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NEWSLETTER

Gulf Breeze Laboratory



FROM THE DIRECTOR

This second issue of our newsletter reflects our continued concern with the dissemination of information on current investigations and developments at the Environmental Research Laboratory, Gulf Breeze (ERL, GB), and its Bears Bluff Field Station on Johns Island, SC. We are appreciative of the warm reception given our first issue. Use of additional photographs in this issue is in response to suggestions for more graphics.

Because the newsletter contains current and newsworthy information that may be incomplete or preliminary, I want to remind readers that all data and conclusions must be regarded as provisional. The names of scientists associated with ongoing experiments are again included with each article describing a project. These staff members should be contacted before any use is made of this report, either at (904) 932-5311 or FTS 686-9011 at ERL, GB or (803) 559-0371 for the Bears Bluff Field Station.

We continue to solicit ideas from our readership for ways to improve this publication. We hope that these brief summaries of research projects will enlighten the readers and provide an insight into the work and the mission of EPA's Office of Research and Development and the role of its support laboratories.

A handwritten signature in cursive script, reading "Thomas W. Luke". The signature is written in dark ink and is positioned above the printed name and title.

Director, Environmental Research Laboratory
Gulf Breeze, Florida



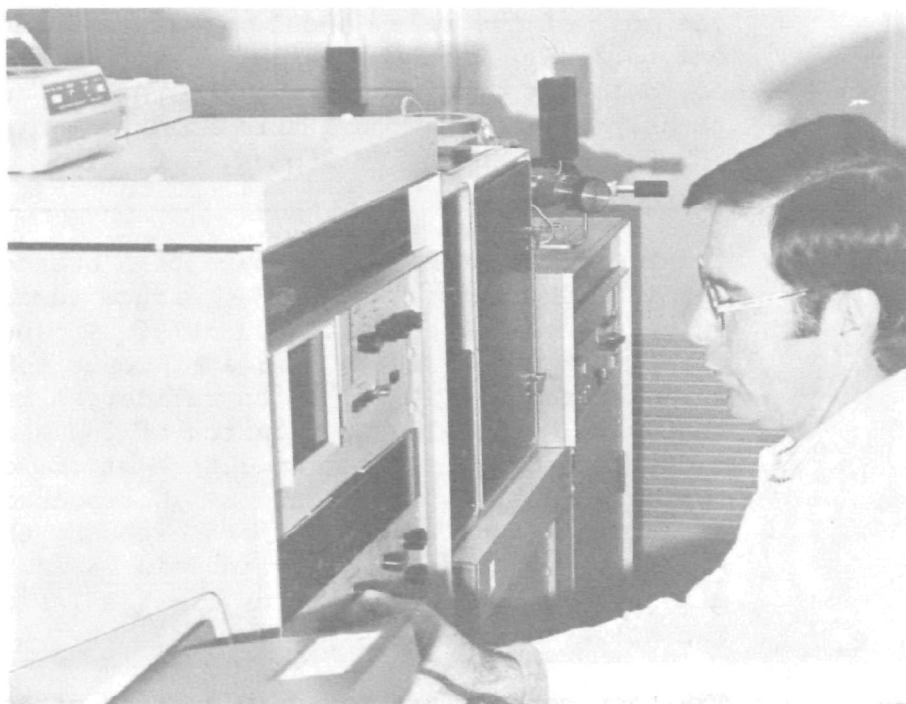
NEWSLETTER

NEW EQUIPMENT INSTALLED IN ANALYSIS UNIT

A gas chromatograph/mass spectrometer (GC/MS) coupled to a minicomputer will be installed and operational in the Analytical Services Section of the Environmental Research Laboratory (ERL,GB) by January 1.

The system will enhance the laboratory's capabilities to detect pollutants in all media. It incorporates standardized techniques, such as chemical ionization, capillary column gas chromatography, and data system control/processing. It is designed to accommodate new advances in the future in positive/negative ion mass spectroscopy and liquid chromatography interfacing.

EPA has made a major commitment to computerized GC/MS for organic pollutant analysis. Twenty-three EPA laboratories have installed these systems and a library of mass spectra has been established for agencywide and possibly international use. (J. C. Moore, ext. 269).



Chemist J. C. Moore tunes a new model gas chromatograph/mass spectrometer (GC/MS) installed at ERL,GB.

SPECTROMETER
USERS MEET
AT ERL,GB

Representatives of the EPA Mass Spectrometer Users Group and the Food and Drug Administration (FDA) exchanged technical information on the use of computerized gas chromatography in identifying and measuring environmental pollutants at a conference hosted by ERL,GB on November 14-15.

Participants discussed priority pollutant analysis by the EPA protocol, mass spectral search system, advances in technology, problems associated with the operation of equipment, training, and future exchanges.

Purpose of the meeting was to facilitate the informal exchange of technical information among EPA personnel using computerized/mass spectrometry to assess environmental pollutants. The group's next meeting will be held November 1979 in Seattle, WA. (J. C. Moore, ext. 269)

DEVICE DETECTS
ELECTRICAL
HAZARDS

Use of 60z, 120-V alternating current with saltwater holding tanks poses possible hazards to laboratory personnel. A device has been designed at ERL,GB to detect a voltage differential between a container of saltwater and a ground.

The device activates an alarm and turns off current to a hearing element relay. The voltage remains off and the alarm continues until a reset button is pressed.

The coil of the relay should activate when the current reaches only 3.2 mA. In the event of metal heater malfunctions due to corrosion or other failures, the voltage and current would greatly exceed this coil threshold and quickly be detected. (C. R. Cripe and B. E. Stokes, ext. 215)

CONTRACTS
AWARDED FOR
TOXICITY TESTS

A series of four contracts have been awarded to private testing laboratories to conduct acute toxicity tests with three species of estuarine animals. The purpose of the contracts, funded by EPA's Office of Toxic Substances (OTS), and administered by ERL,GB, is to validate a method for studies that will eventually be required of industry in a pre-manufacturing screening program. Each of the contractor laboratories as well as ERL,GB and ERL,Narragansett are presently conducting acute toxicity tests exposing the copepod, Acartia tonsa, the mysid shrimp, Mysidopsis bahia, and the sheepshead minnow, Cyprinodon variegatus, to the insecticide, endosulfan and silver nitrate.

The test methods are based on a draft of American Society for Testing and Materials (ASTM) "Standard Practice for Conducting Basic Acute Toxicity Tests with Fishes, Macroinvertebrates, and Amphibians." After the tests from all six institutions

are completed, data will be analyzed to determine the reproducibility of the method, using the same species and test conditions. (S. C. Schimmel, ext. 238)

CIVIL RIGHTS
COORDINATOR
VISITS ERL,GB

Ms. Marian Woods, director of EPA's Office of Civil Rights, Las Vegas, visited ERL,GB December 6-8 to discuss Equal Employment Opportunity (EEO) and the Federal Women's Program (FWP).

As area director, Ms. Woods provides guidance and direction to coordinators and directors of eight EPA research laboratories.

At ERL,GB she conferred with EEO Coordinator D. R. Nimmo, Counselors Edward Matthews and Dana Beth Tyler-Schroeder, and FWP Manager Betty P. Jackson and her alternate, Lynn Faas. Their discussions focused on affirmative action planning, upward mobility and career counseling for federal employees, recruitment of women and minorities, and the role of management in program planning. Ms. Woods also addressed a general meeting of laboratory staff and a meeting of supervisory personnel.



Adviser Marian Woods (center, seated) meets with ERL,GB personnel Edward Matthews, Betty Jackson, Dana Beth Tyler-Schroeder (standing); D. R. Nimmo and Lynn Faas (seated).

OIL SPILL
RESPONSE
WORKSHOP

Proceedings of the Southeast Oil Spill Response Workshop, hosted Dec. 12-14 by the Bears Bluff Field Station, are scheduled for publication in the near future.

