



Volume 5

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Triumphant Return – The Oceanographer arrives at Seattle on July 28 bearing banner that welcomed it to China. See page 3.

Twelve Bills Affecting NOAA Passed By 96th

Dick Keating, NOAA's Congressional Affairs Director, reports a successful legislative period by the Congress in this past session, the 96th Congress scheduled to adjourn on October 4th. Twelve Bills affecting NOAA and of particular interest to the public and private sectors were passed into law between June, 1979 and August, 1980.

Bringing to the oceans a new dimension of activity, the Deep Seabed Mining Bill established its title in the canon of America's laws under sponsorship of Senator Matsunaga (HI) and Congressman Murphy (NY). Finally guided through a labyrinth of debates, over a seven-year period, this bill in comprehensiveness of vision and respect for the environment rewards the efforts of NOAA. Of all the legislation passed this session, the Deep Seabed Mining Bill recognizes

NOAA's efforts in research and planning. Farsighted projects such as the Deep Seabed Mining Environmental Study did much to allay the fears of the Congress as to the

environmental impact of the seabed mining operation.

Perhaps the Ocean Thermal Energy Conversion Acts (OTEC) guided through
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Underwater Research Team Seeks To Uncover Unrecorded Species

A team of underwater scientists have set out for the Gulf of Mexico to examine one of the most unusual marine communities ever discovered in hopes of recovering and identifying animals never before reported.

The expedition is supported by a \$50,000 grant from NOAA's Office of Coastal Zone Management. Participating in it are scientists from Texas A&M University and the Florida based Harbor Branch Foundation.

The scientists, Dr. Thomas J. Bright and Dr. Eric N. Powell, both marine ecologists at Texas A&M are exploring an area of the Gulf known as the East Flower Garden Banks, about 100 miles southeast of Galveston, using a four-man submersible provided by Harbor Branch.

The area contains a brine seep – an underwater "salt spring" discovered in 1976 – whose high salt and sulfur content have created a com-
(Continued on p. 2)

GOES-D Headed For Orbit

A launching was scheduled for early September of the first U.S. satellite capable of near-continuous monitoring of atmospheric water vapor and temperatures used in the analysis of storms and the short lived weather phenomena they produce.

NOAA announced that the National Aeronautics and Space Administration (NASA) would launch the GOES-D satellite for the agency on Tuesday, September 9 or later from NASA's Kennedy Space Center in Florida. The satellite will be the first spacecraft in the Nation's space program to be put in orbit as a joint operational research mission. NASA will use the GOES-D which will be in a geosynchronous orbit at 22,200 miles altitude.

Weather forecasters and other scientists will use the data the satellite gathers on atmospheric water vapor and temperatures to study severe storms and storm-spawned phenomena such as hail, flash floods, and tornadoes.

Once in orbit, the satellite will be renamed GOES 4. It will be equipped with a new type of radiometer that provides the traditional imagery of the Earth's surface and cloud cover used by forecasters with NOAA's National Weather Service.

Additionally, the instrument, a Visible Infrared Spin-Scan Radiometric Atmospheric Sounder (VAS), will record atmospheric temperatures at varying levels and is expected to monitor the amount, distribution, and

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It's been said that in the ocean-atmosphere system, everything is connected to everything else. Conditions at a certain point may consistently be a good clue to features about to take shape thousands of miles away. Such "teleconnections" are studied not only for their potential value in weather forecasting, but also in order to learn more about how the ocean and atmosphere behave.

Space-age Rain Gauge — Dr. Oswaldo Garcia of the NOAA-University of Hawaii Joint Institute for Marine and Atmospheric Research is working on a satellite rain estimation technique that will, among other things, "identify anomalous rainfall episodes in the tropics and help in the study of their possible teleconnections with mid-latitude weather."

During his recent visit to Boulder, Dr. Garcia told NOAA and University of Colorado scientists about his work with the "Kilonsky-Ramage" technique. This procedure, developed at the University of Hawaii, estimates monthly rainfall distributions over the tropical oceans, using cloud pictures from polar-orbiting satellites.

Daily satellite picture mosaics are scanned by eye, and areas of highly reflective clouds are measured. The measurements are subjective because the brightness levels often change from orbit to orbit and day to day, and also because textural features are sometimes used to distinguish between cumulus and stratiform clouds. The size of each

cloud area is plugged into a simple equation to estimate the average rainfall over that area.

Garcia explains that "Most rainfall in the tropics falls in areas of organized convection, which show up well in satellite pictures — the brighter clouds usually indicate deeper convection." The equation relating cloud area to rainfall amount was developed by using a few coral islands in the tropical Pacific as "ground truth" stations. The net result, so far, is more than eight years of uniformly-derived tropical rainfall estimates, which show major large-scale changes in conjunction with "El Nino" equatorial warnings.

