

# American Institute of Fishery Research Biologists

## . . . BRIEFS . . .

VOL. 11, NO. 1

FEBRUARY 1982

### Editorial

With this number we are launching a new BRIEFS with six issues a year to include news of fishery science, fishery administration, fishery politics, and fishery scientists. We will include news of the Institute, District activities, and Institute Members, but we hope to broaden BRIEFS appeal and make it more interesting. It is not easy to produce a newsletter that will be read, and there is really little purpose in publishing one if it is not read.

So for the new BRIEFS to accomplish these objectives we need help. Be a correspondent and contribute fishery news items that will interest our members. There have been times, in the not too distant past, when there was an overabundance of fishery news. International, federal, state and industrial administrative and research activities were intense as commissions, councils, governments responded to economic, environmental and jurisdictional concerns. But the times have changed and the climate in February 1982 is quite different. There does not seem to be an overabundance of fishery news. In fact, it appears to be a rather quiet time. So with your help we would like to bring up and bring out the happenings in the world of fishery science.

We would like to commend Eric H. Knaggs for serving as BRIEFS Editor during 1981.

### SPECIAL NOTICE

The Board of Control has approved a plan to permit payment of \$25.00 for 1982, 1983, and 1984 dues, if paid by April 1, 1982. A one-time payment and savings of \$5.00.

### Federal Legislation

The following action was taken on Federal legislation of interest to AIFRB members:

**S. 1337 & H.R. 3867** are identical bills that would temporarily exclude foreign fishing support vessels from Alaskan internal waters.

**S. 1337** was passed by the Senate on June 10, 1981. The bill follows enforcement provisions of the Magnuson Fishery Conservation and Management Act (MFCMA).

**S. 1564 and H.R. 4457** are similar bills that would amend the MFCMA to include tuna.

**S. 522 (Hayakawa/CA) 7 H.R. 770 (Panetta/CA)** - to amend the FCMA to create a new California Pacific Council with authority over the fisheries in the Pacific Ocean seaward of California.

**H.R. 3924** would amend the Commercial Fisheries Research and Development Act of 1964.

**P.L. 97-68, October 26, 1981 (S.1191)** The Act of October 26, 1981 amends section 7 of the Fishermen's Protective Act of 1967, which relates to the reimbursement of U.S. commercial fishermen for certain losses incurred incident to the seizure of their vessels by foreign nations.

**H.R. 2250 & H.R. 3717** are similar bills that would amend the Federal Aid in Fish Restoration Act (commonly known as the Dingel-Johnson or D-J Act).

As introduced, H.R. 3717 would —

- impose a 10% excise tax on certain fishing equipment;
- provide that new monies accumulated to a coastal state as a result of the Act shall be equitably allocated by such state between marine and freshwater fish projects;
- provide funding support to states for the development of fish restoration plans, to conduct priority research, and improve opportunities for fishing; and
- reduce the overhead charge available to DOI from 8% to 4% of the revenues generated.

**H.R. 4002 & S. 1564** would amend the tariff schedules of the U.S. to provide for a lower rate of duty for fish netting and fish nets. Both bills, as introduced, would set the duty level at 17% ad valorem as of January 1, 1982

**S. 532 and S. 791** are bills that would extend a social security and income withholding rule relating to certain fishing boat services to the unemployment tax. Under current law, certain crew members of fishing boats are treated as self-employed, not as employees, for purposes of the Federal Insurance contributions Act (FICA) and income tax withholding. Fishermen treated as self-employed are those working on boats with 10 or fewer crew members (or a fleet of boats each of which has 10 or fewer crew members), where compensation is determined by sharing the catch.

**H.R. 4041** is a bill that would establish a program designed to help the U.S. shrimp industry overcome economic problems and improve the markets for shrimp.

The bill, as introduced, would —

- impose a temporary, 5-year quota on the levels of foreign shrimp that can be imported into the United States;
- impose a 30 percent ad valorem tariff on foreign imports;
- provide for the establishment of shrimp harvester cooperatives, enabling harvesters to effectively participate in the marketing and distribution chain for their product;
- dedicate 25 percent of the money raised by the tariff for low-interest loans to the shrimp harvester cooperatives and their members to better enable them to accomplish their long-term objectives;
- provide authority for the voluntary establishment of shrimp-marketing boards; and
- require special consideration by the Department of Commerce for industry projects that address fuel efficiency and the utilization of by-catch fisheries.

**S. 874 & H.R. 2978** would provide for additional protection of steelhead trout as a game fish. As introduced, the bills would allow a state to prohibit the commercial taking of steelhead both on and off Indian reservations; and give the Indian tribes authority to license and manage fees to sport fishermen who wish to fish for steelhead on the tribes' Indian trust land or in waters within the exterior boundary of the tribes' reservation.

**H.R. 3668** would amend sec. 607 of the Merchant Marine Act, 1936, to permit the establishment of capital construction funds for shoreside facilities in the fishing industry.

**H.R. 3667 & H.R. 3816** are similar bills that would improve the operation of the Fishermen's Contingency Fund established under the Outer Continental Shelf Lands Act to compensate commercial fishermen for damages resulting from oil and gas exploration, development, and production in areas of the OCS.

## **Federal Legislation** from Page 1

**P.L. 97-79, November 16, 1981 (S. 736)** The Act of November 16, 1981, the "Black Bass and Lacey Act Amendments of 1981" provides for the control of interstate and foreign commerce in fish and wildlife. The Act consolidates the Black Bass and Lacey Acts addressing illegal trade in fish, wildlife, or plants. In addition, the Act broadens the coverage of the present Lacey Act to include wildlife and wildlife parts of products taken in violation of Indian tribal law, and revises the penalty structures and amounts; provides felony punishment for cases involving specific intent and repeat offenders would be dealt with more harshly for unlawful conduct committed after an initial conviction; revises marking requirements for shipment of fish and wildlife; and specifies in detail the differences between a felony and a misdemeanor involving the import and export of species of fish and wildlife subject to Federal, state or foreign conservation laws.

**P.L. 97-58, October 9, 1981 (H.R. 4048)** The Act of October 9, 1981 improves the operation of the Marine Mammal Protection Act of 1972.

**P.L. 97-58** provides that the existing requirement of reducing the incidental take of marine mammals to insignificant levels approaching a zero mortality and serious injury rate, can be satisfied for the tuna purse seine fishery by the use of marine mammal safety techniques and equipment that are economically and technologically practicable. It also provides for the establishment of a cooperative system among fishermen for the monitoring of incidental taking and allows for the incidental taking of a small number of marine mammals which may occur during other activities. It revises the procedure which provides for the return of marine mammal management to the states, and sets up a cooperative Federal/state procedure for marine mammal management in the waters from three to 200 miles offshore. It directs the Secretary of Commerce to undertake a program for research into new methods of locating and catching yellowfin tuna and provide financial assistance for such research.

**H.R. 4804** was signed into law on October 9, 1981 (P.L. 97-58).

**Clarence P. Idyll, Washington, D.C.**

## ✓ **Atlantic Tunas**

Atlantic (including Mediterranean and Caribbean) tuna fisheries have been increasing rapidly in the last 30 years. Prior to 1955, Atlantic catches of tunas and tuna-like species never exceeded 70,000 metric tons a year. By 1960 they were over 200,000 tons; by 1970 they were approaching 400,000 tons; since 1977 they have been close to 500,000 tons each year. Preliminary estimates place 1981 catches close to 510,000 tons, 20 percent of the world tuna catch. The value of the catches to the fishermen is approaching \$1 billion.

Nearly half of the Atlantic catches are taken off the west coast of Africa, north of the Congo River (FAO Area 34). At least 20 species of tunas and tuna-like fishes are caught; yellowfin and skipjack each account for about 20 percent of the total, with albacore contributing another 10 percent.

Although over 50 countries and political units report catches in the Atlantic, Spain and France (including some former French colonies) each take about 20 percent of the total. Japan, Korea and China (Taiwan) together take over 20 percent. No other country takes as much as 5 percent.

Coordination of research and international management of the fisheries is achieved through the International Commission for the Conservation of Atlantic Tunas, which came into being in 1969. ICCAT has 19 member states, including Korea and Japan. Among the important fishing countries, China and Italy are not members, but Taiwan and Italy send observers to most ICCAT meetings.

It appears that fisheries on yellowfin and on southern albacore and bigeye stocks are close to maximum yield levels with present fishing patterns. There are good possibilities for increased catches of skipjack, as well as for many species of "small tunas" such as *Auxis*, and to some extent for northern albacore, and northern bigeye. The abundance of western Atlantic bluefin has decreased markedly,

although a similar decrease has not been observed in the eastern Atlantic. (The question of one or two stocks of bluefin has not been resolved.)

ICCAT has recommended, and all member and many non-member states have accepted, size limits on yellowfin (1973), bluefin (1975), and bigeye (1980). In addition, most member and non-member states have agreed (1975) to limit fishing mortality on bluefin to recent levels. ICCAT agreed at its November, 1981, meeting that member states should take measures to prohibit the capture of bluefin in the western Atlantic for two years, except for very limited fishing for monitoring purposes, and to avoid increasing fishing mortality in the eastern Atlantic.

In summary, although Atlantic tuna fisheries have increased by more than seven times in the last 30 years, there appears to be room for further rational expansion of the fisheries, with reasonable international control to prevent overfishing.

**John P. Wise, Madrid, Spain**

## ✓ **South Pacific Skipjack**

The Skipjack Survey and Assessment Programme of the South Pacific Commission (SPC), an international organization with its headquarters in Noumea, New Caledonia, has recently completed three years of field work in the south central and southwestern Pacific Ocean. During this period nearly 140,000 skipjack were tagged and released, and numerous biological samples were taken. The analyses of the data are not yet complete, but some preliminary results were presented at a meeting held in Noumea in August 1981. The standing Stock of skipjack in the SPC area (Pitcairn Islands to the Trust Territory of the Pacific Islands) is estimated to be about 3.4 million metric tons, according to Dr. Robert E. Kearney, coordinator of the project. He estimates that the annual catch in the SPC area, currently about 200,000 metric tons, could probably be increased 10-fold without affecting the long-term productivity of the stock. Currently there are more than 100 purse seiners and large baitboats fishing in the southwestern Pacific, plus many smaller vessels. Fourteen U.S.-flag purse seiners fished in that area during 1981.

**William H. Bayliff, La Jolla, CA**

## **Atlantic Salmon Convention**

Canada, the European Economic Community, Faroe Islands (Denmark), Iceland, Norway, Sweden and the United States have prepared a draft agreement to establish a new international convention called the North Atlantic Salmon Conservation Organization. The proposed purposes of the Organization are to promote the acquisition, analysis and dissemination of scientific information pertaining to Atlantic salmon stocks and to promote the conservation, restoration, enhancement and rational management of salmon stocks in the North Atlantic Ocean through international cooperation. As presently conceived, there would be a main body, the Council, that would have three Regional Commissions: North American, West Greenland and North-East Atlantic. The efforts to establish this international organization stem from the high-seas fishery for salmon during the 1960's off West Greenland. Tagging experiments showed that the salmon in the area were of both North American and European origin. Quotas for the fishery were eventually established under the International Commission for Northwest Atlantic Fisheries (ICNAF). This body was reorganized in 1978 and salmon were specifically excluded from its jurisdiction, although the fishery still has a quota. A high-seas fishery has also developed in the Eastern North Atlantic. The impact of these fisheries on home-water stocks has been a major concern and led to the present negotiations which will continue in 1982.

**Bernard E. Skud, Narragansett, RI**

## **Pacific Salmon**

Planning to integrate artificial propagation with management of

natural stocks is receiving considerable attention in the northeastern Pacific. Agencies responsible for managing salmon fisheries are providing leadership for planning. User groups are active participants in the planning process. Purpose of planning is to avoid unnecessary risks to natural production with growth of artificial propagation and to maximize the sustainable yield of salmon.

Alaska has adopted a regional plan for southeastern Alaska and is reviewing draft plans for Prince William Sound and Cook Inlet. The long-term goal in Alaska is to insure a state-wide harvest of more than 110 million hatchery and wild salmon annually.

Canada has implemented a plan with a long-term goal of doubling salmon production in British Columbia to about 50 million fish annually. Oregon is completing a plan for coho salmon to be implemented in 1982. The Oregon plan will integrate production from public and nonpublic hatcheries and natural streams with the long-term goal of harvesting more than 2 million adult coho annually.

**William J. McNeil, Eugene, OR**

## Small Hydro Projects

Apparently almost all of the state fish management agencies are taking a rather strict line with respect to fish protection at small hydro projects, and the Federal Energy Regulatory Commission (FERC) is supporting them in this. From the onset of the current rush to small hydro, most states have been requiring adequate fish passage facilities for upstream migrants and full screening and bypassing around turbines of young anadromous downstream migrants.

In many cases, this allowed improved fish passage over existing conditions. Many small hydro proposals are built around existing dams, many of which either presently have no upstream passage facilities or such are in poor conditions. Existing turbines, normally unscreened, are being replaced with screened units.

**George J. Eicher, Portland, OR**

## Fishery Biologists in the Electric Utility Industry

The fishery biologist profession has greatly changed and expanded over the years. Twenty-five years ago you could count the number of fishery biologists employed by the electric utility industry on one hand and essentially all of these were employed by utilities or the Corps of Engineers in the Washington-Oregon area. The numbers remained fairly static until the strong push for improved water quality standards, particularly as these standards relate to steam plants and thermal and other water quality effects of plant discharges. The early power biologists were concerned and involved with hydroelectric projects. Most of the present fishery biologists are involved with the effects of thermal power plants on the aquatic environment.

The Edison Electric Institute, the association of the nation's investor-owned electric utilities, whose membership generates about 80% of the electricity in the U.S. publishes a directory of Power Industry Biologists. This directory is undoubtedly incomplete but it lists nearly 350 biologists employed by the industry. Of these, I estimate about 300 are directly or indirectly involved with fish related matters. Impingement and entrainment of fish at power plant water intakes are the principal areas of fishery study at this time. Other areas of study include acid rain, aquaculture, fish migration, thermal effects, reservoir limnology and near shore oceanography, to name a few. The EEI biologists meet annually to present technical papers and to share information on fishery matters relating to the hydroelectric industry.

**J.A.R. Hamilton, Portland, OR**

## Nuclear Power and Fish

A benefit of the NEPA review process results when experience at existing projects is fed back into the design and siting process, and back into the environmental impact assessment process. In so doing,

past successes and failures are drawn upon in a positive way and the lessons learned are applied to future actions and planning. To these ends, the Nuclear Regulatory Commission has published the results of a study comparing the aquatic biological and fisheries impacts at three operating midwestern nuclear power stations: Fort Calhoun and Cooper Stations on the Missouri River, Nebraska; and Duane Arnold Energy Center on the Cedar River, Iowa. The assessments utilize at least five years of data for each station, and consider: thermal effluents; entrainment and impingement; phyto/zooplankton; benthic macroinvertebrates; ichthyoplankton; juvenile and adult fishes; and river fisheries. Case-specific and regional analyses are made. Station siting and design are evaluated in relation to observed impacts. The impacts projected in preoperational EISs are compared with those observed. The four-volume study (Tech. Rept. NUREG/CR-2337) is available from: GPO Sales Program, TIDC, U.S. Nuclear Regulatory Commission, Wash., D.C. 20555. Similar reports for other nuclear stations will be available in the future.

**Clarence R. Hickey, Washington, D.C.**

## Research in Lake Huron

Studies conducted in Lake Huron by fisheries section personnel at Great Lakes Research Division, University of Michigan have found that direct underwater observation (via divers) and low-light sensitive underwater television camera monitoring complement each other well during assessment of fish behavior in trap nets. Direct observation permitted mobility that enhanced evaluation of fish gilling in relation to mesh size and location in the net, fright responses during lifting of the net, and positioning of the gear in relation to anchor line location and tension. Video monitoring allowed lengthy observation of fish behavior (e.g., location in net, swimming patterns, speed and schooling behavior) and species interactions. Additional features of the video system were: fish were not disturbed by divers, observations could be recorded for further analysis, and the low-light sensitivity of the camera permitted observations (without artificial light) when light levels were too low for divers to see. The video recording system has since been equipped with underwater flood lights (with red filters to minimize phototactic responses) and a hydrophonic recording system.

Preliminary analysis of another study recently completed in southeastern Lake Michigan suggests that yellow perch aggregated and spawned over areas of rough (e.g., cobble, clay, riprap) substrate in preference to areas of smooth (sand) bottom. It was also noted that males preceded females during onshore spring migration to spawning areas, and at least some spawning was suspected to have occurred during daylight. Gill net catches were greatest during dusk compared with exclusively day or night fishing efforts. Although fish (alewife and smelt) were the predominant prey, opportunistic feeding on substrate-specific organisms (i.e., crayfish and snails — occurring in rocky but not sandy areas) was documented.

Results of both studies will be published in the near future along with a 750-page descriptive manual for the identification of larval fishes of the Great Lakes basin, with emphasis on the Lake Michigan drainage.

**John A. Dorr, III, Ann Arbor, MI**

## ASZ and AAAS Meetings

A number of papers on fishes were given at the American Society of Zoologists meeting in Washington, D.C. One on the hearing in goldfish by Richard Ray and Sheryl Coombs of Loyola U. was especially memorable. The American Association for the Advancement of Science Youth Symposium at the Washington Hilton on January 3 was highlighted by a marvelous illustrated lecture by Eugenie Clark, U. of Maryland, that presented some of her work and adventures with shark biology. She spoke to a large audience of young people bound to have been stimulated towards a study of fishes. There was also a National Geographic Society film "About Sharks" shown at the AAAS Science Film Festival on January 7.

**James M. Moulton, Brunswick, ME**

## IN MEMORIAM

Gerald V. Howard, Fellow 1958  
Poway, California - December 18, 1981

## New Journals and Publications

**FISHERIES RESEARCH** can be ordered from Journal Information Center, Elsevier North-Holland Inc., 52 Vanderbilt Ave., New York, NY 10017. The Editor-in-Chief is G. L. Kesteven, 12 O'Briens Road, Hurstville 2220, New South Wales, Australia. "*The purpose of this new journal is to provide a truly international forum for the publication of research results and other relevant information in the three main areas of fishing technology, fisheries science, and fisheries management.*" Quarterly, \$59.25 (US).

**NORTH AMERICAN JOURNAL OF FISHERIES MANAGEMENT.** Editor Mercer H. Patriarche, 2667 Esch Ave., Ann Arbor, MI 48104. Subscriptions can be ordered from the AFS, 5410 Grosvenor Lane, Bethesda, MD, 20014. The Journal is intended "...as a medium for the society to focus on one of its five Constitutional objectives — to promote the conservation, development and wise utilization of the Fisheries." Quarterly, \$10.00 (US) for AFS members. (Volume 1, No. 2 includes "*An Open Letter to Anglers and Fisheries Professionals*" by Doug Stange, Managing Editor, **In-Fisherman**, Brainerd, Minn. The article is thought-provoking and the author's suggestions — take time to listen to each other; be patient; and keep a perspective on who you are and what you know — (are also applicable to contacts between biologists and commercial fishermen.)

**JOURNAL OF FRESHWATER ECOLOGY** "...is intended to be a vehicle for the reasonably rapid dissemination of current limnological information. The Journal will publish refereed manuscripts dealing with a wide variety of original ecological studies, observations, surveys, and techniques. Review articles, abstracts and extensive monographs will not normally be published..." Correspondence concerning publication and subscriptions should be addressed to Editor Joseph A. Kawatski, Dept. Biol., Viterbo College, P.O. Box 2558, LaCrosse, WI 54601. Oikos Publishers in LaCrosse. Subscription \$25.00, Library \$35.00.

**WORLD LITERATURE TO FISH HYBRIDS** with an Analysis by Family, Species, and Hybrid: Supplement I, by Frank J. Schwartz. Supplement I comprises 1,814 citations published between 1971 and October 1980 which deal with fish hybrids of the world. Continuing the format of the original compilation, each reference has been read, analyzed and referenced by author, family, species and hybrid cross. NOAA Technical Report NMFS SSRF-750, 507 pp.

## District News

### ALASKA

John H. Helle, Director

Alaska District held a dinner meeting December 10 with the Executive Director of the Governor's Alaska Fisheries Research Center Study Group summarizing their progress. The Group was formed to evaluate pending legislation to form the Center. AIFRB members were asked to participate in the study. District Director Helle summarized AIFRB members recommendation in a letter to the Group and Bruce Wing and Richard Straty attended Group meetings.

At the January 14 meeting, Rupert Andrews summarized for the members the legislative bills and resolutions concerning fisheries that have been pending or filed for the 1982 Alaska Legislature.

### NORTHWEST WASHINGTON

Robert R. French, Director

Northwest Washington District met December 15 with Edward R. Long, NOAA/MESA Puget Sound Project, presenting a summary of the past 5 years of research sponsored by EPA and managed by MESA. Enthusiastic discussion followed on the proposed oil ports and pipelines and the application of study results to the decision process.

## Port Aransas Marine Laboratory of the University of Texas at Austin

Applied and academically oriented fisheries and fish-related research has received increased emphasis in the last two decades at these Gulf Coast facilities in Port Aransas, Texas.

Since the University of Texas has taken over and expanded the operations of the former NOAA/NMFS Port Aransas laboratories under Dr. C.R. (Connie) Arnold's direction, research orientation toward eventual maricultural application has increased. With S. Holt, Arnold's research involvement is with seagrass habitat preference relationships of the red drum; earlier interests in the nature and mechanisms of spawning for species like the red snapper and sciaenids continue; and current work is underway on systems for grow-out of red drum at high densities in race ways. Several research associates also have related research projects on Gulf fishes.

Dr. Joan Holt has active studies on temperature, salinity, photoperiod, density, and other ecological factors on the early life history stages of the red snapper, the red drum and other sciaenids.

Dr. Peter Thomas is working on endocrine control of reproduction of spotted seatrout and red drum; in another project he is investigating the nature of endocrine response to environmental and specific chemical stresses; and with Dr. W. Wofford he is determining the toxicology of polycyclic hydrocarbon pollutants. Dr. W.Y. Lee is investigating the energetics of egg-through-juvenile stages of red drum with emphasis on cultured invertebrates in terms of food preference and quality for growth.

Dr. H. Lin is setting up a biochemical nutrition and nutrient program that includes research both on glucose and amino acid utilization and on fatty acid synthesis.

Several professors and their students in the biological fields also are in related research. Dr. D.E. Wohlschlag continues studies of coastal fishes in terms of subtle energetic optima in relation to size, swimming rates, temperature, and especially salinity.

Dr. C. Kitting has interests in the role of fishes in the operation and maintenance of seagrass communities.

Dr. Checkley's research in biological oceanography involves the role of planktonic fishes in general makeup and functioning of the zooplankton community.

Other resident faculty, research staff, students and visiting investigators in ecological, physiological, and related fields regularly utilize the extensive laboratory and field facilities at Port Aransas for investigations involving both finfish and shellfish.

Donald E. Wohlschlag, Aransas Pass, TX

## Meetings

Third International Conference on State-of-the-Art of Ecological Modelling. Theme: Application of Ecological Modelling to Environmental Management. May 24-28, 1982. Natural Resource Ecology Laboratory, Colorado State University, Fort Collins, Colorado 80523. (Deadline expired.)

Wildlife Values of Gravel Pits. June 25-26, 1982. Natural Resources Department, University of Minnesota, Crookston, Minn. 56716. (Wildlife includes fishes. Deadline expired.)

Final call for papers for the American Fisheries Society Annual Meeting. There is still time to submit an abstract by March 15. See BRIEFS, Vol. 10, No. 4, December for details.

**Editor's Note:** Contributions for BRIEFS, 11 (2) April, due March 15. I would appreciate more freshwater fishery news.

BRIEFS, the newsletter of the American Institute of Fishery Research Biologists, is published six times a year. It is intended to communicate the professional activities and accomplishments of the Institute, its Districts and Members. Comments and contributions should be sent to the Editor: John W. Reintjes, Route 3, Box 85, Morehead City, NC 28557

**. . . BRIEFS . . .**

VOL. 11, NO. 2

APRIL 1982

**New Features**

**Request For Calculator/Computer Program**

**Announcements:** As a service to members, BRIEFS will announce the availability of programmable calculator and microcomputer programs which have been written especially for fishery applications. Announcements should be brief with the program's title, what the program does, make and model of the device for which it was designed and the language in which written. Mail your submissions to: Norman J. Abramson, Tiburon Laboratory, 3150 Paradise Drive, Tiburon, CA 94920.

The following program description may be used as a guide to the appropriate format:

**Yield/Recruit:** A calculator program that calculates yield per recruit using the Beverton and Holt method. Yield per recruit calculations are made in both numbers and weight. Required input parameters are natural mortality and Von Bertalanffy growth curve parameters. Output can be calculated for varying fishing mortalities or ages at first recruitment. The program is written for Texas Instruments SR-52 Calculator. Obtain program from: Peter Adams, NMFS, 3150 Paradise Dr., Tiburon, CA 94920.

**Synopses of Fishery-Related Theses:** To disseminate current research results and familiarize AIFRB members with activities and areas of interest in Academia, graduate students and professors are urged to submit synopses of fishery-related theses to the Editor, BRIEFS. An abstract of the thesis will be acceptable or as in the following example, a special note describing the results can be prepared.

**Test In Groups For Efficiency** by John Hoenig and William D. Lawing, Dept. Exper. Stat., Univ. Rhode Island, Kingston, RI 02881. Testing animals to estimate the proportion with a certain disease, parasite or genetic protein can be done more efficiently if the animals are tested in randomly formed groups of constant size. For example, if blood samples from 100 animals are randomly allocated to 20 groups (5 per group) and the grouped samples are cultured for a pathogen, then the number of positive groups is an indication of the proportion of individuals infected. The proportion can be estimated by  $\hat{p} = 1 - (1 - X/n)^{1/k}$

where X is the number of positive groups, n is the total number of groups, and k is the number per group. Thus if 17 of the 20 groups turn out positive,  $\hat{p}$  is 0.32 with an approximate variance of 0.005. The technique works well, provided all tests are not positive and not too many animals are put in a group. If all the tests turn out positive the estimate is 1.0 even though  $\hat{p}$  could be much lower. Possible applications include the study of whirling disease, parasitic copepods, protozoa, bacteria, fungi, etc. and the technique can be used to examine results of agglutination tests and electrophoresis studies to identify species or to determine genetic makeup. Procedures for planning such studies are described in Hoenig's thesis (1981) and these and other details are available from the authors.

**AIFRB Recognition**

The role of AIFRB and AFS in advancing "the cause of fish species preservation in North America" was discussed in a recent paper entitled "A Wild Salmon, Trout and Char Watch: An International Strategy for Salmonid Conservation" by Maitland, Regier, Power and Nilsson. The authors specifically mentioned the impact of the recommendations made by the Alaska District of AIFRB concerning the rehabilitation of salmon stocks. This recognition of our National and District organization is gratifying.