The workshop was one of a series under sponsorship of the National Response Team, Environmental Research Laboratories, National Oceanic and Atmospheric Administration (NOAA). Participants addressed questions related to southeast oil spill response operations, criteria, and strategies for response. Plans were discussed for environmental impact assessment.

Dr. William P. Davis, chief of the Bears Bluff Field Station, served as workshop coordinator. Participants included experts with first-hand experience in oil spill response, university researchers, and representatives of State and Federal agencies.

Topics included: roles of State and Federal governments in spill response, coastal and inland operational responses, roles of scientists, socioeconomic analysis, cleanup and disposal, chemistry, physical modeling, and coastal and off-shore processes and ecology. (W. P. Davis, 803-559-0371)

ROLE OF ALGAE
IN HALOFORM
PRODUCTION
STUDIED

Laboratory evidence has confirmed the ability of soluble chlorophyll to generate chloroform (CHCl_3) when chlorinated. Three species of marine algae have been investigated at the Bears Bluff Field Station to determine if a relationship exists between their chlorophyll a content and the generation of trihalomethanes (THM) during chlorination of saline waters.

Chlorination of filtered estuarine water (salinity 23⁰/oo) from the North Edisto River, SC, results in a rapid formation of 200 $\mu\text{g/l}$ trihalomethanes comprised mainly of tribromo-methane (CHBr_3) and dibromochloromethane (CHBr_2Cl). In the presence of 10^6 cells/ml of Isochrysis galbana, chlorination with NaOCl to a nominal 10 mg/l chlorine increased the total THM concentration by an average of 35 percent. Carteria sp. had a negligible effect, whereas chlorination of Thalassiosira pseudonana resulted in an average 24 percent decrease in total THM.

Regression analysis of each algal species revealed no significant correlations between the total haloform concentration generated during chlorination and chlorophyll a concentrations of a known algal biomass. The statistical evidence, and observation of similar trends in THM production during chlorination of culture media with the algal populations removed,

lead investigators to discount chlorine-chlorophyll a interactions. However, data suggest that extracellular material (i.e. algal excretion/secretion products) play the major role in determining an algal species' contribution, or lack of contribution, to the total trihalomethane production of chlorinated estuarine waters. (A. M. Crane, S. J. Erickson, or C. E. Hawkins, 803-559-0371)

NEW STAFF

Dr. Peter F. Sheridan, formerly of Arlington, VA, has been named a marine ecologist assigned to the Bears Bluff Field Station. He joined the staff in the fall after completing his Ph.D. in biological oceanography at Florida State University, Tallahassee.

Dr. Sheridan is currently involved with the Marine Ecosystem Testing Units (METU) experiment designed to assess long-term impacts of chlorination of seawater on the development of benthic communities. His research specialties include: characterization of epibenthic fish and invertebrate communities throughout long time spans, benthic community ecology, trophic relationships of estuarine fishes and invertebrates, and taxonomy of estuarine organisms, particularly amphipods.

He presented a paper titled "Cyclic Trophic Relationships of Fishes in an Unpolluted, River-dominated Estuary" at the Conference on Ecological Processes in Coastal and Marine Systems in Tallahassee, FL, in April. He has manuscripts in preparation on the subject of trophic interactions of fishes and new species of amphipods from the Gulf of Mexico.

At ERL,GB, Ms. Jimmie Yasson has replaced Ms. Lakely B. Snider who retired as purchasing agent. A native of southeastern Alabama, Ms. Yasson formerly served in the office of program and budget at Fort Rucker, AL. She moved to Pensacola with her husband, who is retired from the Army.

Ms. Snider, who plans to travel extensively in retirement, was recently honored by the laboratory staff at a luncheon. She served as purchasing agent for the laboratory since 1974, when she transferred to ERL,GB from the Naval Air Station.

SECRETARY HONORED

Ms. Jacqueline Holley, secretary to ERL,GB Director Thomas W. Duke, has been inducted into the Pensacola chapter, National Secretaries Association. Employed for three years at the laboratory, she previously worked at the U. S. Naval Air Station, Pensacola; St. Regis Paper Co., Pensacola; and at the Department of Commerce, Washington, DC. She is a founder and former officer of the Information, Motivational, and Preparational Organization for women with the U. S. Navy.

EFFECTS OF
DIMILIN
REPORTED

Toxic effects of Dimilin^R, the insecticide that interferes with the formation of chitin (the hard outer-covering or exoskeleton), were described by ERL,GB Research Ecologist Del Wayne R. Nimmo at the annual meeting of the American Society for Testing and Materials, October 17-18, in New Orleans, LA.

Results of exposures of Dimilin to a small crustacean, Mysidopsis bahia, at ERL,GB indicated: (1) a toxicity level of 2.0 parts per billion (ppb); (2) inhibition of the molt at acutely toxic concentrations of Dimilin and after long-term exposure; (3) diminished reproduction proportionate to increases in Dimilin concentrations and exposure time; (4) latent lethality; and (5) higher susceptibility among younger shrimp.

In the 96-hr toxicity test, animals lacked a normal exoskeleton after molt; attempts to remove dead animals by a pipet often resulted in complete disintegration of their bodies. Pronounced latent effects on reproduction and survival were also apparent in succeeding generations (particularly the second generation) at parts per trillion (ppt) concentrations of Dimilin.

Studies are continuing regarding the toxicity of Dimilin to aquatic species, its duration in the environment, and the nature of compounds formed by its decomposition. (D. R. Nimmo or T. L. Hamaker, ext. 270)

COMMUNITY
TEST RESULTS

Effects of an insecticide and two biocides on settling benthic animals have been investigated in community tests in which exposed planktonic larvae were observed in flowing seawater. In the ERL,GB tests, 12 or less species of animals were collected from aquaria containing 11.1 and 103 µg/l Sevin^R, whereas 20 or more species were collected from control aquaria and aquaria containing 1.1 µg/l. Also, the abundant clam, Ensis minor, grew significantly less in length at the higher concentrations of Sevin.

Other tests with two biocides used in offshore oil drilling, Aldacide^R and Suflo^R B33, are being analyzed. Results will be compared with an earlier test on the biocide Dowicide^R to provide information of the relative toxicity of these substances to bottom organisms. (M. E. Tagatz, ext. 277)

MICROCOSM
SYMPOSIUM

ERL,GB Microbial Ecologist P. H. Pritchard attended a symposium on "Microcosm in Ecological Research" November 8-10 in Augusta, GA. The meeting was sponsored by the Savannah River Ecology Laboratory to evaluate the state-of-the-art of microcosm development and application.

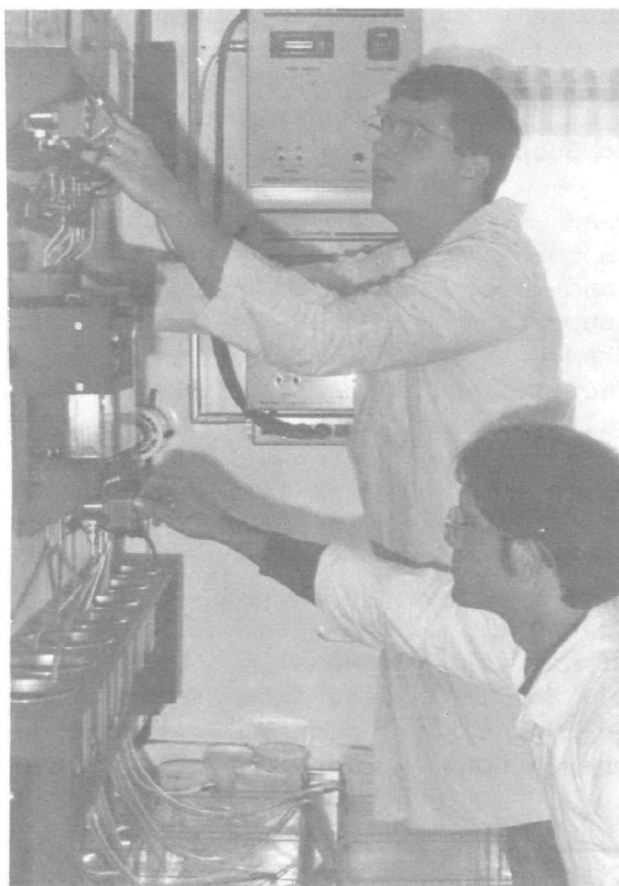
INDUSTRIAL
WASTES ARE
ASSESSED

A testing protocol developed in ERL,GB's Industrial Waste Source Assessment Program requires bioassays with algae and mysids coupled to chemical analyses of liquid industrial wastes.

