

WATERLINES

NEWSLETTER OF THE WESTERN REGIONAL AQUACULTURE CENTER

Alaska • Arizona • California • Colorado • Idaho • Montana • Nevada • New Mexico • Oregon • Utah • Washington • Wyoming

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USDA Joint Aquaculture Program Workshop

Lew Smith, ARS, and Meryl Broussard, CSREES

In November, the Agricultural Research Service (ARS) and the Cooperative State Research, Education, and Extension Service (CSREES) held a joint aquaculture program planning workshop in St. Louis, Missouri. The workshop objectives were to validate and update USDA national aquaculture program plans; learn about the needs of customers, stakeholders, and partners; communicate USDA capabilities and accomplishments; and help maintain program relevance.

Approximately 100 participants attended, representing farmers, associations, advocacy groups, industry, scientists, and the Joint Subcommittee on Aquaculture.

Dr. Randy MacMillan, President of the National Aquaculture Association, delivered the keynote address. He spoke about the many challenges facing the aquaculture industry—a weak economy, food safety issues, consumer confusion and preferences, environmental stewardship, international competition, US policy focus, national resource competition, production system control and costs, fish health management, bio-security, and research timeliness and financial cost.

Randy pointed out that there also are opportunities for research to discover ways to lower production costs, improve products, and increase aquatic species

continued on page 2



(l to r): Randy MacMillan, President, NAA; Lew Smith, ARS; and Meryl Broussard, CSREES



Funding provided by the US Department of Agriculture, Cooperative State Research, Education & Extension Service

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Visit our website at: www.fish.washington.edu/wrac

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USDA Joint Aquaculture Program Workshop *continued from page 1*

diversity to help the US aquaculture industry survive and prosper.

Industry associations presented their research and extension needs in well-organized and definitive statements that will be very useful to the USDA in their update activity.

The regional aquaculture centers explained how they address the research needs of aquaculture producers and described their ongoing research projects.

A panel of experts addressed the *Challenges for the Future of Aquaculture*. Jim Anderson from Synergy International in Berkeley, California, talked about the application and impact of technology on fish farming; George Chamberlain of Global Aquaculture Alliance in St. Louis, Missouri, spoke about how the US aquaculture industry can compete in a global economy; Howard Johnson from H. M. Johnson & Associates in Jacksonville, Oregon, discussed the consumer perspective of farmed fish; and Richard Smith, Jr., of Robinson & Cole in Hartford, Connecticut, outlined the legal and regulatory issues facing aquaculture.

During the workshop, several over-arching themes emerged. While some of these may be difficult to incorporate at the research-project level, they may be addressed at the program level.

One recurring theme was the need to consider economics in evaluating aquaculture research, involving all aspects of the production system with marketing and consumer input. One approach that might be applied is "path analysis," which includes integration of biological and social sciences to consider environmental stewardship, animal well-being, and other contemporary societal issues in food production.

Participants stressed the need for the aquaculture community to provide more value-added information about its products to consumers and to market the attributes of farmed-raised fish for human health and nutrition.

Participants also voiced concern about international competitiveness and globalization of

markets. Bio-security and security of intellectual property are viewed as being linked to competitiveness. Research that helps to lower the cost of production will directly support competitiveness. However, the bounds of lowered input costs need to be acceptable to consumers. ≈



*(l to r):
Max Mayeaux, CSREES;
Robin Downey, Pacific
Coast Shellfish Growers
Association; and
Ray RaLonde,
University of Alaska*



*Representing the Western
region: Joe Cloud,
University of Idaho;
Jim Parsons,
Troutlodge, Inc.;
and Bill Dewey,
Taylor Shellfish Company*



*Scott LaPatra, Clear
Springs Foods, Inc.;
and Hugh Warren,
US Catfish Growers
Association*



Ken Chew, anonymous

*Ken Chew talking with
Howard Johnson about
the annual report
Johnson published on
the US seafood industry*

Serving World Aquaculture

Excerpted from an article by Craig Browdey, World Aquaculture Society President, World Aquaculture Magazine, September 2002

According to the UN Food and Agriculture Organization, approximately 90% of the world's aquaculture production is produced in developing countries, and a large proportion is produced by small-scale farmers in low-income food-deficit countries. Aquaculture can and does play a key role in rural development, particularly among the poorer sectors of society.

Responsible development of export-oriented industrial and commercial aquaculture can bring in much-needed foreign exchange, revenue, and employment, while minimizing environmental impacts. Extensive and integrated small-scale aquaculture can make a significant contribution to improving livelihoods and promoting efficient use of resources.

The mission of the World Aquaculture Society (WAS) is to promote the educational, scientific, and technological development of aquaculture throughout the world. Since 1970, WAS has strived to meet this ambitious goal in many ways. The publication of meeting proceedings evolved into the *Journal of the World Aquaculture Society*, a world-class publication with an increasing impact factor. *World Aquaculture* magazine was later added with high-quality content.

In the 1990s, a new strategic plan was adopted, focusing on increasing the society's international reach through regional chapters and forging closer affiliations with other international bodies such as the European Aquaculture Society and the Asian Fisheries Society. Regional meetings were initiated, including the Aquaculture America meetings of the US Aquaculture Society, a chapter of WAS; an annual meeting in Latin America sponsored by the Latin American chapter; and meetings in Asia sponsored by the Asian Pacific chapter.