The paper was published in a special issue, Volume 38 (2), of the Canadian Journal of Fisheries and Aquatic Sciences: **The Stock Concept International Symposium (STOCS)**. There were 46 papers in all, and they were presented in groups in accordance with the organization of the conference: Introduction (1), Perspective (6), Background Papers (7), Evidence of the Stock Concept and its Applications (23), and Synthesis Paper (9). The papers concentrated, in sequence, on salmon, trout, lamprey, bass, whitefish and walleye, but many other freshwater species were also included. A wide range of topics were discussed, among them: behavior, fish culture, evolution, genetics, management, migrations, and spawning — something of interest for all AIFRB members.

## AIFRB Recognition Cont.

The organizers and contributors of the symposium are to be commended for an excellent collection of papers and the Journal staff and Canada's Fisheries and Oceans also deserve a commendation for their foresight in publishing this volume and for their editorial and financial assistance.

Bernard E. Skud, *Narragansett, RI*

## Sand Lance Population Explosion Continues off Northeastern United States

A comprehensive fishery ecosystems study known as MARMAP (Marine Resources Monitoring Assessment and Prediction) has been a major research activity at NOAA's Northeast Fisheries Center for nearly a decade. With principal focus on fish stocks, scientists at NEFC have been conducting broadscale MARMAP surveys to measure seasonal and annual variability in the structure, function and rates of change of biological and environmental components of the shelf ecosystem, as well as target studies to identify and evaluate mechanisms which control population variability.

Plankton surveys, an integral part of the Center's MARMAP program, have been conducted six or more times/year in the 260,000 km<sup>2</sup> of shelf waters from Cape Hatteras to Nova Scotia since 1976, when the program took on international dimensions through the joint participation of ships and scientific personnel from Poland, USSR, FRG, GDR, Canada and the United States. These labor-intensive surveys measure seasonal and annual variability in primary productivity (14C), chlorophyll A, nutrients NO<sub>3</sub>, NO<sub>4</sub>, SiO<sub>3</sub>, NH<sub>4</sub> and PO<sub>4</sub>), zooplankton, ichthyoplankton, seabirds and water column temperature, salinity, dissolved oxygen and circulation. In addition, information on fish eggs and larvae is used to derive fishery-independent estimates of adult spawning biomass.

The MARMAP plankton surveys provided the initial scientific evidence of a recent and seemingly significant change in the ichthyofaunal structure off northeastern United States. Immediately following an 8-year period of heavy fishing pressure which was accompanied by a 50% decline in fish biomass, the surveys produced evidence of a population explosion of sand lance (*Ammodytes* sp.) larvae, the young of small, fast growing plankton feeders of no direct importance to the United States fishing interests. Population estimates of sand lance larvae from winter survey collections increased from a low abundance of  $490 \times 10^9$  in 1974 to a high of  $9,640 \times 10^9$  in 1979. (Commercial landings and MARMAP trawl surveys conducted during the 1974-81 time period indicate a sharp decline in population levels of Atlantic herring, *Clupea harengus*, and Atlantic mackerel, *Scomber scombrus*, two

economically important plankton feeders.) With the exception of 1976 when the center of their distribution was Georges Bank, larval sand lance have been most concentrated off New York and southern New England where large patches exceeding 1,000 larvae/10m<sup>2</sup> surface area have extended for distances exceeding 300km. More recent evidence from other MARMAP activities i.e., trawl surveys, diver observations and food habits studies, indicate that adult populations of sand lance have indeed increased sharply since 1976. NEFC scientists are now attempting to unscramble inter- and intra-specific ecosystem relationships to determine what, if any, impact the apparent explosion of sand lance will have on the return of economically important fish stocks in pre-1968 levels.

Wallace G. Smith, *Highlands, NJ*

## Texas Brown Shrimp Fishery

The brown shrimp fishery in Texas coastal waters was closed for 55 days, from May 22 through July 15, 1981. The closure was effected in both state- and federally-managed waters, as proposed in the Gulf of Mexico Shrimp Fishery Management Plan. The intent of the closure was to allow brown shrimp to grow to a larger size before being caught and thereby increase the weight and value of the harvest. The closure was timed to coincide with peak migration of juvenile shrimp from bays to offshore.

A team of scientists at the Southeast Fisheries Center, National Marine Fisheries Service, NOAA, evaluated the effect of and estimated the amount of the benefit achieved from the 1981 regulation. Specific management-related questions were formulated, research strategy was developed to collect scientific data, information was analyzed to provide the necessary answers, and conclusions were provided to the Gulf of Mexico Fishery Management Council (GMFMC) to enable them to consider changes in the regulation for the 1982 fishing season.

The topic areas of the management-related questions were: (1) the size composition and abundance of brown shrimp in the area during the time it was closed to fishing; (2) the quantity and value of shrimp harvested by the regulated fishery compared to the amounts that would have been taken if the fishery had not been regulated, and (3) the changes in fishing patterns and use of shore facilities that resulted from the regulation.

The research strategy included a field survey for measuring the abundance and size composition of the shrimp population in the closed area, a dockside survey for collecting data on catch, effort, fishing location, and utilization of shoreside facilities, and observations at sea for measuring the bycatch. The information collected in 1981 was analyzed and compared with data collected in earlier years on research cruises and from

### **Texas Brown Shrimp Fishery** Cont.

the fishery. Also, using yield per recruit, virtual population, and price flexibility models, yield and value from the 1981 fishery were compared to that which have been obtained in 1981 if there had not been a closure.

The conclusions were that catches and catch rates were significantly higher in 1981 than in previous years and that this increase was due to the closure as well as to a good recruitment in 1981. The weight and value of the catch for May-August was estimated to be 11.7 million pounds higher (29% increase) and \$19.7-21.6 million for (20%-22% increase) than the amounts that would have been taken if there had been no closure. The increase was in part due to the large number of vessels attracted to Texas waters by the high catch rates experienced after July 15. Consequently, probable long-term (fishable life span) yield was estimated to be only 4.1 million pounds (7% increase) more than if there had been no closure. The closure caused changes in fishing and processing practices, but no major or unsolved problems occurred. No significant change in magnitude of the bycatch was detectable.

The GMFMC reviewed the conclusions of the scientific team and determined that the closure had achieved its intent of increasing weight and value of the catch. On this basis, GMFMC decided to effect a similar regulation in 1982.

Albert C. Jones, *Miami, FL*

### **Age and Growth of Freshwater Fishes**

For many years we have accumulated data on age and growth of freshwater fishes by rather routine analysis of scales, but there is now an increased interest in the validity and improvement of the methods and data. There has been a growing recognition that ages may be significantly underestimated on scales of older fish and that age may be more accurately represented by rings on otoliths and other bones. The discovery of daily rings on otoliths has stimulated some new approaches. The symposium on techniques of age and growth, chaired by Dr. John Casselman at Albuquerque AFS meeting was one sign of this renewed interest. Also an International Workshop on Age Determination of Oceanic Pelagic Fishes — Tunas, Billfishes, Sharks — at the NOAA Southeast Fisheries Center, Miami, Feb. 15-18 included several stimulating discussions. The results of this workshop are to be published as a NOAA Fishery circular. The Proceedings of the International Symposium on "The Aging of Fish" in Reading England, July 1973, edited by T.B. Banegal (Unwin Brothers, 1974) was an earlier expression of the same trend.

I have become concerned that the use of the body-scale relationships based upon inadequate samples are introducing unnecessary errors into growth computations and therefore am recommending standard  $a$  values

for the Fraser-Lee formula in growth computations (Fisheries 6(1):2-4; Trans. Am. Fish. Soc. 111(3)). Improvements of these  $a$  values and their use will require greater standardization of the area of scale collections and more understanding of the body-scale relationship and the factors that affect it.

Kenneth D. Carlander, *College Station, TX*

Kenneth D. Carlander is serving as a Visiting Lecturer in the Department of Wildlife and Fisheries Sciences at Texas A & M University this spring semester. He is teaching an undergraduate course on the historical development of some principles of fishery management and a graduate course on problems in age and growth studies of fish. As of mid May he returns to his position in the Department of Animal Ecology, at Iowa State University. The 50th Anniversary of the Cooperative Wildlife Research and Fishery Research Units at Iowa State is being celebrated with a symposium June 3-5.

### **Shark Tagging**

The cooperative Shark Tagging Program of the National Marine Fisheries Service, Narragansett, annually oversees the tagging of 5,000 sharks and other large gamefish. Sport and commercial fishermen and biologists from other institutions participate in this tagging operation on a volunteer basis. In 1981, there were 148 recaptures. One of these, a shortfin mako that was tagged at Oregon Inlet, N.C. was captured 3 years and 10 months later off Grenada in the West Indies, a distance of 1,650 miles. Six blue sharks, that were tagged in New England waters, were recovered in the Eastern Atlantic near the Canary Islands and Morocco, and approximate distance of 2,500 to 3,000 miles. One of these blues was 114cm when tagged at Coxes Ledge, R.I. in September 1978 and was 250cm and 50kg when recovered off Portugal in April 1981, and was carrying 28 embryos.

Jack Casey, *Narragansett, RI*

### **New Approach to Fishery Management**

A bold new plan to manage the catch of cod, haddock and yellowtail flounder off the new England coast has been developed by the New England Fishery Management Council and approved by the National Oceanic and Atmospheric Administration's (NOAA) National Marine Fisheries Service.

"The New England Council has worked with the industry for more than two years in developing this Interim Fishery Management Plan for Atlantic Groundfish," said William Gordon, NOAA's Assistant Administrator for Fisheries. "They are to be commended for this dramatic new approach to fishery management."

Gordon said the proposed regulations to implement the plan include basic conservation measures of minimum net mesh size, minimum fish sizes, and voluntary catch reporting. "They are a far cry from the present plan which uses quotas, trip limits, and mandatory



reporting requirements to control the catch," he said.

"Because of an increase in abundance of these fish stocks during the past few years, we are able to reduce the fishing regulations," said Gordon. "The proposed regulations are designed to reduce the risk of catching the smaller fish, enhance fish spawning activity, and collect accurate catch data," he said.

The plan will be effective for three years. During the first two years the Council has agreed to define its long-term management goals for these species and determine if certain levels of stocks should be maintained and what measures will be needed to reach the levels. Any additional protection measures will be implemented during the third year of the plan.

The public may comment on the plan and the proposed regulations when they are published. Final regulations implementing the plan are expected to be in place by mid-year. The current plan and its regulations remain in force until that time.

(Excerpt from NMFS News Release, Gloucester, Mass.)

## **Trapped Reef Fish Behavior**

The Southeast Fisheries Center's Miami Laboratory recently began a study of the behavior of reef fishes in relation to fish traps. A variety of reef fishes were collected using commercial type wire fish traps. The fish were returned to the laboratory and introduced to a large tank. Initial mortality was low and most specimens adapted readily to the tank. Almost all fishes are now feeding on commercial fish food pellets.

A standard wire fish trap was placed in one end of the tank. Daily observations and fish counts during working hours are made to determine the number of species of fish entering and leaving the trap. During non-working hours, a video-tape machine with a 7 hour duration at reduced speed is used. Some species, such as angelfish, triggerfish, and small groupers have been observed to enter and leave the trap almost at will. On the other hand, a large Nassau grouper entered the trap and almost immediately tried to get out by banging forcefully against the wire mesh. It was unable to find the entrance/exit and finally settled down and remained relatively stationary on the floor of the trap.

Experiments are underway to evaluate the effects of different mesh sizes on species retention and to determine the effects of various levels of starvation on some commercial species and their ability to recover. A study is also being made on the levels of mortality of fish caught in traps at various depths and then brought rapidly to the surface and released.

Grant Beardsley, Miami, FL

## **Nuclear Power and Fish**

On March 28, 1979, malfunctions at Three Mile Island Nuclear Station, Unit 2, escalated into the worst accident experienced to date by the U.S. nuclear power industry. During the accident, about one million gallons of highly radioactive water was released inside the power plant where it has been confined. This has generated public concern about the potential effects to downstream aquatic resource users, should the water leak to the Susquehanna River and enter the Chesapeake Bay. At present, the water is being decontaminated by an ion-exchange process and stored on Three Mile Island, while a series of alternatives for its ultimate disposal are being examined.

One of the alternatives is release of the decontaminated water to the river in a controlled manner that would result in no impact to downstream resource users or to the aquatic life. While such a release is not permitted now (and has not been proposed), it has sparked public concern that to do so might create a perception of threat (even if none actually exists), with the potential for consumer avoidance of Chesapeake Bay fisheries products and/or recreational resources, leading to economic impacts to the Bay fishing industries. These possibilities were recognized in the Nuclear Regulatory Commission's Final Programmatic EIS on the cleanup of Three Mile Island (Tech. Rept. NUREG-0683, March 1981) and are the subject of a one-year study begun in February 1982 by the State of Maryland Department of Natural Resources. The NRC also will examine the potential for impact to the Bay fishery resources from water releases at Three Mile Island during an ongoing disposal of the decontamination accident water. These studies will be completed prior to consideration of any action for disposal of the water.

Clarence R. Hickey, Washington, D.C.

## **University of Maine**

Fish biologists in the Department of Zoology, University of Maine, have among others the following interests and projects under their overview: Dr. Bruce Sidell, studies on fish musculature; Dr. David Stevenson (also Department of Marine Resources), population studies; Dr. Irving Kornfield, genetic studies; Dr. Terry Haines (also USFWS), water acidification and fish biology; Dr. Bruce Nicholson and Dr. Paul Reno, immunological studies; Dr. Jon Stanley and Dr. John Moring (Also Maine Cooperative Fishery Research Unit), salmon survival, insecticides and fishes, logging and fishes, fish polyploidy, population studies, fish habitat evaluation; Dr. James McCleave and Dr. James Kleckner, eel migration and locomotion; Dr. Hugh DeWitt, Antarctic fish systematics, ecology of Gulf of Maine coastal fishes; and Dr. Franklin Roberts, fish cytogenetics and aquaculture.

James M. Moulton, Brunswick, ME



## **Subsurface Temperature Data From The Great Lakes**

Two moored bouys with thermistor lines for measuring subsurface temperatures were developed in the Great Lakes this past summer. One buoy was deployed in June in western Lake Superior and the other in July in the center of southern Lake Michigan. The bouys were retrieved in November. During late June, temperatures were nearly isothermal with depth. Warming commenced in July and continued into August. The maximum surface temperature (19°C) was observed on August 23. During this period of warming, the development of a strong thermocline was observed, and the mean depth of the mixed layer increased. By mid-August, the mean depth of the thermocline was near 15 meters with a thermal gradient near 2°C/m. A slow, gradual cooling of the mixed layer began in late August and continued through mid-September in response to rather frequent cold fronts. As more data become available the dynamics of the thermocline and the dynamics of the fall overturn will become better understood. These data will also be useful in the forecasting of the winter freeze-up in the Great Lakes during years to come.

(NOAA, Ocean Engineering, Technical Bulletin, Vol. 7, No. 3)

## **✓ Geomagnetic Orientation By Pelagic Fish**

The pelagic domain, when compared to the terrestrial environment, can be characterized as devoid of sensory cues. Yet here is where some of the most amazing feats of animals migration occur. How this is done has been the subject of much scientific speculation. Scales of temperature and chemical and biotic concentrations, and the vector fields of light, electrical, and mechanical displacements have figured predominately in the literature as cues for orienting the long migrations undertaken by pelagic animals. Yet, all of these suggested mechanisms are flawed for one reason or another; most lack an absolute reference and celestial cues are unlikely for deep-swimming animals or those with poor vision in air.

Cues provided by the geomagnetic field do not suffer from these shortcomings. The field can provide not only compass direction but time cues and local piloting information to the sufficiently sensitive animal. The earth's magnetic field has been shown reliable to influence behavior and orientation in a wide variety of organisms. Yet there has been only a handful of studies demonstrating successful conditioning to magnetic fields. Most of these conditioned responses have been very difficult to obtain or have failed subsequent replication attempts.

Work of my colleagues and myself, with yellowfin and skipjack tuna and kawakawa, are an exception. We

have shown that these tropical tunas are easily conditioned to earth-strength fields. Captive tuna are trained to swim through a hoop suspended in the water for food reinforcement under one set of magnetic conditions and to withhold the response under another.

In addition, we discovered magnetite, a ferromagnetic mineral, concentrated within the ethmoid complex of the skulls of three tropical tunas and in blue marlin. Mineralogical analysis revealed that the material is exceptionally pure and thus is likely to be biosynthesized. Magnetite has been found in an astonishing number of animals from bacteria to humans and in the vertebrates is localized either in the ethmoids or at least the anterior dura mater. This biogenic magnetic material is likely to form the basis of a magnetoreceptor.

Andrew E. Dizon, *La Jolla, CA*

## **Atlantic Herring Tagging Conference**

Scientist from NMFS, Maine Department of Marine Resources, and Canadian Department of Fisheries and Oceans convened at Quebec City on January 12-14, 1982. The conference, held under the auspices of the Northwest Atlantic Fisheries Organization (NAFO), was chaired by Dr. Wayne Stobo (Canada). The purpose of the meeting was to review past herring tagging results and to determine future emphasis for tagging research.

The review of tag recovery data confirmed the complexity of herring stock dynamics and migratory patterns in the western North Atlantic. After a review of the available data, the scientists established priorities for future tagging programs. The conference results will be issued as a NAFO document.

Recently, the Maine Department of Marine Resources modified an existing herring tagging proposal to accommodate the priorities established by the Quebec working group. This proposal for extending Maine's herring tagging program was submitted to the New England Fishery Management Council. The proposed study, incorporating attempts to tag ripe (stage 6) herring in two areas of the Gulf of Maine, has been favorably received by the Council. If research funds are available the tagging work will be started in 1982 and will be coordinated with scientists from the State of Massachusetts.

Joseph J. Graham, *West Boothbay Harbor, ME*

## **Heart of the Hills Fisheries Research Station**

In 1969 this station, part of Texas Parks and Wildlife Department, was established at Mountain Home, Texas on the site of one of the oldest State fish hatcheries, originally constructed in 1925.

## Heart of the Hills Fisheries Research Station Cont.

Station facilities include 25 ponds, from 1/5 to 2½ acres, an office, laboratory, wet laboratory building, shop, two residences and several storage buildings.

Exotic fish research includes assessment studies on African Nile perch (*Lates* spp.) and South American peacock bass (*Cichla* spp.) as faunal additions to heated reservoirs. The large size and preadaptation to higher temperatures of these species may provide a more balanced fishery in heated reservoirs.

Work with various transotics continues to account for much of the research efforts at the Station. Two warmwater strains of rainbow trout are being cultured for potential enhancement of the Texas trout fisheries. Other studies involve work with striped and hybrid striped bass. Life history information on smallmouth bass is being gathered as well as an electrophoretic analysis of largemouth bass and bluegill populations following the introduction of Florida bass and coppernose bluegill subspecies. Blueback herring, anadromous native of the East Coast, are also being cultured for evaluation as a forage fish. Other work involves several saltwater species which continue to show great potential for stocking in fresh waters. These include the red drum, southern flounder and orangemouth corvina.

In addition to this work with exotic and transotic fishes, Station personnel are also involved in a largemouth bass length limit evaluation, flathead catfish egg procurement study and bass hybridization work.

Gary Garrett, Ingram, TX

## New Role for the Morphoedaphic Index

Morphoedaphic indices have traditionally been utilized for the first approximation of potential fish yields from freshwater lakes and reservoirs. Recently, Michael Michalski and John Hanna, in consultation for the Canadian Department of Fisheries and Oceans, have proposed the use of a morphoedaphic index to determine the loss of potential fish yield due to acid precipitation stresses. In this instance, total inflection point alkalinity would replace total dissolved solids in the numerator of the index, while the mean depth denominator would retain its previous function. Presumably, with time, declining buffering capacity as indicated from decreased alkalinity levels will be indicative of potentially declining fish stocks. The index may be calibrated to account for critical biological thresholds, spring depressions, metal mobilization or episodic events as appropriate. Early application of this method will provide rapid first estimates of both potential or actual losses of fish stocks in hundreds of thousands of poorly buffered lakes. These preliminary estimates may be verified in time through more intensive investigations in the future.

R. A. Ryder, Thunder Bay, Ontario

## ✓ Dr. Joseph Honored

Dr. James Joseph, Director of Investigations of the Inter-American Tropical Tuna Commission was awarded the honorary degree of "*Docteur Honoris Causa*" on May 11, 1981, by the Université de Bretagne Occidentale, Brest, France. On March 25, 1982, Dr. Joseph received the Nautilus Award from the Washington, D.C., chapter of the Marine Technology Society and Nautilus Press, Inc. At that time he delivered the David H. Wallace Memorial Lecture at the waterfront conference facility of Nautilus Press.

Richard J. Myhre, Seattle, WA

## AIFRB Annual Business Meeting

The Annual Business Meeting of AIFRB will be held on September 20 and 21, 1982. As in the past, this meeting will be held at the same time and place as the Annual Meeting of the American Fisheries Society. The meeting place is the Hyatt Hotel, Hilton Head, South Carolina. AIFRB will hold its meeting prior to the AFS scientific sessions which are scheduled for September 22 to 25. AIFRB and AFS will co-sponsor the marine session. Vaughn Anthony (MA) will be the AFS Chairman and William Fox (FL) will be the AIFRB Chairman. Further announcements concerning AIFRB's meeting and the marine session will be made in later issues of BRIEFS.

## Meeting Announcement

The North Atlantic Fisheries Organization, NAFO (formerly ICNAF), will hold a special scientific session on **Stock Discrimination** on September 8-9, 1982, at the Bedford Institute of Oceanography, Dartmouth, Nova Scotia. The session will concentrate on marine fishes and squid, but papers dealing with other species that are relevant to the underlying scientific concepts or to methodological problems will be considered. The session will include invited and contributed papers of a general nature, as well as papers on particular aspects, such as parasitology, meristics, morphometrics, tagging, etc. Scientists working on different aspects of stock discrimination are urged to contribute papers. Each contributor should submit the proposed title, and abstract of the paper to NAFO by May 30, 1982. The complete paper will be due on August 30, 1982. NAFO, P.O. Box 368, Dartmouth, Nova Scotia, Canada B2Y 3Y9.

Please submit information for June BRIEF's by May 15 to the Editor.

## New Journals and Publications

**EPA Acid Rain Bibliography** lists 4,000 documents dealing with every topic related to acidic deposition. A complete alphabetical list of all titles/citations, most with abstracts, and an index of all authors is available on microfiche free of charge. The entire data base is stored on computer. This can be searched by the public or by a specialist on a user fee basis. The bibliography is also available as a printed reference manual of about 1,000 pages at its production cost of \$50.00. Topics include natural sulfur and nitrogen cycles; gaseous acidic precursors and combustion phenomena; long-range transport and transformation; deposition; effects on materials, soils sediments terrestrial and aquatic biota. Contact Danny L. Rambo, Northrop Services Inc., 200 SW 35th St., Corvallis, OR 97333 (503)757-4695, FTS 420-4695.

**Fish Biologics: Serodiagnostics and Vaccines**, D.P. Anderson and W. Hennessen, Editors. A book of the scientific papers presented at the Symposium, National Fish Health Research Laboratory, Leetown, WV. Over 52 contributions give positions and statement of the art advances in detection, identification and prevention of fish diseases. Volume 49 of *Developments in Biological Standardization*, 489 pages \$56.50. S. Karger Publ. Inc., 150 5th Avenue, New York, NY 10011.

**NODC Taxonomic Code.** The National Oceanographic Data Center announces the availability of the third edition of its Taxonomic Code. This expanded edition comprises nearly 28,000 entries giving the scientific names and corresponding numerical codes of worldwide flora and fauna from viruses to mammals. The code was developed to simplify and systematize computer processing of data about aquatic and terrestrial organisms. The Code is a hierarchical system of numerical codes of up to twelve digits. Ten digits are used to represent five or more levels of classification from phylum to species; two additional digits are available to code subspecies or variety. Order from National Oceanographic Data Center, NOAA/EDIS OA/D761, Washington, DC 20235. Hardcopy \$16. Magnetic tape \$70.

**Nutrient Requirements of Coldwater Fishes.** Developed to update and expand data originally presented in *Nutrient Requirements of Trout, Salmon and Catfish* (1973), this report presents qualitative and quantitative nutrition requirements for growth and maintenance of various coldwater species. The report includes discussions of feed nutrient contents, nutrition-related diseases, feed processing, and feeding practices. Thorough consideration of relevant technical literature and an extensive bibliography make this a useful volume for nutritionists, researchers and others engaged in aquaculture. Extended tables of nutrient require-

ments and feed energy components make the report indispensable for the fish farmer. National Academy Press, 2101 Constitution Ave., Washington DC 20418, 72 pages, \$8.95.

## Districts In Action

### ALASKA

J. H. Helle, *Director*

At the February meeting, Tom Lane, Executive Director, Alaska Fisheries Research Center Study Group summarized the recommendations the Group will make to the Governor.

District Director Helle testified before a State Senate Committee on legislation for the Center.

The Alaska Council of Science and Technology awarded a grant to the District to help publish *Proceedings of the Symposium — Old Growth Forests-Fishery Relationships*. A companion Symposium — *Old Growth Forests-Wildlife Relationships* also will be held April 12-16 in Juneau.

### FLORIDA

Joan A. Browder, *Director*

Paul Shafland, Director, Non-Native Fish Research Laboratory, Boca Raton, gave a report on exotic fish research in South Florida at the March meeting.

The District Fisheries Environmental Advisory Committee responded to environmental problems relevant to fisheries that has resulted in several white papers. Last year testimony was prepared relative to saltwater fishery legislation.

### GULF OF MEXICO NORTHEAST

Thomas W. Duke, *Director*

The District held its first meeting of the year at the Environmental Research Laboratory in Gulf Breeze, Florida. The concept of sponsoring a workshop concerned with a current topic of interest to fishery biologists was presented and the group decided to poll the membership by letter to determine interest and topics. Dr. Tom Duke presented an evaluation of the Adaptive Environmental Assessment the Process in evaluating the potential impact of drilling fluids on the marine environment and possibilities of applying this method to other fishery and pollution issues provided an interesting and informative afternoon.

## Members Service

E. W. Bonn M73 E81, 1300 W. Munson, Denison, TX 75020 has journals for sale, best offer. AFS Trans. 1945-77; Copeia 1948-53; Sport Fish. Abs. 1955-74; Wildlife Abs. 1935-60; Calif. Fish & Game 1955-81; Texas Parks & Wildlife 1942-81 and others.

## Library And Non-Member Subscription

**BRIEFS**, American Institute of Fishery Research Biologists newsletter is published six times a year. Send \$15.00 to John W. Reintjes, Editor, Route 3, Box 85, Morehead City, NC 28557

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## Membership Report

### NEW ASSOCIATES

Curt Kerns	AK
Loretta F. Sullivan	RI

### NEW MEMBERS

John M. Mason, Jr.	NY
Dr. Warren E. Stuntz	MS
Dr. Joseph R. Sullivan	AK

### PROMOTION TO FELLOW

Dr. William Aron	WA
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**Prospective AIFRB Members** send your request for membership to the Membership Review Committee.