Raw effluents are tested to determine if they are toxic or stimulatory. Then a series of chemical fractionations and analyses utilize gas chromatography, mass spectrometry, and inductively coupled plasma to identify bioactive substances.

ERL,GB investigators have found that most bioactive substances of wastes are in either the organic or inorganic fraction, but seldom in both. Further, the chain-forming diatom, Skeletonema costatum, has been identified as the organism usually most sensitive to complex wastes. In contrast to studies with single substances such as pesticides, S. costatum responded much more strongly to complex wastes than did estuarine fishes, mysids, or grass shrimp.

Plans are underway at ERL,GB to continue exposure assessment with laboratory microcosms, field studies, and research related to bioconcentration by algae and animals. (G. E. Walsh, ext. 235)



AT LEFT: ERL,GB Biological aide Alan Miller (standing) and Coop student Hank Cantrell examine diluters in the ERL,GB mobile laboratory established to conduct field surveys at industrial waste outfalls. The diluters fractionate wastes before they are passed into exposure tanks.

The mobile laboratory, which is required by the Surveillance and Analysis Division of EPA's Region IV, will be used extensively in 1979 to supplement ERL,GB laboratory analyses. Staff of the mobile unit can perform fish and mysid bioassays with field samples. This method allows comparison of field and laboratory results and is of help in development of methods for analysis of liquid industrial wastes.

OFFSHORE TESTS Offshore "community structure tests," developed by ERL,GB
DESCRIBED as a predictive tool for selective toxicity tests, were
AT MEETING described by ERL,GB Associate Director Norman L. Richards at
the First International Dumping Symposium sponsored by the
U.S. National Ocean Survey October 10-13 in Kingston, RI.

The tests utilize acute, chronic, behavioral, and community structure data in analyzing toxicity of drilling fluids in a sequence of steps. Their primary objective is to determine the effects of drilling fluids and their chemical components on the structure and function of offshore benthic communities.

An analysis of the communities that become established in flowing seawater aquaria is proposed as a guide in selecting appropriate organisms for subsequent toxicity testing. The more sensitive, cultivatable species are selected for laboratory tests in which environmental conditions are simulated with fluctuating temperatures, natural substrate, photoperiods, and other parameters. These "community structure tests" also may be appropriate for the selection of benthic species to be monitored in the field. Soluble components, water soluble fractions of oil, and components of drilling fluids have been tested by this method. (N. L. Richards, ext. 213)

OIL SPILL Observations and data gathered along the French coast of Brit-
IMPACT IS tany after the Amoco Cadiz oil spill were presented by Dr.
ASSESSED W. P. Davis, chief of the Bears Bluff Field Station, at the
Fourth Meeting of U.S.-Japan Experts on Management of Bottom
Sediments Containing Toxic Substances November 3-4, in Tokyo.

Dr. Davis, member of a NOAA/EPA scientific team, visited impacted areas of the French coast, and described the response of citizens, scientists, and government to the crises created by oil released when the supertanker Amoco Cadiz went aground offshore from Portsall, France on March 16. He also summarized initial damage to recreational beaches, mariculture, the fisheries industry, agriculture, and wildlife. In conclusion, he emphasized the need for a long-term international effort to explore the long-range consequences of such incidents and to understand the nature and effectiveness of natural recovery processes.

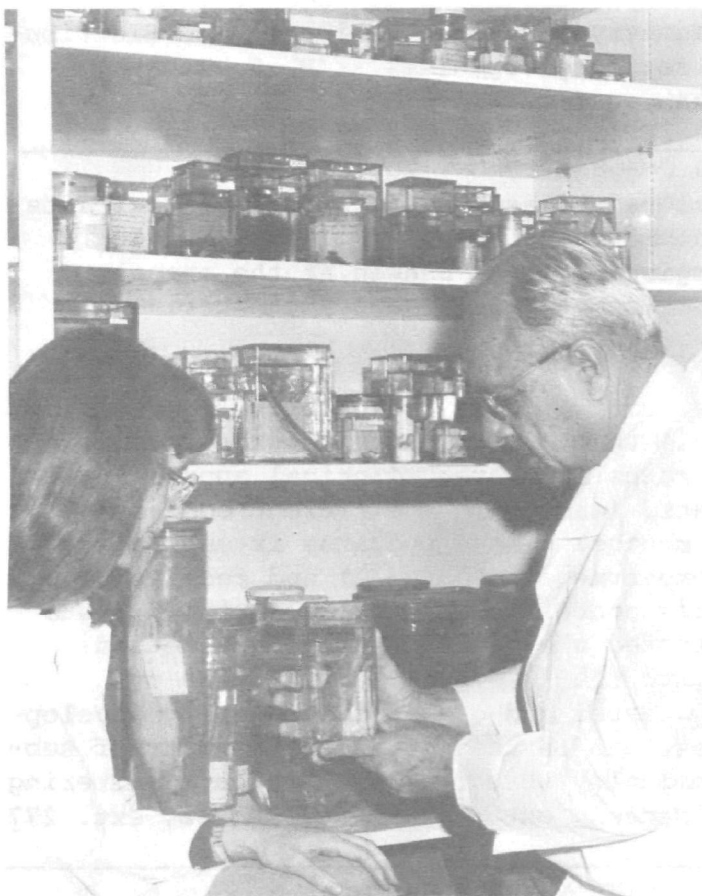
An article, "Biological Observations," co-authored by Dr. Davis and other members of his team, appears in a report titled "The Amoco Cadiz Oil Spill: A Preliminary Scientific Report." It was published by the Government Printing Office for the Department of Commerce NOAA and EPA. (W. P. Davis, 803-559-0371)

INVENTORY
PUBLISHED OF
PENSACOLA
ESTUARINE FAUNA

The first inventory of the fauna of the Pensacola Estuary, Florida is in press. It records 705 species of benthic and pelagic animals obtained by ERL,GB Microbiologist Nelson R. Cooley during systematic collections from 1961 to 1963 and by casual collections in other years.

The inventory is being published by the Florida Department of Natural Resources, St. Petersburg, FL, in its Florida Marine Research Publications. Data provided for each species include the salinity of the sampling station, habitat and season in which collected, and relative abundance. Sampling dates approximate times of annual extremes and midpoints of the spring rise and autumnal decline in water temperature.

Predominate animals collected were mollusks (225 species), annelids (91 species, chiefly polychaetes), arthropods (100 species, chiefly crustaceans), and bony fishes (182 species). Spawning of a turbellarian, 7 species of mollusks, and 25 species of crustaceans, and breeding of horseshoe crabs are reported in the inventory. Information is also given on the season, duration, and intensity of settling of larvae of oysters, barnacles, bryozoans, and serpulid worms in Santa Rosa Sound during 1962-63 and in Little Sabine Bay from 1960-63. (N. R. Cooley, ext. 231)



AT LEFT: ERL,GB Museum Curator Nelson Cooley shows Biological Technician Terri Rawlins a fish from the Laboratory Reference Collection.

