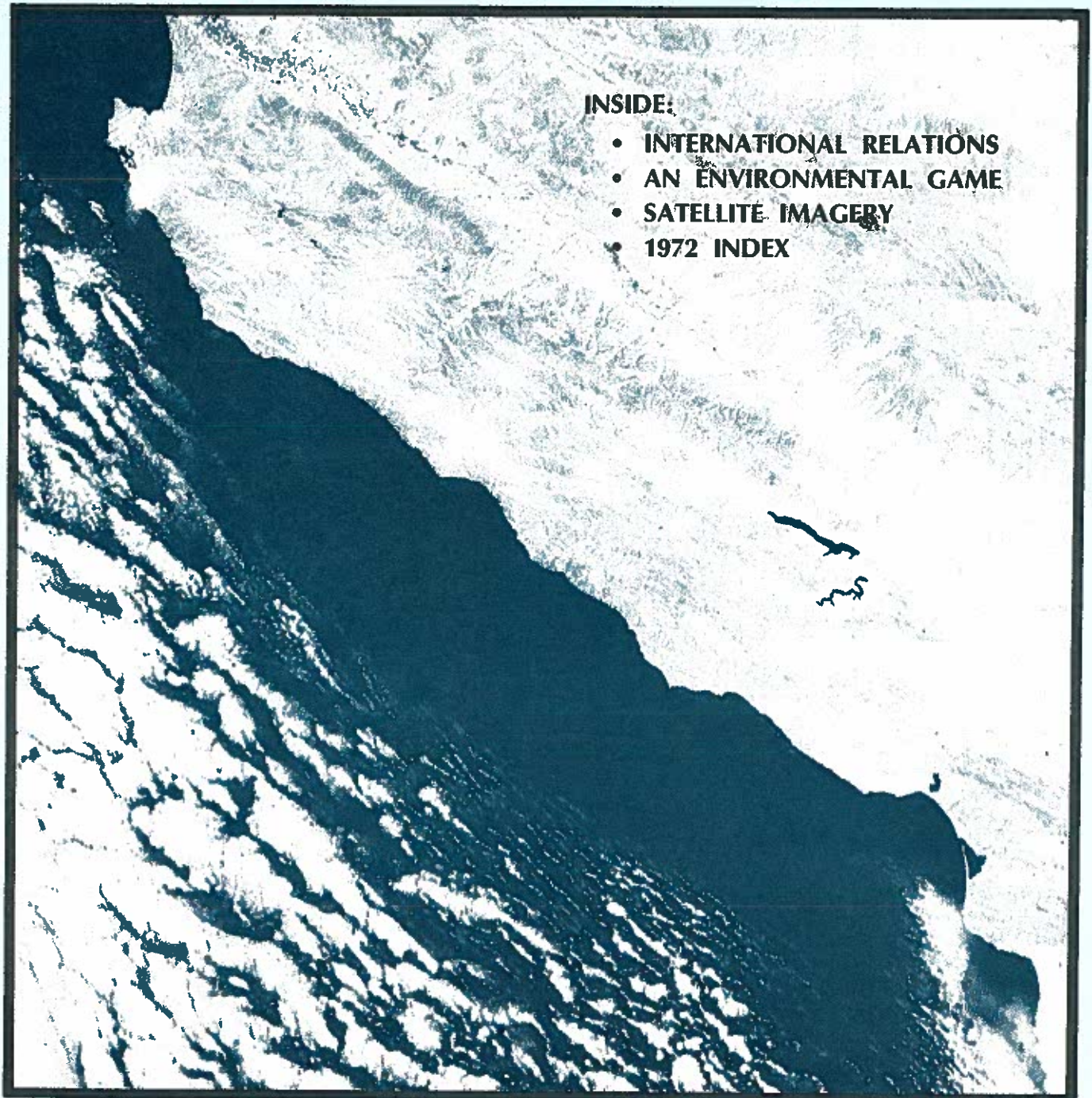


# The University and the Sea

January-February 1973  
Volume 6, Number 1



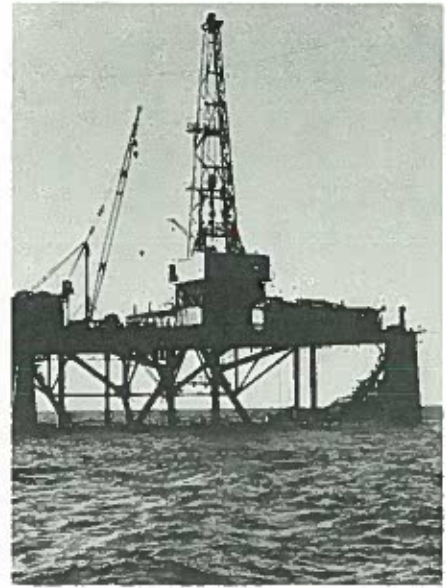
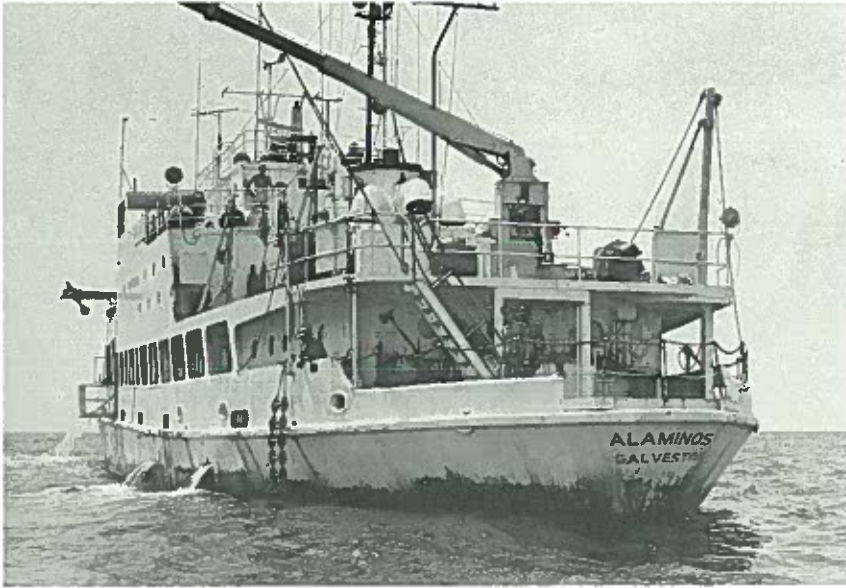
**INSIDE:**

- **INTERNATIONAL RELATIONS**
- **AN ENVIRONMENTAL GAME**
- **SATELLITE IMAGERY**
- **1972 INDEX**

**A SEA GRANT COLLEGE**

**TEXAS A&M UNIVERSITY**





(L) Texas A&M's R/V ALAMINOS participated in a sampling cruise in the summer of last year. (R) Comparative studies are made from this Production Platform.

# Petroleum Activities: EFFECTS?

For more than a decade, Texas A&M University has played a prominent role in "man's return to the sea." The University's Department of Oceanography, Sea Grant College Program and the Moody College of Marine Sciences and Maritime Resources have made A&M a key center of marine research and information for the Gulf of Mexico.

One man who plays an important role in biological oceanographic research in the Gulf and the Antarctic Ocean is **Sayed Z. El-Sayed**, member of A&M's oceanography department for 11 years. Among the many on-going research projects he is currently involved with is a Gulf-wide cooperative environmental research program investigating the effects, if any, petroleum activities have on the marine environment.

Gulf Universities Research Consortium (GURC), a research organization composed of 23 educational and research institutions, is directing the study off the Louisiana coast. According to GURC President, **James M. Sharp**, the Offshore Ecology Investigation (OEI) operates utilizing "sound scientific and administrative bases, dealing with the quantity and diversity of data for its scientific synthesis and interpretation, while establishing adequate standards and valid syntheses."

A member of the GURC/OEI scientific planning council and one of the 20 principal investigators, El-Sayed explains, "Criterion for studying the effects of petroleum activity on marine environs lies in the comparison of relatively undisturbed sectors of coastal waters, referred to in the study as Control Platforms, and

those areas which have experienced extensive drilling and production, cited as Production Platforms."

To date sampling has been within a 10 by 40 mile area, including Timbalier Bay in Louisiana's delta country. This area extends to a 90-foot depth contour on the continental shelf.