Dr. Sammy M. Ray, *Chairman*  
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Galveston, TX 77550

Dr. Bernard Griswold  
Coop Fishery Res. Unit  
U.S. Fish and Wildlife Service  
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Iowa State University  
Ames, IA 50011

Kendall Warner  
Dept. of Fish and Game  
34 Idaho Ave.  
Bangor, ME 04401

## IN MEMORIAM

**Dr. Lyle S. St Amant, Fellow 1975**

Hammond, Louisiana

December 21, 1981

**Dr. Ralph O. Hile, Fellow 1958**

Ann Arbor, Michigan

March 28, 1982

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**. . . BRIEFS . . .**

VOL 11, NO. 3

JUNE, 1982

**— ANNOUNCEMENT —**

**Nominations For The  
1982 W. F. Thompson Award**

The Award Committee for selection of the 1982 W. F. Thompson Award has been convened and would like to receive recommendations for the one best paper published during the years 1979, 1980 and 1981. The student winning the award will receive a certificate from AIFRB and a check for \$750.

Papers can be multiple-authored; occasionally, as in 1980, a major professor is a junior author. In this case, the student receives the certificate and \$750 award while the professor receives a certificate acknowledging his role in the outstanding paper.

Papers should be concerned with freshwater or marine fisheries problems and may deal with biological or management topics. The papers are judged on the basis of originality, development and organization, and interests to current problems in fisheries.

Nominations for papers must be received no later than July 30, 1982. Seven copies of the paper should be sent to Dr. John B. Pearce, Chairman, AIFRB W.F. Thompson Award Committee, Northeast Fisheries Center, Sandy Hook Laboratory, Highlands, NJ 07732.

If there are questions in regard to the award, the Chairman can be contacted at (201) 872-0200, extension 206, or FTS 342-8206.

**Outstanding Achievement Award — 1980**

Richard H. Stroud received the AIFRB Award in Fort Lauderdale, on May 10. Past President Eugene Nakamura made the presentation at the Marine Recreational Fisheries Symposium luncheon. *Congratulations Dick!*

**President's Travel and Research**

AIFRB President, Bernard E. Skud, spent a week in April at the headquarters of the International Council for the Exploration of the Sea (ICES). He is the U.S. member of the ICES Working Group on North Atlantic Salmon which meets annually to assess the impact of the West Greenland salmon fishery on home-water stocks.

This year's meeting also included discussions on the high-seas salmon fishery by Faroese fishermen in the Eastern North Atlantic. After this meeting, Skud met with scientists at the Fisheries Laboratory in Lowestoft, England, to confer about his current research on the interspecific interactions of pelagic fishes. His recent paper (*Science*, Vol. 216, No. 4542, April 1982) on this subject was entitled: *Dominance in Fishes: The Relation Between Environment and Abundance*. The summary of this paper states:

Changes in abundance of dominant species of fish were positively correlated with environmental factors that improved survival, and abundance of the subordinate species was negatively correlated with the same factors. When dominance changed, the responses of both the dominant and subordinate species also changed. Implicit in this inverse relation is the conclusion that the abundance of the subordinate depends on the density of the dominant species, and this hierarchy must be recognized in the interpretation of the correlations. Changes in dominance not only explained why the response of a species changed from positive to negative, but also why different stocks did not respond in the same way to temperature. The findings support the thesis that climatic factors can affect the abundance of a species but do not govern its absolute population density. The results have important implications for fishery management.

**Editor's Note**

A significant article by our President, Bernie Skud, appeared in *Science*, Vol 216, April 9, 1982: "*Dominance in Fishes: The Relation Between Environment and Abundance*." There is much for thought in the five pages.

**NMFS Forecast of Atlantic and Gulf  
Menhaden Landings in 1982 Season**

The forecasting method employed by the Southeast Fisheries Center's Beaufort Laboratory, uses catch and effort data for the years 1955-1981 in the Atlantic purse-seine fishery and accounts for about 88 percent of the annual variation in catches. It appears that purse-seine fishing effort in 1982 will be less than the 1,133 weeks recorded in 1981 due to the decision of a company in New Jersey to temporarily close operations. Approximately 50 active vessels with about 1,000 vessel weeks of effort are expected in 1982. We predict a season catch of 340,000 metric tons and the chances are 4 out of 5 that it will be between 255,000 and 435,000 metric tons.

*Cont. on Page Two*

Migration patterns of Atlantic menhaden and observed small size of age-1, -2, and -3 fish in the current population suggest good catch potentials for Chesapeake Bay and South Atlantic fishing areas.

In the Gulf fishery, the historical fit of catch and effort data for the years 1946-1981 accounts for about 84 percent of the annual variation in catches. The number of active vessels should increase to about 84 in 1982, from 80 in 1981, due to the arrival of some displaced Atlantic Fishery vessels. Therefore, fishing effort is expected to exceed the 620,000 vessel-ton weeks recorded for 1981 by about 4 percent. Since 1-year-old menhaden made good contributions to the age makeup of 1981 catches in most areas, total landing in 1982 should make for a good season. Also, the central fishing areas should benefit from greater numbers of 2-year-old fish in 1982. If effort amounts to 645,000 vessel-ton weeks in 1982, a catch of 650,000 metric tons is estimated and the chances are 4 out of 5 that it will be between 525,000 and 770,000 metric tons.

T. R. Rice, *Beaufort, NC*

## **New Index For Size Composition Of Shrimp**

In a series of recent papers in *Fishery Bulletin*, *Marine Fisheries Review* and *Gulf Research Reports*, Charles Caillouet and colleagues of the National Marine Fisheries Service, Southeast Fisheries Center, Galveston Laboratory have developed a new and unique index to depict the size composition of catches and landings of commercial shrimp (*Penaeus* spp.) from the Gulf and southeast coasts of the United States. In these shrimp fisheries, the size of shrimp in the catch is expressed in terms of numbers of shrimp per pound (known as "count"), which amounts to a reciprocal transformation of the weight per shrimp. Caillouet et al. cumulated the catch (or landings) in each size category (for a given time interval and area), starting with the size category of smallest shrimp and cumulating toward the size categories of larger shrimp and plotted this cumulative catch against count. The plot showed a logarithmic decline in cumulative catch with increase in count (i.e., decrease in size of shrimp). A logarithmic transformation converted the relationship to a straight line, with a negative slope which is an index of size composition of the catch (or landings). The smaller the slope, the larger are the shrimp in the catch (or landings). Proceeding further, Caillouet et al. were able to assess fluctuations and detect trends in size composition of the catches (and landings) of brown shrimp (*P. aztecus*), white shrimp (*P. setiferus*), and pink shrimp (*P. duorarum*), over a period of years. Using a similar analytical approach, they have investigated fluctuations and trends in the ex-vessel value of the catches and landings of shrimp.

*Gulf Research Reports*, vol. 7, no. 1, 1981

## **Effects of Point Beach Nuclear Plant on Lake Michigan Fisheries**

The Nuclear Regulatory Commission has published technical report NUREG-0816 entitled "Power Plant Siting and Design: Intake and Discharge Effects at Point Beach Nuclear Plant on Lake Michigan Biota and Fisheries." The assessment utilizes: five years of data during power plant operation collected by the licensee; data and studies from the State of Wisconsin; and studies conducted at Point Beach by Argonne National Laboratory under the sponsorship of the Atomic Energy Commission, the Nuclear Regulatory Commission, and the Department of Energy. The 53 page report is available from: GPO Sales Program, TIDC, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555.

Significant adverse impacts were not detected; however, localized effects were identified that are related to thermal discharges and to the interactions between the large thermal plume and the offshore cooling water intake crib. These station design features apparently contributed to greater effects than anticipated in preoperational NEPA reviews. The operation of Point Beach primarily affects the exotic lake fishes, that is, the introduced species (alewife, smelt) and stocked species (trout and salmon), rather than the native fishes. However, it is the exotic fishes that now constitute either a significant portion of recreational and commercial fishery harvests or significant portions of the food resources for important predator and economic species. Assessment of the acceptability of impact on alewife (the species most affected by operation) was complicated because of its status as both a nuisance species and an important economic resource. A solution to this dichotomy could aid in judging acceptability and could shed some light on the conflict between the recognized large-scale losses of Great Lakes fishes (especially alewife) by water withdrawals at once-through cooling power plants and the high costs and disadvantages of instituting alternative cooling system designs.

The thermal discharge plumes at once-through cooling power plants have become favorite sport fishing locations on Lake Michigan, due to the attraction of prey and predator species to the warm effluents. At Point Beach, construction of fishing facilities at the power plant has increased fishing opportunities, and the thermal effluents have contributed to a near-shore availability of desirable fish species. As a result, fishing success there is much better than in ambient-temperature areas. Angler catches have averaged more than 10,000 trout and salmon per year at the power plant site, with estimated angler expenses exceeding \$125,000 per year in pursuit of the fish. In the absence of any significant adverse impacts on fishes, the enhancement of the recreational fishery at Point Beach is a benefit of station operation. It also contributes to

the success of the state trout/salmon stocking program because fishing success at the power plant increases the harvest-to-stocking ratio.

Clarence R. Hickey, *Washington, D.C.*

**PLEASE NOTE:** Errors were made during the printing of April BRIEFS "Nuclear Power and Fish". Part of a sentence was deleted and word misspelled. As these errors critically changed the report, the corrected sentence is "The NRC also will examine the potential for impact to the Bay fishery resources from water releases at Three Mile Island during an ongoing comprehensive assessment of the several alternative methods for ultimate disposal of the decontaminated accident water." The underlined were omitted.

Editor

## Energy Minimizing Behavior of Wild Brown Trout (*Salmo trutta*)

Free-ranging wild brown trout (*Salmo trutta*) in a fertile, high conductivity stream were observed from camouflaged observation towers for three consecutive years in order to quantify the diurnal feeding and social behavior of undisturbed adult trout. The behavior exhibited was characterized in general as being one of cost minimization. Individuals ranging in age from young-of-the-year to eight years old used discrete energy-saving foraging sites year after year, and fed mainly off drift, taking less than 15% of their food items directly off the bottom. The home range of most individuals was established when the trout were young-of-the-year or yearlings, and changed little thereafter. The mean size of the home range of all individuals observed was 15.6 m<sup>2</sup>, and decreased slightly during the first four years of growth. No individual had exclusive use of any home range, and no clearly defined territory could be described for any trout. Rather, the social structure evidenced is best described as a cost-minimizing, size dependent despotic dominance hierarchy consisting of individuals having overlapping home ranges.

Feeding rates decreased with age, were highest in spring and fall, and showed little effect of time of day except for short peaks at dusk in May and June. There was no apparent correlation between dominance and site selection with respect to distance to cover or feeding rate. Wild trout used overhead cover less than 60% of daylight hours. Use of cover increased with age starting with age-group three. Growth was asymptotic at 40 cm. A rectangular hyperbola described well the overall growth curve of the population with a half-saturation constant of 23 months. Hatchery-reared brown trout, introduced for experimental purposes, fed less, moved more, and were less likely to use cost-minimizing features of the substrate than wild trout. High energy cost is postulated as a major cause of mortality among hatchery-reared trout stocked in streams.

Techniques for identifying individuals for as long as 5 years, measuring growth and photographing free-ranging trout are described in Bachman's thesis (1982).

Robert A. Bachman and Robert L. Butler, *University Park, PA*

## Computer Program Announcement

DISBCAL: A package of Applesoft BASIC computer programs for the Apple II. DIS utilizes a digitizing pad to compute and file measurements from fish bony structures such as scales. An image of the scale is projected onto the digitizing pad and a touch of the probe at each annulus results in measurement. REGRESS computes a body-scale regression and BCAL back-calculates lengths at annuli using the regression intercept parameter and scale measurements. Outputs from all three programs are stored as files on the diskette. Obtain more information from: Richard V. Frie, University of Minnesota, Dept. of Entomology, Fisheries, and Wildlife, 219 Hodson Hall, 1980 Folwell Avenue, St. Paul, MN 55108.

## International Workshop on Age Determination of Oceanic Pelagic Fishes — Tunas, Billfishes, and Sharks

A total of 63 scientists from 10 states in the continental United States and Hawaii, 3 provinces in Canada, France, Republic of Senegal, Spain, Mexico, Ivory Coast, and New South Wales (Australia) attended the workshop on age determination of oceanic pelagic fishes held at the Southeast Fisheries Center, Miami, Florida, February 15-18, 1982. A packet of the 24 working papers was distributed to each participant at registration. The papers were partitioned into sections according to subject and species examined. Dr. Eric D. Prince, workshop convener, began the workshop by welcoming all participants and Dr. William W. Fox, Jr., Director, Southeast Fisheries Center, and Dr. William J. Richards, Director of the Miami Laboratory, gave opening remarks. The meeting started with two general overview papers, one on statistical characteristics of ageing data for population analysis and another that reviewed age and growth assessment techniques and tools — past, present, and future.

The section on tunas consisted of 11 papers which addressed age determination of various life stages of bluefin tuna, yellowfin tuna, skipjack tuna, little tunny, albacore, and Pacific bonito. Examples of ageing techniques included otolith microstructure of young-of-the-year; vertebrae, otolith, and fin spine analyses of adults and juveniles; stochastic age frequency estimation using the von Bertalanffy growth equation; and tetracycline and tag-recapture validation of age estimates. A night session at the end of the first day included three papers covering scanning electron microscope analysis of giant bluefin tuna otoliths, processing and handling fin rays and spines for age determination, and uncertainties of partitioning the catch of southern bluefin tuna into age classes using an age-length relationship.

There were three separate papers on ageing broadbill swordfish using otoliths and anal spines; age estimation of sailfin from dorsal spines; and a review of anatomical characteristics of otoliths from seven species of billfishes and their potential use as ageing structures. A general paper reviewed ageing techniques used on California elasmobranchs, while other papers covered silver nitrate staining of vertebrae, x-radiography, tagging, and length-frequency analysis to estimate age of sandbar, shortfin mako, blue, thresher, scalloped hammerhead, dusky, and lemon sharks. Tetracycline marking showed promise as a means to validate age estimates using vertebrae from several species.

Subjects covered by round-table discussions and demonstrations included age validation, back calculation of length from growth bands on skeletal hardparts, ring counting techniques, and the use of silver nitrate in combination with tetracycline to age sharks. The overwhelming majority of workshop participants agreed that the lack of validation of age estimates (or means to accomplish the same) is one of the most serious problems preventing advancements in assessing the age and growth of fishes, particularly oceanic pelagics.

The proceedings of the workshop is planned for publication as a Special Scientific Report — Fisheries (NOAA), hopefully within the year. Contact Southeast Fisheries Center, Miami Laboratory, 75 Virginia Beach Drive, Miami, FL 33149.

Eric D. Prince, *Miami, FL*

## RASA — Restoration of Atlantic Salmon in America

"New Directions — New Dimensions — New Disciplines" — This is the credo of RASA, a private non-profit organization "... dedicated to the Restoration of Atlantic Salmon in America and to protect the species as far offshore as the stocks may range in the ocean." RASA was incorporated in 1973. The following quotations have been excerpted from the RASA brochure authored by its Chairman, Richard A. Buck.

"The RASA Philosophy... For Atlantic salmon, the old order has



failed; the system is sick. Man has the knowledge and ability to produce these fish in any required numbers. The obstacles to conservation and restoration are therefore political, sociological and economic, rather than ones of science and research. Effective resolution of these problems calls first for knowledge and understanding, then and most important, perception, imagination and innovation..."

"Ocean Affairs... RASA believes that only a multilateral treaty can set up an effective commission mechanism for addressing and solving the problem of one nation's intercepting stocks originating in another nation's rivers... RASA, in 1975 became the first to call for such a treaty, and began promoting the concept with United States governmental agencies. In early 1978, our government agreed to undertake the effort, and introduced a draft, offering it for comment to interested nations. We are deeply involved in this treaty-making process, with the RASA Chairman serving as a Member of the Ocean Affairs Advisory Committee of the United States Department of State, and of the U. S. Negotiating Team on Atlantic Salmon. Our knowledge and years of experience in this complicated geopolitical area of salmon conservation enables us to make important contributions." (Editor's Note: The North Atlantic Salmon Convention is now in the ratification process.)

"How RASA Functions... RASA marshals United States and world opinion through public information programs. We provide guidelines to effective action, encouraging commitment, by individuals and institutions, to attack critical problems of Atlantic Salmon Restoration with a sense of urgency and priority. RASA works closely with governmental agencies, conservation organizations and private industry."

RASA P.O. Box 164, Hancock, NH 03449

Any Member or Non-member that knows of a significant publication, thesis or dissertation, or computer program of interest to fishery scientists, please send that information to the Editor.

Please submit your reports for August BRIEFS by July 15.

## Districts In Action

### ALASKA

John H. Helle, *Director*

The Symposium on Fish and Wildlife Relationships in Old-Growth Forests, co-sponsored by the Alaska District of AIFRB and the Northwest Section of the Wildlife Society, April 12-15, in Juneau, Alaska, was an outstanding success. Both numbers of participants and quality of presented papers exceeded expectations. The Proceedings will be published by the national AIFRB Organization as the first of an annual series, each of which will cover a special topic or theme. Copies of the Proceedings will be distributed to all AIFRB members, and additional copies will be available for purchase. Publication costs will be covered by: the symposium registration fees, and contributions from the Alaska Council on Science and Technology, National Audubon Society, Territorial Sportsmen, Inc., Pope and Young Club, and the Alaska Conservation Foundation.

Total paid registration was 255 persons, of which 85 were fisheries biologists and 162, wildlife. Good representation from British Columbia, Washington, and Oregon, despite current budget and travel restrictions, was especially gratifying. Nineteen fisheries papers and 22 wildlife papers were presented; all will be peer-reviewed before final acceptance for publication, which is scheduled for fall 1982.

There were three sessions in the AIFRB fisheries program: Session I, on Fisheries ecology in pristine old-growth forests, Session II on timber management-fish habitat productivity (primarily clearcut logging effects), and Session III, a panel discussion between five representatives of industries and agencies that are users or managers of timber and fishery products in Southeast Alaska. This discussion generated a lively debate between logging and fisheries panelists, and there were many comments from the audience.

The symposium was noteworthy in that it was the first time that fisheries, wildlife, and forestry scientists have collaborated in sponsoring a professional meeting in Alaska. The common theme was old-growth forests and the interactions of logging with fish and game habitat. Many requests already have been received for copies of Proceedings.

**NOTE:** Planning for the second annual AIFRB Fishery Perspectives will begin with in the next few months. Districts (or individuals) who wish to make suggestions and/or to sponsor a workshop or a symposium or a collection of invited papers on a particular theme should submit their topics and ideas to President Bernard Skud by August 1, 1982. As with the Alaska District's symposium, once the selection is made and endorsed by AIFRB, the National Body of AIFRB will commit to contributing to the publication costs of the proceedings, but the sponsor will also be expected to provide some funding from registration fees, donations, or other sources.

### FLORIDA

Joan A. Browder, *Director*

The Annual Dinner Meeting of the District was held May at the University of Miami Rosenstiel School of Marine and Atmospheric Science dining hall. More than 50 attended to hear Dennis E. Hammond, Assistant Director of Florida Game and Freshwater Fish Commission on "Our Dwindling Fisheries Resources: The Biologist's Role."

### NORTHWEST WASHINGTON

John S. Isakson, *Director*

Dr. William F. Royce discussed the profession of fisheries at the April District meeting, focusing on changes he has seen over the years. He noted that a major change is associated with how fisheries professionals now work on multidisciplinary teams much more than in the past. He also discussed the term "fisheries scientist" as compared to "fisheries biologist" and indicated the former title seems more appropriate to the mixed discipline efforts in which people are now involved. He has also noted more fisheries scientists are now in upper senior management roles in organizations as compared to earlier years. Another change noted was in the dominant type of work completed in fisheries: basic/applied research down while social decision studies are going up. Dr. Royce also reviewed the educational preparation of fisheries scientists and indicated some criticisms that exist from high management fisheries scientists in federal, state and private sectors. A great deal of discussion followed, indicating the complexity and sensitivity of the subject.

Joint Southwest Washington-Oregon and Northwest Washington District Meeting was held in Olympia on May 25. Clinton E. Stockley discussed the Columbia River White Sturgeon.

## Membership Report

### ASSOCIATES

Norman R. Dube	ME
Marion Y. Hedgepeth	FL
Konstantin A. Karpov	CA
Denis R. Lassuy	LA
Donald Eugene Marchette	SC
Steven A. Murawski	MA
Michael L. Murphy	AK
Dr. Donald J. Orth	VA
Terrance John Quinn, II	WA
J. Michael Redding	OR
Gary H. Sanders	AK
Teresa Ann Wilson	FL

### MEMBERS

Edward Baum	ME
Arthur John Derksen	MB
Dr. Jeffrey Michael Reutter	OH

### EMERITUS

Dr. Allan C. Hartt	WA
Donald R. Johnson	WA

Sammy M. Ray

Secretary of Membership

**BRIEFS**, the newsletter of the American Institute of Fishery Research Biologists, is published six times a year. It is intended to communicate the professional activities and accomplishments of the Institute, its Districts and Members. Comments and contributions should be sent to the Editor: John W. Reintjes, Route 3 Box 85, Morehead City, NC 28557. Subscription \$15 a year to Institutions and Non-members.

**. . . BRIEFS . . .**

VOL. 11, NO. 4

AUGUST, 1982

**SPECIAL NOTICE**

Extension until August 31 for nominations for the 1982 W.F. Thompson Award. Please submit your nomination to Dr. John B. Pearce, NMFS, Sandy Hook Laboratory, Highlands, NJ 07732. See June BRIEFS for details.

**Board of Control Agenda  
September 20-21, Hilton Head, S.C.**

1. CALL TO ORDER AND ADOPTION OF AGENDA
2. REPORTS —
  - i) Treasurer — Financial Standing • Relations with Internal Revenue Service • Mailing List • Investments • Dues - increase/decrease, 3-year option
  - ii) Membership — New Members • Delinquents • Application Processing • Other Items
  - iii) Publications — BRIEFS • Membership List • Bylaws Annual "Perspectives" 1982 & 1983
3. AWARDS —
  - i) Best Student Paper 1982
  - ii) Outstanding Achievement Award 1982 and Report on 1981
  - iii) Group Award 1982
  - iv) New System 1983
4. DISTRICT ACTIVITIES —
  - i) Special Problems
  - ii) Director's Reports
  - iii) Delineation of existing Districts and Establishment of new.
5. BYLAWS —
  - i) Approved changes
  - ii) Other changes
  - iii) "Guidelines" — duties of Officers • Awards
6. OTHER ITEMS —
  - i) Activities with American Fisheries Society
  - ii) Approval of Emeritus Status
  - iii) Additional issues.

All AIFRB members are urged to submit any items which they feel should be considered at the annual meeting.

**AIFRB No Host Cocktail Hour**

A gathering of Members, Friends, and Perspective Members will begin at 5:30 P.M. on Thursday, September 23, at the Hyatt Hotel, prior to the Low Country Cookout. The place will be posted at the AFS Meeting.

**Treasurer's Notice**

A recent count of AIFRB membership revealed 171 Associates, 660 Members, 247 Fellows and 87 Emeritus or a total of 1165. As of June 21, dues have been received from 617 since the 1982 bills were sent out in late January. Sixty-eight have taken advantage of the 3-year Special Plan (1982-4) for \$25.00. This offer is still open for those who haven't yet paid their dues. For those not wishing this great bargain we are happy to receive your \$10.00 at your earliest convenience. Second notices will be mailed in September — help save me the trouble.

C.F. Cole, Treasurer



**In Memoriam**

Bob Borovicka, President AIFRB 1977-1978, died from a heart attack on June 22 while vacationing at the family cabin on the Deschutes River. He lived and enjoyed life to the fullest. Bob leaves his wife, Georgia, six children and 4 grandchildren. Bob was born in Portland in 1920, received B.S. in Fish and Game Management in

Cont. on page two



**In Memoriam...** Cont. from page one

1942, and served as an officer in the U.S. Army Artillery during World War II in Europe.

His outstanding career as fishery biologist began with the Oregon State Game Commission in 1946 when he was hired to conduct special lake and stream studies in Central Oregon. From 1957 to June 1966, he was Chief, Coordinating Fishery Biologist for the Game Commission. In 1966 he became the first Fishery Biologist hired by the Bureau of Land Management. While in the Portland Service Center, Bob worked on important fishery issues in most states west of the Rockies. He also developed the first technical standards and guidelines for the Bureau's aquatic habitat management program. Later he worked in the Oregon State Office as a Fishery Biologist and after July 1977 was Chief, Branch of Range, Watershed and Wildlife.

Bob retired in April 1982 after 36 years of service. He set high personal and professional standards for himself and encouraged others to strive for professional excellence. He became a member of AIFRB in 1967, was Director of the Oregon-Southwest Washington District, 1973-74 and served as AIFRB President, 1977-78. He was a member of AFS since 1946 and served on many committees at the State, Western Division and National levels. Bob was also a member of the Pacific Fishery Biologists since 1948.

Bob was well known and respected by those he worked with. Those of us who knew him are deeply saddened by his death but his enthusiasm, innovative ideas, thoughts and desires for professional achievements are still at work in our minds.

Art Oakley

## — NOTICE —

On occasion, arrangements can be made to accept a well-qualified college or university student in a fisheries-related discipline for a minimum 2 month internship assisting a policy specialist serving the U.S. Congress and the Congressional Research Service. Persons interested in an opportunity to become more aware of fisheries policy and decision making at the Federal level should be able to arrange for such an internship to be accepted as part of their academic program, have a keen interest in and ability to conceptualize national policy issues in fisheries, and be a college or university graduate or advanced undergraduate student in a fisheries-related discipline. This is an **unpaid** internship and **no** housing or other allowance is provided.

Interested persons should correspond with Eugene H. Buck, Specialist in Natural Resources Policy, Environment and Natural Resources Policy Division, Congressional Research Service, Library of Congress, Washington, D.C. 20540 indicating their particular interest in national fisheries issues and their availability for such an internship.

## Atlas Of Fish Spawning And Nursery Areas In The Great Lakes

A 1,200 page fourteen-volume atlas is being prepared under contract for the Army Corps of Engineers. This atlas consolidates existing information describing spawning and nursery areas used by stocks of fish, including anadromous ones, considered to be residents of the Great Lakes and their connecting waters. The information presented for each spawning or nursery area identified in the atlas includes, when known, the area's precise location, history of use, season of use, water temperature during the season of use, major substrate type, and water depth. Pre- and post-spawning migrations of mature fish and movements of young fish are also described, insofar as this information serves to better delineate spawning or nursery areas. Concise descriptions of what are perceived to be the general spawning and nursery requirements of the more common Great Lakes fishes were compiled from the literature and are also presented.

Thomas A. Edsall / Carole D. Goodyear - Ann Arbor, MI

## Performance Differs Among Lake Trout Strains

In a cooperative effort to offset disappearance of the indigenous lake trout from Lake Ontario in the 1950's, due to exploitation compounded by lamprey predation, the U.S. Fish and Wildlife Service, New York Department of Environmental Conservation, and Province of Ontario began a massive program of restoration in the 1970's. This program included sustained control of the sea lamprey, large annual stockings of juvenile hatchery-reared lake trout, and continuing evaluation of the relative performance of the three strains of lake trout being stocked. Recent evidence shows that lake trout of the Lake Superior Strain prefer much deeper water and grow much more slowly than lake trout of the Clearwater Lake (Manitoba) or Seneca Lake (New York) Strains. Trout of the Clearwater Lake strain demonstrate much higher mortality, however, with relatively few surviving past age III. If this differential survival continues to be supported by additional evidence, fishery managers will have to begin questioning the suitability of Clearwater Lake fish as source material for restoring self-renewing trout populations in Lake Ontario.