The collection includes more than 2,000 identified and cataloged specimens and aids in the rapid identification of specimens in field collections. The museum work area contains specimen catalogs, dry-storage files, and a herbarium of multicellular marine algae. It is also equipped with storage bays for wet specimens as well as a work station with dissecting and compound microscopes, photographic equipment, and curatorial supplies.

DRILLING MUD
RESEARCH

The impact of drilling rig discharges on the estuarine and marine environment is yet to be determined because relatively few toxicological studies have focused on salt-water environments.

A study was undertaken at ERL,GB to assess the effect of whole drilling mud on development of estuarine communities. Numbers and species of animals that grew from planktonic larvae in aquaria containing sand mixed with or covered by drilling mud were compared with control animals.

Results show that the abundance of animals was affected by drilling mud. Total numbers of animals and average number of species per aquarium were significantly less ($\alpha = 0.05$) in aquaria containing sand under the mud cover than in control aquaria. Numbers of animals in aquaria containing mixtures of mud and sand also differed ($\alpha = 0.05$) from the numbers in control aquaria; numbers of species did not significantly differ.

Further, community structure changed as a result of contamination by drilling mud. Although annelids were dominant in number in control and in all concentrations, relative abundance of other phyla varied. For example, coelenterates were second in abundance in the control, but fourth in abundance in all concentrations. Tests indicate that large quantities of drilling mud mixed with or covering marine sediments would change sediment granulometry and could influence the distribution and abundance of settling organisms. (M. E. Tagatz, J. M. Ivey, H. K. Lehman, ext. 277)

COMMUNITY
TEST IS
DESCRIBED

A laboratory test developed to assess the impact of toxicants on benthic estuarine communities was described by ERL,GB Research Aquatic Biologist David J. Hansen at the annual meeting of the American Society of Testing and Materials, October 17-18, in New Orleans, LA.

The test method allows comparison of the numbers, species, and phyla of benthic animals that grow from planktonic larvae in an uncontaminated apparatus and three identical apparatuses continuously contaminated (each with a different concentration) for two to four months. Each apparatus is separated into 10 sand-filled compartments (40 total) and receive a continuous flow of seawater containing natural plankton. Tests at ERL,GB have demonstrated the usefulness of this method in providing insight into the relative sensitivities of species not previously tested and of species in early developmental stages. The test can be used to assess impacts of substances that affect community structure by physically altering the substrate. (D. J. Hansen, ext. 207; M. E. Tagatz, ext. 277)

DATA FILES
DEVELOPED
FOR LIBRARY

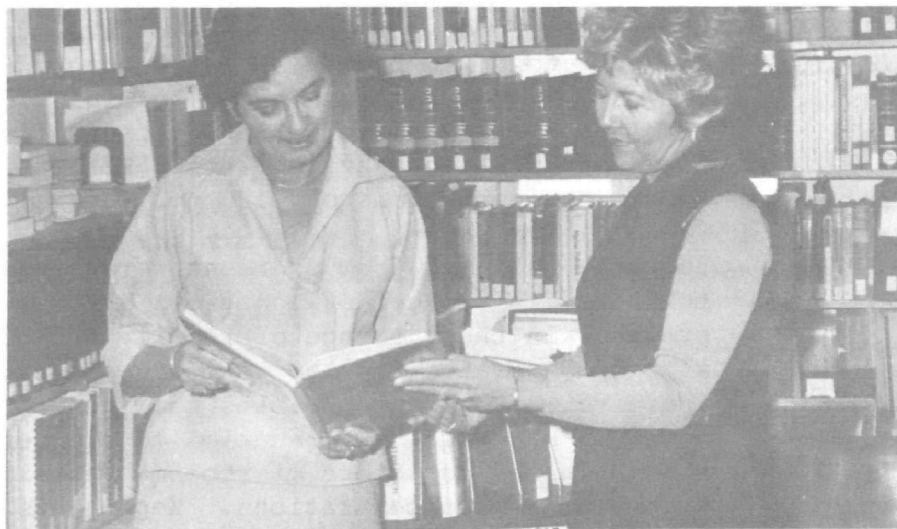
EPALIT, a text data management system developed at ERL,GB, provides for the computerized collection and rapid retrieval of library data.

The system was developed for the ERL,GB library to store descriptive and status information on books, reprints, magazines, and other holdings. EPALIT will interface in the future with EPA's DATALIB system, which will give ERL,GB national access to agencywide information resources.

Patricia W. Berger, recently named chief, Information Resources and Services Branch of EPA's Management and Organization Division, was briefed on the system during a visit to ERL,GB on December 13.

Ms. Berger also discussed the development of on-line agencywide bibliographic and data files with EPA library and data processing staff. Currently, the EPA library system includes 28 libraries that share resources, services, and expertise. Their operation is coordinated by the Information and Resources Services Branch.

In November, EPA librarians were briefed on the implementation of DATALIB, currently being used for cataloging books, reports, and documents. The workshop was attended by Ms. Andree F. Lowry, ERL,GB library supervisor who formerly headed the loan department at McKeldin Library at the University of Maryland. Ms. Lowry has also served as public library consultant for the State Library of Florida, head of the bibliographic search unit for the cataloging department, Strozier Library, at Florida State University, and as government documents librarian for the Florida A&M University Library. (R. H. Ryder, ext. 257; A. F. Lowry, ext. 218)



Librarian A. Lowry shows visitor P. Berger new acquisition.

DEGRADATION
TESTS UNDER
DEVELOPMENT

ERL,GB researchers are developing microcosms designed to study the fate of toxic chemicals in aquatic environments by an integrated assessment of the major degradative mechanisms. These systems can be adjusted to determine aerobic and anaerobic effects. Data can be obtained on the effect of the chemical on microbial processes. The test system, termed Eco-core, is a microcosm developed at ERL,GB to monitor changes in microbial populations exposed to toxicants and provides an integrated assessment of the fate of the chemical. These microcosms use a sediment/water core taken directly from the aquatic environment under study.

These advantages are cited for this approach:

- . The natural environment is simulated as closely as possible, and sediment-water interfaces are basically preserved.
- . Separation of a metabolism study into an aerobic and anaerobic phase is not required. Both phases are combined in the experimental system as found in nature.
- . Coring mechanisms are small, simple, and inexpensive. Replicates and samples from different aquatic environments (ponds, lakes, rivers, marshes) can be tested simultaneously.
- . A total metabolic picture is obtainable. Rates and extents of chemical hydrolysis, CO₂ evolution, and polar-product formation can be assessed. Distribution of pollutants and the production of degradation products can be examined.

Investigators believe that this microcosm will be useful as a reference for comparisons with toxicants being screened for the first time. (A. W. Bourquin or P. H. Pritchard, ext. 260 or 268)

KEPONE TOXICITY
TO BACTERIA
IS INVESTIGATED

Research at ERL,GB on the toxic effects of Kepone to estuarine bacteria is near completion. To date, data show Kepone to be the most toxic to bacteria of any compound to be tested at ERL,GB. Kepone has been shown to significantly reduce total viable counts of bacteria in water samples taken from several types of estuarine environments. Effects were observed at Kepone concentrations of 0.2 ppm.

Bacteria isolated from sediment were better able to grow at toxic levels of Kepone when grown aerobically. Oxygen uptake studies, in the presence of readily metabolizable substrates, also demonstrated similar toxic responses. These studies indicate that Kepone inhibits some generalized membrane functions in bacteria. Degradation of the pesticide, methyl parathion, in sediment-core microcosms was similarly inhibited by Kepone at low concentrations. Kepone has not been shown to degrade in any of these studies. (P. H. Pritchard, ext. 268)

EFFECTS OF
KEPONE VARY
IN ORGANISMS

ERL,GB experiments with Kepone in the James River sediments, water, or food organisms have determined that each source of Kepone can have differing effects on various animal species.

