentii</th>
<th>Phycodurus eques</th>
<th>Cruise</th>
<th>Vampyrenia lutea</th>
<th>Trachurus mexicanus</th>
<th>Scomberomorus laticlavius</th>
<th>Bathypterois owentii</th>
</tr>
</thead>
<tbody>
<tr>
<td>5501</td>
<td>2 64 125 175</td>
<td>T 269</td>
<td>T</td>
<td>0</td>
<td></td>
<td>5801</td>
<td>5 66 127 177</td>
<td>T 233</td>
<td>T</td>
<td>0</td>
</tr>
<tr>
<td>02</td>
<td>8 69 130 180 225</td>
<td>T 274</td>
<td>0</td>
<td>0</td>
<td></td>
<td>02</td>
<td>11 72 133 183</td>
<td>T 226</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>03</td>
<td>14 75 136 186 228</td>
<td>T 280</td>
<td>0</td>
<td>0</td>
<td></td>
<td>03</td>
<td>17 78 139 189</td>
<td>T 231</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>04</td>
<td>20 81 142 192 234</td>
<td>T 286</td>
<td>0</td>
<td>0</td>
<td></td>
<td>04</td>
<td>23 84 145 195</td>
<td>T 237</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>05</td>
<td>26 87 148 198 240</td>
<td>T 292</td>
<td>0</td>
<td>0</td>
<td></td>
<td>05</td>
<td>29 90 151 201</td>
<td>T 243</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>06</td>
<td>32 93 154 204 246</td>
<td>T 298</td>
<td>0</td>
<td>0</td>
<td></td>
<td>06</td>
<td>35 96 157 207</td>
<td>T 249</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>07</td>
<td>38 99 160 210 252</td>
<td>T 303</td>
<td>0</td>
<td>0</td>
<td></td>
<td>07</td>
<td>41 102 163</td>
<td>T 253</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>08</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>08</td>
<td>46 107</td>
<td>0 0</td>
<td></td>
<td>0 0</td>
</tr>
<tr>
<td>09</td>
<td>T 110 166 217</td>
<td>T T 264 272</td>
<td></td>
<td>T 0</td>
<td>0 0</td>
<td>09</td>
<td>T 110 166 217</td>
<td>T 272</td>
<td>0 0</td>
<td>T 262 272</td>
</tr>
<tr>
<td>10</td>
<td>54 116 T 218 264</td>
<td>T T 275</td>
<td></td>
<td>T T 266</td>
<td>0 0</td>
<td>10</td>
<td>56 119</td>
<td>T 266</td>
<td>0 0</td>
<td>T 266 270</td>
</tr>
<tr>
<td>11</td>
<td>0 0 122 168 219</td>
<td>0 0 T T 268</td>
<td></td>
<td>0 0</td>
<td>0 0</td>
<td>11</td>
<td>11 59 159</td>
<td>T 269</td>
<td>0 0</td>
<td>T 269 271</td>
</tr>
<tr>
<td>12</td>
<td>61 124 T 171 222</td>
<td>T T 263</td>
<td></td>
<td>T T 266</td>
<td>0 0</td>
<td>12</td>
<td>62 159</td>
<td>T T 266</td>
<td>0 0</td>
<td>T 266 270</td>
</tr>
<tr>
<td>5601</td>
<td>3 65 126 176</td>
<td>T 270</td>
<td></td>
<td>0</td>
<td></td>
<td>5901</td>
<td>2 67 125 178</td>
<td>T 272</td>
<td>0 0</td>
<td>T 272 272</td>
</tr>
<tr>
<td>02</td>
<td>9 70 131 181 227</td>
<td>T 275</td>
<td></td>
<td>0</td>
<td></td>
<td>02</td>
<td>12 73 134 184</td>
<td>T T 278</td>
<td>0 0</td>
<td>T 278 278</td>
</tr>
<tr>
<td>03</td>
<td>13 76 137 187 229</td>
<td>T 281</td>
<td></td>
<td>0</td>
<td></td>
<td>03</td>
<td>18 79 140 190</td>
<td>T 232</td>
<td>0 0</td>
<td>T 232 234</td>
</tr>
<tr>
<td>04</td>
<td>21 82 143 193 235</td>
<td>T 287</td>
<td></td>
<td>0</td>
<td></td>
<td>04</td>
<td>24 85 146 196</td>
<td>T 238</td>
<td>0 0</td>
<td>T 238 239</td>
</tr>
<tr>
<td>05</td>
<td>27 88 149 199 241</td>
<td>T 293</td>
<td></td>
<td>0</td>
<td></td>
<td>05</td>
<td>30 91 152 202</td>
<td>T 244</td>
<td>0 0</td>
<td>T 244 246</td>
</tr>
<tr>
<td>06</td>
<td>33 94 155 205 247</td>
<td>T 299</td>
<td></td>
<td>0</td>
<td></td>
<td>06</td>
<td>36 97 158 208</td>
<td>T 250</td>
<td>0 0</td>
<td>T 250 252</td>
</tr>
<tr>
<td>07</td>
<td>39 100 161 211 253</td>
<td>T 304</td>
<td></td>
<td>0</td>
<td></td>
<td>07</td>
<td>42 103 164 214</td>
<td>T 256</td>
<td>0 0</td>
<td>T 256 258</td>
</tr>
<tr>
<td>08</td>
<td>44 105 0 0 258 0</td>
<td>T 308</td>
<td></td>
<td>0</td>
<td></td>
<td>08</td>
<td>48 108</td>
<td>T 259</td>
<td>0 0</td>
<td>T 259 261</td>
</tr>
<tr>
<td>09</td>
<td>49 111 0 0 258 0</td>
<td>T T 308</td>
<td></td>
<td>0</td>
<td></td>
<td>09</td>
<td>52 114</td>
<td>T 263</td>
<td>0 0</td>
<td>T 263 265</td>
</tr>
<tr>
<td>10</td>
<td>0 0 117 0 0 0 0 258</td>
<td>T 308</td>
<td></td>
<td>0</td>
<td></td>
<td>10</td>
<td>57 120</td>
<td>T 267</td>
<td>0 0</td>
<td>T 267 269</td>
</tr>
<tr>
<td>11</td>
<td>T T T T T T 0</td>
<td>11 60 170 221 222 0</td>
<td>T 269</td>
<td>0 0</td>
<td>T 269 271</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>T T T T 172 222 0</td>
<td>T T 269</td>
<td></td>
<td>0 0</td>
<td></td>
<td>12</td>
<td>63 0</td>
<td>T 268</td>
<td>0 0</td>
<td>T 268 270</td>
</tr>
</tbody>
</table>

viii
TABLE 4. Record of stations containing 1 to 4 positive samples of larvae on indicated cruises for each of the six mesopelagic fishes treated in this atlas. (These data are not presented in distribution chart form).

<table>
<thead>
<tr>
<th>Year</th>
<th>Cruise</th>
<th>Station</th>
<th>Number of larvae</th>
<th>Year</th>
<th>Cruise</th>
<th>Station</th>
<th>Number of larvae</th>
</tr>
</thead>
<tbody>
<tr>
<td>1955</td>
<td>5509A</td>
<td>83.55</td>
<td>3 Leuroglossus stilbius</td>
<td>1960</td>
<td>6009</td>
<td>110.40</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>85.39</td>
<td>3 (cont.)</td>
<td></td>
<td>6010</td>
<td>63.60</td>
<td>3</td>
</tr>
<tr>
<td>1956</td>
<td>5611</td>
<td>93.50</td>
<td>3</td>
<td>1955</td>
<td>5501</td>
<td>120.45</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>5612</td>
<td>97.45</td>
<td>3 Bathyergus wesetii</td>
<td></td>
<td>5501</td>
<td>120.45</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>97.55</td>
<td>3</td>
<td></td>
<td>5601</td>
<td>120.10</td>
<td>3</td>
</tr>
<tr>
<td>1957</td>
<td>5711</td>
<td>90.28</td>
<td>6 5509B 85.35</td>
<td>5509B</td>
<td>85.35</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>5712</td>
<td>100.40</td>
<td>3 5512 113.35</td>
<td>5512</td>
<td>113.35</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>107.60</td>
<td>7 5601 110.33</td>
<td>5601</td>
<td>110.33</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>110.70</td>
<td>114 5602 120.35</td>
<td>5602</td>
<td>120.35</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>5602 123.50</td>
<td>5602</td>
<td>123.50</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1958</td>
<td>5811</td>
<td>100.50</td>
<td>3</td>
<td>1957</td>
<td>5701</td>
<td>120.70</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>100.60</td>
<td>37</td>
<td></td>
<td>5702</td>
<td>110.60</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>114.30</td>
<td>3</td>
<td></td>
<td>5708</td>
<td>114.30</td>
<td>9</td>
</tr>
<tr>
<td>1959</td>
<td>5911</td>
<td>87.55</td>
<td>3</td>
<td>5712</td>
<td>90.90</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>90.70</td>
<td>10</td>
<td></td>
<td>5812</td>
<td>93.80</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>93.35</td>
<td>7</td>
<td></td>
<td>5911</td>
<td>85.35</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>95.55</td>
<td>5</td>
<td></td>
<td>5903</td>
<td>90.80</td>
<td>3</td>
</tr>
<tr>
<td>1957</td>
<td>5701</td>
<td>103.30</td>
<td>3</td>
<td>1958</td>
<td>5811</td>
<td>97.55</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td></td>
<td>103.40</td>
<td>6</td>
<td></td>
<td>5909</td>
<td>93.50</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>107.40</td>
<td>3</td>
<td></td>
<td>5912</td>
<td>93.10</td>
<td>6</td>
</tr>
<tr>
<td>1958</td>
<td>5809</td>
<td>83.70</td>
<td>9 Bathyergus 1955</td>
<td>5509B</td>
<td>85.55</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>90.70</td>
<td>2 5509A 1957 120.45</td>
<td>5509A</td>
<td>85.55</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>93.27</td>
<td>1</td>
<td></td>
<td>5509B</td>
<td>83.80</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>93.65</td>
<td>1 5509B 120.45</td>
<td>5509B</td>
<td>85.60</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>83.50</td>
<td>3 5512 85.60</td>
<td>5512</td>
<td>87.60</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>83.51</td>
<td>3</td>
<td></td>
<td>5911</td>
<td>60.10</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>83.51</td>
<td>3</td>
<td></td>
<td>5906</td>
<td>70.50</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>93.30</td>
<td>2 1957 87.50</td>
<td>5707</td>
<td>87.50</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>1958</td>
<td>5712</td>
<td>80.51</td>
<td>2 1955 87.50</td>
<td>5908</td>
<td>83.80</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>82.47</td>
<td>4</td>
<td></td>
<td>5909</td>
<td>83.80</td>
<td>2</td>
</tr>
<tr>
<td>1959</td>
<td>5908</td>
<td>83.80</td>
<td>2</td>
<td>1957</td>
<td>5701</td>
<td>83.80</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>90.55</td>
<td>3 1959 60.10</td>
<td>5909</td>
<td>83.80</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>5909</td>
<td>90.110</td>
<td>3 1960 60.10</td>
<td>5912</td>
<td>110.70</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>80.30</td>
<td>2</td>
<td></td>
<td>5908</td>
<td>87.35</td>
<td>3</td>
</tr>
</tbody>
</table>

ix
Larvae of *Triphoturus mexicanus* (Figure 2; Distribution Charts 64-124)

Three sizes of larvae, 4.4 mm, 6.75 mm and 10.5 mm are illustrated in Ahlstrom (1965) as *Lampanyctus mexicanus*. Small-sized larvae have a series of ventral pigment spots on the tail that coalesce during development into one or two spots. Unusual pigment possessed by *T. mexicanus* larvae is a continuous ventral line of pigment spots under the intestine; larvae also develop a conspicuous dorsal pigment spot on the caudal peduncle behind the adipose fin.