Wilbur L. Hartman - Whitmore Lake, MI

## Ciguatera Poisoning

Ciguatera is a serious circumtropical human illness that can result from the ingestion of a wide variety of coral reef fish (especially red snapper, barracuda, grouper and amberjack). The toxic substance, called



ciguatoxin, originates in benthic dinoflagellates and accumulates often unpredictably in marine organisms via the food web. The Southeast Fisheries Center's Charleston Laboratory has been conducting ciguatoxin research in cooperation with the Medical University of South Carolina (MUSC), the College of the Virgin Islands, the University of Hawaii, and the U. S. Food and Drug Administration. The MUSC has recently completed a report describing a method of distinguishing toxic from non-toxic fish. Development of a detection system for ciguatoxin applicable to the market place, and improved understanding of the physiology of ciguatoxin production and the chemical structure of the toxin are being pursued.

Harry Seagran, Charleston, SC

## Alaska Salmon Ranching

Salmon ranching is in an early rapid growth phase in Alaska. Releases from public hatcheries increased from 7 million juveniles in 1976 to 131 million in 1981. Releases from nonpublic hatcheries increased from 4 million juveniles in 1976 to 101 million in 1981. Of the 232 million juvenile salmon released from public and nonpublic hatcheries in 1981, 61% were pink, 26% chum, 11% sockeye, 2% coho, and less than 1% chinook.

There are currently 20 operational public and 11 operational nonpublic hatcheries in Alaska. Transfer of 4 public hatcheries to the nonpublic sector is being considered. Permits have been issued for the operation of 4 additional nonpublic hatcheries, and 9 applications for nonpublic hatcheries are under review by the State. Also in operation are 10 scientific/educational salmon hatcheries with a combined capacity for about 2.5 million juveniles.

Egg capacity of the 20 public hatcheries is 672 million. The 15 permitted nonpublic hatcheries are authorized to handle 363 million eggs. Should all approved public and nonpublic hatcheries attain full production, more than one billion eggs would be required annually and production of juveniles should increase at least three-fold over the 1981 figure of 232 million. (Statistics are from 1980 and 1981 Annual Reports of the Division of Fisheries Rehabilitation, Enhancement, and Development, Alaska Department of Fish and Game.)

William J. McNeil - Springfield, OR

## The Ocean Pulse Program

The Ocean Pulse Program of the Northeast Fisheries Center, a primary element of the Northeast Monitoring Program, is beginning its third year of intensive field monitoring over the continental shelf between Cape Hatteras and the Canadian border. Monitoring activities involve measurements of plankton and benthic

community structure and integration of contaminant levels in sediments and biota, and biological responses to natural and stressed habitats.

Elevated levels of contaminants such as PCBs and PAHs have been found in demersal fish that range from coastal waters of the New York Harbor to the edge of the continental shelf. Fish from offshore sites have as high levels of these contaminants as fish taken inshore. In some cases, the levels of PCBs were of the same order of magnitude as action levels established by FDA for finfish.

Our biological effects measurements, using species such as crabs, clams and scallops, indicate that stressed environments, natural or man-induced, result in changes in enzyme activities and physiological activities.

Complementary laboratory work, including physiological, biochemical and behavioral responses indicate that organisms have aberrations at levels of contaminants found in several coastal Water Management Units. Scallops from deeper waters and from areas such as the "mud patch" off Nantucket Shoals, have abnormal biochemical activities.

Behavioral responses measured in the laboratory and field also suggest that interactions between crabs and clams are affected by levels of contaminants measured in estuarine and marine sediments. The responses of clams to the presence of petroleum result in behavioral change that subjects the clams to greater levels of predation. Similar changes are observed in the predator crabs and the polychaete worms.

The results of our 1980 studies have been published as the "Annual NEMP Report on the Health of the Northeast Coastal Waters of the United States, 1980". We are presently preparing our second annual report for the year 1981. This report will contain information on distribution and abundances of phytoplankton species, benthic communities, and other variables that are being measured as part of the Ocean Pulse and Northeast Monitoring Programs.

John B. Pearce - Highlands, NJ

## Contribution Of Studies On Nuclear Power Plants To the Journal Literature

Monitoring of the aquatic environment near U.S. nuclear power plants by utility companies and their consultant, universities, and state and federal agencies has resulted in many publications in the primary literature. A preliminary analysis indicates that during the period 1970-1981, at least 245 articles have been published in more than 25 professional aquatic science, fishery, and environmental science journals. The articles are based on preoperational and operational studies at 40 nuclear sites. Most of the papers are related to sites on the Great Lakes (Michigan, Erie, Ontario), on several rivers (Susquehanna, Hudson, Connecticut,

Cont. on page four

### **Nuclear Power Plants...** Cont. from page three

Delaware, Columbia, Savannah, Missouri, Mississippi), and on east and west coastal and estuarine areas. Subjects covered include: impact assessments and methodology; thermal and chemical effluent effects; radiation effects; entrainment and impingement; fish biology and life history; fisheries; macroinvertebrates; aquatic insects; plankton dynamics; sampling methodology; and modeling.

Seven journals contain about 70% of the papers. American Fisheries Society journals account for about 32% of the papers. Research sponsored by the Nuclear Regulatory Commission (and its predecessor the Atomic Energy Commission) accounts for about 14% of the published papers. Most papers (~84%) were published after 1975. During the 1970's, many new aquatic science and environmental journals emerged, while others altered the scope of their coverage and the frequency of publication, thus providing more and improved outlets for quality papers.

An annotated bibliography is being prepared by the NRC on aquatic science and fishery journal articles that have resulted from studies and concerns at nuclear power plant sites. Literature search methods include the use of published reviews and "*literature cited*", personal author contact, computer searches, and number-by-number perusal of the journals. The latter method has been the most laborious, yet the most effective, and illustrates the tedious task of keeping abreast of the published literature. Data base searches by computer have been less successful due to a frequent lack of acknowledgement, citation, or key wording that the research resulted from work at a nuclear site.

Open literature publishing from studies at nuclear sites lends credibility to the work performed and the researchers or consultants. Journal communications contribute to the body of certified knowledge and to the scientific quality of data input for environmental assessments. Good resource management depends on quality scientific advice. Overall aquatic resource management includes consideration of the effects of energy production. Journal literature derived from concerns at nuclear sites contributes to the base of certified knowledge useable for resource description and management.

Clarence R. Hickey - Washington, DC

### **Simple Ecosystem Model Of North-Central Gulf of Mexico**

A simple ecosystem model is under development for the nearshore fishery ecosystem of the north-central Gulf of Mexico. The model consists of 12 compartments, connected by flows of energy and nitrogen. Four major fishery stocks — shrimp, bottom fish, menhaden, and the mackerels — were distinguished in the model as

major components of trophic groups. Other trophic groups include zooplankton, marine mammals such as dolphins, and large scavengers such as sharks. The model was quantified for steady state conditions by estimating biomass, respiration rates, and harvesting rates from available data and then setting inflows equal to outflows, working from the top trophic levels downward. Feeding rates were apportioned among alternative food sources on the basis of the relative biomasses of the food sources in the environment. A log-scale weighting factor was used to approximate food-source selectivity when selectivity was thought to exist.

Preliminary computer executions of the model tested the effect of reducing the bottomfish discards of shrimp trawlers on shrimp yields. Reducing discards could affect shrimp yields in at least four ways: (1) increasing predation on shrimp by bottomfish, (2) increasing competition of bottomfish with shrimp for food, (3) reducing the dead fish flesh (discards) available as food to shrimp, and (4) reducing mineral cycling of the system, which could reduce primary productivity and the rain of phytoplankton, a major source of shrimp food.

Two ways of reducing the bottom fish discards of shrimp trawlers were tested: (1) the use of selective trawls to reduce the bycatch and (2) utilization of a portion of the bycatch. In the first case, more live fish biomass and less dead fish biomass in the system would be expected. In the second case, we might expect the dead fish biomass to be less, but the live fish biomass to be the same. Because of these differences, reducing discards by these alternative methods might have different effects.

In the simulation tests, shrimp stocks initially declined but quickly recovered when discards were reduced with selective trawls; shrimp stocks declined and did not recover when discards were reduced with bycatch utilization. The simulations suggested that competition could more strongly affect shrimp stocks than predation; mineral cycling might be stimulated rather than suppressed if discards were reduced with selective trawls; and another major food source of shrimp, the rain of zooplankton fecal pellets, might be increased by reducing discards with selective trawls. Indirect effects were more important than direct effects on shrimp stocks. Marine mammals were important in transferring the effects of reducing discards to other parts of the system, particularly lower trophic levels.

Model behavior was sensitive to selectivity-weighting factors and to coefficients controlling the proportion of waste nitrogen eliminated in fecal material or excrement (urine). Other sensitivity tests and further development of the model are planned.

Joan A. Browder - Miami, FL

## Natural Fluctuations Of Marine Fish Stocks

Empirical data have shown that fish stocks fluctuate in abundance also without the effects of fishery and that these natural fluctuations mask the consequences of fishing on stocks. Fisheries research has been able to demonstrate the causes and estimate the magnitudes and periods of these fluctuations in only a few stocks.

Holistic numerical marine ecosystem simulations have opened new ways to study these fluctuations, their causes, and their effects on management. Such studies have been carried out with DYNUMES and PROBUB simulations in Northwest and Alaska Fisheries Center in Seattle.

Preliminary results indicate that the fluctuations caused by environmental anomalies and by fishing have average periods of 4 to 8 years and average magnitudes of 35% to 80% of "equilibrium biomasses". Density dependent predation seems to regulate the magnitudes of these fluctuations to a considerable extent. Although the abundance of individual species fluctuates, some decreasing and some increasing in abundance, the total biomass of all finfish remains relatively constant in any given region.

T. Laevastu - Seattle, WA

## Columbia River Sturgeon

My last effort with the Washington Department of Fisheries before retirement was to complete a paper on sturgeon. This report reviews life history, landings, tagging and recovery, spawning surveys, environmental contaminants, effects of Mt. St. Helens' eruptions upon distribution and recommendations for management.

A figure was shown depicting fecundity of females first maturing at 15 years at 64 inches T.L. and weighing 60-70 pounds. It takes three to five years for eggs to mature. Females shocked by hooking or netting will reabsorb their ova. After recovery, they begin their reproduction cycle anew. This figure shows that the older, the larger — the more eggs. Therefore brood stock protection is essential.

A second figure illustrated growth rate of white sturgeon in length, weight and age. The legal sport minimum at three feet T.L. (8 years and 8 pounds), the minimum commercial length at four feet T.L. (10 years and 10 pounds), and the maximum legal length at six feet T.L. (17 years and 80-100 pounds) were shown.

The aging method was illustrated with projections of cross sections of first bony ray of pectoral fin.

A third figure summarized landings from 1889-1980. The boom and bust trend is typical of early unregulated fisheries. Sturgeon were only a "pain in the net" as fishery and markets were targeted on salmon. By 1894 sturgeon were nearly wiped out. A four foot minimum length was established in 1897, but slaughter of un-

wanted small sturgeon continued. In 1950 a six foot maximum length was established to protect brood stock. Stocks have recovered as a result of improved water quality and shortened gill net seasons. Dams have reduced habitat and blocked migration in the formerly accessible 1200 miles of river resulting in diminished production ascending the watershed.

A decline in salmon and steelhead seasons has resulted in anglers turning to sturgeon with angler trips in the 1960's rising from 30,000 to 110,000 trips by 1981, below Bonneville Dam.

Figures were presented to illustrate length frequencies of sturgeon in test fisheries and sport angling showing that about half the fish were protected for recruitment, nearly half available to sport fishery, only 4-5% available to commercial fishery and about 1% reserved for brood stock.

Tagging was discussed with description of tag types employed, recoveries — by month, duration of freedom, distance traveled and location of recoveries. Tagging showed a strong upstream movement of small and large fish, while large fish tended to range greater distances downstream and seaward.

Spawning surveys were performed in 1979, 80 and 81. Ichthio plankton nets were employed. Eggs and fry were captured by 30 minute static trawling. Captured fry were 1 cm T.L., black, polywog-like, yolk-sac stage and 2 to 3 days post hatch. In 1979 they were found between May 11 and June 27 from 5 to 10 miles downstream from Bonneville Dam. Sampling in 1980 from April 29 through June 18 produced eggs and fry from May 8 to June 18, mainly in an area 7 to 8 miles below Bonneville. In 1981 no fry were found until May 20-21 in the same areas as in prior seasons.

Sturgeon and Mt. St. Helens' Eruptions: Test fishing showed that sturgeon had been displaced from the devastated area. Later many tag recoveries from Willapa Bay, Grays Harbor, Neah Bay and inner Puget Sound indicated resident sturgeon in Columbia River below mouth of Toutle-Cowlitz River were forced seaward only to return to Columbia River as habitat recovered. Following massive dredging in Cowlitz system, sturgeon penetrated river to dam and continue to occur in Cowlitz River catch.

Regulation Changes: Washington closed sturgeon to night angling to agree with Oregon and to temper the predominant sport catch. A spawning sanctuary was established in mid-March 1982, below Bonneville Dam, after completion of new north powerhouse and tail race area. W.D.F. closed sturgeon angling from the dam downstream to power line crossing. Ironically, following this talk, the W.D.F. revised and reduced the sanctuary on June 11. With insufficient evidence for conservation, the Department capitulated to user group pressure.

Proposals: Lack of success in finding sturgeon larvae upstream in interdam areas in contrast to consistent success below Bonneville Dam strongly suggests need for

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## Columbia River Sturgeon... Cont. from page five

more formal studies. Interdam populations may be so depressed that restocking may be the only solution. Spawning sanctuaries below dams must be established and maintained to provide safe areas for spawners to congregate without being harassed by man.

Clint Stockley - Vancouver, WA

## Thesis And Dissertation Abstracts

### Genetic Structure Of Sea-Run Cutthroat Trout (*Salmo clarki clarki*) Population In The Puget Sound Area

Donald E. Campton, M.S. 1981, University of Washington

The breeding structure and genetic relationships among sea-run cutthroat trout populations in the Hood Canal and north Puget Sound regions were assessed by electrophoretic methods. Two year classes of juvenile cutthroat trout were collected from four tributaries to the Skagit River and eight tributaries to the Stillaguamish River (north Puget Sound region) while the Hood Canal region was represented by a northern cluster of four streams and a southern cluster of six streams. These stream clusters were treated for statistical purposes as being equivalent (in a biological sense) to the two river drainages.

Analyses of variance and gene diversities revealed that sea-run cutthroat trout populations in the Puget Sound area are primarily structured at the between-region and among-stream levels. Variance component estimates associated with region and stream effects were each significant ( $P < .05$ ) in six out of eleven and seven out of eleven intra-locus comparisons respectively. In addition, population subdivision and genetic differentiation at the between-region and among-stream levels made the greatest contributions to the total decrease in average heterozygosities resulting from population structuring. In contrast to region and stream effects, however, gene frequency differences between drainages (or stream clusters) within regions were not significant. Two multivariate techniques (cluster analysis and principle coordinates analysis) were both able to completely distinguish the Hood Canal populations from the north Puget Sound populations.

The genetic differences and relationships observed among sea-run cutthroat trout populations in the Puget Sound area are easily explained in terms of the life history of this subspecies. The Hood Canal and north Puget Sound populations are believed to be two genetically-diverged stocks between which gene flow is highly restricted. Similarly, the significant genetic heterogeneity observed among streams within drainages relative to the variation observed between year classes within streams suggests that sea-run cutthroat trout home to and spawn in their natal streams with a high degree of precision; i.e., each stream tends to support a distinct and semi-isolated breeding unit. Genetic structuring at the among-stream level is attributed to random genetic drift resulting from a dynamic population structure whereby gene flow is sufficient to maintain average within-population (stream) heterozygosities at relatively high level ( $> .10$ ) but insufficient to homogenize gene frequencies among geographically-adjacent streams relative to the differences between consecutive year classes within each stream.

### Physiological And Immunological Differences Among Three Stocks of Coho Salmon, *Oncorhynchus kisutch*.

Dolores Miranda Gould, University of Washington

Differences in growth rate and immune response among three stocks of coho salmon, *Oncorhynchus kisutch*, at several water temperatures were demonstrated. Coho salmon from Rock Creek Hatchery near Idleyld Park, Oregon, were found to be more susceptible to vibriosis (*Vibrio anguillarum*) than were coho salmon from Big Creek Salmon Hatchery, Knappa, Oregon or Soleduck Hatchery, near Sappho, Washington. I concluded that there were genetic differences among the stocks producing the observed responses. Significance of the results for habitat evaluation methodology and coho salmon broodstock management is discussed.

## The Impact Of Thermal Effluents On Smallmouth Bass Reproductive Success At Baie Du Doré, Lake Huron

Donald A Wismer, M.S. 1980, University of Toronto

A preliminary assessment was made of the impact of thermal effluent released from the Bruce 'A' Nuclear Generating Station since fall of 1977 on smallmouth bass reproductive success at Baie du Doré, Lake Huron. The major interpretive tool in this assessment was a computer simulation model of temperature effects on first-year survival of small-mouth bass previously developed by workers during the pre-impact period.

Two alternative analytical approaches were employed to use the simulation model for post-impact assessment purposes. An overall assessment of model performance was made based on observed and predicted values of year class strength. The data series was not yet sufficient to allow complete evaluation by this method. Alternatively a mechanistic evaluation of the predictive accuracy of each of the model components was conducted for the post-impact years. These considerations of biological processes were linked with observations of unnatural thermal regime alterations to evaluate previous impact scenarios.

Detailed field observations of nest events, juvenile growth and recruitment were made in 1978 and 1979. These were compared with historical data sets to assess thermal discharge effects on the population.

Nests events were largely unaffected by the plume. Spawning observations indicated a potential for minor advanced spawning which was unpredicted by the model. Model predictions of respawning and nest success were inaccurate due in part to a post-impact alteration of the historical open water-littoral zone temperature relationship upon which these were based. Additional nest observations indicated these inaccuracies were to some extent the result of exclusion of temperature-independent sources of mortality from the biological model.

Growth was increased for the fraction of the juvenile population which took up late season residency in the inner discharge area of the power plant. A continued occurrence of this thermoselective behavior in future years would require adjustment of the model's summer growth function to accurately predict over-winter survival and year class strength. Occurrence of unpredicted advanced spring spawning and extended juvenile growth in the fall of the same year will cause underestimation of recruitment success.

This model inadequacy could be counterbalanced by built-in inaccuracies in the "survival on nests" component. The extent to which this opportunity is realized will vary directly with the severity of fluctuations in the summer temperature regime. In moderate years wind-induced physical disruptions are not accompanied by severe temperature drops. Model predictions of temperature-dependent fry mortality on nests generated from these regimes would not account for such temperature-independent sources of mortality. The result would be overestimation of actual survival on nests. This would compensate, to a certain extent, for the increased values of average survival over winter expected to result from unpredicted advanced spring spawning and extended fall growth.

This would not be the case for years showing severe temperature regimes. Variable summer regimes display frequently large drops in temperature which cause predictions of high temperature-dependent mortality on nests. These values would eliminate nest success predictive inaccuracies as a compensatory factor by further diminishing estimates of total recruitment success.

Perpetuation of recent post-impact trends in fishing effectiveness combined with sustained early recruitment to the sport fishery will result in a decreased abundance of older age smallmouth bass and a shift to a population of younger fish.

## Behavioral And Sensory Aspects Of Petrochemical Pollution on Pacific Salmon

Desmond Joseph Maynard, M.S. 1980, University of Washington

The avoidance of monocyclic aromatic hydrocarbon mixture by juvenile coho salmon (*Oncorhynchus kisutch*) tested in a Y maze and adult coho salmon tested in situ was found to depend strongly on the internal motivation of fish to remain in or reach a particular habitat.  $AL_{50}$  values representing the concentrations which 50%



## Pollution on Pacific Salmon...

of the fish were expected to avoid were found to be 3.7 ppm, 1.9 ppm, 5.6 ppm, and 2.7 ppm for presmolts, smolts, late returning adults, and early returning adults respectively. The principal components of the mixture were tested individually, and none of these compounds appeared to be solely responsible for the avoidance shown to the mixture, and the respective  $AL_{50}$  values determined for these compounds in tests with presmolt coho salmon were 2.0 ppm, 1.7 ppm, and 0.7 ppm.

Electrophysiological recording of the neural response from the olfactory bulb indicated the olfactory system was stimulated by the mixture at concentrations which correlate with observed avoidance behavior, and the short-term exposure of the nares to 3.7 to 4.6 ppm of the mixture did not observably disrupt the response to  $10^{-3}$  M solutions of L-serine.

A light-dark choice study utilizing a Y maze showed that presmolt coho strongly prefer a lighted area, and that this preference is not altered by exposure up to 1.4 ppm of the monocyclic mixture for 110 minutes.

Presmolt coho tested in a Y maze were nonsignificantly ( $P > 0.05$ ) attracted to a fine dispersion of 0.9 ppm Prudhoe Bay crude oil, but significantly ( $P < 0.001$ ) avoided a fine dispersion of 4.6 ppm Prudhoe Bay crude oil. Choice studies conducted in an aquarium indicated presmolt are attracted to a Prudhoe Bay crude oil slick except when expected levels of WSF are high.

Mark and recapture experiments were conducted to assess the ability of adult chinook (*Oncorhynchus tshawytscha*) and coho salmon to repeat their spawning migration following exposure to petroleum hydrocarbons. Chinook salmon were exposed from 14 to 18 hours to water containing 0.5 to 40.0 ppm of fresh Prudhoe Bay crude oil and no alteration of their freshwater homing capability was observed. Coho salmon were exposed for 8 to 22 hours to water containing up to 2 ppm of the monocyclic aromatic mixture and were challenged to repeat their marine migration. Exposure altered the percent of returning fish and caused significant ( $P < 0.05$ ) delay in time to return.

## International Commercial Fishing Arrangements and Their Implications for Fisheries Development in The North West Indian Ocean Region

Khaled Ibrahim Hariri, Ph.D. 1982, University of Washington

Regardless of the distribution of capital and the financial wealth of the countries of the North West Indian Ocean Region (NWIOR), they all face a shortage of local food supply. Projections of demand for and local supply of animal proteins from livestock and dairy products indicate deficits in meeting the demands even until the year 2000. Presently, demand for seafoods in most of these countries exceeds their local supply. Fisheries production is based largely on artisanal fisheries and potential fishery resources are under utilized due to the lack of know-how and technologies. Fisheries development can result in the increase of seafood consumption and, in some cases, the export of surplus fishery products if the constraints facing artisanal and large-scale commercial fisheries are reduced.

International commercial fishing arrangements with extraregional partners have exploited the more lucrative species like shrimp, cuttlefish and lobster mainly for export. These arrangements are in the form of:

1. Equity joint ventures
2. Licensing agreements
3. Package-deal licensing arrangements

Criteria to evaluate the contribution of each of these forms to fisheries development in the host country are established. Application of these criteria on the NWIOR, shows that package-deal licensing can contribute more than others to fisheries development in host countries.

The geographical distribution of the fisheries stocks require intraregional coordination in fisheries management and development. A regional fisheries research and development center is proposed to achieve this objective. Assessment of the existing regional or Arab fisheries institutions is necessary to avoid overlapping jurisdiction and functions. Large pan-Arab equity fishing joint ventures are presently non-viable. In the long run, several regional fishing and related industries can be established if regional policies of developing the fisheries sector are undertaken by the Arab governments and private enterprises.

## Distribution, Abundance, and Food Habits Of The Dungeness Crab, *Cancer magister*, In Grays Harbor, Washington

Bradley Gene Stevens, Ph.D. 1982, University of Washington

The Dungeness crab, *Cancer magister*, which supports a major Pacific coast fishery, often occurs in large numbers in coastal estuaries, but the importance of these habitats is unknown. In Grays Harbor, Washington, a major proposed dredging project threatens to destroy several million crabs.

The crab population of Grays Harbor was surveyed from May 1980, to July 1981. Crabs were collected by trawl at nine stations, and by ring net at three stations, at monthly or bimonthly intervals. Early postlarval crabs were most abundant on or near mudflats with eelgrass beds. One year old crabs were widespread throughout the harbor, and older crabs were most abundant in the central outer harbor. Crab densities fluctuated seasonally; population size was estimated to range from three million (winter) to thirty million (summer) due to a great influx of megalops larvae and first instar crabs in April-June. Using known and estimated mortality rates, it was estimated that young-of-the-year crabs in Grays Harbor could provide 50-80% of the crabs caught by the offshore fishery 3.5 years later.

Growth of three year classes was followed separately. First instar postlarvae which metamorphosed in May 1980 were 7.2 mm carapace width and .023 g dry weight (d.wt.). Crabs averaged 45 mm and 4.2 g d.wt. after one year, and 85 mm and 25.5 g d.wt. after two years in the harbor. Growth was rapid from May to October, but slower during winter.

First year crabs preyed greatly on small bivalves and crustaceans. Larger crabs switched to larger invertebrates (*Crangon* shrimp) and later to juvenile fish. Night-time foraging movements onto intertidal mudflats were associated with high *Crangon* abundance and predation.

The results of this research show that Grays Harbor is an important habitat for juvenile crabs. Changes in food preferences and density with age may allow partitioning of food and space resources among the various age classes. Population estimates will allow better estimation of the relative mortality caused by dredging and habitat changes.

## Compass Orientation Of Juvenile Sockeye Salmon (*Oncorhynchus nerka*)

Thomas Peter Quinn, Ph.D. 1981, University of Washington

The life history of the sockeye salmon, *Oncorhynchus nerka*, is comprised largely of migrations of various sorts. Fry move from gravel redds to nursery lakes and then disperse in the lakes. A year later, they migrate to the outlet of the lake, then downstream to the ocean. They then spend several years in a broadly defined feeding migration, followed by movement on the high seas to the mouth of their natal river, and subsequent movement upstream to spawn and die. The river movements of fry and the upstream homing of adults have been studied in some detail, but the open water movements of fry, smolts and adults are less well understood. This dissertation reports the results of experiments designed to investigate the orientation mechanisms guiding fry and smolt movements in open water.

Fry have innate directional preferences, apparently to facilitate dispersal in nursery lakes. These preferences are guided by the earth's magnetic field, by daytime celestial cues, and perhaps by the moon at night. The expression of the directional preferences is affected by environmental stimuli such as water source and the passage of time.

The sensory basis of fry magnetic sensitivity is undetermined, but such mechanisms as optical pumping, electro-orientation, and single domain magnetic particles are probably not involved. The fry seem to sense the field's horizontal component, not the vertical component as birds apparently do.

Sockeye salmon smolts also have compass directional preferences which guide them to the outlet of their lake prior to the downstream movement to the ocean. These directional preferences were displayed in testing arenas after dusk, when the smolts normally migrate to the lake's outlet. Orientation was not affected by a change in the magnetic field when the fish could see the sky. When the tanks were covered, smolts displayed bimodal orientation towards and away from the lake's outlet. A change in the magnetic field under covers rotated the axis of bimodality.