International venues for WAS annual meetings increase opportunities to reach new constituencies, develop international cooperation, and share ideas and experiences. The Beijing meeting attracted delegates from over 90 countries!

WAS online

The WAS website (www.was.org) has become an international electronic gateway to aquaculture. In addition to online conference registrations and abstract submissions, and a comprehensive meeting calendar, the site offers a host of benefits to members and nonmembers alike.

The Online Store provides access to reference books published by WAS. In addition, WAS has negotiated agreements with publishers to provide books for members at significant savings.

The site's electronic library is expanding. Abstracts of presentations from WAS meetings are available for members in a searchable database. We are exploring opportunities to post oral presentations from meetings as well.

The site also provides information on aquaculture courses and degree programs from all over the world. We invite all academic institutions offering qualifications in aquaculture to submit details of their courses and programs of study through the online submission forms.

Outreach

WAS is taking steps to reach aquaculturists in least-developed countries (as defined by the Organization for Economic Cooperation and Development) by developing an e-subscription. Aquaculturists in those countries will be able to subscribe to WAS electronically, receiving access to our web content and announcement listserv, and getting a listing in our electronic directory.

Efforts are underway to develop funding sources and distribution logistics for getting books and other resources to institutions in the developing world. This effort, much appreciated by the recipients, requires considerable funding for shipping the materials, and any offers of financial support will be much appreciated.

Through these combined efforts, WAS can expand its role in contributing excellence in science, technology, education, and information exchange to enhance the progressive and sustainable development of aquaculture where it is needed most. ≈

Shellfish Industry Wins Landmark Decision

Excerpted from an article by Stephen Rappaport, *Fish Farming News*, July/August, 2002

The author Charles Dickens wrote, “The law is a ass.” But every once in a while the law comes out looking like a wiser, more sensible animal. To the relief of the West Coast shellfish industry, such was the case with a decision handed down by the federal appeals court in San Francisco, which makes the law look positively owlsh.

Shellfish farming giant Taylor Resources, Inc., was sued by a coalition of shorefront property owners in federal court in 1999. The landowners charged that the company’s suspended culture mussel-farming operations violated the federal Clean Water Act (CWA) by discharging pollutants into Puget Sound without a National Pollutant Discharge Elimination System (NPDES) permit. The coalition claimed that the mussels, and the byproducts of their natural processes, were pollutants within the meaning of the CWA.

In August 2002, the 9th US Circuit Court of Appeals threw out the lawsuit and emphatically affirmed what shellfish farmers, and many scientists, have long argued. The natural byproducts from farmed shellfish, which are neither fed by the farmer nor treated with drugs or other chemicals during growout, are in no way pollutants that require an NPDES permit.

“The decision is good news for Taylor, and good news for everyone here in the shellfish industry,” said Diane Cooper, a spokesperson for the company.

Background

The Taylor family has been farming shellfish—first oysters, then clams—in Puget Sound for more than a century. About ten years ago, the company established its first mussel raft in Totten Inlet; a second raft site was added in 1996. Last year, Cooper said, Taylor harvested about one million pounds of mussels from its two sites. Those sites never generated any complaints or controversy, Cooper said, until the company applied to establish another site in southern Puget Sound, which would

be almost as large as its two existing sites combined.

Taylor won the first round in court when the suit was dismissed by US District Court Judge Franklin D. Burgess. The landowners then appealed to the federal appeals court.

Court ruling

The appeals court considered three issues: could the landowners sue Taylor without suing the Washington state agency that has authority to issue NPDES permits; are mussel byproducts and shells pollutants; and were Taylor’s rafts “point sources” within the meaning of the CWA?

From the aquaculture industry’s point of view, the significant part of the court’s decision was its finding on the two latter issues. The court ruled explicitly that “mussel byproduct and mussel shells that enter Puget Sound from the living creatures suspended on ropes attached to Taylor’s rafts are not ‘pollutants,’ Taylor rafts are not ‘point sources,’ and Taylor’s mussel harvesting on these rafts without a permit does not offend the Clean Water Act.”

Early on, Taylor had asked the Washington State Department of Ecology (DOE) about NPDES permits for its mussel-farming operations. The DOE took the position that it would not issue permits for the shellfish operations because they did not need them under the terms of the CWA.

According to the Clean Water Act (CWA)

The CWA classifies “biological materials” among pollutants that can’t be discharged into the navigable waters of the United States without an NPDES permit, but it is silent as to whether all such materials are pollutants. The CWA also sets the protection and propagation of shellfish as among its goals.

According to the court, it would be “anomalous” to hold that living shellfish, which the act is designed to protect, are also forbidden pollutants. As further support for its decision,

Mussel byproduct and mussel shells that enter Puget Sound from the living creatures suspended on ropes attached to Taylor’s rafts are not “pollutants”

—9th US Circuit Court of Appeals

the court found that the release of the shells and mussel byproducts “so far as the record shows, does not add any identifiable harm, let alone appreciable or significant damage, to the Puget Sound environment.”

In fact, the court added, there might well be “environmental benefits” from shellfish farming that might encourage the practice.

For the CWA to apply, there must be a “point source” from which pollutants are discharged. Under regulations promulgated by the US Environmental Protection Agency (EPA), a “concentrated aquatic animal production facility” (CAAPF) is a point source and subject to the NPDES permit requirements if, among other requirements, it grows or holds cold water fish species or aquatic animals “in ponds, raceways, or other similar structures which discharge at least 30 days per year.”

