data report

PHYSICAL AND CHEMICAL DATA

CCOFI Cruise 5607
6-25 July 1956

CCOFI Cruise 5608
7-19 August 1956

CCOFI Cruise 5609
5-17 September 1956

CCOFI Cruise 5610
27 September – 5 October 1956

CCOFI Cruise 5611
30 October – 5 November 1956

SIO Reference 60-35
27 April 1960
UNIVERSITY OF CALIFORNIA
SCRIPPS INSTITUTION OF OCEANOGRAPHY

PHYSICAL AND CHEMICAL DATA

CCOFI CRUISE 5607
6–25 July 1956

CCOFI CRUISE 5608
7–19 August 1956

CCOFI CRUISE 5609
5–17 September 1956

CCOFI CRUISE 5610
27 September - 5 October 1956

CCOFI CRUISE 5611
30 October - 5 November 1956

Sponsored by
Marine Research Committee

SIO Reference 60–35
27 April 1960

Approved for distribution:

Roger Revelle, Director
CONTENTS

INTRODUCTION ................................................................. iii

CRUISE 5607
    List of Figures ................................................... v
    Personnel ........................................................... vi
    Tabulated Data .................................................... 193
        Observations at 10 Meters (Net-Tow Stations) ............. 193

CRUISE 5608
    List of Figures ................................................... viii
    Personnel ........................................................... ix
    Tabulated Data .................................................. 204
        Hydrographic Casts ........................................... 204
        Observations at 10 Meters (Net-Tow Stations) ............. 207

CRUISE 5609
    List of Figures ................................................... xi
    Personnel ........................................................... xii
    Tabulated Data .................................................. 209
        Hydrographic Casts ........................................... 209
        Observations at 10 Meters (Net-Tow Stations) ............. 212

CRUISE 5610
    List of Figures ................................................... xiv
    Personnel ........................................................... xv
    Tabulated Data .................................................. 214
        Observations at 10 Meters (Net-Tow Stations) ............. 214

CRUISE 5611
    List of Figures ................................................... xvii
    Personnel ........................................................... xviii
    Tabulated Data .................................................. 217
        Observations at 10 Meters (Net-Tow Stations) ............. 217

DISTRIBUTION LIST ......................................................... 221
INTRODUCTION

The data presented in this report were collected on the eighty-sixth, eighty-seventh, eighty-eighth, eighty-nineth and ninetieth consecutive cruises of the California Cooperative Oceanic Fisheries Investigations program. The R/V Black Douglas of the U. S. Fish and Wildlife Service participated in all five cruises; the R/V Paolina-T of the Scripps Institution participated in Cruise 5607; the R/V Orca of the Scripps Institution participated in Cruises 5607, 5610 and 5611.

The data are tabulated at observed depths; the interpolated and computed values tabulated at standard depths and are accompanied by charts of horizontal distribution. The presentation of data in this report does not constitute publication; however, the data contained in this report have been carefully edited and no modifications should be necessary before final publication.

STANDARD PROCEDURES

To indicate degree of accuracy, temperatures are recorded in tenths of a degree when obtained by bucket thermometer, thermograph, or bathythermograph, while temperatures from reversing thermometers are recorded in hundredths of a degree. Extrapolated values and values interpolated between remote observations are entered within parentheses. A hyphen is used to indicate a missing observed value. The time is the time of messenger release. When more than one cast was made on a station, messenger times and wire angles are given in the order of increasing depth. A line is left blank between the observed data of each cast.

FOOTNOTES

Footnotes which appear frequently are "loose bottle cap" and "possible evaporation." To avoid any confusion as to their meaning the following explanation is included.

Laboratory personnel, before titrating the salinity samples, note any possible imperfections in the sealing of the bottles as follows:

Loose bottle cap: The cap is definitely loose so that it could be moved with very little applied pressure. The salinity values obtained from these samples may be usable depending on time and/or conditions of storage.
Possible evaporation: Either the cap was sealed with less than usual pressure, the bottle edge chipped, the rubber washer cracked, or the bale broke on opening, etc.

Use of the above values in interpolation depends upon consistency with other values of salinity and other properties, and these footnotes are supplemented with "falls on property curve" or "does not fall on property curve," depending upon whether the property curve was drawn through the value or not.

In addition to footnotes, three special notations are used without footnotes because their meaning is always the same.