In using oceanic radar and continental rain gauge data from the GATE project (Global Atmospheric Research Program's Atlantic Tropical Experiment, 1974) to test the technique, Garcia found that its accuracy is about 90 percent for oceanic rainfall, but drops to about 60 percent when both land and sea areas are combined. He pointed out that polar orbiting satellites supply cloud observations only, and do not observe the vigorous convection over land areas, which usually doesn't begin until afternoon.

A Second Sensor — Dr. Garcia also used GATE data to compare the Kilonsky-Ramage technique with NOAA's "Griffith-Woodley" technique. The latter method uses thermal, infrared observations of clouds, from geostationary satellites, to pro-

vide automated estimates of rainfall over large areas on an hourly or monthly basis. Cloud area is defined by an infrared threshold of -20 degrees Celsius (-4 degrees Fahrenheit), which corresponds to cloud tops high enough to be associated with deep convection and active rainfall.

The infrared technique was also about 90 percent accurate over oceanic areas, except during a period when most of the rainfall was associated with shallow convection. The technique scored about 80 percent when applied to land and sea areas combined.

"Obviously, both methods have their strengths and weaknesses," says Cecilia Griffith, co-ordinator of the G-W technique. Griffith, of the Office of Weather Research and Modification (OWRM), explains that the preferred approach may ultimately rely on some combination of the visible and infrared wavelengths. In this regard, Garcia has started to extend the K-R technique to infrared data as well.

Tool of the Trade — One application of the Griffith-Woodley technique is to estimate the flood potential of hurricanes. The technique was converted to operational use just in time to generate rainfall profiles for Hurricane Allen. Dr. William Woodley, also of OWRM, states that this new tool of the trade, developed through the cooperative efforts of NOAA's National Hurricane and Experimental Meteorol-

ogy Laboratory, National Hurricane Center, and National Earth Satellite Service, is certain to provide valuable hurricane flood warnings in the years ahead.

Tropical Surprise — The weather systems that produce tropical rainfall were described at a recent ERL seminar by Professor Robert Houze of the University of Washington, who operated the NOAA ship *Researcher's* weather radar during the GATE project.

"For years," said Houze, "we've been telling our Meteorology 101 students that there are basically two types of precipitation — convective and stratiform — and that convective systems are responsible for most tropical rainfall. But how well does this traditional thinking really describe precipitation as we know it today, in light of field studies such as GATE?"

Houze states that, surprisingly, almost as much rain seems to fall from the horizontally-stratified clouds that extend far to the rear of towering tropical buildups, as is associated with the convective showers themselves. He says that much of this light rainfall probably comes from convectively generated particles that drift down from the trailing anvil cloud, after convection dies out. He feels that this convective-stratiform mix is rather typical of precipitation systems all over the world, but the ratio of convective to stratiform rain-cloud varies appreciably from one storm to another.

Underwater Research Team Searches For New Species *(Continued from p. 1)*

munity that is "absolutely unprecedented," Dr. Powell said.

"The hydrogen sulfide found near the seep is some 30 times greater than the lethal limits for most known organisms," Dr. Powell said, "but apparently the plants and animals there not only

are surviving, they're thriving."

Although the underwater salt lake formed by the brine contains only bacteria, in one area, the brine tumbles river-like down a canyon wall and mixes with seawater, creating an ecosystem that the researchers expect will

yield at least three of four brand new species of a class of animals known as gnathostomulids.

"We're very excited about this expedition," Dr. Powell reported, "because the sulfur-oxidizing bacteria in the underwater salt lake that act as a food source are separate from

the nearby gnathostomulids and other 'consumers' in the system. It's a perfect arrangement for a comparative study."

The gnathostomulids resemble the flat worms that most biology students have seen under the microscope.



Samples — Dr. Malahoff and his collection.

Tuna Spawned in Captivity; Project Termed Breakthrough

National Marine Fisheries Service fishery biologists and physiologists at the South-west Fisheries Center's Honolulu Laboratory, with the guidance of a biologist from Montana State University, have artificially spawned skipjack tuna in captivity for the first time.

The spawnings took place in large tanks at the Kewalo Research Facility in Honolulu where tropical tunas have been maintained in captivity by NMFS researchers for many years. Richard Shomura, Director of the Honolulu Laboratory, hailed the achievement as a significant development with important implications for future tuna research. Scientists hope to develop techniques to induce tunas to spawn routinely and to rear their young in captivity, and in the process to increase their knowledge of tuna biology.