The court found that Taylor’s facilities met those criteria, but still could not be classed as CAAPFs because no feed is used. The regulations exclude facilities that use less than about 5,000 pounds of feed during “the calendar month of maximum feeding.”

Just as important, the court rejected the landowners’ claim that Taylor’s rafts were themselves point sources under the CWA. According to the court, the EPA had the authority to define what kind of “aquatic animal feeding operation” is a point source and that it would be improper to ignore the definition the agency developed in promulgating its CAAPF rules.

At this point, Cooper said, it is too soon to know whether the landowners will file an appeal. Taylor’s plans, though, are clear. It intends to continue to pursue its application to the state for another mussel operation in Totten Inlet.

“We’re still moving forward,” Cooper said. “We’re doing an environmental impact study, looking at carrying capacities and at remediation. Once we get through the process, we’ll install a new farm. And we will get there.” ≈



Ken Chew

Ian Jefferds of Penn Cove Shellfish, LLC, on a mussel float

Mussels in the Operating Room

Longlines, a Pacific Coast Seafood Growers Association publication
July/August 2002

The amazing fixative ability of mussels may hold the key to a surgical adhesive that could be used to close incisions in lieu of the more invasive, tissue-damaging sutures now used. Purdue University researchers have discovered that mussel adhesive is made up of soluble proteins that cross-link to form a hardened matrix. Metals, such as iron (which mussels are full of) are vital to this link. Scientists hope that this holds the key to humans someday replicating what happens naturally for mussels.

Pacific Aquaculture Caucus (PAC) Update

Dan Cheney, Pacific Aquaculture Caucus, December 2002

In October 2002, PAC held its second annual meeting in Seattle. The meeting followed an earlier workshop held in March 2002 on aquaculture regulations and research goals. At both meetings, leaders representing industry, research and education, governmental and nongovernmental organizations, and Native American tribes tackled key issues affecting the West Coast aquaculture community.

The workshop and annual meeting were supported with the assistance of members and friends of PAC and the National Oceanic and Atmospheric Administration (NOAA).

March workshop

Organized with the assistance of PAC board member Peter Becker of Little Skookum Shellfish Growers, the workshop goals were to *identify problems, look for opportunities* to resolve the problems, and *create solutions* by working with regulatory agencies, policy makers, and others.

The West Coast region could be a key player in meeting the goal proposed by the US Department of Commerce—attaining a five-fold increase in US aquaculture production by the year 2025 and reducing the national trade imbalance in seafood products.

Two speakers presented their perspectives on aquaculture regulations. Courtney Hough described the Federation of European Aquaculture Producers (FEAP)—a consortium of 31 national associations within 22 countries. FEAP is a member of the European Union (EU) Advisory Committee on Fisheries and Aquaculture and an observer on several UN Food and Agriculture Organization committees. FEAP is active in an aquaculture information network for training and public education, coordinating research projects and disseminating of research results, and maintaining contact between aquatic farmers and the regulatory sector. FEAP deals with food safety, animal welfare, water use, coastal zone management, product promotion, and harmonizing aquaculture regulations and policy throughout the EU.

John Ewart, Delaware Marine Studies Program, described a recently developed national policy framework for aquaculture in the Exclusive Economic Zone (EEZ). (See John Corbin's article on page 8.) The policy report, *Towards an Operational Framework for Offshore Aquaculture*, was prepared by the Offshore Aquaculture Policy Group at the Center for the Study of Marine Policy at the University of Delaware.

Following the speakers' presentations, participants discussed regulatory, public policy, and public education needs and goals—from specific regulations to broad policy directives. This discussion was summarized in 6 priority areas and 20 findings.

The six priority areas are: 1) a code of conduct for global aquaculture; 2) a strong public voice; 3) increased effectiveness of state aquaculture coordinators through national program coordination and core funding; 4) education of legislators, agency administrators, and the public in all aspects of the national aquaculture industry; 5) new federal funding to complement private investment for offshore and coastal development; and 6) greater participation by the industry in formulating regulations.

The findings are available in a pamphlet, *Aquaculture Regulations and Research Goals—A West Coast Perspective*, available through the PAC secretary at PO Box 888, Manchester, WA 98353 (www.pacaqua.org), or the Pacific Shellfish Institute, 120 State Ave NE #142, Olympia, WA 98501 (psi@pacshell.org). An overview of the findings can be downloaded from the PAC website at www.pacaqua.org.