Larvae of *T. mexicanus* were obtained on all but one cruise between 1955 and 1960, but much more abundantly during the spring and summer cruises, with July usually the month of peak abundance. Distribution charts for *T. mexicanus* larvae are included for 61 cruises (see Table 3 for pagination); in addition larvae were taken at one to four stations on seven cruises (Table 4). This species is mainly distributed in the California Current region surveyed on CalCOFI cruises.
Larvae of *Stenobrachius leucopsarus* (Figure 3; Distribution Charts 125-174)

Larvae of three sizes, 5.3 mm, 7.8 mm, and 12.5 mm, are illustrated in Ahlstrom (1965) as *Lampamyctus leucopsarus*. Small larvae have a large number of ventral pigment spots on the tail portion of the body (usually 19 to 21) which coalesce into one to three larger pigment spots in middle stage larvae.

This is one of the two most abundant kinds of myctophid larvae in the California Current region. We sample the southern portion of its distribution on our CalCOFI cruises. It was taken most commonly from January to June and least frequently from August to October. The pagination of distribution charts for larvae of *S. leucopsarus* is given in Table 3. Distribution charts are included for 50 cruises. Some larvae (one to four collections per cruise) were taken on eight additional cruises (Table 4). No larvae were obtained on 11 cruises.
Larvae of *Leuroglossus stilbius* (Figure 4; Distribution Charts 175-222)

Two sizes of larvae, 5.4 mm and 15.7 mm and one late metamorphic specimen, 28.5 mm are illustrated in Ahlstrom (1965). Eggs are illustrated and described in Ahlstrom (1971b). During the middle period of embryonic development in the egg, the multiple oil globules coalesce into two, situated at opposite pole positions with respect to the developing embryo, which occupies the equatorial plane. During the late period of embryonic development the oil globules move toward the embryo and finally coalesce under the embryo soon before hatching. Eggs of *L. stilbius* are among the most common in CalCOFI collections during winter and spring months.

Larvae were taken in largest numbers between January and May. The pagination for distribution charts for larvae of *L. stilbius* is given in Table 3. Distribution charts are included for 48 cruises. Some larvae (one to four collections per cruise) were taken on eight additional cruises (Table 4). No larvae were taken on 13 cruises.
Larvae of *Bathylagus wesethi* (Figure 5; Distribution Charts 223-268)

Three sizes of larvae of this bathylagid smelt are illustrated in Ahlstrom (1965). Bathylagid larvae characteristically have wide finfolds and the dorsal fin forms at the outer margin of the finfold. Larvae of *B. wesethi* lack stalked eyes. Eggs of this species were described and illustrated in Ahlstrom (1971b). The multiple oil globules in these eggs perform complex movements in a sequential manner during embryonic development.

The majority of larvae of *B. wesethi* were taken from April to July; usually few larvae were taken from September to March, although larvae were collected during all months of the year. The pagination of distribution charts for larvae of *B. wesethi* is given in Table 3. Distribution charts are included for 46 cruises. On 17 additional cruises one to four collections of *B. wesethi* larvae were obtained (Table 4). On only six cruises were larvae completely lacking.
Larvae of *Batbylagus ochotensis* (Figure 6; Distribution Charts 269-306)

Larvae of this bathylagid smelt have not been described in print, although they have been known and identified from CalCOFI collections since 1949. The southern portion of the distribution of larvae of this widely distributed subarctic transition species was sampled on CalCOFI cruises. As can be seen from the monthly distribution charts the larvae were taken mostly during winter and spring cruises.

Larvae of this species have their eyes on short stalks, a larval character shared with several other bathylagid smelts.

The pagination of distribution charts for larvae of *B. ochotensis* is given in Table 3. Distribution charts are included for 38 cruises, all falling between January and July. On 13 additional cruises, samples were obtained from one of four stations (Table 4). On 18 cruises no specimens of *B. ochotensis* were obtained.
REFERENCES CITED


Vinciguerria lucetia

Triphoturus mexicanus

Stenobrachius leucopsarus

Leuroglossus stilbius

Bathylagus wesethi

Bathylagus ochotensis
CALCOFI
BASIC STATION PLAN
SINCE 1950
Vinciguerria lucetia larvae

CALCOFI CRUISE 5601
5 - 18 JANUARY 1956

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: • NIGHT • SUNRISE
○ DAY • SUNSET

PUNTA EUGENIA
Vinciguerria lucetia larvae

CALCOFI CRUISE 5701
3 - 19 JANUARY 1957

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS • NIGHT ○ SUNRISE
○ DAY • SUNSET

Vinciguerria lucetia larvae
Vinciguerra lucetia larvae

CALCOFI CRUISE 5801
8 JANUARY - 2 FEBRUARY 1958

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS • NIGHT • SUNRISE
○ DAY • SUNSET

10
100
1,000

Vinciguerra lucetia larvae
Vinciguerra lucetia larvae

CALCOFI CRUISE 5901
7 - 29 JANUARY 1959

ESTIMATED RELATIVE ABUNDANCE UNDER 10m² OF SEA SURFACE

STATIONS: ● NIGHT ○ SUNRISE
○ DAY ● SUNSET

1,000
100
10
Vinciguerra lucetia larvae

CALCOFI CRUISE 6001
8 JANUARY - 13 FEBRUARY 1960

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS • NIGHT • SUNRISE
○ DAY • SUNSET

SAN FRANCISCO

POINT CONCEPTION

SAN DIEGO

PUNTA EUGENIA

Vinciguerra lucetia larvae
Vinciguerria lucetia larvae

CALCOFI CRUISE 5502
9-23 FEBRUARY 1955

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS:
- NIGHT
- SUNRISE
- DAY
- SUNSET

PUNTA EUGENIA

SAN DIEGO

POINT CONCEPTION

SAN FRANCISCO

CAPE MENDOCINO

Vinciguerria lucetia larvae
Estimated relative abundance under 10 m² of sea surface

Vinciguerria lucetia larvae

CALCOFI CRUISE 5602
3 - 21 FEBRUARY 1956

Stations
- Night
- Sunrise
- Day
- Sunset

SAN FRANCISCO
POINT CONCEPTION
SAN DIEGO
PUNTA EUGENIA
Vinciguerria lucetia larvae

CALCOFI CRUISE 5702
6 - 26 FEBRUARY 1957

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS:  ● NIGHT  ● SUNRISE
           ○ DAY  ○ SUNSET

Vinciguerria lucetia larvae
Vinciguerria lucetia larvae

CALCOFI CRUISE 5802
7 - 24 FEBRUARY 1958

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: • NIGHT ○ SUNRISE
○ DAY ○ SUNSET

Vinciguerria lucetia larvae
Vinciguerria lucetia larvae

CALCOFI CRUISE 5902
6 - 28 FEBRUARY 1959

ESTIMATED RELATIVE ABUNDANCE UNDER
10 m² OF SEA SURFACE

STATIONS

• NIGHT
○ DAY
• SUNRISE
• SUNSET

Vinciguerria lucetia larvae
CALCOFI CRUISE 6002
11 FEBRUARY – 3 MARCH 1960

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS
• NIGHT
• SUNRISE
• DAY
• SUNSET

Vinciguerria lucetia larvae

6002
**Vinciguerria lucetia** larvae

**CALCOFI CRUISE 5703**

6 - 30 MARCH 1957

**ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE**

STATIONS: ● NIGHT ○ SUNRISE ○ DAY ● SUNSET

![Map of Vinciguerria lucetia larvae distribution](image_url)
Vinciguerria lucetia larvae

CALCOFI CRUISE 5803
27 FEBRUARY - 21 MARCH 1958

ESTIMATED RELATIVE ABUNDANCE UNDER
10 m² OF SEA SURFACE

STATIONS: ● NIGHT ○ SUNRISE
○ DAY ● SUNSET

10
100
1,000
Vinciguerria lucetia larvae

CALCOFI CRUISE 5903
11 - 28 MARCH 1959

ESTIMATED RELATIVE ABUNDANCE UNDER
10m² OF SEA SURFACE

STATIONS
● NIGHT
● SUNRISE
○ DAY
● SUNSET

SAN FRANCISCO
CAPE MENDOCINO
POINT CONCEPTION
SAN DIEGO
PUNTA EUGENIA

Vinciguerria lucetia larvae

5903
Vinciguerria lucetia larvae

CALCOFI CRUISE 6003
10 - 29 MARCH 1960

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS
- NIGHT
- SUNRISE
- DAY
- SUNSET

Vinciguerria lucetia larvae
Vinciguerria lucetia larvae

CALCOFI CRUISE 5504
5-22 APRIL 1955

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m2 OF SEA SURFACE

STATIONS: • NIGHT ● SUNRISE ○ DAY ● SUNSET

1

10

100

1,000
Vinciguerria lucetia larvae

CALCOFI CRUISE 5604
5 - 27 APRIL 1956

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS:
- NIGHT
- SUNRISE
- DAY
- SUNSET

SAN FRANCISCO
CAPE MENDOCINO
POINT CONCEPTION
SAN DIEGO
PUNTA EUGENIA
Vinciguerria lucetia larvae

CALCOFI CRUISE 5804
30 MARCH - 27 APRIL 1958

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS
● NIGHT
○ SUNRISE
○ DAY
○ SUNSET

SAN FRANCISCO

POINT CONCEPTION

SAN DIEGO

PUNTA EUGENIA

Vinciguerria lucetia larvae

5804
Vinciguerria lucetia larvae

CALCOFI CRUISE 6004
29 MARCH - 30 APRIL 1960

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: ● NIGHT ○ SUNRISE ○ DAY ● SUNSET

1,000
100
10

PUNTA EUGENIA
SANTA CRUZ ISLAND
POINT CONCEPTION
SAN PEDRO
SAN DIEGO
SAN FRANCISCO
CAPE MENDOCINO
Vinciguerria lucetia larvae

