American Institute of Fishery Research Biologists

. . . BRIEFS . . .

VOL. 13, NO. 1 FEBRUARY, 1984

Group Award Presented

The AIFRB Special Group Award of Merit for 1983 honored all the agencies involved in the successful control of the sea lamprey in the Great Lakes, as announced in BRIEFS for December 1983.

AIFRB President Bernard Skud presented the award to Ken Loftus, Chairman of the Great Lakes Fishery Commission at Ann Arbor, Michigan on November 30, 1983. The Commission received the award on behalf of the several agencies which share the success of revitalization of existing fisheries and introduction of species that have helped the expansion of recreational angling.

Bernard Skud, AIFRB President (left), presents the AIFRB 1983 Special Group Award of Merit to Ken Loftus, Chairman of the Great Lakes Fishery Commission (right). In foreground are Commissioners Pat Chamut (Canada) and Bill Horn (U.S.).

Remember the Student Travel Raffle

Previous issues of BRIEFS have announced the beginning of the AIFRB student travel raffle program. This is another reminder that Associate Members who are graduate students are eligible to participate in this $250 grant program to help students in their travel to scientific meetings. A student may submit his name, university affiliation, name of major professor, and the meeting name and location to: AIFRB Treasurer C.F. Cole, 365 Kottman Hall, 2021 Coffey Road, Ohio State University, Columbus, Ohio 43210 for the next drawing on June 1, 1984. Students who submitted their names for the January 1, 1984 drawing need not resubmit their names — non-winners will be included in the June drawing.

Kewalo Research Facility 1958 to 1983 — 25 Years of Progress

The National Marine Fisheries Service, Southwest Fisheries Center Honolulu Laboratory's Kewalo Research Facility (KRF) celebrated its 25th anniversary in 1983. After 25 years, the KRF continues as a leading center for research on the physiology, behavior, sensory biology, and energetics of tropical tunas. The KRF is still the only laboratory in the world that routinely maintains live tunas in captivity for scientific research. The KRF also continues to attract scientists of diverse backgrounds. Indeed, many of the research projects currently in progress at the KRF involve visiting scientists.

Current research projects at the KRF include measurement of the standard metabolic rate (SMR) (i.e., the metabolic rate at zero overt muscular activity) which is an important input parameter to swimming energetics and energy budget models. The SMR of kawakawa, *Euthynnus affinis,* bigeye tuna, *Thunnus obesus,* and yellowfin tuna, *T. albacares,* is currently being determined. Results to date indicate that the SMR's of these species are not significantly different from each other nor from the SMR of skipjack tuna, *Katsuwonus pelamis,* which had been previously determined. Other tests on the effect of temperature change on the SMR of these four species surprisingly have shown that, unlike the active metabolic rate, the SMR is temperature-dependent.

Another project is designed to test the reactions of captive tunas to natural and artificial prey odors. The ultimate objective of these experiments (being run under the direction of Dr. Kim Holland, University of Hawaii) is to develop odors and odor-releasing systems that can be used to enhance the effectiveness of tuna fishing operations that involve bait and to increase the efficacy

Kewalo Research Facility cont.

of fish-aggregating buoys. Captive yellowfin tuna are fed a diverse natural diet consisting of normal prey species. Rinses taken from the external surfaces of these prey types are freeze-dried and then redissolved in equal amounts before being introduced into the tanks containing the tuna. Video tape recording of the behavioral responses to the prey odors allows objective evaluations of the responses to the prey odors.

These experiments have demonstrated for the first time that naive tuna will respond to prey ordors by exhibiting food-search behavior, and that tuna have different preferences for the odors of different prey types. For instance, opelu, *Decapterus macarellus,* and squid, *Loligo* sp., odors were the most effective in eliciting a behavioral response. However, nehu, *Stolephorus purpureus,* the most popular Hawaiian live-bait species for tuna, provided the least-effective odor.

The Honolulu Laboratory's 33-ft research vessel, RV *Kaahele'ale,* is currently being used in a project designed to elucidate the behavior and residence times of tuna around fish-aggregating buoys. The project involves catching a tuna and attaching a depth-sensitive ultrasonic transmitter. The fish is then followed for 24- to 48-hour periods and its swimming depth and position recorded. Results so far indicate that tunas may have a relatively small "home range" that they may occupy for up to 2 weeks.

Other projects at the KRF include attempts to spawn and rear tuna in captivity. The ultimate objective of this study is to provide a source of larval tuna that can be used to study the effects of diet, environment, etc., on the survival and growth of larval and juvenile tunas.

Richard W. Brill, *Honolulu, HI*
Experimental Ecology of Tunas Program

Hudson River Foundation

In December 1980, electric utilities, environmental and fishermen groups, and state and federal regulatory authorities signed an agreement ending the legal dispute over the environmental impacts of the large power plants on the lower Hudson River. A critical element in the settlement was the establishment of a new, independent scientific institution to research, study, and publish results concerning all aspects of the Hudson River ecological system. The Hudson River Foundation of Science and Environmental Research was incorporated in June 1981, received its initial endowment ($12 million), and made 19 grants for research projects by the fall of 1983. During 1984, the Foundation plans to sponsor approximately one million dollars in grants. Requests for information or proposals should be addressed to Proposal Section, Hudson River Foundation, 122 East 42nd Street, Suite 1901, NY, NY 10168.

The goals of the Foundation are "to sponsor scientific, economic, and public policy research on matters of the environmental, ecological, and public health concern and to publish the results of such research". The Hudson River Panel, a group of 17 scientists, is responsible for the scientific policy as well as decisions of grant awards based on scientific merit. The Panel also perceives various allied functions as part of its mission. These include assisting in the coordination of various research activities concerning the Hudson River System, and promoting educational and professional efforts which would lead to improved public perceptions about the values of the system and about policies that affect it. The Foundation is interested in supporting research at all levels of ecological organization, from detailed studies of individual organisms and populations to investigations of the river as an ecosystem. While it has a particular interest in those aspects of the system which relate to human uses, especially the fishery resources, the Foundation also seeks proposals for reseach on the other species of interest, food web interactions, elemental dynamics, processing of toxics and heavy metals, and other aspects of the ecosystem which affect the fisheries and other resources.

Cephalopod International Advisory Council

Founded in September 1983, C.I.A.C. consists of nine executive members and nine alternate or substitute members from Australia, Canada, England, France, Japan, South Africa, Spain, and U.S.A. whose research interests include systematics, ecology, behavior, embryology, parasitology, physiology, culture, capture, and fisheries. The aims of the Council are to stimulate, speed up, and influence the direction of cephalopod research, to provide help and advice on aspects of cephalopod biology, including those relevant to the management of fisheries, and to spread information on past and current research. The methods by which these aims will be fulfilled includes the organization of workshops and training courses, production of handbooks, and a computerized bibliography and "state-of-the-art" papers, and will provide addresses of competent consultants. C.I.A.C. will also distribute a newsletter. The Executive Secretary is Malcolm R. Clarke, DSc, FRS, Marine Biological Association, The Laboratory, Citadel Hill, Plymouth PL1 2PB, United Kingdom.

Nominations for the 1984 W.F. Thompson Award, AIFRB

The Award Committee for selection of the 1984 W.F. Thompson Award has been convened and would like to receive recommendations for the best student paper published during the years 1982 through 1984. The

W.F. Thompson Award cont.

student winning the award will receive a certificate from AIFRB and a check for $750.

Papers can be multiple-authored; occasionally a major professor is a junior author. In this case, the student receives the certificate and the $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 interest to current problems in fisheries.

Nominations for papers must be received no later than 15 June 1984. A final decision on the award will be announced by 1 August 1984. *Seven* copies of the paper should be sent to Dr. John B. Pearce, Chairman, AIFRB W.F. Thompson Award Committee, NMFS/NOAA, Northeast Fisheries Center, Sandy Hook Laboratory, Highlands, NJ 07732.

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

Legislation Progress

Atlantic Coast Striped Bass

A progress report on the Emergency Striped Bass Study will be presented to the U.S. Congress on 12 February 1984. The study, mandated by Congress in 1979 by amendment [Section 7 (b)] of the Anadromous Fish Conservation Act (Public Law 89-304) and underway since 1980, was to address the decline of striped bass along the Atlantic Coast. But Congress will be provided no solutions on 12 February. Chesapeake Bay stocks of the species are thought to be critically depressed and the status of the fishery is prompting heated political debate and varied forms of legislative and regulatory action at state and federal levels.

The present concern over striped bass began in the mid-1970's when anglers and commercial fishermen noticed a decline in the number of bass available and a lack of young fish in the catch. Ups and downs in the striped bass fishery have occurred since at least the late 1800's. The fishery usually is sustained by dominant year-classes, but the last dominant year-class in the upper Chesapeake Bay occured in 1970, when the young-of-the-year index was the highest since record-keeping began in 1954. Chesapeake Bay stocks have accounted for 60-90% of the Atlantic Coast fishery, with the remainder coming from the Hudson River, and perhaps the Roanoke River.

From the 1970 high, which resulted in record-breaking catches in 1973, the fishery has declined. Production of young bass in 3 of the last 4 years has been alarming poor. Yet, fishing effort for bass remains high because of the fish's popularity among anglers and high dockside value.

The reasons for the striped bass decline are as yet unclear, although research indicates that no one cause probably is to blame entirely. Overharvest, habitat degradation (including pollution, toxic contamination, and agricultural practices), sewage treatment practices, food availability to larval fish, and environmental variables such as weather condition, all may play a varying role in determining production and survival of young striped bass.

To address the need for better and unified management of the fishery, the Atlantic States Marine Fisheries Commission (ASMFC) adopted an Interstate Fisheries Management Plan for Striped Bass in October 1981. Provisions include minimum size limits for fish in inshore and offshore areas, closure of spawning areas to fishing, catch limits, and establishment of a monitoring program. Presently, 12 states and 2 federal agencies are involved in managing the fish. Only three states have not yet implemented major harvest restrictions of the Plan — North Carolina, New Jersey, and Delaware. However, even if the provisions of the Plan were fully implemented coastwide it is now recognized that the stock could not continue to support the present level of fishing activity. Therefore, the Striped Bass Management Board of the ASFMC recently has recommended that states adopt additional restrictions on fishing.

The new measures would address two objectives — a long-term objective of maintaining spawning stock and minimizing the possibility of a recruitment failure, and a short-term objective of restoring Chesapeake Bay spawning stocks so that egg production increases six-fold. To achieve the objectives, the states agreed to reduce current harvest levels an additional 55% on Chesapeake Bay stocks over and above that achieved by full implementation of the October 1981 provisions of the Striped Bass Management Plan. The additional harvest reduction may be accomplished by any means a state considers practical and which undergoes satisfactory review by the Scientific and Statistical Committee of the Striped Bass Management Board.

In the meantime, sportsmen have become increasingly alarmed over the decline of the fishery and the perceived lack of response by federal and state agencies.

In 1982, Stripers Unlimited, a Massachusetts-based angler group, petitioned the National Marine Fisheries Service (NMFS) to list the "Chesapeake Bay strain" of striped bass on the U.S. List of Endangered Species. The NMFS denied the petition on the basis of the best scientific information available. But on 23 December 1983, armed with stronger public support and additional information, Stripers Unlimited repetitioned NMFS to list the species. Also in December, meetings were held in Washington, D.C. by concerned sportsmen to discuss federal legislation that would preempt the states' management efforts on the species. The primary proposal discussed was a federal moratorium on possession of the fish, but also discussed was a prohibition on all sale or of interstate transport for the purpose of sale

Legislation Progress cont.

of the fish, and federal "striped bass stamp." The meetings were given widespread coverage in the press and pressure for federal intervention is growing.

Other proposals proposed recently include a prohibition on possession of "large" fish and enactment of federal legislation to provide for management of *all* inshore migratory species. The states also have been subject to varied pressures. For example, Rhode Island's Marine Fisheries Council, their fishery regulatory body, voted to ban striped bass fishing in state waters for 3 years, and recent proposals in Maryland include implementation of a major hatchery program for striped bass.

Hearings are expected this year in Congress to look for solutions to the striped bass management dilemma. Hopefully, Congress' solution will include continued funding of the Emergency Striped Bass Study and strong Congressional support for implementation of all provisions of the Atlantic States Marine Fisheries Commission's Interstate Management Plan for Striped Bass and the recent recommendations of the Striped Bass Management Board.

National Wildlife Federation
Washington, DC

District Activities

CENTRAL CALIFORNIA **Tina Echeverria,** *Director*

The Central California District installed 1984-85 officers Tina Echeverria, *Director,* Brian Waters, *Vice-Director,* and Paget Leh, *Secretary-Treasurer,* on December 10, 1983. The installation took place at the annual banquet, held at the Lantern Restaurant in Oakland. The banquet was attended by 45 members and guests.

The District plans continuation of bi-monthly dinner meetings; the next meeting is scheduled for January 19, 1984.

NORTHWEST WASHINGTON **Ed. A. Best,** *Director*

At our November meeting, District Vice-Chairman Steve Hughes, Natural Resources Consultant, outlined the recent collapse in the Alaska crab fishery plus the reduction of salmon in the Puget Sound region. Factors contributing to the collapse in the king and Tanner crab resources are not clear, but there does not appear to be any supporting evidence that overfishing played a significant role. It is evident that major environmental changes have occurred in the Bering Sea and Gulf over the past decade, but the impact of these elements on productivity of crab stocks is speculative.

The dramatic reduction in harvest of pink and sockeye salmon coincided with a major migration pattern change which reduced the number of fish available for harvest by U.S. fishermen. It also coincided with the El Niño ocean-warming phenomenon, which is widely speculated as being a major contributory cause to the fishing collapse. The nature of fishery management of the north Puget Sound pink and sockeye net fisheries eliminated overfishing as a serious contribution to the harvest disaster. Consequently, the economic impacts are widespread and severe throughout the fishing and processing segments of the commercial salmon industry based on these stocks.

New Publications and Announcements

Great Lakes Research Conference

The International Association for Great Lakes Research will hold its 27th Great Lakes Research Conference on 30 April - 3 May 1984 at St. Catherines, Ontario. The contact for information is J. Terasmae, Department of Geological Sciences, Brock University, St. Catherines, Ontario, L2S 3A1. Phone:416 688-5550.

World Water Watch Conference

The World Water Watch Conference will be held in conjunction with the 1984 Louisiana World Exposition in New Orleans, Louisiana on 10-13 October 1984. The Conference is being hosted by the City of New Orleans under the co-sponsorship of the Atlantic Richfield Company and the United States Conference of Mayors.

For information, write Valsin A. Marmillion, ARCO Manager, Public Information Programs, 515 S. Flower Street, AP 1625, Los Angeles, CA 90071.

International Symposium:
Lake/Watershed Management

The North American Lake Management Society will sponsor an international lake and reservoir management symposium on Oct. 16-19, 1984 (Tuesday-Friday), in McAfee, NJ.

The symposium will have international coverage emphasizing material relating to lake/reservoir management techniques and research oriented toward management goals.

Additional information is available from Bob Burrows, NALMS, P.O. Box 206, Mahwah, NJ 07430.

International Symposium on Muskellunge

Muskies, Inc. and The American Fisheries Society will present an International Symposium on Muskellunge on 4-6 April 1984 at the LaCrosse, Wisconsin Convention Center.

This Symposium is designed to provide state-of-the-art information to governmental and private organizations to develop and improve their muskie fisheries programs. World experts on the subject will be brought together in one location to develop beneficial relationships and exchange ideas.

Areas requiring funding, such as research from private organizations, will be identified as well as improving the relationships between sportsman and management.

This Symposium will endeavor to emphasize trophy aspects for the species and to accent unique biological characteristics and attendant management problems.

Registration and other information are available from International Muskie Symposium, 2301 N. 7th Street, Fargo, ND 58102.

International Fishery and Processing Exhibition

The "International Fishery & Processing Exhibition" China '84 (Fishery China '84) will be held in Guangzhou, China on August 21-26, 1984. This is an officially approved event, first exhibition of its kind, to take place in China. It is also sponsored by "Fishery Bureau of The Ministry of Agriculture Animal-husbandry and Fishery of the P.R. China", "Guangdong Aquatic Products Bureau, Guangzhou, P.R. China", "Shanghai Bureau of Fisheries, Shanghai, P.R. China" and "Fishery Bureau of Fujiang province, P.O. China".

This exhibition will provide an opportunity to the China's fishery organizations and the foreign fishery equipment manufacturers, suppliers, exporters/importers and parties concerned for their direct contact in business discussions and technical exchanges.

The range of exhibits includes various fishing boats, marine machinery & fittings, fishing machinery, fishing tackles/material and their making machines, fishing aids and instruments, navigation and communication system, management/operation, fish processing machines, fishery product processing, gauges used in processing, pearl processing machines, live fish transportation and devices, farming machines and water quality control instruments, sea oil pollution control & treatment equipment, instruments, lifesaving apparatus & protection kits/clothing in operation, acoustic/light/electricity/solar energy application, artifical fish shelter farming & hatching, shipbuilding & repairing equipment/fitting/material, finance/insurance/marketing/management etc. Also technical seminar and business discussion will be held.

The contact for more information is: China Marine Industries Corporation, 1103 Loong San Building, 140 Connaught Road, Central, Hong Kong.

Fishery Professorship Opening

The University of Washington College of Ocean and Fisheries Sciences, School of Fisheries, has issued a position announcement for Associate Professor/Full Professor in Fisheries Science. The position requires successful research/teaching activities in fisheries sciences with expertise in one or more of: Ecology of salmonids; Fisheries management; Aquatic ecology and ecosystem dynamics; Applied fishery hydroacoustics; Population dynamics. Candidates should have a doctorate, preferably in fisheries science, with demonstrated teaching and/or research experience at the university level.

For more information, contact Dr. Ernest O. Salo, Chairman, Search Committee, Fisheries Research Institute, WH-10, Univeristy of Washington, Seattle, WA 98195

Antigens of Fish Pathogens

This new book, edited by D.P. Anderson, M. Dorson, and Ph. Dubourget, covers state-of-the-art information of fish disease agents, antigens, immunology, and disease diagnosis. It is published by Foundation Marcel Merieux, the research branch of IFFA-Merieux, a veterinary biologics and pharmaceutical company based in Lyon, France. The technical, scientific publication presents reports from authorities addressing the most important disease problems of fish considered for aquaculture, fish farming, and sport fisheries.

Major contributions deal with IPN of salmonids, channel catfish virus disease, VHS, IHN, spring viremia of carp, *Aeromonas hydrophila,* furunculosis, columnaris disease, edwardsiellosis, *Pasteurella piscicida,* bacterial kidney disease, enteric redmouth disease, vibriosis, and trypanoplasmiasis in flounder. Short reports treat immunosupression and immunostimulation of rainbow trout, vibriosis in turbot, *Aeromonas* problems in serologics, bacterial gill disease of carp, isolation of rhabdivirus, control of bacterial kidney disease in Atlantic salmon, immune response and antigen localization in carp, vaccines for vibriosis, and strains of *Yersinia ruckeri.*

The 274-page text is $50.00 (US) and can be obtained by writing to the following address: Foundation Marcel Merieux, Dr. Louis Valette, 17 rue Bourgelat, 69002 LYON, France

Fisheries Techniques

This new book, edited by Larry A. Nielsen (AIFRB member) and David L. Johnson, is published by the American Fisheries Society, Bethesda, MD.

Fisheries Techniques fills a widespread demand for a reference volume on methodology for fisheries science and management. For the first time, a single source provides entree into the broad range of techniques and analyses upon which the fisheries profession is based. Chapters have been written by top educators and scientists, and peer-reviewed by practicing biologists and managers. The book has been edited and illustrated to a high degree of internal consistency, and abounds with practical examples of technical applications. Each chapter contains a list of key references to guide the reader into the original literature.

Fisheries Techniques is designed for graduate students and upper-level undergraduates. It will serve them well as a text, but the book's value extends far beyond its use as a teaching tool. No one can master every fisheries technique simultaneously, yet the pace of change in resource science and management requires versatility of everyone. New problems arise; old problems need new approaches. Career opportunities ap-

pear and must be grasped. With its coverage of proven and evolving methodologies, *Fisheries Techniques* expands the technical repertoire and adaptability of any fisheries professional.

This book has 496 pages and costs $30.00.

Marine Animals of Baja California

Daniel W. Gotshall is the author of this guide to common nearshore marine fishes and invertebrates of Baja California. The book is the first all-color field guide to the nearshore marine fishes and invertebrates that occur from the area of Scammons Lagoon, around the tip of Baja California and up to Bahia de Los Angeles; it also includes the shallow waters of the Revillagigedos Islands. This outstanding new guide features the following; approximately 180 color photographs, 126 species of fish, 64 species of invertebrates, all color plates illustrating each animal, pictorial family key, indentification characters, size, habitat and geographical range for each species, English translations of scientific names, and common Spanish names for each species of fish.

Thi volume is available from Sea Challengers, 1851 Don Avenue, Los Osos, CA 93402 for $17.95 paperback and $29.95 cloth.

Nutrient Requirements of Warmwater Fishes and Shellfishes

Over the past few years, new data have been developed on the formulation and manufacture of feeds that are inexpensive, nutritionally sound, and readily available. Now this wealth of recent information is reviewed in *Nutrient Requirements of Warmwater Fishes and Shellfishes.* This updated edition reflects the scope of new feeding data, especially for channel catfish, common carp, and a variety of shellfishes.

In addition to surveying requirements of various species for proteins and amino acids, carbohydrates, vitamins, and minerals, the report discusses digestibility, feeding practices, diet formulation and processing, and such antinutrients as thiaminase, aflatoxins, and heavy metals. Extensive feed composition tables provide nutritional data for over 100 of the most common fish feed components and mineral supplements.

This is a "must have" resource for aquaculturists, marine biologists, feed manufacturers, and anyone concerned with the care and maintenance of warmwater species.

ISBN 0-309-03428-0; 1983, 112 pages, 8½ × 11, paperbound, index, $14.50. Order from National Academy Press, 2101 Constitution Avenue, NW, Washington, DC 20418.

ELECTION OF PRESIDENT-ELECT

You will be receiving your Ballot and Biographical Sketches of the two candidates in the mail before BRIEFS, Vol. 13, No. 2. Please VOTE and send your ballot to Secretary G.H. Lawler.

Thesis and Dissertation Abstracts

Competition Among Juveniles of Coho Salmon, Brook and Brown Trout for Resources in Streams

Kurt Daniel Fausch, Ph.D. 1981
Michigan State University

Coho salmon *(Oncorhynchus kisutch)* were introduced to the Great Lakes in 1966. Naturally reproduced juvenile coho may have detrimental effects on juveniles of resident brook trout *(Salvelinus fontinalis)* and brown trout *(Salmo trutta)* in Great Lakes tributaries. I investigated the timing of fry emergence, their size at emergence, and the growth of the three species during their first summer of life in eight Lake Michigan tributaries. In a laboratory stream aquarium, the competitive relationships between pairs of the three species were studied by measuring niche shifts of the subordinate species to more advantageous stream positions after release from competition with the dominant species. I also developed and tested a model of specific growth rate as a function of "potential profit" at stream positions. Potential profit was a measure of the energy potentially available from the invertebrate drift at a fish's position in the stream, minus the cost of swimming to maintain that position.

In Lake Michigan tributaries coho salmon emerged 2-3 weeks earlier and were 6-8 mm longer than either brook or brown trout at emergence. On average, coho were larger than brook or brown trout in all streams, maintaining a 6 to 20-mm length advantage and a 0.5 to 4.0-g weight advantage through their first summer of life. In laboratory experiments, coho salmon dominated brook or brown trout at all levels of potential profit, and ceased growing at a lower threshold of potential profit than the trout.

These results indicate that age-0 brook and brown trout could not gain advantageous stream positions in the face of competition from age-0 coho salmon even if the coho were of equal size. In streams where they occur together, juveniles of coho are larger than those of brook and brown trout, which gives the coho an even greater competitive advantage. Instream cover that affords visual isolation may somewhat ameliorate the competitive disadvantage of brook and brown trout in Great Lakes tributaries where coho salmon reproduce.

The Effect of Diet Protein Level and the Rearing Water Temperature on the Growth and Reproductive Performance of Rainbow Trout Broodstock

Dennis Dale Roley, Ph.D. 1983
University of Washington

Two separate feeding trials were conducted using University of Washington rainbow trout broodstock to determine the effect of dietary protein level, ration size, and water temperature during the period of gonad development on their pre-spawning growth and reproductive performance. During the 8 months prior to spawning, four isocaloric diets with 27, 37, 47, or 56% protein were fed to separate groups of the 1973 brood; four groups of the 1974 brood were reared under the cross-classified design of two water-temperature profiles, cool and warm, and two ration sizes, repletion and half-repletion (as a precent of body weight per day).

Length, weight, condition factor, food conversion, caloric utilization, protein efficiency ration, pre-spawning mortality, the time and duration of spawning, egg production, egg size, and embryo survival were measured to determine the effects of dietary protein level, feeding level, and water temperature on pre-spawning growth, food efficiency, and reproductive performance.

The dietary protein requirement for maximum growth was between 37 and 47% of a diet containing 3.8 kcal/g metabolizable energy (dry matter basis). Caloric utilization, food conversion, and protein efficiency ratio decreased with increasing levels of dietary protein. Dietary protein level did not affect pre-spawning mortality, spawning success, or the duration of spawning. Dietary protein level did not have a significant effect on the absolute or relative number of eggs spawned, relative egg size, or embryo survival.

Maximum growth was achieved by feeding repletion rations under warm-water conditions. Food and protein utilization for growth was optimum with repletion rations in warm water or half-repletion rations in cool water. Feeding repletion rations in warm water increased pre-spawning mortality. Water temperature or feeding level did not affect spawning success, but feeding half-repletion rations increased the duration of spawning and warm water delayed the time of spawning. Relative fecundity was increased by feeding half-repletion rations in wârm water. Relative egg size was increased by feeding half-repletion rations in cool water. Warm water and feeding repletion rations had deleterious effects on embryo survival due to their effects on egg size. Ratio size also had an independent effect on embryo survival.

Saginaw Bay Suckers: Their Dynamics and Potential for Increased Utilization

Douglas Wayne Kononen, Ph.D. 1981
Michigan State University

Yield potential estimates from underutilized Great Lakes fish stocks are lacking for most species. This investigation was undertaken to determine potential limits on the commercial exploitation of white suckers *(Catostomus commersoni)* in Saginaw Bay, Lake Huron. Principal data sources included historical fishery catch and effort data along with biological data on the size, sex, and age-composition of the commercial catch. Fish of different sizes and sexes were sampled for analyses of PCB's and DDT. Commercial fishery cost and revenue data were incorporated into a logistic surplus production model function and used in a rudimentary bioeconomic analysis of the fishery.

Approximately 1,000,000 pounds of white suckers were harvested annually from Saginaw Bay during the first half of the 20th centry. Current harvest levels range from 100,000 to 150,000 pounds per year. Catch-effort analyses indicate a general pattern of decreased exploitation and increased abundance of Saginaw Bay suckers since the early 1950's. Cautious interpretation of catch-effort data indicates that landings could be increased by as much as 500% without danger of stock overexploitation.

Surplus production model estimates of mean exploitable population biomass approximate 4,000,000 pounds. Bioeconomic analysis indicates that an ex-vessel price increase of $0.05/lb would generate a short-term economic rent of about $11,000 to the commercial fishery. Contaminant analyses indicate that the mean levels of PCB's (0.05 ppm) and ΣDDT (0.015 ppm) in Saginaw Bay white sucker fillets are well below the FAD's 5 ppm tolerance limit for these compounds. Adult white suckers experience low annual growth rates (1-2 cm in total length), high annual survival rates, S (0.59-0.72), and long life spans (up to 19+ years). Females grow faster and larger and, on the average, live longer than males.

The Beverton-Holt dynamic pool model, incorporating a linear age-weight relationship, was used to estimate the equilibrium yield per recruit at different rates of fishing. Optimal utilization of this fishery, in terms of maximizing yield per recruit, can only occur with a six to ten-fold increase in the rate of fishing. The current absence of profitable markets for suckers render immediate increases in the rate of exploitation unlikely.

Evaluation of New Scale Characters and an Algorithm for Stock Identification of Chinook Salmon *(Oncorhynchus tschawytscha)* by Scale Patterns

Tsutomu Nishida, M.S. 1983
University of Washington

Salmon scale patterns have been used in various discriminant analyses to classify their origins. In this study, a new discriminant analytical technique, new scale characters, and scale measurement criteria were examined to determine if classification accuracies of mixed stocks of salmon could be improved. Scales were sampled from the large geographical region (Kamchatka, Yukon, Frazer, and Columbia rivers) and the small region (Frazer, Quinault, Queets rivers, and Willapa Bay).