To indicate a premature or a delayed reversal of the water-sampling device which results in certain depth and property errors, the following notation is used.

\( p: \) pretrip or posttrip

Values which are not drawn through because they seem to be in error without apparent reason are indicated by one of the following notations.

\( r: \) rejected value (value seems to be definitely wrong),

\( u: \) uncertain value (value may be correct; occasionally it can influence the drawing of the property curve).

FORMAT

These data are typed in the format of the University of California Press publication, Oceanic Observations of the Pacific. So that these pages can be used as copy for the 1956 volume, the first page of the Cruise 5607 data is numbered 193; 5608, 204; 5609, 209; 5610, 214; 5611, 217.
FIGURES

1. CCOFI Cruise 5609, station positions
2. Horizontal distribution of temperature at 10 meters
3. Horizontal distribution of salinity at 10 meters
CCOFI CRUISE 5609
5-17 SEPTEMBER 1956

STATION POSITIONS

DIRECTION OF TRAVEL

- NET TOW STATION
- HYDROGRAPHIC STATION

BLACK DOUGLAS
5-17 SEPTEMBER

FIGURE 1
CCOFI CRUISE 5609
5-17 SEPTEMBER 1956
10 METER TEMPERATURE
CONTOUR INTERVAL 1.0°C
PERSONNEL
Cruise 5609

SHIP'S CAPTAIN

Forster, Charles W., R/V Black Douglas

PERSONNEL PARTICIPATING IN THE COLLECTION OF DATA

R/V Black Douglas

Wolf, Robert S., Fishery Research Biologist, U. S. Fish and Wildlife Service
Vorobiov, Alexander V., Fishery Aid, U. S. Fish and Wildlife Service
<table>
<thead>
<tr>
<th></th>
<th>OBSERVED</th>
<th>INTERPOLATED</th>
<th>COMPUTED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Z</td>
<td>T</td>
<td>S</td>
<td>O₂</td>
</tr>
<tr>
<td>m</td>
<td>°C</td>
<td>%</td>
<td>ml/L</td>
</tr>
<tr>
<td>0</td>
<td>21.56</td>
<td>33.64</td>
<td>446</td>
</tr>
<tr>
<td>10</td>
<td>19.73</td>
<td>33.62</td>
<td>410</td>
</tr>
<tr>
<td>30</td>
<td>(16.4)</td>
<td>33.53</td>
<td>(340)</td>
</tr>
<tr>
<td>50</td>
<td>13.42</td>
<td>33.49</td>
<td>282</td>
</tr>
</tbody>
</table>

DOUGLAS, September 16, 1966; 1658 GCT; 28°22.5'N, 115°17.5'W; sounding, 30 ft; wind, 310°, force 1; weather, clear; sea, slight; wire angle, 0°.

DOUGLAS, September 16, 1966; 1659 GCT; 28°12'N, 115°39'W; sounding, 700 ft; wind, calm; weather, clear; sea, slight; wire angle, 0°.

DOUGLAS, September 16, 1966; 0335 GCT; 29°11'N, 114°55'W; sounding, 40 ft; wind, 280°, force 2; weather, cloudy; sea, slight; wire angle, 0°.

DOUGLAS, September 16, 1966; 0335 GCT; 29°05'N, 115°08'W; sounding, 51 ft; wind, 270°, force 2; weather, cloudy; sea, slight; wire angle, 0°.

DOUGLAS, September 16, 1966; 0832 GCT; 28°55'N, 115°27.5'W; sounding, 600 ft; wind, calm; weather, clear; sea; slight; wire angle, 0°.

Note: The hydrographic casts on this cruise were made with four, five or six Nansen bottles, only three of which contained reversing thermometers. The temperature values for the remaining bottles were obtained from bathythermogram readings although the traces were very wide and much below the usual standards.
<table>
<thead>
<tr>
<th>S10</th>
<th>OBSERVED</th>
<th>INTERPOLATED</th>
<th>COMPUTED</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Z T S O₂ 0₂ 5 5</td>
<td>Z T S O₂ 0₂ 5 ΔD</td>
<td></td>
</tr>
<tr>
<td>COFOI</td>
<td>m °C % ml/L m °C % ml/L g/L 10 cm³/g</td>
<td>m °C % ml/L g/L 10 cm³/g dyn. m</td>
<td></td>
</tr>
</tbody>
</table>