CALCOFI CRUISE 5605
4 - 22 MAY 1956

ESTIMATED RELATIVE ABUNDANCE UNDER 10m² OF SEA SURFACE

STATIONS: • NIGHT • SUNRISE
           ○ DAY • SUNSET

1
10
100
1,000

Vinciguerria lucetia larvae
Vinciguerria lucetia larvae

CALCOFI CRUISE 5705
9 - 23 MAY 1957

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS:
- NIGHT
- SUNRISE
- DAY
- SUNSET

Vinciguerria lucetia larvae 5705
Vinciguerria lucetia larvae

CALCOFI CRUISE 5805
3-22 MAY 1958

ESTIMATED RELATIVE ABUNDANCE UNDER
10 m² OF SEA SURFACE

STATIONS: NIGHT • SUNRISE
O DAY • SUNSET

Notes:
- Cape Mendocino
- San Francisco
- Point Conception
- San Diego
- Punta Eugenia

Vinciguerria lucetia larvae
5805
Vinciguerria lucetia larvae

CALCOFI CRUISE 6005
13 - 29 MAY 1960

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: • NIGHT • SUNRISE
○ DAY • SUNSET

1000
100
10

Vinciguerria lucetia larvae

6005
Vinciguerria lucetia larvae

CALCOFI CRUISE 5506
11-28 JUNE 1955

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: • NIGHT  • SUNRISE
          ○ DAY   • SUNSET

Vinciguerria lucetia larvae
Vinciguerria lucetia larvae

CALCOFI CRUISE 5706
5 - 23 JUNE 1957

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS • NIGHT • SUNRISE
○ DAY • SUNSET

Vinciguerria lucetia larvae
Vinciguerria lucetia larvae

CALCOFI CRUISE 5806
4-26 JUNE 1958

ESTIMATED RELATIVE ABUNDANCE UNDER 10m² OF SEA SURFACE

STATIONS: Night • Sunrise
          Day • Sunset

1
10
100
1,000

Vinciguerria lucetia larvae
Vinciguerria lucetia larvae

CALCOFI CRUISE 5906
3 - 30 JUNE 1959

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: ● NIGHT ○ SUNRISE
○ DAY ● SUNSET

Vinciguerria lucetia larvae
Vinciguerria lucetia larvae

CALCOFI CRUISE 6006
14 - 30 JUNE 1960

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: • NIGHT • SUNRISE
○ DAY • SUNSET

Vinciguerria lucetia larvae
Vinciguerria lucetia larvae

CALCOFI CRUISE 5607
6 - 25 JULY 1956

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: • NIGHT ○ SUNRISE
○ DAY ● SUNSET

Vinciguerria lucetia larvae
CALCOFI CRUISE 5707
8 JULY - 3 AUGUST 1957

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: • NIGHT - • SUNRISE
          ○ DAY - ○ SUNSET

Vinciguerria lucetia larvae
Vinciguerria lucetia larvae

CALCOFI CRUISE 5807
30 JUNE - 22 JULY 1958

ESTIMATED RELATIVE ABUNDANCE UNDER 10m^2 OF SEA SURFACE

STATIONS: • NIGHT  • SUNRISE
          • DAY    • SUNSET

Vinciguerria lucetia larvae
Vinciguerria lucetia larvae

CALCOFI CRUISE 5907
9 JULY - 3 AUGUST 1959

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: ● NIGHT ○ SUNRISE
           ○ DAY ● SUNSET

PAINTS: 10 100 1,000 10,000
Estimated relative abundance under 10 m² of sea surface

Stations: • Night  • Sunrise
  ○ Day    • Sunset

Vinciguerria lucetia larvae

Calfcofi Cruise 5608
7 - 19 August 1956

San Francisco
Point Conception
San Diego
Punta Eugenia
Cape Mendocino
**Vinciguerria lucetia larvae**

**CALCOFI CRUISE 5808**

6-21 AUGUST 1958

Estimated relative abundance under 10 m² of sea surface

Stations: • Night  ○ Sunrise  ○ Day  ○ Sunset

- Cape Mendocino
- San Francisco
- Point Conception
- San Diego
- Punta Eugenia
Vinciguerra lucetia larvae

CALCOFI CRUISE 5908
13 - 31 AUGUST 1959

ESTIMATED RELATIVE ABUNDANCE UNDER 10m² OF SEA SURFACE

STATIONS: • NIGHT ○ SUNRISE
○ DAY ● SUNSET

Vinciguerra lucetia larvae

5908
Estimated relative abundance under 10 m² of sea surface.

Stations:
- Night
- Sunrise
- Day
- Sunset

Vinciguerria lucetia larvae

CALCOFI CRUISE 5609
5 - 17 SEPTEMBER 1956
**Vinciguerria lucetia** larvae

CALCOFI CRUISE 5809
4-19 SEPTEMBER 1958

ESTIMATED RELATIVE ABUNDANCE UNDER 10m² OF SEA SURFACE

STATIONS: ● NIGHT ○ SUNRISE
○ DAY ● SUNSET

---

**Vinciguerria lucetia** larvae

5809
Vinciguerria lucetia larvae

CALCOFI CRUISE 5510
16 – 30 OCTOBER 1955

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: ● NIGHT ○ SUNRISE
○ DAY ● SUNSET

Vinciguerria lucetia larvae
Vinciguerria lucetia larvae

CALCOFI CRUISE 5710
4 OCTOBER - 8 NOVEMBER 1957

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: • NIGHT  • SUNRISE
          • DAY    • SUNSET

Vinciguerria lucetia larvae
Vinciguerra lucetia larvae

CALCOFI CRUISE 5810
8 OCTOBER - 6 NOVEMBER 1958

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: • NIGHT • SUNRISE
          ○ DAY • SUNSET

1 10
100
1,000
Vinciguerria lucetia larvae

CALCOFI CRUISE 5910
8 - 30 OCTOBER 1959

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: ● NIGHT ○ SUNRISE
□ DAY ○ SUNSET

- Viciguerria lucetia larvae

5910
Vinciguerria lucetia larvae

CALCOFI CRUISE 6010
22 SEPTEMBER - 22 OCTOBER 1960
ESTIMATED RELATIVE ABUNDANCE UNDER 10 m OF SEA SURFACE

STATIONS: • NIGHT • SUNRISE • DAY • SUNSET

PUNTA EUGENIA

Vinciguerria lucetia larvae

6010
**Vinciguerria lucetia** larvae

**CALCOFI CRUISE 5911**

16 - 25 November 1959

Estimated relative abundance under 10 m² of sea surface

- Stations: ● NIGHT ● SUNRISE ○ DAY ○ SUNSET

---

**Vinciguerria lucetia** larvae
**Vinciguerria lucetia** larvae

**CALCOFI CRUISE 5812**

1 - 11 DECEMBER 1958

ESTIMATED RELATIVE ABUNDANCE UNDER 10m² OF SEA SURFACE

STATIONS: ● NIGHT ○ SUNRISE ○ DAY ○ SUNSET

\[
\begin{array}{ccc}
\text{SAN FRANCISCO} & & \\
\text{POINT CONCEPTION} & & \\
\text{SAN DIEGO} & & \\
\text{PUNTA EUGENIA} & & \\
\end{array}
\]
Vinciguerria lucetia larvae

CALCOFI CRUISE 5912
9 - 19 DECEMBER 1959

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: ● NIGHT ○ SUNRISE
            ○ DAY ● SUNSET

Vinciguerria lucetia larvae
Triphoturus mexicanus larvae

CALCOFI CRUISE 5501
13-29 JANUARY 1955

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS:
• NIGHT  ○ SUNRISE
○ DAY   • SUNSET

Triphoturus mexicanus larvae
Triphoturus mexicanus larvae

CALCOFI CRUISE 5601
5 - 18 JANUARY 1956

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: ● NIGHT ○ SUNRISE
○ DAY ● SUNSET

Triphoturus mexicanus larvae

5601
Triphoturus mexicanus larvae

CALCOFI CRUISE 5801
8 JANUARY – 2 FEBRUARY 1958

ESTIMATED RELATIVE ABUNDANCE UNDER 10m² OF SEA SURFACE

STATIONS: • NIGHT • SUNRISE
          o DAY • SUNSET

Triphoturus mexicanus larvae
Triphoturus mexicanus larvae

CALCOFI CRUISE 5901
7 - 29 JANUARY 1959

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: ● NIGHT ○ SUNRISE ○ DAY ● SUNSET

Triphoturus mexicanus larvae
Triphoturus mexicanus larvae

CALCOFI CRUISE 6001
8 JANUARY - 13 FEBRUARY 1960

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: NIGHT — SUNRISE
          DAY — SUNSET

PUNTA EUGENIA

Triphoturus mexicanus larvae
Triphoturus mexicanus larvae

CALCOFI CRUISE 5502
9-23 FEBRUARY 1955

ESTIMATED RELATIVE ABUNDANCE UNDER
10 m² OF SEA SURFACE

STATIONS
• NIGHT
• SUNRISE
• DAY
• SUNSET

PUNTA EUGENIA

SAN DIEGO

POINT CONCEPTION

SAN FRANCISCO

CAPE MENDOCINO

Triphoturus mexicanus larvae
Triphoturus mexicanus larvae

CALCOFI CRUISE 5702
6 - 26 FEBRUARY 1957

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: NIGHT SUNRISE
DAY SUNSET

Triphoturus mexicanus larvae

5702
Triphoturus mexicanus larvae

CALCOFI CRUISE 5802
7 - 24 FEBRUARY 1958

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: NIGHT • SUNRISE
           • DAY • SUNSET

SAN FRANCISCO

POINT CONCEPTION

SAN DIEGO

PUNTA EUGENIA

Triphoturus mexicanus larvae

5802
Triphoturus mexicanus larvae

CALCOFI CRUISE 5902
6 - 28 FEBRUARY 1959

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: • NIGHT • SUNRISE
○ DAY • SUNSET

PUNTA EUGENIA
SAN DIEGO
POINTE CONCEPTION
SAN FRANCISCO
CAPE MENDOCINO
Triphoturus mexicanus larvae

CALCOFI CRUISE 5503
8-22 MARCH 1955

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: • NIGHT • SUNRISE
○ DAY • SUNSET

Triphoturus mexicanus larvae

5503
Triphoturus mexicanus larvae

CALCOFI CRUISE 5603
4 - 19 MARCH 1956

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: • NIGHT • SUNRISE
○ DAY • SUNSET

Triphoturus mexicanus larvae
Triphoturus mexicanus larvae

CALCOFI CRUISE 5703
6 - 30 MARCH 1957

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: ○ NIGHT  ● SUNRISE
          ○ DAY      ● SUNSET

Triphoturus mexicanus larvae

5703
ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: ● NIGHT ○ SUNRISE ○ DAY ● SUNSET