An algorithm was developed where stocks were separated *group by group* with one subset of scale characters unique to each group, selected by a specially formulated screening method and decision rule. The algorithm differs from standard discriminant methods which separate *all groups at once* with one subset of scale characters that is unique to all groups.

To evaluate the effectiveness of the algorithm, it was compared with the linear discriminant function (LDF) analysis of Fisher (1936) and a nonparametric method of Cook (1982) as the standard techniques. The LDF resulted in classification accuracies of 78% and 66% for the large and small geographical regions, respectively. The algorithm resulted in 71% and 55%, while Cook's accuracies were 70% and 60.5% for the two regions. The LDF was likely the most accurate method in this case probably because the majority of selected characters showed normal distributions univariately.

Another comparison was made concurrently in discriminant analyses between new scale characters (areas and perimeters) and standard characters (numbers of circuli and widths between circuli). As a result, the mean classification accuracies based on new characters were increased by 7.2% and 10.2% in the two regions.

Thesis and Dissertation Abstracts cont.

Other factors which increased classification accuracies were also investigated. Useful scale characters for stock separation in the small geographical region were found in the freshwater zone. However, the first ocean zone contained effective characters for separation in the large geographical region. The relative measurement by constant circuli count provided useful characters, also. The cumulative data supplied profitable characters for the standard discriminant techniques, while the incremental and ratio data provided for the algorithm.

In Memoriam

Stanislas F. Snieszko

Dr. Stanislas F. Snieszko, who has been called the "world's leading authority on fish diseases", passed away on January 11, 1984. Dr. Snieszko became a Fellow in AIFRB in 1960, and received Emeritus status in 1983. Among the numerous honors accorded in his long and illustrious career were the Award of Excellence of the American Fisheries Society and Honorary Membership in the AFS.

Dr. Snieszko began his career with the Fish and Wildlife Service in 1946 and continued his research and research administration as Director of the Eastern Fish Disease Laboratory at Leetown, West Virginia until his retirement in 1972. Even after retirement, Dr. Snieszko continued his vigorous schedule at the laboratory.

Membership Report

PROMOTION TO FELLOW

Janice S. Hughes	LA

PROMOTION TO MEMBER

Roger S. C. Wolcott, Jr.	CA
David B. Clellan	FL

NEW MEMBERS

Paul A. Dinnel	WA
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Dr. Tomio Iwamoto	CA
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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: Dr. Oliver B. Cope, 15 Adamswood Road, Asheville, NC 28803. Subscription $15 a year to Institutions and Non-Members.

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VOL. 13, NO. 2 APRIL, 1984

Dr. Hugh R. MacCrimmon

New President-Elect

AIFRB Co-Sponsors Shrimp Yield Workshop

AIFRB, the Texas A & M Sea Grant College Program, and the NOAA/NMFS Galveston Laboratory collaborated in sponsorship of a workshop on shrimp yield prediction on November 16-17 at the Mitchell Campus of Texas A & M University at Galveston.

Shrimp stocks of the Gulf of Mexico represent an extremely valuable commodity whose management falls under the jurisdiction of state and federal fisheries agencies. The workshop traced the evolution of state and federal programs designed to manage shrimp resources.

Coordinators of the Shrimp Yield Prediction Workshop — A.M. Landry of Texas A & M University and E.F. Klima of NMFS. Dr. Landry is currently director of the AIFRB Texas District, and Dr. Klima is an AIFRB Fellow.

Management strategies and goals of various agencies' shrimp research programs were discussed. Of particular interest are the various methods used by these agencies to predict shrimp yield and to open and close shrimp seasons. Insight was gained into the significance of abundance and size data obtained by traditional sampling methods, correlations of life history trends and hydrological factors, census data gathered from the bait shrimp fishery, and density information acquired from new quantitative techniques as predictive tools for shrimp resource management. The workshop also attempted to assess the state of the art of predicting shrimp yield and identify critical problems in rendering meaningful predictions.

The Proceedings of this workshop will be published by Texas A & M Sea Grant, and should be released by the summer of 1984.

First Student Travel Raffle Winners

AIFRB is proud to announce the names of the first five winners in our new Student Travel Raffle program. The drawing produced the following names of students who will attend professional meetings in 1984:

Paul E. Carothers, Texas A & M Univ.	AFS Meeting
Michael H. Prager, Univ. of Rhode Island	AFS Meeting
Alec G. Maule, Oregon State Univ.	Salmon Symposium
Andrew S. Kane, Ohio State Univ.	Mariculture Meeting
Raymond M. Newman, Univ. of Minnesota	Benthic Meeting

Letters of congratulation are being sent to all winners, and checks will be forwarded in time for the $250 to be used by each student for attendance at the meeting specified.

The next drawing for student grants will be held on June 1, so interested students should get their applications to AIFRB Treasurer Cole in advance of that date.

Fishery Legislation

What's in Store After FY '84: The New Federal Budget

Projected spending by the U.S. Government for Fiscal Year 1985 totals nearly $1 trillion, about a quarter of which would be in "deficit" spending and about a third to be spent on defense (a 13% increase over last year). Total natural resources and environment spending is projected at about $1.3 billion (a 10%

Cont. on page 2

Legislation cont.

decrease). Fishery dollars total only about 0.01-0.02% of the U.S. budget requested by President Reagan.

There is good news and bad news in the President's budget request for fishery programs.

USFWS. The good news is in the U.S. Fish and Wildlife Service's (USFWS) budget, where for the first time since President Reagan took office, funding has been requested for the Cooperative Fishery and Wildlife Research Units. Albeit the requested funds would be insufficient to continue the program at present levels, the Administration has responded positively to political pressure exerted by Unit supporters. The Administration requested $3.7 million, a $1.3 million decrease from FY '84 levels.

No new hatcheries were targeted for closure in FY '85. In 1981, prior to the Administration's first proposal to abandon hatcheries no longer addressing the "new directions" of the Service, there were 89 National Fish Hatcheries. Now USFWS has 69 hatcheries, of which 7 more presently are scheduled to "go" by October 1984. Also a first for President Reagan is a request for funding the Anadromous Fish Conservation Act's Section 4 grants to states ($3.5 million). The only loss for anadromous fish was deletion of funding for Section 7 (– $400,000), the Emergency Striped Bass Study, which is essential to recovery efforts for the critically depressed Atlantic Coast migratory stocks of striped bass.

New for fisheries this year is increased funding for fishery work related to acid rain effects and more money for operation and maintenance at remaining hatcheries. Not new is another request for a $300,000 cut to fish drug and control chemical registration at the La Crosse, Wisconsin laboratory. In addition, no increased funding was requested to gear-up operations at the Exotic Species Research Laboratory in Gainesville, construction of which should be complete in about 1 year.

NMFS. The bad news is in the National Marine Fisheries Service's (NMFS) budget, where the Administration is continuing its battle with Congress to gut important fishery programs. The proposal for NMFS includes a personnel reduction of 400 full-time permanent employees, which means about 23% of current staff would be fired.

This is the third year in a row for nearly identical proposals to end valuable grants to states for anadromous and commercial fishery research and management, fish culture research, marine recreational fisheries work, salmon and steelhead hatchery programs, and nearshore research. Five major and five smaller fishery research laboratories would be closed, and seven research stations would receive drastic cuts. Details are provided in the table.

National Marine Fisheries Service Budget Information for Fiscal Year 1985 (selected programs where decreases were proposed by Reagan Administration)

Program	FY 1985 Base Budget (roughly equivalent to funding from FY 84 but not always exactly the same as funds available for FY 84) ($ x 1,000)	FY 85 Reagan Administration request to Congress (x $1,000)	Percent Change	Full time Permanent Positions
Information Collection and Analysis				
Resource Information				
Surveys	11,371	-1,078	-10	- 4
Protected Species	2,190	-1,180	-54	0
Habitat Research	8,465	-4,543	-54	-72
Salmon Research	1,107	- 365	-33	0
Aquaculture	5,356	-5,356	-100	-66
Marine Rec. Fisheries	2,800	- 918	-33	-16
Oceanography Survey Tech.	4,600	- 922	-20	-10
Salmon Treaty Research	1,450	-1,450	-100	0
Total	51,108[1/]	-15,812	-31	-168
Fisheries Industry Information (Economics + Commercial Fish. Stats.)	9,879	-3,000	-30	-23
Information Analysis + Dissemination				
Nearshore Research	738	- 738	-100	-15
Stock Abundance Prediction	236	- 236	-100	- 1
Total	17,823	- 974	- 5	-16
Grand Total	78,919	-19,786	-25	-207
Conservation and Management				
Fisheries Management				
Regional Councils	7,200	-4,000	-56	0
Columbia River Program	9,954	-9,954	-100	-15
Salmon and Steelhead Enhancement	1,000	-1,000	-100	0
Salmon Vessel Buy-back	2,500	-2,500	-100	0
Total	30,971	-17,454	-56	-15
Habitat Conservation	4,875	-1,425	-29	-16
Grand Total	48,289	-18,878	-39	-31
State and Industry Assistance				
Grants to States				
Anadromous Fish Act	3,200[2/]	-3,200	-100	0
Commercial R&D	4,000	-4,000	-100	0
Total	7,200	-7,200	-100	0
Fisheries Development	11,227	-8,027	-68	-162
Grand Total	19,314	-15,227	-79	-162
NMFS Total for Operation, Research and Facilities	146,522	-53,891	-37	-400

[1/] Base includes savings anticipated from deactivating seven NOAA research vessels ($4,338,000) and reassigning another NOAA vessel ($1,000,000); FY 1984 funds available = $44,322,000.

[2/] Includes $400,000 for Emergency Striped Bass Research Study.

Legislation cont.

Representative John Breaux, who chairs the powerful House Subcommitte on Fisheries, Wildlife Conservation, and the Environment, called the Administration's proposed reductions "so severe and so poorly justified that it is hard to take them seriously" at a recent Congressional hearing. NMFS Director William G. Gordon detailed the evolution of the budget before Breaux's Subcommittee, revealing that the recommendation by NMFS staff to the Administration for funding NMFS Operations, Research, and Facilities was $175 million, while the amount the Administration formally requested Congress to provide was only slightly more than half that amount — $92.6 million.

If you want to let Congress know how you feel about what is proposed for fishery programs in FY '85, contact *your* Representative and two Senators and the following Committee chairmen:

Senate Appropriations Committee
NMFS - Sen. Paul Laxalt, Subcommittee on Commerce
USFWS - Sen. James McClure, Subcommitte on Interior

House Appropriations Committee
NMFS - Rep. Neal Smith, Subcommittee on Commerce
USFWS - Rep. Sidney Yates, Subcommittee on Interior

All Congressmen can be reached at 202-224-3121, or by writing The Honorable _____, U.S. Senate, Washington, DC 20510; *or* U.S. House of Representatives, Washington, DC 20515.

Rudolph Rosen, *National Wildlife Federation, Washington, D.C.*

AIFRB Outstanding Achievement Award

Dr. Kenneth D. Carlander receives the 1983 AIFRB Outstanding Achievement Award at a ceremony in Ames, Iowa. Shown are James Mayhew, Chief of Fisheries, Iowa Conservation Commission; Robert Summerfelt, Head, Department of Animal Ecology, Iowa State University; Kenneth Carlander; and Fred P. Meyer, Chairman of AIFRB Awards Committee.

Shad Workshop

Fifty scientists from the United States and Canada met in New York City on February 8 and 9, 1984 under the sponsorship of the Hudson River Foundation to discuss the precipitous decline of shad stocks along the Atlantic Coast. The scientists recommended seven research projects urgently needed to fill critical gaps in knowledge concerning shad.

It was the consensus of the group, which included fisheries managers representing twelve states and the United States government, that a scientifically-based management plan is needed for shad. These fish are an important food species along the Atlantic Coast, where they spawn in 23 major river systems in every state from Florida to Maine. Shad is the second largest catch of fish in many Southern waters. The eggs or "roe" from the females are a particular delicacy. During the past decade many of the runs of shad have declined dramatically in numbers. The likely causes of the decline are pollution of spawning rivers, siltation of spawning areas, dams preventing access to spawning areas, and overharvesting.

Research projects identified by the scientists fell into two major areas: 1) construction of a complete life profile on the shad and 2) identification of factors which are causing and contributing to their decline.

The six research projects identified by the scientists are:

An intensive fish tagging program in the ocean, with special emphasis on Canadian waters, to examine migration routes;

Development of techniques to discriminate between shad stocks from different rivers and streams;

Studies on the feeding areas and feeding habits of adult and juvenile shad, again with special emphasis on northern waters such as the Gulf of Maine and the Bay of Fundy;

Studies on egg and larval survival and development, and on biological and non-biological mechanisms affecting reproduction of shad stocks;

Surveys of the number of shad taken by fishing in selective geographic areas; and

An historical analysis of pollutant sources and habitat modification of selected shad rivers along the east coast.

The scientific workshop also examined the possible effects on shad of a proposed large-scale tidal power plant for the Bay of Fundy, Nova Scotia, Canada. Recent tagging studies have established the Bay of Fundy area as a major feeding ground for all East Coast shad stocks. The research projects identified will also help answer questions about this power plant, as will an additional recommended study on fish mortality associated with large turbine structures similar to those expected to be used if the plant is built.

According to Dr. Jon Cooper, Science Officer for the Hudson River Foundation, "The gathering of scientists is the first concerted effort by coastal fishery scientists and managers to focus on the research problems associated with shad. The scientists, along with the Atlantic States Marine Fisheries Commission, a federal fishery management agency, have asked the Foundation to coordinate research and to help find funding among national, state and private groups. The research findings will then be used to develop management plans to enhance shad fishing along the Atlantic Coast."

Center Offers Weed Data

The Aquatic Weed Information and Retrieval Center is a computerized library of aquatic plant literature, especially literature about aquatic weeds. This data base is supported by the University of Florida Center for Aquatic Weeds, the U.S. Agency for International Development, and the Florida State Department of Natural Resources.

The library provides several free services to researchers, institutions, and government agencies in 63 countries who are interested in aquatic plant ecology, biology, control or utilization.

Free services provided include:

1. Collection. The library collects information on nearly 4,000 species of aquatic plants, but especially on the hundred or so nuisance aquatic plants usually referred to as weeds. As of January 1984, the library had collected more than 17,000 books, research articles and reports about aquatic plants. Approximately 250 articles and books every month are added to the collection.

2. Computerization. The staff catalogs the collected information and enters bibliographic information as well as subject categories and subcategories, and keywords of the literature into a computer data base. The computer therefore can be instructed to retrieve aquatic plant information according to any combination of species, categories, subcategories, keywords, authors, dates, journals, countries and so on.

3. Bibliographies. The library provides bibliographic printouts from its collection to its users, thus making users aware of past and current literature in their areas of interest. Each year approximately 1,500 users request these bibliographies.

4. Updates. Users can receive updated listings of new library acquisitions on request. More than 700 users receive these updates to their original bibliographies.

5. Newsletter. The library newsletter, *Aquaphyte,* informs its 3,500 subscribers of aquatic plant news items, conferences and short courses, and new books and reports.

6. Referrals. The library maintains files of names and addresses of several thousand researchers, managers and government officers who are interested in aquatic plants. We are happy to help our users contact others interested in aquatic plants.

For more information about the Center for Aquatic Weeds and its newsletter and other services, contact Victor Ramey at the Center, Room 2183 McCarty Hall, University of Florida, Gainesville 32611; 904-392-1799.

District Activities

ARE ALL DISTRICTS ALIVE?

When your BRIEFS Editor made his report to the Board of Control last August, he noted that one area that was ripe for improvement of BRIEFS lay in the reports of meetings and other activities in the Districts.

Sadly, this part of BRIEFS has become weaker instead of stronger. For example, only one District has contributed to every issue since last August. *Six* Districts have contributed *no* reports of District meetings. Most of the other Districts have given us only one item for the four issues involved.

This part of BRIEFS has a potential for becoming an exciting section of the newsletter, and can be a source of ideas for Districts to step up their activities.

Your Editor would like to have two or three reports per year from each District. You can do it, and we're ready to handle it.

NORTHWESTERN WASHINGTON

Ed. A. Best, *Director*

At the January meeting, Bob Pfeifer, Area Sport Fishery Biologist, Washington Department of Game, presented an overview of the Lake Washington-Lake Sammamish fisheries. These large urban lakes are open year-round for sport fishing and have had no significant changes in fishing regulations since 1945. Although there was a wealth of life-history information on various species, there were no data on effort, catch, or management philosophy.

The project goals were (1) protect and enhance self-sustaining populations of salmonid gamefish, (2) optimize recreational opportunities by stocking hatchery fish where feasible, (3) protect and enhance existing warm-water gamefish, (4) develop and maintain a viable warm-water fishery-management program, and (5) assure and promote adequate public areas.

Creel census indicated that the fishermen using the lakes had a mean driving distance of 4.8 miles. Shore fishing accounted for over 90% of the effort on Lake Washington, whereas on Lake Sammamish over 80% of the fishing effort was from boats. About 60% of the catch from Lake Washington was trout species. Lake Sammamish produced 40% yellow perch, 25% smallmouth bass, 20% cutthroat trout, and 4% kokanee salmon. Fishing occurred in every month of the year, with best catches in August through December on Lake Washington and May through August on lake Sammamish.

The Department developed a fishing guide for the two lakes and utilized local news media to publicize the fishing opportunities close to Seattle. They are currently evaluating enhancement techniques to apply to the area. Some increased regulation is also being considered to enhance native cutthroat trout and kokanee salmon in Lake Sammamish. The interaction of the rainbow/steelhead population with outmigrating sockeye salmon smolts was investigated and found to have little or no effect.

At our meeting in February, Drs. Ronald Reed, Pacific Marine Environmental Laboratory, and Alan Mearns, NOAA Ocean Assessment Division, discussed

Districts cont.

long-term environmental and biological trends along the Pacific Coast. The effect of the recent El Ninõ phenomenon on currents, temperature, and sea level were discussed. The timing of these changes from south to north along the coast was documented. The recorded increase in sea level heights during previous El Ninõs was also shown, with some indication of a decrease in mean sea level prior to the El Ninõ event.

The occurrences of northern marine forms in southern waters seemed to reach maximum numbers in 1915 and 1951. The reverse movement of southern forms to northern waters had numerous occurrences in 1937, 1958, 1962-65, and again in 1984. The peak years of reported occurrences of oceanic fishes in coastal waters were 1926 and 1935. Dr. Mearns is anxious to compile a record of these found occurrences along the Pacific Coast and would welcome pertinent information.

New Publications and Announcements

Symposium—Variability and Management of Large Marine Ecosystems (LMEs)

The American Association for the Advancement of Science will sponsor this symposium on May 28-29, 1984 in New York City.

Large marine ecosystems adjacent to land masses are being subjected to increased stress from heavy exploitation of renewable resources and as disposal areas for industrial and urban wastes and aerosol contaminants. Recent reports suggest that the population structure of LMEs can be altered by natural and anthropogenic changes resulting in significant negative economic impact. Perturbations of ecosystems resulting in dominance shifts among the predator field of LMEs have been reported for the North Sea, Gulf of Thailand, northeast US coast, the Antarctic, California Current, El Ninõ region off Peru, Gulf of Alaska, East Bering Sea, and the Baltic. The objective of the symposium is to provide a forum for reviewing strategies for measuring natural variability of LMEs against a background of increasing evidence of anthropogenically induced perturbations from overexploitation and pollution. The symposium will encourage the synthesis of a large body of existing but scattered data on effective means for measuring changes in the populations, physical-chemical environments, and management options for LMEs. The convenors expect that it is scientifically and technically feasible and cost-effective to implement holistic conservation and management regimes for large ecosystems. The three sessions will deal with: (1) impact of perturbations on the productivity of renewable resources in LMEs; (2) measuring variability in LMEs; and (3) institutional framework for managing LMEs.

Applications for attendance at the symposium dinner and cocktail reception are being accepted at the Northeast Fisheries Center, Narragansett Laboratory, South Ferry Road, Narragansett, RI 02882. Registration for the symposium will be handled through the AAAS. See the March 9 issue of SCIENCE for more information.

Biology and Ecology of Squid

The Northwest Atlantic Fisheries Organization has announced a special session at the 6th Annual Meeting to deal with the biology and ecology of the squids, *Illex illecebrosus* and *Loligo pealei,* in the Northwest Atlantic.

The special session is to be held September 5-7, 1984 at Dartmouth, Nova Scotia, Canada. The general theme of the special session is "Progress in the Study of the Biology and Ecology of Squid with Emphasis on Life Histories and Distributional Characteristics of Particular Life-Stages in Relation to Environmental Conditions and Ocean Processes." Papers reviewing and synthesizing the results of data series developed under the NAFO coordinated research program for *Illex illecebrosus* are particularly welcome. Papers will be published in the Journal of Northwest Atlantic Fishery Science, or NAFO Scientific Council Studies.

Further information may be obtained from Mr. T. W. Rowell, Halifax Laboratory, Dept. of Fisheries & Oceans, PO Box 550, Halifax, Nova Scotia, CANADA V3J 2S7.

FWRS Has Moved

The Fish and Wildlife Reference Service has moved to Maryland. FWRS was established several years ago as an agency of the Denver Public Library and was funded by the Federal Aid Division of the U.S Fish and Wildlife Service. With the same sponsorship, it is now operated by Informatics General Corporation, 1776 E. Jefferson St., Rockville, MD 20852.

The Fish and Wildlife Reference Service is an indexing and retrieval service which provides reports, publications and theses. It is not a lending library nor a reprint supplier. It was set up as the only library in the world to store reports emanating from the Federal Aid in Fish and Wildlife Restoration Program (Pittman-Robertson and Dingell-Johnson Acts). The storage and retrieval of these documents was once the only function of the library. Today, Federal Aid reports remain the heart of the accessions, but the indexed collection also contains selected reports and theses which result from the Anadromous Fish Conservation Program, Endangered Species Grants Program, work done at the Cooperative Fishery and Wildlife Research Units, and by state game and fish agencies. Selection of reports to be indexed is based on the value of the research to biologists outside the state where the research was done. At the present time the Service offers computer access to more than 14,000 fish and wildlife reports and shelf entree to an additional 35,000 (non-indexed) papers.

Information of use of FWRS services is available from Informatics General Corporation at the above address.

Publications & Announcements cont.

The Meeman Archive

Established in 1982 by the Scripps-Howard Foundation at the University of Michigan's School of Natural Resources, the Meeman Archive was created to preserve and make accessible to the public outstanding journalism concerning conservation, natural resources, and the environment. This valuable service is now available to any individuals and organizations needing information in the field of natural resource use. It is of particular value to natural resource professionals, environmental groups, students, journalists, and the public. The Archive is being financed by continuing grants from the Scripps-Howard Foundation, as well as by financial and human resources of the University of Michigan.

The Archive receives articles from a variety of sources. The principal source is the national Meeman Awards of the Scripps-Howard Foundation to honor outstanding coverage of environmental topics. The Archive staff selects articles from many other sources as well.

Over 100 subject areas are indexed, including:

Hazardous Waste	Water Policy	Wind Energy
Endangered Species	Soil Erosion	Occupational Health
Energy Conservation	Native Americans	Transportation

New articles are constantly being added to the Archive, making available an expanding collection of environmental information.

To find out if the information you need may be found within the archive, you may phone, write, or visit us at the address below. Our computerized database allows us to search for articles by author, title, publication, or subject category. Once we know what you are looking for, we will provide you with a list of articles, abstracts, or copies of the articles in our microfiche files. The only charge for the service is for postage and reproduction costs.

The Meeman Archive, School of Natural Resources, University of Michigan, Ann Arbor, MI 48109-1115 (313) 763-5327.

Key Papers on Fish Populations

Edited by D.H. Cushing, this book provides dissemination for five classic papers on fisheries science reprinted together with nine others which describe more recent developments on the basis of older work. The Editor provides an introduction to each of the five classic papers and a linking chapter between these and the later contributions.

The literature on fisheries research is not easily accessible to general ecologists — for example the older material is often difficult and expensive to obtain. In addition many developing countries do not possess the older journals although they may be well equipped with recent series of the same publications. As some of the more recent papers have been published in extremely specialized journals, they may not be readily accessible.

The contents are:

Some theoretical considerations on the 'overfishing' problem *E.S. Russell 1931.*

Modern theory of exploiting a fishery, and application to North Sea trawling *M. Graham 1935.*

The theory of fishing *R.J.H. Beverton and S.J. Holt 1956.*

Some aspects of the dynamics of populations important to the management of the commercial fish population *M.B. Schaefer 1954.*

A study of the dynamics of fishery for yellowfin tuna in the eastern tropical Pacific Ocean *M.B. Schaefer 1957.*

Stock and recruitment *W.E. Ricker 1954.*

Handbook of computations for biological statistics of fish populations. Appendix I. Development of model reproduction curves on the basis of a theory of predation at random encounters *W.E. Ricker 1958.*

Introduction to the later papers in the development of fisheries science *D.H. Cushing.*

Estimation of mortality rates *J.A. Gulland 1956.*

Population dynamics of the Arcto-Norwegian cod *D.H. Garrod 1967.*

An investigation of accuracy of virtual population analysis using cohort analysis *J.G. Pope 1972.*

A generalized stock production model *J.J Pella and P.K. Tomlinson 1969.*

The effect of fishing on the marine finfish biomass in the Northwest Atlantic from the Gulf of Maine to Cape Hatteras *B.E. Brown, J.A. Brennan, M.D. Grosslein, E.G. Heyerdahl and R.C. Hennermuth 1975.*

The concept of the marginal yield from exploited fish stock *J.A. Gulland 1968.*

Stock and recruitment *D.H. Cushing 1981.*

426 pp; illus; 0 904147 58 4 (soft) US $42.00/£21.00 October 1983.

Order from IRL Press, Suite 907, 1911 Jefferson Davis Highway, Arlington, VA 22202.

Journal of Great Lakes Research

The Journal of Great Lakes Research, published by the International Association for Great Lakes Research, is devoted to research on the Great Lakes of North America and other large lakes of the world. A complete, 24-issue set, containing volumes 1-8 of the journal (1975-1982), is available for $120 (U.S. currency). The journal index is available for $5 (U.S.) or free with orders of $50(U.S.) or more. Regular journal issues devoted to special topics are described below.

Niagara River Population Problem - 1983; 232 pp; Sediments, water quality, biota, chlorinated hydrocarbons, trace organics. $5.

Contaminants and Surface Films - 1982; 137 pp; Physical-chemical interactions, pesticides, PCB, metals, biotic impacts, modeling. $5.

Ecology of Filamentous Algae - 1982; 237 pp; *Bangia, Cladophora, Ulothrix* field ecology, applied studies—modeling, remote sensing, PCB, annotated bibliography. $15.

Publications & Announcements cont.

Long Point Bay—Nanticoke - 1981; 162 pp.; Baseline impact analysis for power generating plant, steel mill, oil refinery on Lake Erie; ecosystem characterization. $5.

Limnology of Lake Superior - 1978; 308 pp; Historical developments, sediments, climate, energy/water budgets, circulation, transparency, water chemistry, ion loadings, plankton, benthos, fish. $5.

Atmospheric Contribution - 1976; 225 pp; Pollutant pathways, sampling and measurement techniques, nutrients, metals, biotic impacts, acid rain. $5.

Membership in the International Association for Great Lakes Research includes the journal and is available in several categories: member ($25), student ($15), and library ($50). Membership applications and orders for back issues of the journal should be directed to Mr. William L. Richardson, U.S. EPA, Large Lakes Research Station, 9311 Groh Raod, Grosse Ile, MI 48138.

Thesis and Dissertation Abstracts

Hydrologic, Diel and Lunar Factors Affecting Fishes on Artificial Reefs off Panama City, Florida

Richard Morgan Sanders, Jr., M.S. 1983
Texas A & M University

Ichthyofaunal surveys were made on two principal artificial reefs (#1 and #2) from August 1979 to August 1980, and six secondary artificial reefs (#3-#8) from April to August 1980 offshore Panama City, Florida. Temperature, visibility, current speed and direction of bottom waters at reef sites, time of day, absolute time from noon (ATFN) and moon phase were tested via multiple regression to determine which factor(s) affected fish community abundance and abundance of common taxa. In addition, seasonal trends of fishes present on these reefs were reported.