The abundance and distribution of the older, commercially valuable tunas are greatly influenced by the fate of the young. Because local fishermen rarely catch tunas under 10 inches, the smaller fish cannot be obtained alive for study. Only adult and

larger juvenile tunas have been successfully captured and returned alive to the laboratory. Fishery scientists have long wanted to produce tuna larvae in captivity, but until recently considered this a remote possibility.

In 1977, Dr. Andrew Dizon, leader of the live tuna studies at the Honolulu Laboratory, teamed up with Dr. Calvin Kaya of Montana State University to determine whether tropical tunas could be bred in captivity. In 1979, Kaya induced maturation and spawning of kawakawa (related to black skipjack) with hormone injections. This was the first time this experiment had ever been performed on tunas. Encouraged by Kaya's results, Director Shomura authorized further intensified efforts at the Honolulu Laboratory to breed tuna. The immediate goal was to produce and rear young tunas in the oceanarium at Kewalo, using planktonic food cultured in the laboratory.

Dizon selected fishery biologist Thomas Kazama of the Honolulu Laboratory staff as the overall coordinator for the tuna breeding project. Kazama and his team

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Dense Sulfide Ores Found on Ocean Floor

A dense sulfide ore formation discovered at a depth of 2600 meters in the Panama Basin may prove an important mineral resource in the future. The find also may yield clues to the formation of primeval metallic ores within the Earth.

The sulfide ores found along the Galapagos Ridge contain zinc, copper, iron, barium and trace amounts of platinum, silver and gold. Dr. Alex Malahoff, a NOS geophysicist, speculated that this type of sulfide formation could exist along all ridges throughout the ocean floor. "If such quantities truly exist, mining is a possibility, despite the depth," Malahoff said.

The discovery was a chance finding in January 1980 by a research team comprised of Dr. Malahoff and three co-workers from various institutions who were studying geological underwater formations along the ridge using the deep-diving submarine ALVIN.

The sulfides are formed as a result of seawater coming into contact with underground magma — liquified rock — from the Earth's mantle. The water is heated from 2 degrees centigrade to 400 degrees centigrade when it touches the molten magma at a depth of a few hundred meters below the ocean floor. Isotopes (unattached nuclear elements) leave the liquified magma and mix with the water. These elements then settle out of the water to produce minerals. The minerals precipitate out as the water cools, forming volcano-like columns one meter to three meters high along the ocean floor. The series of formations can stretch for 2-3 kilometers along the ocean floor.

The vents within the column range from millimeters to a few centimeters in diameter. The jet of mineral-water spewing from

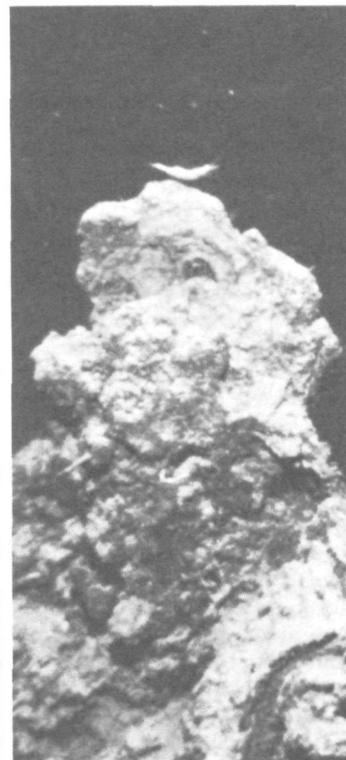
the narrow spout of the active columns is hot enough to melt a metal probe.

Two scientists are analyzing the mineral samples collected during the expedition. Dr. Daniel Appleman, of the Smithsonian Institution, is researching the content of minerals and how they are formed underwater. His results are expected shortly.

Meantime, Dr. David Kronan of the Imperial College of London, England, is expected to complete a study by November of sulfide absorption by the sediments.

Similar sulfide formations were discovered earlier last year along the East Pacific Rise south of Baja California, but they were spongier and less dense than the more recent find. Dr. Malahoff thinks the East Pacific Rise formations could be an earlier stage in the development of the sulfide deposits.

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Sulfide Ore Formation — A shrimp perches on top of a sulfide ore formation found along the Galapagos Ridge.



Graduation — NOAA's Keith W. Johnson, visiting professor of meteorology, and, June Bacon-Bercey, Public Affairs, with graduate Patricia Ann Brown.

JSU Meteorology Program Graduates Its First Student

Patricia Ann Brown of Jackson, Miss., became the first graduate of the NOAA-assisted Jackson State University Meteorology program this summer. Brown was able to graduate this year because of NOAA's efforts in 1979 to expand Jackson's offerings from a few limited courses to an accredited degree program. She will enter the Georgia Institute of Technology graduate school in Atlanta this fall.