117.26
BLACK DOUGLAS; September 15, 1956; 2130 GCT; 28°56'N, 114°41'W; sounding, 125 fm; wind, 320°, force 2; weather; cloudy; sea, calm; wind angle, 0°.

| 0  | 12.03  | 33.48 | 435 | 0  | 20.32 | 33.48 | 435 | 23.54 | 435 |
| 10 | 17.96  | 33.53 | 376 | 10 | 18.30 | 33.53 | 376 | 24.25 | 376 |
| 30 | 16.30  | 33.53 | 355 | 30 | 17.96 | 33.53 | 355 | 24.25 | 355 |
| 50 | 11.77  | 33.53 | 248 | 50 | 12.28 | 33.53 | 248 | 25.41 | 248 |
| 75 | 11.18  | 33.53 | 207 | 75 | 11.77 | 33.53 | 207 | 25.15 | 207 |
| 100| 11.18  | 33.94 | 207 | 100| 11.18 | 33.94 | 207 | 25.95 | 207 |

117.30
BLACK DOUGLAS; September 15, 1956; 0100 GCT; 28°56'N, 114°41'W; sounding, 125 fm; wind, 320°, force 2; weather; cloudy; sea, moderate; wind angle, 0°.

| 0  | 20.32  | 33.48 | 435 | 0  | 20.32 | 33.48 | 435 | 23.54 | 435 |
| 10 | 18.30  | 33.53 | 376 | 10 | 18.30 | 33.53 | 376 | 24.25 | 376 |
| 30 | 16.30  | 33.53 | 355 | 30 | 16.30 | 33.53 | 355 | 24.25 | 355 |
| 50 | 12.28  | 33.53 | 248 | 50 | 12.28 | 33.53 | 248 | 25.41 | 248 |
| 75 | 11.77  | 33.53 | 207 | 75 | 11.77 | 33.53 | 207 | 25.15 | 207 |
| 100| 11.18  | 33.94 | 207 | 100| 11.18 | 33.94 | 207 | 25.95 | 207 |

117.35
BLACK DOUGLAS; September 15, 1956; 0130 GCT; 28°58'N, 114°16'W; sounding, 125 fm; wind, calm; weather; cloudy; sea, slight; wind angle, 0°.

| 0  | 19.32  | 33.53 | 407 | 0  | 19.32 | 33.53 | 407 | 23.83 | 407 |
| 10 | 17.96  | 33.53 | 376 | 10 | 17.96 | 33.53 | 376 | 24.17 | 376 |
| 30 | 17.0   | 33.53 | 353 | 30 | 17.0  | 33.53 | 353 | 24.17 | 353 |
| 50 | 12.7   | 33.53 | 265 | 50 | 12.7  | 33.53 | 265 | 24.41 | 265 |
| 75 | 11.8   | 33.77 | 232 | 75 | 12.7  | 33.77 | 232 | 25.34 | 232 |
| 100| 11.18  | 33.94 | 207 | 100| 11.18 | 33.94 | 207 | 25.95 | 207 |

117.40
BLACK DOUGLAS; September 15, 1956; 1730 GCT; 28°28'N, 115°35.5'W; sounding, 380 fm; wind, 320°, force 2; weather; cloudy; sea, moderate; wind angle, 0°.

| 0  | 18.24  | 33.53 | 382 | 0  | 18.24 | 33.53 | 382 | 24.10 | 382 |
| 10 | 18.16  | 33.53 | 382 | 10 | 18.16 | 33.53 | 382 | 24.13 | 382 |
| 30 | 15.8   | 33.48 | 330 | 30 | 15.8  | 33.48 | 330 | 24.22 | 330 |
| 50 | 14.0   | 33.45 | 298 | 50 | 14.0  | 33.45 | 298 | 24.65 | 298 |
| 75 | 12.4   | 33.53 | 260 | 75 | 14.0  | 33.53 | 260 | 24.99 | 260 |
| 100| 11.67  | 33.78 | 239 | 100| 12.4  | 33.78 | 239 | 25.39 | 239 |

118.25
BLACK DOUGLAS; September 15, 1956; 0745 GCT; 28°40.5'N, 114°25.5'W; sounding, 48 fm; wind, 300°, force 1; weather; cloudy; sea, slight; wind angle, 0°.