Water temperature had the greatest influence on fish populations present on reefs offshore Panama City, Florida. Number of taxa (lnS) and individuals (lnN) of countable reef fishes and abundance of many common taxa increased with increasing temperature. Seasonal trends reinforced regression findings, as most common taxa's abundance declined during winter-spring.

lnN and abundance of several common taxa increased with increasing visibility.

Moon phase was an important factor in community index models at reefs #5-#8, but not at reefs #1 and #2. The Shannon-Wiener index (H''), lnS, and lnN were positively correlated with increasing moon phase. Conversely, number of taxa (MWS) and individuals (MWS) of fishes present in midwater censuses were negatively correleated with moon phase. Abundance of common taxa at both reef groupings usually increased with increasing moon phase.

Current speed had a negative influence on every community index for which it was a significant factor (lnN, lnS, and MWS at reefs #1 and #2 and Pielou's evenness index, J, at reefs #5-#8). On the other hand, current speed had a positive influence on abundance of most common taxa in whose equations it appeared.

lnN (reefs #1 and #2) and MWS (reefs #5-#8) were greatest during easterly current, whereas, J (reefs #1 and #2) and lnN (reefs #5-#8) were greatest during westerly current. Although not conclusive, most common taxa's abundance was greatest during easterly current.

Time of census exerted a positive influence on H'' and lnS at reefs #5-#8. Time, expressed as time of census and ATFN, exerted positive and negative influences on some common taxa's abundance.

Except for J, all community indices (H'', lnN, lnS, MW and MWS) had highest values during summer-fall 1979 or 1980.

Effects of Three Substrate Variables on Two Artificial Reef Fish Communities

Charlie Ray Chandler, M.S. 1983
Texas A & M University

Effects of three substrate variables — substrate rugosity, percentage substrate cover, and vertical relief — on resident and semiresident ichthyofaunal communities associated with two artificial reefs were investigated off Panama City, Florida. The reefs, known as Inshore and Offshore Barges, were steel barges of identical size and shape which were located close enough to one another to insure their ichthyofaunal communities were affected by similar environmental conditions.

Thirty-two visual censuses were conducted on each reef between August 1979 and August 1980 to determine differences in the structure of resident and semiresident fish communities supported by the two barges. These differences were then related to comparisons of the three substrate variables measured along census transects on each reef. Differences in substrate rugosity and percentage substrate cover between reefs were attributable to the greater structural deterioration of Offshore Barge. Differences in vertical relief were created by suspending midwater structures 8 m in length from Inshore Barge. Each midwater structure was constructed of 10 automobile tires tethered together and located around the periphery of the reef to maximize its visibility.

Measures of substrate rugosity and percentage substrate cover indicate Offshore Barge had 1.75 times the amount of surface area accessible to reef organisms for both sand and metal substrates compared to that available at Inshore Barge. Offshore Barge also supported a significantly greater abundance, species richness, and species diversity of resident fishes during summer (>21 °C) and winter (<18 °C) censuses. Both barges supported similar dominant species, with no significant differences detected in the evenness of fish

Thesis and Dissertation Abstracts Cont.

abundances. Greater abundance of semiresident species on Offshore Barge during winter indicated that higher structural complexities take precedence over vertical relief in attracting or concentrating these fishes when abundances (or temperatures) drop below a critical level. Effects of vertical relief and substrate rugosity during the summer were similar for the area immediately above the reefs as no difference was detected in abundances of semiresident species occurring within 1 m of the decking of both barges. Above this zone, midwater structures on Inshore Barge supported significantly greater numbers of semiresident species during summer censuses.

In Memoriam

James E. Phelan

AIFRB has received word of the death of James E. Phelan. James became an Associate in 1982, and passed away that same year. We all regret that he did not have more time to be among us.

Membership Report

Promotion to FELLOW	
Dr. Saul B. Saila	RI
Thomas A. Edsall	MI
Richard N. Uchida	HI
Dr. Gene R. Huntsman	NC
Dr. Gilbert W. Bane	LA
Dr. John R. Hunter	CA
S.A. Moberly	AK

Promotion to MEMBER	
Lyman E. Barger	FL
Dennis D. Dauble	WA
Dr. Charles A. Barans	SC

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Colin K. Harris	WA
Dr. Gerald W. Esch	NC

New ASSOCIATES	
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William H. Bradshaw	LA
Charles M. Wooley	FL
Thomas H. Jagielo	WA
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William R. Meyers	PA
D. Scott Becker	WA
Scott A. Willis	FL

EMERITUS	
J.R. Snow	AL

Sammy M. Ray
Membership Chairperson

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: Dr. Oliver B. Cope, 15 Adamswood Road, Asheville, NC 28803. Subscription $15 a year to Institutions and Non-Members.

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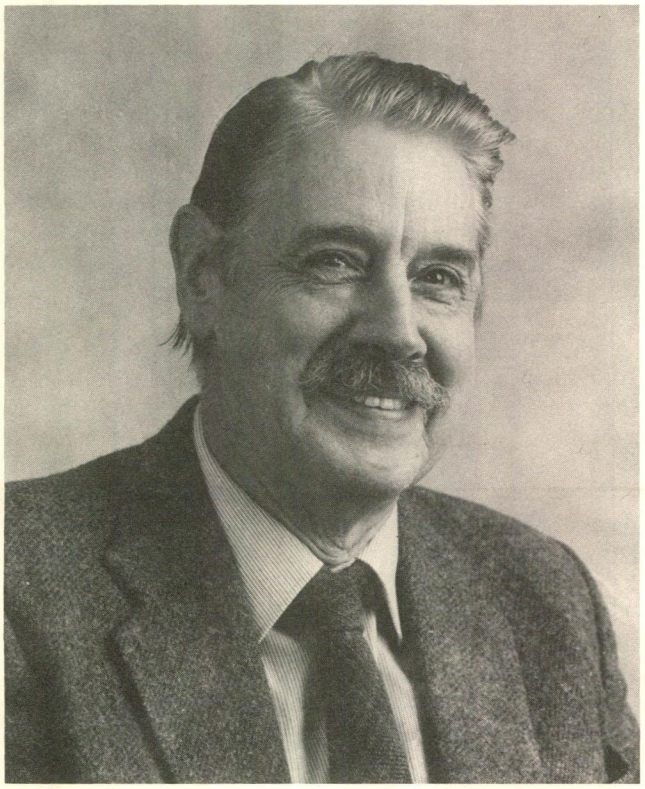
VOL. 13, NO. 3 JUNE 1984



Our President Elect

Dr. Hugh R. MacCrimmon will take office as President of AIFRB at the end of the annual meeting of the Board of Control in August, 1984.

Hugh is presently Professor in the Department of Zoology, University of Guelph, Guelph, Ontario. He has a B.A. from McMaster University and a Ph.D. from the University of Toronto. His professional experience includes service as a Research Biologist, Ontario Department of Lands and Forests (1946-1949); Demonstrator in Biology and Anatomy, Department of Zoology, University of Toronto (1946-1948); Management Biologist and Administrator, Ontario Department of Lands and Forests (1949-1957); Assistant Professor, Department of Entomology, Ontario Agricultural College (1957-1958); Associate Professor, Department of Zoology, Ontario Agricultural College and the University of Guelph (1958-1967); Professor of Zoology, University of Guelph (1967-). Hugh earned his B.A. with Honours in Chemistry and Zoology. He has been a recipient of Commendation Award from the Sport Fishing Institute. He has also been a free-lance consultant since 1958 with various government and consulting agencies. From 1957 to 1983, about 50 graduate students have earned M.Sc. and Ph.D degrees under his supervision. His principal research interests include: zoogeography and bio-ecology of centrarchid, salmonid, and other fishes; ecotaxonomy of freshwater fishes, especially salmonids and related species on an ecosystem and world basis; comparative ecology of stream salmonids; limnology; bioaccumulation and biomagnification of heavy metals in freshwater ecosystems; aquaculture in temperate and tropical countries; biological, social, and economic aspects of natural (wild) fisheries and commercial (domestic) aquaculture. Hugh has over 100 publications, including books, chapters in books, bulletins, and papers in refereed journals, on these research interests. He has been a Fellow of the AIFRB since 1973.

ANNUAL MEETING

of

AMERICAN INSTITUTE OF FISHERY RESEARCH BIOLOGISTS

to be held at

Statler Hotel (on campus)
Cornell University in Ithaca, New York
August 11-13 (noon), 1984

1. Call to Order and Adoption of Agenda
2. Reports —
   - i) Treasurer
   - ii) Membership
   - iii) Publications
3. Awards —
   - i) Best Student Paper 1984
   - ii) Outstanding Achievement Award 1984 and report on 1983
   - iii) Group Award 1984
   - iv) Proposed new award sponsored by Seattle-based fishing organization
4. District Activities —
   - i) Directors' report, including special problems
5. Bylaws

Annual Meeting cont.

6. Other Items —
   - i) Interaction with American Fisheries Society
   - ii) Approval of Emeritus Status candidates
   - iii) Installation of New President
   - iv) Other issues

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

1984 AIFRB Awards

Nominations are requested for the AIFRB Outstanding Achievement Award for Individuals and the AIFRB Group Award of Excellence. Criteria for these awards are similar: significant publications, exceptional service, outstanding teaching or training of students, important discoveries or inventions, and major contributions to the advancement of Fishery Science.

AIFRB members are invited to submit nominations for these awards to R.J. Myhre, P.O. Box 95009, Seattle, WA 98145-2009.

Nominations should be submitted by July 1, 1984, and should include a one-page summary of noteworthy qualifications of the nominee. Selections for the two awards will be made by the Board of Control at its August meeting.

The Ecosystem Approach Workshop in Hiram, Ohio

In late years both fishery and water quality interests in the Great Lakes basin have explicitly identified the need to develop and adopt ecosystem-level approaches to management. To this end, a Steering Committee was formed in the summer of 1981 for the purpose of achieving a definition for the expression *Ecosystem Approach* which could be readily understood in operational terms, and to suggest pragmatic initiatives to further its institution in practice. The activity was cosponsored by the International Joint Commission, the Great Lakes Fishery Commission, the International Association for Great Lakes Research, and a citizen's group called Great Lakes Tomorrow. J. R. Vallentyne served as chairman.

The Steering Committee saw its challenge in terms of getting people together to talk, developing non-adversarial discussions, and producing a useful product. The task was approached in four stages:

Stage 1 Overview: The Steering Committee put the concensus of its perceptions into a single document.

Stage 2 Development Papers: A person of each national origin representing business, government, voluntary membership organizations, and the general public was selected and asked to write a paper in response to the overview, from his/her perspective.

Stage 3 Strategy: After interaction between authors, subsequent revisions to their papers reflecting misconceptions which had been cleared up, and a reactive revision to the Overview, a general strategy was developed from analysis of the symptomatic and basic issues exposed by the documents. It was called "Enlightened Self-Interest."

Stage 4 The Workshop: The workshop was convened at Hiram College in March 1983 after the foregoing sequence was complete, and after the various documents had been circulated. Some 60 participants were chosen, representing the above-mentioned constituencies. The conference spanned 2 evenings and 1.5 days and discussed, in turn, criteria for identifying ecosystem approaches, and initiatives appropriate to them. Some 54 individual initiatives, ranging from educational to legal, emerged.

Conclusions: The first and obvious conclusion was that this particular model worked. Even though the participants were somewhat selected for their ecological leanings, you don't normally expect a vice-president for a major oil company to sit down with a lobbyist for the Sierra Club and discuss ecological issues in full harmony. It happened, however, and it was concluded that the method of obtaining and synthesizing societal inputs in advance was a significant factor in the success.

The idea of ecosystem approach can now be considered the prevailing mode of thought — and one which has evolved in a natural way out of a succession of previous approaches which were appropriate for their particular eras.

The initiatives were categorized and somewhat combined to reduce the number to 33. It was concluded that there was no clear advantage to assigning priority ranks to them, and that the ongoing task was to expedite their delivery to appropriate agencies and media.

These conclusions led the Steering Committee to recommend that the International Joint Commission alone or in conjunction with the Great Lakes Fishery Commission:

1. Establish a continuing group to assist in the implementation of an ecosystem approach in the Great Lakes Basin and to monitor and evaluate progress, with annual reports and 5-year reviews in full;
2. Institute and support a program of public information to redress knowledge gaps and create suitably broad perspectives to help with issue evaluation in an ecosystem context.

The third part of the Workshop challenge (the product) has not yet been tested. The report is complete and so the recommendations will shortly be in the hands of the two Commissions.

W. J. Christie
Glenora Fisheries Station
Ontario Ministry of Natural Resources
R.R. #2, Picton, Ontario KOK-2T0

Contaminant Levels Lower in Great Lakes Salmon

Good news for Great Lakes fish and fishermen: contaminant levels are down in coho and chinook salmon.

Recent analysis by the Michigan Department of Agriculture indicates continued reductions of PCBs, DDT, dieldrin, and chlordane in coho and chinook salmon from mid and northern Lake Michigan. The amounts of these chemicals in the fish tested were below the federal Food and Drug Administration (FDA) tolerance levels for human consumption.

According to Al Hafner, food technologist with the Michigan Department of Agriculture, "Coho and chinook salmon and whitefish are in good shape, but lake trout are not such a good story. The lake trout sampled are under the tolerance levels for many chemicals, but they are over for chlordane." Part of the reason for this is that lake trout do not die after spawning, as do salmon. Thus, they have a longer life span in which to take in contaminants. The older fish are fatter, too, and the fat is where most contaminants accumulate.

In the most recent tests for salmon 18 chinook salmon, ranging from 11 to 21 pounds, and 24 coho salmon, ranging from 5 to 9 pounds, were tested for PCBs, DDT, dieldrin, and chlordane.

All the fish had below the PCB tolerance level of 5 parts per million (ppm) and 90 percent of the fish had less than 2 ppm of PCBs. Twenty of the 24 coho sampled contained less than 1 ppm PCBs.

Chlordane levels were closer to the FDA tolerance level, but still below it. The chlordane tolerance level for whole fish is 0.3 ppm. Levels of chlordane in the salmon ranged from 0.02 to 0.28 ppm, with the average for chinook being 0.13 and the average for coho 0.07.

Fishers should take notice that the fish sampled are from Lake Michigan only. These fish may indicate a Great Lakes-wide trend, but this cannot yet be verified. Continued sampling and analysis by the Department of Agriculture, in cooperation with the Michigan Department of Natural Resources, will yield more data by the end of 1984.

Caution is still required in consuming Great Lakes sport fish. Cleaning and cooking methods can reduce contaminant levels in cooked fish. These methods may involve reducing the fat content by skinning the fish, cutting away the fat, and cooking so that the fat is drawn away from the meat.

Michigan Sea Grant College Program

Food Studies in Juvenile Sandbar Sharks

The study of food consumption in sharks can lead to a better understanding of the amount of energy they require for growth and daily activities. In addition, knowledge of the type and amount of food consumed by sharks is vital for assessing the impact of predation by sharks on important stocks of prey species. Although the prey of some sharks is known, very little has been learned about the amount of food consumed by sharks. Traditionally, food consumption in fishes has been studied in hatcheries or in laboratory aquaria under carefully controlled conditions. Unfortunately, these methods are not suitable for most sharks because they are difficult to maintain in captivity. An alternative method for studying food consumption is to measure the amount of food in stomachs at different times to determine the rate of food intake and the rate of gastric evacuation (emptying of the stomach). During the past several summers we have been collecting data of this sort for young (52 to 100 cm total length) sandbar sharks in the area of Chincoteague Bay, Virginia. The sandbar shark was selected for this study because it is an abundant, inshore shark known to eat commercially valuable species such as blue crabs.

The rate at which food is emptied from the stomach was investigated in a fenced off area (100 m x 75 m x 4 m) in the natural environment. Sharks were captured with rod and reel fishing gear and were transported to the enclosure in a large holding tank. Before being released, the stomach of each shark was pumped to remove all food. Each animal was then fed a preweighed meal of either soft blue crab or menhaden and was released in the enclosure. At various times after feeding the sharks were retrieved and the amount of food remaining in the stomach was measured. During the study 98 sharks ranging in size from 53 to 87 cm TL were fed and released. The results indicated that the passage of food from the stomach was relatively slow compared to other species of fish that have been studied. The average time required to completely evacuate a meal from the stomach was approximately 75 h. Meals of menhaden were evacuated from the stomach slightly slower than were meals of soft blue crab.

Comparative information on the types and amounts of food in the stomachs of sharks in the wild was obtained by examining the stomachs of 414 sharks captured by gill nets and rod and reel fishing gear. The primary food items were soft blue crabs and menhaden. Blue crabs were found in 67.4% and menhaden in 13.3% of the stomachs examined. Other species of crabs and fishes were found in only a small percentage of the stomachs and 17.9% of the stomachs were empty. Data collected concerning the amount, stage of digestion, and number of items of food in the stomachs indicated that feeding occurred during relatively short periods of time (12 h) separated by long periods (60 h) during which food was digested. The average quantity of food in the stomachs was 0.96% of body weight and the maximum quantity was 5.28% of body weight. The quantity of food in all stomachs was substantially less than the estimated maximum stomach capacity (13.0% of body weight). Finally, sharks caught between 0130 and 0430 h were found to contain considerably more food than those caught during other times of the day, suggesting that the early morning hours may be a period of increased feeding activity for this species.

The information concerning gastric evacuation and stomach contents is presently being used to construct a mathematical model of food consumption for the sandbar shark. This model will not only provide an estimate of the amount of food consumed by the sandbar shark, but should also give an indication of the impact by other sharks on important prey species, some of which are commercially valuable.

Robert Medved
Narragansett, RI
(Reprinted from The Shark Tagger--1983 Summary)

Fishery Legislation

East Coast Striped Bass

Congress presently is working on legislation to address declines in the striped bass fishery on the East Coast [BRIEFS 13(1):3-4]. Representative Claudine

Fishery Legislation cont.

Schneider (RI) introduced H.R. 4884 on 21 February, which would impose an immediate moratorium on harvest of striped bass from South Carolina to Canada. Alternate legislation (H.R. 5492) was introduced by Representative Gerry Studds (MA) on 12 April. H.R. 5492 would provide states a "grace" period to implement an already-agreed-upon interjurisdictional fishery management plan for striped bass. After the grace period, and a period of evaluation, any state not effectively enforcing provisions of the fishery management plan would have a federally-enforced moratorium on fishing for striped bass imposed in its waters. The fishery management plan was developed by the Scientific and Statistical Committee of the Atlantic States Marine Fisheries Commission's Striped Bass Management Board.

Markup of H.R. 5492 (with H.R. 4884 offered as an amendment) was held by the House Subcommittee on Fisheries and Wildlife Conservation and the Environment on 9 May. During markup, Representative Schneider forced Subcommittee Chairman John Breaux (LA) to adjourn the Committee without allowing discussion or vote on the bill on the grounds a quorum was not present. It is unlikely the House will reconsider either bill in the near future.

In the Senate, John Chafee (RI) introduced S. 2667 on 11 May. S. 2667 would provide a framework to manage coastal migratory fisheries (including striped bass) and impose a moratorium on striped bass fishing in all states' waters until a management plan for striped bass, as provided for in the bill, is implemented. The bill would provide increased funding for fishery management plan development to the Interstate Fisheries Commissions through increases in state grants under the Anadromous Fish Conservation Act and Commercial Fisheries Research and Development Act programs. Hearings are to be held in early June in Providence, and Washington, D.C., by the Senate Committee on Environment and Public Works (the bill also was referred to the Senate Commerce Committee).

Artificial Reefs

A bill to establish financial incentives and siting standards for artificial reefs (H.R. 3474) was introduced 30 June 1983 by Representative John Breaux, and hearings were held 18 July [BRIEFS 12(6):6]. On 5 April the original bill was amended and re-introduced as H.R. 5447 and was entitled *The National Fishing Enhancement Act of 1984.* H.R. 5447 would establish standards for siting reefs (including environmental criteria) and clarify financial liabilities and agency responsibilities; deleted from H.R. 5447 are tax credit provisions conceived in the original bill that would have provided industry incentives for donating materials for artificial reef construction. The House Merchant Marine and Fisheries Committee favorably reported H.R. 5447 on 10 May. The bill now goes to the House Committee on Public Works and Transportation.

Dingell-Johnson (D-J) Expansion

The House of Representatives passed H.R. 2163 on 12 July [BRIEFS 12 (5):7; 12(6):6]. The Senate passed its version of the new D-J tax bill as part of a $48 billion, 1,325-page "amendment" to H.R. 2163. D-J provisions roughly were similar to those passed by the House and will generate an estimated 300% increase in revenues. Differences between the bills include the effective date of new taxes, tax provisions for fish finders and tackle boxes, and the point of tax application (manufacturer level or last sale before retail).

However, before the bill was sent to the House-Senate conference, which would iron out differences between the House and Senate versions, H.R. 2163 was incorporated into an even larger tax and spending bill, H.R. 4170. The new bill was passed by the Senate on 17 May. The House-Senate conference is expected to take place soon after the Memorial Day recess.

After over 7 years of hope and desperation, it appears likely that D-J will have passed by the end of June.

Rudolph Rosen, *National Wildlife Federation, Washington, D.C.*

District Activities

NORTHWEST WASHINGTON — Ed A. Best, *Director*

At our March meeting, Dr. Ken Chew made all the arrangements, as he has for the past several years, for another excellent 9-course dinner at the Chinese Palace Restaurant.

No official business was conducted at this meeting attended by 42 members and spouses. Entertainment was provided by Mr. Bill High, Northwest and Alaska Fisheries Center. Bill narrated a film of a joint National Marine Fisheries Service/International Pacific Halibut Commission cruise during the summer of 1983 to monitor longline fishing gear from a submersible vehicle. Repeated observations from the submersible provided information on the longevity of bait types, attraction of small animals to the bait, and the superior holding quality of circle hooks compared with the conventional halibut hook.

For the April meeting, Vice-Director Steve Hughes assembled a panel consisting of Dr. Dayton L. Alverson, Natural Resources Consultants; Mr. Barry Collier, North Pacific Fishing Vessel Owners Association; Mr. Ted Smits, Pacific Seafood Processors Association; and Mr. Rudy Peterson, North Pacific Fisheries Management Council, to discuss future fisheries research needs. All panel members commented that for a discussion of future fisheries research needs the younger biologists were conspicuous by their absence. A general theme of all talks noted a lack of communication between regulatory agencies and the fishing industry. Provincialism between states has resulted in discussions before regulatory bodies that only lead to a lack of credibility of testimony.

A need for evaluating mortalities caused by the incidental catches of all fisheries was expressed. Existing size-limit regulations should be evaluated to determine the effects of handling mortality resulting from catch and rejection of undersized animals upon stock biomass. Development of surveys to provide sex, size, and stock assessments for management of existing fisheries as well as latent resources is needed. The collected information would be valuable in solving problems of allocation of fish stocks to foreign, domestic, and joint venture fisheries.

Today's fisherman has to be a good businessman, use all available information, and be flexible enough to change fisheries as needs dictate if he is to survive.

Announcements and New Publications

American Fisheries Society Annual Meeting

The 1984 Annual Meeting (114th) of the American Fisheries Society will be held at Cornell University, Ithaca, New York, August 12-17, 1984. The theme for the 1984 meeting is:

> FISHERIES MANAGEMENT, NINETEEN EIGHTY-FOUR: Philosophy, Science, Economics and Politics.
>
> This broad theme encompasses all aspects of the management spectrum. It denotes a need to document the current state of the arts and sciences associated with fisheries management.
>
> The theme's emphasis, however, is not limited to the present. In fact, it places great significance on the profession's unrelenting responsibility to provide for the future well-being of the resource.

Marine and Aquarium Studies

The Institute for Marine and Aquarium Studies, formerly the Institute of Aquarium Studies, recently moved its office and laboratory from Hartford, CT, to the campus of Eastern Connecticut State University in Willimantic, CT. It is now operated jointly by Sea Research Foundation, Inc., and ECSU's Biology Department.

Established in 1977, the Institute has been conducting research devoted exclusively to the problem of keeping marine fishes and invertebrates in captive, artificial environments. The analysis of inorganic nitrogen, the effects of environmental changes on the activities of nitrifying bacteria, and the maintenance of high water quality during fish transportation have been studied extensively and are the subjects of numerous Institute publications, including a book. For the past 2 years, research has focused on methods of controlling *Oodinium ocellatum,* a dinoflagellate parasite of marine fishes.

Carol E. Bower is director of the Institute, and the new affiliation with ECSU means the scope of research may now be expanded to encompass the study of marine plants and animals in their natural habitats. Institute staff will also assume various instructional responsibilities at the University.

The Institute for Marine and Aquarium Studies is a division of Sea Research Foundation, Inc., other branches of which are Mystic Marine Life Aquarium and the Aquarium of Niagara Falls. It is funded by public and private grants and donations. For more information, contact Carol E. Bower, Director, IMAS, Biology Department, Eastern Connecticut State University, Willimantic, CT 06226, (203) 423-7007. *(Contributed by Carol Bower; reprinted from AFS NE Division Newsletter, March 1984)*

National Association of Environmental Professionals

The National Association of Environmental Professionals is an interdisciplinary society of environmental professionals in the U.S. and abroad, a forum in which the state-of-the-art in environmental planning, research, and management is advanced, a focal point for objectivity, ethical standards, and technical excellence in our diverse profession, a medium of professional contact and information exchange among colleagues in business, government, and academe, and a foundation for structured career development from student membership to certified environmental professional.

NAEP has an annual Conference, a monthly newsletter, a quarterly journal, Professional and Technical Committees, Regional/State Chapter activities, and professional certification. It is an organization in which you can receive recognition for your efforts, whether it be for environmental education, planning, engineering, or management.

For membership and other information, write P.O. Box 9400, Washington, D.C. 20016.

Ontogeny and Systematics of Fishes

This volume, Special Publication Number 1 from the American Society of Ichthyologists and Herpetologists, is the proceedings of an international symposium dedicated to the memory of Elbert Halvor Ahlstrom, held August 15-18, 1983, at La Jolla, California, organized and sponsored by the National Marine Fisheries Service, attended by 250 scientists from 10 countries. It contains 88 original papers presented by 76 invited scientists and includes major contributions on the developmental stages of the world's fishes, their relationships and fisheries.

The volume is highlighted by three conceptual chapters on fish ontogeny, systematics and fisheries. These are followed by 12 chapters on techniques and methodology used in research on fish early life history, systematics and ichthyoplankton. It also has 61 chapters which survey the characters of developmental stages of more than 24 orders of marine and freshwater fishes. For each group the current systematic status is presented along with new analyses using both developmental and adult characters. This book contains more than 800 pages in an easy-to-read, 8½″ × 11″ format; 364 plates and figures; 171 tables summarizing meristics and other characters; bibliography with over 2600 citations; hard bound cover.

Ontogeny and Systematics of Fishes will be available in late summer, 1984. Price is $60 for members of ASIH (nonmembers $100) before July 1, 1984, and $100 for members ($150 for nonmembers) after July 1. Order from Dr. Linda Trueb, Museum of Natural History, University of Kansas, Lawrence, Kansas 66045.

Northeast Coldwater Workshop — Management Strategies for the Eastern Brook Trout

A workshop will be held July 9-11, 1984 at Lock Haven University of Pennsylvania, Lock Haven, Pennsylvania to summarize the state-of-the-art for management of the eastern brook trout, determine status and management problems in the northeastern United States and Canada, and synthesize recommendations for future policy and management needs. Additional information is available from Dr. Robert C. Scherer, Lock Haven University.

Announcements and New Publications cont.

Restoration Ecology Symposium

A group of distinguished scientists from the U.S. and Great Britain will assemble at the University of Wisconsin-Madison October 11-12, 1984 for a 2-day symposium on the scientific value of attempts to restore ecological communities and ecosystems.

The symposium, sponsored by the UW Arboretum, will also consider the role of experimental ecology in the development of the science and art of ecological restoration, according to William R. Jordan, III, editor of the biannual *Restoration & Management Notes,* who is working with the Arboretum committee organizing the event.

The symposium will commemorate the 50th anniversary of the Arboretum, which was established in 1934, and which, under the early direction of biologists such as Aldo Leopold and John Curtis, became a pioneer in the development of restoration techniques.

Though in recent years restoration has become an increasingly important form of environmental technology in areas such as reclamation and landscape architecture, its role in conservation has remained ill-defined, and many scientists and managers feel a need for more research and better communicaton in this area, Jordan said. The October meeting has been conceived as a way of focusing attention on restoration by looking at it as an intellectual challenge and opportunity as well as a response to a purely practical problem.

