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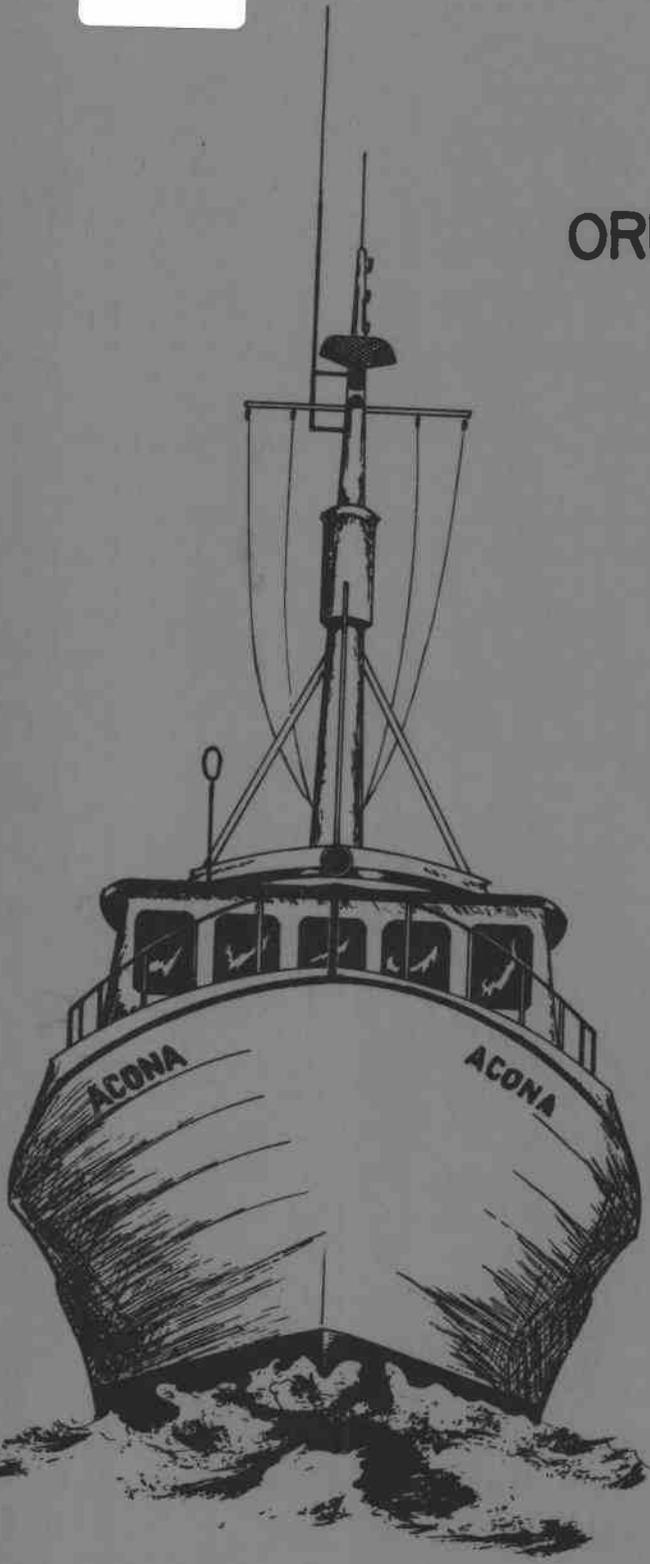
DEPARTMENT of OCEANOGRAPHY

COLUMBIA R.

NEHALEM R.
TILLAMOOK BAY

SCHOOL of SCIENCE

OREGON STATE UNIVERSITY



SILETZ R.

YAQUINA R.

ALSEA R.



SIUSLAW R.

UNPQUA R.

COOS BAY

COQUILLE R.

ROBUE R.

RESEARCH ACTIVITIES

1 October through 31 December
1961

Edited by

June G. Pattullo

Progress Report No. 5

January 1962

Reference 62-1

Department of Oceanography
School of Science
Oregon State University

School of Oceanography

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Office of Naval Research
Contract Nonr 1286 (02)
Project NR 083-102

National Science Foundation
Grant No. G 19783

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(Reference) 62-1
January 1962

Wayne V. Burt
Chairman

INTRODUCTION

This report summarizes the research conducted during the fourth quarter of the calendar year 1961 by the Department of Oceanography, Oregon State University, under contract Nonr 1286(02) Project NR 083-102 with the Office of Naval Research, and Grant No. G 19783 with the National Science Foundation.