PAC 2002 annual conference

The annual meeting was held in conjunction with the EEZ Aquaculture Guidelines Workshop. There were presentations on suspended nearshore and offshore aquaculture—ranging from pilot-scale to production systems for finfish and shellfish, ocean policy issues, and marketing and product promotion. Highlights included the following:

PAC mission

to promote
economically
viable and
environmentally
responsible
aquaculture for
the Pacific region
through sound
public policy and
best available
science

- Gary Loverich, Ocean Spar Technologies, Bainbridge Island, Washington, gave a technical overview of their culture and cage systems for salmon, sea bass, bream, tuna, and other species. These innovative systems are used for commercial sea surface and submerged finfish culture, and recently have been extended to the experimental culture of rock scallops.
- Randy Cates of Cates International Inc., Kailua, Hawaii, offered practical hands-on experiences with an Ocean Spar net cage to rear “moi” or threadfin, a popular food fish in Hawaii. This extension of aquaculture to offshore and open-ocean waters has been widely described in the press. The net cage is totally submerged and anchored off Oahu. All stocking, feeding, and harvesting are done from a small surface vessel with scuba divers assisting in net cleaning and maintenance.
- Paula Sylvia of Hubbs-Seaworld Research Institute, San Diego, California, provided a glimpse of a potentially large-scale effort to use a decommissioned offshore oil platform as a staging base for a multi-species finfish and shellfish culture and conservation project. The completed project will consist of an on-site hatchery and nursery and multiple growout netpens.
- Kevin Amos, National Marine Fisheries Service, Olympia, Washington, reviewed federal requirements for the aquatic animal health plan for the EEZ and high-health planning and federal coordination through NMFS and the USDA Animal and Plant Health Inspection Service program.
- Hauke Kite-Powell, Marine Policy Center, Woods Hole Oceanographic Institution, Massachusetts, described the installation and test of a pilot long-line suspended blue-mussel culture system, introduced open-ocean aquaculture economic models and risk analyses, and illustrated economic model results for mussel and finfish culture. The economic models are portable and spreadsheet-based, and may be



Ken Chew

(l to r): Courtney Hough, John Ewart, Dan Cheney, Bill Dewey, Colin Nash, and Peter Becker during a break at the March 2002 Workshop in Aquaculture Regulations and Research Goals in Sequim, Washington

obtained by contacting Kite-Powell at hauke@whoi.edu.

- Dr. Marc Hershman, Director and Professor, University of Washington School of Marine Affairs, and member of the federal Commission on Ocean Policy, gave an update of the Commission’s public activities relating to aquaculture issues as they apply to ocean policy questions under consideration. Hershman suggested that PAC members and others send comments to the Commission at mail@oceancommission.gov.

The Washington Fish Growers Association (WFGA) sponsored two marketing presentations. *Northwest Cherries—Expanding the International Market* was an eye-opener for aquaculture product exporters. For information regarding these sessions, contact PAC at www.pacshell.org or WFGA at www.wfga.net.

Common to the workshop and the annual meeting were recognition of the need for the PAC membership to: 1) serve as a source of information both to the aquaculture community and the general public using the PAC website and regular meetings; 2) communicate the issues affecting the entire aquaculture community, not a narrow sector; 3) engage in positive and proactive “spokesperson-ship” to respond to critical environmental, regulatory, and food safety issues; 4) be an aquaculture advocate at the local level; and 5) work to resolve “turf” battles of authority between agencies.

PAC, a volunteer organization, relies on its members and others in the aquaculture community to carry out these tasks. ≈

Moving US Aquaculture Offshore to the EEZ

John Corbin, Team Member, EEZ Aquaculture Project, December 2002

If aquaculture is going to assume its place as the dominant producer of the world's aquatic protein in the 21st Century, then sustainable farming of the ocean is a must. Other nations are moving their industries farther offshore, with next-generation cage technologies and new breakthroughs in marine hatcheries. Meanwhile, US efforts are stalled by not having a recognizable and supportive federal policy framework for aquaculture in the Exclusive Economic Zone (EEZ) or guidelines for authorizing and administering commercial leases in the area 3 to 200 miles out to sea.

In October 2002, a workshop was held in Seattle to obtain stakeholder comments on a first draft of operational guidelines for EEZ aquaculture leasing. The guidelines were developed by a multi-disciplinary team under the leadership

of the Center for the Study of Marine Policy at the University of Delaware.

This study builds on a previous report by the same group that formulated a set of policy approaches to address the gaps and deficiencies of current federal policy with respect to the siting and operation of aquaculture facilities in the EEZ—both studies were funded by the National Sea Grant Program.

The workshop was facilitated by three project team members and organized with the assistance of the Pacific Aquaculture Caucus. Participants represented federal, state, and tribal governments; the research community; private aqua-farmers; environmental and fishing interests; and the public. They came from Alaska, California, Oregon, and Canada. Other stakeholder workshops have been held in New England, the Gulf Coast, and Hawaii.

The draft of the EEZ operational framework touched upon critical areas including regional planning and identification of sites, permitting procedures, environmental review, leasing approaches, project monitoring, and enforcement of permit/lease conditions and farmer rights.

The team proposed dual agency responsibility—with the US Army Corps of Engineers to handle permitting and the National Oceanic and Atmospheric Administration to handle leasing.

Issues related to the implementation of the proposed framework received an abundance of comments from the diverse audience.

The report should be completed and delivered to Congress by September 2003. Between now and then, a revised draft will be prepared by the team and a second national workshop will be held in Washington, DC, in the spring for federal agencies and other interests.

The team anticipates making this next draft and subsequent drafts available to other interested individuals and groups around the country, including those who participated in the regional stakeholder workshops.

More information about the project and its status is available at the center's website at <http://128.175.24.162/SGEEZ/>. ≈

Aquarium rates farmed rainbow trout

Ron Hardy, University of Idaho, January 2002

The Monterey Bay Aquarium's Seafood Watch Program (<http://www.mbayaq.org/or/seafoodwatch.asp>) rates species' suitability for consumption based upon the environmental impact from capture fisheries or aquaculture.