While there have been a number of symposia and conferences on the restoration of ecosystems in recent years, this will apparently be the first to focus specifically on restoration as a technique for basic research.

"The idea is that the attempt to put a system back together is often a good way to test ideas about it," Jordan said. "Physicians have learned a great deal as a result of their attempts to heal sick or injured organisms, for example, and a number of people have pointed out that very much the same thing has been true in ecology. Attempts to restore ecosystems have frequently raised new questions about them and provided novel ways of testing basic hypotheses. Still, no one seems to have developed this idea systematically, and that is what we are planning to do."

The symposium will deal with attempts to construct or reconstruct communities ranging from relatively simple assemblages of organisms in the laboratory to restoration in the field of actual communities modeled on those occurring naturally. It will also explore the relationship between theory being developed through this work and the practice of ecosystem restoration.

This development of restoration for both heuristic and applied purposes the symposium organizers has been termed *restoration*—or *synthetic—ecology.*

Speakers scheduled for the 2-day meeting are: John Aber, University of Wisconsin-Madison; Anthony Bradshaw, University of Liverpool; John Cairns, Virginia Polytechnic Institute; Grant Cottam, University of Wisconsin-Madison; John Ewel, University of Florida-Gainesville; Michael Gilpin, University of California-San Diego; John Harper, University College of North Wales; James MacMahon, Utah State University; Michael Miller, Argonne National Laboratory; William Platt, Tall Timbers Research Station; Michael Rosenzweig, University of Arizona; Joseph Shapiro, University of Minnesota; and Patricia and Earl Werner, Michigan State University.

For further information contact Nancy Dopkins, 1207 Seminole Highway, Madison, WI 53711 (608) 262-2746.

International Symposium on Age and Growth of Fish--Recent Trends and State of the Art

The Department of Animal Ecology, Iowa State University, is organizing the *International Symposium on Age and Growth of Fish--Recent Trends and State of the Art,* to be held June 9-11, 1985 at the Hotel Fort Des Moines, Des Moines, Iowa.

Many advances have been made in techniques and understanding of age and growth of fishes since the International Symposium of Ageing of Fish at Reading, England, 1973. These advances and their relationship to future development will be reviewed in invited and contributed papers and a poster session. Age and growth information is widely used in fishery management and this symposium will give an opportunity to share information on methods of making their study more efficient and meaningful. Biologists from marine and from freshwater fisheries often have different approaches which may be shared.

Eight 90-minute sessions are planned, with the following topics:

1. Historical perspective: Current trends and problems.
2. Age determination: old problems and new approaches.
3. Length-frequency analysis.
4. Short-term growth: daily growth rings.
5. Short-term growth: biochemical and other methods.
6. Biological and mathematical expression of growth.
7. Applications to fishery management.
8. Growth in specialized environments: eutrophic, thermally enriched, tropical and others.

Authors wishing to present papers for any of the sessions, or posters, should submit title, abstract, address, and phone number to Dr. Robert Summerfelt, Chairman, Department of Animal Ecology, Iowa State University, Ames, Iowa 50011 (Phone 515-294-6417). Information on manuscript format, hotel reservations ($44/52), and conference registration is also available from Dr. Summerfelt.

Thesis and Dissertation Abstracts

On Red Snapper Caught by the Galveston, Texas Headboat Fishery: Movement, Population Characteristcs, and Productivity

Ian Rosman, M.S. 1983
Texas A & M University

Modern literature concerning red snapper *(Lutjanus campechanus)* is reviewed with particular attention to the Texas Gulf Coast. Red snapper were caught on headboats in waters off Galveston, Texas. A total of 1,431 red snapper was tagged using Floy "spaghetti" tags. Recaptures totaled 129 (9.08%), of which 17 (14.26%) exhibited movement of 9.3-27.9 km during the period of liberty. The majority (85.6%) of recaptures

were reported by headboat anglers. Fishing effort characteristics of the headboat fleet are described. Length frequencies of headboat red snapper catches collected by the author and by Texas Parks and Wildlife Department were converted to age-frequency distributions using red snapper growth data published by Nelson and Manooch (1982). Comparison of age-frequency distributions of red snapper landed at Galveston, Port Aransas, and Port Isabel, Texas showed marked juvenescence in the Galveston catches. Adjustment for seasonal bias removed some, but not all, of this trend. These findings were used to motivate a Ricker year-class yield model of the Galveston headboat fishery for red snapper. Various configurations and applications of the model are described, including an index of harvest that combines yield in weight and catch in numbers.

A Simulation Model of English Sole *(Parophrys vetulus)* Recruitment Mechanisms

G.H. Kruse, Ph.D. 1983
Oregon State University

A computer simulation model was constructed to investigate the following relationships between English sole and the marine environment: (1) fecundity and bottom temperatures, (2) hatching success and surface temperatures, (3) advective losses and winds, (4) stress mortality and storms, and (5) starvation and primary productivity. Hypotheses about these relationships were tested against observation, and curve fitting as a means of explanation was not attempted. Functional relationships of each hypothesis, and the relevant time series of physical and fishery data, were switched on or off as required in the model.

Recruitment was not affected by mortalities from storms or starvation from low primary production. About 12% of the variance was attributed to stock size, age structure, and individual fecundity. A complete model with egg production, hatching success, and transport accounted for 53% of the variation.

Larval fish survival is increased by seasonal spawning. Spawning, cued by warming shelf waters, is timed to match onshore transport that carries the larval fish and food organisms toward the nursery grounds. As data on future year-classes become available, the model can be used to evaluate further these relationships and their effect on recruitment.

The Relationships of Wood Debris to Juvenile Salmonid Production and Microhabitat Selection in Small Southeast Alaska Streams

C. Andrew Dolloff, Ph.D. 1983
Montana State University

Many small streams in southeast Alaska contain both wood debris deposited by natural causes and logging and populations of juvenile salmonids. In the past, resource managers have assumed that large amounts of wood debris were detrimental to fish populations and have recommended debris removal. This study was initiated to describe the effects of wood debris and debris removal on populations of juvenile coho salmon and Dolly Varden in four tributary streams of Staney Creek, Prince of Wales Island, Alaska during the summers of 1979-1981. Three streams were located in clearcuts and had debris removed from selected subsections by manual labor. A fourth stream was located in an uncut forest stand and provided information on fish populations under natural conditons.

Population densities and production typically were higher in subsections having debris accumulations intact. Production during June-September for age 0+ and age 1+ coho combined ranged from 0.46 to 2.50 g/sq m. Dolly Varden production ranged from 0.11 to 0.88 g/sq m. For coho, debris provided visual isolation, permitting larger numbers of fish to live together without excessive territorial interactions. Greater Dolly Varden numbers were related to increased cover provided by debris.

There was little apparent competition between the species. An examination of microhabitat preferences showed that each of two coho and three Dolly Varden age-classes was found in distinct areas. Coho occupied midwater positions that they defended from other fish. Dolly Varden were found on the stream bottom in dense cover. Analysis of stomach contents showed that coho selected most dietary items from the drift whereas Dolly Varden primarily exploited benthic prey.

Discriminant analysis showed that depth of focal point, depth of water, distance to nearest fish and distance to nearest cover were the most important variables accounting for separation of the five species-age class groups. Discriminant analysis using species as groups and incorporating the proportion of diet from terrestrial sources as an independent variable revealed that dietary differences also contributed to group separation. Stream cleaning in streams similar to those studied will likely be detrimental to anadromous juvenile fish populations.

The Relationship of Size-Class Distribution to Migratory Behavior in the Brown Shrimp *(Penaeus aztecus)* in Pamlico Sound, North Carolina

Mario A. Paula, M.S. 1983
Old Dominion University

The potential of migratory timing information for the dynamic yield estimation in the North Carolina brown shrimp fishery has been shown. The present research investigates the influence of size-class distribution on the quantitative characterization of migratory timing in brown shrimp. Catch and nominal effort data were stratified into count size ranges and the time density model of Mundy (1979) was specified for each stratum. The recruitment patterns of the shrimp into the fishery was also investigated.

The stratification of time densities by size-class has shown a definite pattern in the migratory behavior of the brown shrimp. It appears that recruitment by size-class to the fishery is discrete. Total yield estimates generated from the size-class stratification were frequently better than the yield estimates of Babcock in 1982 and Matylewich in 1982. Inferences can be made about the adaptive responses of brown shrimp to different environmental regimes by looking at the time density distributions.

Dissertation and Thesis Abstracts cont.

An Intraseason Forecasting System for Commercial Marine Fisheries

Erik J. Barth, Ph.D. 1984
Old Dominion University

The reliability of an intraseason yield estimation technique which is commonly used by Pacific salmon harvest managers is evaluated for applicability to a variety of commercial finfish and crustacean fisheries. The estimation technique is known as the average timing or the average performance model. The method is not easily related to standard statistical models, but does show some similarity to both a single parameter linear regression model and the ratio estimator of sampling theory. A comparison of these models, a two-parameter linear model, and a regression estimator is made to determine if the precision of forecasts of performance can be improved.

Forecasts by all methods are calculated on each successive time interval of the season. For a yield estimate by the average timing estimator, the cumulative catch of the current year is divided by the corresponding expected cumulative proportion of total yield. The time series of expected proportions is calculated from historical data. The linear model regresses annual yield on cumulative catch. Forecasts of period catches, by similar methods, have also been presented. Use of the estimation techniques has been extended to other measures of fishery performance, including catch-per-unit-of-effort (CPUE) data and abundance data.

Stratification of historical data, performed on the basis of statistical criteria, is used to select annual data series that have patterns similar to the current year. Such stratification is done in conjunction with the ratio estimator.

Six different estimators of annual performance were applied to 56 years of data from six different commercial fisheries. Two methods of forecasting performance for each time interval within a season were also used. The estimators were evaluated on the basis of the mean absolute percentage deviation (MAPD), where percentage deviation is the forecasting error expressed as a percentage of the forecast.

A simple linear regression model of annual performance versus cumulative performance for each time interval of the season proved to be more accurate than all other methods. In general, estimates improve as the season progresses but for all methods except the linear regression model are unreliable prior to the midpoint of the season. The overall precision of the linear regression forecasts are correlated with the variability of annual performance. Fisheries which exhibit conservative seasonal patterns of performance are well suited for this type of forecasting regime.

Factors Related to Selection of Fish Scales for Growth Studies of Yellow Perch, *Perca flavescens*

Ahmad Hassan Abdu-Nabi, Ph.D. 1984
Iowa State University

Standardization of the body area for scale sampling for growth studies of fish becomes more essential if the *a* value in the Fraser-Lee equation is to be standardized as suggested by Carlander in 1982. In a study on yellow perch (*Perca flavescens*) from West Okoboji Lake and Clear Lake in Iowa, the body area located at the tip of the pectoral fin below the lateral line was found to be the best area for scale sampling. This area exhibited the lowest variability in scale size and the lowest frequency of regenerated scales of the 10 areas sampled. The optimum number of scales to be sampled from the best area was three scales if at least one readable scale is sought. No significant difference in the body-scale relationship was found between sexes nor among the four seasons in which fish were sampled. There was a significant difference in the *a* value of the regression equation between West Okoboji and Clear Lake samples. The number of scales along the lateral line did not differ significantly among various fish lengths nor between sexes or the two sampled populations. The scale shape (scale radius/diameter ratio) changed in young fish as the fish grew in length until a total length of about 100 mm was reached, beyond which the scale shape remained constant. This feature of change in the scale shape contributes to curvilinearity in the body-scale relationship in young fish. Key scales sampled in two previous studies varied more in scale radius and in body-scale relationship than scales sampled from the best area.

Methods for the Comparison of Timing Behavior Applied to the Pink Salmon Fisheries of Prince William Sound, Alaska

Louis John Rugolo, Ph.D. 1984
Old Dominion University

Harvest control in salmonid fisheries was examined as a problem in the objective formulation of regulations which restrict the time and area of fishing. An ability to rigorously define and compare the form of the progression of the migration across time and between harvest areas was judged fundamental to objective harvest management decisions. The identification and evaluation of statistical methods appropriate to a quantitative comparison of empirical migratory time densities between years and harvest areas was performed.

Previously applied methods for the comparison of migratory behavior were shown to be lacking. The development of the measure of central tendency (mean date) of the time density as the consistent, unbiased estimator of migratory behavior was given. Practical evidence demonstrated that the mean date was highly resistant to factors which contribute variability to the basic expression of migratory behavior. The mean date was the statistic of choice to serve as the basis for the comparative analysis of empirical time densities.

Brood-year cycle and locality were treated as fixed effects in statistical analyses which were applied to the timing statistics of catch and spawning escapement. Fixed effects, two-way and one-way analysis of variance models were examined to analyze differences in the mean dates of migration. Multiple comparison analysis, Scheffe's *a priori* method, correlation, and multiple regression analyses were employed to objectively define the performance of the fishery and the escapement in time and space.

Highly significant differences were shown to exist between the timings of odd and even populations. For each cycle year for both catch and escapement the management districts were shown to be highly distinct with respect to timing behavior.

Considering even-cycle catch data, the combined migratory behavior in the Coghill and Northwestern districts was shown to be significantly different from the combination of the remaining districts. Multiple regression analysis revealed that these two districts explained 99.98% of the total variation in the sound-wide timing behavior. Using odd-cycle catch data, Northern, Coghill, and Northwestern combined had a highly distinct timing behavior from other districts, and they collectively explained 95.95% of the total sound-wide variation in timing behavior.

Linear combinations of escapement data for historically early districts were identified which collectively explained a large percentage of the total sound-wide variation in the mean dates of migration for both cycle years. For even-cycle escapement, the subset of districts consisted of Eastern, Northern, and Coghill, while for odd-cycle escapement several combinations of Eastern, Northern, Coghill and Southeastern Districts were suitable for predictive purposes.

It was concluded that migratory timing as a quantitative description of migratory behavior could be rigorously compared across years and harvest areas. Several statistical models were shown to be extremely robust for determining differences in migratory behavior when the measures of central tendency of the time densities were employed as modeled variables. Results of the analysis of even and odd cycles were consistent with the genetic distinctness between these two populations, and with the hypothesis of the genetic heritability of migratory timing.

The statistical system of analysis identified was shown to be highly appropriate for quantitatively describing the functional relationships between timing behaviors across spatial and temporal dimensions. It was concluded that this system will serve as a design standard for the comparison of migratory behavior, and that it will be applicable to the needs of harvest control for any migratory organism.

Determinants for the Timing of Escapement from the Sockeye Salmon Fishery of the Cooper River, Alaska: A Simulation Model

Howard A. Schaller, Ph.D. 1984
Old Dominion University

A model to estimate determinants for migratory timing of catch and escapement in a terminal salmon fishery is presented. A method was developed to estimate average seasonal migration rates of salmon through a harvest area from catch and escapement data. The time series for the total population of Cooper River sockeye salmon (*Oncorhynchus nerka*) was reconstructed in the reference frame of the commercial harvest area from catch and escapement data.

The catchability coefficients (q), derived from the reconstructed populations, were found to vary within season and between seasons. The relation between q and effort was attributed to a highly competitive fishery.

The differences found between the descriptive statistics for the time densities of catch and catch-per-unit-of-effort (CPUE) are attributed to varying q. In a highly competitive terminal fishery the time density of catch was found to be a better representation of the time density of total abundance than that of CPUE. The comparison of the time series of daily proportions of catch and CPUE was found to be a valuable diagnostic tool for determining whether q was variable over a season.

It was inferred from the reconstructed time series of total abundance that escapement from the commercial harvest area was underestimated by the sonar counter. The underestimation of escapement from the commercial harvest area may be attributed to two sources; (1) the delta stocks are higher than point estimates found by stock-separation studies; (2) the enumeration of escapement to the upper Cooper River spawning areas are being underestimated by the sonar counter.

The simulation model was a useful tool for investigating the behavior of migratory time densities and for evaluating the success of alternative management strategies in terms of distributing an escapement goal proportionately over time.

Evaluation of Three Strains of Rainbow Trout Stocked in a Reservior Where the Ectoparasite *Lernaea cyprinacea* is Endemic

George John Babey, M.S. 1983
Utah State University

Three strains (Ten Sleep, Sand Creek and Shepherd-of-the-Hills) of rainbow trout *(Salmo gairdneri)* were stocked as fingerlings in a 277-ha Utah reservoir and compared for growth, body condition, return to the creel, and parasitism by *Lernaea cyprinacea.* Fish marked with fluorescent spray and tetracycline marking techniques were stocked in the spring of 1981 and 1982, and were subsequently captured with gill nets and sampled from anglers' creels. Vertical gill nets were used to compare the vertical distribution of the strains. An angler survey was conducted to determine anglers' use of creeled fish.

The Ten Sleep strain grew better both years and exhibited the highest return to the creel compared to other strains. Percent return of each strain was similar in gill nets and in anglers' creels. Good fingerling quality at stocking has a positive influence on return to the creel. Body condition was generally equal among strains. The Sand Creek strain had significantly more *Lernaea* than the other strains during both years. Rainbow trout had significantly more *Lernaea* than Utah suckers *(Catastomus ardens)* or redside shiners *(Richardsonius balteatus).* Histological analyses revealed destruction of host tissues, edema, and leucocytic infiltration at the site of *Lernaea* attachment on rainbow trout. Parasitism by *Lernaea* in August and September had a negative effect on wound healing, growth, and body condition of rainbow trout, which was not evident until October and November.

Dissertation and Thesis Abstracts cont.

A Description and Analysis of the Timing of Virginia's Weakfish Fishery

Bruce William Hill, M.S. 1984
Old Dominion University

The seasonality of Virginia's weakfish fishery is quantitatively defined by providing a mean time of catch and variance of catch for the years 1960-1981. On the average, the central half of the population is available for harvest from mid-May through September in all of Virginia's waters, and the mean date of harvest is July 20th. The 22-year average variance of catch for Virginia's waters is 3.97. In Virginia's Chesapeake Bay tributaries the mean date of harvest is July 17th and the 22-year average variance of catch is 2.50. There is evidence for an inverse relationship between the mean date of harvest and variance of catch for both Chesapeake Bay tributaries and all of Virginia's waters. In Virginia's waters only, the variance of catch is proportional to the magnitude of harvest. The average error for prediction of total annual harvest exceeds 100% during the month of April, while dropping steadily to 18% by August. The average error of estimation at the end of June was 50%. The average semi-annual price per pound does not appear to be related to the mean day of catch.

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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: Dr. Oliver B. Cope, 15 Adamswood Road, Asheville, NC 28803. Subscription $15 a year to Institutions and Non-Members.

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VOL. 13, NO. 4 AUGUST 1984

AIFRB Members in AFS People-to-People Delegation

The American Fisheries Society sent a delegation to Finland, Russia, and China in June as part of the People-to-People Program. This program was conceived by President Eisenhower to foster better understanding between people of the United States and the rest of the world, and provides Americans the opportunity to travel in congenial groups with similar occupational or professional interests. The AFS delegation of 36 members, including some wives, traveled to Helsinki on June 9 and returned from China on June 30. Included in the goodwill group were 12 AIFRB members and 7 AIFRB wives.

The delegation visited Helsinki, Finland; Leningrad and Moscow, Russia; and Beijing, Wuchan, Wuxi, and Shanghai, China. We had numerous visits, tours, and meetings with fishery counterparts in all these cities and their environs. We conferred with government fishery officials, university professors, museum curators, fishery researchers, ichthyologists, and private fish farmers, and visited fish farms, museum collections, fishery laboratories, fishing operations, fish markets, village communes featuring integrated resource management, a hydrobiology institute, and other facilities relating to fishery science.

In addition to the professional contacts, the group did considerable sightseeing and rubbed elbows with the people of these countries in a down-to-earth manner.

Eels for sale in Wuxi outdoor market.

We all came home with the feeling that the goodwill aspects of our program were successful, and that the fishery features of the tour helped make better professionals of all of us.

Oliver B. Cope
Asheville, NC

Second Student Travel Raffle Winners

AIFRB announces the names of the winners in the second drawing in the new Student Travel Raffle program. The winners, all of whom will use their awards to attend the American Fisheries Society meetings in Ithaca, New York in August, are:

Kathleen Mathews, University of Washington
Richard Frie, University of Minnesota
Daniel Hayes, Michigan State University
Douglas Austen, Virginia Polytechnical Institute
Julie Massey, Texas A & M University

It is important for nominators to know that applicants for the Student Travel raffle drawings must be Associate Members of AIFRB in good standing. In the June drawing, two of the applicants were not Associate Members of AIFRB, and so were not eligible for consideration.

Marine Fish Enhancement

The Southern California District of AIFRB sponsored a symposium on *Challenges and Potentials of Marine Fish Enhancement in Southern California* on June 8, 1984 in San Diego, California. The symposium was a review of the potential for development of marine fish hatcheries in southern California to enhance stocks of coastal species, with particular reference to the State of California Ocean Resources Enhancement and Hatchery Bill (AB 1414).

Foreword

Assembly Bill 1414, which provides for the establishment of an "Ocean Resources Enhancement and Hatchery Program," was signed into law by the Governor of California during 1983. This program provides for evaluation of artificial propagation, rearing, and stocking of marine fishes. The program is supervised by an advisory panel consisting of representatives

cont. page 2

Marine Fish Enhancement Cont.

from the California Department of Fish and Game, the state university system, sport and commercial fishing interests, and the California Aquaculture Industry Advisory Committee. The bill provides for funding from special stamps sold to sport and commercial fishermen, but additional funding from other sources can also be used. The funding from the special stamps is expected to amount to about $300,000 a year for the 5-year period of the program (1984-1988). If the results appear to be promising the program can be extended after that period has ended. Anyone from a non-profit organization which was conducting research related to the objectives of the program prior to 1984 may submit proposals for funding for projects to be carried out under this program. Endorsement by a majority of the advisory panel is required for approval of any project.

Initially the emphasis will be on white seabass, *Atractoscion nobilis,* and California halibut, *Paralichthys californicus.* According to the instructions for the preparation of research proposals the immediate goals will be "brood stock capture and maintenance, artifically stimulated spawning in tanks, successful hatching and rearing of larvae and/or small juveniles, and development of a model to evaluate and predict probable results of stock enhancement based on known enconomics of hatchery operation and known biology of target species," and the long-range goals will be "assessment of age pattern of natural mortality during first year of life (in nature) to determine optimum age at release; geography of survival (in nature); where should releases be made to maximize survival; assessment of mechanisms to trace hatchery-reared fish in nature (tagging, mutants, biochemical or morphometric identification, etc.); and assessment of the success of released, reared young in nature."

On June 8, 1984, the Southern California District of the AIFRB sponsored a symposium on this bill. This symposium, held at the Tuna Hall of Progress, Van Camp Seafood Company, San Diego, was attended by more than 70 persons, including public officials, biologists, representatives of sport and commercial fishing interests, aquaculturists, etc. The symposium chairman was Craig J. Orange, Inter-American Tropical Tuna Commission, and the program chairman was Dr. John R. Hunter, U.S. National Marine Fisheries Service. Mr. Orange expressed the goals of the symposium by stating that the Ocean Resources Enhancement and Hatchery Program bill presents a challenge to our society to improve the fisheries resources available to saltwater fishermen in Southern California. This may be an opportunity for the AIFRB to assist the fishing industry by using our skills and training to help meet the goals of the legislation. It was generally agreed that the meeting was successful, as persons with different backgrounds and interests had the opportunity to state their views and learn from the views of others.

The keynote speaker was Assemblyman Larry Sterling of San Diego, the principal author of the bill. He stated that the resource of marine fish is diminishing, while the number of people who wish to catch the fish is increasing. Reducing the share of one user group to increase the share of another is obviously not the answer to the problem. The objective of the bill is to increase the size of the resource so that everyone can catch more fish. This objective can most likely be realized by a carefully planned program carried out by qualified persons using information on the life histories of the fishes under consideration, the ecology of their habitat, and the results obtained with similar programs in other parts of the world. In addition to the possibility of increasing the population of marine fish, the information collected in the course of the program is likely to be useful for other purposes, as has been the case in the U.S. space program and other such endeavors.

After Assemblyman Sterling's address short talks on various aspects of the program were given by six speakers. Abstracts of these talks follow.

The Fisherman's Perspective of Marine Fish Enhancement

To describe the fisherman's perspective of marine fish enhancement is a complex task encompassing commercial and recreational fisheries, industry perspectives, the opinions of conservation groups, and the viewpoint of the individual angler.

Commercial fishermen tend to be skeptical of marine fish enhancement due to their view of natural events being the ocean's controlling force.

The recreational fishing industry is fully in favor of marine fish enhancement. The commercial passenger fishing vessel (CPFV) fleet has historically pushed for catch enhancement through introduction of exotics to improve coastal fishing. The fleet itself is now split between the previous attitude and one favoring stock enhancement as an investment in its future.

The manufacturing and retail industry generally favors what anglers favor and have given support to marine fish enhancement projects.

Conservation groups supported by recreational anglers are committed to ecosystem management, are leery of the introduction of exotics, and feel stock enhancement is the only reason for marine fishery enhancement. Even that is viewed as a bonus because research leading to stock enhancement will provide early life history information and other important research opportunities.

To individual fishermen the answer is more simple—marine fish enhancement gives each of them hope that despite the seemingly insolvable problems facing marine fisheries there is the possibility that their favored activity will be secure.

Carl E. Nettleton, *Executive Director*
National Coalition for Marine Conservation
530 'B' Street, Suite 1335
Los Angeles, CA 92101

White Seabass, California Halibut, and the Growing Potential for Artificial Enhancement of California's Marine Fisheries

The biology and current status of the populations of both white seabass and California halibut indicate that these species may be prime candidates for artifical enhancement of their populations. The growing

numbers of users of marine fish resources in California will provide an increased demand for marine fish, both for recreation and commercial sale.

Robson A. Collins and Marija A. Vojkovich,
California Dept. of Fish and Game
1301 West 12th St.
Long Beach, CA 90813

Implementation of the Ocean Resources Enhancement and Hatchery Bill

The Ocean Resources Enhancement and Hatchery Program, as provided for in AB 1414 by Assemblyman Sterling, has been in effect since January 1, 1984. Several of the provisions of AB 1414 specify intent and direction with respect to implementation and provide a mandate to the Department of Fish and Game in carrying out its provisions. The Department's first step in implementing the provisions of AB 1414 was to appoint the members of the Ocean Resources Enhancement and Hatchery Advisory Panel, commonly known as OREHAP. The members, acting in an advisory capacity to the Director, assist in establishing policy direction for research projects to be funded under the Ocean Resources Enhancement and Hatchery Program (OREHP).

The white seabass and California halibut are the two species OREHAP members selected for the initial research phases of OREHP; OREHAP also identified priority 1 and 2 research areas for the initial phases of OREHP. Priority 1 research areas included brookstock capture and maintenance; artificially stimulated spawning in tanks; successful hatching and rearing of larvae and/or small juveniles; and the development of a model which would address the cost/benefit ratios of stock enhancement and hatchery operations. Priority 2 research areas are basically concerned with the various phases of stocking and subsequent survival in the wild. Fourteen preliminary research proposals (PRP's) were submitted for funding consideration. Of these, nine were preliminarily approved for submission as final research proposals (FRP's), with a submission deadline of June 30, 1984.

The next meeting of OREHAP will be July 9, 1984, to consider and approve the FRP's selected for funding under OREHP. We hope to have the approved project(s) underway by September or October, 1984. Implementation of the provisions of AB 1414 is proceeding on schedule and should produce valuable information during the next several years regarding the feasibility of artifical propagation, rearing, and stocking of the marine fish species being investigated.

A. Petrovich, Jr., *Chief, Marine Resources Branch*
California Dept. of Fish and Game
1416 Ninth Street
Sacramento, CA 95814

Historical Perspective on Hatcheries for Marine Fish Stock Enhancement

Dr. G.O. Sars suggested in the 1860's the possibility of using hatcheries to smooth out the violent fluctuations in the catches of cod in northern Norway. His suggestion, which was based on his having identified cod eggs to be pelagic, and on having just artifically hatched some himself, was to be picked up in the United States, Norway, and Scotland. The U.S. efforts, initially sponsored by Dr. Spencer Baird of the recently created Fish Commission, resulted in decades of ultimately fruitless hatchery releases of yolk-sac larvae. The Norwegian efforts were sponsored by one Captain Dannevig, who felt that something needed to be done for the fishermen. Through his efforts a private fish hatchery was established in southern Norway, in the town of Arendal. As in the U.S. efforts, Captain Dannevig's hatchery proceeded without the benefit of science to release millions of yolk-sac cod larvae.