"In order to enhance our data collection," states El-Sayed, "additional data have been introduced based on research in the Northeastern Gulf of Mexico—an area noted for drilling activity."

In December 1972, after the first six months of operation, the GURC/OEI investigators met to exchange information and plan for the project's continuation during the next year. Progress reports from the 20 individual studies composing OEI revealed productive coordination and field effort.

"At that point," says El-Sayed, "the OEI council agreed to withhold findings of the comprehensive study until its completion date." When that time comes, findings will be made public. According to President Sharp, the more than 50 sponsoring companies will have no control over either the collection or interpretation of data.

El-Sayed's individual research component of OEI deals with the lower end of the marine ecosystem—phytoplankton (**phyto** denoting "plant" and **plankton** denoting "wandering"). Main objective of his investigation is to estimate the standing crop of phytoplankton (in terms of chlorophyll a, one component of plant life). He is also looking at primary production and inorganic nutrient salts in water columns at both the Production and the Control Platforms off Timbalier Bay.

Cover: ERTS-1 photographic image of California's southern coastline. See story page 10.

# INDEX TO THE UNIVERSITY AND THE SEA

## VOLUME 5, 1972

**Editor's Note:** Numbers appearing next to alphabetically listed entries refer to the issue and the page number respectively.

### a

- Abel, Robert B., 2:4
- Academies, Maritime
  - Texas Maritime Academy, 3:4-5
  - U. S. Merchant Marine Academy, 2:2
- Advisory services, marine
  - for commercial and small business firms, 6:3
  - for environmental problems, 6:2
  - for fishermen, 2:11
  - for industry, 6:3
- Anderson, Roger D., 3:10; 4:10
- Antoine, John W., 4:11
- Atlases
  - environmental geologic atlas of Galveston/Houston area, 4:9
  - of Louisiana wetlands, 1:5
  - on marine environment of the Gulf of Mexico, 6:2

### b

- Baylor College of Medicine, 5:6-8
- Berg, Robert R., 3:12
- Bentley, Helen Delich, 3:5
- Boating seminar, proceedings of recreational, 2:8
- Bradley, James R., 4:4; 6:3
- Bragg, Dan, 3:6; 4:4
- Brazosport College, 1:6-8
- Brimble, Ray, 3:8

### c

- Cable systems in the ocean, 1:9
- Calhoun, John C., 2:3, 8; 3:12; 4:3; 5:2; 5:4; 5:12
- Charts, Nautical
  - of Galveston Bay shipping dangers, 4:5
  - of Matagorda Bay, Texas, 6:3
- Clark, Willis H., 4:11; 5:2
- Clayton, William H., 3:4-5
- Coastal zone planning/management
  - curricula in, 2:5; 3:11
  - in NACOA report, 5:4
  - Texas legislation on, 1:10
  - Texas Senate Interim Coastal Zone Study committee, 6:6
  - Woods Hole Oceanographic Institute workshop on, 4:10
- Cobb, Bryant, 2:8-9
- Colp, John L., 3:9
- Conservation (see Coastal zone planning/management)
- Cook, Earl, 5:11
- Coral reefs (see Flower Gardens)

### d

- Data buoys, oceanographic/meteorological in Gulf of Mexico, 4:5
- Deadweight tonnage, (dwt), 3:6-8
- Deep Sea Drilling Project, 1:4
- Delaune, Kathryn M., 2:8
- Denman, Diane, 3:4-5
- Dinkins, Carol, 2:11

### Directories

- of personnel in government agencies, marine-related, 2:8
- of Texas' marine resource capabilities, 4:10

### Diving

- at Flower Gardens, 3:9
- in Florida Aquanaut Research Expedition (FLARE), 1:3
- training programs in, 2:5
- Dominquez, Richard R., 1:9
- Dredging, hydraulic, 3:3
- Dredging, Fifth Annual Seminar, 5:12
- Duerr, Christine, 4:6

### e

- Eddy, Gulf Stream, 2:10-11
- Education/training, marine
  - College of Marine Sciences and Maritime Resources, 3:4-5
  - workshop on, 6:7
  - in hyperbaric/underwater physiology, 2:5
  - in SCUBA, 2:5
  - marine law curriculums, 2:11
  - marine resources management graduate study, 2:5
  - oceanic/marine technology program, 1:7-8
  - oceanography information kit, 1:3
  - post-doctoral program, 3:11
  - teaching aids for, 3:10
  - Texas Maritime Academy, 3:4-5
- El-Sayed, S. Z., 3:12; 6:2
- Energy, U. S., 4:12
- Environment
  - catalog of services/technical books, 5:5
  - information center, 6:3
  - protection of coastal zone, 6:6
  - studies of problems, 1:5
  - troubleshooter team, Texas A&M, 6:2-3
- Environmental Protection Agency (EPA) 4:11
- Environmental Quality, Citizen's Advisory Committee on, 1:5
- Environmental Quality, Council on, 1:5
- Exhibits, Texas A&M, 2:12

### f

- Federal Maritime Commission, 3:5
- Fife, William P., 2:5
- Fish culture station, freshwater, 1:12
- Films
  - FLARE, Florida Aquanaut Research Expedition, 5:11
  - SEA DOC, Texas A&M University, 4:9
- Fisheries, U. S.
  - finfish, 3:2-3
  - Gulf and Caribbean Fisheries Institute, 5:9
  - shellfish, 5:6
  - shrimp, 2:6-7; 6:5
- Fish protein concentrate (FPC), 2:8-9
- Flower Gardens, 3:9; 6-8
  - research center for, 3:9

### g

- Galveston, Texas, 2:2; 4:5
- Game Fish Research Conference, International, 5:9

- Geyer, Richard A., 1:12; 2:12
- Gillespie, Samuel M., 3:2-3

### h

- Hann, Roy W., 6:2
- Herbich, John B., 3:9, 11
- Holcomb, Hoyt, 6:4
- Hollin, Dewayne, 6:3
- Houston Ship Channel, 5:7-8
- Houston, University of, 1:8
- Hughes, J. Martin, 6:2
- Huitt, Ralph K., 4:11; 5:11
- Hurricane Celia, human response to, 5:11
- Hyder, Kamaluddin, 2:8-9
- Hydromechanics Laboratory, Texas A&M, 2:11
- Hydrodynamic forces, 1:9

### i

- Information centers, marine
  - at Corpus Christi, 3:12
  - at Galveston, 6:8
- Isbell, Truman, 1:8

### k

- Ketchum, Boswick H., 4:10
- Klontz, Bill, 4:9
- Klussmann, Wallace, 4:12

### l

- Laguna Madre, 4:6
- Law, marine, 5:3-4
  - Bates College of Law, University of Houston, 2:11
  - curricula in, 2:5
  - public rights on beaches, 6:6
- Lemmon, Rep. Ray, 2:3; 3:11; 4:11; 6:7
- Lohse, Alan, 2:4
- Louisiana State University, 1:5

### m

- MacVicar, Robert, 4:11
- Malaquite Beach, 4:8
- Manned Undersea Science & Technology Program (MUST&T), 1:3; 3:9
- Maps
  - of continental drift theory, 4:3
  - of Mid-Atlantic Ridge, 4:2
  - of Padre Island, 4:6
- Mariculture, shrimp, 6:4-5
  - World Society of, meeting, 4:12
- Marina management/operation seminar, 5:11
  - proceedings of, 5:9
- Marine affairs, student conference on, 4:10
- Marine Technology Society, 1:3
  - conference/exposition, 4:12
- McCloy, James, 6:8
- Medicine
  - Aquatic Animal Program, Texas A&M
  - College of Veterinary Medicine, 4:9
  - Baylor College of Medicine, 5:6-8
  - virologic/epidemiologic studies in, 5:6-8
- Metcalf, Theodore, 5:1
- Meteorology, 4:5; 5:4
- Mid-Atlantic Ridge, 4:2
- Middleton, Capt. Edward (Ned), 1:7-8
- Miloy, Leatha R., 4:11; 5:9, 12