With new and correct information supplied by Dr. Randy MacMillan, President, NAA; Dr. Jeff Hinshaw, North Carolina State University; Dr. Ron Hardy and Gary Fornshell, University of Idaho; and the Idaho Department of Environmental Quality, the website now offers the following:

Rainbow trout, native only to western North America, is now widely farm-raised. All trout you'll find in US markets is farm-raised, mainly from Idaho and North Carolina. US trout farms are regulated and monitored by the EPA and state water quality departments. Though there has been concern that farmed trout could spread disease to wild trout populations, research shows that disease outbreaks and their effect on wild populations are minimal. Although trout are carnivorous fish, they are efficient at converting their feed into edible protein. To reduce their impact on wild fisheries, trout farmers are reducing the amount of fishmeal in trout feed. Therefore, we can recommend trout as a "Best Choice."

WRAC seeks Committee Nominations

WRAC is soliciting nominations for leaders in the aquaculture industry to serve as representatives on the Industry Advisory Council (IAC) and as members of the Technical Committee's (TC) Research Subcommittee. Nominations are invited from all sectors of the aquaculture community in the twelve states of the western region. *(You may nominate more than one individual for both IAC and TC.)*

Industry Advisory Council

Members are selected from all sectors of the aquaculture industry, including finfish and shellfish producers, suppliers of goods and services, and marketing and distribution personnel.

Technical Committee's Research Subcommittee

Individuals with extensive scientific expertise in any of the following disciplines are desired:

<i>General fish culture</i>	<i>Fish nutrition</i>	<i>Physiology</i>
<i>Diseases of shellfish</i>	<i>Engineering</i>	<i>Product quality/preservation</i>
<i>General shellfish culture</i>	<i>Marketing</i>	<i>Diseases of fish</i>
<i>Shellfish nutrition</i>	<i>Water quality</i>	<i>Reproduction</i>
<i>Broodstock management</i>	<i>Genetics</i>	<i>Economics</i>

To submit a nomination, provide the information requested below, specifying whether the nomination is for the IAC or TC. Please include your name, phone number, and e-mail, in case further information is needed. Forward the information via:

e-mail: cjn4@u.washington.edu
 fax: 206-685-4674
 mail: Carla Norwood, WRAC Administrative Office, School of Aquatic and Fishery Sciences
 University of Washington, Box 355020, Seattle, WA 98195-5020.

If you have questions regarding the nomination process, contact Carla Norwood: ph: 206-685-2479; email (see above)

NOMINATION DEADLINE IS FRIDAY, April 11, 2003

Technical Committee Industry Advisory Council

Name of nominee _____

Address _____

Phone _____

Area(s) of expertise _____

Your name _____

Your phone _____

Farmers Raise Fish and Shrimp in the Desert

Amanda Onion, ABCNews.com, August 2002

water resources

A decade ago, the idea of raising fish in the desert might have been ridiculed, but ten years of successful aquaculture in Israel and the southwestern United States have proven that the idea can work. Samuel Appelbaum, head of Israel's Bengis Center for Desert Aquaculture, and others are working to help the concept catch on in arid regions around the world as future water supplies are tapped dry.

"People thought we were lunatics at first," Appelbaum said, "but we know there is a need and this can answer that need. Much of the world has arid land that is rich in sun and cheap labor—for aquaculture you don't need much else to be successful."

Raised in ancient water

Aquaculture may not need much, but water, of course, is necessary. To host fish and shrimp in the desert, farmers draw water from underground aquifers that exist under many arid regions. The warm, ancient water is contained in prehistoric caverns 50–150 feet beneath the desert surface and is slightly brackish or salty.

In ten years of experimentation, farmers have found that some species, including shrimp, catfish, tilapia, and striped bass, thrive in the warm, lightly salty water. In fact, the warm water appears to accelerate the breeding rate of many species.

To access the salty water supply, farmers drill through the desert floor using equipment similar to oil drilling machinery and collect the water in above ground pools, creating comfortable living quarters for edible creatures.

Keeping fish and shrimp farms in desert communities may seem impractical, but the enclosed farms actually hold a key advantage over coastal ones—the animals remain protected from diseases that are often spread between seaside farms through ocean waters.

Appelbaum estimates that more than 30 million tons of shrimp and fish are raised annually on desert farms, producing an industry worth more than \$40 billion. In Israel, most fish and shrimp are raised in the Negev Desert,

where annual rainfall is close to zero.

Shrimp are not in great demand in Israel because the crustacean is a nonkosher food, but as Appelbaum points out, the London market is a mere 3½-hour plane trip away. The shrimp's quick maturation rate (about five to six months) makes it a desirable crop because aqua-farmers can harvest at least two crops each year.

In recent years, Arizona has also made significant contributions to the annual harvest with 30 licensed facilities producing about 1.3 million pounds of striped and largemouth bass, catfish, tilapia, and trout, and more than 168,000 pounds of shrimp.

The Wood Brothers Farm, an hour outside of Phoenix, markets its shrimp as "Desert Sweet"—the brackish water from the state's underground aquifer lends the shrimp a particularly sweet flesh.

"As water supplies get tighter, we have to be creative about how we can put water to use," explains Kevin Fitzsimmons, an aquaculture extension specialist at the University of Arizona who has been encouraging the development of aquaculture in the state.