## **Biology and Management of Pacific Cod (*Gadus macrocephalus* Tilesius) in Port Townsend, Washington**

William Arnold Karp, Ph.D. 1982, University of Washington

Pacific cod (*Gadus macrocephalus*) migrate into the waters of Port Townsend, Washington, during the winter. An intense commercial set net and trawl fishery is directed at these Pacific cod spawning aggregations.

Life history parameters estimated during this study were consistent with those expected from a fast-growing, early-maturing stock close to the southern limit of its range. Growth was allometric; analyses of length frequency data and tag returns provided length-at-age estimates of 27.0, 43.6, 55.5, and 64.2 cm at ages of 1, 2, 3, and 4 years. Estimates of fecundity were  $6.61 \times 10^3$ ,  $1.28 \times 10^6$ , and  $2.20 \times 10^6$  eggs per female at total length of 40, 50, and 60 cm. Estimates of annual instantaneous rates of total and natural mortality were 1.5 to 1.7 and 0.7 to 0.8. Exploitation and migration rates and population sizes were determined from a multi-stage tagging study. Twenty-four percent of the cod tagged during the 1979 season were recovered from the commercial fishery during the season. Most fish spend only a few days in the bay before emigration or capture. Population estimates indicated that there were about 14,000 fish in the bay when the fishery began. The population increased rapidly and reached a peak of more than 100,000 fish within 10 days of the start of the fishery. Peak abundances were observed for approximately 1 week and then a gradual decline in the population size was observed. Seven weeks after the fishery had begun, the population size was estimated to be 35,000 fish. Between 15 and 20 percent of the cod present in the bay on a given day emigrated or were caught during the subsequent 24 hours. Between 359,000 and 510,000 fish migrated into the bay during the season and 24 to 34 percent were harvested. The set net gear was more effective in harvesting larger fish, especially females. Yield-per-recruit analysis indicated that greatest yields can be obtained by high exploitation at an early age of entry.

## **Swimming Stamina and Survival Related to Swimming Fatigue in Response to Direct Seawater Entry During The Parr-Smolt Transformation of Coho Salmon (*Oncorhynchus kisutch*)**

Thomas Alvin Flagg, M.S. 1981, University of Washington

Swimming stamina and swimming fatigue survival were assessed in fresh water and seawater during various stages of the parr-smolt transformation for both O-age and yearling coho salmon. It was determined that coho salmon normally experience transient 30-75% reductions in stamina when transferred directly to seawater. Coho salmon also experienced transient 10-50% reductions in their ability to survive severe physical stress (swimming fatigue) at direct seawater entry. Stress survival during the first week of seawater residence was significantly correlated to the status of smoltification, with the maximum ability to survive stress coinciding with the freshwater developmental peaks of both plasma thyroxine ( $T_4$ ) and gill  $Na^+ - K^+$  ATPase.

## **A Streamside Management Plan for the Protection of Salmonid Resources in Southeast Alaska**

Dave Robert Gibbons, Ph.D. 1982, University of Washington

In response to the recently completed Tongass Land Management Plan, a Salmonid Habitat Risk Analysis was developed providing a management procedure for stream habitat protection. This was developed and tested from the period of 1976 to the present.

The Analysis is more comprehensive in its approach than any other system previously developed in Alaska. It combines both a classification of environmental sensitivity to disturbance and an evaluation of risk due to land management activities, such as timber harvesting and road building. Field and office evaluations of the Risk Analysis were started in July, 1979. These evaluations were conducted to refine and modify the original concepts of the Analysis. During the field evaluations, several biologists of the U.S.D.A. Forest Service and I were easily able to apply the Analysis and to determine the various risk scores. The salmonid Habitat Risk Analysis is presently being used by

biologists of the U.S.D.A. Forest Service in southeast Alaska.

The Salmonid Habitat Risk Analysis fits into a three-part management program described in this dissertation. The objectives of this plan are: (1) to protect salmonid habitat by designating the amount of timber to be retained near streams; (2) to provide a method of analyzing the timber harvest as to its compliance with the fisheries aspect of the timber sale plan, which was developed using the Salmonid Habitat Risk Analysis; and (3) to outline a procedure for salmon stock protection in instances where their freshwater habitat has been impacted by timber harvesting.

## **Oxygen Consumption of Bluegill (*Lepomis macrochirus*)**

Ruth A. Williams, M.S. 1982, Iowa State University

A modified static system was developed to study the metabolism (standard, routine, or active) of one or several fish at a temperature range of 0-35°C. In this study, the system was used to measure, individually, the routine oxygen consumption of 10 bluegill (mean weight = 79 grams) at 10°C.

The 84  $Vo_2$  observations obtained at <10°C and at 10-25°C in this study were combined with 50  $Vo_2$  values obtained from the literature, a data base of 134  $Vo_2$  observations, were used to develop four multiple regression models estimating the oxygen consumption (mg  $O_2$ /kg/hr) of blue gill using temperature (C) and fish weight (kilograms) as the independent variables.

1. unweighted regression, 0-35°C
2. unweighted regression, 0-25°C
3. weighted regression, 0-35°C
4. weighted regression, 0-25°C

The second model,

$$\text{Log } Vo_2 = 1.539 + 0.036 T - 0.241 \text{ Log } W,$$

was selected as the best predictive model of bluegill  $Vo_2$  at <25°C because (1) the regression coefficient of Log W is within the range reported for bluegill, (2) the values used to derive it are believed to be representative of bluegill  $Vo_2$  (those at >25°C may not be representative), (3) its derivation was simple - not requiring mathematical manipulation, and (4) unbiased statistical parameters may be calculated. This model provides an estimate of the typical oxygen consumption of bluegill which may be useful in toxicology and aquaculture studies.

## **The Development of the Hexagonally Structured Egg Envelope of the C-O Sole (*Pleuronichthys coenosus*)**

Carla Marie Stehr, 1982, University of Washington

Elaborate structures on the surface of fish eggs, such as the hexagonally patterned egg envelope of the C-O sole (*Pleuronichthys coenosus*) are present in only some species of teleosts. Although the development of egg envelopes with ornate surface structures has been described for a few species of teleosts with demersal eggs, it has not been examined for any species with elaborately surfaced pelagic eggs. The honey-comb patterned envelope of the pelagic C-O sole egg initially develops as a thin layer of compact, electron dense material evenly dispersed on the surface of primary oocytes. The hexagonal structures of the envelope first appear as discrete thickenings on perinuclear stage oocytes, and lengthen and thin to form the hexagon walls of oocytes undergoing yolk vesicle formation.

A single follicle cell is associated with each hexagon chamber, and the hexagon walls develop beneath the lateral margins of the hexagonally shaped follicle cells. Ultrastructural evidence indicates that the hexagon structures are a secondary envelope layer produced by the follicle cells. At vitellogenesis, when the secondary envelope layer is nearly complete, another envelope layer that is striated in appearance and composed of fibrillar lamellae develops between the hexagon layer and the oocyte. This is a primary envelope layer secreted by the oocyte itself.

Oocytes that have completed vitellogenesis are released from the follicle and double their size during maturation. Concurrently, the striated primary envelope stretches and thins into 8-9 horizontal lamellae. The surface structure of mature C-O sole eggs is composed of polygonal chambers having 4-8 sides, most of which are hexagonally shaped and are 24 - 31  $\mu\text{m}$  in diameter. A polygonal subpattern that circumscribes each pore canal opening is also present on the surface of the egg. Although the functional significance of the hexagonally patterned egg envelope is not known, it may furnish the egg with some protection, resiliency and buoyancy.

### **Effects of Chronic Exposure to Arsenic Trioxide on Smoltification, Downstream Migration, and Seawater Adaptation of Coho Salmon (*Oncorhynchus kisutch*)**

John Warren Nichols, M.S. 1981, University of Washington

Yearling coho salmon (*Oncorhynchus kisutch*) were exposed to arsenic trioxide (10 to 300 µg/L) for five months prior to transfer to sea water, and the effects of the exposure on selected aspects of the parr-smolt transformation were determined. Exposure to 300 µg/L delayed the onset of increase of plasma thyroxine (T<sub>4</sub>) concentration. A transient reduction of gill Na<sup>+</sup> - K<sup>+</sup> stimulated ATPase activity was also observed at this level. Exposure to arsenic trioxide did not affect the ability of fish to adapt to premature transfer seawater. Six month survival and growth in sea water following exposure to arsenic trioxide were also unaffected. Fish exposed to 300 µg/L migrated to sea less successfully (80%) than controls (91%). Intermediate groups did not, however, describe a dose-dependent relationship. The data suggest that chronic exposure to 300 µg/L arsenic trioxide measurably affected the normal progression of physiological and hormonal events which characterize the parr-smolt transformation. These effects did not, however, reduce the ability of fish to make the transition from fresh water to salt water.

### **Substrate and Other Environmental Factors in Reproduction of the Yellow Perch (*Perca flavescens*)**

John Adam Dorr III, Ph.D. 1982, University of Michigan

Field studies were conducted during 1980-81 to evaluate the hypothesis that the yellow perch in southeastern Lake Michigan spawn preferentially on rough rather than smooth substrate, and to study effects of environmental factors on reproduction and early life history of this fish. Gillnetting and direct observation revealed males concentrated during early May at 6-12 m on rough substrate, i.e., till, clayey till, and riprap (artificial substrate). Few females occurred at depths less than 18 m until late May, then were abundant on reefs where spawning took place during 1-2 wk in late May-early June. The adults dispersed into surrounding areas after spawning, but remained more concentrated about reefs than in surrounding waters throughout summer. Feeding recommenced soon after spawning; fish, primarily the alewife and rainbow smelt comprised the bulk of the diet supplemented by crayfish and snails. Multiple linear regression of catch-per-effort against day, number, a measure of substrate conditions, water temperature, photoperiod, and gonad maturation explained 60% of the variability in catch; substrate alone accounted for 30-40%.

Divers observed perch egg masses deposited exclusively on rough substrate in densities as high as 184/1000m<sup>2</sup>, but usually less than 10/1000m<sup>2</sup> which suggested that spawning was not substrate-limited. Egg masses collected and planted by divers at 6 and 9 m were transported by currents from smooth (sandy) substrate areas within 24 h, but not from rough bottom where the rugosity impeded their translocation by wave and other currents. This stability may promote egg incubation and subsequent initial exposure of larval hatchlings to environmental conditions most favorable to survival. Multiple linear regression of egg mass density against day number, substrate conditions, depth, water temperature, and photoperiod explained 60% of the variability in density; substrate alone accounted for 20-30%.

Larval perch dispersed from spawning areas within a few hours of hatching. No significant mathematical relationship was established between abundance of larvae and environmental factors, but wave and other currents were suspected to influence their early distribution. Larvae from nearby river spawnings appeared in the lake 2-4 wk prior to lake-spawned larvae and contributed to an unmeasured but potentially significant segment of total coastal zone production of perch.

### **The Exploitation, Harvest, and Abundance of Largemouth Bass Populations in Three Southeastern Michigan Lakes**

Greg W. Goudy, M.S. 1981, University of Michigan

Fishing pressure, exploitation, growth, mortality, harvest, population size-age structure, and abundance of largemouth bass (*Micropterus salmoides*) were measured in Pontiac, Whitmore, and

Kent lakes in southeastern Michigan. The effects of a change in the minimum size limit from 254 mm to 304 mm in 1976, and a 200% increase in bass fishing pressure from the levels of 30 years ago, on bass populations were evaluated. Despite annual fishing pressure as high as 472 hours per hectare, producing exploitation rates ranging from 18% to 48% and total mortality rates from 31% to 53%, one bass population contained 22% more bass 254 mm and larger (20.2 bass per hectare) now than 30 years ago. There was a significant catch-and-release fishery of sublegal bass with from 200% to 600% more bass being caught and released than harvested. Though there was a greater percentage of large bass harvested than in the past, the number of bass harvested by anglers has fallen 25% and catch rates for harvested bass have dropped considerably to an average of 0.06 bass per hour.

Creel census clerks used a questionnaire to obtain angler opinions on bass fishing in Michigan. Seventy-seven percent of 1,113 fishermen interviewed responded that they fish for bass in Michigan at least once a year. Of the 862 bass anglers questioned, 27% reported that they usually release their catch. If there was catch-and-release fishing prior to the season opening, 58% of the bass anglers would approve delaying the opening of the bass season from late May until July 1 in order to increase the size of bass available for harvest. Fifty-two percent of the bass anglers would rather catch one large bass than four small (but legal size) bass. Fishermen reported catching more bass but keeping fewer as a result of the size limit change. However, most anglers were happy with the new regulation citing that though they were keeping fewer bass, they were catching more large bass than before.

### **Potential for Production of Coho Salmon (*Oncorhynchus kisutch*) in Lakes with Outlet Barrier Falls, Southeastern Alaska**

Richard Allan Crone, Ph.D. 1981, University of Michigan

Three salmon-free lakes in southeastern Alaska, located above waterfalls that are barriers to upstream movement of fish, were stocked with young-of-the-year coho salmon (*Oncorhynchus kisutch*) to determine potential of such lakes to produce emigrant smolts. Two lakes were fishless; the third and largest contained Dolly Varden (*Salvelinus malma*). Coho fry were stocked at a density of 8,571/ha in 1.4-ha, shallow Tranquil Lake, whereas, in 15.3-ha Ludvik and 95.4-ha Osprey lakes, both deep and with steeply sloping bottoms, the rates were 6,677 and 2,893/ha, respectively.

Initially the young salmon grew rapidly while feeding almost exclusively on large-sized, indigenous zooplankters, including those found in the limnetic zone. As a result, macrozooplankter populations were decimated in only 2 to 8 weeks. The coho then switched to feeding on benthos and small-sized zooplankton, and slowed sharply in their growth.

Only in Osprey did the initial period of rapid growth continue long enough (8 weeks) so that the great majority of coho exceeded the threshold size for smolting in the first growing season. Here, 91% of the smolts were age I at emigration and only 9% were age II. In contrast, in Tranquil these values were respectively 66 and 34%, and in heavily stocked Ludvik 46% left at age I, 6% at age II, 32% at age III, and 16% at age IV. Survival to emigration (age-I plus age-II smolts) totalled 57, 7, and 58%, respectively, of the fry stocked in Tranquil, Ludvik, and Osprey. In Ludvik, through age IV, it doubled to 14%.

Efficiency of production (percentage of coho biomass produced in a lake that became the desired yield as spring emigrants) was high in Tranquil and Osprey (respectively, 86 and 73%). In Ludvik, efficiency was only 11% after 2 years and 30% after 4.

The number of adults returning from age-I and age-II smolts equaled, respectively, 396 and 106/ha of lake surface for Tranquil, and 147 and 12/ha for Osprey. For Ludvik, annual adult yields from age-I through age-IV emigrants ranged from 2 to 30/ha. Adult returns totalled 6, 1, and 6%, respectively, of the fry stocked in Tranquil, Ludvik, and Osprey.

It is concluded that by stocking at conservative rates and at proper times, barriered lakes in southeastern Alaska (including those with Dolly Varden) have rewarding potential for rearing coho fry to smolts, with the ultimate result of increasing the number of harvestable adults.

## Diving Accident Network Hotline

The hotline **919-684-8111** provides expert medical advice to rescuers and physicians for treating diving accidents. Along with advice on the treatment of victims, hotline physicians can help set up such emergency services as transportation to the nearest facility capable of handling diving-related accidents.

DAN is sponsored by three federal agencies, the Commerce Department's NOAA, the National Institute for Occupational Health and Safety, and the Department of Energy. Telephone number reaches an operator at Duke University Medical Center in Durham, N.C., who will put the caller in touch with a physician, trained in hyperbaric medicine, available 24 hours a day.

The Duke physician will either advise the caller directly, or put him or her in touch with the nearest regional coordinator of the network. Each region — with centers at Seattle; Honolulu; Santa Barbara, Calif.; Milwaukee; New Orleans; Philadelphia; and Durham, N.C. — has trained medical staff, 24 hour service, and suitable pressure chambers available for treatment.

An average of 125 persons die in diving accidents each year. Death most often results from misdiagnosis or improper treatment of the two most common medical emergencies in diving — decompression sickness (the bends) and gas embolism (bubbles in the blood stream).

The bends are caused by nitrogen absorbed in body tissues (while breathing underwater) turning gaseous before the diver can breathe it out.

The bends can produce paralysis, unconsciousness, arthritis-like symptoms, and debilitating pain. In severe cases they can result in death. Gas embolism occurs when the diver exhales improperly while ascending causing pressurized air breathed underwater to over-expand in the lungs. This forces gas into the bloodstream; it is carried to the heart and then to the brain where the gas bubbles can produce stroke-like symptoms and, if not properly treated, death.

The Diving Accident Network hotline is open 24 hours a day, year-round, to provide emergency service to recreational and working divers in trouble.

Charles Thomas - Rockville, MD

## Legislative Activities

### Bills Introduced:

**H.R. 6535** (Chappie/CA) - to provide for the restoration of the fish and wildlife in the Trinity River. Referred to the Committees on the Interior and Merchant Marine and Fisheries.

**H.R. 6582** (Don Young/AK) - to give priority to any unsecured claims of U.S. fishermen arising from sales to certain processors. Referred to the Committee on the Judiciary.

**H.R. 6626** (Carmen/NY) - to establish a National Ex-

port Policy Commission. Referred to the Committees on Banking, Foreign Affairs, and on Rules.

**S. 2660** (Packwood/OR) - to consolidate and reenact certain of the marine safety and seaman's welfare laws of the U.S. Referred to the Committee on Commerce.

**H.R. 6647** (Breaux/LA) - to extend certain Governing International Fishery Agreements. Referred to the Committee on Merchant Marine and Fisheries.

**H.R. 6660** (Snyder/KY) - to provide additional revenues for projects relating to fish restoration and management. Referred to the Committees on Merchant Marine and Fisheries and on Ways and Means.

### Committee and Floor Action:

**Anadromous Fish Conservation Act** - On June 8, the House passed **H.R. 5663**, the Anadromous Fish Conservation Act Authorization bill. The bill would provide for an authorization of \$7.5 million for each of FY 83, 84, and 85 for Section 4 grants program. Also, it would provide \$1 million authorization in each of FY 83, 84, and 85 for the Chafee Striped Bass Study. The bill includes an amendment requiring that the States approve the Striped Bass Plan by 1984 or lose their Federal funding for Striped Bass research. The Senate approved an authorization of \$2 million for FY 83 and 84 in **H.R. 1952**.

**Endangered Species Act Amendments/Authorization** - On June 8, the House approved **H.R. 6133**, a bill to amend and extend authorization of appropriations for the Endangered Species Act. The bill would: define time limits for Secretarial decisions in the listing and delisting process, reducing maximum time to one-year with a possible six month extension; streamline the exemption process from 360 days to 180 days; replaces the exemption review board with the Secretary; allows for incidental takings subject to consultation and through a permit process; requires that if critical habitat is not determinable at the time of listing, such habitat must be designated within one-year; increases the Federal funding share from 66-2/3% to 75% for single State projects and from 75% to 90% for multi-state projects; raises the burden upon a petitioner requesting a species listing or delisting to submit substantial evidence to make his/her case; and authorizes appropriations for the Department of Commerce for \$3.5 million for each of FY 83, 84, and 85.

The Senate and House bills are similar in many respects. However, there were enough substantive differences to warrant a Conference of the two Chambers to resolve the matter. (NOTE: The Senate bill is identical to the House bill regarding authorization figures.)

**Fisheries Loan Fund** - On June 8, the House passed **H.R. 5662**, a bill to extend the Fisheries Loan Fund for FY 83. The bill includes a \$50,000 authorization for volunteer services performed for NOAA under the Fish and Wildlife Act.

### **Fisherman's Contingency Fund /GIFA Extension -**

On June 29, the Senate concurred in the House Amendments to H.R. 3816, a bill to streamline the administrative procedures of the Fisherman's Contingency Fund. Attached to the bill is an amendment to extend the Polish and the Russian GIFAs for one year, approve a new Taiwanese GIFA for five years, and provide that if one year, approve a new Taiwanese GIFA for five years, and provide that if the Administration transmits the new Korean and Spanish GIFAs before July 31, the existing GIFAs with these two countries would continue in effect until Congress has such time to consider the new agreements. **H.R. 3816** was signed by the President on June 30 (P.L. 97-212).

**Shrimp Development Legislation** - On June 23, the House Subcommittee on Fisheries and Wildlife approved **H.R. 4041**, the American Shrimp Development Act with amendments. The bill includes new provisions for those sections involving marketing boards, tariffs, and quotas.

### **Hearings Held:**

**IWC Oversight** - On June 9, the House Committee on Foreign Affairs, Subcommittee on Human Rights and International Organizations held oversight hearings on the upcoming International Whaling Commission meetings. John Byrne, Administrator of NOAA, testified.

**GIFA Extension** - On June 10, the House Subcommittee on Fisheries and Wildlife held hearings on the extension of certain Governing International Fishery Agreements. William Stevenson, Depute Assistant Administrator for Fisheries, testified.

Kevin A. Ford - Washington, DC

## **Salmonid Enhancement**

Canada's Federal-Provincial Salmonid Enhancement Program (SEP) on the Pacific Coast has a long term objective of restoring total salmon production to peak historic levels. However, SEP is currently going through some heavy soul searching as the critical issues of stock manageability and optimum species mix have assumed major importance.

British Columbia is still blessed with strong natural runs of Pacific salmon and both professionals and informed public advisors argue convincingly for a balanced production. This implies that species should be produced in a proportion and in locations which will best assure the continuation, and indeed growth of the resource overall. This requires particular care in management to reduce over-harvesting of natural stocks in mixed stock fisheries, and to ensure optimum escape-ments to productive streams. It also requires wise selection of enhancement techniques, particularly when the choice is between a few large centralized operations such as major hatchery facilities, and numerous local, highly stock specific ones.

B.C. chinook stocks are depressed and under continuing heavy exploitation and this species has been singled out for a major "save our chinook" program. This program, recently announced by the Minister of Fisheries and Oceans, will rely heavily upon SEP initiatives in concert with volunteer help from fishermen's groups and native Indian and other communities to enhance production of natural runs.

In launching this important program, managers are reminded of the historic species mix and are urged to adhere as far as possible to that which existed during the successful high production decades of the 1930's and 1940's.

Howard D. Smith - Vancouver, BC

## **Computer Programs**

**Bioprofile** is an entire system supporting life history research (reproduction, age and growth, and food habits) for fish. The system builds and maintains data files containing, for each specimen, capture date, gear, and location; fork length; total and gonad weight; sex and maturation stage; age, appearance of marginal increment, and annular ring measurements; and taxa and their weights, volumes, and numbers of individuals found in the stomach. The output products cover most of the "classical" approaches to analyzing the types of data maintained. The system is written in North Star BASIC and runs on a North Star Horizon microcomputer operating under North Star DOS. For more information contact: Mark L. Williams, NMFS, 3500 Delwood Beach Road, Panama City, FL 32407.

**Distribution of biomass and mortality with age.** BIODIS model, programmed in FORTRAN, but adaptable in BASIC to any microcomputer, computes the distribution of biomass, total mortalities, growth rates of total, juvenile and exploited population, and other age dependent parameters.

Inputs are: long-term mean age composition of exploited part of the population, weights at age and biomass turnover rate (different estimates possible in the latter). Examples of the model outputs can be seen in Canadian Special Publication of Fisheries and Aquatic Sciences, 59 (1982), p. 74.

Detailed model documentation is available upon request from T. Laevastu, Northwest & Alaska Fisheries Center, 2725 Montlake Blvd., Seattle, WA 98112.

## **New Publications**

**Atlas of the Oceans:** 1,000 full-color photographs, paintings, diagrams and maps with tables of marine life, glossary of nautical terms, index. 208 pages, \$35.00. Rand McNally Map Store, 10 East 53 St., New York, NY 10022, \$5 postage. *Editor's comment: I have not seen this and believe it more suitable for general public and library use than for the professional.*

**Annotated Bibliography of the Hard Clam (*Mercenaria mercenaria*).** By J. L. McHugh, Marjorie W. Sumner, Paul J. Flagg, Douglas W. Lipton and William J. Behrens. 1982, 845 pages. NOAA Tech. Rept. NMFS SSRF 756. Copies from D822 User Serv. Branch, Environmental Science Information Center, NOAA, Rockville, MD 20852.

**Tunas and Their Environment in the Pacific Ocean:** A review. By Paul N. Sund, Maurice Blackburn and Francis Williams. Oceanography and Marine Biology Annual Review, 1981, Vol. 19, 443-512 pp. Margaret Barnes, Editor, Aberdeen U. Press.

**Towed Systems:** An illustrated brochure of towed systems and their application can be obtained from Endeco, Inc., 13 Marconi Lane, Marion, MA 02738.

## Coastal Society Annual Conference

The Annual Conference will convene at the Holiday Inn Downtown, Baltimore, MD October 11-13. Proceedings of Estuarine Sanctuary Workshop held at Jekyll Is., GA in 1979 are now available for \$8.50. Information on the Annual Conference or copies of the Proceedings can be obtained from The Coastal Society, 5410 Grosvenor Ln., Bethesda, MD 20814.

### IN MEMORIAM

**Elmer Higgins, Fellow 1960**  
Alexandria, Virginia

**Robert L. Borovicka, Fellow 1974**  
Bend, Oregon - June 22, 1982

## District News

### CENTRAL CALIFORNIA DISTRICT

**Tom Jow, Director**

During the year, dinner meetings were held on alternate months in Vallejo, a convenient location for members in the Sacramento-Stockton and San Francisco area. Guest speakers provided a wide spectrum of subjects on fisheries science and management. A low point in attendance occurred during January when flooding prevented Marin County members from coming.

Tom Jow, Director, Sus Kato, Vice Director and Roger Wolcott, Secretary-Treasurer were installed at the Annual Meeting in San Francisco's Chinatown.

### NORTHWEST WASHINGTON

**John S. Isakson, Director**

The final meeting of the 81-82 year occurred on June 29 with Dr. Quentin J. Stober (University of Washington, Fisheries Research Institute) discussing the instream flow modeling process.

Western streams and rivers support mixed stocks of salmon, trout, and char, each of which requires a particular set of optimal flow-mediated habitat characteristics. There is considerable concern that development of hundreds of small hydroelectric plants and other activities will conflict with salmonid instream flow requirements. Dr. Stober reviewed the approach and conceptual aspects of a biologically oriented instream flow model used by himself and his colleagues to address flow needs in Washington rivers. Dr. Stober's review was brief and concise and stimulated considerable discussion about uses and misuses of a variety of available techniques for projecting flow requirements. He defended his model because it specifically addresses particular life history requirements of particular species but also noted that common sense is required in applying any models: detailed projects are useless if a given reach is not noted for supporting fish to begin with!

Twenty-four members and guests attended this last but clearly timely meeting of the season.

### OREGON-SOUTHWEST WASHINGTON

**Clyde S. Sayce, Director**

Joint meeting with Northwest Washington District was held in May at Olympia. Clint Stockley, Washington Dept. Fisheries retired, reported on Columbia River sturgeon.