## N

National Academy of Science Committee on Polar Research, 3:12  
National Advisory Committee on Oceans and Atmosphere (NACOA), 5:3-4  
National Ocean Survey (NOS), 1:9  
National Oceanic and Atmospheric Administration, Department of Commerce, 1:3, 9; 2:4; 3:9; 4:2  
National Maritime Research Center, 2:2  
National Science Foundation, 1:4; 2:5  
National Seashore, 4:6-8  
Nets, construction/repair, 1:7-8  
Newsletters  
    "Texas Trawler," 6:8  
    "The Texas Law Institute Reporter," 2:11  
Nickelson, Ranzell, 2:8; 4:10; 5:9; 6:8  
Nierenberg, William A., 4:12; 5:2

## O

Occupations, maritime, 1:7-8; 3:4, 8  
Oetking, Philip, 2:6-7  
Ocean engineering, 1:9  
Oceaneeing Conference, First Caribbean, 6:8  
Oceanographer, Navy, 4:11  
Oceanography, American Society of, 1:3  
Oceanography information kit, 1:3  
Oil spills (see also Pollution, Water)  
    containment studies, 2:11  
    control of, 3:9

## P

Padre Island, Texas, 4:6-8  
Paralytic shellfish poisoning (PSP), 1:2-3  
Parker, Jack, 3:9, 6:4-5  
Pelican Island, Galveston, 3:4  
Petrochemical industry of Texas, 3:6  
Phillips, Clinton, 2:5  
Pollock, Howard W., 4:11; 5:10  
Pollution, noise, 4:10  
Pollution, water  
    by oil spill, 5:4  
    by viruses, 5:6-8  
Ports, offshore  
    for Texas, 3:6-8  
    socio-economic impact of, 4:4  
    workplan for, 3:7-8  
Ports, Texas, 3:7-8  
Ports, U. S., 3:6-8  
Prensal, Rep. Bill, 3:4

## R

Ray, Sammy, 1:2  
Recreation (see Tourism/recreation)  
Red tide, 1:2  
Rock, formation of, 1:4  
Rona, Pete A., 4:2

## S

Santa Barbara Oil Spill Symposium, 5:4  
Schaffer, Ruth C., 5:11  
Schwartz, Sen. A. R., 1:10; 3:4; 6:6  
Science/Engineering Fair, in Houston, 1:12; 2:8  
Scott, Martha R., 5:11  
Scott, Robert B., 4:2  
Sea floor/spreading theory, 4:2  
Seafood  
    marketing of, 3:2-3  
    processing plants, 4:10  
    quality control publications, 2:8; 4-10

Sea Grant Advisory Panel  
    Southern California, University of, 1:12  
Sea Grant Institutions, National Association of, 4:11; 5:10  
    award of, 5:10  
Sea Grant Program, National, 5:3-4  
    at Texas A&M University, 5:2  
    director, 5:2  
    establishment of, 5:10  
    grant, 4:3  
    program description, 1:7-8  
    Sea Grant College designation, 1:12; 2:4  
Shih, C. S., 4:11  
Shipbuilding facilities, 2:2  
Ships (see also Texas A&M Research Vessels)  
    ACUSHNET, 4:5  
    DISCOVERER, 4:2  
    GLOMAR CHALLENGER, 1:4  
    LULU, 1:3  
    MT MITCHELL, 1:9  
    M/V CAROL, 4:5  
    M/V LADY ANNA, 1:7-8  
    M/V MISS FREEPORT, 1:7-8; 3:9  
    M/V TEXSUN, 1:7-8  
    NASSAU/FREEPORT, 5:9  
    NISSEKI MARU, 3:6  
    QUEEN ELIZABETH 2, 5:5  
    RHETORIC, 3:1  
    RUDE and HECK, 4:5  
    R/V ISELIN, 4:2  
    ship sharing program, 1:11  
    shipwrecks, 4:6-8  
    Spanish galleons, 4:6-8  
    SS WILLIAM BEAUMONT, 4:5  
    V. A. FOGG, 4:5  
    VALLEY FORGE, 3:8

Shrimp (see Mariculture and U. S. Fisheries, Shrimp)

Smith, Gov. Preston, 2:3, 12  
Spilhaus, Athelstan, 5:10  
Sorensen, Robert M., 6:8  
Southwest Research Institute, 2:6-7

### State agencies

Florida Department of Commerce, Section of Technology and Coastal Resources Development, 5:12

South Texas Regional Export Expansion Council (STREEC), 3:7

Texas Council on Marine Related Affairs, 2:3; 4:11; 6:7

Texas Interagency Natural Resources Council (INRC), 1:10

Texas Senate Interim Coastal Zone Study Committee, 6:6

Stephenson, Robert C., 5:2

### Submersibles

EDALHAB II, 1:3  
    laboratory design of, 6:8  
NEKTON GAMMA, 3:9

Superports (see Ports, offshore)  
Supertankers, 3:6-8

## T

Texas A&M University  
    Biology, Dept. of, 2:5  
    Center for Dredging, Civil Engineering Dept., 3:3; 5:12  
    Center for Marine Resources, 5:2  
    Coastal and Ocean Engineering Division, Civil Engineering Dept., 1:9  
    College of Business Administration, 2:5  
    College of Marine Sciences and Maritime Resources, 3:5  
    Data Processing Center, 1:9

Environmental Engineering Division, Civil Engineering Dept., 5:7-8; 6:2  
Environmental Quality Program, 5:11  
Health and Physical Education, Dept. of, 2:5  
Industrial Economics Research Division (IERD), Texas Engineering Experiment Station, 4:4; 6:3  
Marine Laboratory, Moody College of Marine Sciences and Maritime Resources, 1:2-3  
Marketing, Dept. of, 3:2  
Oceanography, Dept. of, 1:11; 2:12; 4:11  
Research vessels  
    ALAMINOS, 2:12  
    DUET, 1:11  
    EXCELLENCE, 5:7-8; 6:1  
    KASIDAH II, 1:11  
    LA MER II, 1:11  
    LEPRECHAUN, 1:11  
    MARINER, 1:11  
    ORCA, 1:11  
Sea Grant College Program  
    day, 1:12  
    dedication, 2:4  
    director, 5:2  
    grant, 4:3  
    program description, 1:7-8  
Texas Agricultural Extension Service, 2:11, 6:4-5  
Texas Agriculture Experiment Station, 1:12  
TEXAS CLIPPER, training vessel, 3:4-5  
Texas Maritime Academy, 1:8  
Wildlife and Fisheries Sciences, Dept. of, 1:12; 4:12  
Texas Council on Marine Related Affairs, 2:3, 4:11; 6:7  
Texas Industrial Commission, 5:5  
Texas Superport Study Corp., 4:4  
Texas, University of, 2:12; 4:9; 5:12; 6:8  
Tourism/recreation, 4:8  
Trade Fair, Texas/International, 5:5  
Trans-Atlantic Geotraverse (TAG), 4:2  
Transmission of graphics, 1:9  
Treadwell, T. K., 1:11, 12

## U

University-National Oceanographic Laboratory System (UNOLS), 1:11

## V

Virology/epidemiology, Baylor College of Medicine, 5:6-8

## W

Wallis, Craig, 5:8

### Water quality

determination of standards when accounting for uncontrollable pollution, 4:11  
International Water Resources Association (IWRA), 2:12  
sanitary control measurements in Texas, 5:7  
water resources symposium, 5:12

Water Resources Association, International, 2:12

White, Robert M., 2:4

Whitehorn, Norman C., 2:8; 3:9; 4:10

Williams, President Jack K. (Texas A&M), 3:5, 12; 4:3

Winkler, Capt. Bowlin, 1:7-8

Woods Hole Oceanographic Institution, 3:11; 4:10



Other GURC-member institutions participating in OEI are the University of Florida, the Gulf South Research Institute, University of Southern Mississippi, University of South Florida, Louisiana State Universities at New Orleans and at Baton Rouge, University of Texas at Port Aransas, Gulf Coast Research Laboratory and Southwest Research Institute.

Program coordinator for GURC, **Joe W. Tyson**, says that OEI is a one-of-a-kind program in many aspects. He says, "The importance of OEI extends well beyond our deriving a valid and acceptable definition of the possible effects of petroleum operations in estuarine and continental shelf environments. Properly accomplished and reported, OEI can do much to establish a pattern for similar environmental research efforts on a national and international basis, thereby enhancing environmental science and the solution of environmental dependent public problems."

Tyson concluded, "Hopefully, the Gulf Region will have led the way in demonstrating to the scientific community the ability of the academic community to accomplish good science and solve problems concurrently with obvious and visible benefits to the public." ■

## on undersea mineral exploration

**Underwater mining** will be the theme for an institute and short course April 12-14, at the University of Wisconsin's downtown Milwaukee campus.

