



**Section Officers**

**President  
Max Stocker**

Fisheries & Oceans Canada  
Pacific Biological Station  
Nanaimo, B.C. V9R 5K6 Canada  
Phone: 250-756-7200  
FAX: 250-756-7209  
StockerM@dfo-mpo.gc.ca

**Past-President  
John Boreman**

NMFS-NEFSC  
Woods Hole, MA  
Phone: 508-495-2233  
FAX: 508-495-2232  
John.Boreman@noaa.gov

**President-Elect  
Steven Berkeley**

Hatfield Marine Sci. Center  
Oregon State University  
Newport, OR 97365  
Phone: 541-867-0135  
FAX: 541-867-0138  
steve.berkeley@hmsc.orst.edu

**Secretary/Treasurer  
Anne-Marie Eklund**

NMFS-SEFSC  
75 Virginia Beach Drive  
Miami, FL 33149  
Phone: 305-361-4271  
FAX: 305-361-4478  
anne.marie eklund@noaa.gov

**President's Comments**

*This is my last President's Comments column as your president. I have enjoyed being President of the Marine Fisheries Section, and I want to take this opportunity to thank all of you who contributed to the MFS efforts over the past two years. I urge you to provide the same support to Steve Berkeley when he takes over as MFS President during the Hartford meeting.*

*During the two-year term of office, serving as a member of the Governing Board and the Special Management Committee, I have gained great insight into the workings of the Society. Most recently, I participated at the mid-term meetings of the Society's Governing Board on March 14th in Phoenix. During the meeting, the Board reviewed the reports of the subunits and special committees of the Society, and made critical decisions about the future direction in which the Society is moving. Major Governing Board action items have been summarized in "The AFS Diary" in the May 1998 (p. 43) issue of Fisheries. During the meeting, the Governing Board also held a retreat to review the Society's strategic plan. A revision of the plan by the Strategic Plan Review Committee is underway, and a draft of the plan for review by the membership will be ready for the annual meeting in Hartford.*

*Many members of the Marine Fisheries Section have again been busy during the last six months preparing material on behalf of the Section. I have reported on the following items on behalf of the Section at the mid-year AFS Governing Board meeting held on March 14th, 1998, in Phoenix:*

**Bycatch:** *The book resulting from the Dearborn symposium on bycatch entitled, "Fisheries Bycatch: Consequences and Management" is now available from the Alaska Sea Grant Program. Twenty-five extended abstracts and a panel discussion on bycatch management are included in this book.*

**Northwest Atlantic Groundfish:** *The groundfish book entitled, "Northwest Atlantic Groundfish: Perspectives on a Fishery Collapse" is out. The book was edited by John Boreman, Brian Nakashima, Howard Powles, Jim Wilson, and Bob Kendall.*

**Endangered Marine Fisheries:** *Although many North American marine fisheries stocks have been identified to be at risk, quantitative criteria defining the degree of endangerment have been questionable. The AFS, through its Marine Fisheries Section and Endangered Species Committee, has begun an initiative to identify marine fish stocks at risk in North America. The AFS is planning a workshop in late spring or early summer of 1998 to discuss and resolve these issues. Jack Musick is heading the effort on behalf of the Section. His overview on the issue has been published in the Winter Issue of the MFS Newsletter under the title, "Endangered Marine Fishes: Criteria and Identification of North American Stocks at Risk."*

**Bluefin Tuna:** *Steve Berkeley has prepared a statement on Bluefin tuna on behalf of the Section. The statement is responding to recent ICCAT action. The statement has been published in the Winter 1997 issue of the Marine Fisheries Section Newsletter. Steve has prepared a similar draft statement on Atlantic Swordfish which is currently under review (see insert).*

**THIS ISSUE**

President's Comments .....	1
Alaska SeaLife Center .....	2
Grouper Stocks at Risk .....	3
AFS Raffle/Auction .....	4
Symposia Calendar .....	5
Workshop Report .....	6
Bluefin Tuna Study .....	7
Annual Meeting .....	8
Swordfish Statement - Insert	
MFS-AFS Ballot .....	Insert

(continued on page 2)

*(President's Comments continued from page 1)*

**Mote International Symposium:** Florida State University is holding the Second Mote International Symposium on November 4-6, 1998. The topic of the symposium is Essential Fish Habitat and Marine Reserves. The topic area was chosen because it represents a substantial change in ethics in the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) to adopt a precautionary approach in fisheries management. Marine reserves provide one of the tools available to protect habitat deemed essential to sustainable fisheries. The Marine Fisheries Section has agreed to sponsor the poster session for the symposium.