Free-swimming animals--mysids, grass shrimp, spot, sheepshead minnows--accumulated Kepone when exposed in water or food, but not from sediments. Bottom-dwelling animals (fiddler crabs and lugworms) accumulated large quantities of Kepone from water or sediment exposures. Blue crabs, however, did not accumulate large amounts of Kepone from either water or sediment exposures even though the crabs burrowed into the contaminated substrates. Food-chain experiments with blue crabs fed oysters containing Kepone showed high residues of Kepone in edible tissues. Mortality of blue crabs was observed.

Results of these tests indicate that effects of Kepone poisoning depend not only on exposure concentrations but also on the method of exposure: whether in water, food, or sediment. (L. H. Bahner, ext. 249)

EFFECTS OF
CHLORINE-
PRODUCED
OXIDANTS
EXPLORED

Toxicological and physiological responses of juvenile spot (Leiostomus xanthurus) have been determined by the Bears Bluff Field Station in short-term exposures to chlorine-produced oxidants (CPO's).

In flowing water tests, 0.09 and 0.12 mg/l CPO concentrations were sublethal in 48-hr exposures. Concentrations of 0.13, 0.20, and 0.36 mg/l were acutely toxic.

Opercular ventilation rates in exposed spot were much higher than in control fish, but decreased to slightly above those of controls during the latter portion of the 48-hr exposures to the two sublethal CPO concentrations. Ventilation rates for the three acutely toxic CPO concentrations remained much higher than control rates until the exposed fish died.

Blood pH of spot after 48-hr exposure to sublethal concentrations of CPO, or at the respective estimated LT50 for lethal concentrations, showed significant decreases when compared to controls. No concurrent changes in the percentage methemoglobin were observed.

Oxygen uptake by spot was depressed at all CPO concentrations tested. Histological examination showed that gill respiratory epithelial tissues sloughed away from the underlying pillar cells. (D. P. Middaugh, 803-559-0371)

DOCUMENTS
PREPARED FOR
WATER QUALITY
CRITERIA

Fifteen ERL,GB scientists are assisting the EPA Office of Water and Waste Management in preparing water quality criteria documents on 65 chemical pollutants, in response to a court decree.

The project is being coordinated by the Environmental Research Laboratory (ERL), Duluth, which is responsible for preparing a single document combining marine and freshwater data.

The scientists are reviewing aquatic toxicity data and literature, preparing guidelines for the development of criteria, and writing sections relating to the ecological effects on aquatic life. Each staff member works independently on specific pollutants, reviews pertinent literature, and summarizes results of research and data related to its toxicity to aquatic species.

Similar work was performed by 11 ERL,GB scientists earlier this year, and their service was rewarded in December by the presentation of special achievement awards by ERL,GB Laboratory Director Thomas W. Duke.

Recipients of the awards were: Lowell Bahner, Patrick Borthwick, Nelson Cooley, John Couch, David Hansen, Del Wayne Nimmo, Steven Schimmel, Dana Beth Tyler-Schroeder, Marlin E. Tagatz, and Gerald Walsh. Douglas Middaugh of Bears Bluff Field Station also received an award.

In presenting the awards, Dr. Duke said: "The importance of this task to EPA and the public may be known only after the courts have made their decisions. It is hoped that toxic levels of these pollutants are not allowed to reach fresh and marine waters." (D. J. Hansen, coordinator, ext. 207)



Recipients of awards for special achievement: left to right, P. W. Borthwick, N. R. Cooley, G. e. Walsh, Dana Beth Tyler-Schroeder, D. R. Nimmo, L. H. Bahner, and D. J. Hansen.

AWARDS
ANNOUNCED

ERL,GB Associate Director Norman L. Richards was awarded the EPA Bronze Medal on October 12 by Dr. Stephen J. Gage, Assistant EPA Administrator for Research and Development (R&D). He was cited for his outstanding contribution "in launching the Federal Interagency Energy/Environment R&D Program in the winter of 1974-75."

ERL,GB Director Thomas W. Duke was presented in December a special achievement award for continued superior service. In the award citation he was commended for sustained outstanding performance "as an administrator, scientist, and leader of scientists who have contributed significantly to the success of EPA's pesticide and estuarine water quality research." He also was praised for his involvement in the development of environmental programs with the Soviet Union, Yugoslavia, Egypt, and Poland, and his service on advisory committees, including his recent assignment to the committee investigating the Seabrook Nuclear Power Question.

LABORATORY
PRACTICES
MANUAL

ERL,GB Microbiologist Nelson R. Cooley is preparing text for the Office of Research and Development's contribution to a Good Laboratory Practices Manual (Quality Assurance Standard) for Ecological Effects in aid of OTS (Office of Toxic Substances) Pre-manufacture Testing Guidelines for Sections 4 and 5, Toxic Substances Control Act. Dr. Cooley has submitted a draft outline and text to EPA headquarters.

CAREER
FAIRS

Staff personnel have represented ERL,GB in recent career fairs sponsored in the Gulf Coast area.

Ms. Helen May, personnel coordinator, presented information about career opportunities in EPA at a Career Fair October 11 at the University of Alabama in Mobile. The program was sponsored by the university's Office of Cooperative Education Placement Services for high school students of Mobile County.

Environmental Protection Assistant Nancy Duvall represented the laboratory at a Career Day Observance at Catholic High School in Pensacola. She described the organizational structure of EPA and requirements for career employees within the organization. Her presentation was attended by students interested in professions related to the biological and life sciences.

PUBLICATIONS

Recent publications by the ERL,GB staff and researchers supported by EPA grants or contracts are listed below. Single copies of these publications can be obtained from Betty Jackson, Technical Information Coordinator, ext. 202.

JOURNAL
ARTICLES

Butler, Philip A., and Roy L. Schutzmann. 1978. RESIDUES OF PESTICIDES AND PCB'S IN ESTUARINE FISH, 1972 - 76--NATIONAL PESTICIDE MONITORING PROGRAM. Pestic. Monit. J. 12(2):51-59.

This report summarizes 1524 analyses of juvenile fish collected semiannually in 144 estuaries nationwide from July 1972 through June 1976. Pooled samples of 25 whole fish were screened for 20 common pesticides and polychlorinated biphenyls (PCB's). Field data gave divergent results.

Middaugh, D. P., J. M. Dean, R. G. Domey, and G. Floyd. 1978. EFFECT OF THERMAL STRESS AND TOTAL RESIDUAL CHLORINATION ON EARLY LIFE STAGES OF THE MUMMICHOG FUNDULUS HETEROCLITUS. Mar. Biol. 46(1):1-8. (ERL,GB Reprint #308).

Effects of simultaneous short-term (7.5 to 60 min) thermal stress (24° to 34°C) and total residual chlorination (0.05 to 1.0 mg l⁻¹) on specific development stages of the mummichog Fundulus heteroclitus (Pisces: Cyprinodontidae), are investigated. For the embryonic stages, the total number of successfully hatched larvae was used as the criterion to measure effect. For the larval stages, survival 24 hr after exposure was used. In the embryonic stages, temperature was the most important main variable. Only one embryonic stage (gastrula) was confounded by second-order interactions (temperature x duration of exposure x total residual chlorination). Both 0-day and 7-day-old larval stages showed significant higher-order interactions for all combinations of test parameters, suggesting the presence of synergistic effects of the three main experimental variables.

Reish, Donald J., Thomas J. Kauwling, Alan J. Mearns, Philip S. Oshida, Steven S. Rossi, Frank G. Wilkes, and Marjorie J. Ray. 1978. MARINE AND ESTUARINE POLLUTION. J. Water Pollut. Control Fed. 50(6):1424-1469.

This literature review summarizes current data on the effects of pesticides on marine organisms, aquatic environmental research methods, bioaccumulation of pesticides by estuarine and marine organisms, and biota residue. Results of studies of the environmental effects of dredging and the occurrence of diseases and tissue abnormalities in fish, shellfish, and marine plants also are reported.