Wisconsin's Sea Grant Program, the Mining Engineers of the AIME and NOAA's Marine Mineral Technology Center, Tiburon, Calif., are sponsoring the Institute.

Keynote speakers from the industry will give presentations on mineral exploration offshore Greenland; spherical agglomeration of metals recovery; profitable management; Manganese values and sites in the Pacific; locating deposits electrically; spade corer and camera exploration; mineral prospects off Seward Peninsula; a breakthrough in profitable recovery; special techniques for locating copper; and the New England Offshore Mining Environmental Study.

"Noteworthy of this year's Institute is the innovation of a special one-day short course covering the very latest procedures in underwater minerals exploration," states **J. Robert Moore**, program chairman for the Institute. Open to all registrants, the short course which follows the institute, will be conducted by UW staff. Course discussions will cover program planning, geophysical instruments, shipboard procedures, coring and sea floor sampling, mineral and chemical analyses, data handling, dispersal patterns as clues to ore, interpretation of survey results and economic considerations.

For registration information contact **Gregory Hedden**, Sea Grant Advisory Services, University of Wisconsin, 610 Langdon St., Madison, Wisc. 53706. ■

## Maps to aid storm victims

Storm evacuation maps of the Corpus Christi and the Galveston/Houston areas of Texas are now being issued to possible storm-endangered areas.

Four maps have been issued for the area, including the communities of Corpus Christi, Robstown, Odem, Taft, Portland, Aransas Pass, Rockport and Refugio. They show emergency evacuation routes, areas subject to flooding and elevations which might afford "safety islands" for storm evacuees. The maps are distributed to state and local officials and community emergency preparedness committees by the National Oceanic and Atmospheric Administration's National Weather Service. Maps also may be purchased by the public for \$2 each from the Distribution Division (C44), NOAA National Ocean Survey, Riverdale, Md. 20840.

Storms, particularly hurricanes, on the Atlantic Coast and the Gulf of Mexico have periodically caused extensive tidal flooding of low-lying regions. The National Weather Service maintains a close watch on the storms, predicting the height of the storm tide and issuing warnings for areas subject to flooding. The storm evacuation map program was instituted by NOAA to fill a need for small-scale, special-purpose maps to facilitate evacuation of people from endangered areas. Material for the maps is provided by field survey teams of the National Ocean Survey.

Contours on the maps provide a means of estimating areas of possible flooding. They include delineations of main evacuation roads and feeder roads; low points along the roads that might be engulfed; and high spots which are likely to remain above flood waters, thus affording degree of refuge. These critical elevations are spaced on the maps at intervals of at least two miles.

Areas subject to flooding in increments of five and ten feet are shown in distinctive color tones. Both surfaced and unsurfaced evacuation roads are identified, along with county, state and federal designations and the number of lanes for each road. The maps are printed at a scale of approximately one mile to the inch and can be reproduced by mass communication media, including newspapers and television.

In addition to the Corpus Christi and Galveston/Houston areas, five maps are available from New Orleans, La. to Mobile, Ala. ■

THE UNIVERSITY AND THE SEA is published bi-monthly by the Texas A&M University Sea Grant College Program, College Station, Texas 77843. Leatha Miloy, Head, Department of Marine Resources Information; Ronda Reagan, Editor. Vol 6, No. 1. January-February 1973. Second-class postage is paid at College Station, Texas 77843.

## World Mariculturists Meet

# U.S., Mexico Talk Fish Culture

Among the major nations of the world, Mexico and the United States enjoy a particularly close relationship sharing ties of heritage, blood, culture and common goals. Theirs is a friendship that has matured through the centuries and is bridged by the waters of the 889-mile river, the Rio Bravo to Mexicans and the Rio Grande to Americans.

In late January, Mexico hosted the Fourth Annual Meeting and Workshop of the World Mariculture Society, an international conference that emphasized the bond between the neighboring countries. Approximately 200 representatives from four countries attended a series of eight workshops related to fish and invertebrate culture.

Following a welcome to the state of Nuevo León by **Governor Luis M. Farias, Hector Medina Neri**, Subsecretary of Fisheries, commented on the fishing industry of his country.

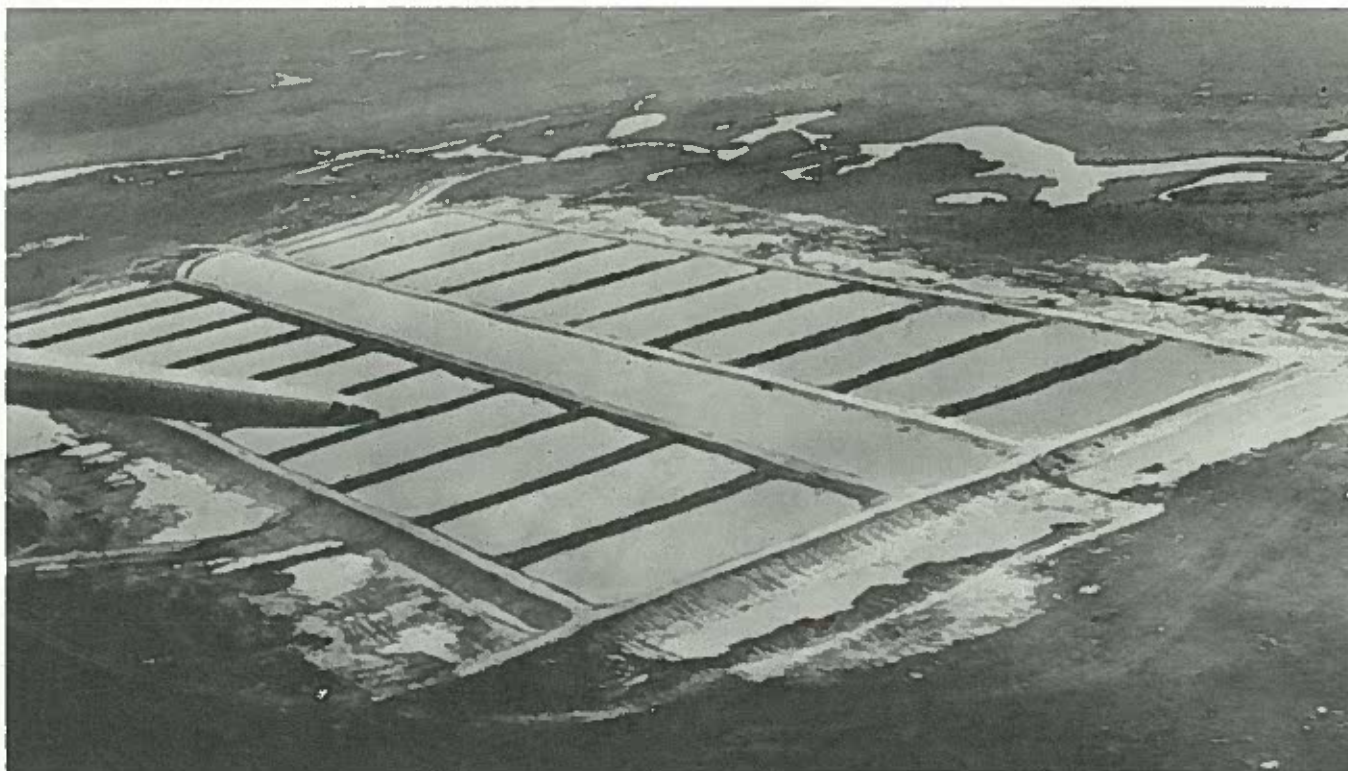
"In the seas and in the rivers are unexploited resources, of which we shall avail ourselves with the

audacity of a young nation that believes in its destiny," said Neri, quoting the words of **Mexican President Luis Echeverría**.

Neri pointed out that fishing has been transformed into one of the most dynamic activities of his country as a result of the economic policies of President Echeverría.

"To encourage the utilization of our fishing resources, the Mexican government has implemented a large number of measures that have created the foundation of an economic and administrative structure which will permit the integrated development of fishing on a short-term basis," Neri told members of the Society.

"For this reason," he continued, "the present administration is emphasizing the diversification of the catch, favoring those scaled species that promise good economic prospectives, healthful and abundant food, new jobs, an influx of foreign currency and the development of related industries."