**Annual Meeting Symposia:** The Section is sponsoring four symposia at the upcoming annual meeting in Hartford. John Hoenig, Doug Vaughan and Michael Prager have organized two symposia. One on "New quantitative methods in fisheries stock assessment," and the other on "Overfishing." The third symposium has been organized by Gavin Begg and Kevin Friedland and is on "Stock identification - its role in stock assessment and fisheries management." And finally, a symposium co-sponsored with the Estuarine Section is on "Biological integrity of fish habitat: a key tool for ecosystem management?" This symposium has been organized by Ian Hartwell, Anne-Marie Eklund, and Stephen Waste.

**Newsletter and Communication:** Newsletter Editor Jane DiCosimo produced two issues of the newsletter. To communicate more effectively among members, the Section is establishing a web page. Russel Brown is taking the lead in this project. Russel has provided a web page outline, and we hope to have the page up and running by mid-winter or early spring.

**Treasury/Membership:** The reported balance in the Section account as of February 23, 1998 was \$17,631.79. The Section had 417 members as of the end of December 1997.

**Elections:** MFS elections are held in even-numbered years, so 1998 is the year! During 1998 elections will be held for two positions, President-elect and Secretary-Treasurer. Both positions are two-year terms. The Nominating Committee, chaired by John Boreman (Past-President), has prepared a slate of candidates to stand for election. The candidates are Doug Vaughan and Anne Richards for President-elect. Anne-Marie Eklund has agreed to run unopposed for a second term as Secretary/Treasurer. **Don't forget to vote! Return your ballot to me today!**

In closing, I urge Section members to attend the MFS business meeting in Hartford. **The meeting will be held on Sunday, August 23rd from 5-7 p.m. at the Sheraton Hotel.** The EXCOM requires your input in developing the Annual

*Program of Work for the Section. To prepare your input for 1998/99 work planning, I reiterate the goals of the MFS: (1) to continue to be AFS member's primary resource of for development of marine professionals, (2) MFS will assist in developing public policy affecting marine fish and fisheries, (3) MFS will serve as a source of experts for evaluating research and monitoring programs that address marine fisheries issues in North America, and (4) MFS will increase the diversity of its membership and the marine fisheries profession. If you can't make it to the meeting please send me your ideas by mail, fax or e-mail.*

*Have a nice summer, and I hope to see you in Hartford.*

*~Max Stocker, President*

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## Alaska SeaLife Center Partnership

The National Fish and Wildlife Foundation was specifically provided in FY 98, through the National Marine Fisheries Service's budget, a grant of \$1,000,000 to support the Alaska SeaLife Center's sea lion conservation efforts and other priority activities related to marine mammal conservation of the Prince William Sound area. These funds will support a competitive challenge grant program that will leverage additional dollars from non-federal sources for Stellar sea lion recovery. These funds will also be used to coordinate and administer research at the Alaska SeaLife Center. The



involvement of the National Fish and Wildlife Foundation in this conservation effort will bring about the partnership and coordination to complement what NOAA, the State of Alaska, the North Pacific Universities Marine Mammal Research Consortium, and other entities are doing for marine mammal conservation for this area of Alaska.



## Flatfish Biology Workshop

The National Marine Fisheries Service Northeast Fisheries Science Center is sponsoring a Flatfish Biology Workshop to be held December 1-2, 1998, at the Best Western Sovereign Hotel in Mystic, CT. The workshop is the sixth in a series that began in 1986 dealing with Northeastern Atlantic flatfishes. Individuals conducting research on various flatfishes may present their findings to others interested in gaining a better understanding of flatfish biology. Of particular emphasis this year will be research activities related to essential fish habitat for species covered under Fishery Management Plans, including the American plaice, Atlantic halibut, and the witch, yellowtail, summer, winter, and windowpane flounders. However, oral presentations or posters on any aspect of flatfish biology will be considered by the organizing committee, with the exception of stock assessment, which is covered by other workshops. Persons who have not received a prior mailing and are interested in attending or presenting a paper should contact Dr. Anthony Calabrese of NMFS-Milford Laboratory (anthony.calabrese@noaa.gov), 212 Rogers Avenue, Milford, CT 06460-6499. Abstracts are due no later than **July 31, 1998**. Further details will be provided in September and will be available on the Milford Laboratory home page at [www.mi.nmfs.gov](http://www.mi.nmfs.gov).