| 0  | 20.00  | 33.68 | 439 | 0  | 20.00 | 33.68 | 439 | 23.50 | 439 |
| 10 | 19.68  | 33.67 | 439 | 10 | 19.68 | 33.67 | 439 | 23.60 | 439 |
| 30 | 16.2   | 33.77 | 315 | 30 | 16.2  | 33.77 | 315 | 24.40 | 315 |
| 49 | 13.1   | 33.51 | 274 | 49 | 16.2  | 33.77 | 274 | 24.78 | 274 |
| 74 | 12.53  | 33.62 | 255 | 74 | 16.2  | 33.77 | 255 | 25.25 | 255 |

a) See footnote, page 209.
<table>
<thead>
<tr>
<th>Z (m)</th>
<th>T (°C)</th>
<th>S (%)</th>
<th>O₂ (ml/L)</th>
<th>T³ (10⁻³ cm/g)</th>
<th>Z (m)</th>
<th>T (°C)</th>
<th>S (%)</th>
<th>O₂ (ml/L)</th>
<th>T³ (10⁻³ cm/g)</th>
<th>ΔD (dyn. m)</th>
<th>q₅ (g/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>20.58</td>
<td>33.72</td>
<td>425</td>
<td>0</td>
<td>0</td>
<td>20.58</td>
<td>33.72</td>
<td>425</td>
<td>0</td>
<td>23.65</td>
<td>425</td>
</tr>
<tr>
<td>10</td>
<td>20.60</td>
<td>33.68</td>
<td>428</td>
<td>10</td>
<td>20.60</td>
<td>33.68</td>
<td>428</td>
<td>10</td>
<td>23.62</td>
<td>428</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>20.60</td>
<td>33.68</td>
<td>(430)</td>
<td>20</td>
<td>20.60</td>
<td>33.68</td>
<td>430</td>
<td>20</td>
<td>23.61</td>
<td>(429)</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>17.6</td>
<td>33.62</td>
<td>(365)</td>
<td>30</td>
<td>20.56</td>
<td>33.66</td>
<td>365</td>
<td>30</td>
<td>23.60</td>
<td>(430)</td>
<td></td>
</tr>
<tr>
<td>75</td>
<td>13.2</td>
<td>33.46</td>
<td>(279)</td>
<td>50</td>
<td>17.8</td>
<td>33.62</td>
<td>279</td>
<td>50</td>
<td>24.29</td>
<td>(365)</td>
<td></td>
</tr>
<tr>
<td>100</td>
<td>11.94</td>
<td>33.62</td>
<td>244</td>
<td>75</td>
<td>13.2</td>
<td>33.46</td>
<td>244</td>
<td>75</td>
<td>25.19</td>
<td>(279)</td>
<td></td>
</tr>
</tbody>
</table>

BLACK DOUGLAS; September 15, 1956; 1338 GCT; 28°30.5°N, 115°05’W; sounding, 67 ft; wind, variable, force 1; weather, cloudy; sea, rough; wire angle, 07°.

0     | 20.79  | 33.68 | 433       | 0             | 20.79 | 33.68 | 433   | 0         | 23.57         | 433        |
| 10    | 20.40  | 33.76 | 421       | 10            | 20.40 | 33.76 | 421   | 10        | 23.70         | 421        |
| 30    | 16.4   | 33.55 | (340)     | 20            | 18.6  | 33.64 | (340)  | 20        | 24.11         | (382)       |
| 50    | 14.06  | 33.48 | 294       | 30            | 17.8  | 33.59 | 294   | 30        | 24.27         | (366)       |
| 75    | 13.7   | 33.68 | (272)     | 50            | 15.3  | 33.49 | (272)  | 50        | 24.77         | (319)       |
| 100   | 11.48  | 33.80 | 223       | 75            | 13.7  | 33.68 | 223   | 75        | 25.27         | (272)       |

BLACK DOUGLAS; September 14, 1956; 2232 GCT; 28°03.5°N, 114°54’W; sounding, 45 ft; wind, 320°, force 3; weather, partly cloudy; sea, rough; wire angle, 00°.