At Angleton, Texas in Brazoria County, Texas A&M mariculture specialists operate 20 one-half acre ponds. Record yield for one pond is 1,800 pounds of white shrimp (tails on).

Prior to the first workshop of the four-day meeting, **Harold H. Webber**, president of Groton BioIndustries Development Co., discussed the risks of aquaculture. In his keynote address, Webber summarized the points of the sessions that followed.

"Aquaculture is an enterprise that requires knowledgeable, venturesome and resourceful technologists-business managers to structure a practicable system of economic aquafood production," Webber maintained. "The risks in this undertaking are numerous and often ill-defined, but the potential rewards are great.

"Although it has become common to compare aquaculture with the poultry production industry, which has now reached a highly sophisticated and complex state of development, no aquacultural candidate animal is as well understood as is the chicken.

"Nor do we have command over the environment to such a degree that the production of aquafoods in adequate sustained supply justifies the major investment that seems to be required."

Webber further pointed out that researchers must still provide assurance that they are able to control diseases, predators and competitors. In addition, aquaculturists must be able to command a supply of vigorous seed stock, to obtain an appropriate feed for growing and to manage the environment in order to enhance the probability of a satisfactory return on investment.

Concerning the future of aquaculture and especially shrimp mariculture, **Jack C. Parker** of Texas A&M University predicted that in 10 or 15 years experimental ponds in the southern United States and in Mexico will produce enough shrimp to meet not only the market demands of the U. S. and Mexico but also those not currently met in Europe.

"In the not-so-distant future it will be possible to produce, by means of control systems in estuaries and ponds, a quantity of shrimp equivalent to the 1,500,000 pounds annually extracted from the Gulf of Mexico," Parker told members of the Society.

Parker also noted that results of shrimp mariculture may be especially good in Mexico because of the excellent climatic conditions.

Parker, who served as program chairman for the meeting, said in retrospect, "One thing that is especially obvious from this last conference is that the interest and emphasis is on shrimp culture. Up until now researchers have been demonstrating that shrimp mariculture is certainly feasible. This in turn has encouraged more basic research in the areas of nutrition, reproduction and physiology."

Parker also pointed out that the general attitude of the Society's annual meeting is changing. "In the past tremendous optimism but little extensive economical review characterized Society workshops and meetings. Now, however, attitudes have become more realistic about mariculture as a commercial endeavor," he said.

Other activities of the meeting included the election of new officers: **Wallace Klussmann**, Texas A&M University, president-elect; **Don Moss**, Auburn University, secretary-treasurer; and **Harry Schafer** and **Harold H. Webber**, directors. ■

## new publications

The following new publications are available from Texas A&M University's Center for Marine Resources, College Station, Tx. 77843. Please make requests for TAMU publications by title and publication number; prices are given where applicable.

### A FIELD INVESTIGATION OF ROLLOVER FISH PASS, BOLIVAR PENINSULA, TEXAS

S. H. Prather and R. M. Sorensen, TAMU-SG-72-202. September 1972. Cost: \$3.

A field study was conducted to evaluate flow and stability characteristics of the tidal inlet, investigate the propagation of the tidal wave through the connected bay system, and evaluate the effect of the inlet on tidal fluctuations. Data analysis was complemented by Gulf tidal data provided by the Galveston District Corps of Engineers.

### ECONOMIC DEVELOPMENT STUDY OF THE TEXAS COASTAL ZONE

Gerald R. Rapp, David M. French and John Miloy, TAMU-SG-72-212. June 1972. Cost: \$3.

Data compiled from records of 36 Texas coastal counties between 1940-1970 are related to future projections of growth from the present to 2000 AD. Analysis of population, industrial, employment and economic trends suggests potential shifts due to decline in extractive industries and increase in secondary industries.

### EXTENDED RESULTS ON OPTIMAL INVESTMENT STRATEGIES IN SHRIMP FISHING

R. L. Sielken, Jr., R. G. Thompson and R. R. Wilson, TAMU-SG-72-211. December 1972. Cost: \$3.

A method of obtaining optimal investment strategies for shrimp fishermen is developed and illustrated in this report. It is designed to enable shrimp fishermen, with a given amount of capital, to obtain guidelines for financial decision making.

### THE ECONOMIC IMPACT OF A DEEPWATER TERMINAL IN TEXAS

Daniel M. Bragg and James R. Bradley, TAMU-SG-72-213. November 1972, 55 pp. Cost: \$3.

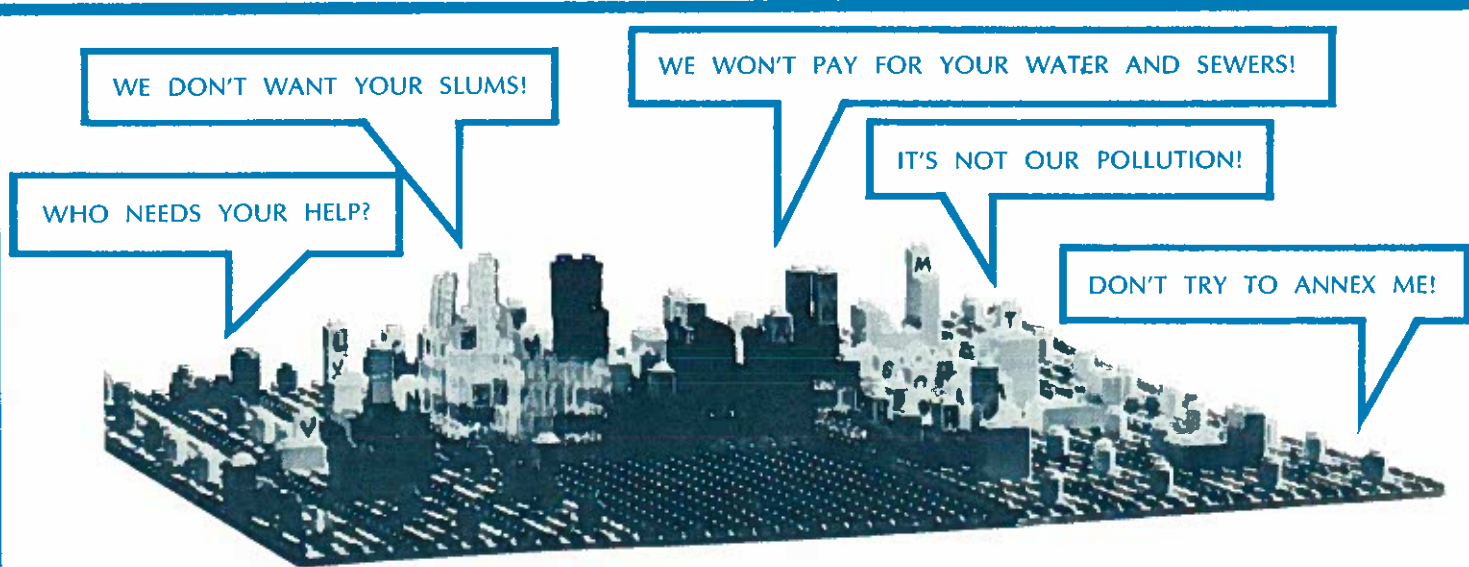
This report is the first known effort to assess the economic multiplier effect of an offshore, bulk-unloading ship terminal in the United States. Discussion considers not only what effects are expected to result from construction and operation of the facility, but also what may happen to the state's economy if the terminal is not built. A study area is defined, a methodology for economic impact determination is established, and the nature of the inputs into the Texas Input-Output Model is described.

### THE POST-GRADUATE FATE OF OCEANOGRAPHY MAJORS FROM TEXAS A&M UNIVERSITY

Worth D. Nowlin, Jr., Reference 72-9-T. September 1972, 17 pp. Order from the author, Dept. of Oceanography, TAMU, College Station, Tx. 77843.

A study of the fate of 111 M.S. and 72 Ph.D degree recipients in the field of oceanography at Texas A&M from 1952 to 1970 is reported as to type of employment and employer, location of employment and the number of publications per year since graduation from Texas A&M.





# Gaming and the Environment

\*by Roland D. Paine

Karl Wilhelm Ferdinand, duke of Brunswick-Wolfenbüttel and general in the Prussian army, was fleeing across the plains of Saxony with his King Friedrich Wilhelm III. Their army had been routed by French soldiers near the village of Auerstädt.