~Don Danila

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## REFLECTIONS

We would like to extend an early invitation to all subunits to participate in the program of the 130th Annual Meeting, to be held in St. Louis, Missouri, August 14-19, 2000. Many of you are doing long range planning for your sections and we want you to consider joining us in St. Louis.

The theme for the meeting will be "Reflections." Our hope is that this theme will provide an opportunity to look back at milestones as well as honestly assess our oversights. One of our goals for this meeting, as well as the term of Chris Moffitt as AFS President (1999-2000), will be to foster greater communications among disciplines. We hope you consider this as one of your goals as well as you plan for the future.

Julie Claussen  
Illinois Natural History Survey  
607 E. Peabody  
Champaign, IL 61820  
(217) 244-5113  
[juliec@uiuc.edu](mailto:juliec@uiuc.edu)

Roger A. Rulifson, Director  
Field Station for Coastal  
Studies at Mattamuskeet  
College of Arts and Sciences,  
Mamie Jenkins Bldg.  
East Carolina University  
Greenville, NC 27858-4353  
(252) 328-1757 Voice,  
(252) 328-4265 FA X  
[RulifsonR@mail.ecu.edu](mailto:RulifsonR@mail.ecu.edu)

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**Please don't forget to Vote!**  
**Ballot can be mailed or faxed**  
**Must receive by August 15**

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## Current Research and Management of Grouper Stocks at Risk

Grouper, from the family Serranidae, are generally found on coral reefs or rocky bottoms as adults and often in estuarine areas, associated with seagrass beds or mangrove shorelines, as juveniles. Groupers are highly susceptible to overexploitation due their life history strategy of slow growth, long lives and delayed age of reproductive maturity. Many grouper species aggregate to spawn in large numbers at predictable locations and seasons, making it easy to locate and harvest large numbers at once.

Jewfish, *Epinephelus itajara*, and Nassau grouper, *E. striatus*, were once targeted at their spawning aggregations and were overfished to the point of economic extinction. The jewfish fishery has been closed in US waters since 1990. All harvest of Nassau grouper has been closed for several years in US Atlantic and Caribbean waters and since 1997 in the Gulf of Mexico.



They are both candidate species for the US Threatened/Endangered Species List. Species that have been added to the candidate list recently, include Warsaw grouper, *E. nigritus*, speckled hind, *E. drummondhayi*, and marbled grouper, *Dermatolepis inermis*.

Research is currently underway to determine if jewfish populations are recovering in the Gulf of Mexico, off southwest Florida. Florida State University and National Marine Fishery Service (NMFS) biologists, Felicia Coleman, Chris Koenig and I, have been tagging adult jewfish at their spawning aggregations to determine stock structure and distribution. With the help of a local spearfisher, we have been able to census the aggregations for several years. Although the aggregations have increased in numbers, it is too early to assess population recovery. Progeny spawned since the fishery closure are only now old enough to reproduce. By monitoring the year-class strength of juveniles in their nursery habitat, along the mangrove shores of southwest Florida, we hope to determine population status. Although overfishing was the ultimate cause of the decline in jewfish populations, we are not sure if degradation of their nursery habitat may have contributed to lower population sizes.

Another NMFS biologist, Stephanie Bolden, is investigating home range size of Nassau grouper in the Bahamas. Results of her research could be used in designing marine reserves, so that they would contain the quality and quantity of habitat necessary for these top predators. Although Warsaw grouper, speckled hind and marbled grouper have been added to the candidate species list, we know little about these species' habitat requirements and biology, mainly due to the fact that they inhabit less accessible, deep reef areas.

Even with complete fishery closure, some mortality of these species is bound to occur, due to release mortality, by catch associated with trap and long-line fisheries, mis-identifications and intentional poaching. Complete no-take zones are a fishery management strategy that is rapidly gaining approval. In areas where none of the fish are exploited, we may learn more about fish species' food and habitat requirements than we can today with such heavily exploited marine food webs. Marine reserves, such as those currently in place in the Florida Keys National Marine Sanctuary, may give scientists and managers a clearer picture of the reef habitats needed to sustain predatory fishes, such as the easily overexploited groupers.