NOAA helped Jackson State begin its meteorology program in 1977, and now sponsors summer programs for high school and university students. The agency conducted a seven week introductory course this summer through NWS' Jackson forecast office that trained volunteer high school students to operate simple weather instruments. Dr. Keith Johnson, a meteorologist with NWS, is currently serving as a visiting professor of meteorology at the university. His hope is that "the project will make college

bound students in Mississippi want to major in meteorology."

Meantime, JSU students participated in a 10-week NOAA Summer Student Trainee Program. The internship acquainted students with life aboard NOS research vessels and ocean-atmospheric research.

NOAA also offers further meteorological training through a cooperative program that allows students to work two semesters at a NOAA facility.

The university has established a modern, well-equipped meteorological laboratory. Among the equipment NOAA has furnished the university are a weather facsimile machine which reproduces weather maps and satellite pictures, a weather teletype circuit that provides current weather reports, and a set of instruments similar to those found at NWS observing stations.

NOAA meteorologists will be serving as program consul-
(Continued on p. 7)

NOAA Satellite Unit Upgraded and Renamed

The satellite division of NOAA has been upgraded and renamed to reflect its new and broader responsibilities, Administrator Richard A. Frank has announced.

Frank said the National Environmental Satellite Service will now be known as the National Earth Satellite Service (NESS).

He also announced that David S. Johnson, former director of the service and Diana H. Josephson, former deputy assistant administrator for Policy and Planning, have been named assistant administrator (designate) and deputy assistant administrator (designate), respectively of the reorganized division. They will report directly to the NOAA Administrator.

Earlier this year NOAA was assigned the responsibility for developing and managing a civil, operational, land remote sensing satellite system based upon the technology of the National Aeronautics and Space Administration's experimental Landsat program.

Secretary of Commerce Philip H. Klutznick has provided the Office of Manage-

ment and Budget with a transition plan for NOAA assuming operation of the Landsat system.

NOAA and its predecessor agency, the Environmental Science Services Administration, have managed the Nation's operational weather satellites since 1965. Imagery and data from these spacecraft have been used broadly for weather forecasting and such environmental monitoring as marine navigation, commercial fishing and water resource management.

The Landsat system, with its greater resolution, is expected to be of even greater value for such monitoring and provide data for farming, urban planning, mineral exploration, and other activities.

Johnson has directed NOAA's satellite activities since they began in 1958, and is considered a pioneer in remote sensing satellite systems and their application. He enjoys an international reputation in the field.

Josephson has been involved in NOAA's planning for a national land remote sensing satellite system since the first of the year.

Bay Forecasts Expanded

Recreational boaters who sail the Chesapeake can now venture into remote regions and know the wind and wave conditions that they will encounter because of the National Weather Service is expanded marine forecasts. Nineteen volunteers are now reporting conditions from formerly data-sparse areas along the Bay.

The volunteers, all Chesapeake Bay residents, report directly via touch-tone telephone to the NWS computer in Suitland, Maryland. They phone in the data three times a day, seven days a week.

The volunteers estimate wave heights in one-half to one foot increments. They also note the visual roughness of the Bay.

Wind velocity is measured with a hand-held wind gage, or anemometer.

NOAA started the experimental program last year with 10 observers. Participants were recruited through a door-to-door campaign. They were chosen on the basis of their residency along the Bay, to ensure familiarity with its conditions, and their location near a desirable point for wind and wave observations.

Carolyn Habbersett

Another GOES Satellite Providing Weather Data

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movement of water vapor at various altitudes.

Initially, NASA will use the spacecraft to verify the VAS capabilities. Later, it will replace one of NOAA's existing GOES satellites.

NOAA has operated geostationary satellites for environmental monitoring since 1974. These spacecraft orbit at a speed and altitude which keeps them continually over the same point above the equator, repetitively viewing one-third of the earth's surface. Two are operational now — one over northern Peru, and the other over the central Pacific. Each one provides new imagery every 30 minutes, or more frequently if desired.