Friedrich Wilhelm von Hohenlohe-Kirchberg, general in the Prussian army, was also fleeing across the plains of Saxony with fellow general Ernst von Rūchel. Their army had been routed by French soldiers near the town of Jena.

It was late afternoon, October 14, 1806. The twin defeats of Auerstädt and Jena marked the utter destruction of a once-proud Prussian military machine and foreshadowed the surrender of the kingdom of Napoleon Bonaparte, one month later. They also foreshadowed a period of reform, emancipation of peasants, intellectual upsurge, increased freedom and thoroughgoing reshaping of government and society.

## Let's Play War

Participating in the intense period of self-analysis and reconstruction that took place throughout the Prussian kingdom was the army. And one of the intellectual techniques that was revived and sharpened for purposes of officer training was the war game. War games, in their modern form, had been originated by the Prussian army in the latter half of the eighteenth century when it was building toward its first period of influence under Frederick the Great. Earlier war games,

*\*Permission to reprint from NOAA, October 1972, from author, Roland Paine.*

used not for training but for sport, still exist in such games as chess.

The war game, as used for officer training, is meant to simulate real-life problems. It can be more or less complex, depending upon the kind of tactical situation to be analyzed. Sometimes designed as a model by which an actual battle is to be conducted, the major use is as a way of helping officers learn about the many factors that can affect the course of an operation. So successful was this Prussian invention that it was later adopted and expanded by the Russian, British and American armies, among others.

## It's Business's Turn

An outgrowth of war games began to appear in the 1930's, when various kinds of "crisis" games were developed to permit analysis of problems in international politics. This led eventually to the development of business games, beginning in 1956 under the sponsorship of the American Management Association.

Again, as with war games, these games are used primarily for training purposes, though sometimes extended into examination of actual operational problems.

## Playing Games with Water Resources?

Enter the Sea Grant Program, University of Michigan. Michigan Sea Grant scientists are working toward nothing less than an overall model of Great Lakes water resources, which can be used to optimize the uses of that water. "Like a game of chess," said a Michigan Sea Grant article in 1970, "the proper management of our natural resources involves understanding all the



**ramifications of any given move.** Michigan Sea Grant studies the interactions of the uses and attributes of the Great Lakes, with an eye to providing decision-makers with a clear understanding of the consequences of any given action. Only if the rules are clearly understood can a good 'game' be played."

The Michigan Sea Grant team is very clear about the dual nature of its objective—first, to obtain the knowledge needed for sound decision-making, and second, to get that knowledge into the hands of the decisionmakers in forms that they can use. Because the fresh water resources of America's "Fourth Sea-coast" are deteriorating, the problems undertaken are serious and urgent. Research is geared to providing reasonable action alternatives, and NOAA is supporting the program at an annual level of about \$1 million.

Public policymakers are involved in the design of some of the Michigan Sea Grant experiments, so that the scientists will better understand the kinds of information public officials need when they exercise their responsibilities to make decisions affecting water resource use. And the scientists, in turn, frequently furnish data that they know to be relevant but that the public officials were not aware of.

**Allan G. Feldt** of the university's Environmental Simulation Laboratory, School of Natural Resources, has worked with simulation games for several years. He and two associates have now completed the first game—called **WALRUS I**, for "Water and Land Resource Utilization Simulation"—for Michigan Sea Grant. **"The purpose of this game,"** Feldt explains, **"is to provide one means of communication and interaction among the Sea Grant scientists, and between the Sea Grant team and the public that they seek to serve."** WALRUS I is the first of three planned gaming-simulation models of increasing complexity and sophistication. Work is currently under way on the development of a second, more sophisticated and more "true to life" model—WALRUS II.

### Who Plays?

As with all simulation games, WALRUS involves three basic elements. First, the players assume roles—roles that do not necessarily correspond to their real-life situations. Second, they have a scenario that defines a problem area. And third, there is an accounting system designed to keep track of events and their consequences during the play.

**"WALRUS players assume the roles of city officials and other local groups who are faced with the problem of pollution in a nearby waterway,"** Feldt explains. **"The various teams of players represent groups with different economic and geographical interests. In a few rounds of the game, the players are supposed to work up a solution that is acceptable both scientifically and politically. They learn, too, that no matter what decisions they make, the environment is going to reflect them—for good or for bad."**

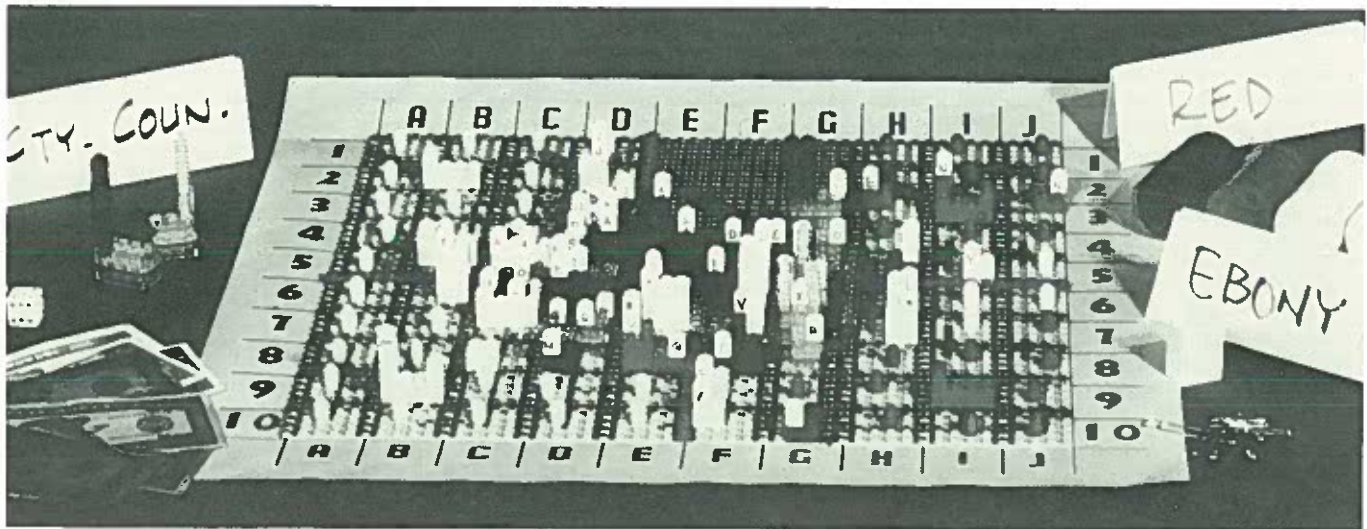
The game was tested and retested during the course of its development, first among the Sea Grant team and later by outside groups of the type that might use it for purposes of analysis, either in exercising their own decisionmaking responsibilities or for educational purposes. Numerous games have been played by city officials of Traverse City, Michigan, as well as by students and other groups in the small city at the foot of Grand Traverse Bay.

**"Traverse City is particularly appropriate because WALRUS was planned as a sort of simplistic analog of the problems of Traverse City and Grand Traverse Bay,"** Feldt notes. Grand Traverse Bay itself bears many resemblances to Lake Michigan, in microcosm, and is the concentrated field study area of Michigan Sea Grant in developing its techniques for later extension to the problems of the Great Lakes as a whole. **"So if we can develop a game that is really useful for analysis of the kinds of decisions that Traverse City has to make,"** Feldt says, **"then we have one more tool in making Sea Grant useful to the very people it is designed to serve."**

Elected officials and planning board members of Traverse City gave assistance, advice and criticism of the game in its earlier forms, and this has helped greatly in defining the present state of the game. There is evidence too, that WALRUS is already proving useful to them, for many have expressed great interest in playing it again, saying that it has given them a new look at the total environmental system that they are dealing with. Indeed, the Chairman of the Regional Planning Commission and a long-time member of that body exclaimed, following his exposure to it: "I'm

**"WALRUS players assume the roles of city officials and other local groups who are faced with the problem of pollution in a nearby waterway,"** explains **Allan Feldt, the game designer.**





going to have to rethink my whole approach to planning because of this!"

Played by high school students, WALRUS has fascinated them and shown them how complex environmental decisions are, helping some of them begin to realize that simply "shutting down the factory" isn't an adequate solution.