~Anne-Marie Eklund

# Calendar of Upcoming Symposia

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**Lowell Wakefield Fisheries Symposium:** The 16th *Lowell Wakefield Fisheries Symposium* will be held September 29–October 3, 1998, in Anchorage, Alaska. As a joint meeting with the AFS Western Division Alaska Chapter and North Pacific International Chapter, the joint meeting theme is "Ecosystem Considerations in Fisheries Management."

Wakefield Sessions – Oral and poster presentations scheduled in the Wakefield sessions are by researchers from Sweden, Ukraine, United Kingdom and United States. The program is organized into six sessions: Physical and Environmental Effects; Species Interactions; Concepts and Tools for Management; Anthropogenic Influences; Habitat and Spatial Considerations; and Whole Ecosystem Approaches. For complete information, including titles and continuing education courses, visit the Sea Grant web site at [www.uaf.edu/seagrant/Conferences/symposia.html](http://www.uaf.edu/seagrant/Conferences/symposia.html).

AFS Sessions - Oral and poster presentations for the AFS program are organized into the following sessions: Lake Fertilization; Influence of Spawning Anadromous Fishes on Freshwater and Terrestrial Ecosystems; Sockeye Salmon Ecology and Management; Recent Developments in Modeling Salmon Populations; Riparian Ecology and Management; Rainbow Trout in Alaska; Ecosystem Management on Commercial Forest Land; Current Topics in Marine Fisheries Assessment and Management in the North Pacific; Pink Salmon and Oil; What Have We Learned from the *Exxon Valdez*?; Adaptive Management for Fish Recovery and Enhancement; Applications of Mass Marking in Fisheries Management Research; and Effects of Urban Development on Fish and Their Habitat. For AFS session information and updates, visit the Chapter web site at [www.alaska.net/~fishak](http://www.alaska.net/~fishak).

You are urged to register in advance so that adequate materials are available. A registration form and instructions are on the Sea Grant and Chapter web sites. For more information, contact Brenda Baxter at (907) 474-6701, fax (907) 474-6285, or e-mail: [FNBRB@uaf.edu](mailto:FNBRB@uaf.edu).

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**William R. and Lenore Mote Symposium:** November 4-6, 1998 - Florida State University's Second International *William R. and Lenore Mote Symposium*, Sarasota, FL. Symposium topics related to essential fish habitat and marine reserves include: Selection of sites; Management; Function; Population-Level Effects, and; Social Aspects. Contact Chuck Jones, Center for Professional Development, Florida State University, Tallahassee, FL 32306-1640. Phone (850) 644-3806 or e-mail: [CJones@cpd.fsu.edu](mailto:CJones@cpd.fsu.edu).

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**ICES/SCOR Symposium: "The Ecosystem Effects of Fishing":** March 16-19, 1999, Montpellier, France. The aim of the symposium is to provide a world-class synthesis of the impacts of fishing on the marine ecosystem, to report on new methods for quantifying these impacts and to provide a forum for discussion on how objectives related to nature conservation can be integrated in future fisheries management. Poster contributions documenting case studies of fisheries impacts in different ecosystems, methods to quantify fisheries impacts at the ecosystem level, or integration of environmental considerations in fisheries management are especially encouraged. Invited papers and papers based on poster presentations will be considered for publication following peer review in a special issue of the ICES Journal of Marine Science. For more information contact Ussif Rashid Sumaila ([Sumaila@fisheries.com](mailto:Sumaila@fisheries.com)), the ICES Secretariat or from the co-convenors: Mike Sinclair ([sinclairm@mar.dfo-mpo.gc.ca](mailto:sinclairm@mar.dfo-mpo.gc.ca)) and Henrik Gislason ([hg@dfu.min.dk](mailto:hg@dfu.min.dk)).

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**15th International Symposium on Biotelemetry:** The 15th International Symposium on Biotelemetry is being held in Juneau from May 9-14, 1999. The conference is sponsored by the International Society on Biotelemetry (ISOB) and hosted by the NMFS Auke Bay Laboratory. Increasingly, telemetry is becoming an important tool in fish and wildlife research for addressing natural resource issues. Unprecedented advances in electronics and telecommunications are providing new approaches and applications that can substantially enhance ability to meet research and management goals. Often the challenge is just to keep up with the available technology. The purpose of the ISOB is to encourage effective use of telemetry by promoting exchange of information between people in related fields. The 15th ISOB Symposium is designed to provide biologists, researchers, managers, and technical engineers and opportunity to discuss current work, new technologies, and applications. A commercial exhibition highlighting advances in telemetry and telecommunication equipment will be held with the Symposium from May 10-12, allowing discussion of specific equipment and applications.