However, Dannevig's aspirations soon exceeded the financial resources of even the rather wealthy citizens of Arendal, and he went to the Norwegian government for support. Norwegian fishery research was then controlled by Dr. John Hjort, a particularly skeptical scientist. He did not share Dannevig's confidence in the utility of releasing these very small cod, and felt that the effort was doomed just on the basis of numbers alone. A series of experiments were agreed to, although reluctantly by Dannevig, to provide conclusive proof of the utility of Dannevig's hatchery. Despite overwhelming failure of the experiments to show the benefits of the releases, the Norwegian government bowed to public sentiment and took over the hatchery in 1910; cod larvae were released for the next half century.

The U.S. hatchery efforts fell to the control of various retired military pesonnel after Spencer Baird's death, and the possibility of experimental tests of the utility of the hatchery work was lost. The primary support for the program was various letters of testimonial to the wonderful results of the hatcheries in creating new fish stocks, and in creating large numbers of juvenile lobsters seen stranded. None of these testimonials, used so freely by the Fish Commission in justifying its work, was ever investigated.

The Scots also became interested in using fish hatcheries to augment their stocks of plaice. However, they lived up to their reputation as being dour and skeptical, and undertook some experiments of their own. Although their results were always subject to possible interpretation in favor of hatcheries, the most obvious conclusion was that the effect on the plaice populations was negligible. Fortunately, at least in one country, saner heads prevailed. The hatcheries were abandoned, and marine fish enhancement did not dominate fishery research.

Recent renewed interests in marine fish enhancement are different from and yet very similar to this early interest. The differences are the vastly more sophisticated approach, invoking modern technology to improve efficiency, and modern ecological theory to improve the effectiveness of each released fish. The similarities to earlier attempts lie in the tendency to uncritical acceptance of the utility of hatching for stock enhancement. Although the improvements in technology and the releasing of larger fish ought to make each fish released and each dollar spent more effective, experimental proof is needed if the mistakes of the past are to be avoided. A research program which does not include a large proportion of its effort in

testing the effectiveness of its releases is doomed to a limited life span because only proof will guarantee continued support.

Tim D. Smith, *Southwest Fisheries Center*
U.S. National Marine Fisheries Service
La Jolla, CA 92038

Technology and Cost of Marine Fish Hatcheries

White seabass and California halibut have been reared through all life stages using small-scale culture systems, and the adults of both species reach sexual maturity and spawn in the laboratory. The hatchery work that remains to be done is the development of the technology for large-scale culture systems for these species (e.g., volume $\geq$ 20m^3 per unit). In the last 5 years significant advances have been made in hatchery systems for mass production of finfish. This technology can be used to produce white seabass and California halibut fry. Research on the culture of these species should address the slow growth of juvenile halibut, sibling cannibalism of white seabass, early weaning to dead foods, and the usual economic, engineering and disease problems associated with mass production of seed and juvenile fishes. Owing to the high cost of producing live foods required by marine fish larvae (algae, rotifers, and brine shrimp) and labor costs, intensive tank culture of marine fish fry may cost 5 times more than rearing of rainbow trout or other freshwater fishes. Pond culture, where the natural production of zooplankton is used for food, may be a less expensive method for producing white seabass fry.

The goal of the marine hatchery act (AB 1414), to enhance large marine fish stocks that exist in the open sea, is unique. The production of marine fish hatcheries elsewhere in the world is used either to produce fish for market or to enhance small stocks that occur in partially enclosed areas (red seabream in the inland Sea of Japan; cod in the fjords of Norway), or to enhance the recreational catch of juveniles (red drum in Texas bays). Two significant constraints to stock enhancement are that artifically reared fish are equivalent to those from natural reproduction and that enhancement can be scientifically evaluated.

John R. Hunter, *Southwest Fisheries Center*
U.S. National Marine Fisheries Service
La Jolla, CA 92038

Evaluation of Effects of Stocking on Marine Fish

Past efforts at artificial propagation of marine fishes for purposes of stock enhancement have lacked rigorous evaluations. Little quantitative evaluation of a program's success can be obtained without marking the hatchery-produced fish. Small fish could be given a tetracycline mark on their otoliths, while larger fish could bear a coded-wire nose tag and be fin-clipped for external identification. The marked fish would provide substantial information on rates of return, survival rates, behavior, population size, and other vital parameters. Long-lived fish may not contribute to the harvest for many years after their release. Based on assumed rates of survival and no immediate post-release mortality, about 20 1-year-old white seabass would have to be released to replace an average (10-year-old) fish caught by the commercial fishery. Thus an annual hatchery production of 70,000 1-year-old fish would be required to replace the present level of commercial harvest. Biological (i.e.survival) and economic (i.e. interest rates, fish prices, and harvesting costs) discounting require that 1-year-old fish be produced for less than $1.00 apiece, a price that may be difficult to achieve. This emphasizes that a marine enhancement program should be coordinated with effective controls on harvesting. A fish that avoids being harvested "augments" the stock at a much lower price and several years earlier than would a hatchery-produced fish. Usually, overfishing is a major contributing cause of the depleted status of the stock to be enhanced. Without bringing harvesting rates into balance with natural rates of productivity, artificial stock enhancement is unlikely to succeed.

Alec. D. MacCall, *Southwest Fisheries Center*
U.S. National Marine Fisheries Service
La Jolla, CA 92038

Summary

After the talks a panel discussion was held. It consisted of questions and comments from members of the audience directed at the six speakers, their replies, and exchange of ideas among the speakers. The topics of conversation ranged from broad philosophical concepts to specific questions and comments regarding implementation. It was generally agreed that success is by no means certain. There is no doubt that fish can be hatched and reared in captivity, but the cost per fish and the proportions of the fish which would survive when released are unknown. It is essential that the best available propagation and rearing techniques be used and that data necessary to evaluate the impact of the program be collected. Unfortunately, due to the long life spans of the white seabass and the California halibut, it is unlikely that the necessary data will become available during the initial 5 years of the program. It is nonetheless important to release hatchery-raised fish during this initial period, both to initiate scientific evaluation of their survival and the provide the supporting fishermen with a sense of accomplishment.

Several members of the audience pointed out that this program is not a panacea, as the declines in white seabass and California halibut are probably due to environmental degradation and overfishing, and those problems must be addressed unless artificial propagation and rearing is to continue in perpetuity (i.e. catch enhancement, rather than stock enhancement). It was generally agreed that the program provided for in the bill must be carried out in concert with management of the fishery and protection and improvement of the environment, especially since publicity associated with the program might cause increased fishing on already depleted populations. It was agreed that even if the success of the program is limited it is likely that much information useful for other purposes will be collected during the course of the investigations. For example, release of tagged fish reared in hatcheries could provide an inexpensive method for investigating migrations, growth, and mortality, and consequently might allow more effective population and habitat management.

Spring Die-off of Alewives and Smelt in Northern Lakes Michigan and Huron

Biologists, fishermen, and the local press reported a widespread die-off of alewives and smelt in northern Lake Michigan and northern Lake Huron during April, May, and June 1984. The die-off was heaviest in State of Michigan waters of eastern Lake Michigan, above the 45th parallel, but extended south to Sturgeon Bay, Wisconsin on the lake's west shore. Most dead and dying alewives were yearlings, whereas smelt of several age-groups were involved. The windrows of dead alewives subsequently stranded on certain beaches reminded some observers of the heavy mortalities observed during the massive die-off in 1966-67 at the peak of the alewife's "population explosion" in Lake Michigan.

The public's interest in these die-offs and the status of the alewife in general reflects the importance of this nonendemic species as forage for lake trout and other salmonid predators. Indeed, its high abundance in Lake Michigan in the 1960's and 1970's is credited for the spectacular growth there of coho and chinook salmon which were first planted in 1966 and 1967, respectively. Although the alewife is also suspected of competing with other species for food and space, and preying on their eggs and fry, it has filled a partial void in the prey-fish community left by the mid-century decline of lake herring and several species of deepwater ciscos or "chubs", of which all but one are now rare or extinct in Lake Michigan.

Cold stress and/or thermal shock in the Lake's northern reaches, possibly complicated by a limited invertebrate food supply (speculation only), is the most plausible cause of the alewife die-off in 1984. The winter and spring of 1983-84 were among the harshest in recent years, and alewives are known to be less tolerant of low water temperature than are various native species with which they "associate." Poor physical condition of the alewives caused by high population density, such as that which preceded the two heaviest die-offs ever recorded on the Great lakes (i.e., Lake Michigan in 1966-67 and Lake Ontario in 1976-77) would have made them even more vulnerable to cold stress or shock in winter and spring. However, by fall 1983, the adult alewife population in Lake Michigan had declined to the lowest level recorded since its upsurge of the 1960's, and condition of the adults, at least, was relatively good.

Some biologists have suggested nevertheless that young alewives and possibly smelt have become more abundant and therefore more prone to die-off in some northern areas of Lake Michigan because of a scarcity of large predators. The abundance of lake trout has indeed been reduced by incidental catches in commercial fisheries for whitefish and by a moratorium on the stocking of lake trout in prime northern whitefish waters, State of Michigan. It is also a fact that almost all salmon plantings in State of Michigan waters of Lake Michigan are made south of the 45th parallel.

The prey fish community in Lake Michigan has undergone changes in recent years that appear to offset reduction in alewife abundance. The bloater chub, smallest of the deepwater ciscoes, and historically a very important prey fish for lake trout, has recovered dramatically. Smelt have roughly doubled in abundance. Finally, yellow perch appear to have produced the strongest year-classes since the 1950's in the warmer inshore areas of the southern basin.

E.H. Brown, Jr.
Great Lakes Fishery Laboratory
Ann Arbor, MI

FAO World Fisheries Conference

The FAO World Conference on Fisheries Management and Development has ended after approving by consensus a global strategy and five special action programs.

The Conference, the largest intergovernmental meeting on world fishery problems and prospects ever held, began on June 27 with addresses by King Juan Carlos I of Spain and Edouard Saouma, Director-General of the UN Food and Agriculture Organization (FAO). It was held at FAO headquarters in Rome, Italy.

The Conference reviewed the world fisheries situation both as regards marine and inland water fisheries, including aquaculture. It agreed on the need to promote fishery development in light of current and future world food and nutritional needs and third-world development, taking into account the new situation created by the almost universal proclamation of Exclusive Economic Zones (EEZS) in coastal waters as codified by the U.N. Convention on the Law of the Sea adopted in 1982.

Special emphasis was laid on aquaculture as a source of protein food and on the need to assist small-scale fisheries in developing countries.

Mr. Saouma declared that "one can say that this has been an historic event in the world of fisheries" since "this was the first time that nearly all the nations of the world, great and small, came together to discuss on such a comprehensive basis the fundamental problems of fisheries as a vital global source of food, employment, and income".

The strategy lays down policy principles and guidelines for fishery management and development in the new world situation. The aim is to enhance the role of fisheries in contributing to national economic, social, and nutritional goals. Coastal developing countries, in particular, stand to gain from the proclamation of exclusive economic zones in their waters. However, improved national self-reliance in fisheries management and development is needed if they are to benefit fully from the advantages offered by EEZS under the new Law of the Sea. The strategy also affirms the need to boost international trade in fish and fishery products, promote greater investment in fisheries management and development, and increase economic and technical cooperation in fisheries management and development.

The Conference noted that "Fish is an essential part of daily diets in many developing countries and provides nearly one-quarter of the world's supply of animal

FAO World Fisheries Conference Cont.

protein and that in many countries fisheries are important sources of employment, income, and foreign exchange."

The action programs involve proposals for the planning, management, and development of fisheries, development of small-scale fisheries, aquaculture, international trade in fish and fishery products, and the promotion of fisheries in alleviating undernutrition.

In its other resolutions, the Conference:

Requested donors and financial institutions to provide funding for the action programs; asked greater priority for fishery investment projects and urged the World Bank and other funding agencies to accord special and favorable attention to projects for investment in fisheries; called for international action to combat pollution in the Exclusive Economic Zones of developing countries; suggested that an International Year of the Fisherman be instituted; called for greater technical and economic cooperation among developing countries in fisheries; and called for greater international solidarity for land-locked countries, particularly in the African Sahel.

Pedro Ojeda Paullada, Secretary of Fisheries of Mexico, served as chairman of the Conference.

District Activities

FLORIDA

E.D. Prince, *Director*

Dr. Karen Steindinger (Florida Dept. Nat. Res.) gave a seminar on DNR research in Florida's coastal waters at the annual AIFRB dinner meeting, May 24, 1984. FEA committee chairman Dr. James Bohnsack announced that he will head an AIFRB effort to produce a "white paper" on artificial reef managment policies in Florida coastal waters. An award of appreciation was also given to Don Allen for his 17 years of continuous service to the Florida district. Don is retiring this year.

NORTHWEST WASHINGTON

Ed. A. Best, *Director*

At our May meeting, Mr. Colin Harris, Fisheries Research Institute, University of Washington, spoke on the recent U.S.-U.S.S.R. cooperative high seas salmon research program. As background for the talk a brief history of U.S. participation in international Pacific salmon research was given.

In 1979, an exchange of sockeye salmon scales was initiated with the U.S.S.R. A Soviet tagging program in 1980 proved to be less successful than planned with only 63 salmon caught in 20 sets, of which 54 were tagged and 1 recovered. By 1982, formal bilateral discussions arranged for an exchange of information pertinent to salmon management. Arrangements were made for two U.S. scientists to participate in a high-seas tagging program in 1983. In 100 sets about 1,600 salmon were caught and about 1,400 tagged, with 28 recoveries to date. Extremely cold water was encountered in the central north Pacific, temperatures were actually higher in the Bering Sea, and most of the catch was pink and chum salmon. For 1984, the U.S. will again provide personnel for a tagging operation although the budget will not permit participation by a U.S. vessel. Arrangements have been made for exchange visits of scientists to salmon research facilities of both countries.

SOUTH CENTRAL GREAT LAKES

C.R. Liston, *Director*

AIFRB Secretary Herb Lawler announces that an election has been held in the South Central Great Lakes District, and that Howard A. Tanner has received the majority vote for the office of Director. We all thank Charlie Liston for his past service and wish Howard the best of luck!

SOUTHERN CALIFORNIA

R.G. Rinaldo, *Director*

Our February meeting was highlighted by a presentation to the members of Gary Davis, Research Biologist, Channel Islands National Park entitled "Marine Monitoring of Resources in the Channel Islands". Mr. Davis told us of the ongoing monitoring of the marine and terrestrial resources at five islands lying off southern California.

The May meeting featured Dr. Richard Bray, California State University at Long Beach, who presented "Life in a Fish Bowl", which dealt with his work in the underwater habitat Hydrolab.

Dr. Craig Orange, Chairman and organizer, gave a progress report on the upcoming Southern California District AIFRB Annual Symposium entitled "Challenges and Potentials of Marine Fish Enhancement in Southern California. This symposium deals with the potential development of marine fish hatcheries to be used to enhance stocks of coastal fishes. The topic was selected partly in response to the recently passed California Ocean Resources Enhancement and Hatchery Bill (AB 1414). Speakers include Assemblyman Sterling, author of the bill, and representatives from the Department of Fish and Game, National Marine Fisheries Service, and the National Coalition for Marine Conservation. Program Chairman is Dr. John Hunter, NMFS, Southwest Fisheries Center. See article in this issue of BRIEFS.

Fishery Legislation

History Made — Dingell-Johnson Fund Expanded

July 18, 1984, marks one of the most significant dates in the history of fishery research and management in the U.S. On that date President Ronald Reagan signed the Deficit Reduction Act of 1984. Within this mammoth legislation, which combines tax code revision with spending reduction, is a historic provision that will expand "Dingell-Johnson" (D-J) excise taxes on fishing-related items and redistribute tax revenues collected on motor boat fuels and imported fishing tackle and boats. Annual funding for state fishery agency research, management, facilities, and education programs is expected to increase by nearly $100 million. New monies will be allocated to marine as well as freshwater pro-

grams and may be used to underwrite the cost of aquatic resource education programs.

The significance of expanded federal aid for fishery programs, for fishery resources and for our future as professionals, cannot be overstated.

Many individuals gave unselfishly of their time and energy over the years to help expand D-J. To list the key figures would fill many pages. However, special recognition must go to the primary Congressional sponsors of D-J expansion over the years: Rep. John Breaux (LA), Sen. Jennings Randolph (WV), and Sen. Malcolm Wallop (WY). In addition, we owe a special debt to Carl Sullivan, Executive Director of the American Fisheries Society, who as Chairman of the D-J Steering Committee and later Co-Chairman of the Sport Fishing and Boating Enhancement Committee, provided the leadership that brought together and held our forces strong through a series of demoralizing defeats until ultimate victory.

Federal Budgets Look Good — So Far

FWS — The House Committee on Appropriations has recommended a budget for the Fish and Wildlife Service's fishery resources programs nearly $3 million above the President's request (see BRIEFS 13(2):1-3). Included in the increase is $1.3 million to restore seven hatcheries scheduled for deletion from the federal hatchery system, $1 million for hatchery maintenance, $300,000 restoration for fishery research at the LaCrosse laboratory, $200,000 to begin staffing the Gainesville Fishery Research Laboratory, $600,000 to continue the Emergency Striped Bass Study, and $500,000 to plan an anadromous fishery research facility on the Connecticut River, Massachusetts. Also included is restoration of the Cooperative Fishery and Wildlife Research Unit Program to current funding levels and a mandate to provide the units with full staffing. The full House is scheduled to vote on the committee's recommendations soon. The Senate is expected to begin action on the USFWS budget in late July.

NMFS — On 31 May the House passed the appropriations bill containing National Marine Fisheries Service funding. The Senate passed its version of the NMFS appropriations bill on 28 June. Both the Senate and House versions would restore funding to current levels for nearly all NMFS programs, such as the Regional Fishery Management Councils, resource surveys, anadromous fish grants, and striped bass research. In addition, substantial increases above current funding levels would be provided to habitat conservation ($0.85 million), habitat research ($0.5 million), and commercial fisheries research and development grants ($1.0 million).

Attached to the House version is an amendment offered by Rep. Clarence Miller (OH) that would impose a 4% across-the-board cut of NMFS funds; the Senate tabled a similar proposal offered by Sen. Don Nickles (OK). A House-Senate conference committee is expected to resolve differences in the two versions of the bill during the latter part of July.

New Anadromous Fishery Research Laboratory

Thanks to the efforts of Rep. Silvio Conte (MA), anadromous fishery research in the Northeast may get a major boost. The USFWS funding bill passed by the House Appropriations Committee includes "$500,000 to design an Atlantic anadromous fish research center on the Connecticut River in Massachusetts." Programs of the proposed lab would be in addition to ongoing federal anadromous fishery research. For a summary of anadromous fishery research needs in the Connecticut River/Northeast, please contact Rudolph Rosen, 1412 16th Street, N.W., Washington, DC 20036.

This year's appropriation will provide only for research facility design. Actual construction and operation funding will come later. To express your support for Mr. Conte's efforts and urge his continued leadership in funding fishery research, please send a short note to The Honorable Silvio Conte, U.S. House of Representatives, Washington, DC 20515. It is imperative we let our friends in Congress know we appreciate their efforts on our behalf.

Rudolph Rosen, *National Wildlife Federation, Washington, D.C.*

Announcements and New Publications

Fish Culture and Fishery Management Symposium

The Fish Culture and Fisheries Management Sections of the American Fisheries Society are organizing a symposium entitled *Fish Culture, Fish Management's Ally?* The symposium will be held March 31 - April 3, 1985 at the Lodge of the Four Seasons, Lake Ozark, Missouri.

The objectives of this symposium are to:

1. Synthesize and publish key information on the cooperative role of fish culture in fishery management.
2. Define common principles for the use of cultured fish in fishery management.
3. Identify needs and opportunities for improvement of fish culture in meeting fishery management goals.

This symposium will provide a state-of-the-art assessment of the modern role of fish culture in fishery management and will provide a forum for exchange of ideas between managers and culturists. This will result in better understanding of the problems, opportunities, and the necessity for increased day-to-day communication if we are to meet the needs of growing numbers of fishermen in a finite environment.

The symposium will address the role of fish culture in fishery management in the United States and Canada. The program will include five technical sessions dealing with warm/coolwater, coldwater, marine, anadromous, and exotic fishes.

Each technical session will include a mixture of invited review papers and contributed case histories. Review papers will encompass and synthesize current and projected applications of fish culture in freshwater and marine fishery management; case histories will be contributions resulting from specific uses of cultured fish in fishery management.

All correspondence concerning the symposium should be sent to: **Delano R. Graff,** *Chairman,* **AFS Symposium Committee, Pennsylvania Fish Commission,** 450 Robinson Lane, Bellefonte, PA 16823-9616, Telephone (814) 359-5154.

Wild Trout III Symposium

Sponsored by the Federation of Fly Fishers, Trout Unlimited, the U.S. Department of the Interior, and the U.S. Department of Agriculture, *Wild Trout III Symposium* will take place at Yellowstone National Park on September 24 and 25, 1984. After the welcome and introduction, there will be workshops and discussions of **Where the Trout Live, Catch and Release, Saving the Dirt and Water,** and **People, Politics, Pesos.** The Symposium Chairman is Roger Barnhart, Humboldt State University, Fish Unit, Arcata, CA 95521.

Eighth Symposium on Statistics, Law, and the Environment

The Eighth Symposium on Statistics, Law, and the Environment is scheduled for October 15-16, 1984, at the National Academy of

Announcements and New Publications Cont.

Sciences, Washington, D.C. The Steering Committee for the Symposium, chaired by Dr. Clifford Russell, Resources for the Future, is composed of representatives from the American Statistical Association, the National Academy of Sciences/National Research Council's Committees on National Statistics, Toxicology, Applied and Theoretical Statistics, and the Environmental Studies Board; Natural Resources Law Section of the American Bar Association; American Economic Association, Society for Epidemiologic Research; American Public Health Association; Society for Toxicology; and the Society for Risk Analysis.

These biennial symposia were initiated in 1970 to address the problems in areas of major environmental concern to serve as a forum for exchange of knowledge in fields concerned with environmental decision-making problems. At the Eighth Symposium there will be four sessions: data needs and problems, modeling, forecasting, and policy implications. Within each session there will be presentations on hurricanes, fishery and forest management, materials damage from ambient pollution, and health damage from workplace air pollution. Proceedings will be published in *The American Statistician,* a professional quarterly journal of the American Statistical Association.

For further information regarding the program topics and speakers, and registration materials, please write to Ede Denenberg, ASA, 806 15th St., N.W., Suite 640, Washington, DC 20005.

Directory of North American Fisheries Scientists

The *Directory of North American Fisheries Scientists, 1983* is being published by the American Fisheries Society. This "Who's Who" in aquatic and fisheries science contains names, addresses and telephone numbers, employers, subject specialties, and geographic directory for over 8,000 individuals in all aspects of aquatic life sciences. The book costs $25.00 for AFS members and $30.00 for non-members. Order from the American Fisheries Society, Bethesda, MD.

Progressive Fish-Culturist

The *Progressive Fish Culturist,* formerly published by the U.S. Fish and Wildlife Service, is now published by the American Fisheries Society. This quarterly, which contains articles on culture systems; hatchery materials and equipment; growth, feeding, and nutrition; disease; and population studies, breeding, and rearing, costs $12.50 in the USA, and can be ordered from the American Fisheries Society in Bethesda, MD.

Workshop Proceedings — Age Determination of Oceanic Pelagic Fishes

Proceedings of the International Workshop on Age Determination of Oceanic Pelagic Fishes: Tunas, Billfishes, and Sharks was edited by Eric D. Prince and Lynn M. Pulos. Each item in these proceedings was refereed by at least 3 workshop participants and includes 16 full-length papers, 9 summary papers, 2 round-table discussions, and a glossary. A list of workshop participants is also provided. The volume consists of 211 pages, with over 130 figures and plates. The papers are partitioned into sections by species and provide an overview of the state of the art, including innovative approaches to resolving the difficult problem of ageing oceanic pelagic fishes. The publication is NOAA Technical Report-NMFS 8, and can be purchased by writing the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20401.

Current References in Fish Research

Current References in Fish Research 1983 is an accurate indexed bibliography of research publications published during the 1983 year. It is a quick source for locating published articles by **keyword, author,** or **scientific name.** It is designed for the fish researcher, aquatic biologist, ecologist, graduate student, laboratory technician or anyone interested in the field of fish research. This book will enable the researcher to locate articles pertinent to his interest area without spending hours each week at a large library which is often unavailable. Order from Dr. Victor Cvancara, Rt. 1, 296 E. Hagen Rd., Chippewa Falls, WI 54729 for $9.50.

Distribution, Biology, and Management of Exotic Fishes

Edited by Walter B. Courtenay, Jr. and Jay R. Stauffer, Jr., this book has historical overviews and detailed case studies, new scientific observations, and important policy proposals. Twenty-eight experts from around the world examine the many facets of exotic fish introduction and management. Here is a volume of unprecedented detail and scope, an exceptional synthesis of current thought and practice — and *the* essential base for future research and study.

With eighteen chapters and more than 400 pages, *Distribution, Biology, and Management of Exotic Fishes* will normally be priced at $40.00. For a limited time only, however, the book is offered at a special price of just $34.00 — a full 15% off the regular cost. This offer is good only until September 30, 1984. Order from The Johns Hopkins University Press, Baltimore, MD 21218.

Membership Report

NEW MEMBERS

Duane A. Neitzel	WA
Dr. Daniel L. Johnson	OH
Dr. Robert E. Schmidt	NJ

NEW ASSOCIATES

J. Christopher Powell	RI
Daniel Hayes	MI
Jerald S. Ault	FL
Albin J. Sonski, Jr.	NY

EMERITUS

Bernard R. Smith	MI
Donald L. Tennant	MT
Herbert C. Tegelberg	WA
Lloyd O. Rothfus	WA
Dr. Clarence P. Idyll	MD
Dr. W. R. Martin	ONT

Sammy M. Ray
Membership Chairperson

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: Dr. Oliver B. Cope, 15 Adamswood Road, Asheville, NC 28803. Subscription $15 a year to Institutions and Non-Members.

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VOL. 13, NO. 5 OCTOBER 1984

The 1984 Board of Control Meeting

The meeting was convened at 9:20 a.m. August 11, 1984 with President Skud in the Chair. President Skud circulated the updated version of the briefing book, which he initiated in 1982, and this book became the working document of the meeting. The members have found the briefing document very helpful and recommended its continued use in future years. Newly appointed executives and directors will find it extremely useful and are urged to forward copies to their successors.

Treasurer Cole's Report was well received and, although the Institute remains solvent, expenses exceeded revenues so steps were taken to ensure balance. Your Board approved an increase in annual dues from $10.00 to $15.00. There has been a continuing need for the Institute to acquire a personal computer, including printer and software, and Chairman Skud appointed C. Liston to head a committee (including Pete Cole and others as required) to investigate the purchase of a computer that will satisfy our requirements.

Chairman of the Membership Committee, Sammy Ray, reported that 70 applications for membership were processed in the following categories: 47 Associates, 19 Members, and 7 Fellows. During the past year, there were 19 promotions in rank and Emeritus status was granted to 18 persons. Chairman Ray noted that processing graduate students as Associate members was time-consuming and expensive. The Board of Control

Cont.

Participants in the 1984 Board of Control Meeting in Ithaca, August 11-12, 1984. Front row — **Tina Echeverria,** *Central California District Director;* **Ed Best,** *NW Washington District Director;* **Gene Nakamura,** *Past President;* **Charles Liston,** *S. Central Great Lakes District Director;* **Herb Lawler,** *AIFRB Secretary. Back row —* **Dave Gibbons,** *Alaska District Director;* **Howard Horton,** *SW Washington-Oregon District Director;* **Bernie Skud,** *Outgoing AIFRB President;* **Hugh MacCrimmon,** *Incoming AIFRB President;* **Ron Rinaldo,** *S. California District Director. Missing from photo —* **Pete Cole, Eric Prince,** *and* **Charles Roithmayr.**

1984 Board of Control Meeting Cont.

agreed that the Chairman of the Membership Committee could approve applications for Associate status. However, when the Associate Member applies for Member status, the full review process will be followed.

BRIEFS Editor Cope felt that BRIEFS had a pretty good year and that he could do even better if more District news items and more original articles were submitted. Chairman Skud urged the members of the Board to solicit articles from regions and districts, from newspapers, periodicals, etc.

There was no W. F. Thompson Award given this year because few papers were submitted. However, the Board agreed that the Award should continue to be given and urged that District Directors should stimulate schools in their areas to participate.