Radiometers on the present GOES spacecraft detect and measure the intensity of reflected sunlight, and,

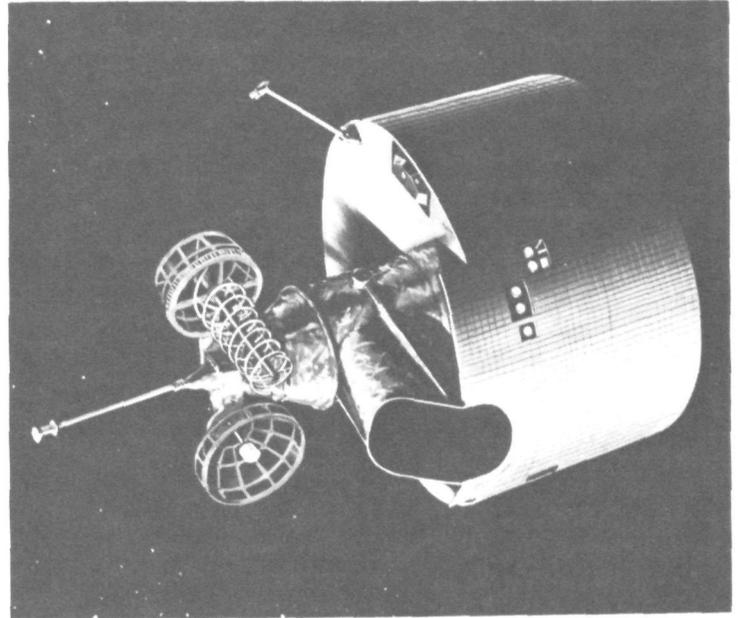
in a single band, can sense a small portion of the heat — or infrared — energy radiated by the Earth and its cloud cover.

The VAS radiometer also detects and measures reflected sunlight, and can sense infrared energy in 12 bands. This expanded capability is expected to give the instrument its "sounding" ability — the capability of observing water vapor and temperature in a column of air. At its present stage of development, the VAS cannot function in all modes simultaneously.

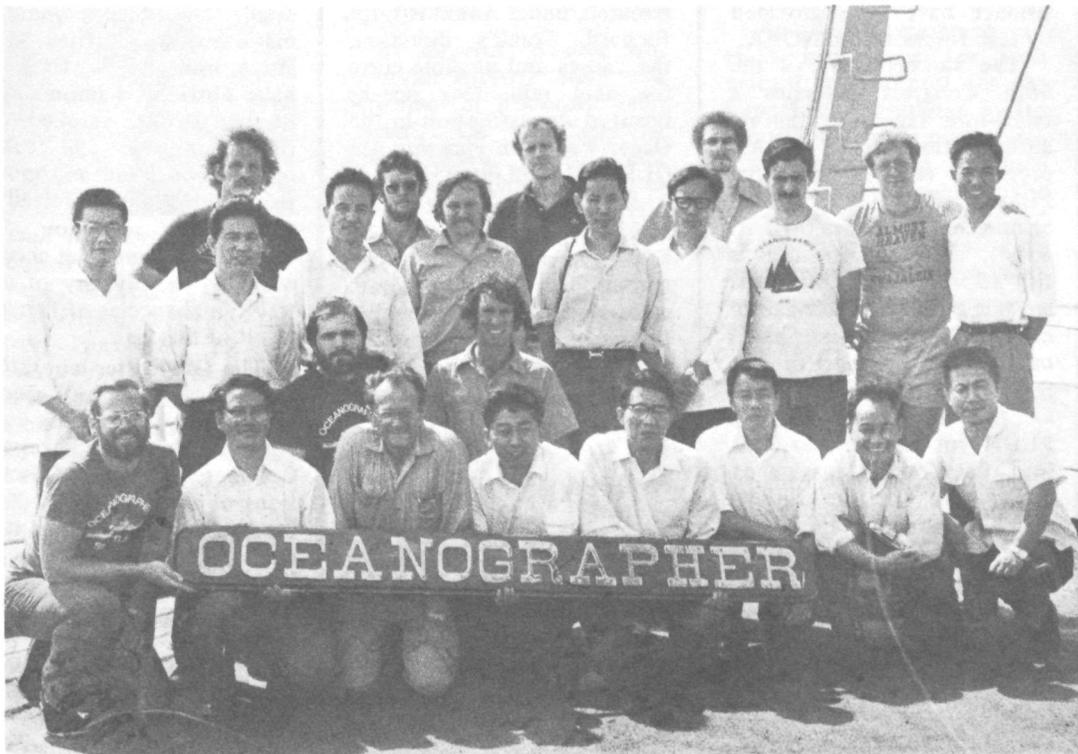
GOES-D will carry aloft three other subsystems. These include a Space Environmental Monitor for measuring solar activity, a Data Collection System for relaying environmental data back to Earth from remote land platforms and from other plat-

forms at fixed locations at sea, and a Telemetry, Tracking, and Command sub-

system that performs a variety of communications functions.