For additional information on registration, submission of papers, and general information about the conference, please contact: 15th ISOB Organizing Committee, P.O. Box 35205, Juneau, AK 99803; (907) 789-6033, fax (907) 789-6094 or e-mail [john.eiler@noaa.gov](mailto:john.eiler@noaa.gov).

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**“Pandalid Shrimp Fisheries - Science and Management at the Millennium”**

Marking the 50th anniversary of ICNAF/NAFO, hosted by NAFO and co-sponsored by ICES and PICES, this symposium will be held September 8-10, 1999 (venue to be announced). Some aspects of management of pandalid shrimp management to be considered include: environmental and ecological influences, stock assessments and associated biological research, management strategies, and harvests. For more information, contact: O. Koeller (NAFO - koellerp@mar.dfo-mpo.gc.ca; (902) 426-5379; fax (902) 426-1862; J. Boutillier (PICES - boutillier@dfo-mpo.gc.ca); or S. Tveite (ICES - Stein.Tveite@imr.no; phone +47 37 05 90 00; fax +47 37 05 90 01).

**1998 AMERICAN FISHERIES SOCIETY RAFFLE/AUCTION**

*As the great Yogi Berra is credited with saying, “It’s deja vu all over again.” Yes, it’s almost AFS Raffle time again, and this year’s raffle and auction could be the biggest ever held, but only with your help. The Raffle Committee, comprised of representatives from most AFS units, has worked hard to get super prizes from their units as well as from lots of individual members and corporations. As a result, we have so many prizes that we’ll have enough for a silent auction at Monday night’s Trade Show Social in Hartford, CT, on August 24, 1998.*

Bid on something for yourself or someone special and contribute to a great cause. We will auction off (1) fishing, hunting, whitewater rafting trips, (2) an original watercolor of a jumping tarpon that was an AFS book cover, (3) several framed wildlife prints, and (4) other “wild” stuff.

You don’t have to be a member nor do you have to be present to win fabulous prizes at the all-members raffle. You could win a guided fishing trip (all raffle trips will have expenses paid or substantially covered), a dreamy vacation, or other outdoor adventure in the US and Canada. We also have a great selection of collectibles, including framed stamp/prints, signed and numbered wildlife prints, a Gyo-taku print, and outdoor photography. We have already received donations of wildlife crafts, home furnishings, jewelry, clothing, and other fish paraphernalia. President Bob Carline has carved a black cherry shortfin mako shark specially for this year’s raffle. Of course, there will be fishing equipment, computer software, books, and other prizes to be won. But you cannot win unless you buy a ticket.

Each raffle ticket costs \$4 US/ \$5 CAN. If you sell 5 tickets, the LAST TICKET IS FREE. You can keep the 6th ticket or you can sell it and either keep the proceeds or donate it to your favorite AFS subunit. I hope you will buy tickets yourself and sell tickets to your colleagues, friends, and family. For a \$40 US/ \$50 CAN donation, you get two books of 6 tickets each plus another 2 tickets. For \$100 US/ \$125 CAN, you get 5 books of 6 tickets plus another book of 6—36 CHANCES TO WIN, 11 FREE TICKETS! Every ticket holder is eligible to win all of the prizes. Ticket stubs with name, address, and phone number should be returned to the Parent Society Office by August 15, 1998 to be sure of making it into the raffle drawing in Hartford, CT, on August 26, 1998. If you would like more tickets, please call Marilyn Brown, Unit Services Coordinator, at (301) 897-8616 x201.

If great prizes and free tickets aren’t enough incentive to participate in the 1998 AFS raffle and/or auction, perhaps you need to know that all the proceeds will go to an excellent cause—the Skinner Memorial Trust Fund. By awarding our best students with Skinner travel funds to attend AFS annual meetings, they get to know our great fisheries professionals, while we help assure future fisheries and aquatic resource professionals. Help make this year the best-ever raffle and perhaps be a big winner yourself.