In the mid-1890s size limits were imposed following a period of heavy and disastrous overfishing in the 1880s. Landings have never been as high since. However, white sturgeon are currently target of a major sport fishery and small commercial fishery. Sportfishing has increased from 30,000 angler trips in the 1960s to 100,000 angler trips in

1981. Five thousand fish have been tagged over the past two decades with returns both upriver and down river (Yaquina Bay and Grays Harbor) of the central research area (mouth to river mile 144). Coastal catches in Washington increased dramatically following the Mt. St. Helens eruption (May 1980); 14,000 pounds were landed near Neah Bay and 1 Columbia River tag was returned from Puget Sound's Carr Inlet following the eruption. (See p.5 for more complete report).

### SOUTHERN CALIFORNIA

**Norm Bartoo, Director**

In the 1981-1982 period the membership of the Southern California District continued its series of bimonthly meetings which served as a forum for exchange of ideas and discussions as well as a vehicle for some semi-formal presentations of research and results. In addition, in the spring of 1981 the Southern California District hosted a workshop/panel discussion for members and nonmembers.

At their monthly meetings AIFRB members heard reports on advanced technology and fishery biology — the use of satellite and radio telemetry for tuna research, techniques and results of otolith aging of yellowfin tuna, the effects of geomagnetic fields and tuna behavior, and a description of the flora and fauna of the newly discovered geothermal vents along the Pacific rise. Attendance at these monthly meetings averaged approximately 15 members per meeting.

The district hosted a panel discussion on the topic of communication between policy makers and users of research results and the scientists themselves. The panel was made up of both state and federal officials who were responsible for implementing and enforcing regulations and researchers who are responsible for presentation of their results. The bottom line of the discussions was that often some additional considerations, often simple, should be given to the presentation of scientific results to assure that they are not misinterpreted. Additionally, it appears that some useful data and results may be lying fallow in various files and the researcher has an obligation to get them into a position where they can be of use.

### SOUTH CENTRAL GREAT LAKES

**Wilbur L. Hartman, Director**

Dr. Charles R. Liston, Michigan State University, was awarded the majority vote and will be the new District Director.

### TEXAS

**C.T. Fontaine, Director**

The First Annual Meeting of the Texas District will meet on August 10 at the NMFS Laboratory, Galveston. Six speakers will discuss informally marine related research in the forenoon. A business meeting will follow lunch at Gaido's with nominations of new District Officers. Efforts to obtain members has been difficult, as in many of our Districts, by the widespread geographical separation of fishery biologists.

## Membership Report

### Promotion to FELLOW:

Dr. Paul L. Fore NM

### New MEMBERS:

Dr. Richard B. Deriso WA  
Robert Bruce MacGregor ON  
James E. Phelan NV  
Dr. Karen A. Steidinger FL

### Promotion to MEMBER:

Dr. Frank M. Panek NY

### ASSOCIATES:

Tamra L. Faris AK  
Jessica A. Gharrett AK  
John M. Hoenig RI  
Patricia J. Michael WA  
Thomas O. Moore, Jr. CA  
David R. Sager MD  
Mark W. Schwan AK  
Dr. Phyllis K. Weber AK  
Alex C. Wertheimer AK

**Sammy M. Ray, Secretary of Membership**

**BRIEFS**, the newsletter of the American Institute of Fishery Research Biologists, is published six times a year. It is intended to communicate the professional activities and accomplishments of the Institute, its Districts and Members. Comments and contributions should be sent to the Editor: John W. Reintjes, Route 3 Box 85, Morehead City, NC 28557. Subscription \$15 a year to Institutions and Non-members.

### AIFRB Group Award of Excellence

The Group Award of Excellence is a new award initiated by the Institute this year. It will be awarded periodically to an organization, group or team of fishery scientists who have made an outstanding contribution to fishery science or professionalism. The first recipient of this award is the Canadian Journal of Fisheries and Aquatic Sciences (formerly the Journal of the Fisheries Research Board of Canada). The Certificate for this award will be presented by President Bernard Skud to Jeff Watson, *Editor-in-Chief*, of the Journal next January at the annual Canadian Conference for Fisheries Research.

This Certificate reads:

"In recognition of the outstanding contribution to fishery science, the staff of

The Canadian Journal of Fisheries and Aquatic Sciences

formerly

The Journal of the Fisheries Research Board of Canada

and its predecessors

is hereby commended by the American Institute of Fishery Research Biologists. For more than 80 years, this extraordinary team effort has established and maintained a standard of scientific excellence that has gained international acclaim. All of the editors, scientists and other employees, as well as the administrators of the Canadian government who supported this initiative, share in this success and can be justly proud of their accomplishments. The institute also recognizes the role of the Journal in furthering the standards of professionalism among fishery scientists."

### History Of The Journal

by J. Watson, *Editor-in-Chief*,

Canadian Journal of Fisheries and Aquatic Sciences

The roots of the Canadian Journal of Fisheries and Aquatic Sciences reach back to the beginning of this century and the start of organized fisheries research in Canada. In 1899 the Board of Management of the Marine Biological Station, directed by Dr. E.E. Prince began investigations at St. Andrews, N.B. from a moveable laboratory that was designed to be towed from one location to another along the shoreline. Less than two years later the first of the Journal's predecessors appeared as a supplement to the 32nd Annual

Report of the Department of Marine and Fisheries. Seven articles constituted the first "*Contributions to Canadian Biology*" and described research on both fundamental and applied problems.

From these small beginnings, an occasional publication intended primarily to record the investigations of the Board of Management and a few visiting academics has grown into one of the leading international media for communicating research results in fisheries and aquatic sciences...

In 80 years the Journal's title has changed five times:

- Contributions to Canadian Biology 1901-1925
- Contributions to Canadian Biology and Fisheries 1926-1934
- Journal of the Biological Board of Canada 1934-1937
- Journal of the Fisheries Research Board of Canada 1938-1979
- Canadian Journal of Fisheries and Aquatic Sciences 1980-

From the very beginning articles spanned most disciplines in marine and freshwater research. Editorial boards and advisors were drawn from universities and government across Canada - a profitable linkage between Government and Academia that continues today. By 1934 the publication had clearly become a periodical directed mainly to other scientists, so the name was changed to reflect its status as a repository of original research. In 1937 when the Board's name changed so did that of the Journal. When the Fisheries Research Board of Canada was dissolved in the mid '70's the inevitability of another name change was apparent. The current name is free of organizational connotations and reflects the broad scope that has always been characteristic of the Journal so further name changes are not anticipated. Although the scope has been similar over the years, the content of the Journal has changed as fisheries and aquatic sciences evolved from descriptive approaches to more sophisticated experimental and holistic investigations of aquatic systems.

The Board attached considerable importance to publications; Prince, the first Chairman, was also the first editor and subsequently other Chairmen and Senior Members of the Board became editors. The appointment of Dr. W.E. Ricker as editor in 1950 had a profound influence on the development of the Journal of the Fisheries Research Board of Canada. Ricker set about getting the best Board work published, encouraging publication of important work from elsewhere, par-

Cont. on page 2



## History Of The Journal

from page 1

ticularly the United States, and making sure that the Journal was distributed widely. Ricker set up an extensive publication exchange program for both the Journal and the Bulletin Series. Institutions in Developing Countries with no publications to exchange received the Journal as a gift. This program was continued actively by Dr. J.C. Stevenson, the first full time editor, and ensured that much of Canadian fisheries science reached all corners of the globe. The distribution of the Journal to so many marine and freshwater laboratories played a significant role in enhancing Canada's reputation in fisheries science.

Since its inception, the growth and influence of the Journal increased greatly. To illustrate, an average of 13 articles per year appeared up to 1950, 51 articles per year between 1950-1962, and 224 articles per year since 1962. But numbers tell an incomplete story. Despite firm editorial policies, increased rejection rates and introduction of page charges, paid subscriptions as well as manuscript submissions have increased dramatically. A change from bimonthly to monthly publication in 1966 and continued maintenance of high standards gave another boost to the Journal, doubling its exposure to the readership. During the '60's and '70's Journal papers won a number of awards from the Wildlife Society of America. Several papers have been identified as Citation Classics in Current Contents, and the Science Citation Index shows that the Journal's citation rates and impact is increasing every year.

In the '70's a deliberate effort was made to build upon Ricker's example and broaden the intellectual scope of the Journal by introducing "*Perspectives*" which are broadly based essays of opinion or hypotheses and by publishing sound critical reviews. At the same time the Journal published Special Issues on specific topics of high scientific interest or the proceedings of major symposia on critical areas of concern. Many of these special issues have become classics and are the benchmark publications on which future research or management strategy can be based.

On behalf of present and past employees of the Journal, I thank the American Institute of Fishery Research Biologists for selecting the Journal as the first recipient of its Special Group Award of Excellence. Much of the success of any journal is due to the authors it attracts, the quality of advice provided by reviewers to help editors evaluate contributions and the dedication of its staff. The Canadian Journal of Fisheries and Aquatic Sciences and its predecessors has been fortunate in receiving top quality manuscripts and advice from the scientific community and has been blessed by a staff dedicated to excellence.

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## Highlights Of The Board Of Control Meeting

The meeting was convened at 9 A.M., September 20, 1982 with President Skud in the chair. A briefing book, covering most of the affairs of the Institute, prepared by the President became the working document for the meeting, and with additions or deletions will be updated annually. This book will be of invaluable assistance to newly appointed executives and directors.

Treasurer Cole's report was well received by all members as the Institute continues to be solvent. Steps have been taken to obtain Tax Exempt Status however the IRS has not as yet completed their review. Treasurer Cole proposed that the Institute adopt standard business practices and for the first time, a budget was prepared and accepted and will be in effect for the 1982/83 fiscal year. Your Board of Control also approved a change in the By-Laws that would establish the fiscal year to run from September 1 to August 31. This change thus allows the Board, at the time of the annual meeting, to consider the past year's operation in a timely fashion while considering the next year's fiscal plans and budget preparation. It is the hope of the Treasurer that in time, both the addressing and the bookkeeping systems can be automated and continued into a single computer system such as a micro-computer.

Membership Committee Chairman, Sammy Ray, reported that during the past year new members admitted to AIFRB included 31 Associates, 12 Members and 2 Fellows. Other actions by this Committee included promotions of 2 to Members, 3 to Fellows and the denial of 4 promotions. There was considerable discussion on 1) admission to the Membership in AIFRB, and 2) promotions and the need to establish a better set of criteria. The Board also decided, at the meeting, that members who are in full status may hold membership if they move to another job which may not be in the field of biology.

John Reintjes, Editor of BRIEFS, presented an overview of the activities of the Editor's office which included his recommendations for easing the workload for future editors.

Editor Reintjes commented on the extra effort that was required to produce six issues per year instead of the 4 previously. However the Board and President Skud generally agreed that his efforts certainly have done much to giving the membership a more interesting and meaningful newsletter and improved our image nationally. John Reintjes indicated he felt it was nearly time to designate another Editor, however he is prepared to remain for several more issues and will be ready to provide advice and guidance to his successor.

The AIFRB now has an official gavel to be passed from President to President. This handsome walnut gavel was handcrafted by member James Sykes and

presented to Bernie Skud at the meeting on his behalf by Bill Nicholson. Our sincere thanks to Jim.

There was considerable discussion on the AIFRB "Outstanding Achievement Award" and President Skud suggested the establishment of an "Adhoc Awards Systems Committee" to be headed by Gene Nakamura, assisted by Jack Helle and Joan Browder to examine all AIFRB awards and establish criteria, including new suggestions.

President Skud designated the following District Directors to be Regional Directors:

Alaska — J.H. Helle

California — T. Jow

Southeast — W.R. Nicholson

Northeast — C.S. Sayce

Washington — A.M. Andersen, Jr.

Great Lakes — C.R. Liston

Early in 1983, President Skud will name new Regional Directors.

Considerable discussion and much time was spent the second day of the meeting, on By-Laws Articles I, II, III, IV, and V and several sections within these articles. You will be informed of accepted changes in subsequent issues of BRIEFS.

AIFRB will meet with the American Fisheries Society in Milwaukee next year and will sponsor a joint session as was done this year.

The Board of Control unanimously approved the promotion to **Emeritus** status of Leslie Scattergood, J. Lawrence McHugh and Richard Stroud.

## American Fisheries Society Annual Meeting

Several AIFRB members were installed as AFS officers or received an award. William M. Lewis (IL), *President*, John J. Magnuson (WI), *Past President*, Janice Hughes, *President Elect*, William S. Platts, *First Vice President*. The Annual AFS Award of Excellence was awarded to AIFRB Fellow, Douglas G. Chapman (WA).

The Marine Section of AFS and AIFRB co-sponsored a session "Evaluation of Marine Assessment Procedures for Providing Management Advice". William W. Fox (FL) represented AIFRB as Convenor and Brad Brown (MA) substituted for Vaughn Anthony (MA) as the Convenor for AFS Marine Section. Speakers for the session were William G. Doubleday (ON), William W. Fox (FL), Brian J. Rothschild (MD) and Richard C. Hennemuth (MA).

## Legislative Activities

### Bills Introduced:

**H.R. 6961** (Lagomarsino/CA) — to prohibit the Department of Interior from issuing oil and gas leases in

the area of the Pacific Ocean off the California coast. Referred to the Committee on the Interior.

**S. 2835** (Humphrey/NH) — to grant consent and approval of the Congress to an interstate agreement or compact relating to the restoration of Atlantic Salmon in the Connecticut River Basin and to allow the Department of Interior and the Department of Commerce to participate as members in a Commission. Referred to the Committee on the Judiciary.

**H.J. Res. 557** (Breux/LA) — to disapprove the Governing International Fishery Agreement between the U.S. and the Republic of Korea. Referred to the Committee on Merchant Marine and Fisheries.

**H.J. Res. 580** (Breux/LA) — to disapprove the Governing International Fishery Agreement between the U.S. and Spain. Referred to the Committee on Merchant Marine and Fisheries.

**S. Res. 454** (Murkowski/AK) — instructing the Secretary of Commerce to take all appropriate steps necessary to strengthen and define a United States position that will insure: (1) that our anadromous fish stocks are perpetuated at productive levels; (2) that our fishermen are treated in an equitable manner in terms of sacrifices necessary to achieve conservation goals; and (3) that the problem of interception of Chinook Salmon by British Columbia fishermen be addressed in a manner having minimum impact on user groups and report to Congress on a semiannual basis. The Resolution, if passed, would not have the force of law. Referred to the Committee on Commerce.

**H.R. 7077** (Breux/LA) — to establish a fund for the sharing of revenues from OCS Shelf oil and gas development with coastal states and units of local coastal governments.

**H.R. 7225** (Breux/LA) — to establish an exclusive economic zone adjacent to the territorial waters of the United States. The bill would provide that the sovereign rights and exclusive fishery management authority be exercised within the EEZ. Highly migratory species would be exempted from this provision. The bill would not provide for control the conduct of marine scientific research in the EEZ.

### Committee and Floor Action:

**Dingell-Johnson Expansion** — on August 17, the House and Senate had placed before it the Conference Report on **H.R. 4961**, the Tax Equity and Fiscal Responsibility Act. The original Senate version of the bill included provisions to increase the Dingell-Johnson tax on certain fishing equipment and recreational boats and to exempt helicopters used in tuna operations from the airplane fuel tax increase. These provisions were dropped from the Conference Committee Report.

**Endangered Species Act.** On September 30, the House adopted the Conference Report on **H.R. 6133**, a bill to amend the Endangered Species Act. The bill now goes to the President for consideration. Earlier in September, the Senate adopted the Conference Report.

## Legislative Activities

The bill approved by Congress would (1) set a one-year deadline for the Interior Department to decide whether to list or delist a species after receiving a petition containing substantial evidence on such questions; (2) set a similar one-year deadline for decisions on petitions to revise a designation of critical habitat; (3) require listing decisions to be made solely on the biological question of whether the species is endangered or threatened; (4) streamline the exemption mechanism to reduce the maximum processing time from 360 days to 190 days; (5) eliminate the threat of criminal penalty or project shut-down for industries that incidentally take endangered species in the course of their activities; (6) increase the maximum share of costs for which states may receive grants under the act from 66.7% to 75% for single state projects and from 75% to 90% for multi-state projects; and (7) authorizes appropriations of \$3.5 million for the Department of Commerce for each of FY 1983, 1984, and 1985.

**Striped Bass Study Authorization:** On September 30, the House concurred in all but one amendment of Senate passed version of **H.R. 1952**, the Sikes Act Authorization. The one amendment altered by the House resulted in the deletion of the Striped Bass Authorization. Subsequently, the Striped Bass Authorization has been added to the most recent version of **S.2350**, a bill to amend the Fishery Conservation and Management Act. The authorization is for \$1 million for each of FY 1983 and FY 1984.

### Upcoming Hearings:

**Disposal of Decommissioned Nuclear Submarines:** On October 19, the House Committee on Merchant Marine and Fisheries will hold an oversight hearing on the disposal of decommissioned nuclear submarines off North Carolina. The hearing will be held in Manteo, North Carolina and will be chaired by Congressman Walter Jones (D-NC).

**Toxic Chemical Pollution in Puget Sound:** On October 25, the Senate Committee on Commerce, Science, and Transportation and the Committee on Environment and Public Works will hold a joint hearing on toxic chemical pollution of portions of Puget Sound. Dr. Donald Malins NMFS Northwest and Alaska Fisheries Center, will testify.

Kevin A. Ford - Washington, DC

### AN EDITORIAL:

## Who Are The Managers? What Is A Manager?

At the recent meeting of AFS, AIFRB co-sponsored a session with the Marine Section of AFS. The topic of the session concerned the Assessment of marine populations and procedures for providing advice to Manage-

ment. There was constant reference to scientists and managers. Late in the discussion period an AIFRB member, Robert Chapoton (NC), asked the question: "*Who are the Managers?*". Time did not permit a lengthy reply from the Speakers. I think this was an important question, one that has many ramifications.

In some governmental bodies the legislators have the final say about certain management measures and in a sense are "*managers*"; in other bodies these measures are established by fishery agencies or Commissions. In the first instance, the "*managers*" seldom have training or experience in management of renewable resources and probably would not consider themselves as managers; in the other case, the managers often include trained fishery biologists with extensive management experience. Neither system is free of political pressure, but I assume decisions by the legislators are usually more politically influenced than those of fishery bodies.

In Canada, the federal Parliament has delegated much of the responsibility for managing fisheries to the Executive Branch of government or to Provincial governments and it is my impression that most, if no all, regulations are proposed by staffs of experienced biologists, economists, etc. Minor regulatory changes may be approved by a Minister or his staff, but major changes may need approval by the Cabinet (Order-in-Council). In the U.S., the regulatory proposals for fisheries in federally-controlled marine waters are made by the Regional Management Councils and must be approved by NMFS and the Department of Commerce. Council members and staff include scientists or ex-scientists who are wearing new hats, but many of the Council members are not trained in fishery science or management. However, Council members also include fishermen and industry members whose knowledge of fisheries adds dimensions to the decision-making process that may not be familiar to biologists. Others on the Council have little experience with fisheries, but may offer expertise in related economic or social aspects.

In the classic sense, it is a misnomer to label as managers all of the decision-makers involved in these diverse arrangements. Yet all of these individuals and bodies are involved in the management process and indeed the term, manager, has taken on a broader connotation than it had even a decade ago. By force, I expect we must adjust to this semantic change, whether or not we agree that it is justified by the broader scope of today's management regimes.

A related aspect was also raised at this AIFRB/AFS session, i.e. the roles and interactions of scientists and managers. Some decision-making bodies receive specific recommendations from the scientists who are intimately involved in the management process, other bodies use the scientific information in a more general sense and obtain options from scientists who are somewhat remote from the management process. Some research administrators pride themselves with efforts to keep scientists aloof from the decision-making process —

## Managers?

others take as much pride in having their scientists involved as much as possible. Where do you stand and why?

**Bernard E. Skud (RI), President AIFRB**

(Editor John Reintjes will welcome replies and will decide how best to handle any responses that are received. AIFRB members who are willing to prepare a similar brief discourse on a fishery-related issue or problem should submit their contribution directly to the Editor.)

## Tortugas Pink Shrimp Fishery

The Gulf of Mexico Fishery Management Council (GMFMC) implemented a Shrimp Fishery Management Plan in May 1981 which included a recommendation for a shrimp sanctuary in Florida. The sanctuary was established by action of the State of Florida and the U.S. Department of Commerce. The sanctuary area (near the Dry Tortugas) is designed to protect small pink shrimp (*Penaeus duorarum*) until they attain a size range of 69 tails/lb. Prior scientific information indicated that small shrimp were most abundant inside the proposed sanctuary area and that predominantly larger shrimp were caught outside the area. Preliminary estimates indicated that the establishment of the permanent sanctuary would result in a greater yield to the fishery.

A team of scientists from the Southeast Fisheries Center's Galveston Laboratory conducted monthly cruises from September 1981 through February 1982 to determine whether the permanent closure area should be modified, abolished or remain unchanged. Three reports were presented to the GMFMC at its August 1982 meeting in Key West, Florida. Management-related questions were 1) what was the size composition and abundance of pink shrimp inside and outside the sanctuary during the period of the study; 2) what were the changes in fishing patterns of the commercial fishery resulting from the regulations; and 3) should the sanctuary area be modified, abolished or remain intact?

The research strategy included a field survey of the abundance and size composition of the shrimp population inside and outside the closed area and the collection of data on catch, effort and fishing locations of the commercial fishery. The information collected from September 1981 through February 1982 was analyzed and compared to research and fishery statistics from earlier years.

The sampling survey information revealed that a large portion of the shrimp population on the Tortugas grounds consisted of small pink shrimp and that these shrimp were predominantly inside the permanent closed area. One notable exception occurred in December 1981, however, when large concentrations of large shrimp (less than 70-count) were found inside the sanctuary along with a very small proportion of smaller shrimp.

Commercial catches and catch rates were significantly higher in 1981 than in previous years and the major recruitment onto the Tortugas grounds in 1981 occurred in March and April (prior to the implementation of the closure), rather than occurring in September-November as was documented for previous years. SEFC scientists concluded that the 1981 fishery and recruitment patterns were very different from the 20-year history for which data was available. Because of the abnormal year and because the sanctuary was not implemented until May, it was not possible to attribute the increase in catch solely to the management measure.

The GMFMC reviewed the conclusions of the scientific team and determined that the western-most portion of the sanctuary, an area of about 50 square miles, should be opened to fishing for one year starting October 1982. Field studies will continue on the Tortugas grounds to measure the specific movement and migration of shrimp within and outside the previously closed area to determine whether the shrimp are lost from the fishery or contribute significantly to it. Further studies will be conducted on the size distribution of shrimp on the entire fishing grounds in the next year.

**Edward F. Klima - Galveston, TX**

## Tuna Tagging In The Pacific And Atlantic Oceans ✓

There have recently been some important developments in tuna tagging in both the Pacific and Atlantic Oceans.

The Skipjack Survey and Assessment Programme of the South Pacific Commission, which tagged about 150,000 tunas, mostly skipjack, during the 1977-1980 period, has completed the at-sea portion of its work. The Inter-American Tropical Tuna Commission, which tagged more than 200,000 tunas, mostly yellowfin and skipjack, during the 1955-1981 period, has done no tagging in the eastern Pacific in 1982, although it is continuing to tag bluefin in Japan in cooperation with the Far Seas Fisheries Research Laboratory (FSFRL) of Japan. The Division of Fisheries Research, CSIRO, Australia, and the Fisheries Research Division, MAF, New Zealand, are currently beginning tagging programs on southern bluefin, and the latter organization has recently been tagging tunas, mostly skipjack and albacore, in cooperation with the Japan Marine Fishery Resources Center (JAMARC). The FSFRL, the JAMARC, the Tohoku Regional Fisheries Research Laboratory, and the Nansei Regional Fisheries Research Laboratory have been tagging skipjack, bluefin, yellowfin, albacore, and bigeye in the western and central Pacific. The U.S. National Marine Fisheries Service is continuing to tag albacore in the northeastern and north central Pacific.

The International Commission for the Conservation

## Tuna Tagging

of Atlantic Tunas coordinates tuna research activities, including tagging, in the Atlantic Ocean. It sponsored the International Skipjack Year Program, which began in 1979 and ended in 1982. During 1980 and 1981 about 24,000 skipjack were tagged in the eastern Atlantic and about 2,000 in the western Atlantic. In addition, other species of tunas, especially yellowfin and bluefin, have been tagged in the Atlantic by various organizations, particularly since the early 1970's, and many of these programs will be continued.

The above programs in both the Pacific and the Atlantic are carried out by scientists. In addition, various organizations furnish tags and other equipment to sport fishermen in many localities, who tag and release tunas, billfishes, and other sport fish and send the release information to the organizations which gave them the tags.

William H. Bayliff - La Jolla, CA

## Fish Aggregation Devices ✓

Fishermen worldwide are increasingly taking advantage of the aggregating behavior of tunas and other fishes around surface objects in the ocean by anchoring man-made buoys at fishing grounds. These fish aggregating devices, or FADs, are being deployed by both established and developing fishing nations, private fishing companies, fisheries research agencies, and even individual fishing vessels. FAD projects are especially popular around island groups in the western Pacific and Indian Oceans. The obvious benefits of having fish aggregating stations are increased production and reduced fuel costs.

Philippine fishermen were the first to use anchored fish aggregating devices on a large scale, employing bamboo rafts, called "payaos," to attract tunas in the calm waters around their islands. These rafts attracted tunas in large enough quantities that tuna purse seiners began fishing them in the mid-1970's and a successful tuna purse seine fishery utilizing FADs has developed there. Based on this success, many FAD programs have been established over the past few years, and most have been successful, resulting in greatly increased catches of tunas and other commercial fishes.

One of the most successful FAD programs has been in Hawaii, where in 1977, the Pacific Tuna Development Foundation (PTDF) and the U.S. National Marine Fisheries Service jointly funded an experiment to deploy FADs in waters off Hawaii. The FADs greatly benefited that state's commercial tuna pole and line fishery, and their success prompted the state to continue the project and set up its own FAD system. Hawaii Fish and Game biologists estimated that their FADs produced about one million pounds of fish, mostly skipjack, yellowfin, and bigeye tuna, during a one-year period from 1980 to 1981. Many of the other FAD programs have benefited

from technical and financial support from fisheries consulting groups such as PTDF and the Food and Agriculture Organization of the United Nations.

Many types of buoys and anchoring systems have been used in these projects, and the main problem has been their longevity. Often, the devices break loose from their moorings before fishermen can get much use from them. But FADs have proven their potential benefit to fishermen, and their increased utilization will probably result in more efficient FAD systems in the future.

David A. Bratten - La Jolla, CA

## W.F. Thompson Award For 1982

Mr. Lewis S. Incze was awarded the American Institute of Fishery Research Biologists W.F. Thompson Award for the outstanding student paper in fisheries biology. The paper was entitled "Relationships Between Effects of Environmental Temperature and Seston on Growth and Mortality of *Mytilus edulis* in a Temperate Northern Estuary" which was published in *Marine Biology* 57:147-156 (1980), co-authored by L.S. Incze, R.A. Lutz and L. Watling. This paper was based in large part on a Masters Thesis completed at the University of Maine, Walpole, ME 04573.