Expedition Crew Photographed



Oceanographer expedition — Scientists and crewmen who took part in the NOAA/Chinese survey of China's outer continental shelf pose for a photograph. The American crew pictured at left are, from left to right, first row, Bob Beardsley, Woods Hole, Tom O'Callahan, NOAA, Tony Manditch, NOAA, Mike Bates, NOAA. Second row — Dick Linebowner, Woods Hole, Ed Enos, NOAA, Gary Nelson, NOAA, John Milliman, Woods Hole, Steve Masterson, NOAA, Jeff Ellis, Woods Hole, Gary Zwifel, NOAA. Twelve of the thirteen members of the Chinese scientific party are pictured. The participants were Sui Liangren, Ying Renfang, Jiang Jingzhong, Zhu Yonggi, Miao Yutian, Guo Binghuo, Le Kentang, Li Fan, Zhou Fugen, Xu Dongyu, Shi Maochong, Xu Mingcai, and Zhao Xucai.

Try To Be Courteous ...Please!

During the hearings on the Civil Service Reform Act, (CSRA) members of Congress and others repeatedly expressed their concern for and emphasized the importance of good manners, courtesy and prompt service by Federal employees. As an outgrowth of its concerns, Congress dealt with these matters directly in the Act.

To further emphasize the importance of good manners, and courtesy in the United States Government, the Office of Personnel Management (OPM) has issued a policy statement, which will be followed up by a Federal Personnel Management Bul-

letin (FPM Bulletin), a two-day course, multiple awards of recognition, and a series of articles to be published in OPM periodicals. The policy statement defines *good manners* as a standard of behavior among Federal employees that is polite and considerate of others, and *courtesy* as the practice, day in and day out, of good manners. These must be reflected in direct dealings between Federal employees and the public as well as in correspondence and publications.

Federal employees are responsible for their own *good* behavior. Supervisors and managers are responsible for creating and maintaining a positive and productive work environment in which employees are held fully accountable for discourteous service to the public and inappropriate, unprofessional or irresponsible behavior. As a part of their responsibility, supervisors and managers should take action to:

- eliminate discourtesy and poor service to the public.
- inform subordinate super-

visors and employees of OPM's Policy Statement

- counsel subordinates and initiate appropriate action to correct inappropriate or unprofessional behavior.
- pursue actively a positive approach to good manners, courtesy and service in the U.S. Government that goes well beyond routine performance appraisals.

Also under the CSRA, the "extent of courtesy" a Federal worker demonstrates to the public may be included among the objective criteria on which performance evaluations are based. The Act also provides that workers may be suspended for up to 14 days for discourteous conduct to the public confirmed by an immediate supervisor's report of four such instances within any one year period or any other pattern of discourteous conduct.

OPM urges, and expects, the full cooperation of all Federal managers, supervisors, and employees in this important dimension of good and efficient administration of the Federal Government.

Panel Evaluates Seafood Buffet

On July 9 the Gloucester Laboratory, Northeast Fisheries Center, hosted the Armed Forces Product Evaluation Committee and their consultant for a buffet of non-traditional fishery products and a tour of the Laboratory.

The Armed Forces Product Evaluation committee is composed of members of each military service, Defense Personnel Support Center, Department of Defense and the Natick Laboratories that meet once every other month at different military bases to consider new products offered by industry of possible government interest.

In 1979, the military purchased 22.4 million pounds of fresh and frozen seafoods worth \$52.8 million, 6.9 million pounds of canned seafoods worth \$12.1 million. John Ryan and his staff at the Gloucester laboratory serve as the consultants for fishery products procurement to the military.

The buffet served to the visitors included red crab salad, stuffed quahogs, marinated squid, fried squid strips, mussel stew, fried red hake portions, salmon cakes, herring steaks, smoked cod fillets, minced cod cakes, minced cod salad and monkfish. All products received an enthusiastic reception. We can expect increasing acceptance by the Military of non traditional species of fish as a result of this visit.

The Gloucester laboratory is also preparing simple descriptions of existing commercial fishery items termed Commercial Item Descriptions or CID's which will be used to purchase canned tuna fish and canned salmon by the Department of Agriculture. These will replace federal specifications which are believed to be complex and restrictive, and, tended to limit competition and increase production and distribution costs.

Twelve Bills Affecting NOAA Passed By 96th

(Continued from p. 1)

Congress by Senator Inouye and Congressman Studds (S.2492 and H.R. 7474 respectively, naming NOAA the lead agency in licensing and ordering OTEC facilities) as well as the companion legislation shepherded by Senator Matsunaga and Congressman Fuqua (S. 1830 and H.R. 7474, supplying fundamental financial and technological foundations for the ultimate "commercialization of ocean energy technology") stand vanguard to the other ten bills affecting our country's natural resources, parks and their sources of management. With OTEC plant-ships supported by guaranteed loans and construction aid, accountability for scientific and environmental leadership rests to a great degree on NOAA's support teams. Prior to this time, OTEC policy guidance and Congressional technical as-

sistance have been provided by task forces within NOAA.