*~Donna D. Turgeon, Chairman  
1998 AFS Raffle / Auction*

# Workshop Report: "The Use of Ecosim to Evaluate Strategies for the Sustainable Exploitation of Multispecies Resources"

by *Dr. Daniel Pauly*

Fisheries science, based almost exclusively on single species population dynamics since World War II, has been conspicuously unable to answer, and often has failed even to pose, questions about the impacts of fishing on marine ecosystems. In fact, changes to ecosystems after the collapse of stock have generally caught fisheries science by surprise; now it is gradually being realized that the historical impacts of fishing have been large, dramatic and difficult to reverse.

The FAO Code of Conduct for Responsible Fisheries highlights the importance of multi-species approaches to fisheries management. For example, Paragraph 12.5 recommends that, "States should be able to monitor and assess the state of stocks under their jurisdiction, including the impacts of ecosystem changes resulting from fishing pressure, pollution or habitat alteration. They should also establish the research capacity necessary to assess the effects of climate or environmental change on fish stocks and aquatic ecosystems." This issue was also identified as being of particular importance at the 1996 Kyoto Conference and in the resulting Kyoto Declaration. After the Kyoto Conference, the host Japanese government established a trust fund to be administered by the FAO Fisheries Department, to follow up on a number of recommendations contained within the Declaration, including that to promote a strengthened scientific basis for multi-species and ecosystem management.

In recent years, substantial progress has been made with the Ecopath ([www.ecopath.org](http://www.ecopath.org)) approach for modeling fisheries resource systems, both in terms of the number of systems to which it has been applied and in the types of applications. Within the latter category, Ecoranger (allowing incorporation of uncertainty), Ecosim (allowing simulation of ecosystem changes over time) and Ecospace (adding a spatial dimension to Ecopath) have been particularly important developments, as they allow for screening of policy options in multi-species/ecosystem contexts, a facility not previously available without the massive data sets required e.g., for the implementation of Multi-species Virtual Population Analysis.

Policy screening is particularly relevant to the multi-species requirements of the Code of Conduct and the Kyoto Declaration. FAO therefore approached the UBC Fisheries Centre, a base for several of the key scientists working on Ecopath, to host a workshop to evaluate the current status and capabilities of the Ecopath package for potential application in multi-species assessment and management. The objectives of the workshop were: To investigate the use of the Ecopath software package as a tool to study the impacts of different harvesting approaches on simulated ecosystems, with a view to application of suitable approaches in actual multi-species fisheries; and, To identify and document the strengths and weaknesses of the Ecopath approach in this role.

If the Ecopath approach was found, in some or all cases, to provide acceptably realistic representations of actual ecosystems, then it would open up the possibility of using Ecopath or Ecopath-type models to explore different management strategies and to identify the most appropriate option for implementation.

The workshop was held March 25-27, 1998, at the Fisheries Centre and included more than twenty researchers from international organizations and academia. The full workshop report (presently being edited by Daniel Pauly and soon to be available as a Fisheries Centre Research Report), includes summaries of key lectures describing Ecopath 4.0 (V. Christensen), the background, capabilities and shortcomings of Ecosim (C. Walters), the use of Ecosim in an economic context (R. Sumaila), to assess the effectiveness of marine protected areas (R. Watson), and as a conceptual tool for ecosystem rebuilding efforts (T. Pitcher). Also included is a description of Ecospace, recently developed by C. Walters and bundled, along with Ecosim, into Ecopath 4.0.

Particular emphasis was given in the report to results of various simulations, designed to test Ecosim predictions and thus to meet FAO's requirements of an analysis of the software's potentials and limitations. The report concludes with a general discussion of the level of prediction that can be expected as results of Ecosim/Ecospace applications. The single most important result of this workshop is a clear idea of the potential usefulness of the Ecopath approach in the varied circumstances of FAO member countries, tempered by a realistic understanding of the limitations of the software.

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## Publications

***Forage Fishes in Marine Ecosystems*** - Alaska Sea Grant College Program publication number AK-SG-97-01. Includes 56 research contributions and one workshop report from the 14th Lowell Wakefield Symposium in 1996. Visit [www.uaf.edu/seagrant](http://www.uaf.edu/seagrant), or call (907) 474-6707, fax (907) 474-6285 or email [FYPUBS@aurora.alaska.edu](mailto:FYPUBS@aurora.alaska.edu).