RESEARCH IN PROGRESS

Hydrographic Survey of Oregon Coastal Waters -- Wyatt, Kujala and Lollock

Two hydrographic cruises were made during the quarter. From 26 October to 9 November, lines of stations were completed to 165 miles west of Newport, Astoria, and Coos Bay. From 1 December to 4 December a line of stations was completed to 165 miles west of Newport. Observations of nekton distribution (midwater trawl tows) were made in conjunction with the hydrographic casts in an attempt to determine the relationship between organism distribution and the physical and chemical properties existing offshore.

Summary of Samples Taken

Hydrographic Casts.....	46
BT Casts.....	72
Surface Temp. Sal. Obs.....	84
Clarke-Bumpus Plankton Tows.....	29
Midwater Trawl Tows.....	16
Drift Bottles Released.....	356 at 28 Stations

Shore Station Observations -- Hubbard and Kujala

Since May 1959 we have been collecting observations of sea water temperature and salinity at locations along the Oregon coast, in order to supplement the offshore hydrographic casts. A report on the early results from these collections was issued in June, 1961: Surface temperature and salinity observations at shore stations on the Oregon coast, Norman Kujala and Bruce Wyatt, Data Report No. 6, ref. 61-4, Department of Oceanography, Oregon State University.

At present, ten locations are being sampled weekly, from the Columbia River Lightship to Crescent City, California. U. S. Coast Guard personnel take the observations at the Columbia River Lightship; staff of the Seaside Aquarium send us copies of their daily observations; other observers are individual volunteers.

The data are proving very useful in delineating areas of upwelling and in studying nearshore circulation.

Two additional stations, where data are collected daily, were added this fall by research assistant Warren Denner. The observations are made at Newport and Ocean Lake, Oregon, by members of school science classes in these cities. It is anticipated that these data will make possible study and interpretation of variations of shorter periods than can be described from weekly observations.

Water Masses off the Oregon Coast -- Rosenberg and Pattullo

Analyses of historical data in the region are nearly complete and comparisons with recent data collected from the ACONA are being made. A paper is in the early stages of preparation.

Seasonal Heat Storage in the Pacific Ocean -- Pattullo

Compilation of all data and charts for presentation in published form is nearly complete and the main structure of the paper is in hand. Due to other commitments (teaching) it will probably not be possible to finish the paper until late spring.

Plankton Inventories -- Frolander

Weekly sampling in Yaquina Bay, Oregon from 1 October to 31 December 1961 consisted of 16 sampling days during which the following samples were taken at two stations.

Physical data:

Surface and bottom water samples at each station, a total of 48 measurements each of temperature, salinity, and dissolved oxygen.

Biological data:

Quantitative net tows

# 6 mesh tows	22
#12 mesh tows	24

Qualitative half-meter net tows	24
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The following volumetric analyses of zooplankton have been made:

1. Completed volumetric analyses #6 mesh samples
taken 1 April 1961 - 28 September 1961 49 samples
2. Completed volumetric analyses #12 mesh samples
taken 1 April 1961 - 28 September 1961 40 samples

Nekton Studies -- Pearcy, Day and Hubbard

During this quarter a systematic sampling program for small nekton and macroplankton has been established. Midwater trawl collections are now made routinely during the regular hydrographic cruises, thereby providing valuable oceanographic and ecological data for each collection. Moreover, this combination of biological and hydrographic cruises also allows for more efficient utilization of the ACONA.

A total of 24 collections have been taken with the Isaacs-Kidd midwater trawl during this quarter; very few collections have been made during this season in the northeastern Pacific in the past. Although the species composition of these catches appears to be similar to those made during summer, the total biomass of collections for November and December is appreciably lower than those for the summer.

A preliminary survey of the depth distribution of demersal fishes and large epibenthic animals was completed this quarter after making 22 more collections with a small otter trawl. These samples of the benthic fauna from 20 to 1000 fathoms depth represent the largest number of deep-water collections ever made off the Oregon coast.

Benthic Fauna -- McCauley

The inventory of the bottom invertebrates is continuing. To date 40 collections have been made. Seven of these collections were taken with the biological dredge and 33 with the otter trawl. Material from 31 of

the stations has been sorted and 665 species have been accessioned (including duplications from different stations). Of these 665 accessions, 265 have been identified and represent 110 invertebrate species.

The reference collection is being enlarged and now contains 110 species of invertebrates. It includes: 53 species of molluscs, 27 species of echinoderms, 23 species of crustaceans, 5 species of annelids, one species of brachiopod, and one species of pogonophoran.

One of the more interesting collections included a number of tubes from pogonophoran worms. This group of animals has only recently been discovered, and has not heretofore been found off the Oregon coast.

Andrew G. Carey, who recently joined the staff, has been completing an analysis of data collected in Long Island Sound. He has been helping to organize a benthic research program and collecting suitable equipment.