Inland fish farms have been installed recently in Alabama, Georgia, Florida, and Texas. US researchers are now visiting regions in central China where it's believed farmers are using brackish water to raise shrimp and fish. And Appelbaum is encouraging development in central Asia by recruiting students from the region to his desert aquaculture program.

From spa to fish to olives

Desert farms are promising because they use a water resource that is not in high demand for urban centers due to its salinity. For about 30 years, farmers have drawn underground water to raise tomatoes, olives, figs, and other salt-tolerant crops. This produce is generally sweeter than that raised in regular water, because the salt water inhibits growth and the crops retain their juices, including sugars.

Researchers are eager to combine desert agriculture with desert aquaculture. Sharing

West's Water Woes

Andrew Bridges, Associated Press, November 22, 2002



Ken Chew

Tilapia harvest at AquaFarming Technologies, Inc. in Thermal, California

water works well because water used to house fish is enriched by fish waste and makes a nourishing drink for crops.

Some have considered adding a third station to the recycled water chain. According to Applebaum, because water from these deep aquifers is naturally hot, it could be used first in hot-water spas, then pooled to host fish and shrimp, and finally sprayed on crops.

Right now, agriculture remains the highest water consumer in the world, using 70% of the world's water supply. The World Resources Institute recently estimated that by the year 2025, 48 countries with 3 billion people could face chronic water shortages.

Although the underground brackish aquifers are not an endless water resource, Appelbaum estimates most contain 200-years' worth of water. He argues that using the salty resources can help buy time until the day when scientists find a cheap way to desalinate ocean water.

As Fitzsimmons says, "In the desert, and in the future, we've got to use every litre of water we've got." ≈

Global warming will have a devastating effect on the availability of water in the western United States according to a new study which, despite its dismal outlook, was billed as the rosiest of a series of climate forecasts. Even as a best-case scenario, it forecasts water supplies falling far short of future demands by cities, farms, and wildlife.

"You'd like there to be some good news in there somewhere, but unfortunately, there is not," said Tim Barnett, a research marine physicist at the Scripps Institution of Oceanography.

Overall precipitation levels are likely to remain constant, but warmer temperatures mean what would have fallen as snow will instead come down as rain, greatly reducing snowpack on which we rely for water in summer, for example.

The new study involved more than two dozen scientists and engineers from institutions including Scripps, the University of Washington, the Energy Department, and the US Geological Survey, who undertook it as a test of a national climate forecasting effort. The results are expected to appear in a future issue of the journal, *Climatic Change*.

During the next 25 to 50 years on the Columbia River system, the study forecasts, there will be water in the summer and fall to generate electricity, or in the spring and summer for salmon runs—but not both. ≈



Ken Chew

Columbia River Fish Farm in the Columbia River below the Grand Coulee dam

The Role of Hatcheries in Pacific Salmon Management

Donald Amend, James Lannan, Scott LaPatra, Robert Piper, William McNeil, Charlie Smith, and Gary Wedemeyer

Space allows us to include only the conclusion section of this article. The complete article appears in the December 2002 issue of World Aquaculture Magazine.

Salmon and steelhead hatcheries have historically had the twin goals of 1) helping to recover and conserve natural spawning populations and 2) supporting sustainable commercial, recreational, subsistence, and ceremonial fisheries.

Most hatcheries in the Pacific Northwest and Alaska have been operating for decades and have generally been very successful in producing fish for harvest and compensating for declines in wild salmon populations. Like it or not, hatchery populations now comprise a major component of Pacific salmon and steelhead species gene pools and are critical to maintaining future recreational and commercial fishing in the Pacific Ocean and in meeting treaty harvest obligations.

In 2002, 60–80% of Pacific salmon that were harvested originated in state, federal, and tribal hatcheries. Given the additional 20–40 million in human population growth predicted for the Pacific Northwest alone in coming decades, it is almost certain that the downward trend in purely wild salmon populations will continue.¹ For example, the east coast of the United States, as well as Europe, China, Japan, and Korea, formerly supported large populations of purely wild salmon. They no longer do so, and it is unlikely they will ever do so again.²

Not only did today's hatchery salmon originate from the eggs and sperm of naturally reproducing salmon populations, but hatchery-produced fish have been thriving and returning to Pacific Northwest rivers in unprecedented numbers for many decades. Unfortunately, these same hatchery fish are now being labeled genetically inferior, hunted down and clubbed, and their eggs sold as fish bait.

There is very real danger that present anti-hatchery policies will, if pursued, reduce salmon and steelhead populations to the point that there will be no significant recreational

or commercial fishing for decades to come. In addition, the deliberate destruction of hatchery populations by natural resource management agencies may actually be destroying genetic material needed for the continued health of salmon populations. The size of some remaining "wild" fish populations is now so small, it is entirely possible their genetic diversity has been reduced to the point that they may be unable to grow sufficiently without an infusion of genetic material from hatchery fish.

In contrast to the genetic management of naturally spawning fish populations, inherited traits in hatchery salmon populations can be readily adjusted to suit management goals and objectives. Establishing and maintaining hatchery populations with a prescribed pattern of life history variation similar or identical to the naturally spawning populations with which they may interbreed is an attainable management goal that could ameliorate concerns about detrimental interactions.