## Stanford Scientists to Study Pacific Bluefin Tuna

**La Jolla, CA** . . . Using innovative technology, such as “pop-off” satellite and archival tags and recently developed sea pen systems, Drs. Barbara Block and Heidi Dewar of the Hopkins Marine Station, Stanford University, and Charles Farwell of the Monterey Bay Aquarium, are initiating a major interdisciplinary study of the Pacific bluefin tuna, both in captivity and in the wild. Their work is being funded by the California Sea Grant College System with matched funding provided by the Packard Foundation.

Pacific bluefin tuna, which range the Pacific basin, will face intense fishing pressure in the coming decade. The situation results not only from the fish’s economic importance (one kilogram can sell for nearly \$300 in Japan), but from the fact that bluefins have been so heavily exploited in recent decades. The Atlantic bluefin tuna and southern bluefin tuna, both cousins of the Pacific bluefin, are heavily regulated and populations are overexploited. The Pacific bluefin fishery is the only unregulated bluefin fishery remaining in the world.

Studies with captive fish will include work in an newly developed pen system in Baja California, in collaboration with Tedd Dunn, as well as at the Tuna Research and Conservation Center, a joint facility of Stanford University and the Monterey Bay Aquarium. “We’re trying to establish a protocol for holding bluefin tuna fish long-term in good health and condition,” says Block. “This will not only contribute to our understanding of the basic biology of tuna, but will also assist bluefin farmers in maximizing price by improving the condition of fish.”

Bluefin are presently farmed in the Mediterranean, western Atlantic, and western and southern Pacific. This past year, Block, Farwell and Dewar initiated studies with Dunn to better understand the bluefin tuna he and his partners had brought into captivity. For the bluefin tuna pen operation, fish are caught during July and August, fed a diet rich in calories to promote growth, and then harvested during January and February.

Studies of long-term movement patterns and behavior in the wild will complement studies of captive populations. Twenty-eight tuna will be implanted with pop-off satellite tags capable of strong information. At a predetermined time, these tags detach from the fish and float to the surface where they transmit stored data to a satellite. The tags will provide a continuous record of depth and water temperature, as well as position estimates at least several times per week.

“These tags will provide information that’s normally tough to get in a large pelagic fish,” according to Dr. James J. Sullivan, director of California Sea Grant. “They’ll help us determine what oceanographic features dictate the movements of bluefin tunas in the eastern Pacific. And they’ll tell us, for example, whether bluefin tuna captured in southern California or Mexican waters move up to the Monterey area later in the summer . . . and whether any of these fish begin the journey west, back out into the Pacific.”

For further information, contact:

Dr. Barbara Block, Hopkins Marine Station, Stanford University  
(408) 655-6236 or [bblock@leland.stanford.edu](mailto:bblock@leland.stanford.edu)

Dr. Heidi Dewar, Hopkins Marine Station, Stanford University  
(408) 655-6237 or [hdewar@leland.stanford.edu](mailto:hdewar@leland.stanford.edu)



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SEND YOUR CONTRIBUTIONS TO THE MFS EDITOR OR YOUR REGIONAL REPRESENTATIVE

**Western**

**Grant Thompson**  
NMFS/AFSC  
7600 Sand Point Way NE  
Seattle, WA 98115-0070  
206/526-4232  
Grant.Thompson@noaa.gov

**Central**

**Daniel Hayes**  
Dept Fish & Wildlife  
13 Natural Resources Bldg  
East Lansing, MI 48824  
517/432-3781  
dhayes@perm.fw.msu.edu

**Northeast**

**Russel Brown**  
NMFS  
Northeast Fish. Sci Center  
Woods Hole, MA 02543  
508/495-2380  
Russel.Brown@noaa.gov

**Southeast**

**Charlie Wenner**  
SCWMRD  
P.O. Box 12559  
Charleston, SC 29412  
803/795-6350  
wennerc@mrd.dnr.state.sc.us

**BUSINESS MEETING**

**DURING**

**ANNUAL MEETING IN HARTFORD**

**SUNDAY, AUGUST 23, 1998**

**FROM 5:00 P.M. - 7:00 P.M.**

**IN THE NATHAN HALE N ROOM**

**AT THE SHERATON HOTEL**



Newsletter layout/graphic design by Linda Roberts (NPFMC)

***Marine Fisheries Section Newsletter***

***Jane DiCosimo, Editor***

*North Pacific Fishery Management Council*

*605 West 4th Avenue, Suite 306*

*Anchorage Alaska 99501*

*Phone: 907-271-2809*

*FAX: 907-271-2817*

*Jane.DiCosimo@noaa.gov*

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