The success story of the 96th Congress becomes a twice-told tale with the re-authorizations of NOAA programs (e.g., Commercial Fisheries R&D: H.R. 4890), endangered species (H.R. 4388), and the anadromous fish (S. 838). Add to these advances the reauthorization of NACOA and, most significantly, the passage of the Supplemental Appropriations and Recision Act including \$1.0M for Landsat, \$5.25M for Coastal Zone Management and \$.93M for the Fishermen's Guarantee Fund, in addition to \$.50M for repairs and restoration of Mt. St. Helens' flood river guages. Furthermore, Senator Proxmire spearheaded legislation (S. 932: the Syn-Fuels Act) defining "acid precipitation," and calling for an inter-agency task force to further

research, under Administrator Richard Frank's direction, the causes and possible cures for acid rain. Our oceans received due attention in the Ocean Pollution Planning Act (H.R. 6615-PL-96-255).

Such evidence of these legislative successes attest to the excellent working relationship of NOAA program efforts with Congressionally-desired program implementation.

New Appointments

Eleven people have been appointed to vacancies on the eight Regional Fishery Management Councils. Eight incumbents also have been reappointed.

Administrator Richard A. Frank, said all will serve three-year terms.



Perry L. Baker has been appointed Meteorologist-in-Charge of the National Weather Service Forecast Office at Des Moines. Baker succeeds Warren C. Caldwell who retired January 11, 1980. The selection was made by NWS Director Richard E. Hallgren, and announced by Central Region Director, Allen Pearson. Baker began his National Weather Service career in October, 1956 as a Meteorological Aide at Rapid City.



Norman E. Carroll has been appointed Official-in-Charge of the National Weather Service Office at Evansville. Carroll succeeds Roland Loffredo who transferred to Weather Service Headquarters. Carroll's weather career began in 1954 in the Air Force. He entered the "Weather Bureau" in 1958 at Washington National Airport as a Meteorological Aide. His rather mobile career took him to Seattle, Honolulu, Northwind Icebreaker (as OIC), San Francisco (as OIC of the Pacific Weather Project), Boothville, Minneapolis (SNS), Key West (Acting MIC) and Caribou (as OIC).

At the invitation of the Navy Oceanographic Institute in Guayaquil, Ecuador, Paul Sund, a National Marine Fisheries Service Oceanographer with the Southwest Fisheries Center's Pacific Environmental Group in Monterey, will present a series of guest lectures on biological oceanography and zooplankton ecology as part of a course in marine science. Sund, whose travel is being funded by the Organization of American States, will be in Guayaquil during October and November, 1980.

Dr. Izadore Barrett, Director of the Southwest Fisheries Center, said that the invitation to Sund is a distinct honor and a recognition of his contributions as a scientist.

The appointment of Captain John D. Bossler, of Johnstown, Pa., as director of the National Geodetic Survey (NGS) was announced recently by the National Ocean Survey.

As director, Bossler will supervise approximately 400 personnel in Rockville, Md., Corbin, Va., Gaithersburg, Md., Ukiah, Calif., and Anchorage, Alaska, and field parties conducting geodetic surveys throughout the United States.

Since 1975, Bossler has served as deputy director of the NGS. He is a commissioned officer in the NOAA Corps and has served as executive officer aboard the NOAA Ship *Davidson*.

A native of Johnstown, Pa., Bossler attended Johnston High School. He received a bachelor's degree in civil engineering from the University of Pittsburgh in 1959 and a doctorate in 1972 in geodetic science from Ohio State University, which bestowed upon him the Heiskanen award for excellence in his field of study.

Tuna Spawned In Captivity; Project Termed Breakthrough

(Continued from p. 3)

of biologists, and technicians—Sharon Hendrix and Martina Queenth—worked for many months to prepare experimental facilities and to produce the required plankton cultures in time for the 1980 summer tuna spawning season in Hawaiian waters. Shoji Teramoto served as the all-important liaison between the laboratory and the local fishing fleet from whom the live tuna were obtained.

There were several false starts. Initially, tuna larvae were spawned but died within a few days. However, On July 15, 1980, a group of skipjack tuna were delivered by the fishing vessel, *Bluefin*. More than 100,000 eggs were stripped from the ovaries of two females and fertilized with milt from two males. Many of the larvae produced from this spawning were alive and feeding actively 10 days later and the scientists at Kewalo hope to raise some of them to metamorphosis, a period which occurs at about two weeks of age when an adult body shape forms.