Tagatz, Marlin E., and Michael Tobia. 1978. EFFECT OF BARITE (BaSO_4) ON DEVELOPMENT OF ESTUARINE COMMUNITIES. Estuarine Coastal Mar. Sci. 7(4):401-407. (ERL,GB Reprint #340).

Barite (BaSO_4), the primary component of oil drilling muds, affected the composition of estuarine communities developed from planktonic larvae in aquaria containing sand and flowing estuarine water. Aquaria contained: sand only; a mixture (by volume) of 1 part barite and 10 parts sand; 1 part barite and 3 parts sand; or sand covered by 0.5 cm of barite. For all environments, annelids and mollusks were the numerically dominant phyla collected in a 1-mm-mesh sieve after 10 weeks exposure; a total of 3020 animals, representing 59 species, was collected. Significantly fewer animals and species ($\alpha = 0.01$) developed in aquaria sand covered by barite than in aquaria unexposed or exposed to 1 barite:10 sand. Number of animals in aquaria containing 1 barite:3 sand also differed ($\alpha = 0.05$) from that in control aquaria. Annelids were particularly affected and significantly fewer ($\alpha = 0.01$) were found in all treatments than in the control. Mollusks decreased markedly in number only in barite-covered aquaria. Barite, however, did not impede growth (as height) of the abundant clam, Laevicardium murtoni, or decrease abundance of six other phyla. Our data indicate that large quantities of this compound, as discharged in offshore oil drilling, possibly could adversely affect the colonization of benthic animals.

Tagatz, M. E., J. M. Ivey, H. K. Lehman, and J. L. Oglesby. 1978. EFFECTS OF A LIGNOSULFONATE-TYPE DRILLING MUD ON DEVELOPMENT OF EXPERIMENTAL ESTUARINE MACROBENTHIC COMMUNITIES. Northeast Gulf Science 2(1):35-42. (ERL,GB Reprint #370).

Drilling mud, as used in exploratory drilling for oil offshore, affected the composition of estuarine communities that developed from planktonic larvae in aquaria containing sand and flowing estuarine water. Aquaria contained: sand only; a mixture (by volume) of 1 part mud and 10 parts sand; 1 part mud and 5 parts sand; or sand covered by 0.2 cm mud. For all environments, annelids, mollusks, arthropods, and coelenterates were the numerically dominant phyla collected in a 1-mm mesh sieve after eight weeks exposure; a total of 1,025 animals, representing 45 species, was collected. Annelids and coelenterates were significantly fewer ($\alpha = 0.05$) in aquaria containing drilling mud than in the control aquaria. Arthropods were significantly affected only by mud cover over sand; mollusks also were diminished in this environment, but not significantly. Exposure to concentrations of drilling mud reduced not only the number of individuals, but also the

frequency of occurrence of macrobenthic species. Thus, the average number of annelid species in 1 part mud:5 parts sand aquaria or in mud-covered aquaria was significantly less than in control aquaria. The average number of arthropod species per aquarium was also significantly less in the mud-cover exposure than in the control. Discharge of large quantities of drilling mud at levels tested in the laboratory could adversely affect the colonization of various substrata by benthic animals in nature.

Walsh, Gerald E. 1978. TOXIC EFFECTS OF POLLUTANTS ON PLANKTON. In: Ecotoxicology, G. E. Butler, editor. John Wiley & Sons, New York, NY, pp. 257-274. (ERL,GB Reprint #341)

Pollution is considered as it affects plankton communities and species. Plankton (Gr. 'wandering') is a general term for organisms that drift or swim feebly in the surface water of ponds, lakes, streams, rivers, estuaries, and oceans. It is composed of organisms with chlorophyll (phytoplankton) and animals (zooplankton). A large scientific literature deals with the effects of pollutants on planktonic species of fresh and marine waters; less has been reported about effects of pollution on plankton communities. Mathematical models can be used to predict such effects; a few simple models are cited to suggest possible effects of selected pollutants.

Wilson, Alfred J., and Jerrold Forester. 1978. PERSISTENCE OF AROCLOR 1254 IN A CONTAMINATED ESTUARY. Bull. Environ. Contam. Toxicol. 19(5):637-640. (ERL,GB Reprint #339)

This brief report summarizes the concentrations of PCB's in oyster tissue (Crassostrea virginica) observed from April 1969 to June 1976 at three locations in the Escambia Bay estuary, following elimination of an accidental leak of Aroclor^R 1254 from an industrial site. Data show that PCB's in oyster tissue decreased after the leak was eliminated, and a steady-state concentration was reached. No Aroclor 1254 was detectable in water at stations sampled, but sediments were found to contain relatively low amounts (>0.31 ppm) in 1970 and 1971. The study demonstrates the persistence of PCB's long after point-source discharges are eliminated.

RESEARCH
REPORTS

Bierman, Victor, William Richardson, and Tudor T. Davies. 1978. MATHEMATICAL MODELING STRATEGIES APPLIED TO SAGINAW BAY, LAKE HURON. In: American-Soviet Symposium on Use of Mathematical Models to Optimize Water Quality Management, T. T. Davies and V. R. Lozanskiy, editors. Environmental Research Laboratory, Gulf Breeze, FL. EPA Ecological Research Series, EPA-600/9-78-024. pp. 397-432.

This research is directed toward water quality problems of international waters of the North American Great Lakes. The prime objective is to develop quantitative tools to supplement intuition and scientific judgment in policy decisions related to water quality. Transport models and algal growth modeling concepts are applied to Saginaw Bay to describe prevailing conditions.

Davies, T. T., and V. R. Lozanskiy, editors. 1978. AMERICAN-SOVIET SYMPOSIUM ON USE OF MATHEMATICAL MODELS TO OPTIMIZE WATER QUALITY MANAGEMENT. Environmental Research Laboratory, Gulf Breeze, FL. U.S. EPA Ecological Research Series, EPA-600/9-78-024. 453 p.

The American-Soviet Symposium on Use of Mathematical Models to Optimize Water Quality Management examines methodological questions related to simulation and optimization modeling of processes that determine water quality of river basins. Participants describe the general state of development and application of mathematical models designed to predict and optimize water quality management in the USA and USSR. American and Soviet specialists discuss graphic-economic aspects of pollution control systems; identification of ecosystem models by field data; management decisions for lake systems on a survey of trophic status, limiting nutrients, and nutrient loadings; and a descriptive simulation model for forecasting the condition of a water system. Publication of the proceedings held December 9-16, 1975, in Kharkov and Rostov-on-Don, USSR, is in compliance with the Memorandum from the Fourth Session of the Joint American-Soviet Committee on Cooperation in the Field of Environmental Research.

Duke, Thomas W., and Anatoliy I. Simonov, editors. 1978. FIRST AMERICAN-SOVIET SYMPOSIUM ON THE BIOLOGICAL EFFECTS OF POLLUTION ON MARINE ORGANISMS. Environmental Research Laboratory, Gulf Breeze, FL. U.S. EPA Ecological Research Series, EPA-600/9-78-007. 166 p.

American and Soviet specialists discuss state-of-the-art for hydrobiological analysis of basic structural components of marine ecosystems and the influence of various pollutants on these components. Participants define problems related to methods for modeling the influence of pollutants on the marine environment, long-term forecasting and determination of permissible loads of pollutants, and the unification and intercalibration of methods for determining production of microorganisms of ocean bacterio-plankton and phytoplankton. Results of laboratory research on the influence of pollution on the marine environment are presented. Proceedings held September 20-24, 1976, in Gulf Breeze, FL, were published in

English and Russian in compliance with the Memorandum from the 4th Session of the Joint American-Soviet Committee on Cooperation in the Field of Environmental Research.