0     | 21.30  | 33.74 | 442       | 0             | 21.30 | 33.74 | 442   | 0         | 23.48         | 442        |
| 10    | 21.2   | 33.77 | (436)     | 10            | 21.2  | 33.77 | (436)  | 10        | 23.51         | (436)       |
| 30    | 21.0   | 33.71 | (436)     | 20            | 21.1  | 33.74 | (436)  | 20        | 23.52         | (437)       |
| 50    | 19.8   | 33.64 | (413)     | 30            | 21.0  | 33.71 | (413)  | 30        | 23.53         | (436)       |
| 75    | 13.87  | 33.50 | 290       | 75            | 13.87 | 33.50 | 290   | 75        | 25.08         | 290        |

a) See footnote, page 209.
<table>
<thead>
<tr>
<th>Station</th>
<th>Date</th>
<th>Time GCT</th>
<th>Latitude North</th>
<th>Longitude West</th>
<th>Sounding Dir</th>
<th>Wind Force</th>
<th>Weather</th>
<th>Sea</th>
<th>10 Meters</th>
</tr>
</thead>
<tbody>
<tr>
<td>110.33-B</td>
<td>IX-17</td>
<td>0100</td>
<td>29°50.5'</td>
<td>115°52.0'</td>
<td>50</td>
<td>330°</td>
<td>2</td>
<td>clear</td>
<td>moderate</td>
</tr>
<tr>
<td>110.35-B</td>
<td>17</td>
<td>0240</td>
<td>29°46.5'</td>
<td>116°00.0'</td>
<td>550</td>
<td>270°</td>
<td>2</td>
<td>clear</td>
<td>slight</td>
</tr>
<tr>
<td>110.40-B</td>
<td>17</td>
<td>0610</td>
<td>29°36.5'</td>
<td>116°19.5'</td>
<td>1300</td>
<td>270°</td>
<td>2</td>
<td>clear</td>
<td>slight</td>
</tr>
<tr>
<td>113.40-B</td>
<td>16</td>
<td>1400</td>
<td>29°02.0'</td>
<td>115°59.0'</td>
<td>1100</td>
<td>calm</td>
<td>clear</td>
<td>slight</td>
<td></td>
</tr>
<tr>
<td>115.40-B</td>
<td>16</td>
<td>1100</td>
<td>28°45.0'</td>
<td>115°47.0'</td>
<td>770</td>
<td>calm</td>
<td>partly cloudy</td>
<td>slight</td>
<td></td>
</tr>
<tr>
<td>120.40-B</td>
<td>14</td>
<td>1950</td>
<td>27°56.5'</td>
<td>115°14.0'</td>
<td>21</td>
<td>300°</td>
<td>4</td>
<td>partly cloudy</td>
<td>moderate</td>
</tr>
<tr>
<td>120.45-B</td>
<td>14</td>
<td>1640</td>
<td>27°43.0'</td>
<td>115°33.0'</td>
<td>1100</td>
<td>320°</td>
<td>4</td>
<td>partly cloudy</td>
<td>rough</td>
</tr>
<tr>
<td>123.37-B</td>
<td>14</td>
<td>0430</td>
<td>27°24.0'</td>
<td>114°39.5'</td>
<td>40</td>
<td>300°</td>
<td>3</td>
<td>clear</td>
<td>rough</td>
</tr>
<tr>
<td>123.42-B</td>
<td>14</td>
<td>0730</td>
<td>27°14.0'</td>
<td>114°59.5'</td>
<td>1000</td>
<td>330°</td>
<td>6</td>
<td>clear</td>
<td>very rough</td>
</tr>
<tr>
<td>123.45-B</td>
<td>14</td>
<td>0950</td>
<td>27°08.0'</td>
<td>115°11.0'</td>
<td>2100</td>
<td>320°</td>
<td>5</td>
<td>clear</td>
<td>very rough</td>
</tr>
<tr>
<td>127.34-B</td>
<td>13</td>
<td>2235</td>
<td>26°55.5'</td>
<td>114°06.0'</td>
<td>41</td>
<td>300°</td>
<td>3</td>
<td>clear</td>
<td>rough</td>
</tr>
<tr>
<td>127.40-B</td>
<td>13</td>
<td>1930</td>
<td>26°43.0'</td>
<td>114°29.5'</td>
<td>1900</td>
<td>320°</td>
<td>6</td>
<td>clear</td>
<td>rough</td>
</tr>
<tr>
<td>127.45-B</td>
<td>13</td>
<td>1625</td>
<td>26°33.5'</td>
<td>114°48.5'</td>
<td>1800</td>
<td>330°</td>
<td>5</td>
<td>clear</td>
<td>rough</td>
</tr>
<tr>
<td>130.30-B</td>
<td>12</td>
<td>1300</td>
<td>26°29.0'</td>
<td>113°29.0'</td>
<td>45</td>
<td>320°</td>
<td>3</td>
<td>clear</td>
<td>rough</td>
</tr>
<tr>
<td>130.35-B</td>
<td>13</td>
<td>0340</td>
<td>26°19.0'</td>
<td>113°48.5'</td>
<td>250</td>
<td>300°</td>
<td>5</td>
<td>clear</td>
<td>rough</td>
</tr>
<tr>
<td>130.40-B</td>
<td>13</td>
<td>0655</td>
<td>26°09.0'</td>
<td>114°07.5'</td>
<td>1200</td>
<td>300°</td>
<td>4</td>
<td>clear</td>
<td>moderate</td>
</tr>
<tr>
<td>130.45-B</td>
<td>13</td>
<td>1000</td>
<td>25°59.0'</td>
<td>114°25.5'</td>
<td>2000</td>
<td>320°</td>
<td>4</td>
<td>clear</td>
<td>moderate</td>
</tr>
<tr>
<td>133.25-B</td>
<td>12</td>
<td>0650</td>
<td>26°04.5'</td>
<td>112°48.0'</td>
<td>45</td>
<td>290°</td>
<td>3</td>
<td>clear</td>
<td>rough</td>
</tr>
<tr>
<td>133.30-B</td>
<td>12</td>
<td>0340</td>
<td>25°54.5'</td>
<td>113°07.5'</td>
<td>110</td>
<td>280°</td>
<td>4</td>
<td>clear</td>
<td>moderate</td>
</tr>
<tr>
<td>Station</td>
<td>Date</td>
<td>Time GCT</td>
<td>Latitude North</td>
<td>Longitude West</td>
<td>Sounding (fm)</td>
<td>Wind Dir</td>
<td>Wind Force</td>
<td>Weather</td>
<td>Sea</td>
</tr>
<tr>
<td>---------</td>
<td>------</td>
<td>----------</td>
<td>----------------</td>
<td>---------------</td>
<td>--------------</td>
<td>----------</td>
<td>------------</td>
<td>---------</td>
<td>----</td>
</tr>
<tr>
<td>137.23-B</td>
<td>IX-11</td>
<td>1600</td>
<td>25°34.0'</td>
<td>112°18.5'</td>
<td>42</td>
<td>280°</td>
<td>3</td>
<td>clear</td>
<td>moderate</td>
</tr>
<tr>
<td>137.30-B</td>
<td>11</td>
<td>1900</td>
<td>25°20.0'</td>
<td>112°45.5'</td>
<td>135</td>
<td>290°</td>
<td>4</td>
<td>clear</td>
<td>moderate</td>
</tr>
</tbody>
</table>