The Travel Raffle for graduate students who are Associate Members will continue in 1985 with five awards valued at $250.00. More publicity will be given to this award and Eric Prince is in charge of publicity. The raffle award will be discussed in BRIEFS. During our meeting, one of the recipients of this year's award appeared at our Board meeting to extend his thanks for having had the opportunity, through the AIFRB award, to attend the AFS meeting in Ithaca.

The Outstanding Achievement Award was awarded to Dr. David Schindler from the Freshwater Institute, Winnipeg, Manitoba, Canada for his scientific contributions to acid rain research and continuing eutrophications studies. A further description will appear in BRIEFS. The Committee considered 11 individuals in their deliberations.

The NMFS Pascagoula Harvesting Division was awarded the Outstanding Group Award for the Development of the sea turtle excluder device to reduce the incidental catch of sea turtles by groundfish trawlers. The time and place for the award ceremony will appear in BRIEFS.

Considerable discussion took place on how AIFRB might interact with IESC (International Executive Service Corps), a not-for-profit organization that recruits retired, highly skilled U.S. executives and technical advisors to share their expertise and knowledge with business people in developing countries. Chairman Skud appointed Ron Rinaldo and Bill Bayliff to act as a committee, with others as they see fit, to examine how AIFRB might associate or assist with the Program. A Canadian counterpart (CESO) Canadian Executives Serving Overseas is structured along similar lines and Secretary Lawler will be preparing an article for BRIEFS on this subject.

District Directors present reported on their activities. President Skud urged them to submit lists of salient activities for dissemination to membership.

Gene Nakamura spoke on his 7 years as a voting member and thanked members for their support. Chairman Skud thanked Gene for his excellent input to AIFRB and wished him well.

President Skud turned the Chairmanship and gavel over to Dr. H. R. MacCrimmon, our new President, and the meeting was adjourned at 6:04 p.m. August 12, 1984.

G.H. Lawler, *AIFRB Secretary*

AIFRB President's Report

Presented at the Annual Board of Control Meeting, Cornell University, August 11, 1984

After the last annual meeting, my first function as AIFRB President was the presentation of the 1983 Special Group Award of Excellence to the agencies and institutions responsible for the success of the Lamprey Control Program on the Great Lakes. The Award was presented, in behalf of these agencies, to Ken Loftus, Chairman of the Great Lakes Fishery Commission, in Ann Arbor, MI on November 30 and certificates were mailed to the heads of all of the Agencies.

The recipient of the 1983 Outstanding Achievement Award, Kenneth Carlander, was ill when the presentation was planned at a meeting in St. Louis, but the Chairman of last year's Award Committee, Fred Meyer, arranged a later presentation at a ceremony at Iowa State University, Ames, Iowa. The W. F. Thompson Committee did not make an award for the Best Student Paper in 1983. AIFRB did issue ten $250 travel grants to student Associates for attendance at scientific meetings in 1984.

During the past year, the Membership Committee, under the leadership of Sammy Ray, has again processed more than 70 nominations for membership. Although I am very pleased that the number of new members (140) in 1983 and 1984 has increased 50% over the number (92) in 1981 and 1982 and that the number of Associates has increased in each of the last 4 years, I think our potential for eligible new members is much greater. I urge the Board of Control to consider a major effort to contact fishery scientists who are unfamiliar with AIFRB, particularly in areas where we have no Districts, so that those who are eligible and interested can submit applications for membership. I think our Associate membership holds the key to the future of AIFRB and I think our publication, in BRIEFS, of abstracts of theses has helped to attract students as Associate members. I call on our members affiliated with academic institutions to urge their colleagues to alert students about this feature of our newsletter and about their eligibility in AIFRB.

I am especially pleased with the job Oliver Cope (Editor) and John Reintjes (Production Editor) have accomplished with the newsletter, BRIEFS. During the past two years, we've produced 106 pages of the newsletter, far more than in any comparable period since its inception. Further, with our tax-free status and use of bulk-mailing privileges, the 8 to 12-page newsletter is distributed for about $100 less than the former cost of distributing a 4-page newsletter, but, of course, the printing costs have increased by some $2,000 with the six issues annually. I think we have fulfilled our initial goal of demonstrating the feasibility of producing a bi-monthly newsletter. Now that we have the mechanism for communication of current events pertinent to fishery research, we should concentrate on providing the Editor with more substantive information that will result in a more meaningful service to our members and the profession. *It is up to the members to provide the material and to suggest changes that will help us achieve recognition for the newsletter and for*

AIFRB. Let's hear about results of research, effects of management, political problems, unusual biological events, matters affecting the profession, etc., etc. I think BRIEFS has the potential of helping to answer the question ... What does AIFRB do for me? ... but this potential will not be realized unless the members ask what they can do for AIFRB and respond by sending the needed information to the Editor.

After much delay, the Alaska Symposium, *Old-Growth Forests and Fish and Wildlife Relations,* is now in press and Oliver Cope, who prepared the copy for the printer, soon will be distributing (or already has) the page proofs to the 40 authors. Over $12,000 has been received from "outside sources" to subsidize the printing costs. Publication of the book will be announced in BRIEFS and when it is, all AIFRB members should alert their colleagues about its availability. This publication will be a first for AIFRB, and the support of all members is needed to make it a success and to provide funding to undertake other publications of this type in the future.

Based on expenditures of the past several years, our Treasurer, Charles Cole, has recommended an increase in dues. A committee of members who audited the financial records concur with this recommendation. With two annual meetings to finance in 1983, publication costs of the Directory in 1984, and other one-time expenses, we have exceeded our income by approximately $5,000 in these years. Although we still have nearly $30,000 in reserves and can, with the interest from these sources and our dues, balance our annual budget, there is no funding to undertake new activities or to expand existing projects. Further, inflation has been squeezing us, and the "outside agency support" for travel, postage and clerical work, etc. will decline and place an additional strain on our finances. I endorse the Treasurer's recommendation for an increase to $15 annually and recommend that new members and members who are promoted be charged $10 for their certificates.

I have again prepared a Briefing Book for the Annual Meeting and urge that the Secretary prepare similar records in the future so that the members of the Board of Control will have a ready reference of past events, such as recipients of awards, membership changes, names of officers, annual budgets, etc. I have also prepared preliminary guidelines and summaries of the duties for the various offices and hope that these will be reviewed and improved in the future.

With the end of my term as President, I want to acknowledge the support and cooperation of all officers and members of the Board of Control, Committee Chairpersons and members, and many others on whom I have called for special help during the past 3 years. Past President Gene Nakamura provided much helpful advice and willingly accepted numerous tasks, including revision and publication of the Bylaws. Although I am pleased with the progress in several areas, I am also disappointed that more was not accomplished during this period. I hope the new administration will find a suitable base from which to work. President-Elect Hugh MacCrimmon and I have met and discussed AIFRB activities, and he has already selected officers for his coming term. As a result, I expect a smooth transition with a minimum loss of time and effort with the usual routine delays and urge all members to give Hugh their support and to assist in any way they can to further the goals of the profession and of AIFRB.

Bernard E. Skud
President

1984 Outstanding Achievement Award

The AIFRB Outstanding Achievement Award is presented once each year to an individual who has made notable contributions to the realm of fisheries or fishery resources. At the Board of Control meeting in Ithaca, the Institute name David W. Schindler of Winnipeg, Manitoba as the recipient of the 1984 award.

Dr. David W. Schindler, a U.S. citizen, was born in Fargo, North Dakota, in 1940. From 1959 to 1962, he was a National Science Foundation undergraduate research assistant while studying at North Dakota State University in Fargo. In 1962, he was granted a B.S. in zoology by North Dakota State University. From 1964 to 1965, he carried out limnological research at North Dakota State University as a National Institute of Health Research Fellow and, in 1966, he received his doctorate degree in ecology at Oxford University, England, as an American Rhodes Scholar.

From 1966 to 1968, Dr. Schindler was an Assistant Professor of Biology at Trent University, Peterborough, Ontario, where he taught limnology, biology and statistics and carried out limnological research.

For the past 16 years, Dr. Schindler has been employed by the Department of Fisheries and Oceans Canada, Freshwater Institute, Winnipeg, Manitoba, where he has been leader of the Experimental Limnology Program. In the mid 1970's the unique combination of experimental microcosm and whole ecosystem approaches employed by Dr. Schindler and his colleagues at the Experimental Lakes Area in northwestern Ontario provided information essential to the widespread use of phosphorus, rather than nitrogen control, to limit eutrophication. These results played a major role in the Canadian decision to ban phosphates in detergents as well as control legislation in several U.S. states. Dr. Schindler served on the International Joint Commission's Standing Committee on eutrophication from 1973 to 1976 and chaired the IJC's Expert Committee on Ecology and Geochemistry from 1976 to 1979.

In the mid 1970's Dr. Schindler's research emphasis shifted to the problem of acidification. Again, the controlled ecosystem experimental approach was used successfully to tackle a number of key issues in the acidification problem which could not otherwise be readily addressed. Highlights of the results of this work, to date, include the findings that biological damage begins much earlier than previously recognized, at lake-water pH as high as 5.8, and can be caused by acid alone, i.e. without implicating aluminum or other metals. Dr. Schindler chaired the U.S. National Academy of Sciences Committee on the Atmosphere

1984 Outstanding Achievement Award cont.

and the Biosphere, whose 1981 report first recommended a 50% reduction in acidifying emissions on a broad regional scale. In 1980, he delivered a plenary lecture at the International Conference on Acid Precipitation in Norway. In 1981, he was selected as a member of the U.S. National Academy of Sciences-Royal Society of Canada Committee on Acid Rain. In 1982, presentations were made to the Ohio Governor's Task Force and the U.S. Congress Waxman Committee. USEPA Administrator Ruckelshaus, presidential science advisor Keyworth, and National Academy of Science's president Press all received personal briefings in 1983. In 1984, Dr. Schindler addressed the House of Common's Standing Subcommitte on Acid Rain.

Dr. Schindler has authored or coauthored 100 scientific papers and reports. His work and leadership in limnological science have received numerous plaudits, including H. Harvey, J. Fish. Res. Board Can. 33: 2644 (1976); W. Ohle, Archiv fur Hydrobiologie, 79: 274-280 (1977); and the Royal Society of Canada Peer Review of Canadian Federal Research on Long-Range Transport of Airborne Pollutants in North America (1984). In 1978, he was awarded an honorary D.Sc. by North Dakota State University.

Dr. Schindler has maintained a high level of involvement in teaching and supervision of graduate student projects. Currently, he is an adjunct professor with both the Zoology and Botany Departments at the University of Manitoba, and is Adjunct Senior Research Scientist, Lamont-Doherty Geological Observatory, Columbia University. And, he is a member of the U.S. Rhodes Scholarship Selection Committee.

Dr. Schindler is actively associated with numerous scholarly societies and journals. Most notably, from 1977 to 1979, he was the Canadian National Representative and Canadian Secretary of the International Association of Theoretical and Applied Limnology and, at various times beginning in 1973, he has served the American Society of Limnology and Oceanography on the Editorial Board, as a member of the Standing Committee on Policy and Resolution, member of the Board of Directors, Vice-President and President. Since 1977, he has been on the Advances in Water Resources Editorial Board; since 1979, he has been Associate Editor, Journal of the International Association for Great Lakes Research, and, in 1983, he was appointed Associate Editor of Biogeochemistry. Dr. Schindler is a Fellow of the Royal Society of Canada.

The American Institute of Fishery Research Biologists is proud to recognize David W. Schindler for his extensive research and contributions to limnology, ecology, and pollution problems.

AIFRB Special Group Award of Merit

The 1984 Special Group Award of Merit has been given to the Harvesting Technology Division of the National Marine Fisheries Service in Pascagoula, Mississippi. The Division, a part of the NMFS Southeast Fisheries Center, averted a potentially explosive problem in the southeast shrimp fishery through development of a device which allows selective shrimp trawling. The apparatus was developed to prevent the incidental capture and mortality of threatened and endangered sea turtles. Catch record estimates indicate that sea turtle captures in shrimp trawls annually exceed 45,000 with a resulting mortality of more than 10,000 turtles.

The incidental capture of sea turtles posed a serious problem for the southeastern shrimp fishery, the most valuable fishery in the United States, but the declining number of sea turtles had to be reduced even if it meant closing some commercial shrimp grounds. In response to this problem, the Harvesting Technology Division of NMFS Mississippi Laboratories initiated a research project to develop gear modifications which would reduce the number of sea turtles taken by shrimp trawlers. The Harvesting Technology group conducted the research, but worked together with the shrimping industry and several environmental organizations.

The result of the project was the development of a trawl modification called a *trawling efficiency device (TED).* Initially it was called a *turtle excluder device,* since it very successfully prevents turtle captures. However, the device also reduces unwanted bycatch so well (including finfish, jellyfish, horseshoe crabs, sharks, rays, sponges, etc.) that the device has been renamed the trawling efficiency device.

TED consists of a 36- by 42- by 30-inch frame constructed of 3/8-inch galvanized pipe or fiberglass rod. Inside the frame are deflector bars slanted at approximately 45° spaced 3-6 inches apart with a 36- by 30-inch door at the top of the deflector bars. The TED is inserted inside the trawl at the intersection of the trawl body and codend or bag. As a turtle or other large object enters the bag, it strikes the slanted bars and is forced toward the "trap door". The door opens on hinges, allows the object to pass out of the trawl, and then closes as the object is released. Smaller objects (fish, shrimp, etc.) pass through a webbing funnel which accelerates the water flow and carries them through the slanted bars and into the bag. Deflector bar spacing can be adjusted from 6 inches to 3 inches to exclude bycatch such as cannonball jellyfish, horseshoe crabs, sponges, etc. The difference in behavioral responses between shrimp and finfish in the accelerated water flow generated by the funnel is used to separate finfish by providing openings and leading panels to guide them out of the trawl.

Extensive testing has shown that TED reduced the capture of sea turtles in shrimp trawls by more than 97% without any loss in shrimp production. TED also very effectively reduces the bycatch of cannonball jellyfish, sponges, horseshoe crabs, and rays, and as a result improves the efficiency of shrimp trawls by allowing longer towing times with reduced labor in sorting shrimp from the bycatch. Finfish capture and mortality is also significantly reduced. In the Gulf of Mexico, a large percentage of "groundfish" stock mortality is caused by shrimp trawling. Finfish reduction rates exceeding 50% at night and 60% during daytime fishing can be consistently achieved with TED.

The ability of TED to significantly reduce bycatch has made it attractive to shrimp fishermen. Because of this, introduction of TED to the shrimp industry is being accomplished on a voluntary basis. Several hundred TED's are now in use in the South Atlantic and Gulf of Mexico. At least two gear manufacturers have begun building and selling TED's. Foreign acceptance has also started, with over 1,000 TED's in use in Indonesia, and other countries like Honduras, Mexico and Australia either presently conducting demonstrations and tests, or planning them in the near future. A variation of the TED configuration is presently being tested in Norway's shrimp fishery to reduce finfish bycatch.

Development of the device solved the serious problems of protecting endangered sea turtles, problems that confronted the southeast shrimping industry and the National Marine Fisheries Service. In addition, it provided some real benefits to the shrimp industry. A technology-transfer committee with membership from the three interest groups has been formed to promote and monitor acceptance by the shrimp industry.

1984 Student Travel Raffle Program

AIFRB began its Student Travel Raffle Program in 1984, with the awarding of prizes to five winners in the January drawing and to another five in the June drawing.

The program involves the presentation of a $250 award to each winner, the money to be used for attendance at a national or regional scientific meeting of the winner's choice. The purpose of the program is to assist students in attending scientific meetings, where they will gain knowledge and make contacts regarding employment. Applicants must be students who are Associate Members of AIFRB in good standing.

Of the ten winners in 1984, seven used their money to attend the American Fisheries Society national meetings in Ithaca. One winner went to a salmon symposium, one to a mariculture meeting, and one to a conference on benthos.

Opinions regarding the value of the program have been received from five 1984 winners, who were universal in their appreciation for the funds provided by AIFRB. One said, "I definitely would not have been able to attend the national meetings without the financial and political clout of your travel award." Another wrote, "...even if I were not a winner I would still view it as a worthwhile venture."

Tuna Research to the Year 2000

A group of tuna scientists met in La Jolla, California, in January 1984 to discuss current and future tuna research to the year 2000. The convenor was Dr. James Joseph, and the technical secretary was Dr. Alexander Wild, both of the Inter-American Tropical Tuna Commission.

The Agenda consisted of the following items: (1) intraspecific heterogeneity; (2) growth, natural and fishing mortality, and recruitment; (3) behavior, physiology, and the environment; (4) modelling; (5) data requirements.

The participants recommended that the convenor take responsibility for initiating action on the following types of research: (1) tuna movement and distribution; (2) periodic variation in the chemical constituents in relation to ageing, stock heterogeneity, and transfer rates; (3) genetic heterogeneity. A panel on tuna movements, headed by Dr. John R. Hunter, U.S. NMFS, has already been selected, and its first meeting was held on September 5 and 6, 1984. The subject of this meeting was the analysis of existing tag return data. Three additional meetings on movements of tunas in relation to the environment, physiology and behavior of tunas in relation to movements, and acoustic tracking and fishery-independent tag recovery systems will be held later.

Also discussed at the January 1984 meeting was the desirability of holding a world tuna conference somewhat similar to the one sponsored by the FAO in La Jolla in 1962. It was agreed to set up a corresponding committee to further discuss the need for such a conference, what topics should be addressed, and how it should be implemented.

The minutes of the January 1984 meeting are now available from the Inter-American Tropical Tuna Commission, P.O. Box 271, La Jolla, California, 92037.

McHugh Wins Highest AFS Honor

Dr. J.L. (Laurie) McHugh, AIFRB Fellow of 1959 and Emeritus of 1982, has received from the American Fisheries Society its 1984 Award of Excellence, the Society's most prestigious honor. This award is only the 16th given by AFS.

Dr. McHugh's long career in fishery science began in 1929, with the Fisheries Research Board of Canada, at Nanaimo, B.C. In 1941, he joined the Canadian Army, where he served with distinction in Canada, England, and France. Soon after his return to Nanaimo, he went to the Scripps Institute of Oceanography in La Jolla, CA. Soon after receiving his Ph. D. at UCLA in 1950, he moved east to become Director of the Virginia Fisheries Laboratory at Williamsburg. In 1959, Dr. McHugh joined the staff of the U.S. Bureau of Commercial Fisheries in Washington, D.C., where he served as Division Chief, Assistant Director, and Deputy Director, and as Director of the Office of Marine Resources of the Interior Department and head of the Office for the International Decade of Ocean Exploration in the National Science Foundation. Dr. McHugh in 1970 moved to the Marine Sciences Research Center at the State University of New York at Stony Brook, from which he retired in 1982 as Professor Emeritus.

McHugh has also had numerous appointments to international commissions and councils, and has authored more than 150 papers, chapters, and books.

From the AFS Ithaca Meeting

Some highlights emerging from the Executive Committee deliberations at the American Fisheries Society meeting in Ithaca, NY in August involved the name of the Society and procedures for certification.

The membership, voting on changing or retaining the name of the Society, elected by a 2-1 margin to keep the name, *American Fisheries Society.*

New methods of certifying fisheries scientists will be introduced in 1985. A two-tiered certification system will be adopted, and will include Associate Fisheries Scientist and Certified Fisheries Scientist categories based on levels of training and experience. AFS will issue details of the program later this year.

Fishery Legislation

New Dingell-Johnson/Wallop-Breaux Fund

New legislation has rewritten the Federal Aid in Sport Fish Restoration Act and created the Wallop-Breaux Trust Fund to replace the familiar Dingell-Johnson Act. The number of sources contributing to the Fund has been increased and, based on available estimates, the U.S. Fish and Wildlife Service expects the new law to generate an additional $65 million. This, added to the current program of approximately $35 million, will total $100 million. Each state's annual apportionment could almost triple. Notable provisions in the bill include:

	Expected Revenue
A. Establishes the Sport Fish Restoration Trust Account within the Wallop-Breaux Fund.	
B. Extends 10 percent manufacturer's excise tax to other fishing equipment, including tackle boxes. Trolling motors and flasher-type fish finders (maximum tax $30/unit) taxed at 3 percent.	$10 million
C. Transfers import duties on yachts/pleasure craft and imported fishing equipment.	$15 million
D. Revenues accruing from sale of motorboat fuels after $46 million has been deducted.	$30 million
E. D-J tax collected from certain importers not paying full amount at port of entry.	$10 million
F. Provides that coastal states and the territories equitably allocate *new* funds between marine and freshwater in proportion to the number of resident freshwater and resident saltwater anglers.	
G. Decreases amount available for administration of the act from 8% to 6%.	
H. Provides opportunity (up to 10%) for states to establish an Aquatic Resources Education program.	
I. Requires states to use at least 10% of its apportionment for motorboat facilities.	
J. Authorizes prospective funding involvement in multiyear acquisition and development projects.	
K. Provides ⅓ of 1% to the District of Columbia.	
L. First apportionment to states: Unclear, but certainly by October 1, 1985 (FY 86).	

American Fisheries Society

The National Fish Hatchery System Act

On 18 September 1984, the House Subcommitte on Fisheries and Wildlife Conservation and the Environment held a hearing on H.R. 6213, the National Fish Hatchery System Act. Introduced barely a week before the hearing, H.R. 6213 was authored by the Committee's Chairman, John Breaux (LA), and Ranking Minority Member Don Young (AK). The intent of the bill is to provide policy guidance in the operation of federally funded and/or operated hatcheries and their attendant stocking programs.

The hearing provided the Committee the opportunity to examine the role of the federal hatchery system in fishery management and specifically explore the proposals embodied in H.R. 6213. Providing testimony at the hearing were representatives of the U.S. Fish and Wildlife Service (FWS), National Marine Fisheries Service (NMFS), Bonneville Power Administration, International Association of Fish and Wildlife Agencies, Columbia River Intertribal Fish Commission, Bass Anglers Sportsmen Society, American Fisheries Society, and the National Wildlife Federation.

H.R. 6213 would make the FWS responsible for all federally funded or operated hatcheries, including those now assigned to other federal agencies such as the Bureau of Indian Affairs and NMFS ("Mitchell Act" hatcheries). Also included would be hatcheries that, subsequent to enactment of the bill, are constructed, operated, or maintained wholly, or in part, with federal funds (excluded would be funding under the Dingell-Johnson Program and federal grants to states under the Anadromous Fish Conservation Act and Commercial Fisheries Research and Development Act programs).

Federal fish hatcheries would be integrated with overall federal fishery management goals. The hatchery system would be operated to achieve management goals through the following: 1) enhancement of natural stocks, 2) coordination with habitat improvement or protection measures or programs, 3) coordination with harvest management goals, and 4) promotion of coordination of production among federal hatcheries.

The purposes of the federal hatchery system would be defined and funding for fish produced by the system would be determined by classifying fish production into six categories:

1. To mitigate for damages to fisheries resulting from construction and/or operation of federal water projects. *Funding:* the cost of producing fish for mitigation purposes would be assigned to the "users" of water or power who benefit from the federal project. Payment would be proportional to the respective benefits derived by each of the users. Any remaining costs of mitiga-

tion not associated with identifiable beneficiaries would be federally funded.

2. To restore significant current or historical fisheries of recreational or commercial value that are interjurisdictional in nature. *Funding:* All fish-production costs would be federally funded. Restoration plans would be developed jointly by the affected federal, state, or tribal agencies.
3. To stock waters where fisheries are under federal management jurisdiction. *Funding:* Federal funding for fish produced would be provided by the agency having fishery management jurisdiction.
4. To stock waters where fisheries are under state management jurisdiction. *Funding:* States would pay all costs for fish produced. (Stocking of federally produced fish in private waters would end.)
5. To carry out fishery research and development programs. *Funding:* Federally funded.
6. To implement recovery plans for fish species listed under the Endangered Species Act. *Funding:* Federally funded.

All provisions of H.R. 6213 that would alter current funding arrangements would be phased in over a 4-year period.

H.R. 6213 also provides a procedure for reviewing a decision by an agency to close a federal hatchery and would initiate a comprehensive review of existing federally funded or operated hatcheries.

No further action on the bill is intended in this Session of Congress. During the 18 September hearing, sufficient interest in the concepts embodied by H.R. 6213 was expressed by witnesses to ensure further consideration of the bill next year.

Rudolph Rosen
National Wildlife Federation, Washington, D.C.

Thesis and Dissertation Abstracts

Trophic Adaptations and Relationships of Rockfishes (*Sebastes* spp.) of Oregon

Germán E. Pequeño, Ph.D. 1983
Oregon State University

A comparative analysis of structures related to capture and processing of food in 624 specimens belonging to 31 species of *Sebastes* of Oregon was made. The structures studied were the following: the tooth-bearing bones (premaxillary, dentary, vomer, palatine); the maxillary, angular, articular, parasphenoid, and glossohyal bones; the lower limb of the first branchial arch and its gillrakers; the length of the intestine; number of pyloric caeca; and width of orbit.

The mean values calculated formed gradual clines with only minor discontinuities. Overlap of standard deviations and ranges was considerable. Gillrakers showed four types according to the relationship of the length to width, and there is a general relationship of the type to mouth size, and in some, to relative length of intestine. Number and size of spinulae on gillrakers differ with gillraker type. Species with relatively long intestines have more pyloric caeca than those with short intestines. These (long intestines) are generally species that take a high proportion of crustaceans in the diet. Species with smaller relative eye size are generally planktivores, or are known to be diurnal in habit.

Although a few species have distinctive features or specializations that alone or in simple combination can distinguish them, the overlap in trophic adaptation of the somewhat generalized predators is great. There is a continuum of change from planktiphagous to ichthyophagous, so that the genus as a whole should be capable of taking advantage of a wide spectrum of prey over a wide latitudinal and considerable bathymetric range. Overlaps in diet must be common, but there is probably sufficient difference in trophic adaptation so that each species would be successful in a particular niche if food were in short supply.

Age and Growth Aspects of the Life History of Billfishes

Charles Algeo Wilson, III, M.S. 1984
University of South Carolina

Billfishes are economically important in many coastal communities throughout the world. However, the information necessary for adequate management of this resource is very limited. In this study I determined the growth rate, age, and sex-related size differences of Atlantic and Pacific blue marlin (*Makaira nigricans* Lacépède) and Atlantic white marlin (*Tetrapturus albidus* Lacépède); and swordfish (*Xiphias gladius* Linnaeus) landed in South Carolina. Collections of swordfish, Atlantic and Pacific blue marlin, and Atlantic white marlin were made possible through the cooperation of commercial and recreational fishermen. Individual round weight (kg), lower jaw fork length (LJFL cm), and sex were recorded for each fish. Otoliths were collected from the cranial cavity, and age estimates were made by analyzing the sagittal otolith. Growth was modeled by either Von Bertalanffy's model, Gompertz's model, or both types of equations.

There has been a decline in the mean size of swordfish landed over the last 6 years, and individual age data and age structure of the population data show that fishermen have been harvesting an increasingly larger percentage of pre-reproductive females from the population each year. A decrease in mean size and capture of pre-reproductive females are characteristics of an overfished fishery.

Atlantic and Pacific blue marlin otoliths show that their age structure is very similar. The otolith location and their morphologies are virtually indistinguishable. Sagittal otoliths can be used successfully for the estimation of age, and otolith weight is a good indicator of age of both sexes. Both populations demonstrated a sexual dimorphism of size related to sex which is not age-dependent. Males grow rapidly to a maximum size of approximately 80 kilograms in 3-4 years at which time they are reproductively active. Females grow rapidly at highly variable rates, mature at approximately 4 years of age, and do not cease to grow as do the males. Thus it is possible to find a 90 kilogram male that is as old as a 400 kilogram female. *Cont.*

Thesis and Dissertation Abstracts Cont.

White marlin demonstrate a sexual dimorphism which is similar to but not as pronounced as that of blue marlin; females grow to larger sizes than males. Male and female white marlin have similar longevities and reproduce at a younger age than blue marlin or swordfish. Age structure of the white marlin fish population does not indicate overfishing.

These three species of fishes, which occupy the same oceanic environment, exhibit three different reproductive and life history tactics and thus, each species will require a different fishery resource management strategy.

Timing of the Blue Crab Fisheries of Virginia and its Application to Harvest Management

J. Dale Shively, M.S. 1984
Old Dominion University

The timing of a fishery is a quantitative expression of the composite behaviors of harvesters, markets, animals, and climatic events. A quantitative description of the timing of the blue crab *(Callinectes sapidus)* fisheries of Virginia was established using the time density model of Mundy (1979). Blue crab catch statistics supplied by the National Marine Fisheries Service and the Virginia Marine Resource Commission were divided into two fisheries based on gear type — the summer and winter fisheries. Average performance curves were then constructed using average cumulative proportions of catch. Annual yield estimates were also made and timing in five individual water bodies examined.