10 100 1,000

Triphoturus mexicanus larvae

CALCOFI CRUISE 5903
11-28 MARCH 1959
Triphoturus mexicanus larvae

CALCOFI CRUISE 5504
5-22 APRIL 1955

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS:
- NIGHT
- SUNRISE
- DAY
- SUNSET

Triphoturus mexicanus larvae

5504
Triphoturus mexicanus larvae

CALCOFI CRUISE 5604
5 - 27 APRIL 1956

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: ● NIGHT ○ SUNRISE ○ DAY ● SUNSET

10
100

Triphoturus mexicanus larvae

5604
Triphoturus mexicanus larvae

CALCOFI CRUISE 5704
5 - 30 APRIL 1957

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: ○ NIGHT ○ SUNRISE
          ● DAY ● SUNSET

10
100
1,000

SAN FRANCISCO
CAPE MENDOCINO
POINT CONCEPTION
SAN DIEGO
PUNTA EUGENIA

Triphoturus mexicanus larvae
Triphoturus mexicanus larvae

CALCOFI CRUISE 5904
7-26 APRIL 1959

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: ● NIGHT ○ SUNRISE ○ DAY ● SUNSET

1
10
100
1,000

Triphoturus mexicanus larvae
5904
Triphoturus mexicanus larvae

CALCOFI CRUISE 6004
29 MARCH - 30 APRIL 1960

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: ♦ NIGHT  ♦ SUNRISE
          ♣ DAY    ♣ SUNSET

Triphoturus mexicanus larvae
Triphoturus mexicanus larvae

CALCOFI CRUISE 5505
12 MAY-7 JUNE 1955

ESTIMATED RELATIVE ABUNDANCE UNDER 10m² OF SEA SURFACE

STATIONS: ● NIGHT ○ SUNRISE ○ DAY ● SUNSET

SAN FRANCISCO

POINT CONCEPTION

SAN DIEGO

PUNTA EUGENIA
Triphoturus mexicanus larvae

CALCOFI CRUISE 5605
4 - 22 MAY 1956

ESTIMATED RELATIVE ABUNDANCE UNDER 10m² OF SEA SURFACE

STATIONS: • NIGHT • SUNRISE
○ DAY • SUNSET

Triphoturus mexicanus larvae 5605
Tripoturus mexicanus larvae

CALCOFI CRUISE 5805
3 - 22 MAY 1958

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS:
- NIGHT
- SUNRISE
- DAY
- SUNSET

Punta Eugenia

Tripoturus mexicanus larvae 5805
Triphoturus mexicanus larvae

CALCOFI CRUISE 5905
6-27 MAY 1959

ESTIMATED RELATIVE ABUNDANCE UNDER 10m² OF SEA SURFACE

STATIONS
- NIGHT
- SUNRISE
- DAY
- SUNSET

Triphoturus mexicanus larvae

5905
Triphoturus mexicanus larvae

CALCOFI CRUISE 5506
11-28 JUNE 1955

ESTIMATED RELATIVE ABUNDANCE UNDER 10m² OF SEA SURFACE

STATIONS: NIGHT ● SUNRISE ● SUNSET

1
10
100
1,000

Punta Eugenia
Point Conception
San Francisco
San Diego
Cape Mendocino
Triphoturus mexicanus larvae

CALCOFI CRUISE 5606
26 MAY - 25 JUNE 1956

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: ● NIGHT ● SUNRISE
● DAY ● SUNSET

10
100
1,000

Triphoturus mexicanus larvae

5606
Triphoturus mexicanus larvae

CALCOFI CRUISE 5706
5 - 23 JUNE 1957

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: • NIGHT ○ SUNRISE ○ DAY ○ SUNSET

Triphoturus mexicanus larvae
Triphoturus mexicanus larvae

CALCOFI CRUISE 5806
4-26 JUNE 1958

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: ● NIGHT ○ SUNRISE
○ DAY ○ SUNSET

San Francisco
Cape Mendocino
Point Conception
San Diego
Punta Eugenia

Triphoturus mexicanus larvae
Triphoturus mexicanus larvae

CALCOFI CRUISE 6006
14 - 30 JUNE 1960

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: • NIGHT  • SUNRISE
○ DAY  ○ SUNSET

SAN FRANCISCO

POINT CONCEPTION

SAN DIEGO

PUNTA EUGENIA

MENDOCINO

CAPE MENDOCINO

Three rows of stations with relative abundance values of 10, 100, and 1,000.
Triphoturus mexicanus larvae

CALCOFI CRUISE 5507
8 - 23 JULY 1955

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: • NIGHT  • SUNRISE
            ○ DAY    • SUNSET

1
10
100
1,000

20°  25°  30°  35°  40°
110° 115° 120° 125°
Triphoturus mexicanus larvae

CALCOFI CRUISE 5607
6 - 25 JULY 1956

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: ● NIGHT ○ SUNRISE
○ DAY ● SUNSET

Triphoturus mexicanus larvae
Triphoturus mexicanus larvae

CALCOFI CRUISE 5707
8 JULY - 3 AUGUST 1957

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: • NIGHT  ● SUNRISE
            ○ DAY  ● SUNSET

Triphoturus mexicanus larvae
Triphoturus mexicanus larvae

CALCOFI CRUISE 5807
30 JUNE - 22 JULY 1958

ESTIMATED RELATIVE ABUNDANCE UNDER 10m² OF SEA SURFACE

STATIONS
○ NIGHT  ● SUNRISE
○ DAY  ● SUNSET

Triphoturus mexicanus larvae
Triphoturus mexicanus larvae

CALCOFI CRUISE 5907
9 JULY - 3 AUGUST 1959

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: ● NIGHT ○ SUNRISE ○ DAY ● SUNSET

Triphoturus mexicanus larvae
Triphoturus mexicanus larvae

CALCOFI CRUISE 5708
9 - 27 AUGUST 1957

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: ● NIGHT ○ SUNRISE
○ DAY ○ SUNSET

Triphoturus mexicanus larvae

5708
Triphoturus mexicanus larvae

CALCOFI CRUISE 5808
6-21 AUGUST 1958

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: • NIGHT  • SUNRISE
               ○ DAY  • SUNSET

Triphoturus mexicanus larvae
Triphoturus mexicanus larvae

CALCOFI CRUISE 5908
13 - 31 AUGUST 1959

ESTIMATED RELATIVE ABUNDANCE UNDER 10m² OF SEA SURFACE

STATIONS: ● NIGHT ○ SUNRISE ○ DAY ○ SUNSET

Triphoturus mexicanus larvae
Triphoturus mexicanus larvae

CALCOFI CRUISE 6008
10 - 22 AUGUST 1960

ESTIMATED RELATIVE ABUNDANCE UNDER 10m² OF SEA SURFACE

STATIONS: • NIGHT  • SUNRISE
           ○ DAY  • SUNSET

10
100
1,000

Triphoturus mexicanus larvae
6008
Triphoturus mexicanus larvae

CALCOFI CRUISE 5609
5 - 17 SEPTEMBER 1956

ESTIMATED RELATIVE ABUNDANCE UNDER 10m² OF SEA SURFACE

STATIONS: • NIGHT    • SUNRISE
           ○ DAY      • SUNSET

Triphoturus mexicanus larvae
Triphoturus mexicanus larvae

CALCOFI CRUISE 5809
4-19 SEPTEMBER 1958

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: ● NIGHT ○ SUNRISE
○ DAY ◆ SUNSET
**Triphoturus mexicanus larvae**

CALCOFI CRUISE 5909
9 SEPTEMBER - 1 OCTOBER 1959

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: • NIGHT ○ SUNRISE ○ DAY ○ SUNSET

SAN FRANCISCO

CAPE MENDOCINO

POINT CONCEPTION

SAN DIEGO

PUNTA EUGENIA
Triphoturus mexicanus larvae

CALCOFI CRUISE 6009
9 - 21 SEPTEMBER 1960

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: ● NIGHT ○ SUNRISE
○ DAY ● SUNSET

Triphoturus mexicanus larvae
**Triphoturus mexicanus larvae**

CALCOFI CRUISE 5610
27 SEPTEMBER - 5 OCTOBER 1956

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: ● NIGHT ○ SUNRISE ○ DAY ○ SUNSET

**Triphoturus mexicanus** larvae
Triphoturus mexicanus larvae

CALCOFI CRUISE 5810
8 OCTOBER - 6 NOVEMBER 1958

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: • NIGHT  o SUNRISE
           o DAY  o SUNSET

Triphoturus mexicanus larvae
Triphoturus mexicanus larvae

CALCOFI CRUISE 5910
8 - 30 OCTOBER 1959

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: • NIGHT • SUNRISE
           ○ DAY  • SUNSET

San Francisco

Point Conception

San Diego

Punta Eugenia

Triphoturus mexicanus larvae

5910
Triphoturus mexicanus larvae

CALCOFI CRUISE 6010
22 SEPTEMBER - 22 OCTOBER 1960

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m OF SURFACE

STATIONS

NIGHT

DAY

SUNRISE

SUNSET

PUNTA EUGENIO
Triphoturus mexicanus larvae

CALCOFI CRUISE 5711
16-25 NOVEMBER 1957

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: • NIGHT  ● SUNRISE
○ DAY  ● SUNSET

Triphoturus mexicanus larvae
CALCOFI CRUISE 5501
13-29 JANUARY 1955

ESTIMATED RELATIVE ABUNDANCE UNDER 10m² OF SEA SURFACE

STATIONS: • NIGHT ○ SUNRISE
○ DAY ● SUNSET

1
10
100
1,000

Stenobrachius leucopsarus larvae

San Francisco
Point Conception
San Diego
Punta Eugenia
Stenobrachius leucopsarum larvae

CALCOFI CRUISE 5601
5 - 18 JANUARY 1956

ESTIMATED RELATIVE ABUNDANCE UNDER 10m² OF SEA SURFACE

STATIONS: • NIGHT  ○ SUNRISE
○ DAY  • SUNSET

Point Conception
San Francisco
San Diego
Cape Mendocino
Punta Eugenia
Stenobrachius leucopsarum larvae

CALCOFI CRUISE 5801
8 JANUARY - 2 FEBRUARY 1958

Estimated relative abundance under 10 m² of sea surface

Stations
Night
Sunrise
Day
Sunset

San Francisco
Cape Mendocino
Point Conception
San Diego
Punta Eugenia

Stenobrachius leucopsarum larvae
Stenobrachius leucopsarus larvae

CALCOFI CRUISE 5901
7 - 29 JANUARY 1959

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: • NIGHT ◦ SUNRISE
○ DAY ◗ SUNSET

10
100
1,000

SAN DIEGO
PUNTA EUGENIA
Stenobrachius leucopsarus larvae

CALCOFI CRUISE 6001
8 JANUARY - 13 FEBRUARY 1960

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: • NIGHT  • SUNRISE
○ DAY  • SUNSET