TEMPERATURE AND SALINITY AT 10 METERS (NET-TCN STATIONS)
DISTRIBUTION LIST

Mr. D. L. Alverson, Chief
North Pacific Fisheries Exploration and Gear Research
Bureau of Commercial Fisheries
2725 Montlake Boulevard
Seattle 2, Washington

Mr. William Anderson
Bureau of Commercial Fisheries
Brunswick, Georgia

Mr. William E. Batzler
Code 2232
U. S. Navy Electronics Laboratory
San Diego 52, California

British Joint Services
(Navy Staff)
1910 K Street N. W.
Washington, D. C.

Mr. J. G. Burnette, Chairman
Marine Research Committee
P. O. Box 807
Los Altos, California

Librarian (4)
Department of Fish and Game
California State Fisheries Laboratory
Terminal Island, California

Library
Oceanographic Group
Central Fisheries Experiment Station
Pusan, Korea

Dr. Ernest R. Anderson
Code 2233
U. S. Navy Electronics Laboratory
San Diego 52, California

Mr. Thomas S. Austin
Bureau of Commercial Fisheries
Biological Laboratory
P. O. Box 3830
Honolulu 12, Hawaii

Dr. Rolf Bolin
Hopkins Marine Station
Pacific Grove, California

Librarian
Bureau of Commercial Fisheries
Biological Laboratory
P. O. Box 3830
Honolulu 12, Hawaii