Another development of great importance for tuna culture was support for the hypothesis formulated by Dr. Kaya. He believes some form of stress triggered the final maturation. Ova from females caught at the same time but sacrificed and refrigerated immediately after capture were

examined. These fish had ova only about 0.6 mm in diameter, in contrast to the ripe eggs of 1.0 mm that were being spawned from those fish kept alive. This hypothesis twice received further verification when another group of live skipjack were received from the *Bluefin* on July 21 and 22. Again, in each instance, the females kept alive became ripe and released eggs while those that were sacrificed immediately were not ripe and contained only the smaller eggs. The results indicate that this is a consistent and predictable response to captivity and confinement, at least during this time of year, and that fertilized skipjack tuna eggs can indeed be produced on demand.

Dizon and his colleagues caution, however, that there are many problems to be solved before "cultured tunas" are a reality, although they are greatly encouraged by the dramatic progress thus far. Tunas, Dizon noted, are exceedingly active and require much food.

JSU Graduates First Met Student

(Continued from p. 4)

tants to the university faculty and students.

Four institutions, the Massachusetts Institute of Technology, the State University of New York at Albany, the University of Washington and the National Center for Atmospheric Research evaluated the Jackson program and found it both viable and competitive.

The American Meteorological Society and former NWS Director George Cressman, now senior meteorologist at the National Meteorological Center, have aided in building the college's meteorological library through donations of journals and books.

—Heidi Daniel

Deep Sea Divers Find Sulfide Ores

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The co-investigators who also participated on the dives are Dr. Robert Embley, marine geologist at NOS, Dr. Dan Fornari, a rock specialist from State University of New York at Albany and Dr. William Ryan, a marine geologist from the Lamont-Doherty Geological Observatory, Columbia University.

—Heidi Daniel

FROM THE GALLEY

NEW ENGLAND SUMMER SALAD

1-1/2 pounds Monkfish, fresh or frozen
1/4 cup commercial oil and vinegar dressing
1-1/2 cups sliced celery
1/2 package (10 ounce) frozen peas, cooked, drained and chilled
1/3 cup sliced green onion
1/2 teaspoon salt



1/2 cup salad dressing or mayonnaise
1 medium-size ripe tomato, diced
Crisp salad greens

Thaw frozen fish. Cut into chunks. Poach* fish. Drain and chill. Add oil and vinegar dressing to fish. Mix carefully; cover and chill 1 hour or longer. Add celery, peas, green onion, salt, and salad dressing or mayonnaise; mix carefully. Cover and chill until ready to serve. Fold in diced tomato just before serving. Serve on salad greens. Makes 5 cups salad.

*To poach fish, combine 1 cup water, 1 tablespoon lemon juice, 1 teaspoon salt, and 1 slice onion in frying pan. Bring to boil. Add fish cover and lower heat. Simmer until fish flakes easily when tested with a fork, 8 to 10 minutes.

Special Occasion Monkfish Salad

Serve Monkfish Salad in avocado or large tomato halves.

NOAA news

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NOAA's Fall Fashion Line

NOAA shirts, shorts, and caps as modeled above are now available for order. Also available but not shown are wind breakers with pockets, navy blue or white and NOAA chest decal, \$11.00; warm up suits, navy blue only, \$28.00; coaches shorts with pockets, navy blue, \$14.00. Items now shown are sizes, s, m, l, x-l. For NOAA decals and your unit name add an additional \$10.00 silk screen charge per order.

Each NOAA unit is asked to designate one person to handle orders. Orders of six dozen or more will be discounted. Smaller orders will be accepted. Prices are as follows; LaCosta knit (left with pocket and decal, \$11.00; T-shirts with large NOAA decal (center), \$5.00; T-shirts with small NOAA decal (right) \$5.00;

Sizes are adult small, medium, large and x-large, Children's sizes available upon request. Caps (one size fits all) are \$3.50; Shorts in sizes XS 24-26, S 28-38, M 32-34, L 36-38 and XL 40-42, navy blue or white with decal, \$4.50 each.

Each unit can have its unit name printed under the NOAA decal at an additional \$10.00 silk screen cost.

Place orders to John M. Caldwell Dist. Co., Inc., P.O. Box 924, Opa Locka, Fla. 33054, phone (305) 685-9822.

All members of the NOAA Diving Program can order items above with "Diving Program" labeled under the NOAA decal by mailing orders to Dick Rutkowski, NOAA Diving Program, 15 Rickenbacker Causeway, Miami, Fla. 33149.

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