Performance curves for total, summer, and winter harvests could serve as a regulatory tool for blue crab harvest management in the Chesapeake Bay by utilizing available data. The adequacy of present harvest data for regulatory needs is discussed.

Announcements and New Publications

Coastal Pollution in the Marine Environment

The Tufts University School of Veterinary Medicine will sponsor a symposium on *Coastal Pollution — Its Impact on Marine Organisms and Ecosystems* on November 29-30 and December 1, 1984. The symposium will take place at the Marine Biological Laboratory, Woods Hole, Massachusetts.

Topics include: The diagnosis of marine invertebrate diseases using monoclonal antibodies; the impact of PCBs and other industrial pollutants on marine organisms; sublethal indices of population stress; the search for primordial retroviruses in marine invertebrates; where, how and if industrial wastes should be disposed of in the marine environment. Poster sessions will be held Thursday and Friday evenings.

For further details and registration forms contact: Dr. Carol L. Reinisch, T.U.S.V.M., 136 Harrison Avenue, Boston, MA 02111 U.S.A Telephone: (617) 956-6923.

Symposium on Small Hydropower and Fisheries

The Bio-Engineering Section and the Western Division of the American Fisheries Society will sponsor the *Symposium on Small Hydropower and Fisheries*, to be held at the Ramada Renaissance Hotel, Denver, Colorado on May 1-3, 1985.

The recent impetus for small-scale hydropower development has proliferated the number of permits, exemptions, and license applications for hydro sites throughout the United States. Increasing workload for consultation on fisheries concerns by agency personnel and the evolution of regulations and procedures have led to strife and conflict over fisheries protection and arguments over the "terms and conditions" placed upon hydro development activities. Many questions have emerged: Can hydro projects be built without significant impact? Are there standard assessment techniques available? What are the cumulative effects?

The symposium will provide an overview of the scope of small-scale hydropower development and the motivating forces behind it. Sessions will deal with the fisheries issues associated with hydro development, and will focus on fish passage, turbine mortality, and instream flow needs. Regional differences, assessment techniques, and case studies will be presented.

Additional sessions on cumulative impacts, economics, policy, and conflict resolution will be an integral part of the symposium. Issue papers, review papers, case studies, and research needs will be empasized in each session. It is the desire of AFS to provide national, geographic, and species perspectives on these fisheries concerns.

Papers are solicited for technical and poster sessions to address the following topics: Effects of Water Level and Flow Modification; Siting Considerations: Physical Conditions & Plant Design; Fish Migration, Upstream and Downstream; Cumulative Impacts; Benefits and Economics; Policy Issues; Perspectives of Land and Water Management Agencies; and Regional and Geographic Differences on Fisheries Concerns.

Proceedings of this symposium will be published. Authors wishing to contribute a paper or a poster presentation will need to prepare an abstract and draft paper according to the following schedule:

September 15, 1984 — Deadline for Abstracts to the Program Committee

October 15, 1984 — Preliminary Selection of Papers and Posters

January 15, 1985 — Draft Papers and Posters to Session Chairs

Persons planning to submit abstracts of papers should keep in mind the areas of emphasis — methods of problem assessment, case studies, and/or methods of problem resolution, while focusing on the interrelated needs of hydropower and fisheries. Also, the final program will be developed based on your responses to the suggested topics. Do not feel constrained by the preliminary list.

Abstracts for papers and posters should be limited to 200 words and must by submitted no later than September 15, 1984 to:

Forest Olson/Douglas Sheppard, Program Co-Chairmen
Symposium on Small Hydropower and Fisheries
CH_2M-Hill, 1500 114th Avenue Southeast
Bellevue, WA 98004 Phone: 206-453-5000

Symposium—Common Strategies of Anadromous and Catadromous Fishes

Common Strategies of Anadromous and Catadromous Fishes: An International Symposium will be held March 9-13, 1986 at the Boston Park Plaza, Boston, MA. The event will be sponsored by the Northeastern Division, American Fisheries Society.

Anadromous and catadromous fish encounter a suite of similar problems during the course of their life histories, no matter how diverse their phylogeny. This conference will explore, compare, and contrast the survival strategies of anadromous and catadromous species. Through the exchange of different approaches and findings from researchers, students, and managers of diverse fish groups, we will gain a broader perspective, greater awareness, and new directions for research and management.

The conference will consist of four one-day sessions focusing on the following topics:

Session 1: Utilization of the freshwater habitat. Convener: Dr. C.M. Moffitt, Idaho Cooperative Fishery Research Unit, University of Idaho, Moscow, Idaho 83843, (208) 885-7047

Session 2: Transition to and from the marine environment. Convener: Dr. R.L. Saunders, Department of Fisheries and Oceans, Biological Station, St. Andrews, N.B., Canada EOG 2X0, (506) 529-8854

Session 3: Ocean migrations. Convener: Dr. M.S. Dadswell, Department of Fisheries and Oceans, Biological Station, St. Andrews, N.B., Canada EOG 2X0 (506) 529-8854

Session 4: Recruitment mechanisms. Convener: Dr. R.J. Klauda, John Hopkins University, Applied Physics Laboratory, Shadyside, Maryland 20867, (301) 867-7000

The program will consist of oral presentations of invited and contributed papers and a poster session.

Persons wishing to contribute a paper or poster are urged to contact the convener of the most appropriate session. Abstracts of 300 to 500 words must be submitted by December 31, 1984. If the quality of submitted manuscripts meet primary publication criteria, the symposium proceedings will be published in book form.

For additional information contact: Symposium Chairman, Michael J. Dadswell, St. Andrews Biological Station, St. Andrews, NB EOG 2X0 Canada.

International Symposium on Stock Assessment and Yield Prediction

The purpose of the *International Symposium on Stock Assessment and Yield Prediction* (ASPY), scheduled for August 11 - 23, 1985, is to advance the understanding of how aquatic production is best apportioned to maintenance/rehabilitation/surplus production, to achieve optimal fishery productivity and benefits for the Great Lakes Community. This requires examining the applicability of existing theory, and elaborating new theory to better predict the behavior of aquatic communities. It includes determining the potential production of Great Lakes fishery resources and examining the characteristics and dynamics of stress and stability in fish populations and communities.

ASPY is sponsored by the Great Lakes Fishery Commission and has been organized along the same lines as earlier conferences held by the commission. It is an *invited* symposium designed explicitly to foster synthesis in a workshop atmosphere. The four major scientific subject areas to be discussed are Production Theory, Yield Theory, Community Dynamics/Comparative Biology, and Stability Ecology. Participants will include scientists from the Pacific and Atlantic coasts of North America and from Europe as well as those working in the Great Lakes area. Socioeconomic scientists will also participate in the Symposium. During the second week of the session, task groups will address three major synthesis areas: Assessment Methodology; Allocation to Maintenance and Rehabilitation; and Community Processes. The final session will address the Management Implications of ideas developed during the symposium.

The Steering Committee for the symposium includes W.J. Christie, G.R. Spangler, W.L. Hartman, K.H. Loftus, P.J. Colby, M.A. Ross and D.R. Talhelm. Coordinators who have helped in the selection of participants include R.J.H. Beverton, P.J. Colby, L.M. Dickie, C.J. Krebs, B.E. Skud. Information concerning the Symposium can be obtained from W.J. Christie, Glenora Fisheries Station, R R 4 Picton, Ontario, Canada KOK 2T0.

Excerpted from June 1984 Symposium Announcement, a brochure available from the Great Lakes Fishery Commission.

Asian Fisheries Forum

The *First Asian Fisheries Forum* will be held on May 25-31, 1986 in Manila, Philippines under the sponsorship of the newly organized Asian Fisheries Society. The Society is a non-political and non-profit professional organization of fisheries scientists and technicians in the Asia-Pacific region.

Traditional Practices and New Frontiers in Asian Fisheries is the theme of the 1986 forum, a topic that deals with the changing trends in the Asian fisheries sciences but at the same time provides awareness of traditions which exist or have recently been changed. The theme reflects an increasing awareness of the importance of fisheries for food and employment in Asia, as well as the resource limitations presently being faced in capture fisheries. The hope of increased yields through better resource use (including aquaculture) is reflected in The New Frontiers portion of the theme as it is in the objectives of the Forum.

The First Asian Fisheries Forum in 1986 is being planned to realize the following goals and objectives:

- To promote effective interaction and cooperation among the scientists and technicians involved in fisheries research and development in Asia through sharing of information and publication of research results.
- To propagate and create awareness of the importance and the ways of sound utilization, conservation and development of aquatic resources.
- To initiate the holding on a regular, rotational basis, the Asian Fisheries Forum as a gathering of scientists and technicians who, in their professional capacities, can freely discuss broad issues and specific topics related to fisheries.
- To publish the proceedings
- To address important issues related to fisheries interests in the region.

For further information about the First Asian Fisheries Forum in 1986 please send your inquiries to: Chairman, Asian Fisheries Forum, MCC P.O. Box 1501, Makati, Metro Manila, Philippines.

1984 Southeastern Conference

The Southern Division of the American Fisheries Society will hold its 1984 Southeastern Conference at the Fairmont Hotel, New Orleans, LA on November 19-21, 1984. Sessions will cover Habitat Influences/Techniques, Fish Culture, Sportfish Hybrids, Marine Resources, and Angler Utilization.

For information, contact Bennie J. Fontenot, Jr., Louisiana Dept. of Wildlife and Fisheries, Box 15570, Baton Rouge, LA 70895. Phone 504-342-5864.

Artificial Reefs

Artificial Reefs is a book covering the proceedings of a 3-day conference/workshop entitled *The Use of Artificial Reefs as a Fisheries Management Strategy in the Great Lakes.* The conference, sponsored by the Michigan Sea Grant College Program and the Michigan Institute of Water Research, was held at Michigan State University on June 1-3, 1983. The book is edited by F.M. D'Itri, and is published by C.K. Smoley & Sons, Inc.

Artificial reefs have been used to enhance fishing in various countries throughout the world for more than 300 years. In the United States these structures have primarily been constructed by marine sport fishermen; however, in recent years this fishery-management strategy has spread to the Great Lakes. As artificial reefs improve fishing opportunities, the publicity attracts fishing clubs that are eager to provide the same benefits in their areas. However, the construction of modern artificial reefs requires careful design and selection of sites and materials, underwater engineering, and biological monitoring. Some of the latest information for evaluating the effectiveness of artificial reefs as a fisheries-management tool in the Great Lakes, Japan, Virginia, Florida, and other places is provided in this book.

Twenty-three experts from throughout the United States presented their research. Then the current data were reviewed and analyzed as well as the literature to synthesize recommendations into state-of-the-art guidelines to assist government agencies in regulating the siting and construction of artificial reefs.

Several suggestions emerged with respect to the placement of artifical reefs in the Great Lakes. The first area of concern was the effects that the colder water in the Great Lakes would have on the overall productivity of the artificial reef. A number of researchers felt the colder water would result in a smaller rate of periphyton and algeae colonization of the artificial reef compared with the colonization rates reported in the literature for warmer waters. Other researchers noted that many Great Lakes fishes have very specific water-temperature requirements which may be more important in controlling their movements than the increased foraging opportunities provided by the artificial reef. Second, great concern was expressed with respect to the effects of ice scour on the stability of artificial reefs. From the discussions which took place on this subject it is apparent that very little, if any, data are available on this extremely important aspect of siting in the Great Lakes. Third, many experts expressed the opinion that the development of artificial reefs in the Great Lakes should proceed cautiously and expand slowly by building on the accumulating body of knowledge. If possible, new projects should be started only after a careful evaluation of the data generated from artificial reef studies in nearby or similar waters. Finally, research in the use of fish aggregating devices (FADs) to attract migrating salmonoid (pelagic) fishes was recommended. The FADs, constructed of light but rigid metal or plastic frame covered with some type of fabric, netting or plastic film, are much lighter than their counterparts designed for bottom use and have the advantage of not only being easily relocated seasonally but they can also be removed in the water to avoid ice damage.

In summary, the experts felt that artifical reefs could provide positive benefits as a fisheries-management tool; however, their development in Great Lakes should proceed in an orderly manner building on the successes and/or mistakes of earlier experiences.

The book is priced at $39.95, and orders can be sent to C.K. Smoley & Sons at 121 S. Main St., P.O. Box 531, Chelsea, MI 48118.

In Memorium

Edward C. Raney

Dr. Edward C. Raney, a Founding Member of AIFRB, passed away at home in Ithaca, New York on April 20, 1984.

In his long and illustrious career, Dr. Raney graduated from State Teachers College, Slippery Rock, Pennsylvania, and received the M.S. in ornithology and the Ph.D. in vertebrate zoology from Cornell University. Ed Raney had long experience as a science teacher in high school, as a zoology professor, and as curator of the fish collection at Cornell. One of his interests was the effects of power generation on aquatic resources, and his Ichthyological Associates conducted extensive research on this topic.

This leader in fisheries education and research is mourned by an enormous number of co-workers and students.

Richard Van Cleve

Dr. Richard Van Cleve, a Founding Member of AIFRB, passed away on August 27, 1984.

Dr. Van Cleve was a University of Washington graduate in fisheries, and earned the Ph.D. from the same institution. His eminent career included duties with the International Pacific Halibut Commission, the California Fish and Game Department, the International Pacific Salmon Commission, and the School and later College of Fisheries at the University of Washington, where he was Dean of the College from 1948 to the time of his retirement in 1971.

Van Cleve also travelled widely, dealing with fishery problems in Japan, Southeast Asia, and India.

Richard Van Cleve is missed by his numerous students and colleagues in the fishery community.

Announcements and New Publications Cont.

Fisherman's Guide

AIFRB Member Charles S. Manooch III has written a book entitled *Fisherman's Guide—Fishes of the Southeastern United States from New Jersey to Florida.* Anglers, commercial fishermen, nature lovers and devotees of wildlife art will find hours of reading pleasure between the covers of this book, remarkable for its breadth of coverage and clarity of prose. It is the only book of its kind and includes over 250 species of fish and an artist's beautiful color paintings of 150 of those most often caught by fishermen.

A variety of fishing situations are included: mountain streams, ponds, lakes and reservoirs, coastal rivers, inlets, sounds and beaches, offshore reefs, and Gulf Stream waters. Detailed accounts tell the reader how to identify the fish, provide life history, habitat, and distribution information, and present methods of catching and preparing the fish for the table.

Charles S. Manooch, III, the author, is a professional fisheries expert long experienced in the field of fisheries management and technology as is the artist and illustrator, Duane Raver, who is nationally known for his paintings of fish and wildlife.

The book is published by the North Carolina State Museum of Natural History with the collaboration of the International Game Fish Association, the National Wildlife Federation, the North Carolina Wildlife Federation, and the Sport Fishing Institute.

The book costs $24.95, and can be ordered from the North Carolina Museum of Natural History, Box 27647, Raleigh, NC 27611.

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; the results of research; the effects of management; unusual biological events; matters affecting the profession; political problems; and other matters of importance to the fishery community. Comments and contributions should be sent to the Editor, Dr. Oliver B. Cope, 15 Adamswood Road, Asheville, NC 28803. Subscription $15 a year to Institutions and Non-Members.

ISSN-8755-0075

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VOL. 13, NO. 6 DECEMBER 1984

President's Remarks

During my first few months as your new President, I have become increasingly aware of the legacy of achievement left to me by Past President Bernard Skud and his predecessors, and I am ever aware of the dedication of the present Board of Control and, especially, the volunteer support staff who sustain our membership, keep our financial matters in order, and assure that the press keeps rolling out edition after edition of BRIEFS. I am particularly pleased over the very successful 1984 Annual Meeting at Cornell University at which several outstanding concerns of importance to the future of the Institute were favourably resolved.

The Institute plays a very important role in fostering high professional standards within the fisheries profession, but I do believe that our performance can be substantially improved by a more concerted effort within our membership to support and participate in the activities of the Institute. In this regard, the challenge falls to a very considerable extent on the shoulders of the Regional and District Directors. If the "professional aloofness" for which we are seemingly known in some circles is valid, then the Institute is indeed achieving its objective of sponsoring and recognizing superior professionalism. Review of our membership role shows that a number of our highly esteemed fisheries contemporaries are not now affiliated with the Institute, although many are. If the Institute is to grow in stature and professional influence, every effort must be made to recruit new blood into the Institute. No Member or Fellow is immune from this responsibility. A note to our Membership Review Chairman will get you the necessary forms and information. I am convinced that our high standards for professional accreditation will enhance rather than detract from the attractiveness of our Institute to the competent fisheries scientist.

While "professional aloofness" is, in itself a commendable attribute of the Institute, it is not enough. This reality has been recognized by previous Boards of Control who have instigated various innovative activities such as the establishment of individual and group awards for outstanding research achievements, and the creation of the travel raffle to encourage the attendance of graduate students at scientific meetings. Our recent sponsorship of the Alaska Symposium on Fish and Wildlife in Old Growth Forests, and its pending publication, represents a new experience of the Institute in assisting with the collation and dispersal of novel scientific information. Along these same lines, the regular publication of BRIEFS has become an important information medium for our membership, but our Editor can do a still better job if we all cooperate by sending him more news of a personal and scientific nature.

Our greater involvement in current public affairs, such as the recent Southern California District symposium on California State Bill 1414 (Ocean Resources Enhancement and Hatchery Program), and the lake trout biology seminar at Ann Arbor, is a forward step. I strongly urge our greater participation in national and international natural resources issues. Along these lines, a Committee is now acting on a proposal for compilation of a roster of scientific experts within the Institute who would be available for international or other professional assignments. This is a unique AIFRB undertaking which has merit in several respects, and I anticipate that you will be hearing more about it shortly. Surely there are persons within our Regions and Districts who have other ideas which might be adopted by the AIFRB to strengthen its membership and increase its impact on teaching, research and the practice of fisheries in its broadest terms. As your President, I will welcome suggestions and activities by which the AIFRB may better serve its membership, the profession and the public.

Hugh R. MacCrimmon, *AIFRB President*

IESC and CESO

In the recent highlights of the annual AIFRB meeting held at Cornell (BRIEFS, Oct. 1984), reference was made to discussions on how AIFRB might interact with volunteer organizations such as IESC and CESO. For the benefit of the membership, the following information was extracted from informative brochures:

These are acronyms for two voluntary programs, one American (IESC), the other Canadian (CESO). IESC, International Executive Service, is a global network of people working to upgrade the management skills, improve basic technologies, and increase productivity of business in the developing world. Based in Stamford, Connecticut, IESC is a not-for-profit organization that recruits retired, highly skilled US executives and technical advisors to share their years of know-how and expertise with business people in developing nations.

Cont. on page 2

IESC and CESO cont.

The men and women selected by IESC work as Volunteers and serve on short-term assignments overseas. They provide required assistance and develop guidelines that the client, himself, can follow in the future. Advisors assigned by IESC are the very best that US business can provide. Their purpose is to serve the interests of the organization to which they are assigned.

IESC has answered requests to help businesses ranging from handbags to steel mills. Working in 74 different nations since its first advisors were sent abroad in 1965, IESC has a Skills Bank of some 8,500 experienced men and women who are ready to supply their skills to projects where their individual experiences can best be applied. In each country where IESC works, a national Advisory Council of business leaders helps to evaluate the projects presented to IESC. Every day, IESC Volunteers are working around the globe carrying out IESC's original goal: to help developing countries speed their own progress.

IESC is a unique demonstration of how the private sector and the government in this country can work together to address the problems of development overseas. The men and women who go abroad for IESC take with them a special combination of talents: skill, experience, objective service, sympathetic curiosity, and initiative. The keen interest and unselfish dedication of the Volunteers are notably persuasive.

IESC's major emphasis is on the development of a host country's private enterprise. In considering assistance requests, IESC also looks for potential "ripple" effects that may benefit an entire country in addition to providing the direct client benefits. Administering the program abroad are full-time Country Directors who reside in areas of greatest IESC activity. Country Directors are experienced US executives who have been selected for their special aptitudes as counselors and advisors. Country Directors generate assistance requests and service both clients and Volunteers in connection with assignments. They also meet regularly with local Advisory Councils, and with both public- and private-sector representatives from the host country. Advisory Councils abroad are made up of local leaders who use knowledge of their nation's needs to help focus and speed the application of IESC's services in that country. These advisory groups help identify areas where IESC assistance is most needed and clients who can best use it. At present, IESC has Advisory Councils in 49 cities with a total of over 300 members.

Projects approved in IESC's Stamford headquarters go to the Executive Recruiters there who match retired American business executives of renowned expertise with the overseas client requesting specific advice. To select the best Volunteer Executive for each assignment, the Recruiter consults a file of over 8,500 registered Volunteers. If necessary, the Recruiter also explores sources throughout the US business community. Leadership experience in US organizations plus varied services with IESC throughout the world give the IESC Recruiters an exceptional depth of understanding and judgment.

Funding comes mainly from four sources:

A substantial portion comes in the form of grants from the US Agency for International Development (AID), which participated in IESC's formation;

A major portion represents fees contributed by overseas clients, which are agreed upon in advance of assistance;

More than 160 US corporate sponsors, and a growing number of overseas sponsors, provide financial support annually;

Governments of some countries served by IESC provide funds to help speed progress in important sectors of their economies such as small-scale enterprises.

CESO, Canadian Executive Service Overseas, was founded in 1967 at the request of CIDA (Canadian International Development Agency) for the purpose of expanding on an innovative concept of assistance to developing countries — a face-to-face approach rather than relying on infusions of money or equipment. The underlying idea was to provide leverage in the form of volunteer consultants to industry, institutions, and government in developing areas. This selective deployment of recently retired Canadians could then help to strengthen the industrial and economic base of these areas and act as an informal extension of Canada's foreign assistance operation.

The original Overseas Program has expanded over the years in both scope and impact. Operating abroad, it has sponsored experts in a great variety of fields and they have completed more than 3,265 projects in 95 countries around the world. The Canadian Native Program (CNP), started in 1969, offers the same broad range of consulting services to the Indians (status/non-status), Métis, and Inuit people of Canada and has conducted operations in more than 4,900 projects since its inception. The Trade Development Program, undertaken in 1980, enables CESO consultants to function as catalysts in joint ventures between small and medium-sized Canadian industries and their counterparts in the developing world. Funded by Canadian federal and and provincial governments, CESO also receives support from a broad spectrum of corporate contributors as well as individual donors and sustaining members.

What kind of overseas organizations does CESO assist? CESO services are available to governments, institutions, and private enterprises, with the exception of corporations under multinational control or companies financially able to support commercial counselling. The object of CESO assistance is based on the apparent need of a worthy organization for solid long-term development. The majority of projects include technical guidance of a specific nature. The range of projects covers a broad spectrum of expertise. Some general fields include: management, engineering, agriculture and fishing, food processing, forestry, mining and metallurgy, pulp and paper, construction, hotel/restaurants, transportation, manufacturing, education.

What is the financial commitment of the requesting organization? No salary or fee is paid to the consultant by the requesting organization or CESO. CESO pays,

by the most economical and direct route, to and from the project, covers medical and accident insurance, and provides a modest allowance for incidental expenditures. The client-company provides accommodation, meals, and local transportation. The client is also responsible for providing office facilities as well as translation services, if needed. If government-sponsored medical services are available, they are extended to the volunteer (and spouse) at the same standard as those available to local residents of comparable status.

What happens after an overseas request is made? The Overseas Representative forwards the completed request for a volunteer to CESO Operations Centre where available skills are carefully matched with known needs. It is of vital importance that the job description is clearly stated in order for the CESO staff to ensure that a well-qualified volunteer is approached. Once the consultant is selected, a contract is entered into between CESO and the client confirming the terms under which the consultant will serve. The volunteer is then briefed, usually at a regional office or the Operations Centre in Toronto. This briefing attempts to inform the volunteer, in a general way, about the economy, politics, and cultural background of the country where he will be living and working for the duration of the project. It is assumed that CESO volunteers are inquisitive people who will research an area on their own before accepting an assignment. At this time administrative arrangements are completed.

How long does all this take? The usual time is about 2 months from receipt of a completed application until the consultant is on the job. Overseas projects normally take from 1 to 3 months, but may last as long as 6 months. CNP projects are usually conducted on a part-time basis over a longer period. Joint Ventures and Special projects, as studies, are regularly completed in about 2 weeks.

Trade Development was started in 1980 as a logical extension to the Overseas Program. It encompasses Joint Ventures as well as Special Projects and uses the world-wide matrix of Overseas Representatives to assist clients in developing areas. The Joint Venture part of the Program works in two directions: (1) a foreign company looking for a Canadian partner or (2) a Canadian company wishing to identify a potential partner abroad. In both instances, the initial request is submitted to CESO Operations Centre and, if considered feasible, clients are required to complete applications and submit supporting documentation regarding their company's interest. Once these requirements are filled, a volunteer-consultant, highly qualified and knowledgeable in the area of interest indicated, is selected to study the proposal. In the case of a foreign company looking for a Canadian partner, the consultant identifies a capable and interested Canadian company. Then, with the approval and funding of CIDA/INC, he does a short (usually 10 days) survey of the potential foreign partner. If the consultant's written report is positive and two possible partners are identified, CESO then submits the project for finalization to CIDA/INC. In the case of a Joint Venture request originating from Canada, likely companies abroad are identified by selected OR's. Then a senior executive of the Canadian company conducts a feasibility study "on site" and writes a report with final administrative authority carried out by CIDA/INC.

Special projects are usually exhaustive studies done by a team consisting of three or four CESO experts. They often result in a series of "regular" projects. An example would be the study of the agricultural structure of Somalia done at the request of the Somali government and CIDA.

CESO management feels that this "two-directional" Program, which assists both the growth of industry in developing areas and Canadian business, is a contribution to the economic future of people abroad as well as in Canada.

At the AIFRB annual meeting, Past President Skud appointed Ron Rinaldo and Bill Bayliff to form a committee with others as they saw fit, to examine how AIFRB might assist or associate with these programs. In future issues of BRIEFS, you will no doubt learn of the deliberations of this committee.

G. "Herb" Lawler, *AIFRB Secretary*

Surface Fisheries for Tunas in the Eastern and Western Pacific Ocean

The Inter-American Tropical Tuna Commission (IATTC) staff has monitored the status of the yellowfin and skipjack tuna populations in the eastern Pacific Ocean for many years. During the 1950's it was estimated that the average maximum sustainable yield (AMSY) of yellowfin in the portion of the eastern Pacific in which the fishery took place was about 95 thousand short tons. Catches significantly in excess of that amount had not been taken in any year prior to 1960, except 1950, when the catch was 112 thousand tons. During the late 1950's and early 1960's most of the vessels were converted from baitboats to purse seiners, which considerably increased their efficiency. Record catches were made in 1960 and 1961, but then the catches and catch rates decreased in 1962 and 1963, apparently due to overfishing. Then in the mid-1960's new, larger purse seiners were built, and these and some of the older vessels began to fish farther offshore where little or no fishing had previously taken place. As a result, the catches increased to levels even greater than those of 1960-1961, and the catch rates also increased. Since then estimates of the AMSY made by the IATTC staff have been for the Commission's Yellowfin Regulatory Area, which includes the eastern portion of the eastern Pacific Ocean. The most recent estimates range from about 152 to about 175 thousand tons, depending on the assumptions employed for the mathematical models used to evaluate the status of the resource. Catches well in excess of those amounts were taken in the mid- and late 1970's, and the catch rates decreased to levels below those of 1962-1963. For skipjack, in contrast, there is no apparent relationship between fishing effort and catch rate.

During the 1970's interest in fishing for tunas in the western Pacific Ocean began to increase. In this area the catches of skipjack exceed those of yellowfin. The thermocline is normally much deeper in the western Pacific

Surface Fisheries for Tunas cont.

than in the eastern Pacific, which makes purse seining more difficult, but techniques have been developed to increase the success of fishing in such conditions. The development of these techniques, coupled with estimates of a very large resource of skipjack in the western Pacific and reduced catch rates of yellowfin in the eastern Pacific, induced many U.S.- and Latin America-based purse seiners to transfer their operations to the western Pacific. Vessels from Japan and many other nations also fish in this area. In 1982 there were 29 purse seiners in the western Pacific which had previously fished in the eastern Pacific, and in 1983 this number rose to 62. In those two years the average catch rates of yellowfin and skipjack combined in the western Pacific were approximately twice as great as the corresponding rates in the eastern Pacific.