In the meantime, hatchery runs are thriving and must not be destroyed. "Had good salmon fishing lately—thank hatcheries."

Footnotes and authors

- ¹ Lackey, RT, 2000. Restoring wild salmon to the Pacific Northwest: Chasing an illusion? Pages 91–145 in *What we don't know about Pacific Northwest fish runs. An inquiry into decision making*. P. Koss and M. Katz, editors. Portland State University, Portland, Oregon.
- ² Lackey, RT, 2001. Defending reality in salmon recovery: Essay. *Fisheries* 26(6):26–27. American Fisheries Society, Bethesda, Maryland.

Donald Amend (*retired*), Southeastern Regional Aquaculture Association, Ketchikan, AK; James Lannan (*retired*) Oregon State University, Corvallis, OR; Scott LaPatra, Clear Springs Trout Co., Buhl, Idaho; Robert Piper, (*retired*), US Fish and Wildlife Service, Bozeman, MT; William McNeil, (*retired*) Oregon State University, Corvallis, OR; Charlie Smith (*retired*), US Fish and Wildlife Service, Bozeman, M; and Gary Wedemeyer (*retired*) US Fish and Wildlife Service, Seattle, WA.

hatcheries

Review on Hatcheries

Bill Rudolf, NW Fishletter, Energy Newsdata, October 2002

Puget Sound Indian tribes and the Washington Department of Fish & Wildlife (WDFW) have completed a two-year review of more than 40 regional chinook salmon hatcheries as a first step in developing a comprehensive, scientific framework for operations to help recover wild chinook populations that are listed as threatened under the Endangered Species Act.

“The state and tribes have worked hard to do the assessments necessary to correct any deficiencies,” said WDFW director Jeff Koenings. “These corrections will take both time and money. I believe completing this major review demonstrates our commitment to move forward as expeditiously as possible while continuing to operate much-needed facilities.”

The hatcheries are essential to the recovery of many “severely depressed” wild chinook runs, said Billy Frank, Jr., chairman of the Northwest Indian Fisheries Commission. “Hatchery production is necessary to provide an opportunity for the tribes to exercise their treaty-reserved fishing rights. Hatcheries will continue to play an important role in salmon management.”

The co-managers (the state and tribes) have sent the plan to the National Marine Fisheries Service (NMFS) for approval. The federal fish agency had previously approved a chinook harvest plan submitted by the co-managers that was contested by a local conservation group, Washington Trout, who agreed to end their lawsuit if the feds developed an environmental impact statement.

Koenings said the review is part of a broader effort to reform hatchery practices throughout the region. Agency officials say hatchery releases have been significantly reduced in watersheds where wild chinook runs exist, and increased only in places where a hatchery is being used to recover a population through a captive broodstock program.

The latest review calls for more effort to reduce potential risks from interactions between hatchery and wild fish, including changes in hatchery release practices, maintaining state-of-the-art monitoring of fish health, facility disinfecting, and disease management procedures.

The co-managers have also completed genetic management plans for chinook production for hatcheries in the Puget Sound region, currently under review by NMFS. ≈



Ken Chew

Spawning chum salmon at Hoodsport, a Washington Department of Fish and Wildlife hatchery

\$8.1 Million Increase

US Newswire, January 22, 2003

Interior Secretary Gale Norton told 500 delegates at the first National Fisheries Leadership Conference in Washington, DC, on January 22, 2003, that “help is on the way” for the US Fish and Wildlife Service’s 69 national fish hatcheries, and that President Bush will seek a 26% increase (\$8.1 million) in the system’s budget for 2004.

“The proposed budget increase will help to recover imperiled fish species, increase recreational opportunities for anglers, eradicate invasive fish populations, and repair aging infrastructures at fish hatcheries across the nation,” Secretary Norton said.

The conference is the first for a Fish and Wildlife Service program that traces its roots to the US Fish Commission, established under the Grant administration in 1871. The conference was called principally to unveil the program’s years-in-the-making Strategic Vision, which is a blueprint for the fisheries program early in the 21st Century. ≈

Anti-aquaculture Misinformation Campaign Short on Facts

Mary Ellen Walling, Executive Director, British Columbia Salmon Farming Association, Los Angeles Times, January 8, 2003

This letter to the editor was written in response to an anti-salmon farming article published in the Los Angeles Times recently.

Dear Editor,

Ken Weiss' reporting on farm salmon and salmon farming contains a number of inaccuracies. The facts are:

Farm salmon and wild salmon

Omega-3 fatty acids

Both wild and farm salmon are excellent sources of omega-3 fatty acids. Between species of wild salmon, there is more variation in omega-3 fatty acid content than between wild and farm salmon of the same species (US Department of Agriculture).

Likewise, the total fat content of salmon varies more by species and the age of the salmon than by whether it is farm raised or wild. The November 2002 issue of the Harvard Medical School publication, *Harvard Women's Health Watch*, states that among the fish that provide the most omega-3 fatty acids, the differences between farm raised and wild is negligible.

Contaminants

Farm salmon do not contain unsafe levels of PCBs. A study funded by the David Suzuki Foundation found a level of 0.0056 ppm PCB in wild salmon and 0.056 ppm in farm salmon. The untold facts are 1) they only studied four wild salmon and four farm salmon, and 2) the unsafe level for total PCBs in fish, is 2.0 ppm according to the US Food and Drug Administration—a level 35 times higher than found in the farm salmon.