#### How to Play

Unlike most games played for fun, WALRUS does not have a single specific goal that all players strive for and that represents a "win." In chess, a Bobby Fischer attempts to defeat a Boris Spassky through checkmate. In Monopoly, each player tries to force the others out of the game by amassing property and money. **But in WALRUS, as in real life, the players select their own goals.** During play, they attempt to control, and probably optimize, their own position and the status of the region with respect to any one or more of four basic elements: economic strength (measured by play money); political strength (based upon the number of residential units controlled or owned within each political jurisdiction); personal status and prestige (measured by poker chips representing "influents," which are awarded on the basis of public office and other factors); and overall environmental quality of the water (measured according to the number of units of effluents that accumulate in the bay and river system according to the land uses in existence and the type of treatment provided).

When operated on a manual basis, the game operator simply keeps a record of how many effluents are emitted from each land use and notes where it enters a river or bay. The effluents decay slightly over each round but gradually build up in the bay at a rate faster than the rate of "natural" decay. The greater the amount of development, the greater the buildup. The buildup can be decreased by providing sewer lines and treatment facilities, which must be paid for and which require political responsibility for providing for them.

The number and effectiveness of such facilities matched against their cost and associated political factors constitutes the basic attempt at control over environmental degradation that WALRUS permits. Such

control requires money, understanding of the problem and carefully developed political cooperation.

When the game is operated with computer assistance, the computer is the "environment" exercising a subtle but inescapable influence over the decisions.

The kit for the game consists of a playing board "map," and numerous [Lego] pieces of different colors and sizes representing such factors as water and sewer lines, residences, agriculture uses, water plants, industries, sewage plants and many others. Several charts are required, some to be maintained by the players and some by the game operators. They include a pollution record chart, influents and votes accounting sheet, municipal budget sheet, team property holdings and cash flow sheet. The game ordinarily requires 15 to 25 players, arranged in five teams (each at a table), and with other tables for the township boards and city council, the game operators, and the game board itself.

In short, it is a game that cannot be adequately described in words. Even in its present simple form, it is a complex undertaking whose purpose is analysis of real problems and action to recognize and solve those problems through simulation of real-life activities.

As Feldt points out, "Operational games have been developed to make possible understanding of a situation in a way that is not readily transmittable through use of other media, such as the printed word. **To try to convey the real meaning of a game in print is thus necessarily a contradiction in terms. The best way is to play the game.**"

If you would like to give it a try, you won't have to wait long. The Environmental Simulation Laboratory at the university is making arrangements to have the game produced, to make its educational and analytical benefits more widely available. ■

**Editor's Note:** Allan G. Feldt recently visited the Texas A&M University campus to give a presentation on WALRUS I. A cassette tape and slide unit describing gaming and simulation and WALRUS I are available for loan or duplication from the Center for Marine Resources. Interested persons should inquire to the Editor, The University and the Sea.



# Advisory Services Go National

A Texas shrimper is concerned because much of his catch is spoiled by the time he gets back to shore . . . ; a marina operator learns that he has violated a regulation that he did not know existed . . . ; the city council of a coastal community needs help with a solid waste disposal problem . . . ; a commercial fisherman plans to buy a new vessel but does not know how or where to apply for a loan . . . .

Where can people with problems like these turn? To Texas A&M University's marine advisory services personnel.



Seafood quality control is an important area of concern to Sea Grant Advisory specialists.

Initiated in 1968 as one of the Sea Grant Program's three major components, A&M's advisory services operate as a communication link between people whose livelihood and/or leisure time involves marine resources and the University's scientists and engineers, studying their types of problems.

These advisory services recently received new emphasis with the creation of a national network of Marine Advisory Services (MAS), administered by the National Oceanic and Atmospheric Administration (NOAA). MAS will make it easier for Texas A&M advisory personnel to call on technical staff of other NOAA components—the National Marine Fisheries Service, Environmental Research Laboratories, National Ocean Survey, Environmental Data Service, National Weather Service and the National Environmental Satellite Service.

"We are building on the successful tradition of the agricultural extension service, linking colleges and universities to the users at a grassroots level," said NOAA Administrator, **Robert White** in announcing MAS.

Each NOAA component has designated a marine advisory specialist at its headquarters according to White, and NOAA personnel at laboratories and field installations throughout the United States have been designated as MAS representatives.

**Robert C. Stephenson**, director of TAMU's Sea Grant College Program and the Center for Marine Resources, says, "Texas A&M's marine advisory program is a team effort. Creation of MAS, in effect, adds new emphasis to an already active program."

Stephenson explains that advisory personnel are specialists in a broad range of marine-oriented fields. The advisory program uses field specialists, publications conferences, workshops, demonstrations and films to maintain regular contact, individually or collectively, with fishermen, seafood processors, marina operators, city managers and planners, port directors and engineers. Consultation and problem-solving are available to government, business and industry, education and other public and private organizations as well as to the general public.

Stephenson points out that the four primary advisory areas—fisheries and seafood technology, technical development, law and environmental quality—enlist about 16 field specialists with supporting facilities and personnel on the College Station campus.

"With direct communication to all components of the National Oceanic and Atmospheric Administration," Stephenson notes, "Texas A&M's program will be better able to deal with a broader scope of problems in Texas' coastal zone. ■"



# Satellite Aids Resource Management

Earth Resources Technology Satellite (ERTS-1), launched in July of last year by the National Aeronautics and Space Administration, is orbiting the earth collecting valuable data for evaluating the world's oceans, lakes and bays, its marine resources and the atmosphere.

More than 300 scientists are engaged in various research experiments, employing data from ERTS-1 for applications in agriculture, cartography, forestry, geology, geography, hydrology, oceanography and meteorology. During the satellite's projected one year lifetime, several oceanographic studies are being conducted by the National Oceanic and Atmospheric Administration at various locations.

NOAA wants to learn whether satellite imagery can be used to find living resources in the sea or map water masses and surface currents and thusly, assist in sea transportation, weather prediction and fisheries management.

Such ocean phenomena as water masses or currents show up on the satellite's images by color variation. NOAA scientists are attempting to relate the color differences shown in ERTS images to the actual properties of the water as measured at the surface.

National Marine Fisheries scientist **William Stevenson** is experimenting with locating menhaden in the Mississippi Sound. When ERTS-1 is over the Sound, aircraft and surface vessels are gathering data at the same time. If a correlation can be established between the satellite images, environmental conditions, and the presence of fish stocks, as shown by aircraft and surface vessels, such satellite data might be used to assist in fisheries management and operations.

The project's goal is to learn to interpret the satellite data so that studies of oceanographic elements can be undertaken with minimal need for supporting surface or aircraft data.

In NOAA's National Weather Service, meteorologists are studying ERTS images as a potential source of new information on the structure and behavior of severe storms and other weather systems. The images from ERTS-1 have a higher resolution than satellite pictures now in use by meteorologists, and the Weather Service study is directed mainly at determining the usefulness of ERTS's sharper images.

NOAA's Earth Resources Data Center at Suitland, Md., is making the satellite data available to users in the oceanographic, hydrologic and atmospheric sciences and to the general public. Other data centers are operated by the Departments of Interior and Agriculture.

There are public browse files at 22 locations in the United States, one of which is Texas A&M University's Remote Sensing Center. Users may order copies of the

browse file material in a variety of formats: system-corrected images, scene-corrected images, or digital data. Costs vary with the type of format and the number of copies requested.

According to **John W. Rouse, Jr.**, director of the Remote Sensing Center, the browse files at TAMU are open to the public Monday through Friday from 9 a.m. to 4:30 p.m. ■

## Supertanker

**Globtik Tokyo**, a 477,000 dwt tanker, is now the world's largest vessel, stealing the title from the 372,000 dwt **Nisseki Maru**.

Launched in October 1972 by Globtik Tankers Ltd, U.K., the 1,250-ft. long **Globtik Tokyo** exceeds all previous VLCC (very large crude carriers) in all dimensions and features numerous innovative improvements in design. Construction costs for the supertanker neared \$50 million.