Mr. Incze is now a predoctoral candidate at the University of Washington College of Fisheries, Seattle, WA 98195. He is a research associate with Dr. David Armstrong working under a grant from the Office of Marine Pollution Assessment, NOAA. The topic of his current study is "Population Dynamics of Tanner, King Crab, and Other Decapod Larvae in the Southeast Bering Sea." His current research activities are to be used as the basis for his Ph.D. dissertation.

## Aquatic Station

The Aquatic Biology faculty and students will move into the H.M. Freeman Aquatic Biology Building during the Summer, 1983. This 30,000 square foot building, currently under construction, will be devoted entirely to teaching and research in aquatic biology. It will contain faculty and student offices, conference rooms, three teaching laboratories, six research laboratories, a lecture room, a wet lab, an instrument room, a computer room, etc. Research laboratories will be equipped with the latest instrumentation for aquatic studies. The Aquatic Station also has 14 ponds, two large outside raceways, and ten smaller raceways located inside a holding house.

The great diversity of aquatic ecosystems near the Aquatic Station provides exceptional opportunities for study and research in aquatic biology. Canyon Reservoir and the Guadalupe, Blanco, and San Marcos Rivers are less than 25 miles away. The San Marcos River originates from a series of large springs near the Aquatic Station and then flows through a park in the middle of

## Aquatic Station

the campus. This thermally stable river makes a unique biological laboratory with many unusual species. There is an artesian well on campus that contains many species of cave fauna.

Courses of study leading to the degree of Bachelor of Science and Bachelor of Science in Education with a major in Aquatic Biology are offered. Also a Masters of Science degree program with emphasis in Aquatic Biology is offered to qualified students holding a baccalaureate degree. Graduate research projects and courses are available in the areas of aquatic invertebrate ecology, limnology, fisheries biology, aquatic parasitology, pollution biology, aquatic toxicology, aquatic plant ecology, stream ecology, groundwater ecology, and aquatic mycology.

For further information contact: Director, Aquatic Station, Biology Department, Southwest Texas State University, San Marcos, TX 78666-4616, (512) 245-2284.

## Formalin Proved A Safe, Effective Cure For Common Fish Diseases

The U.S. Fish and Wildlife Service has cleared the way for the lawful use of formalin in fish culture after nine years of intensive research that proves the compound can be used without harm to fish, consumers, or the environment.

*"Fish culturists agree that it's almost impossible to raise important food and sport species such as catfish and trout without formalin to control external parasites and fungal infections,"* said Robert A. Jantzen, the Interior agency's Director. *"Thus, our efforts to get this chemical registered have represented one of the Service's primary fishery research responsibilities for nearly a decade."*

*"This is a major accomplishment for the Service. Now that we have satisfied the stringent requirements of the Food and Drug Administration, formalin can be used for fish disease control by Federal and State hatcheries, as well as by the growing U.S. fish farming industry."*

Formalin has been known to fishery experts since 1909, when it was used to control parasites on rainbow trout. In time, the compound became the most widely used chemical in the treatment of fish disease because of its versatility and effectiveness. Use of the drug was lawful until the Federal Food, Drug and Cosmetic Act was amended in 1972, to require registration of all drugs and chemicals used on food animals. After receiving a permit for experimental use, the Service undertook the necessary research to register formalin for fishery use. Now, formalin can be lawfully used by Federal, State, and private fish culturists to control parasites of trout, catfish, salmon, largemouth bass, and bluegills; and to control fungus on salmon, trout, and pike eggs.

*"The Service's investment of \$500,000 in formalin research is money well spent,"* said Jantzen. *"Federal and State hatcheries annually produce fish with a market value of \$7-10 million and \$17 million, respectively. In addition, fish farmers did almost \$400 million dollars' worth of business in 1981 as they helped meet the increasing demand for fish by nutrition-conscious Americans."*

The most common external parasite that plagues fish is *Ichthyophthirius*, commonly known as "*ich*." Formalin can cure "*ich*," which can infect all freshwater species including home aquarium species — a \$60 million industry. All fish are more prone to disease after being handled, as their natural protective coating of slime is gone. Then disease can spread rapidly; for example, *Saprolegnia* fungi can infect and kill virtually all fish or eggs in an enclosure within 24 hours. Both *Saprolegnia* and *Ichtyobodo* ("*costia*"), which infects fish gills, can be successfully treated with formalin.

Formalin is a liquid formaldehyde solution which is heavily diluted for fish culture use. The standard concentrate is 37% formaldehyde, and it is further weakened to a fraction of its original strength before it is used on fish or eggs. The Service investigated possible hazards to fishery workers in the course of its research and found no problems when proper precautions were taken. Jantzen pointed out that recent concerns about urea formaldehyde insulation — which has been banned by the U.S. Consumer Product Safety Commission — do not apply to formalin since the liquid produces practically no vapor to be inhaled.

The Service's formalin-related research has been guided by the agency's National Fishery Research Laboratory at La Crosse, Wisconsin. Studies were designed to answer a broad range of questions about the possible drawbacks if its use. Potential side effects on fish that were ruled out included birth defects, cancer, and chromosomal damage that could cause mutants. Other research measured the interactions with pollutants and other products in the water. According to Jantzen, no test ever showed that formalin was unsafe or ineffective when used as directed. As part of its efforts to get formalin registered as a fish disease control, the Service drafted instructions for its use for manufacturers to include as package inserts.

Since the Fish and Wildlife Service does not manufacture or sell formalin, qualified companies wishing to market the product for fishery use must file a New Animal Drug Application (NADA) with the FDA. However, interested firms will not be required to do any research and testing since they can refer to the FWS master file on record at the FDA.

Formalin is the 34th compound to be made available to fish culturists for disease control, anesthesia, and other purposes. Sixteen compounds are currently being developed and pursued by Fish and Wildlife Service for registration.

## Formalin

*"Most Service research for registration of compounds for fish culture is supported by limited Federal funds, so our emphasis must remain on a few high priority compounds that are directly related to the need of fish hatchery managers and commercial culturists," said Jantzen. "In recent years the need for fish disease controls has led to cooperative agreements between the Service and other Federal and State agencies, and with the chemical and drug industry, to share the workload and costs involved in registration."*

The FDA published an official notice in the April 9, 1982, Federal Register that registration requirements for formalin had been satisfied by the Fish and Wildlife Service.

James Ross - Fort Snelling, MN

## Announcements and Publications

### Tropical and Subtropical Fisheries Technology Conference

The Eighth Annual Conference is scheduled for January 10-13, 1983 in Tampa, Florida. Technical sessions begin Tuesday morning, January 11. The meeting location is adjacent to Tampa International Airport at the Admiral Benbow Inn, 1200 North Westshore Blvd. This Conference is designed to encourage the exchange of current information concerning production, processing, utilization and distribution of tropical and subtropical fishery products. The Conference is open to technologists, industrial groups, fishermen, processors, dealers and anyone interested in seafood technology. The agenda includes topics dealing with research and extension activities in seafood quality control and safety, product development, waste management, marketing and new fisheries. Submit a tentative Abstract, 50 words or less, to W. Steven Otwell, 207 Food Science, Univ. Florida, Gainesville, FL 32611, prior to November 15.

### Workshop Proceedings "Biological Bases for Reef Fishery Management."

The workshop was sponsored by the National Marine Fisheries Service Southeast Fisheries Center and the Caribbean Fishery Management Council. It was held at St. Thomas, Virgin Islands on October 7-10, 1980. The Proceedings were edited by Gene R. Huntsman, William R. Nicholson, and William W. Fox, Jr., and published as NOAA Technical Memorandum NMFS-SEFC-80 in March 1982.

The 215-page document contains 14 formal papers in sessions devoted to (1) Aging of Reef Fishes, (2) Reproduction in Reef Fishes, (3) Recruitment of Reef Fishes and Stock Delineation, (4) Assessment of Reef Stocks, (5) Reef Fish Communities, and (6) Modeling of Reef Fisheries. Each session is summarized by the chairman for the session and each paper literature cited. The names and addresses of attendees are included. The 50 participants represented the Continental U.S. as well as the Caribbean and Pacific Islands.

The document may be obtained from the National Marine Fisheries Service Laboratory, Beaufort, NC 28516.

**Japanese Artificial Reef Technology: Translations of Selected Japanese Literature and An Evaluation of Potential Applications in the U.S.** has been published by Aquabio, Inc., a research and development firm specializing in aquatic habitat improvement technology. This book contains Japanese artificial research reports and papers obtained, translated, and edited by Aquabio as part of NOAA/NMFS Grant No. NA-31-FA-D-00001. Requests for copies should be addressed to Dr. Susan F. Vik, Aquabio, Inc., P.O. Box 2362, Columbia, MD 21045.

## Thesis and Dissertation Abstracts

### Quantitative Genetics of Chum Salmon, *Oncorhynchus keta* (Walbaum)

William Williams Smoker, Ph.D. 1982, Oregon State University

Chum salmon, a valuable North Pacific fishery resource, are experiencing significant natural and human impacts. Rational management requires a genetic understanding of these impacts. This work develops techniques for understanding and predicting genetic impacts.

Chum salmon from different stocks were bred together. Sibling groups of eggs, alevins, and fry were maintained in a common environment. Variabilities of development rates, rearing performance, susceptibility to disease, and behavioral traits were partitioned into genetic and non-genetic components by analysis of variance.

The contribution of additive genetic variability (heritability) of embryonic development rate was significant in crossbred but not in purebred groups. Development rates correlated with temperature regimes of parental stocks and sizes of eggs. Heritability of size after rearing was significant; size was affected by egg size and geographic location of parental stocks. Susceptibility to the disease vibriosis was probably heritable. These factors did not affect response to a salinity gradient or time of residence in freshwater. Evidence for any non-additive variability was lacking.

A conceptual model is developed for assessing selection. Dynamics are simulated for a stock in which (1) survival is density dependent, and (2) survival reflects biennial competition from pink salmon. When age of maturation has high heritability, both average age and abundance cycle biennially; when heritability is low, average age but not abundance cycles biennially. The first pattern has been reported for chum salmon in locales where pink salmon spawn in significant numbers biennially.

### Mineral Composition and Growth Rates of Brook Trout (*Salvelinus fontinalis*) in Four Pennsylvania Streams of Different Mineral Content

Marjorie Cecile Coombs, M.S. 1982, Pennsylvania State University

Brook trout were collected in the early summer and fall of 1979 from four Pennsylvania streams of progressively increasing pH, specific conductance, and total alkalinity. Mean length was calculated for each age class in each stream. Total ash weight of the fish, and the concentrations of Ca, Mg, and Zn were measured in the stream water, whole body, bone, skin, muscle, and viscera. Fish from the low mineral streams grew more slowly than fish from the higher mineral streams. Fish from the low mineral streams also had higher whole body Zn levels even though there were no differences among streams in the total amount of ambient Zn. Previous work has shown that low pH and low dissolved minerals increase the likelihood of uptake and accumulation of Zn by fish. There is little evidence that excess Zn has any direct effect on growth rates, but there may be indirect or synergistic effects from the low pH and low ambient Ca levels, which merit further investigation. Low pH by itself did not limit growth, because there were few differences in growth rates in the two low mineral streams, despite a difference of 1.5 pH units in the stream water. Calcium concentrations did not rise with age in fish from the lowest mineral streams, as they had done in fish from the higher mineral streams. Percent ash weight and Mg levels were lowest in the fish from the lowest mineral stream, but the Ca:ash and Mg:ash ratios were not different in any stream. This indicates that the lower mineralization is affecting the entire process of mineralization, rather than just Ca or Mg. Further investigation is needed to discover whether the lower mineralization is a cause of slow growth rates, or a consequence of them.



## **Foraging Behavior of Free-ranging Wild Brown Trout (*Salmo trutta*) in a Stream**

Robert Allen Bachman, Ph.D. 1981, Pennsylvania State University

Free-ranging wild brown trout (*Salmo trutta*) in a fertile, high-conductivity stream were observed from camouflaged observation towers for three consecutive years in order to quantify the diurnal feeding and social behavior of undisturbed adult trout.

The foraging behavior observed was characterized in general as one of net energy maximization effectuated principally by cost minimization. Individuals ranging in age from young-of-the-year to eight years old spent 86% of foraging time in a sit-and-wait search state, used discrete, energy-saving, foraging sites year after year and fed mainly off drift, taking less than 15% of their food items directly off the bottom. Feeding rates decreased with age, were highest in spring and fall, and showed little effect of time of day except for short peaks at dusk in May and June.

The home range of most individuals was established when the trout were young-of-the-year or yearlings and changed little thereafter. The mean size of the home range of all individuals observed was 15.6 m<sup>2</sup> and decreased slightly during the first four years of growth. No individual had exclusive use of any home range and no clearly defined territory could be described for any trout. Rather, the social structure evidenced is best described as a cost-minimizing, size dependent, linear dominance hierarchy consisting of individuals having overlapping home ranges. There was no apparent correlation between dominance and site selection with respect to distance to cover or feeding rate. Use of overhead cover ranged from less than 17% of daylight hours for trout of age-group 2 to less than 43% for age-group 5.

Growth was asymptotic at 40 cm. A rectangular hyperbola described well the overall growth curve of the population with half of the asymptotic length being attained at an age of 23 months.

Hatchery brown trout, introduced for experimental purposes, fed less, moved more, and used cost-minimizing features of the substrate less than wild trout. High energy cost is postulated as a major cause of mortality among hatchery-reared trout stocked in streams.

An energy-balance growth model is presented which shows how physiological and environmental constraints imposed upon drift-feeding salmonids shape the behavior of the fish.

## **Growth Rate of Brown Trout (*Salmo trutta*) in Areas of the Au Sable River, Michigan, Before and After Domestic Sewage Diversion**

Glenn S. Merron, M.S. 1981, University of Michigan

Comparisons of growth rates for brown trout (*Salmo trutta*) were made for two intervals, one during and the other after termination of the discharge of primary treated domestic sewage effluent into parts of the Au Sable River system, Michigan.

The ages of a total of 3,394 brown trout from the mainstream, South Branch, and North Branch Au Sable River were assessed from scale samples. Estimations of length at age and the annual growth increment in length were obtained by conventional back-calculation methods.

The growth rates of brown trout after termination of discharges from sewage treatment plants into the mainstream at Grayling and into the South Branch at Roscommon were found to be significantly slower than during the discharge period. No change in growth rate occurred for the same time intervals on the control, the North Branch, into which no sewage plants have discharged.

The sewage treatment effluents formerly discharged into the Au Sable River stimulated biological production of aquatic plants and invertebrates. Increased trout production resulted through better growth rates.

Following cessation of sewage input, aquatic production declined in the affected river sections. In terms of growth of brown trout, this was

apparently due most directly to lowered food production, specifically of the amphipod *Gammarus fasciatus* and the isopod *Asellus militaris*.

Back calculation of trout lengths at various ages, made from scale measurements, tended to become progressively longer as older fish were used. This is the reverse of the usual manifestation of Lee's phenomenon of apparent change in the rate of growth. Size selective avian predation of the smallest trout of a cohort is suggested as the principal cause for this reversal.

## **First-Year Effects of Salvage Clearcut Logging Upon Stream Populations of Wild Brook and Brown Trout in the Northcentral Highlands Region of Pennsylvania**

Gerald Francis Lacy, M.S. 1982, Pennsylvania State University

The effects of salvage clearcut logging and associated land and stream disturbances on resident trout populations were investigated in the Appalachian hardwood forest of northcentral Pennsylvania. In this study changes in stream populations of wild brook and brown trout in three study segments draining a 76.9 ha (190 a) clearcut area were evaluated. Results were compared to the characteristics of a resident trout community in a control segment draining an undisturbed basin. Data were collected in the spring of 1973, prior to logging, and again after logging in the spring of 1974. Observations included comparisons of population estimates, age structure composition, biomass and condition factors of resident brook trout, and stream temperatures during and after clearcutting.

Following the salvage clearcut, numbers of young-of-the-year trout declined dramatically in the stream segments draining the cut areas. The number of trout in the I<sup>+</sup> age group represented as age II<sup>+</sup> fish after logging was significantly less in the upper two logged segments than those observed in the control segment. The main condition factor of at least two age groups in these same study sections appeared to decrease slightly after logging. An unlogged buffer zone maintained on both sides of the permanent stream channel within the clearcut basin apparently prevented stream temperatures from reaching levels lethal to resident trout. An increase in total numbers and biomass of resident trout in all the study segments, including the control, after logging, was attributed to a population recovery following losses suffered in a severe flood in June of 1972. Possible explanations for the observed population changes, recommendations for preventing similar problems on future logging operations and suggestions for further research are discussed along with other aspects of logging effects on fish ecology.

## **Contributions for BRIEFS**

It is our hope that BRIEFS will serve the membership of the Institute and also be of interest to others in the professions of Fishery Science. To do this we need contributions of news, announcements, opinions and reports of freshwater and marine fisheries and fishery scientists.

We have increased BRIEFS to six issues a year of 8 or 12 pages. We are soliciting abstracts of recent theses and dissertations and brief summaries of computer programs. We need resumes of progress and happenings in fishery science. Because there is no staff we need copy-ready material of 200 words or less for Abstracts, Computer Programs or Reports, unless the subject cannot be accommodated so briefly and then exceptions will be made. Please double space with 1½ inch margins.

Personal news can be of interest to AIFRB members. Honors, awards, promotions, position changes and appointments are often newsworthy events. For example: Karl F. Lagler, Founding Fellow of AIFRB, has been awarded a multi-disciplinary pre-empoundment study by AID for the Gambia River, in Gambia and Senegal. The study is in collaboration with Faculty of Fisheries, Kasetsart University, Bangkok. Karl will be Resident Director for 2 years, probably starting in January.

Please send your contributions to: John W. Reintjes, BRIEFS Editor, Route 3, Box 85, Morehead City, NC 28557.

## Membership Report

### Promotion to FELLOW:

Dr. Gerald R. Bouck WA

### New FELLOWS:

Dr. Taivo Laevastu WA

Dr. Karen A. Steidinger FL

### Promotion to MEMBER:

Dr. Dave R. Gibbons AK

### New MEMBERS:

Dr. James K. Andreasen TX

Dr. George W. Boehlert OR

Dr. John J. Ney VA

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BRIEFS, the newsletter of the American Institute of Fishery Research Biologists, is published six times a year. It is intended to communicate the professional activities and accomplishments of the Institute, its Districts and Members. Comments and contributions should be sent to the Editor: John W. Reintjes, Route 3 Box 85, Morehead City, NC 28557. Subscription \$15 a year to Institutions and Non-members.

# American Institute of Fishery Research Biologists

## . . . BRIEFS . . .

VOL. 11, NO. 6

DECEMBER, 1982

### New Editor for BRIEFS in 1983

President Skud announced that Dr. Oliver B. Cope would assume the Editorship of BRIEFS early in 1983. John Reintjes will continue the printing and mailing arrangement from Morehead City, N.C. Dr. Cope, now retired, lives in Asheville, N.C.

Oliver B. Cope was born in San Francisco and trained at Stanford University (A.B. 1938; M.A. 1940; Ph.D. 1942). He was a Navy entomologist during World War II, and began his U.S. Fish and Wildlife Service career in 1946 on the Stanford campus. Became Chief, Central Valley Investigations in 1950 (salmon and trout studies), Chief, Rocky Mountain Sport Fishery Investigations in 1952 (trout studies at Yellowstone), Chief, Fish/Pesticide Investigations at Denver in 1959, Director, Fish/Pesticide Research Laboratory at Columbia, Missouri in 1966, and Chief, Branch of Fish Husbandry Research in Washington, D.C. in 1969. Cope transferred to the Office of Water Resources Research in Washington in 1972, and retired from the federal service in 1974.

Dr. Cope became a Fellow of the AIFRB in 1964, and is or has been a member of several fish-oriented scientific and professional societies.

Cope's background in editing includes: Associate Editor, Transactions of the American Fisheries Society; Acting Editor, Transactions of the American Fisheries Society (1974); Associate Editor, Progressive Fish-Culturist; Chairman, Editorial Review Board, Fish and Wildlife Service (1972); Technical Editor, Colorado Division of Wildlife; and free-lance editor of various books and reports on fishery and wildlife subjects.

At present, Dr. Cope works at editing and consulting on short-term fishery assignments.

A transition of Editorship will begin with Volume 12, Number 1. Copy for the February issue, requested by January 15, may be sent either to John Reintjes or to Dr. Oliver B. Cope, 15 Adamswood Road, Asheville, NC 28803.

### South Atlantic-Gulf of Mexico Charterboat Survey

During March of 1982 the Southeast Fisheries Center's Panama City Laboratory initiated a project to

gather daily catch and effort data from selected charterboats along the U.S. south Atlantic and in the Gulf of Mexico. Boats were selected from Oregon Inlet, North Carolina; Key West, Florida; Grand Isle Louisiana; and Port Aransas, Texas. In addition to the area fished (estuarine, 0-10 fm, greater than 10 fm), captains are providing data on fishing method (troll or bottom), hours actually fished using that method, and species caught in that area using a particular method. Sixty-five species of fish have been reported, including coastal pelagic species (king mackerel, Spanish mackerel, bluefish, little tunny), oceanic pelagic species, (wahoo, dolphin, yellowfin tuna, billfish) and demersal species (snappers, groupers, etc.). Data will be evaluated to determine their usefulness in studies of the distribution and abundance of these fishes and the estimation of recreational catches. The 1982 survey will conclude on November 30, however, the project will be continued next year.

Harold A. Brusher - NMFS, Panama City, FL

### Computer Programs

The following three computer programs are available by writing to Dr. T. Laevastu, NOAA, Northwest and Alaska Fisheries Center, 2725 Montlake Boulevard East, Seattle, WA 98112.

1. An abbreviated prognostic bulk biomass ecosystem model (SKEBUB) (T. Laevastu and N. Bax, Program Documentation 14).

2. Program FISHMO for computation of the effects of fishing on the growth rate and spawning stress mortality in a species biomass (T. Laevastu, Program Documentation 13).

3. Program FISHIT for computation of the effects of fishing on a single species biomass (T. Laevastu, Program Documentation 15).

The first program is a simplified ecosystem simulation (containing eleven species/ecological groups). It must be adapted to desired region with specific local data. The second and third programs are species specific. The FISHIT program uses outputs from FISHMO.

The programs are written in FORTRAN II, but can easily be converted to BASIC and can be run on mini

Cont. on page 2

## Computer Programs Cont.

and/or microcomputers. The core storage requirements are 3500, 1300, and 1900 words, respectively.

### Inter- and Intra-specific Stock and Recruitment

The stock-recruitment relationship has traditionally been considered in the intraspecific mode — interactions within a single-species stock. Many of these species have shown a strong relation, fitting either the dome-shaped (Ricker) curve or the asymptotic (Beverton-Holt) curve, but other species have shown little or no relation between stock size and recruitment.

The failure to demonstrate a stock-recruitment relation may be influenced by interspecific relations as indicated by Pauly (Trans. Amer. Fish. Soc., 111, 1982). He showed that recruitment of penaeid shrimp in the Gulf of Thailand was related to the annual egg production of shrimp and the biomass of predators and competitors. His findings were based on evidence that the prerecruit mortality of shrimp was dependent on the total standing stock of demersal species, fish and shrimp (see figure). Skud (Science, 216, 1982) also proposed an

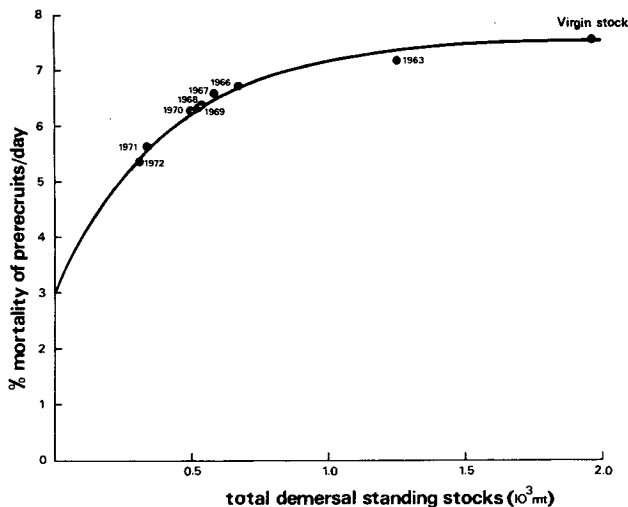


Figure: Relationship between the percent daily mortality of penaeid shrimp prerecruits and the biomass of potential shrimp predators and competitors in the Gulf of Thailand. (From Pauly, 1982)

interspecific explanation for recruitment of competing species such as Atlantic herring, *Clupea harengus*, and Atlantic mackerel, *Scomber scombrus*, which have alternated as the dominant and subordinate species in the Western North Atlantic. He concluded that the density dependent factors that govern the recruitment of the dominant species also function in an interspecific mode to control the abundance of subordinate species.

Interspecific relations may well explain the lack of a stock-recruitment relation in so many studies of single

species. The continued examination of stock recruitment on a species by species basis seems incongruous with the mounting evidence of species interactions — in both freshwater and marine environments — and with the present-day emphasis on an ecosystem approach to management. If one accepts the premise of competition among species, it is incompatible to assume that recruitment is independent of the results of competition. The existence of an interspecific stock-recruitment relation may also explain the apparent disparity between the dome-shaped and the asymptotic recruitment curves. A decline in recruitment may result in a subordinate species when the biomass of all its competitors is high, but the same species, if dominant, may maintain a high recruitment at the expense of subordinate species.

Reader's views on this topic are invited. We would welcome receiving supporting or opposing evidence to the existence of interspecific stock-recruitment relation.

Bernard E. Skud - NMFS, Narragansett, RI

Daniel Pauly — ICLARM, Makati, Metro Manila, Philippines

### Looking Backwards

The conclusions of the 1951 report of the Subcommittee on the Salmon (Atlantic) Fishery in International Waters (International Council for the Exploration of the Sea, ICES) included the following: (1) The only occurrence of salmon in fair numbers in international waters outside the Baltic is that reported by M.R. Vibert for the mackerel grounds SW of the British Isles. Otherwise there is no evidence of feeding grounds in international waters, nor is there any substantial fishery in such waters far offshore in the NW Atlantic. (2) With the possible exception of the areas SW of the British Isles there is probably no danger to salmon stocks as a result of the fishery of international waters.

A minority statement by Sven Sømme (Norway) was attached to the report. The statement included comments about the efforts of all countries to manage and regulate their salmon stocks and the lack of statistics relating to the capture of salmon. He also reiterated the declines that had occurred in the stocks of a number of countries. He added: "I have signed the Report...as I can see that a strictly scientific body such as ICES can take no steps to secure restrictions that are not securely based on scientific evidence. However, I do not in any way feel confident that there is no danger to the stock of salmon from overfishing in the open sea or outside national waters, and it is my sincere belief that no country possessing and taking care of a stock of salmon of her own would care to see it exploited in international waters beyond the control of restrictions. If such exploitation should be started there are no means of stopping it...I feel we would have advanced a very important step if we had been able to agree that the development of salmon fishing in international waters is undesirable. The opinion is based on the probability

that, despite the lack of proof, the stocks are already being fully exploited or over-exploited and that the maintenance of a stock of salmon in any country is due to the amount of success derived from the salmon laws and conservation measures..."