Koch, Robert B. 1978. DETERMINATION OF THE SITE(S) OF ACTION OF SELECTED PESTICIDES BY AN ENZYMATIC-IMMUNOBIOLOGICAL APPROACH. Environmental Research Laboratory, Gulf Breeze, FL. U.S. EPA Ecological Research Series, EPA-600/3-78-093. 29 p.

This report describes development of an antibody to an organo-chlorine pesticide to be used in studies related to its inhibition of the ATPase system. Kelevan, the condensation product of ethyl levulinate and Kepone, was successfully conjugated to bovine serum albumin (BSA), fibrinogen (BF), and gamma globulin (BGG). Rabbits and chickens preimmunized with BSA and then immunized with BSA-Kelevan produced antibodies to both the hapten, Kelevan, and the carrier protein BSA. Antiserum to Kelevan protected ATPase activity against Kepone and its derivatives. The titer of antibody to Kelevan was critical since antiserum with only trace amounts of Kelevan antibody failed to protect the ATPase activity against Kepone inhibition. Antibody was concentrated by Na_2SO_4 fractional precipitation of the antiserum and obtained in pure form by affinity chromatography with BGG-Kel covalently linked to Sepharose 4B. Pure antibody was obtained from untreated blood serum or plasma with no prior pretreatment or fractionation with the BGG-Kel affinity column. Complete protection of mitochondrial mg^{2+} ATPase activity from in vitro inhibition of Kepone was obtained with a 1.2 mg quantity of Na_2SO_4 fractionated antibody and only 120 μg of pure antibody. Reversal of ATPase inhibition was readily obtained by addition of antibody prior to addition of substrate to the reaction mixture.

Vernberg, F. J., W. Kitchens, H. McKellar, K. Summers, and R. Bonnell. 1978. THE DYNAMICS OF AN ESTUARY AS A NATURAL ECOSYSTEM, VOL. II. Environmental Research Laboratory, Gulf Breeze, FL. U.S. EPA Ecological Research Series, EPA-600/3-78-092. 29 p.

This report describes two separate but interrelated sub-studies: an update of the macroecosystem model of the North Inlet Estuary near Georgetown, SC, and a continuing study of experimental salt-marsh microecosystems. The model is under development to help understand the interactions of various parts of a natural ecosystem. The principal objective of the study is to develop and test replicate experimental salt-marsh units at the microecosystem level as diagnostic tools for assessing long- and short-term pollution effects on the Spartina alterniflora salt-marsh community.

Because of the complexity, this study was conceived as a five-year work. Two years of study (March 1, 1976, to February 28, 1978) are reported. A summary of the first phase of this research is contained in the Ecological Research Series (EPA-600/3-77-016, January 1977).

Wilkes, Frank G. 1978. MICROCOSMS AS BIOLOGICAL INDICATORS OF POLLUTION. In: First American-Soviet Symposium on the Biological Effects of Pollution on Marine Organisms, Thomas W. Duke and Anatoliy I. Simonov, editors. Environmental Research Laboratory, Gulf Breeze, FL. U.S. EPA Ecological Research Series, EPA-600/9-78-007. pp. 155-156.

Research conducted and supported by the Environmental Research Laboratory, Gulf Breeze, to develop microcosms as a method for investigating pollutant fate and effects in the environment is described. Ecosystem compartments under investigation include direct accumulation from water and food by organisms at all trophic levels, bioaccumulation through food chains, direct effects of pollutants on organisms, i.e., mortality, reproduction and behavior, and indirect effects of sublethal levels of pollutants, such as changes in predator-prey relationships. Microbial processes at both air-water and sediment-water interfaces are investigated as well as physical and chemical transformations.

PRESENTATIONS

Borthwick, Patrick W., and Steven C. Schimmel. 1978. TOXICITY OF PENTACHLOROPHENOL AND RELATED COMPOUNDS TO EARLY LIFE STAGES OF SELECTED ESTUARINE ANIMALS. In: Pentachlorophenol: Chemistry, Pharmacology, and Environmental Toxicology, K. Ranga Rao, editor, Plenum Press, New York, NY. pp. 141-146.

Newly hatched individuals of four estuarine species were exposed to pentaechlorophenol (PCP), sodium pentachlorophenate (Na-PCP), or Dowicide^{RG} (79% Na-PCP), in static toxicity tests.

The 96-hr LC50 values for sheepshead minnow (Cyprinodon variegatus) fry exposed to PCP at ages 1-day, 2-week, 4-week, and 6-week were 329, 392, 240, and 223 µg/l, respectively. The 96-hr LC50 value for 2-week-old fry exposed to Dowicide^{RG} was 516 µg/l. The larvae (48-hr) post hatch) of pinfish, Lagodon rhomboides, were particularly sensitive to Na-PCP (96-hr LC50:38 µg/l) and Dowicide^{RG} (96-hr LC50:66 µg/l). For 24-hr-old grass shrimp (Palaemonetes pugio) larvae exposed to Na-PCP the 96-hr LC50 was 649 µg/l. Na-PCP caused abnormal development of eastern oyster (Crassostrea virginica) embryos; the 48-hr EC50 was 40 µg/l.

Bourquin, Al W., and David T. Gibson. 1978. MICROBIAL DEGRADATION OF HALOGENATED HYDROCARBONS. In: Water Chlorination, Environmental Impact and Health Effects, Vol. 2, R. L. Jolley et al., editor, Ann Arbor Sci. Publ. Inc., Ann Arbor, MI. pp. 253-258.

Biochemical and soil microbiology studies indicate that numerous mechanisms exist for the dehalogenation of both aliphatic and aromatic hydrocarbons. Tests described in this paper demonstrate that enzymatic systems are capable of dehalogenation. The report does not answer the question of the biodegradability of halogenated hydrocarbons, but illustrates the need for more information in order to identify compounds that are likely to undergo enzymatic cleavage of the carbon-halogen bond.

Carpenter, James H., and Donald L. Macalady. 1978. CHEMISTRY OF HALOGENS IN SEAWATER. In: Water Chlorination: Environmental Impact and Health Effects, Vol. 1, R. L. Jolley, editor, Ann Arbor Sci. Publ. Inc., Ann Arbor, MI. pp. 161-179.

There has not been sufficient research to provide a satisfactory understanding of the reactions that occur when +1 oxidation state chlorine is added to seawater. However, present information suggests that the bromide ion is oxidized and, perhaps, disproportionates to several oxidation states. Formation of brominated or mixed brominated-chlorinated organic compounds can be expected, but the extent and speciation of such reactions remain to be determined.

These experiments show that present analytical procedures do not measure all of the inorganic "residuals" present in chlorinated seawater.

Davis, William P., and William F. McIlhenny. 1978. MARINE WORKSHOP SUMMARY. In: Water Chlorination: Environmental Impact and Health Effects, Vol 2, R. L. Jolley, editor, Ann Arbor Sci. Publ. Inc., Ann Arbor, MI. pp. 859-862.

Proceedings of the Marine Workshop held during the second conference on the Environmental Impact of Water Chlorination, October 31-November 4, 1977, in Gatlinburg, TN, under sponsorship of the Oak Ridge National Laboratory, U.S. Environmental Protection Agency and the Department of Energy. Papers and discussion describe research considerations, problems, and viewpoints regarding chlorination impacts in marine and freshwater ecosystems.

Davis, William P., and Douglas P. Middaugh. 1978. A REVISED REVIEW OF THE IMPACT OF CHLORINATION PROCESSES UPON MARINE ECOSYSTEMS. In: Water Chlorination: Environmental Impact and Health Effects, Vol. 1, R. L. Jolley, editor, Ann Arbor Sci. Publ. Inc., Ann Arbor, MI. pp. 283-310.

This paper presents a theoretical degradation model of chlorine added to marine waters. Additionally, it summarizes literature reporting laboratory or ecological effects of chlorination. The revisions attempt to incorporate pertinent literature through 1977.