Sfenobrachius leucopsorus larvae

PUNTA EUGENIA

SANTO DOMINGO
CALCOFI CRUISE 5502
9-23 FEBRUARY 1955

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS:
- NIGHT
- SUNRISE
- DAY
- SUNSET

Stenobrachius leucopsarum larvae

5502
Estimates of relative abundance under 10 m² of sea surface

Stations:
- Night
- Sunrise
- Day
- Sunset

Stenobrachius leucopsarus larvae

CALCOFI CRUISE 5602
3 - 21 FEBRUARY 1956
Stenobrachius leucopsarus larvae

CALCOFI CRUISE 5702
6 - 26 FEBRUARY 1957

ESTIMATED RELATIVE ABUNDANCE UNDER 10m² OF SEA SURFACE

STATIONS: • NIGHT  ○ SUNRISE  ○ SUNSET

SAN DIEGO
PUNTA EUGENIA

20° 25° 30° 35° 40° 110° 115° 120° 125°
Stenobrachius leucopsarus larvae

CALCOFI CRUISE 5802
7 - 24 FEBRUARY 1958

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: ● NIGHT ○ SUNRISE ○ DAY ● SUNSET

100
1,000

San Francisco
Cape Mendocino
Point Conception
San Diego
Punta Eugenia

Stenobrachius leucopsarus larvae 5802
Stenobrachius leucopsarus larvae

CALCOFI CRUISE 5902
6 - 28 FEBRUARY 1959

ESTIMATED RELATIVE ABUNDANCE UNDER
10 m² OF SEA SURFACE

STATIONS: ● NIGHT ○ SUNRISE
○ DAY ● SUNSET

SAN FRANCISCO
CAPE MENDOCINO
POINT CONCEPTION
SAN DIEGO
PUNTA EUGENIA
Stenobrachius leucopsarum larvae

CALCOFI CRUISE 5603
4 - 19 MARCH 1956

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: ● NIGHT ● SUNRISE
○ DAY ● SUNSET

1,000
100
10

San Francisco
Cape Mendocino
Point Conception
San Diego
Punta Eugenia
CALCOFI CRUISE 5703
6 - 30 MARCH 1957

ESTIMATED RELATIVE ABUNDANCE UNDER 10m² OF SEA SURFACE

STATIONS: ● NIGHT ○ SUNRISE
■ DAY ● SUNSET

Stenobrachius leucopsarum larvae

5703
Stenobrachius leucopsarum larvae

CALCOFI CRUISE 5803
27 FEBRUARY - 21 MARCH 1958

ESTIMATED RELATIVE ABUNDANCE UNDER 10m² OF SEA SURFACE

STATIONS: ● NIGHT ○ SUNRISE ○ DAY ● SUNSET

1
10
100
1,000
Stenobrachius leucopsarum larvae

CALCOFI CRUISE 5903
11 - 28 MARCH 1959

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS
- NIGHT
- SUNRISE
- DAY
- SUNSET
Stenobrachius leucopsarus larvae

CALCOFI CRUISE 6003
10 - 29 MARCH 1960

ESTIMATED RELATIVE ABUNDANCE UNDER 10m² OF SEA SURFACE

STATIONS: • NIGHT • SUNRISE
○ DAY • SUNSET

Sfenobrachiius leucopsarus larva e 6003
Stenobrachius leucopsarvus larvae

CALCOFI CRUISE 5504
5-22 APRIL 1955

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: ● NIGHT ○ SUNRISE
○ DAY ● SUNSET

Point Conception
San Francisco
Cape Mendocino
San Diego
Punta Eugenia
Stenobrachius leucopsarus larvae

CALCOFI CRUISE 5604
5 - 27 APRIL 1956

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: ● NIGHT ○ SUNRISE
○ DAY ● SUNSET

10
100
1,000

Stenobrachius leucopsarus larvae

5604
Stenobrachius leucopsarus larvae

CALCOFI CRUISE 5704
5 - 30 APRIL 1957

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: • NIGHT • SUNRISE
○ DAY • SUNSET

Sfenobrachius leucopsarus larvae

5704
Stenobrachius leucopsarus larvae

CALCOFI CRUISE 5904
7-26 APRIL 1959

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS:
- NIGHT
- SUNRISE
- DAY
- SUNSET

SAN FRANCISCO

POINT CONCEPTION

SAN DIEGO

PUNTA EUGENIA
Stenobrachius leucopsar us larvae

CALCOFI CRUISE 6004
29 MARCH - 30 APRIL 1960

ESTIMATED RELATIVE ABUNDANCE UNDER 10m² OF SEA SURFACE

STATIONS: ● NIGHT ○ SUNRISE
○ DAY ● SUNSET

10 100 1,000

Sfenobrochius leucopsorus larvae

6004
Stenobrachius leucopsarus larvae

CALCOFI CRUISE 5505
12 MAY-7 JUNE 1955

ESTIMATED RELATIVE ABUNDANCE UNDER
10 m² OF SEA SURFACE

STATIONS: • NIGHT ○ SUNRISE
○ DAY • SUNSET

San Francisco
Cape Mendocino
Point Conception
San Diego
Punta Eugenia
Stenobrachius leucopsarus larvae

CALCOFI CRUISE 5605
4 - 22 MAY 1956

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: NIGHT ● SUNRISE ○ DAY ● SUNSET

40° N
35° N
30° N
25° N
20° N
15° N
10° N
5° N
120° W
125° W
130° W
135° W
140° W
145° W
150° W
155° W
160° W

CAPE MENDOCINO
SAN FRANCISCO
POINT CONCEPTION
SAN DIEGO
PUNTA EUGENIA
Stenobrachius leucopsarus larvae

CALCOFI CRUISE 5705
9 - 23 MAY 1957

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: • NIGHT  ○ SUNRISE
           ○ DAY  ● SUNSET

Sfenobrochius leucopsorus arvae 5705
Stenobrachius leucopsarus larvae

CALCOFI CRUISE 5805
3 - 22 MAY 1958

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: • NIGHT • SUNRISE
○ DAY • SUNSET

1
10
100
1,000

Stenobrachius leucopsarus larvae

5805
Stenobrachius leucopsarus larvae

CALCOFI CRUISE 5905
6-27 MAY 1959

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS • NIGHT • SUNRISE
○ DAY • SUNSET

10
100
Stenobrachius leucopsarusb larvae

CALCOFI CRUISE 6005
13 - 29 MAY 1960

ESTIMATED RELATIVE ABUNDANCE UNDER 10m² OF SEA SURFACE

STATIONS
- NIGHT
- SUNRISE
- DAY
- SUNSET

San Francisco

Cape Mendocino

Point Conception

San Diego

Punta Eugenia
CALCOFI CRUISE 5506
11-28 JUNE 1955

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: ● NIGHT ● SUNRISE
○ DAY ● SUNSET

Stenobrachius leucopsarus larvae

Stenobrachius leucopsarus larvae
Stenobrachius leucopsarus larvae

CALCOFI CRUISE 5706
5 - 23 JUNE 1957

ESTIMATED RELATIVE ABUNDANCE UNDER 10m² OF SEA SURFACE

STATIONS: ● NIGHT ○ SUNRISE
O DAY ● SUNSET

1
10
100
1,000
Stenobrachius leucopsarus larvae

CALCOFI CRUISE 5906
3 - 30 JUNE 1959

ESTIMATED RELATIVE ABUNDANCE UNDER 10m² OF SEA SURFACE

STATIONS: • NIGHT  ○ SUNRISE
○ DAY  • SUNSET

SAN FRANCISCO
CAPE MENDOCINO
POINT CONCEPTION
SAN DIEGO
PUNTA EUGENIA
Stenobrachius leucopsarus larvae

CALCOFI CRUISE 6006
14 - 30 JUNE 1960

ESTIMATED RELATIVE ABUNDANCE UNDER 10m² OF SEA SURFACE

STATIONS
- NIGHT
- SUNRISE
- DAY
- SUNSET

SAN FRANCISCO
CAPE MENDOCINO
SAN DIEGO
POINT CONCEPTION
PUNTA EUGENIA
CALCOFI CRUISE 5507
8 - 23 JULY 1955

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: • NIGHT • SUNRISE
○ DAY • SUNSET

Stenobrachius leucopsar usar larvae

Cape Mendocino
San Francisco
Point Conception
San Diego
Punta Eugenia
CALCOFI CRUISE 5607
6 - 25 JULY 1956

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: NIGHT ○ SUNRISE ● DAY ● SUNSET

Stenobrachius leucopsarus larvae
Stenobrachius leucopsarus larvae

CALCOFI CRUISE 5707
8 JULY - 3 AUGUST 1957

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS
- NIGHT
- SUNRISE
- DAY
- SUNSET

Sfenobrachius leucopsarus larvae
Stenobrachius leucopsarurus larvae

CALCOFI CRUISE 5807
30 JUNE – 22 JULY 1958

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: ● NIGHT ○ SUNRISE ○ DAY ● SUNSET

1
10
100
1,000

PUNTA EUGENIA
POINT CONCEPTION
SAN DIEGO
SAN FRANCISCO
CAPE MENDOCINO

Stenobrachius leucopsarurus larvae
Stenobrachius leucopsarbus larvae

CALCOFI CRUISE 6007
12 JULY - 14 AUGUST 1960

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: ● NIGHT ○ SUNRISE ○ DAY ● SUNSET
Stenobrachius leucopsarus larvae

CALCOFI CRUISE 5509
14 - 20 SEPTEMBER 1955

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: • NIGHT  • SUNRISE
○ DAY  • SUNSET

Stenobrachius leucopsarus larvae
5509
Stenobrachius leucopsarus larvae

CALCOFI CRUISE 5910
8 - 30 OCTOBER 1959

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: ● NIGHT ○ SUNRISE ○ DAY ● SUNSET

San Francisco
Cape Mendocino
Point Conception
San Diego
Punta Eugenia
Stenobrachius leucopsarus larvae

CALCOFI CRUISE 5911
16 - 25 NOVEMBER 1959

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS • NIGHT • SUNRISE
○ DAY • SUNSET

SAN DIEGO

PUNTA EUGENIA

CAPE MENDOCINO

SAN FRANCISCO

POINT CONCEPTION
Stenobrachius leucopsarum larva

CALCOFI CRUISE 5512
29 NOVEMBER - 16 DECEMBER 1955

ESTIMATED RELATIVE ABUNDANCE UNDER 10m² OF SEA SURFACE

STATIONS: ● NIGHT ○ SUNRISE
○ DAY ● SUNSET

SAN DIEGO
PUNTA EUGENIA
POINT CONCEPTION
SAN FRANCISCO
CAPE MENDOCINO
Stenobrachius leucopsarus larvae

CALCOFI CRUISE 5612
24 NOVEMBER - 21 DECEMBER 1956

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: • NIGHT • SUNRISE
○ DAY • SUNSET
Stenobrachius leucopsarbus larvae