The exodus of vessels from the eastern Pacific in the early 1980's resulted in catches of yellowfin much less than the AMSY in 1980, 1982, and 1983. This permitted the population of yellowfin to increase in the eastern Pacific, which in turn resulted in catch rates which increased by about 70 percent in 1984 relative to 1982. The average catch rate for yellowfin plus skipjack for 1984 to date is approximately 50 percent greater than for 1983, which may induce some vessels to return to the eastern Pacific.

The condition of the yellowfin resource in the eastern Pacific, as estimated from catch and effort and size composition data, has corresponded remarkably well to what has been predicted from mathematical models used to describe the fishery. The population was diminished by overfishing in the early 1960's and then recovered when effort was diverted offshore during the mid-1960's. The conservation program initiated in 1966 encouraged fishing offshore and maintained the abundance of fish inshore at an optimum level. This program ceased after 1979, and the abundance of yellowfin decreased, contributing to the exodus of vessels to the western Pacific in the early 1980's. The diversion of effort from the eastern to the western Pacific in the early 1980's has contributed to the recent increase in abundance of yellowfin in the eastern Pacific, just as the diversion of effort from the inshore portion to the offshore portion of the eastern Pacific in the mid-1960's contributed to the increase in abundance of that species in the inshore portion of the eastern Pacific.

In addition, anomalous oceanic conditions apparently contributed to the reduced effort and catches of yellowfin and skipjack in the eastern Pacific in 1982 and 1983. The thermocline, which is generally shallow in the eastern Pacific, deepened during those two years as a result of the same forces which caused the El Niño condition at that time. Earlier studies have demonstrated that when the thermocline deepens fishing success decreases. The period of the deeper thermocline in the eastern Pacific corresponds to the period when many vessels left that area for the western Pacific. By the end of 1983 the thermocline depth had returned to normal in the eastern Pacific, and the catch rates of yellowfin and skipjack have increased substantially during 1984. Although there are less environmental data available for the western Pacific, the situation appears to be the opposite there. The thermocline in the western Pacific is normally deep, but during the 1972-1983 El Niño it came nearer to the surface, and the increased fishing success in the western Pacific coincided with this shoaling. The apparent relationship between thermocline topography and fishing success in the two areas is strong; however, one must be cautious about assuming a cause-and-effect relationship, especially for the western Pacific. It is also pointed out that the data used to index the thermocline depths actually represent only small portions of the fishing areas of the eastern and western Pacific.

Inter-American Tropical Tuna Commission
La Jolla, California

Habitat Conservation — Salmon in the Sacramento River

The National Marine Fisheries Service (NMFS) and other federal and state agencies are concerned that channelization of the Sacramento River in California may contribute to the further decline of the chinook salmon resource. Over the years, Congress has authorized several projects in the Sacramento River that together would result in channelization of the river from Red Bluff to the Sacramento-San Joaquin Delta, a distance of about 250 river miles.

Historically, the Sacramento River supported a run of about 400,000 chinook salmon. Although less than 200,000 adult salmon return to spawn in the river today, it still supports an important commercial fishery. Studies conducted by the Fish and Wildlife Service (FWS) and the California Department of Fish and Game indicate that juvenile salmon are more abundant near natural, undercut banks with riparian vegetation than near riprapped banks. Additionally, hydrologic studies suggest that eroding banks in the Sacramento River may provide an important source of spawning gravels.

The effectiveness of measures to mitigate some of the adverse impacts of the project on salmon rearing habitat will be studied by the FWS. For example, the FWS will study juvenile salmon use of a modified (shallow, 5:1 slope) bank, covered with gravel, at the base of some bank protection sites. Additional studies on the impact of the project on spawning habitat should be conducted.

Alternatives to the channelization of the Sacramento River appear feasible from the resource agencies' viewpoint, but do not appear so from the perspective of the landowners adjacent to the river and project sponsors. In spite of many conflicts over optimum use of natural resources, NMFS and other concerned agencies will continue to attempt to resolve this important salmon issue.

Paget Leh, *NMFS, Tiburon, CA*

Recent Developments in Age and Growth Studies

Methods of ageing fish and of backcalculating their lengths have both been given increased critical attention

in the last few years. For about 50 years the methods have been applied to North American freshwater fisheries to accumulate a lot of data, with little attention to some of the inefficiencies and inaccuracies in application of methods. This need for more critical attention was one of the significant items in the *Proceedings of the International Workshop on Age Determination of Oceanic Pelagic Fishes: Tunas, Billfishes, and Sharks* edited by Eric D. Prince and Lynn M. Pulos, announced in the August BRIEFS (13(4):8).

It will also be a major topic in papers and discussions at the International Symposium on Age and Growth of Fishes in Des Moines, Iowa, June 9-11, 1985. For program and registration information write Dr. Robert C. Summerfelt, Dept. of Animal Ecology, Iowa State University, Ames, IA 50011. The speakers giving summary papers include R. J. Beamish, John M. Casselman, P. D. M. MacDonald, Edward B. Brothers, Frank Bulow, Ira A. Adelman, Jacques Moreau, and Daniel Pauley.

Kenneth D. Carlander, *Iowa State Univ.*

Sardine/Anchovy Recruitment Project

The occasional sardine and cracker sandwich and the anchovy atop the pizza are often only the most obvious reminders to the majority of consumers of the billions of small, silvery fish that teem in the world's oceans. Anchovy and sardine contribute about ⅓ to the world's marine fish catch. In 1982, the catch of clupeoid fish totaled an estimated 18-20 million tons with a dockside value of 1 billion dollars. The catch of such fishes, however, fluctuates greatly from year to year, with fishermen reveling in heavy catches one season and facing almost empty nets the next.

Fishermen thus face a continuing dilemma. How intensively can they continue to fish on a population and still be certain a sufficient number of fish will remain to ensure a sustained harvest in future years? Their problem is further complicated by the fact that the number of fish that enter a fishery may not necessarily depend on the number of adult fish but rather on such environmental factors as currents, upwelling, storms, tides, and such phenomena as the recent wide-spread warming of the ocean waters called El Niño which has affected the availability and distribution of fish.

A concerted effort to understand these basic problems got underway in La Jolla, California, November 5-9, 1984 when 20 fishery scientists from the U.S., Mexico, Argentina, Brazil, Chile, Ecuador, and Peru, as well as Spain — all of whom have extensive fisheries off their shores for anchovy and sardine — met to discuss ways of developing cooperative programs on how best to conduct research on recruitment in the sardine and anchovy.

Leaders in these discussions were the fishery scientists of the National Marine Fisheries Services' Southwest Fisheries Center Laboratory in La Jolla. They have developed new techniques with which to study one of the major problems of contemporary fisheries science — the stock and recruitment problem. Their interest stems from the dramatic collapse of the Pacific sardine fishery in the mid-1940's. This fishery, once the most valuable in the U.S., provided at its peak 800,000 tons of sardines a year for human food and for reduction to fish meal. Nobel-laureate John Steinbeck forever immortalized the Pacific sardine fishery in his famous novel, Cannery Row, whose locale was Monterey, California.

Peru, whose representatives attended this meeting, also has an important stake in the discussions. In the 1960's and 70's, Peru was the leading fishery nation of the world, landing 20% of the world fish catch. The fishery was based on one species of fish, the Peruvian anchovy, available in such abundance that there are accounts in the scientific literature of 350 boats fishing on one tremendous school of these fish. The evidence is strong that heavy fishing, coupled with such drastic environmental changes as warming of the ocean, was responsible for the spectacular decline of this fishery. With the decrease in the anchovy population there has been a sharp and accompanying increase in the sardine population off Peru so that today the sardine fishery has become Peru's main fishery. In attempting to explain such major fluctuations in the clupeoid populations, Center scientists, led by Dr. Reuben Lasker, Chief of the Coastal Fisheries Resources Division at La Jolla, met under the auspices of the United Nations Intergovernmental Oceanographic Commission and the National Marine Fisheries Service of the U.S. Department of Commerce National Oceanic and Atmospheric Administration. They planned the international cruises and accompanying work in the laboratory in a program called the Sardine and Anchovy Recruitment Project (SARP).

According to Lasker, SARP is possible because there is a similarity throughout the world of ocean environments where sardine and anchovy are found to flourish. This fact has now provided fishery scientists from these areas with an unique opportunity to attack the recruitment problem by combining their resources from many places and at one time.

S. W. Fisheries Center, NMFS, *La Jolla, CA*

A Research Ship for Antarctica

The 219-ft ice-strengthened research ship *Polar Duke* has been chartered by the National Science Foundation for use in the southern oceans for 3 to 5 years beginning in January 1985. The Foundation invites U.S. scientists to propose to perform research and data collection aboard the ship. Grant funds also are available for evaluation of data and publication of results. *Polar Duke* replaces the Foundation's 125-ft wooden ship *Hero*, which was retired from antarctic service in 1984; the new ship provides greater research capabilities.

Research objectives aboard *Polar Duke* are expected to fall in the disciplines of marine biology, physical and chemical oceanography, and marine geology and geophysics.

During the austral summer (October-April) the ship will work principally near the Antarctic Peninsula in conjunction with Palmer Station (operated year-round by the National Science Foundation as part of USARP, the United States Antarctic Research Program) and in

Research Ship for Antarctia cont.

the Drake Passage and the Scotia Sea. Tents and other field equipment will be available from USARP for shore-based research tended by the ship. The ship will call at ports at the southern tip of South America to embark and disembark scientists several times each summer. During the austral winter (May-September) the ship will be available for work elsewhere in the southern oceans.

Built in 1983, *Polar Duke* was designed for science and transport expeditions in polar areas. The double hull has an ice classification the same as an icebreaker, but the engines are not as powerful as those of an icebreaker. The ship is thus permitted to perform science missions in moderate pack ice, but must stay clear of heavy ice and working pack to avoid besetment. Space formerly used for cargo is being converted to laboratories, including wet laboratories. The ship has a helicopter deck, but helicopters will not be carried on board during the first year.

For further information contact the Division of Polar Programs at (202) 357-7817.

Fishery Legislation

The Final Score for 1984 — 2nd Session, 98th Congress

Dingell-Johnson

On 18 July, President Reagan signed into law legislation that expanded the Federal Aid in Sport Fish Restoration Program (D-J). After seven years of work by a coalition of fishery and boating groups and numerous individuals, D-J was expanded to add over $100 million annually to the budgets of state fisheries agencies. In addition, increased funding was provided to state recreational boating programs (see BRIEFS 13(5):6).

Artificial Reefs

Legislation to establish standards for siting artificial reefs and clarify financial liabilities and federal agency responsibilities was signed into law by President Reagan on 8 November. Deleted from the original bill introduced earlier in this session of Congress were tax credit provisions that would have provided industry incentives for donating materials for reef construction (see BRIEFS 12(6):6;13(3):4).

Federal Budgets

National Marine Fisheries Service (NMFS) — The Department of Commerce's budget, which includes NMFS funding, was one of the few budget bills to be signed by President Reagan before the end of the fiscal year. The NMFS budget was approved on 10 August. As originally proposed, the FY '84 budget would have reduced NMFS's programs drastically. Congress rejected the Administration's proposal and continued funding nearly all NMFS programs at the previous year's level. Several programs received significant increases, such as Habitat Research, Habitat Conservation, and the Commercial Fisheries Research and Development Program's grants to states (see BRIEFS 13(2):1-2).

U.S. Fish and Wildlife Service (FWS) — Funding for the U.S. Department of the Interior's FWS was approved as part of the continuing appropriations bill hammered out by Congress just before adjournment. The budget was approved by the President on 12 October. It is the strongest funding package for FWS since Mr. Reagan took office. Funding for the Cooperative Fish and Wildlife Research Unit Program was maintained at past levels, no new hatcheries were scheduled for closure, funding for the Endangered Species Program was increased significantly, grants to states for anadromous fishery research and management were increased slightly and studies on striped bass continued, hatchery maintenance funding was increased, funds were added to begin programs at the Gainesville Fishery Research Laboratory now under construction, and funds were approved to begin work on a new federal center to conduct research on anadromous fish in the Northeast.

Striped Bass Conservation

The President signed legislation on 31 October that will require states to adopt all provisions of the Atlantic States Marine Fisheries Commission's fishery management plan for striped bass. (The majority of states already are in full compliance with provisions of the plan.) Any states not complying with provisions of the plan will risk having striped bass fisheries in their waters subject to a federally-enforced moratorium. The legislation originates from a bill introduced in the House by Rep. Gerry Studds (MA). The bill also requires the Secretaries of the Departments of Commerce and Interior to review the state's existing management plan and report to Congress within six months. In addition, the Secretaries were directed to recommend additional measures needed for the conservation and protection of striped bass and conduct comprehensive annual surveys of Atlantic Coast striped bass. An authorization of $200,000 for fiscal years 1986 and 1987 was provided for operation and maintenance of striped bass hatcheries in Maryland and Virginia (see BRIEFS 13(1):3-4;13(3):4).

National Aquaculture Act

On 8 November, the President reauthorized the National Aquaculture Program at a level of $2 million each for the Departments of Agriculture and Commerce and $1 million for the Department of the Interior. Reauthorization will extend through fiscal year 1985.

Trinity River Basin Fish and Wildlife Restoration

An act to authorize fish and wildlife mitigation in the Trinity River Basin, California, was signed by the President on 24 November. The program directs the Secretary of the Interior to restore fishery resources over a 10-year period. The cost will be $57 million, with 65% to be paid by the State of California, local governments, and private sources. The program includes rehabilitation of fish habitat, improvements to hatcheries, and monitoring activities.

Marine Protection, Research, and Sanctuaries

The Marine Sanctuaries Act was reauthorized by the President on 19 October. Changes include a requirement that consultation with the appropriate Regional Fishery Management Council take place before sanctuaries are proposed and that Councils prepare regulations for fishing in sanctuaries.

Fishery Conservation and Management Act.

The President signed a bill amending the Fishery Conservation and Management Act to extend jurisdiction of the State of Alaska in certain waters in the southeastern part of the state.

Sea Grant

The National Sea Grant College Program was reauthorized through fiscal year 1987 by the President on 8 November.

Antarctic Marine Living Resources

The President implemented the convention on the conservation of Antarctic marine living resources through legislation signed on 8 November.

National Fish Hatchery System Act

In September 1984 Reps. John Breaux and Don Young introduced a bill to restructure the National Fish Hatchery System. Hearings were held, but no further action took place. A revision of the bill will be introduced early in the next session of Congress, and debate on the measure is expected to begin early next year (see BRIEFS 13(5):6-7).

Saltwater Fishing Licenses

A bill introduced in the House in May 1983 to encourage uniform licensing of saltwater anglers and a revised version of the bill introduced in February 1984 never received a hearing in the committee to which it was referred, the House Subcommittee on Fisheries and Wildlife Conservation and the Environment. Any work on a federal bill to encourage states to license saltwater anglers will have to start all over again in the next Congress (see BRIEFS 12(6):6).

Fishery-Related Bills That Failed To Pass in 1984

Water Resources Development — Massive legislation approved by the House in June contained funding of more than $12 billion for over 200 Army Corps of Engineers projects. No new water projects have been authorized by Congress since 1976. The Senate rejected the House package, and firm opposition by the President stopped all efforts to pass the bill, with the result that no new COE projects were authorized or funded in this session of Congress.

Ocean Dumping — In early October, the House passed a bill that would require municipalities dumping sludge to move dumping sites farther out to sea. The bill also placed a time limit of 5 years on the authorization of $40 million annually for a clean-up program proposed for the New York Bight. No action on ocean-dumping was taken by the Senate. Thus, work on ocean dumping was deferred to the next Congress.

Clean Water Act — Debate over nonpoint pollution control, permit requirements for water discharges and wetlands filling, and funding for sewage treatment facilities prevented reauthorization of the Clean Water Act in 1984.

Emergency Wetlands Resources Act — A bill to provide additional funding for state and federal acquisition and conservation of wetlands was approved by the House and given unanimous approval by the Senate committee with jurisdiction. However, the wetlands act was prevented from reaching the floor of the Senate for a vote due to a controversy surrounding construction of two mile-long jetties on National Wildlife Refuge and Seashore lands at North Carolina's Oregon Inlet.

Clean Air/Acid Rain — Despite extensive hearings and debate, no clean air/acid rain bills came to the floor of the House for a vote. In the Senate, the committee on Environment and Public Works passed a comprehensive rewrite of the Clean Air Act which included a mandated 10-million-ton annual reduction in SO_2 emissions over the eastern 31 states within 10 years, and required states to reduce their SO_2 emissions roughly in proportion to the amounts they emit. No vote in the full Senate occurred before Congress adjourned.

Rudolph A. Rosen, *National Wildlife Federation*
Washington, DC

District Activities

CENTRAL CALIFORNIA **Tina Echeverria,** *Director*

Jay Mallone, formerly an observer for the National Marine Fisheries Service (NMFS), presented a program in September on the porpoise interaction with the Japanese high seas gillnet fishery. NMFS is continuing to experiment with gear modifications to reduce porpoise mortalities.

Our November meeting continued the topic of marine mammals with a different emphasis: Diana Reiss, Director, Project CIRCI, Marine World, Redwood City, California, gave an interesting multi-media presentation on her research in behavior and communication with captive bottlenosed dolphins.

NORTHWEST WASHINGTON **Ed. A. Best,** *Director*

The October meeting time was changed to 12 o'clock noon in an attempt to attract a larger proportion of the District membership. The timing did not change anything and the same familiar faces from the evening meetings appeared at noon.

The business conducted by the Board of Control at the Annual Meeting was reported. Discussion on the future direction of the Northwest District as well as the Institute as a whole took up the remainder of the meeting. Suggestions for future meetings were discussed.

Announcements and New Publications

National Conference on Water Resources Research

The Universities Council on Water Resources will sponsor a *National Conference on Water Resources Research* on February 4-6,

Announcements & Publications cont.

1985 at the National 4-H Center, 7100 Connecticut Ave., Chevy Chase, MD 20815.

The objectives of this conference are:

(1) To seek a renewed effort to re-establish a national water resources research agenda;
(2) To re-state research priorities; and
(3) To develop alternative working arrangements of the research community, including federal, state, university and private sector interests.

The following conference topics will be discussed:

- Nature, Content and Characteristics of a National Water Resources Research Program.
- Structural Arrangements to Support a National Water Resources Research Agenda.
- Current and Proposed Budgetary Allocations for a National Water Resources Research Agenda.
- A Review of Public Policies and Legislation as Guides to Water Resources Research Needs.
- Identifying Policy Implications of Research as an Aid to Decision-Makers and Processes for Implementing Research Findings.
- An Information Transfer Program of Research Findings.
- Education and Training.

In addition, several areas of research needs have been identified by a conference planning committee and have been developed into areas for discussion of a National Water Resources Research Agenda. Draft papers will also be prepared on these eight areas and distributed to attendees prior to the conference.

The eight areas for the proposed National Water Resources Research Agenda are:

- Agricultural Water Use
- Biological Community Water Use
- Domestic Water Use
- Flood Control
- Industrial Water Use
- Drought
- Water Quality
- Water Resources Management

Registration forms for the conference are available from the National 4-H Center. Registration fee is $35.00.

1985 Northeast Fish and Wildlife Conference

This conference, sponsored by the Division of Conservation and Preservation, Connecticut Department of Environmental Protection, will be held May 5-8, 1985 at the Sheraton-Hartford Hotel, Hartford, Connecticut. The theme of the conference is: Conflict and Communication in Natural Resource Management.

Conference information is available from: NE Fish and Wildlife Conference, Room 255, State Office Building, 165 Capitol Avenue, Hartford, CT 06106.

6th Conference of the Comité Arctique International

This conference will be held 13-15 May 1985 at the University of Alaska-Fairbanks.

The conference will synthesize the current status of our understanding of arctic and subarctic marine ecosystems and their component organisms. The need to understand these systems is increasing due to exploitation of new resources for food and energy. At the same time, and in potential conflict, is the increasingly recognized and urgent need to protect the global environment from deterioration. The various developmental events should not occur without adequate knowledge of the complex relationships among the physical, chemical and biological variables operating to maintain the high overall ecosystem productivity of the northern high latitude seas. The true polar arctic sea is very unproductive at the lower trophic levels, although in coastal regions there appear to be localized areas of greater activity. Nevertheless, these seas do support a unique and important mammal component, some resident during all seasons, and others which are migatory and return north to feed each summer season. The marginal seas, which extend as arms into the subarctic, support some of the most extensive fisheries in the world. Yet during a significant portion of the year they are ice-covered and subject to long hours of darkness. The biological regimes of these regions have recently received much attention and the basic scientific importance of these findings is now apparent.

Technological and instrumental developments have played an important part in allowing progress in high latitude seas. Remote sensing, acoustic methods, buoys and submersibles are among the tools which can be applied. Future progress will inevitably require these and other techniques for acquiring data.

In this conference, we will examine the living systems, the contemporary approaches to their investigation and the tools now available in support of the research.

Program sesions will include: Arctic Marine Biota; Major Northern Maritime Compartments; New Ventures in Arctic Marine Environmental Studies; and Arctic Ocean Science Board.

Information on registration is available from: Ms. Maggie Billington, Institute of Marine Science, University of Alaska-Fairbanks, Fairbanks, Alaska 99701.

✓ Annual Tuna Conference

The 36th Annual Tuna Conference will be held at the University of California Conference Center, Lake Arrowhead, California, during May 21-24, 1985. The Tuna Conference has been an annual event since 1950, providing an opportunity to meet and exchange information about current research on tuna and tuna-like species. The meeting is sponsored by the Inter-American Tropical Tuna Commission, La Jolla, California and the National Marine Fisheries Service, La Jolla, California.

The theme of the Conference will be distribution, abundance, and movements of tunas and tuna-like species, since these are subjects of fundamental and applied importance. However, presentation on topics aside from the theme are always welcome. In addition, space will be provided for poster presentations.

For further information on the conference write to Kurt M. Schaefer, Inter-American Tropical Tuna Commission, c/o Scripps Institution of Oceanography, La Jolla, California 92093. Phone (619) 453-2820, ext. 373.

40th Annual Meeting — Soil Conservation Society of America

"Conservation: A Matter of Motivation" will be the theme for the 40th annual meeting of the Soil Conservation Society of America, August 4-7, 1985, at Marriott's Pavilion Hotel in St. Louis, Missouri.

The program will look at the importance of motivation in attaining land and water conservation objectives and at motivational techniques for implementing land and water conservation practices and programs.

Chairman of the Program Committee for the meeting is Donald E. Van Meter, professor and chairman of the Department of Natural Resources at Ball State University in Muncie, Indiana. Russ Mills, deputy state conservationist for the U.S. Department of Agriculture's Soil Conservation Service in Columbia, Missouri, will head the Local Arrangements Committee. Contact: Walt Peechatka, (515)289-2331.

Environmental Opportunities

Sponsored by the Environmental Studies Department, Antioch/New England Graduate School, Keene, NH 03431, *Environmental Opportunities* is a monthly publication which describes job openings throughout the United States. The service is useful for those seeking employment in the environmental area and for employers who wish to fill positions. The vacancies are arranged according to the following categories: Administration, Agriculture, Miscellaneous, Museum, Nature Center, Planning, Research, Teaching, Seasonal Positions/Internships, and Positions Wanted. Subscriptions (6 months — $20.00; 1 year — $36.00) are available from Environmental Opportunities, Box 670, Walpole, NH 03608.

Great Lakes Directory

The Center for the Great Lakes announces its new *Directory of Great Lakes Natural Resource Agencies and Organizations.* The book is a comprehensive collection of U.S. and Canadian Great Lakes agencies and organizations, both public and private. Its scope encompasses groups involved with the management of natural resources and the environment, public health, shipping and economic development.

Each entry contains a detailed description of the organization's purpose, function, activities and publications along with the appropriate names and addresses.

Extensive cross-referencing is provided for agencies and organizations with multiple interests.

To order a copy, send a check or money order [$20, U.S.] to: The Center for the Great Lakes, 435 N. Michigan Ave., Suite 1733, Chicago, IL 60611.

Acute Toxicities of Organic Chemicals to Fathead Minnows (*Pimephales promelas*) Vol. I

Within the last few years, attention has focused upon predictive environmental toxicology as a screening technique in assessing hazardous chemicals. Due to the potential value of using structure-activity relationships to estimate aquatic toxicity from chemical structure, strong needs have developed for accurate databases.

Acute Toxicities of Organic Chemicals to Fathead Minnows (Pimephales promelas) *Vol. I* contains original test data for 174 organic chemicals, comprising one of the largest databases of its kind using a single test species.

The book can be ordered for $62.95 per copy from the Center for Lake Superior Environmental Studies, University of Wisconsin-Superior, Superior, Wisconsin 54880.

Thesis and Dissertation Abstracts

Ages and Growth Aspects of the Life History of Billfishes

Charles Algeo Wilson, III, Ph.D. 1984
University of South Carolina

This dissertation was reported in the October 1984 issue of BRIEFS as an M.S. thesis. The Editor regrets the error.

Species Similarity and Movement of Fish Assemblages on Artificial and Natural Reefs in Monterey Bay, California

Kathleen Ryan Matthews, M.A. 1983
San Jose State University

A study was conducted to investigate the sequence of interactions between the fish populations on a new artificial reef and those on nearby natural reefs in Monterey Bay. Underwater transects revealed that the species composition of fishes on the artificial and natural reefs was similar after 1 year. Colonization on the artificial reef consisted of adult and subadult rockfishes, surfperches, greenlings, and cabezon. Monitoring studies demonstrated that a greater amount of sportfishing occurred on the marked and easily accessible artificial reef, mostly by skiff fishermen. A fish tagging study revealed that substantial movement of fishes occurred, in some cases up to 1.6 km, from the natural reefs onto the artificial, but no movement was observed from the artificial reef to the natural reefs. Early colonization by adult and subadult fishes, subsequent substantiated movement from the natural reefs onto the artificial reefs, and large amounts of fishing pressure suggest that artificial reefs could have detrimental effects on natural reef fish populations. Although it is impossible to know what proportion of colonizers came from nearby natural reefs, the location of the natural reefs may be an important consideration when planning the placement of future artificial reefs.

Molt and Reproduction of the Ridgeback Prawn *Sicyonia ingentis* (Penaeidae)

Susan Anderson, Ph.D. 1983
University of California-Davis

A commercial fishery for the ridgeback prawn (*Sicyonia ingentis;* Penaeidae) has recently developed off Santa Barbara, California, yet little is known of the animal's life history. Growth rates and patterns of molt and reproductive activity were examined for *S. ingentis*. These patterns have not been well characterized in other free-spawning crustaceans.

Gonadosomatic index and percentage of ripe animals present were used to generally delineate the spawning season. The first vitellogenic period of the year occurs in May. Multiple spawning occurs throughout the summer. Prawns cease spawning in October. Multiple spawning is inferred by the high frequency of prominent oocyte features which are termed cortical specializations (CS). The duration of the CS stage and other postvitellogenic oocyte stages was studied in the laboratory using repeated ovarian biopsies. It was determined that prawns with CS-stage ovaries would spawn within 1 week in the field.

Molt studies showed that molt frequency is highest in the winter and spring months when ripe animals are rarely found. Ovarian bulk increases rapidly in May. At this time, the majority of the females begin a synchronous molt cycle which is not completed until late October or early November, after the spawning season is over. Males exhibit similar synchrony, but the period is shorter, and there is more variability.

The indication of a strong potential for multiple spawning throughout the summer, coupled with the observation of almost no molting in the summer, indicate that multiple spawning occurs without intervening molt or mating. This possibility was addressed in laboratory studies which demonstrated multiple spawning activity of these prawns within a single, prolonged molt cycle.

Size distributions obtained from 2 years of monthly offshore trawls and some inshore trawls were analyzed. Settlement, which occurs in relatively shallow water, appears to be completed by December. Based on comparison of size distributions, early juvenile growth rates are approximately 1-2 mm/mo. This species is unique in that there are very few free-spawning crustaceans on the west coast of the U.S. Closed gyral circulation in the Southern California Bight, favorable temperatures for larval development, and a relative abundance of soft substrate over its limited range are possible reasons for its occurrence.

Membership Report

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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; the results of research; the effects of management; unusual biological events; matters affecting the profession; political problems; and other matters of importance to the fishery community. Comments and contributions should be sent to the Editor, Dr. Oliver B. Cope, 15 Adamswood Road, Asheville, NC 28803. Subscription $15 a year to Institutions and Non-Members.

ISSN-8755-0075

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