Erickson, Stanton J., and Anne E. Freeman. 1978. TOXICITY SCREENING OF FIFTEEN CHLORINATED AND BROMINATED COMPOUNDS USING FOUR SPECIES OF MARINE PHYTOPLANKTON. In: Water Chlorination: Environmental Impact and Health Effects, Vol. 2, R. L. Jolley et al., editor, Ann Arbor Sci. Publ. Inc., Ann Arbor, MI. pp. 307-310.

No distinction has been made in the scientific literature between the effects of the oxidative stages of chlorination and the effects of halogenated compounds formed as by-products. Screening tests of compounds, which are known by-products of chlorination, were performed on four species of marine phytoplankton. Eight concentrations of the test compound were studied over a seven-day period. Different responses such as stimulatory, inhibitory or no effect were determined on algal cell division. These tests identified organism sensitivity to the test compounds and established the working range for more comprehensive studies.

Goodman, Larry R., David J. Hansen, John A. Couch, and Jerrold Forester. 1978. EFFECTS OF HEPTACHLOR AND TOXAPHENE ON LABORATORY-REARED EMBRYOS AND FRY OF THE SHEEPSHEAD MINNOW. In: Proceedings of Thirtieth Ann. Conf. Southeast. Assoc. Fish Wild. Agencies, October 24-27, 1976, Jackson, MI, Wilmer Rogers, editor, pp. 192-202.

Flow-through seawater bioassays of 28-days duration were conducted with the organo-chlorine pesticides heptachlor and toxaphene to determine their toxicity to and bioconcentration by embryos and fry of the sheepshead minnow (Cyprinodon variegatus). At technical heptachlor measured concentrations of 4.3, 3.5, 2.2, 2.0, and 1.2 $\mu\text{g/l}$ (ppb), test animal survival was 1, 5, 61, 79, and 88% respectively. At toxaphene measured concentrations of 2.5, 1.1, 0.6, 0.3, and 0.2 $\mu\text{g/l}$, test animal survival was 10, 85, 79, 88, and 80% respectively. Average standard length of fry continuously exposed from fertilization to heptachlor concentrations of 4.3 and 3.5 $\mu\text{g/l}$ was significantly reduced ($\alpha = 0.01$). Concentration factors (concentration in fish/measured concentration in

water) for heptachlor averaged 3,600 and for transchlordane averaged 8,600. Heptachlor epoxide and cis-chlordane were also present in the fish. Concentration factors for toxaphene in fry averaged 9,800.

Rubinstein, Norman I. 1978. EFFECT OF SODIUM PENTACHLOROPHENATE ON THE FEEDING ACTIVITY OF THE LUGWORM, ARENICOLA CRISTATA STIMPSON. In: Pentachlorophenol: Chemistry, Pharmacology, and Environmental Toxicology, K. Rango Rao, editor, Plenum Publ. Corp., New York. pp. 175-180.

A benthic bioassay utilizing time-lapse photography was used to measure the effect of four concentrations of Na-PCP (45, 80, 156, and 276 µg/l) on the feeding activity of Arenicola cristata. There was no marked effect on feeding activity at 45 µg/l. Na-PCP significantly affected feeding activity at concentrations of 80, 156, and 276 µg/l. As the lugworm feeds it mixes organic material and oxygenated water into the substrate. Inhibition of this activity could affect benthic community trophic structure and substrate-water column dynamics.

Schimmel, Steven C., James M. Patrick, Jr., and Linda F. Faas. 1978. EFFECTS OF SODIUM PENTACHLOROPHENATE ON SEVERAL ESTUARINE ANIMALS: TOXICITY, UPTAKE, AND DEPURATION. In: Pentachlorophenol: Chemistry, Pharmacology, and Environmental Toxicology, K. Rango Rao, editor, Plenum Publ. Corp., New York. pp. 147-155.

Several estuarine animals were exposed to sodium pentachlorophenolate (Na-PCP), in flow-through toxicity tests. The following are test animals and their 96-hr LC50 values: grass shrimp (Palaemonetes pugio), >515 µg/l; brown shrimp (Penaeus aztecus), >195 µg/l; longnose killifish (Fundulus similis), >306 µg/l; pinfish (Lagodon rhomboides), 53.2 µg/l; and striped mullet (Mugil cephalus), 112 µg/l. The 192-hr EC50 (effect measured was shell deposition) for the eastern oyster (Crassostrea virginica) was 76.5 µg/l. Eastern oysters exposed to Na-PCP concentrations of 25.0 and 2.5 µg/l accumulated the chemical in their tissues an average of 41 and 78 times, respectively. After Na-PCP delivery was discontinued, however, the oysters purged themselves of the pesticide within four days.

Scott, Geoffrey I., and Douglas P. Middaugh. 1978. SEASONAL CHRONIC TOXICITY OF CHLORINATION TO THE AMERICAN OYSTER. In: Water Chlorination: Environmental Impact and Health Effects, Vol. 2, R. L. Jolley, editor, Ann Arbor Sci. Publ., Inc., Ann Arbor, MI. pp. 311-327.

Lethal and sublethal effects of chlorination to adult oysters (Crassostrea virginia) were observed during chronic exposures on a seasonal basis. Results show that chronic exposures of oysters to chlorine-produced oxidants (CPO's) can produce mortality at high concentrations and severe sublethal effects at lower levels. Toxicity varies from season to season and is related to seasonal changes in measured CPO concentrations, temperature, and the physiological condition of the oyster. Sublethal effects appear to be related to reductions in feeding and increased avoidance of CPO's. This results in reduced tissue production, causing severe reductions in the size of gonadal tissues and increased dependence in glycogen reserves during exposures to CPO's.

Tagatz, M. E., J. M. Ivey, and M. Tobia. 1978. EFFECTS OF DOWICIDE^{RG}-ST ON DEVELOPMENT OF EXPERIMENTAL ESTUARINE MACROBENTHIC COMMUNITIES. In: Pentachlorophenol: Chemistry, Pharmacology, and Environmental Toxicology, K. Rango Rao, editor, Phenum Publ. Corp., New York. pp. 157-163.

Aquaria containing clean sand received a continuous supply of flowing seawater from Santa Rosa Sound, Florida, mixed with known quantities of Dowicide^{RG}-ST (79% sodium pentachlorophenate) for 13 weeks. The measured concentrations of pentachlorophenol (PCP) in the aquaria were 1.8, 15.8, and 161 µg/l. At the end of the experiment, macrofauna established in control and experimental aquaria was examined. Mollusks, arthropods and annelids were numerically dominant among the macrofauna. Although exposure to 1.8 µg/l PCP had no effect, the higher concentrations of PCP caused marked reduction in the numbers of individuals and species. Mollusks were the most sensitive taxonomic group to PCP. These results and our previous studies on the effects of a nine-week exposure to PCP on the establishment of macrobenthic communities indicate that discharge of PCP into natural waters could alter the normal colonization by benthic animals and could impact various ecological relationships among localized populations.

Wilkes, Frank G. 1978. LABORATORY MICROCOSMS FOR USE IN DETERMINING POLLUTANT STRESS. In: Aquatic Pollutants: Transformation and Biological Effects, O. Hutzinger et al., editors, Pergamon Press, New York. pp. 309-321.

Tests under development at ERL,GB to determine effects of pollutants on ecosystem compartments and processes are described. The tests are termed "microcosms," which are miniature ecosystems that can be used to investigate the origin, flow, fate, and effects of materials released in the environment. Examples of various tests and data obtained in their use are presented.

NOTE: This report is for informational purposes only. All data and conclusions must be considered provisional. Mention of trade names or commercial products does not constitute endorsement of recommendation for use.

Credits: Betty P. Jackson, editor; Terry Miller and Steve S. Foss, graphics, and Gail Garnas, editorial assistant.