Phytoplankton Taxonomy and Species Composition -- Small and Lehman

For a preliminary qualitative survey, phytoplankton samples were taken at stations 5, 15 and 25 miles off Newport and 5 miles off Coos Bay, with a 6-inch No. 20 plankton tow. Results were as follows:

Dinoflagellates -- 4 genera with 10 species tentatively identified
Silicoflagellates -- 2 genera with 2 species
Diatoms -- 24 genera with 50 species.

Filtration of water samples through membrane filters has shown that a great number of phytoplankton organisms, due to their small size, are not sampled by using a plankton tow. An apparatus for sampling by Millipore filter has been built for use aboard ship. Millipore filters with the sample on them are made into permanent mounts for microscopic examination by clearing and mounting the filter. Several clearing agents and mounting media have been used in a variety of combinations:

Clearing agents

xylene
beachwood creosote
eugenol
cedarweed oil
acetone

Mounting media

Hyrax
Diaphane
Canada balsam

The xylene-Hyrax combination yields the best results, and will be used in future permanent filter mounts.

Sampling in the future will be done on a quantitative basis for numerical and volumetric determinations of standing crop and evaluation of recurring associations of species, as well as for taxonomic work. Samples will be taken at the same stations and depths as samples for productivity and pigment analysis. Initially, two to four liters will be sampled and fixed at each of five depths from NH-165. One liter will be used for permanent filter mounts. One to three liters will be allowed to settle, and quantitative aliquots used for enumeration of species and taxonomic work. Settled samples are more satisfactory for delicate organisms than filter mounts.

Geology of the Oregon Continental Terrace -- Byrne and Bushnell

Thirty-eight of the 129 bottom samples collected from the central Oregon shelf (see Progress Report 4) have been examined under the binocular microscope; grain-size frequency distributions have been completed for these samples. All are fine and medium sand with median diameters ranging from 0.140 to 0.325 mm.

The samples were all taken from the inner portion of the shelf where water depths are less than 50 fathoms. At these depths the bottom consists of fine sand (median diameters between 0.150 and 0.200 mm) except for several areas off Yaquina, Depoe, and Siletz Bays, where medium sand is present. Coarse sands, as yet unanalyzed, have been collected close to Stonewall Bank. Beach sands along this stretch of coast are generally somewhat coarser than the nearshore sand (median diameters between 0.190 and 0.220 mm), a condition undoubtedly due to the removal of the finer-grained particles during sorting in the littoral zone.

Coastal Erosion and Deposition -- Byrne and Kulm

Deposition - Petrographic analyses of the heavy mineral fractions of sands collected from the major rivers discharging into the Pacific from northern California and southern Oregon are currently underway. Grain mounts have been prepared for all 14 of the samples (see Progress Report No. 4), and a preliminary examination has been made of each. As was expected, the mineralogy of the sands transported by the rivers of southern Oregon, which drain several physiographic provinces, is considerably more varied than is the mineralogy of those sands carried by northern rivers, which drain only the Coast Range.

Erosion - A general analysis of the geologic factors which control erosion along 160 miles of the Oregon coast north of the Siuslaw River has been completed. Aerial photographs and published geologic maps as well as investigations at the coast serve as the basis for this study. More than 112 miles of coastline were examined in the field; several areas were studied in detail.

Erosion is active along more than 108 miles of coastline and is controlled primarily by geologic structure (74 miles), lithology (28 miles), and stratigraphy (6 miles). Structure is most important as a control on erosion where the attitude of bedding planes is conducive to landsliding (54 miles), but is also important where erosion follows fractures in the rock (20 miles). Lithology is the dominant control where zones of weakness formed by fractures or bedding planes are absent. Stratigraphic factors controlling erosion involve thickness and attitude of beds (not conducive to landsliding), and lithologic changes from bed to bed.

Rates of erosion were determined for several rapidly-eroding areas by using old and more recent photographs. Erosion rates over different periods of time range from 1.3 to 53 feet per year in areas of unconsolidated sand near Tillamook. In an area north of Newport, where Miocene sandstones are overlain by weakly lithified terrace deposits, the rate of coastal retreat has been about two feet annually since 1880.

A report on this study is in its final stages of completion and will be submitted for publication prior to 1 February 1962.

Estuarine Sedimentation -- Byrne, Kulm and Maloney

Laboratory analyses for the first phase of the Yaquina Bay sediment study have been completed and the foraminiferal fauna has been identified to species. Reports on both the sediments and the microfauna are in early stages of preparation, but should be completed before 1 June 1962.

Chemical Oceanography -- Park, Latimer and DeBen

The pH profiles off Newport, Oregon, from the coast to 165 miles offshore, show a considerable change between August and December 1961. The pH profile for August shows a distinct upwelling pattern, with some local irregularities, while the December profile indicates only a weak upward trend near shore with surface pH values of about 8.2.