Dr. Wayne V. Burt
Assoc. Prof. of Oceanography
School of Science
Oregon State College
Corvallis, Oregon

Mr. Luis R. A. Capurro
Associate Director
IGY World Data Center
Oceanographic Archive
A. and M. College of Texas
College Station, Texas

Mr. Harold B. Clemens, Jr.
Marine Resources Operations
California State Fisheries Laboratory
Terminal Island, California
Chief, Division of Fisheries
Commonwealth Scientific and Industrial
Research Organization
P. O. Box 21
Crunulla, N. S. W., Australia

Mr. R. S. Croker, Director
California Department of Fish and Game
Marine Fisheries Laboratory Branch
772 Capitol Avenue
Sacramento 14, California

Deutsches Hydrographisches Institut
Bernhard-Nocht-Str. 78
Hamburg 4, Germany

Chief
Division of Biological Research
Bureau of Commercial Fisheries
U. S. Department of the Interior
Washington 25, D. C.

Dr. S. A. El Wardani
Sciences
San Jose State College
San Jose, California

Dr. Richard H. Fleming
University of Washington
Oceanographic Laboratories
Seattle 5, Washington

Prof. James A. Gast
Division of Natural Resources
Humboldt State College
Arcata, California

Mr. Rafael Soto Gil
Secretario General
Universidad de Baja California
Mexicali, B. C.
México

Dr. G. M. Cresswell
Department of Earth Sciences
Stanford Research Institute
Menlo Park, California

Herrn Professor Dr. A. Defant
Sternwartestrasse 38
Innsbruck
Austria

Dirección General de Pesca é
Industrias Conexas
Estación de Biología Marina
Casa del Marina
Mazatlán, Sinaloa, México

Mr. Robert L. Eberhardt
Technology - ASW and Ocean Systems
Lockheed Aircraft Corporation
California Division
Burbank, California

Director of Research
Fish Commission of Oregon
Route 1, Box 31A
Clackamas, Oregon

Dr. Paul M. Fye
Woods Hole Oceanographic Institution
Woods Hole, Massachusetts

Dr. Robert H. Gibbs, Jr.
Department of Biology
Boston University
Boston 15, Massachusetts

Mr. C. G. Gunnerson
Department of Water Resources
Division of Resources Planning
P. O. Box 388
Sacramento 2, California
Hancock Library of Biology and
Oceanography
Allan Hancock Foundation
University of Southern California
Los Angeles 7, California

Mr. John Hawk
c/o Seafarers International Union of
North America
450 Harrison Street
San Francisco 5, California

Mr. T. Hirano
Tokai Regional Fisheries Research
Laboratory
Tsukishima
Tokyo, Japan

Icthyological Laboratory
U. S. Fish and Wildlife Service
U. S. National Museum
Washington 25, D. C.

Director
Instituto de Geofísica
Torre de Ciencias, 3er piso
Universidad Nacional Autónoma de México
Villa Obregón, D. F., México

Mr. Alphonse Kemmerich
Executive Director
Pacific Marine Fisheries Commission
741 State Office Building
1400 S. W. Fifth Avenue
Portland 1, Oregon

Dr. E. Koto
Institute of Fisheries
Hokkaido University
Hakodate, Japan

Dr. John Lyman
National Science Foundation
Washington 25, D. C.

Dr. William J. Hargis, Jr., Director
Virginia Fisheries Laboratory
Gloucester Point, Virginia

Dr. Robert W. Hiatt
University of Hawaii
Honolulu 12, Hawaii

Mr. Charles J. Hoeppel
U. S. Department of Commerce
Coast and Geodetic Survey
417 South Hill Street, Room 535
Los Angeles 13, California

Director (2)
IGY, WDC-A, Oceanography
Texas A. and M. College
College Station, Texas

Japan Meteorological Agency
Oceanographical Section
Tokyo, Japan

Dr. H. Kitamura
Oceanographic Section
Kobe Marine Observatory
Kobe, Japan

Dr. E. C. LaFond
Code 2250
U. S. Navy Electronics Laboratory
San Diego 52, California

Mr. Joseph Mardesich
1513 West Fifteenth Street
San Pedro, California
Dr. D. W. Pritchard, Director
Chesapeake Bay Institute
The Johns Hopkins University
121 Maryland Hall
Baltimore 18, Maryland