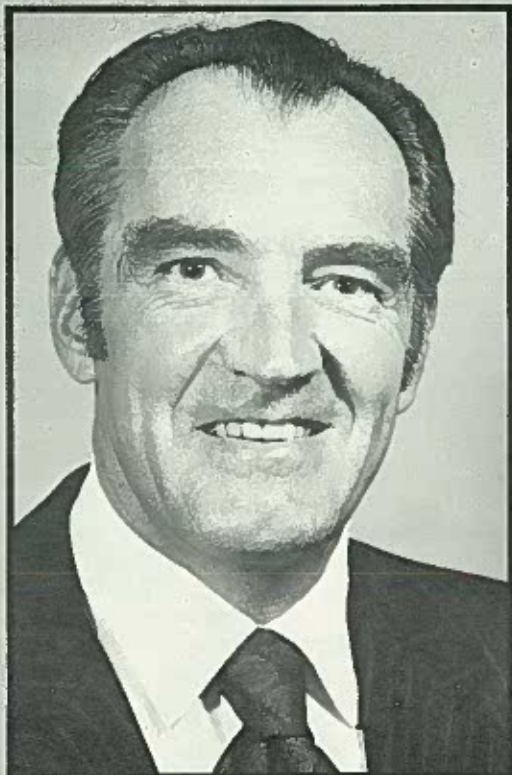
Specifications include a crude oil carrying capacity of 3.6 million barrels (42 gallons per barrel) and a service cruising speed of 15 knots.

**Globtik Tokyo** will be chartered to Tokyo Tanker Co. this month to carry crude oil from the Persian Gulf to Nippon Oil Group's central terminal station in southern Japan.

Significant improvements include an anti-explosive inert gas system which uses exhaust gas from the boiler as an inert gas to blanket the tanks after cleansing and cooling by seawater. A tank cleaning device which allows only clean water to be discharged into the sea is another improvement in vessel design. The system utilizes two slop tanks for collecting oil after each tank has been cleaned by the automatic cleaning equipment.

Other innovations include a slow speed meter which measures finite movements caused from wind and currents; an automatic anti-collision device, part of the ship's two radar units; a navigational satellite system; bridge engine controls; and elevators to transport the crew to living quarters 118 feet below the deck.

For record enthusiasts, the five-blade propeller measures 30 feet in diameter, and paint required for the supertanker totaled 400 tons.



## Meet Adm. Smith

Navy Adm. **John Webster Smith**, former director of instruction at the National War College in Washington, is the new superintendent of the Texas Maritime Academy at Galveston.

William Clayton, dean of TAMU's Moody College of Marine Sciences and Maritime Resources, has served as acting superintendent since Adm. James D. Craik's retirement last year.

Adm. Smith's 30-year Navy career includes several key educational assignments. He participated in the organization of the U. S. Naval Destroyer School at Newport, R. I. and then served as one of the institution's department heads. Prior to that he served two years as assistant professor of naval sciences at Columbia University.

He also has extensive experience at sea, having commanded four vessels and later served as commander of a destroyer squadron. Adm. Smith, a native of Delaware, recently completed a master of science degree from George Washington University's School of Public and International Affairs. ■

# TEXAS MARINAS ORGANIZE

Owners and operators of 25 Texas marinas recently met in College Station to organize the **Marina Association of Texas (MAT)**.

First known organization of its kind in the nation, MAT is an outgrowth of numerous marina management seminars sponsored by the Texas A&M University Industrial Economics Research Division (IERD) and A&M's Sea Grant Program. Purpose of this organization is to provide a central point for communication of ideas, principles, practices and ethics in marina management and operation, while studying means for improving and expanding existing and planned marinas. MAT members will attempt to support, counsel and cooperate with other marine recreational organizations in an effort to improve the state's industrial, business and economic development.

**Robert Bates** of Lake Village Marina, Flint, Tx. will serve as MAT president. Other officers are First Vice President, **Frank R. Nicholson, Jr.** of American Diversified Properties, Inc., Dallas; Second Vice President, **Mike Carmichael** of Carmichael's Marina, Hemphill; Third Vice President, **Henry M. Anderson** of Watergate

Yachting Center, League City; Secretary, **Rick Smith** of Lake View Marina, Belton; Treasurer, **Myrven H. Cron** of Adventure Investment Corp., Houston; and Executive Secretary, **Kathryn M. Delaune** of Texas A&M's Industrial Economics Research Division. A 15-member board of directors has also been elected, and a constitution with by-laws approved.

According to Miss Delaune, a specialist in marine recreation, IERD is providing technical advice and administrative services to the association. She notes that Texas is a leader in the recreational boating industry with Texans owning more boats per capita than residents of any other state. During the past several years, Texas boat registrants grew four times as rapidly as the population of the State.

Membership in MAT is open to all persons with a primary responsibility for marina activities in Texas. Associate memberships are also available.

For further information contact **Kathryn Delaune, Industrial Economics Research Division, Texas A&M University, College Station, Tx. 77843. Telephone (713) 845-5711.** ■

▶ Newest member of the Texas A&M University armada is a 34-ft. cabin cruiser, the **CHEETAH**. A gift from Houston physician, **Thomas P. Kennerly** (a 1934 A&M graduate), the vessel is berthed at A&M's Moody College of Marine Sciences and Maritime Resources at Galveston.

William H. Clayton, dean of the Moody College, says the vessel will be used for coastal research, diving training and for small-craft maneuver drills for the Maritime Academy cadets. The vessel is powered by a twin-screw engine.

▶ Over 65 Gulf coast area boating enthusiasts met in Houston during January to learn about new federal **boat safety regulations** resulting from the Federal Boat Safety Act of 1971. The one-day presentation by the U. S. Coast Guard was sponsored by TAMU's Industrial Economics Research Division with support from the Sea Grant College Program.

Safety personnel from the Eighth Coast Guard District in New Orleans conducted the seminar-type program which included discussions on equipment regulations, boat manufacturers' requirements, safety, education, law enforcement and the Coast Guard Auxiliary.

▶ The Texas Agricultural Experiment Station at Texas A&M University is undertaking a year-long study of the Gulf shrimping industry thanks to a \$48,000 research grant from the National Marine Fisheries Service (NMFS).

Principal investigators, **Wade L. Griffin** and **Ronald D. Lacewell** of the Department of Agricultural Economics and Rural Sociology, hope to establish statistical parameters on predominant fishing ground locations. They will also evaluate the catch in relation to the unit of effort expended for a number of years. Griffin notes that a unit of effort is that of one shrimp boat per fishing day, measured in terms of the physical characteristics of the boat (horsepower, number of nets, gross tons, etc.).

▶ Establishment of a Department of Marine Sciences for the **University of Texas at Austin** was recently authorized by UT's Board of Regents. Final approval from the Texas College and University System Coordinating Board remains.

**Stephen H. Spurr**, president of UT/Austin, and **Truman Blocker**, president of UT's Medical Branch at Galveston recommended the department for providing focus on marine education and research activity as well as an information source on training and careers in marine studies on the Austin campus. The proposed department will promote an interchange of faculty and students among UT's Marine Science Institute at Port Aransas, the Marine Biomedical Institute at Galveston and the Austin campus.

Other objectives are to provide graduate study on an individual basis until formal marine science degrees are approved and to foster cooperative teaching and research among all components of the UT system.

▶ A new publication intended to aid fishermen plan and cut nets is now available free of charge from the University of Rhode Island Marine Advisory Service. The 12-page booklet, "How to Plan and Cut Nets" by veteran fisherman, **Albert J. Hillier**, illustrates laying out and cutting all parts of a trawl from a sheet of webbing with a formula to determine any tapers. Request by bulletin series No. 8 from URI/MAS, Univ. of R.I., Narragansett Bay Campus, Narragansett, R. I. 02882. ■

**LEATHA MILOY**, Head of the Department for Marine Resources Information; **RONDA REAGAN**, Editor for **THE UNIVERSITY AND THE SEA**.

Texas A&M University's Sea Grant College Program is made possible through an institutional award from the National Oceanic and Atmospheric Administration, U. S. Department of Commerce. More than 60 individual marine resource development projects are carried out under the program involving 18 departments and divisions of the University. Dr. Robert C. Stephenson is Sea Grant Director.

**THE UNIVERSITY AND THE SEA** is published bi-monthly by the Center for Marine Resources. Subscriptions are available upon written request. Address all inquiries to the Editor, Center for Marine Resources, Texas A&M University.

## The University and the Sea

TEXAS A&M UNIVERSITY SEA GRANT PROGRAM  
W. T. DOHERTY BUILDING  
COLLEGE STATION, TEXAS 77843

Second Class Postage  
**PAID**  
College Station, Texas