CALCOFI CRUISE 5912
9 - 19 DECEMBER 1959

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: • NIGHT ◦ SUNRISE
○ DAY ◦ SUNSET

Stenobrachius leucopsarbus larvae
Leuroglossus stilbius larvae

CALCOFI CRUISE 5501
13-29 JANUARY 1955

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: • NIGHT  • SUNRISE
           ○ DAY     • SUNSET

1
10
100
1,000

Leuroglossus stilbius larvae
Leuroglossus stilbius larvae

CALCOFI CRUISE 5601
5 - 18 JANUARY 1956

ESTIMATED RELATIVE ABUNDANCE UNDER
10 m² OF SEA SURFACE

STATIONS: ● NIGHT ○ SUNRISE
○ DAY ● SUNSET

Leuroglossus stilbius larvae
Leuroglossus stilbius larvae

CALCOFI CRUISE 5801
8 JANUARY – 2 FEBRUARY 1958

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS
- NIGHT
- SUNRISE
- DAY
- SUNSET

SAN FRANCISCO

POINT CONCEPTION

SAN DIEGO

PUNTA EUGENIA
Leuroglossus stilbius larvae

CALCOFI CRUISE 5901
7 - 29 JANUARY 1959

ESTIMATED RELATIVE ABUNDANCE UNDER 10m² OF SEA SURFACE

STATIONS: ● NIGHT ○ SUNRISE
○ DAY ● SUNSET

Leuroglossus stilbius larvae

5901
Leuroglossus stilbius larvae

CALCOFI CRUISE 5502
9-23 FEBRUARY 1955

ESTIMATED RELATIVE ABUNDANCE UNDER 10m² OF SEA SURFACE

STATIONS NIGHT • SUNRISE
○ DAY • SUNSET

10
100
1,000
Leuroglossus stilbius larvae

CALCOFI CRUISE 5602
3 - 21 FEBRUARY 1956

ESTIMATED RELATIVE ABUNDANCE UNDER
10 m² OF SEA SURFACE

STATIONS
● NIGHT
○ SUNRISE
○ DAY
● SUNSET

Leuroglossus stilbius larvae 5602
Leuroglossus stilbius larvae

CALCOFI CRUISE 5702

6 - 26 FEBRUARY 1957

ESTIMATED RELATIVE ABUNDANCE UNDER
10 m² OF SEA SURFACE

STATIONS
- NIGHT
- SUNRISE
- DAY
- SUNSET

Leuroglossus stilbius larvae
Leuroglossus stilbius larvae

CALCOFI CRUISE 5802
7 - 24 FEBRUARY 1958

ESTIMATED RELATIVE ABUNDANCE UNDER
10 m² OF SEA SURFACE

STATIONS: ● NIGHT ○ SUNRISE
○ DAY ● SUNSET

Leuroglossus stilbius larvae
Leuroglossus stilbius larvae

CALCOFI CRUISE 5902
6-28 FEBRUARY 1959

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: • NIGHT • SUNRISE
○ DAY • SUNSET

Leuroglossus stilbius larvae

5902
Leuroglossus stilbius larvae

CALCOFI CRUISE 6002
11 FEBRUARY - 3 MARCH 1960

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: ● NIGHT ○ SUNRISE
○ DAY ● SUNSET

10
100
1,000

Point Conception
San Diego
Punta Eugenia
San Francisco
Cape Mendocino
Leuroglossus stilbius larvae

CALCOFI CRUISE 5503
8-22 MARCH 1955

ESTIMATED RELATIVE ABUNDANCE UNDER 10m² OF SEA SURFACE

STATIONS: • NIGHT  ○ SUNRISE
○ DAY  ○ SUNSET

Leuroglossus stilbius larvae
Leuroglossus stilbius larvae

CALCOFI CRUISE 5603
4-19 MARCH 1956

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: • NIGHT ○ SUNRISE
○ DAY • SUNSET

Leuroglossus stilbius larvae
Leuroglossus stilbius larvae

CALCOFI CRUISE 5703
6 - 30 MARCH 1957

ESTIMATED RELATIVE ABUNDANCE UNDER 10m² OF SEA SURFACE

STATIONS: ● NIGHT ● SUNRISE
○ DAY ○ SUNSET

10,000
1,000
100
10

CAPE MENDOCINO
SAN FRANCISCO
POINT CONCEPTION
SAN DIEGO
PUNTA EUGENIA
Leuroglossus stilbius larvae

CALCOFI CRUISE 5803
27 FEBRUARY - 21 MARCH 1958

ESTIMATED RELATIVE ABUNDANCE UNDER 10m² OF SEA SURFACE

STATIONS: ● NIGHT ○ SUNRISE
○ DAY ● SUNSET

Leuroglossus stilbius larvae
Leuroglossus stilbius larvae

CALCOFI CRUISE 5903
11-28 MARCH 1959

ESTIMATED RELATIVE ABUNDANCE UNDER
10m² OF SEA SURFACE

STATIONS: ● NIGHT ○ SUNRISE
○ DAY ● SUNSET

10
100

Leuroglossus stilbius larvae

5903
Leuroglossus stilbius larvae

CALCOFI CRUISE 5604
5 - 27 APRIL 1956

ESTIMATED RELATIVE ABUNDANCE UNDER
10 m² OF SEA SURFACE

STATIONS: • NIGHT • SUNRISE
○ DAY • SUNSET

Leuroglossus stilbius larvae
Leuroglossus stilbius larvae

CALCOFI CRUISE 5704
5 - 30 APRIL 1957

ESTIMATED RELATIVE ABUNDANCE UNDER 10m² OF SEA SURFACE

STATIONS: ● NIGHT ○ SUNRISE ○ DAY ● SUNSET

Leuroglossus stilbius larvae

5704
Leuroglossus stilbius larvae

CALCOFI CRUISE 5804
30 MARCH - 27 APRIL 1958

ESTIMATED RELATIVE ABUNDANCE UNDER 10m² OF SEA SURFACE

STATIONS • NIGHT • SUNRISE
• DAY • SUNSET

Leuroglossus stilbius larvae

5804
Leuroglossus stilbius larvae

CALCOFI CRUISE 5904
7-26 APRIL 1959

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: NIGHT • SUNRISE
° DAY • SUNSET

Leuroglossus stilbius larvae
Leuroglossus stilbius larvae

CALCOFI CRUISE 5505
12 MAY-7 JUNE 1955

ESTIMATED RELATIVE ABUNDANCE UNDER 100 m OF SEA SURFACE

STATIONS
- NIGHT
- SUNRISE
- DAY
- SUNSET

Leuroglossus stilbius larvae
Leuroglossus stilbius larvae

CALCOFI CRUISE 5605

4 - 22 MAY 1956

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS:
- NIGHT
- DAY
- SUNRISE
- SUNSET

1
10
100
1,000

Leuroglossus stilbius larvae

5605
Leuroglossus stilbius larvae

CALCOFI CRUISE 5705
9 – 23 MAY 1957

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: • NIGHT • SUNRISE
        ○ DAY • SUNSET

Leuroglossus stilbius larvae
**Leuroglossus stilbius larvae**

CALCOFI CRUISE 5805

3 - 22 MAY 1958

ESTIMATED RELATIVE ABUNDANCE UNDER 10m² OF SEA SURFACE

STATIONS
- NIGHT
- SUNRISE
- DAY
- SUNSET

---

*Leuroglossus stilbius larvae*
Leuroglossus stilbius larvae

CALCOFI CRUISE 6005
13 - 29 MAY 1960

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: ● NIGHT ○ SUNRISE ○ DAY ● SUNSET

Leuroglossus stilbius larvae

6005
Leuroglossus stilbius larvae

CALCOFI CRUISE 5506
11-28 JUNE 1955

ESTIMATED RELATIVE ABUNDANCE UNDER 10m² OF SEA SURFACE

STATIONS
- NIGHT
- SUNRISE
- DAY
- SUNSET

Leuroglossus stilbius larvae
Leuroglossus stilbius larvae

CALCOFI CRUISE 5706
5 - 23 JUNE 1957

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: • NIGHT ○ SUNRISE ○ SUNSET

Leuroglossus stilbius larvae
Leuroglossus stilbius larvae

CALCOFI CRUISE 5806
4-26 JUNE 1958

ESTIMATED RELATIVE ABUNDANCE UNDER 10m² OF SEA SURFACE

STATIONS: ● NIGHT ○ SUNRISE ○ DAY ○ SUNSET

Leuroglossus stilbius larvae
5806
Leuroglossus stilbius larvae

CALCOFI CRUISE 5906
3 - 30 JUNE 1959

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: ● NIGHT ○ SUNRISE
 ○ DAY ● SUNSET

Leuroglossus stilbius larvae
Leuroglossus stilbius larvae

CALCOFI CRUISE 6006
14 - 30 JUNE 1960

ESTIMATED RELATIVE ABUNDANCE UNDER 10m² OF SEA SURFACE

STATIONS • NIGHT • SUNRISE
○ DAY • SUNSET

Leuroglossus stilbius larvae

6006
Leuroglossus stilbius larvae

CALCOFI CRUISE 5507
8 - 23 JULY 1955

ESTIMATED RELATIVE ABUNDANCE UNDER 10m² OF SEA SURFACE

STATIONS: ● NIGHT ○ SUNRISE ○ DAY ● SUNSET

Leuroglossus stilbius larvae
Leuroglossus stilbius larvae

CALCOFI CRUISE 5607
6 - 25 JULY 1956

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m OF SEA SURFACE

STATIONS:
○ NIGHT
○ SUNRISE
○ DAY
○ SUNSET

Leuroglossus stilbius larvae
Leuroglossus stilbius larvae

CALCOFI CRUISE 5707
8 JULY - 3 AUGUST 1957

ESTIMATED RELATIVE ABUNDANCE UNDER 10m² OF SEA SURFACE

STATIONS: • NIGHT • SUNRISE
          ◆ DAY • SUNSET

Leuroglossus stilbius larvae
Leuroglossus stilbius larvae

CALCOFI CRUISE 5807
30 JUNE - 22 JULY 1958

ESTIMATED RELATIVE ABUNDANCE UNDER
10 m² OF SEA SURFACE

STATIONS: ● NIGHT ○ SUNRISE ◇ SUNSET

Leuroglossus stilbius larvae

5807
Leuroglossus stilbius larvae

CALCOFI CRUISE 5907
9 JULY - 3 AUGUST 1959

ESTIMATED RELATIVE ABUNDANCE UNDER 10m² OF SEA SURFACE

STATIONS: ● NIGHT ○ SUNRISE
○ DAY ● SUNSET

Leuroglossus stilbius larvae
Leuroglossus stilbius larvae

CALCOFI CRUISE 6007
12 JULY – 14 AUGUST 1960

ESTIMATED RELATIVE ABUNDANCE UNDER 10m² OF SEA SURFACE

STATIONS: ● NIGHT  ○ SUNRISE  ● DAY  ○ SUNSET

PUNTA EUGENIA
Leuroglossus stilbius larvae

CALCOFI CRUISE 6008
10 - 22 AUGUST 1960

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS • NIGHT • SUNRISE
○ DAY • SUNSET