Mr. D. W. Privett, Librarian
National Institute of Oceanography
Wormley
Near Godalming
Surrey, England

Dr. D. W. Privett, Librarian
National Institute of Oceanography
Wormley
Near Godalming
Surrey, England

Pusan Fisheries College
Pusan
Korea

Mr. John Radovich
California Department of Fish and Game
California State Fisheries Laboratory
Terminal Island, California

Dr. Gordon A. Riley
Bingham Oceanographic Foundation
Yale University
New Haven, Connecticut

Mr. Don T. Saxby
California Division
California Packing Corporation
2600 Seventh Street
Berkeley 10, California

Dr. O. E. Sette, Chief
Bureau of Commercial Fisheries
Biological Laboratory
450-B Jordan Hall
Stanford, California

Mr. W. T. Shannon, Director
California Department of Fish and Game
926 J Street
Sacramento 14, California

Mr. D. Shoji
Japanese Hydrographic Office
Tsukiji
Tokyo, Japan

Dr. Reimer Simonsen
Institut für Meereskunde
Hohenbergstrasse 2
Kiel, Germany

Mr. W. E. Stewart
c/o California State Chamber of Commerce
350 Bush Street
San Francisco 4, California

Prof. Henry M. Stommel
Harvard University
Pierce Hall
Cambridge 38, Massachusetts

Miss Margaret Storey, Librarian
Natural History Museum
Stanford, California

Dr. Y. Takenouti
Oceanographical Section
Japan Meteorological Agency
Chuo-ku
Tokyo, Japan

Mr. Norman Tebble
Annelida Section
British Museum (Natural History)
Cromwell Road
London SW7, England

Department of Oceanography
Texas A. and M. College
College Station, Texas
Mr. A. J. Thomson, Official Secretary
New South Wales Government Offices
56, Strand
London, W. C. 2, England

Dr. M. Uda
Tokyo University of Fisheries
Minato-ku
Tokyo, Japan

Dr. R. B. Tibby
Hancock Foundation
University of Southern California
University Park
Los Angeles 7, California

U. S. Fish and Wildlife Service
Marine Game Fish Research
c/o University of California
Department of Zoology
Los Angeles 24, California

Library, Code 2420 (2)
U. S. Navy Electronics Laboratory
San Diego 52, California

Mr. Richard C. Vetter
Secretary to the Committee on
Oceanography
National Academy of Sciences
2101 Constitution Avenue
Washington 25, D. C.

Mr. Gilbert C. Van Camp, Sr.
772 Tuna Street
Terminal Island, California

Dr. Boyd W. Walker
University of California
Department of Zoology
Los Angeles 24, California

National Academy of Sciences
2101 Constitution Avenue
Washington 25, D. C.
Director
Washington Biological Laboratory
Bureau of Commercial Fisheries
U. S. Fish and Wildlife Service
Washington 25, D. C.

Dr. Warren S. Wooster
Office of Oceanography
UNESCO
Place de Fontenoy
Paris 7ème, France

Inter-American Tropical Tuna Commission
(c/o Scripps Institution of Oceanography)

Mr. Edward B. Bennett
Mr. T. J. Chow
Dr. M. B. Schaefer

Scripps Institution of Oceanography

Mrs. A. Alvarino de Leira
Dr. Leo D. Berner
Dr. Maurice Blackburn
Dr. Edward Brinton
Dr. Abraham Fleminger
Mr. Jeffery D. Frautschy
Mr. John D. Isaacs
Dr. Martin W. Johnson
Mr. Hans T. Klein
Mr. Garth I. Murphy

Dr. M. Pat Wennekens
Oceanic Research Division
(Code 508)
Naval Ordnance Test Station
China Lake, California

Dr. Kozo Yoshida
Geophysical Institute
Tokyo University
Bunkyo-ku
Tokyo, Japan

U. S. Bureau of Commercial Fisheries
(c/o Scripps Institution of Oceanography)

Dr. E. H. Ahlstrom
Mr. Frederick H. Berry
Mr. Gerald V. Howard

Mr. Joseph L. Reid, Jr.
Dr. Roger Revelle
Mrs. Margaret K. Riedel
Mrs. Margaret K. Robinson
Mr. Gunnar I. Roden
Dr. Richard H. Rosenblatt
Mr. Richard A. Schwartzlose
Mr. Charles G. Worrall (20)
Library (4)
Library, SFA