Sømme's statement was made when the high-seas fisheries in Greenland and the NE Atlantic were not a problem, nor in the minds of many experienced people ever likely to be. His statement has a familiar ring today and is echoed regularly at meetings of several international bodies considering salmon management.

*Excerpted by Bernard E. Skud from an ICES meeting document (1975) by Arthur Went (Ireland).*

## Commentary

I think Bernie Skud did a reasonably good job of answering "*Who are the Managers*" in the October BRIEFS. His views on who or what makes a fishery management decision, irrespective of training or other virtues, touches broadly on the evolution of the decision-making process.

At one time the process was vertically integrated; the biologist defined the problem, conducted research, developed solutions presented to an administrator who usually accepted and implemented the recommendation. Rarely considered in that recommendation were economics, judicial review, public sentiment, dependency, optimum yield, etc.

Consider now, however, the diversity occurring on local, regional, national and international levels where nearly all of Murphy's Laws apply. As Skud points out, "... the term, manager, has taken on a broader connotation than it had even a decade ago." Nearly all present management entities that operate, either by legislative mandate or international agreement, must consider any number of dependent and independent variables that synergize human values, for example, economics, in addition to those aspects required to protect the resource and its environment.

Today, if all the attributes needed to be a fisheries manager were to be concentrated in one person, he would be a God. While some administrators agree with that concept and have attempted to emulate Him in this respect, others have opted to intimately involve their scientists in the management process. I favor this latter approach. Why? If we, as supposed experts abrogate our responsibilities to the resources, who will take our place?

**Henry O. Wendler** - *Pacific Fishery Management Council*  
*Portland, OR*

## Energy Development and Fish

Energy augmentation in the Western United States has considerable potential to alter river ecosystems and thereby impact fish and other aquatic organisms.

Energy augmentation has many facets. Existing and new technologies all need considerable amounts of water. Examples include conventional power plants, nuclear plants, coal slurry pipelines, oil shale retorting, biomass conversion units, pumped storage facilities, and geothermal units. The result may be reflected in significant changes in stream flows, stream temperatures, water chemistry, and ecological function.

We have examined some relationships of intensified hydroelectric production in the Hanford Reach of the Columbia River. Four program phases were related to water-level fluctuations, as results from a power peaking mode of operation from an upriver dam.

Annual spawning success of smallmouth bass is influenced by the frequency and extent of daily variations in spring flows. Many adult bass enter sloughs to spawn where the water is warmer than in the main river channel. During low flow periods, the relatively still slough water is warmed by insolation. Cold water enters the sloughs during high flows, delaying bass nesting activities. Our data indicate that alternating flows from upriver dam releases can inhibit adult bass spawning, thermally shock or expose bass eggs, and entrap or strand bass fry. The most productive sloughs for bass are isolated from the effect of daily water level fluctuations.

Flow manipulation by man has potential to dewater intergravel salmon redds during fall and winter. To evaluate this effect, we developed an experimental system of 30 artificial redds. The system consisted of 30 rectangular aquaria, each containing a gravel mix, supplied independently with flowing 10°C water, and easily drained (dewatered) and rewatered. Results with chinook salmon show that cleavage eggs and embryos (egg phases) tolerate continued dewatering for over a week. Eleutheroembryos and alevins (post-hatch phases), however, are destroyed by brief dewatering of less than 24 hours.

Factors in the intergravel environment that influence survival of chinook salmon eggs during dewatering were also evaluated. Prolonged egg survival depends upon intergravel moisture and temperature. High moisture content (near 100% relative humidity) is essential to normal egg development. Intergravel temperature increases from direct insolation on exposed spawning gravel in early fall should not exceed 24°C. Intergravel temperature decreases from a sub-zero air mass during winter should not drop below freezing.

The ability to predict river elevation and temperature at selected downstream locations (e.g., bass and salmon spawning areas) on the basis of variable discharges at upriver dams is essential to impact assessment. We adopted, fitted, and tested a computer model (DWOPER) with Hanford Reach flow data for this purpose. The model proved accurate, and can be applied to other river ecosystems when fitted with proper parameters.

**C. Dale Becker** - *Battelle Pacific Northwest Laboratories*  
*Richland, WA*



## Thesis and Dissertation Abstracts

### Population Dynamics and Management of Largemouth Bass (*Micropterus salmoides*) and Chain Pickerel (*Esox niger*) in Dryden Lake, New York

David Moore Green, Ph. D. 1982, Cornell University

Population dynamics, growth, biomass and food habits of largemouth bass and chain pickerel and number and biomass of associated species in Dryden Lake were determined in 1965-1971. Second year survival of bass was highly variable and positively correlated with age 0 length in October. Bass growth was closely correlated with May to October temperatures. Beyond age I annual survival averaged 0.60 and total mortality was equally proportioned between summer and winter. Over 70% of the natural mortality occurred over winter. Survival of pickerel from age 0 to I was also highly variable, but was not as closely correlated with first year growth as with bass. Beyond age I annual survival of pickerel decreased with age from 0.63 at age III to 0.16 for age V and older. About 70% of the total mortality occurred over summer. Annual natural mortality increased with age from 0.26 at age II to 0.65 for V and older pickerel and was highest over winter.

Although biomass of bass and pickerel was moderately high (mean 42 kg/ha), prey species were extremely abundant and, in general, slow growing. Biomass of brown bullhead, pumpkinseed, yellow perch, creek chubsucker & black crappie  $\geq 15.2$  cm avg. 208 kg/ha & numbers averages 1380/ha. The complex environmental created by extensive beds of aquatic plants may have decreased availability of prey species to predators.

The effect of different minimum length limits on yield per recruit was examined. Maximum yield in weight occurred at minimum size limits of 12 and 14 in. for bass and pickerel, respectively. Yield in weight was fairly insensitive to changes in minimum size limits over the range examined except yield of pickerel would be substantially lower at a 16 in. limit. Biomass and yield in numbers of larger fish would increase if size limits were increased above the 10 in. (bass) and 12 in. (pickerel) limits in effect during the study. Gains in yield and improved size structure may be less than predicted from the model in complex environments like Dryden Lake. Despite high numbers of prey, growth of predators was modest and was depressed when large cohorts were produced.

### Polyculture of Channel Catfish (*Ictalurus punctatus*) with All-Male Tilapia Hybrid *Sarotherodon mossambica* male $\times$ *Sarotherodon hornorum* female

Steven J. Gabel, M.S. 1982, Miami University (Ohio)

Channel catfish fingerlings (*Ictalurus punctatus* Rafinesque) ( $\bar{x}$  = 0.8 g) and all-male hybrid tilapia (*Sarotherodon mossambica* male  $\times$  *S. hornorum* female) ( $\bar{x}$  = 35.0 g) were stocked in experimental 0.04 ha ponds in Baton Rouge, Louisiana, March and July

1981. The ponds were stocked at rates of 11,115 catfish per ha, 11,115 catfish with 5,557 tilapia per ha, 7,410 catfish per ha, and 7,410 catfish with 3,705 tilapia per ha. The fish were fed 4% body weight throughout the experiment and were harvested in November 1981.

There was no significant difference ( $P > 0.05$ ) between dissolved oxygen or water temperature among treatments. The presence of tilapia significantly increased turbidity ( $P < 0.01$ ) and pH ( $P < 0.05$ ) levels in the ponds. The increase in chlorophyll *a* levels approached significance ( $P < 0.1$ ) when tilapia were present. These levels all were within the ranges often times observed in commercial catfish ponds.

There were no significant differences in the yields of the catfish ( $P > 0.05$ ) among the treatments but the presence of tilapia did increase total yields ( $P < 0.05$ ) by 31%. The tilapia did not interfere with the catfish growth ( $P > 0.05$ ) with all catfish being the same size at harvest, 0.39 kg. Tilapia were the same size ( $P < 0.05$ ), 0.25 kg. Catfish survival was low in all ponds ( $P > 0.05$ ), 61%.

### The Feeding Ecology of Juvenile Atlantic Croaker (*Micropogonias undulatus*) in Two Habitats of a Louisiana Brackish Marsh

William B. Dolman, M. S. 1982, Louisiana State University and Agricultural and Mechanical College

The stomach contents of 716 croaker taken from April through September, 1980, were examined to describe the major components of the diet, compare the diets in two marsh habitats, illustrate changes in diet with growth, and demonstrate the temporal separation of feeding groups.

In volume, polychaetes comprised the largest portion of the croaker diet, followed by detritus, fish, amphipods, and mysid shrimp. Copepods were most abundant numerically, followed by polychaetes. Juvenile croaker appeared to eat large amounts of freshwater organisms.

Most of the differences in the diet between the canals and shallow marsh were attributed to particular locations within these areas. Croaker exhibited obvious changes in the diet with growth. Small croaker, below 40 mm standard length, were basically planktivorous, but shifted to larger organisms as they grew, and specialization of the diet occurred in the largest group ( $> 80$  mm).

Canonical correlation and principal components analysis (PCA) were applied to the volumetric and numeric measures of the diet to describe the important diet components in croaker and relate them to environmental variables. Three major diet groups were described by these analyses. These were food items associated with particular size groups of fish. PCA, however, was less useful than canonical correlation in relating these groups to some physical parameters.

An analysis of covariance was employed to assess the

## Thesis and Dissertation Abstracts Cont.

importance of each area in the marsh. The coefficients of condition indicated that croaker in the canals had a higher condition than those in the shallow marsh.

Temporal separation did not appear to be an important mechanism for the division of resources among croaker in the marsh. Regression analysis indicated that all sizes of croaker fed at the same time of day.

Apparently, trophic resource division among juvenile croaker in the marsh occurs through diet specialization among different size groups.

### **Comparative Morphological Development of *Peprilus burti*, *P. triacanthus*, and *P. paru* from the Western North Atlantic**

James Gregory Ditty, M.S. 1981, Louisiana State University & Agricultural & Mechanical College

Larval development of *Peprilus burti*, *P. triacanthus*, and *P. paru* between approximately 2.0 and 20.0 mm SL, was described and compared in terms of general morphology and morphometrics, pigmentation, fin development, and skeletal ossification. Differences in pigmentation and/or body depth distinguish *P. paru* from both *P. burti* and *P. triacanthus* larvae at all sizes. Melanophores formed diagnostic lateral bands, one above and one below the midline on *P. paru* less than about 5.5 mm SL; only the lateral surface of the caudal peduncle and immediately adjacent portion of the trunk remained sparsely pigmented. Conversely, *P. burti* and *P. triacanthus* less than about 5.5 mm SL had 1-2 lateral melanophores. *Peprilus paru* were significantly deeper-bodied than *P. triacanthus* by 7.5 mm SL and *P. burti* by 9.5 mm SL. *Peprilus burti* and *P. triacanthus* less than 4.0 mm SL are usually separated by the number of ventral midline melanophores. *Peprilus burti* usually (92%) (N=50) had 4-8 melanophores between the hindgut and notochord tip, whereas most (94%) (N=50) *P. triacanthus* had 11-15. Above 4.0 mm SL, *P. triacanthus* were usually more densely pigmented than *P. burti* of comparable size. Differences in morphometrics were not distinct enough to reliably separate *P. burti* and *P. triacanthus* had 17-18 and 18-19, respectively. However, on specimens greater than 7.0 mm SL, 86% (N = 22) of *P. burti* had 17 caudal vertebrae, whereas 79% (N = 19) of *P. triacanthus* had 19. Transformation from larval to juvenile stage occurred at approximately 11.0 mm SL in *P. paru* and 14.0 mm SL in *P. burti* and *P. triacanthus*.

### **Mortality Variance Among Full Sib Channel Catfish Families at Low Dissolved Oxygen**

Robert M. Durborow, M.S. 1981, Louisiana State University and Agricultural and Mechanical College

Fifteen full sib (full brothers and sisters) channel catfish (*Ictalurus punctatus*) families from the Yazoo strain

and eight from the LSU strain were tested for genetic variability in mortality rate at a low level of dissolved oxygen ( $1.1 \pm 0.1$  mg/l). Channel catfish fry ranging from 2 to 10 days of age were subjected to low dissolved oxygen shock tests for 10-hour periods following 12-hour acclimation. There was no significant difference ( $P > 0.05$ ) between the LSU and Yazoo strains in mortality. Test fish of each strain averaged 63% mortality during shock tests. No significant differences ( $P > 0.05$ ) were detected among age groups of fry (3 and 4; 5 and 6; 7 and 8; and 9 and 10 days old). There were highly significant ( $P < 0.01$ ) and significant ( $P < 0.05$ ) intra-class correlations among the full sib families. These led to high heritability estimates for the trait of being resistant to low dissolved oxygen. The heritability estimates ranged from  $0.9 \pm 0.3$  to  $1.7 \pm 0.1$ . These inflated heritability estimates were probably due to excess environmental effects common to each full sib family.

### **Effects of Rice Pesticides on *Procambarus clarkii* (Girard) in a Rice/Crawfish Pond Model and in the Laboratory**

Sunday Ben Ekanem, M.S. 1981, Louisiana State University and Agricultural and Mechanical College

In a field study, growth, survival, yield, and reproduction of crawfish (*Procambarus clarkii*) were compared in replicated tanks planted with untreated rice seed (control), in tanks planted with Difolatan treated rice seed (Treatment 2), and in tanks planted with Difolatan treated rice seed which also received Propanil, Ordram, and Furadan applications (Treatment 1). Each treatment and the control were stocked with 236 adult crawfish (male and female in equal proportions), and the tanks were modeled to simulate natural conditions in a rice/crawfish pond. The sequence of rice planting, application and amount of chemicals, and harvesting were the same as farmers follow. Tail meat of crawfish harvested from Treatment 1 and the control were analysed for Propanil, Ordram, and Furadan residues.

Six adult crawfish (all male) were harvested from Treatment 1, all tanks combined; no young were produced. Seven adult crawfish, consisting of five males and two females, were harvested from Treatment 2; over 389 young crawfish with great variation in sizes were produced. Twenty-eight adult crawfish were harvested from the control, 18 being males and 10 females; over 275 young were produced. There were no significant differences ( $P > 0.05$ ) in growth, survival, and yield among treatments. No pesticide residues were detected in the meat.

In laboratory studies, acute toxicity tests (96 hour) showed strong main effect on crawfish when Propanil, Ordram, and Furadan were combined; this combination was the most toxic treatment to crawfish. Furthermore, a strong interaction among the three suggests a non-additive response. Ordram alone was least toxic pesticide. Additive effect was observed when Furadan

## Thesis and Dissertation Abstracts Cont.

was combined with Ordrum or Propanil, but antagonism was detected in the combination of Propanil with Ordrum. Concentrations higher than the recommended rate for use at normal conditions had a significant ( $P < 0.05$ ) lethal effect on crawfish. Soil moderated the toxicity of some pesticides and their combinations.

## New Publications and Announcements

**The Middle Missouri River** - A collection of Papers on the Biology with Special Reference to Power Station Effects. Hesse, Hergenrader, Lewsi, Reetz and Schlesinger, Editors. The Missouri River Study Group, P.O. Box 934, Norfolk, NE 68701. \$8.50

**Guidelines for Marine Ecological Surveys:** Nekton. California Committee on Marine Ecological Survey Standards, C. M. Dewees, Editor. Extension Sea Grant Marine Advisory Program, Univ. Calif., Davis, CA \$2.00

**Modern Concepts of Oceanography.** G.E.R. Deacon and Margaret B. Deacon, Editors. Hutchinson Ross, Stroudsburg, PA. Benchmark Papers in Geology, Vol. 61, 386 pp. Academic Press, New York. \$45.00

**The Atlantic Barrier Reef Ecosystem at Carrie Bow Cay, Belize, Part I Structure and Communities.** Klaus Rutzler and Ian G. MacIntyre, Editors. Smithsonian Press, Supt. of Documents, Washington, D.C. 540 pp. \$18.00

**Acid Rain Bibliography.** Over 4,000 documents dealing with every topic related to acidic deposition has been assembled at the Environmental Research Laboratory, Corvallis. A complete alphabetical list of all titles/citations (most with abstracts) and an index of all authors is available on microfiche free of charge. The entire data base is stored on computer. This can be searched by the public or by a specialist on a user fee basis. The collection has excellent depth in European and Canadian as well as U.S. documents and all gray literature. Also includes material from as early as 1911. Close contact with the research community often results in new literature being located into the computer with one month of publication. Specialty assistance and liaison readily available by phone. Some documents can be loaned or copied if no local sources can be found. For further information or copies of microfiche: Danny L. Rambo, EPA, 200 S.W. 35th Street, Corvallis, OR 97333 (503) 757-4695; FTS 420-4695.

**Proceedings of an Atlantic Salmon Workshop.** The Atlantic Salmon Federation sponsored the workshop on November 1-3, 1982 in Moncton, New Brunswick. Provincial, State, Federal, and academic institutions sent representatives to provide and exchange informa-

tion on research, rearing and management. W.M. Carter and A.W.H. Needler were co-convenors and chaired the initial session which included reports on individual research projects and research programs of agencies. John Pippy, Fisheries and Oceans, Canada, chaired a session on "Enhancement Strategies for the 80's." Ed Baum, Maine Atlantic Sea Run Salmon Commission, chaired the session on "Fish Interception; John Anderson, J.M. Anderson, Consultants, chaired the session on "Aquaculture; and Fred Wheaton, New Brunswick Wildlife Federation, chaired the final session an open forum. Proceedings will be distributed to participants and other interested in purchasing a copy should contact: Atlantic Salmon Federation, Box 429, St. Andrews, N.B. EOG 2X0

## Workshop on Chesapeake Bay Fishery Statistics

Fredericksburg, Virginia - July 1982

### SUMMARY

#### The Fisheries

- The fisheries of Chesapeake Bay and its tidal tributaries are of high economic and social value. The best present estimate of the value of commercial landings is \$86,000,000 at dockside and \$258,000,000 at the consumer level. The recreational fisheries have a direct economic impact of about \$169,000,000 and the total impact is estimated to be \$507,000,000. Together, the annual economic impact is about \$765,000,000. The social values are substantial but unmeasured.
- Potential changes in residence requirements for licensing will mandate a unified Chesapeake Bay data system to assist management and to permit common protection of resources.
- The fisheries of the Bay are quite complex. At least 35 different gear are employed at various seasons, the parts of the bay and its tributaries can involve different kinds of fishing, and the size of the fishing unit varies from one individual to large purse seine vessels and pound nets. It is inherently difficult to obtain reliable data on all of the efforts and yields.
- Fisheries data must permit management of individual species and the requirements vary widely.
- Scientists and managers have been meeting from time to time in recent years and this Workshop brought together all parties concerned with fisheries statistics. Such relationships will be of increasing value. The urgency and importance of continuing Bi-State coordination in management, research and statistics efforts should be recognized by formalizing such interaction.

#### Statistics

- Partial statistics on the fisheries exist. Virginia invests about \$77,000 annually (\$40,000 federal and \$37,000 state) in projects including the statistical program of

## Chesapeake Bay Fishery Statistics cont.

the Virginia Marine Resources Commission, which is based on voluntary compliance. Population and recruitment studies are conducted at the Virginia Institute of Marine Science. Maryland conducts a \$177,000 statistics program (\$88,500 federal and \$88,500 state) based on mandatory compliance. Both the staff of the Tidewater Administration and of the University of Maryland perform relevant surveys and research. The National Marine Fisheries Service collects data on Atlantic Coast landings and has published national fisheries statistics until 1976 and state summaries until 1979. The Potomac River Fisheries Commission obtains catch data from every licensee. However, all of these are primarily for commercial fisheries. Neither state has continuing study and statistical programs on the massive recreational fishery. Maryland conducted cooperative surveys augmenting the program of the National Marine Fisheries Service in 1979 and 1980 and plans resurvey at intervals of three years.

- Statistical efforts have changed greatly from time to time in the Chesapeake Bay region, and it is almost impossible to utilize long-term records for the examinations of any patterns except gross changes.
- Fishery statistical efforts must be Bay-wide in approach and methods and must be effectively coordinated among scientists and managers in the two states if they are to be successful. Most fish and all crabs are widely migratory. Even for sessile species, management will profit from such cooperations.

### Needs

- The ability of fisheries biologists, sociologists and economists to provide reliable information and sound recommendations for effective management of the fisheries industries is severely limited by the quality and scope of present statistical programs. The problems include:
  - There is incomplete coverage of commercial catch and effort.
  - The accuracy of available statistics is rarely known and there is little confidence in the details.
  - Available data on Bay-wide recreational fishery are inadequate and no program exists for annual coverage.
  - It is not possible to compare the accuracy of data between Maryland and Virginia.
  - Many of the data required by fisheries scientists on the composition, age and size in the catch do not exist.
  - Timely data on catch are not readily available.
  - Social and economic data in Bay fisheries are virtually non-existent.
- The fundamental data requirements for management of each stock are:
  - The weight and number in its catch, location and date of catch.

- Gear used per unit of time.
- Composition of the catch by size, sex and age.

### Uses

- These data will permit estimation of stock size, of natural and fishing mortality rates and of the effects of changes in the environment or regulations. These estimates are essential for development of recommendations for optimal management of stocks.
- The data required can be obtained most effectively through appropriate combinations of mandatory reports from fishermen, scientific sampling of the catch, and periodic surveys.

### RECOMMENDATIONS

- That, in order to formalize cooperative fisheries management, research and statistical collection efforts, a Chesapeake Bay Cooperative Fisheries Investigation be established by the Bi-State Working Committee. This cooperative program will focus on such topics as fisheries statistics, blue crab management, striped bass recruitment, technical conferences, and special topics requested by the Bi-State Working Committee, with implementation of effective statistical programs as an urgent topic.
- That Maryland and Virginia develop and support an adequate, quantitative, and coordinated fisheries data and information system. Striped bass, shad and the blue crab are of special present importance.
- That Virginia require reporting of fishing catch and effort.
- That Virginia and Maryland design and implement standardized biological sampling of catches.
- That Maryland and Virginia coordinate monitoring of juvenile and adult stocks.
- That Virginia and Maryland conduct appropriate social and economic surveys.
- That the Commonwealth and State adopt a uniform system for numbering fishing vessels and conspicuous display of such numbers.
- That Maryland and Virginia jointly plan and conduct adequate surveys and sampling of recreational fishing.
- That Virginia and Maryland develop a compatible automated data base management system for such data as catch, effort, and size distribution. Timely and periodic reporting is essential.
- That the National Marine Fisheries Service be urged to up-date annual reports on fisheries and to improve the continuing availability of data to the State and Commonwealth.

L. Eugene Cronin, *Editor*

*Chesapeake Research Consortium - Shady Side, MD*

### *In Memoriam*

Dr. Frank D. McCracken • November 21, 1982  
Fellow 1964 • Emeritus 1980 • St. Andrews, New Brunswick

## Estimating Pre-Recruitment Year Class Strength of Atlantic Menhaden

Year class recruitment into the heavily exploited Atlantic menhaden purse-seine fishery has varied as much as eleven fold during the 26 years that NMFS, Beaufort Laboratory, fishery biologists have monitored landings and estimated numbers-at-age caught. Because of the resulting variability in stock size from season to season, the need for determining pre-recruitment abundance of a year class for purposes of forecasting landings was soon recognized by both the industry and state-federal management agencies. While a variety of analytical techniques were available for estimating the numbers in each recruited year class from catch statistics, most could not be implemented until four or five years of landings from a year class had been made, hence the analysis served more as an historical record than an active management tool. The obvious solution was to estimate the abundance of pre-recruit young-of-the-year menhaden during the estuarine phase of their life cycle.

Since young-of-the-year menhaden occur in estuarine areas at some time of the year from the northern Florida Atlantic Coast to Massachusetts, it was determined impractical to attempt to estimate the absolute number of these fish. Instead, an annual estuarine survey was designed to provide an index of relative abundance. After a period of years, this index could be regressed against absolute abundance subsequently determined by catch analysis (a method for calibration) and then the regression equation and most recent survey could be used for catch forecasting. An annual two boat surface trawl survey of juvenile menhaden was initiated in the late 1960's. The resulting index of relative abundance was based on the catch-per-unit-effort of the sampling gear at preselected sites. Although this measure of abundance followed general trends of recruitment estimated from landings, insufficient precision was obtained to use these results for forecasting, and the survey was discontinued in 1978.

Beginning in 1978, a pilot study was initiated to develop a survey more closely linked with biological characteristics of Atlantic menhaden. This current study is designed to examine two potential approaches for estimating prerecruit abundance.

The first approach uses the density-dependent growth relationship observed for Atlantic menhaden. NMFS biologists have determined from commercial catch samples that size at age is inversely related to year class size. It was later noted that the average size of age-zero menhaden in the Chesapeake Bay commercial landings displayed a significant inverse relationship with year class size. Thus, if average length of young-of-the-year menhaden can be estimated in a consistent fashion seasonally, it could serve as a method for determining abundance independently of commercial catch statistics. The problem is not as simple as it appears,

however. The estuarine distribution of menhaden by size is not random, but rather is at least partially determined by salinity. Past surveys have frequently linked increasing fish size with increasing salinity, i.e. young-of-the-year menhaden are distributed by size along a salinity gradient. Studies are currently being conducted to accurately weight length-frequency distributions from each sampling site to obtain an overall length frequency and subsequently a mean average length.

The second approach being explored is an extension of the earlier discontinued survey, where abundance is the desired estimated parameter. It was believed that the earlier survey may not have sampled fish resulting from the entire temporal range of spawning which occurs offshore from each sampled area. To insure that samples are representative, the current survey is conducted monthly, and the sampled fish will be aged on a daily basis using otoliths to determine the time when spawned. When critical dates are determined, the number of sampling times can be reduced.

If relative abundance can subsequently be estimated within an acceptable level of precision, year class size will be predictable from one to two years prior to the time when the subject year class becomes fully exploited in the fishery. This information, coupled with results of an ongoing tagging program may lead to predictions of actual catch.

Dean Ahrenholz - NMFS, Beaufort, NC

## International Association of Fish Ethologists (I.A.F.E.)

The International Association of Fish Ethologists (I.A.F.E.) is an organization trying to improve contact between fish ethologists all over the world. This is achieved by a Newsletter and by conferences or meetings. The newsletter publishes all kinds of announcements (addresses and research subjects of the members, advertisements of meetings, of new journals...), short descriptions of interesting methods, and progress reports in the field of fish ethology. The committee of the I.A.F.E. is composed of local correspondents (LC's) one per country.

If you are interested in joining the association, the fee is \$9 (US). Make your check payable to M. Nelissen and sent it to Dr. M. Nelissen, Laboratorium Algemeen Dierkunde, R.U.C.A., Groenenborgerlaan 171, B-2020 Antwerpen, Belgium.

## Membership Report

### Promotion to FELLOW:

Dr. G. L. Hergenrader	NE
Dr. Walter T. Momot	ON

### New MEMBERS:

Dr. Lee G. Anderson	DE
Dr. Ronald A. Fritzsche	CA

### Promotion to MEMBER:

Paul L. Shafland	FL
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