Leuroglossus stilbius larvae

6008
Leuroglossus stilbius larvae
CALCOFI CRUISE 5510
16-30 OCTOBER 1955

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: • NIGHT • SUNRISE
○ DAY • SUNSET

Leuroglossus stilbius larvae
Leuroglossus stilbius larvae

CALCOFI CRUISE 5511
9 - 14 NOVEMBER 1955

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS
- NIGHT
- SUNRISE
- DAY
- SUNSET

100
10

CAPE MENDOCINO
SAN FRANCISCO
POINT CONCEPTION
SAN DIEGO
PUNTA EUGENIA
Leuroglossus stilbius larvae

CALCOFI CRUISE 5711
16 - 25 NOVEMBER 1957

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: ● NIGHT ○ SUNRISE ● SUNSET

Leuroglossus stilbius larvae
Leuroglossus stilbius larvae

CALCOFI CRUISE 5911
16 - 25 NOVEMBER 1959

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS
● NIGHT
○ SUNRISE
○ DAY
○ SUNSET
Leuroglossus stilbius larvae

CALCOFI CRUISE 5512
29 NOVEMBER - 16 DECEMBER 1955

ESTIMATED RELATIVE ABUNDANCE UNDER 10m² OF SEA SURFACE

STATIONS: ● NIGHT ○ SUNRISE
○ DAY ○ SUNSET

Leuroglossus stilbius larvae
Bathylagus wesethi larvae

CALCOFI CRUISE 5901
7 - 29 JANUARY 1959

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: • NIGHT • SUNRISE
           ○ DAY  • SUNSET

Bathylagus wesethi larvae
Bathylagus wesethi larvae

CALCOFI CRUISE 5502
9-23 FEBRUARY 1955

ESTIMATED RELATIVE ABUNDANCE UNDER
10 m² OF SEA SURFACE

STATIONS • NIGHT • SUNRISE
○ DAY • SUNSET

Bathylagus wesethi larvae
Bathylagus wesethi larvae

CALCOFI CRUISE 5802
7 - 24 FEBRUARY 1958

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: ● NIGHT ○ SUNRISE ○ DAY ● SUNSET

Bathylagus wesethi larvae
Bathylagus wesethi larvae

CALCOFI CRUISE 6002
11 FEBRUARY - 3 MARCH 1960

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS • NIGHT • SUNRISE
○ DAY • SUNSET

Bathylagus wesethi larvae

6002
**Bathylagus wesethi** larvae

CALCOFI CRUISE 5503

8-22 MARCH 1955

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m<sup>2</sup> OF SEA SURFACE

STATIONS: ● NIGHT ● SUNRISE
○ DAY ● SUNSET

---

Bathylagus wesethi larvae

5503
Bathyergus wesethi larvae

CALCOFI CRUISE 5603
4 - 19 MARCH 1956

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: ● NIGHT ○ SUNRISE
○ DAY ● SUNSET

Bathyergus wesethi larvae
CALCOFI CRUISE 5703
6 - 30 MARCH 1957

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS
- NIGHT
- SUNRISE
- DAY
- SUNSET

Bathyergus wesethi larvae

SAN FRANCISCO
PUNTA EUGENIA
CAPE MENDOCINO
POINT CONCEPTION
Bathyagrus wesethi larvae

CALCOFI CRUISE 5803
27 FEBRUARY - 21 MARCH 1958

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS:● NIGHT o SUNRISE o DAY ● SUNSET

Bathyagrus wesethi larvae

5803
**Bathylagus wesethi** larvae

**CALCOFI CRUISE 5903**
11 - 28 MARCH 1959

**ESTIMATED RELATIVE ABUNDANCE UNDER 10m² OF SEA SURFACE**

**STATIONS:**
- NIGHT
- SUNRISE
- DAY
- SUNSET

**Points:**
- Cape Mendocino
- San Francisco
- Point Conception
- San Diego
- Punta Eugenia

---

**Bathylagus wesethi** larvae
Bathygalus wesethi larvae

CALCOFI CRUISE 6003
10 - 29 MARCH 1960

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: • NIGHT  -  SUNRISE
○ DAY  -  SUNSET

Bathygalus wesethi larvae
Bathylagus wesethi larvae

CALCOFI CRUISE 5604
5 - 27 APRIL 1956

ESTIMATED RELATIVE ABUNDANCE UNDER
10m² OF SEA SURFACE

STATIONS: NIGHT O SUNRISE
O DAY O SUNSET

Bathylagus wesethi larvae

5604
Bathylagus wesethi larvae

CALCOFI CRUISE 5704
5 - 30 APRIL 1957

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: ● NIGHT ○ SUNRISE
○ DAY ● SUNSET

SAN DIEGO
PUNTA EUGENIA

Bathylagus wesethi larvae
Bathylagus wesethi larvae

CALCOFI CRUISE 5804
30 MARCH - 27 APRIL 1958

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS
● NIGHT
○ SUNRISE
○ DAY
○ SUNSET

Bathylagus wesethi larvae
5804
Bathyergus wesethi larvae

CALCOFI CRUISE 5904
7-26 APRIL 1959

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: • NIGHT ○ SUNRISE ○ DAY • SUNSET

Bathyergus wesethi larvae
**Bathylagus wesethi** larvae

**CALCOFI CRUISE 6004**

29 MARCH - 30 APRIL 1960

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: • NIGHT ○ SUNRISE □ DAY ● SUNSET
Bathylagus wesethi larvae

CALCOFI CRUISE 5605
4 - 22 MAY 1956

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS
- NIGHT
- SUNRISE
- DAY
- SUNSET

SAN FRANCISCO

POINT CONCEPTION

SAN DIEGO

PUNTA EUGENIA

Cape Mendocino
Bathylagus wesethi larvae

CALCOFI CRUISE 5705
9 - 23 MAY 1957

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: • NIGHT • SUNRISE
○ DAY • SUNSET

SAN FRANCISCO
POINT CONCEPTION
SAN DIEGO
PUNTA EUGENIA

Bathylagus wesethi larvae
Bathylagrus wesethi larvae

CALCOFI CRUISE 5805
3 - 22 MAY 1958

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: NIGHT • SUNRISE
          DAY • SUNSET

SAN MENDOCINO
SAN FRANCISCO
POINT CONCEPTION
SAN DIEGO
PUNTA EUGENIA
Bathylagus wesethi larvae

CALCOFI CRUISE 5905
6-27 MAY 1959

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: • NIGHT  ○ SUNRISE
○ DAY  • SUNSET

Bathylagus wesethi larvae

5905
**Bathylagus wesethi** larvae

**CALCOFI CRUISE 5506**

11-28 JUNE 1955

**ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE**

STATIONS: • NIGHT  • SUNRISE
○ DAY  • SUNSET

---

**Bathylagus wesethi** larvae
Bathylagus wesethi larvae

CALCOFI CRUISE 5606
26 MAY - 25 JUNE 1956

ESTIMATED RELATIVE ABUNDANCE UNDER
10 m² OF SEA SURFACE

STATIONS: ● NIGHT ○ SUNRISE
○ DAY ● SUNSET

PUNTA EUGENIA

Bathylagus wesethi larvae

5606
Bathylagus wesethi larvae

CALCOFI CRUISE 5706
5 - 23 JUNE 1957

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m$^2$ OF SEA SURFACE

STATIONS: • NIGHT ø SUNRISE
Ø DAY ø SUNSET

Bathylagus wesethi larvae
Bathylagus wesethi larvae

CALCOFI CRUISE 5806
4-26 JUNE 1958

ESTIMATED RELATIVE ABUNDANCE UNDER
10 m² OF SEA SURFACE

STATIONS: • NIGHT  • SUNRISE
          ○ DAY    • SUNSET

10
100
1,000

Bathylagus wesethi larvae
Bathylagus wesethi larvae

CALCOFI CRUISE 5906
3 - 30 JUNE 1959

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS • NIGHT ○ SUNRISE
○ DAY ● SUNSET

SAN FRANCISCO

CAPE MENDOCINO

POINT CONCEPTION

SAN DIEGO

PUNTA EUGENIA
Bathylagus wesethi larvae

CALCOFI CRUISE 6006
14 - 30 JUNE 1960

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: ▲ NIGHT ▩ SUNRISE
○ DAY □ SUNSET

Bathylagus wesethi larvae

6006
Bathylagus wesethi larvae

CALCOFI CRUISE 5507
8 - 23 JULY 1955

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: ⭕ NIGHT, ⭝ SUNRISE, ☀️ DAY, ★ SUNSET

SAN FRANCISCO
CAPE MENDOCINO
POINT CONCEPTION
SAN DIEGO
PUNTA EUGENIA
Bathylagus wesethi larvae

CALCOFI CRUISE 5607
6 - 25 JULY 1956

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: ● NIGHT ○ SUNRISE ○ DAY ● SUNSET

SAN FRANCISCO

POINT CONCEPTION

SAN DIEGO

PUNTA EUGENIA

Bathylagus wesethi larvae

5607
Bathylagus wesethi larvae

CALCOFI CRUISE 5707
8 JULY - 3 AUGUST 1957

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS
- NIGHT
- SUNRISE
- DAY
- SUNSET

SAN FRANCISCO

POINT CONCEPTION

SAN DIEGO

PUNTA EUGENIA
Bathylagus wesethi larvae

CALCOFI CRUISE 5907
9 JULY - 3 AUGUST 1959

ESTIMATED RELATIVE ABUNDANCE UNDER
10 m$^2$ OF SEA SURFACE

STATIONS
- NIGHT
- SUNRISE
- DAY
- SUNSET

10
100

Bathylagus wesethi larvae

5907
Bathylagus wesethi larvae

CALCOFI CRUISE 6007
12 JULY - 14 AUGUST 1960

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS
- NIGHT
- SUNRISE
- DAY
- SUNSET

PUNTA EUGENIA
Bathylagus wesethi larvae

CALCOFI CRUISE 5608
7 - 19 AUGUST 1956

ESTIMATED RELATIVE ABUNDANCE UNDER 10m OF SEA SURFACE

STATIONS: ● NIGHT ○ SUNRISE
○ DAY ○ SUNSET

Bathy/agus wesethi larvae
Bathylagus wesethi larvae

CALCOFI CRUISE 5908
13 - 31 AUGUST 1959

ESTIMATED RELATIVE ABUNDANCE UNDER 10m² OF SEA SURFACE

STATIONS: • NIGHT  ○ SUNRISE
○ DAY  ○ SUNSET

SAN FRANCISCO

POINT CONCEPTION

SAN DIEGO

PUNTA EUGENIA

Bathylagus wesethi larvae
**Bathylagus wesethi** larvae

CALCOFI CRUISE 5709

4 - 21 SEPTEMBER 1957

MENDOCINO

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS
- NIGHT
- SUNRISE
- DAY
- SUNSET