A shipboard constant-temperature bath was constructed, using a serological stainless steel water bath. All inorganic phosphate and pH samples were brought to uniform temperature in the water bath, thus reducing the time between water sampling and chemical analyses.

A systematic chemical investigation of Yaquina Bay, Oregon is being planned.

FACILITIES

Research Vessel ACONA

In September a small fire broke out in one of the generators on the vessel. This necessitated drydocking for repairs for more than a month. Since returning to sea on 19 October, the vessel operated on 25 of the 52 days before cessation of operations for the Christmas holiday.

Cruises taken during the quarter are as follows:

Otter trawl	19 - 21 Oct	300 nautical miles
Hydrographic	26 Oct - 9 Nov	1020
Student training	11 and 13 Nov	20
Mid-water trawl	13 - 16 Nov	300
Hydrographic	1 - 4 Dec	330
Equipment testing	7 Dec	10
Temperature inversion	8 Dec	30
Otter trawl	9 - 11 Dec	<u>200</u>

TOTAL 2210 nautical miles

New Quarters Made Available

At the end of this quarter the department moved into new quarters in the recently-completed wing of the Physics-Chemistry Building. This resulted in a doubling of floor space at our disposal (from 5,000 sq. ft. to 10,000 sq. ft., approximately). Also, the entire staff is housed in the same wing, and the space includes a number of well-designed laboratories and much more adequate space for staff and general offices. The space has been allotted to us for a period of two years.

STAFF

Mr. Andrew G. Carey, Jr., has joined the staff with the rank of Assistant Professor. Mr. Carey comes to Oregon State from Yale University, where he has been working on the ecology of benthic animal communities in Long Island Sound.

Mr. Carey did his undergraduate work at Princeton, where he received a B. A. in Biology in 1955. He expects to receive his Ph. D. from Yale in June, 1962. His major professor in the Zoology Department is Dr. Gordon A. Riley, and he has also worked with Dr. Howard L. Sanders of Woods Hole.

Mr. Carey is especially interested in studying the ecology of the benthic invertebrates off the Oregon coast, and in studying the role of these organisms in the food chain. He will be working with Dr. McCauley on these problems, as well as on the quantitative sampling of the populations.

Dr. Herbert C. Curl, Jr., has joined the staff with the rank of Assistant Professor. For the past five years, Dr. Curl has been with Woods Hole Oceanographic Institution, working principally on the physiological ecology of marine diatoms and on the chemical composition and metabolism of planktonic forms. His interests in oceanography are broad; his publications cover many fields and his teaching experience includes a summer course in physical oceanography at the University of California at Santa Barbara.

Dr. Curl received his B. S. from Wagner College, N. Y., in 1950, his M. S. from Ohio State University in 1951, and his Ph. D. from Florida State University in 1956. His major was biological oceanography with chemistry, and physiology among other fields of interest. Just prior to joining us on campus he attended a two-week course in Nuclear Methods in Oceanography at the Oak Ridge Institute for Nuclear Studies.

Dr. Curl, with Dr. Small, plans extensive field and laboratory work on the populations, chemistry and metabolism of phytoplankton populations of Oregon coastal waters.

PUBLICATIONS AND PAPERS

Published

Pattullo, June G. and Wayne V. Burt, 1961. The Pacific Ocean. p. 92-94. In Richard M. Highsmith, Jr. (ed.), Atlas of the Pacific Northwest. Oregon State University Press, Corvallis.

Pratt, Ivan and James E. McCauley, 1961. Trematodes of the Pacific Northwest, an Annotated Catalogue. Oregon State Monographs, Studies in Zoology No. 11. Oregon State University Press, Corvallis. 113 p.

Accepted for Publication

Byrne, John V. and L. D. Kulm. An inexpensive lightweight piston corer
J. Limnology and Oceanography.

Frolander, Herbert F. Quantitative estimations of temporal variations of zooplankton off the coast of Washington and British Columbia. J. Fisheries Res. Bd., Canada.

Frolander, H. F. and Ivan Pratt. A bottom skimmer. J. Limnology and Oceanography.

Pearcy, William G. Ecology of an estuarine population of winter flounder, Pseudopleuronectes americanus (Walbaum). I. Hydrography of the Mystic River estuary. II. Distribution and dynamics of larvae. III. Distribution, abundance, growth, and production of juveniles. IV. Food habits of larvae and juveniles. Bingham Oceanographic Bull.

Submitted:

Hood, Donald W. and Kilho Park. Bicarbonate utilization by marine phytoplankton in photosynthesis. To Physiologia Plantarum.

Presented at Scientific Meetings.

Pattullo, June G. Education for the marine science student. (Part of a symposium.) Given 29 December, 1961 to the Western Society of Naturalists meeting in Eugene, Oregon.