PUNTA EUGENIA

SAN DIEGO

POINT CONCEPTION

SAN FRANCISCO

CAPE MENDOCINO

**Bathylagus wesethi** larvae
Bathylagus wesethi larvae

CALCOFI CRUISE 5809
4-19 SEPTEMBER 1958

ESTIMATED RELATIVE ABUNDANCE UNDER
10 m² OF SEA SURFACE

STATIONS: ● NIGHT ○ SUNRISE
○ DAY ● SUNSET

Punta Eugenia

Bathylagus wesethi larvae
Bathyilagus wesethi larvae

CALCOFI CRUISE 5710
4 OCTOBER - 8 NOVEMBER 1957

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: • NIGHT ○ SUNRISE □ DAY □ SUNSET

SAN FRANCISCO

CAPE MENDOCINO

POINT CONCEPTION

SAN DIEGO

PUNTA EUGENIA

Bathyilagus wesethi larvae
Bathylagus wesethi larvae

CALCOFI CRUISE 5810
8 OCTOBER - 6 NOVEMBER 1958

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: • NIGHT • SUNRISE
○ DAY • SUNSET

Bathylagus wesethi larvae
Bathylagus wesethi larvae

CALCOFI CRUISE 5910
8 - 30 OCTOBER 1959

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: ● NIGHT ○ SUNRISE ○ DAY ○ SUNSET

100
10

Bathylagus wesethi larvae
Bathylagus wesethi larvae

CALCOFI CRUISE 6010
22 SEPTEMBER - 22 OCTOBER 1960

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: • NIGHT ○ SUNRISE
○ DAY ○ SUNSET

PUNTA EUGENIA

1
10
100
Bathylagus ochotensis larvae

CALCOFI CRUISE 5501
13-29 JANUARY 1955

ESTIMATED RELATIVE ABUNDANCE UNDER
10 m² OF SEA SURFACE

STATIONS: ● NIGHT   ○ SUNRISE
          ○ DAY     ● SUNSET

Bathylagus ochotensis larvae
**Bathytagus ochotensis larvae**

CALCOFI CRUISE 5601
5 - 18 JANUARY 1956

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS:  
- NIGHT
- SUNRISE
- DAY
- SUNSET

**Bathytagus ochotensis larvae**
Bathydagus ochotensis larvae

CALCOFI CRUISE 5801
8 JANUARY - 2 FEBRUARY 1958

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: • NIGHT • SUNRISE
            ○ DAY • SUNSET

SAN FRANCISCO
POINT CONCEPTION
SAN DIEGO
PUNTA EUGENIA
Bathydogus ochotensis larvae

CALCOFI CRUISE 5901
7 - 29 JANUARY 1959

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m OF SEA SURFACE

STATIONS: • NIGHT  ○ SUNRISE
          ○ DAY    ○ SUNSET

Bathydogus ochotensis larvae
Bathyagalus ochotensis larvae

CALCOFI CRUISE 6001
8 JANUARY - 13 FEBRUARY 1960

ESTIMATED RELATIVE ABUNDANCE UNDER
10 m$^2$ OF SEA SURFACE

STATIONS: • NIGHT • SUNRISE
○ DAY • SUNSET

Bathyagalus ochotensis larvae

6001
Bathylagus ochotensis larvae

CALCOFI CRUISE 5502
9-23 FEBRUARY 1955

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: • NIGHT ♦ SUNRISE
○ DAY • SUNSET

10

100

Cape Mendocino
San Francisco
Point Conception
San Diego
Punta Eugenia

Bathylagus ochotensis larvae

5502
CALCOFI CRUISE 5602
3 - 21 FEBRUARY 1956

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: • NIGHT • SUNRISE
○ DAY • SUNSET

Bathylagus ochotensis larvae
Bathylagus ochotensis larvae

CALCOFI CRUISE 5702
6 - 26 FEBRUARY 1957

ESTIMATED RELATIVE ABUNDANCE UNDER
10 m² OF SEA SURFACE

STATIONS: • NIGHT • SUNRISE
○ DAY • SUNSET

Bathyagus ochotensis larvae
CALCOFI CRUISE 5802
7 - 24 FEBRUARY 1958

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS:
- NIGHT
- SUNRISE
- DAY
- SUNSET

Bathylagus ochotensis larvae

Bathylagus ochotensis larvae
Bathylagus ochotensis larvae

CALCOFI CRUISE 6002
11 FEBRUARY – 3 MARCH 1960

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: ● NIGHT ○ SUNRISE
            ○ DAY ○ SUNSET

Bathylagus ochotensis larvae
Bathylagus ochotensis larvae

CALCOFI CRUISE 5503
8-22 MARCH 1955

ESTIMATED RELATIVE ABUNDANCE UNDER
10 m² OF SEA SURFACE

STATIONS: ● NIGHT ○ SUNRISE
○ DAY ● SUNSET

Bathylagus ochotensis larvae
Bathyagus ochotensis larvae

CALCOFI CRUISE 5603
4 - 19 MARCH 1956

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: ● NIGHT ○ SUNRISE
○ DAY ● SUNSET

SAN FRANCISCO

POINT CONCEPTION

SAN DIEGO

PUNTA EUGENIA
Bathylagus ochotensis larvae

CALCOFI CRUISE 5703
6 - 30 MARCH 1957

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: • NIGHT ○ SUNRISE • SUNSET

SAN FRANCISCO

POINT CONCEPTION

SAN DIEGO

PUNTA EUGENIA

Bathylagus ochotensis larvae
CALCOFI CRUISE 5803
27 FEBRUARY - 21 MARCH 1958

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: • NIGHT  • SUNRISE
          ○ DAY      • SUNSET

Bathyergus ochofensis larvae
Bathylagus ochotensis larvae

CALCOFI CRUISE 5903
11-28 MARCH 1959

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS • NIGHT • SUNRISE
○ DAY • SUNSET

Bufy/ugus ochofensis larvae
Bathylagus ochotensis larvae

CALCOFI CRUISE 5604
5 - 27 APRIL 1956

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS
- NIGHT
- SUNRISE
- DAY
- SUNSET

Bathylagus ochotensis larvae

5604
Bathylagus ochotensis larvae

CALCOFI CRUISE 5704
5 - 30 APRIL 1957

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: • NIGHT • SUNRISE
○ DAY • SUNSET

Bathylagus ochotensis larvae
CALCOFI CRUISE 5804
30 MARCH - 27 APRIL 1958

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS
- NIGHT
- SUNRISE
- DAY
- SUNSET

Bathyergus ochotensis larvae

Bathyergus ochotensis larvae
Bathylagus ochotensis larvae

CALCOFI CRUISE 5904
7-26 APRIL 1959

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: • NIGHT • SUNRISE
        ○ DAY • SUNSET

SAN FRANCISCO

POINT CONCEPTION

SAN DIEGO

PUNTA EUGENIA

Bathylagus ochotensis larvae
Bathylagus ochotensis larvae

CALCOFI CRUISE 6004
29 MARCH - 30 APRIL 1960

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: • NIGHT • SUNRISE
○ DAY • SUNSET

Bathylagus ochotensis larvae
**Bathyragus ochotensis** larvae

CALCOFI CRUISE 5505
12 MAY - 7 JUNE 1955

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: • NIGHT  • SUNRISE  
● DAY  • SUNSET

---

**Bathyragus ochotensis** larvae

5505
Bathylagus ochotensis larvae

CALCOFI CRUISE 5605
4 - 22 MAY 1956

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS
○ NIGHT
○ SUNRISE
○ DAY
○ SUNSET

San Francisco
Cape Mendocino
Point Conception
San Diego
Punta Eugenia
Bathylagus ochotensis larvae

CALCOFI CRUISE 5905
6-27 MAY 1959

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS • NIGHT • SUNRISE
○ DAY • SUNSET

Bathylagus ochotensis larvae
Bathylagus ochotensis larvae

CALCOFI CRUISE 6005
13 - 29 MAY 1960

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS
- NIGHT
- SUNRISE
- DAY
- SUNSET

Bathylagus ochotensis larvae

6005
Bathyagus ochotensis larvae

CALCOFI CRUISE 5506
11-28 JUNE 1955

ESTIMATED RELATIVE ABUNDANCE UNDER
10 m² OF SEA SURFACE

STATIONS
- NIGHT
- SUNRISE
- DAY
- SUNSET

10
100

Bathyagus ochotensis larvae

5506
Bathylagus ochotensis larvae

CALCOFI CRUISE 5606
26 MAY - 25 JUNE 1956

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS ● NIGHT ● SUNRISE
○ DAY ● SUNSET

Punta Eugenia

Bathylagus ochotensis larvae
5606
Bathylagus ochotensis larvae

CALCOFI CRUISE 5806
4-26 June 1958

Estimated relative abundance under 10 m² of sea surface.

Stations:
- • Night
- ○ Sunrise
- ○ Day
- ○ Sunset

SAN francisco

Point conception

San Diego

Punta Eugenia

Bathylagus ochotensis larvae

5806
Bufhylagus ochotensis larvae

CALCOFI CRUISE 6006
14 - 30 JUNE 1960

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: ● NIGHT ○ SUNRISE ○ DAY ○ SUNSET

Bathylagus ochotensis larvae
Bathyagrus ochotensis larvae

CALCOFI CRUISE 5507
8 - 23 JULY 1955

ESTIMATED RELATIVE ABUNDANCE UNDER 10m² OF SEA SURFACE

STATIONS: ● NIGHT ● SUNRISE
○ DAY ○ SUNSET

Bathyagrus ochotensis larvae
Bathylagus ochotensis larvae

CALCOFI CRUISE 5807
30 JUNE - 22 JULY 1958

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m² OF SEA SURFACE

STATIONS: • NIGHT  ◇ SUNRISE  ○ DAY  ◇ SUNSET

Bothylagus ochotensis larvae
Bathylagus ochotensis larvae

CALCOFI CRUISE 5907
9 JULY - 3 AUGUST 1959

ESTIMATED RELATIVE ABUNDANCE UNDER 10 m OF SEA SURFACE

STATIONS
- NIGHT
- SUNRISE
- DAY
- SUNSET

Bathylagus ochotensis larvae
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.
Elbert H. Ahlstrom

Distributional atlas of fish larvae in the California Current region: six common mesopelagic fishes—Vinciguerra lucetia, Tripboturus mexicanus, Stenobrachius leucopsarus, LeuroGLOSSUS stilbius, Bathylagus wesethi, and Bathylagus ochotensis, 1955 through 1960

Charts 1-306