Antibiotics

The use of antibiotics in farm salmon is extremely low. Antibiotics are given in feed, and more than 97% of salmon feed contains no antibiotics or medication of any kind. Of the 3% that contains medication, the amount of "active ingredient" contained is very low, from 0.1% to 1%.

Salmon color

Both wild and farm salmon get their color from carotenes, which are essential for the overall health of the salmon. Astaxanthin, a carotenoid, is included in starter feeds for smolts for wild salmon hatcheries, which put about 2 billion smolts into the Pacific Ocean every year. Canthaxanthin, another pigment, is widely used by the poultry industry to make egg yolks yellow. Canthaxanthin has been linked to retinal damage in humans, not from farm salmon, but from mega-doses in sun-tanning pills. In addition, of all carotenoids consumed in food or health products worldwide, only 18% is used in salmon feed.

Nutrition

People should eat more salmon, both farm and wild. Health experts advise at least one serving per week of ocean fish (i.e., salmon, tuna, etc.). Currently, less than 10% of US households eat salmon once a week. More than half of US consumers never eat salmon at home. Annual US per capita consumption is two pounds of salmon vs. 160 pounds of poultry, pork, and beef. The *American Journal of Clinical Nutrition* recently reported that US fish consumption would need to quadruple in order for Americans to get an optimum intake of omega-3 fatty acids.

Salmon farming

Escapement

With well-anchored farms, good net maintenance, and farm management, farm salmon are kept in their pens. Many farms have had zero escapes in three years or longer. Autonomous "feral" populations of escaped farm salmon have not been found anywhere in British Columbia.

Fish meal

Less than 40% of the world's fish meal is used in fish feed and the majority is used in poultry and swine feeds. Species used for fish meal are not considered overexploited by world fisheries experts. Because of advances in fish feed

salmon farming facts

formulation, nonmarine ingredients (i.e., soy, wheat, canola oil, etc.) are now substituted for fish meal and fish oil. The amount of fish meal used in salmon feed has been reduced by half in the last decade.

Farms are now located in deeper, faster-moving water, and underwater cameras are used to monitor the amount of food consumed. There is almost no feed wastage and no buildup of uneaten feed on the ocean bottom. There are verifiable monitoring processes in place to document these controls.

There are a lot of things that we need to do in our world in order to improve the health of people and the health of the oceans. Perpetuating misinformation about farm salmon and salmon farming isn't one of them.

Sincerely,
Mary Ellen Walling



Merle Jensen

(l to r): Kevin Bright and Lou Wiese-Hansen of Cypress Inc. and Ken Chew, WRAC, holding an Atlantic salmon at Cypress, Inc. net pens

Caspian Sea Sturgeon Face Extinction

WFGA News, November, 2002

Caspian Sea sturgeon, which produce most of the world's caviar, are in serious danger of becoming extinct due to poaching, overfishing, habitat loss, and pollution.

The population of beluga sturgeon in the Caspian Sea, an inland sea located between Russia and Iran, has already plunged by more than 90% in recent decades and is now in greater danger of extinction than ever because of poaching, reports the Islamic Republic News Agency, the official news agency of Iran.

"The extraction of caviar in the Caspian Sea dropped to 145 tons in 2002, down from 3,000 tons in 1985 because of irregular poaching," says Mohammad Pour-Kazemi, head of an institute that studies sturgeon.

In June 2001, the UN Convention on International Trade in Endangered Species issued a moratorium for Russia, Kazakhstan, Turkmenistan, and Azerbaijan—the four main producers of the world's caviar—to halt sturgeon fishing or face a ban on their exports of caviar. But it exempted Iran, citing the country's effective conservation measures and policing of its fisheries.

Apart from overfishing and poaching, loss of habitat and destruction of spawning sites are also affecting sturgeon stocks.

Pollutants from urban and agricultural runoff and industrial discharges are blamed for significant reproductive and other abnormalities in sturgeon and for large fish kills. And, there are now additional concerns over a massive oil slick, said to be heading towards lower Iranian shores, after the cargo ship Mercury sank in a storm with about 1,000 tons of crude oil in railway carriages on its deck. ≈

Aquaculture and Traditional Agriculture: A Comparison

Dr. Kenneth M. Brooks, Aquatic Environmental Sciences, August 2002

The following is adapted from a note Dr. Brooks circulated in August 2002, which details some of his thoughts on aquaculture–agriculture comparisons.

The head-in-the-sand approach to risk management is possible because people are disconnected from their environment. They see bread on shelves without seeing the stream-choking wind and water erosion that is a part of the environmental cost of producing wheat; clean meat in cases without realizing the cost of re-ranching cattle or handling the manure from feedlots; fresh fish without noticing the miles of lost net and millions of tonnes of discarded bycatch.

The environmental risks associated with marine aquaculture have to be put into perspective—compared to the risks associated with other ways of producing food. Is it reasonable to demand that aquaculture be conducted with little, or no, allowable effect on aquatic environments? It is my opinion that it is this “no allowable effect” approach to feeding future generations that is unsustainable.

There are at least two more rational approaches to establishing performance standards for aquaculture. One approach determines an acceptable level of risk and then establishes standards that keep environmental costs lower than the determined benchmark. The other approach determines the environmental cost of marine-cage aquaculture as it exists in a competitive world economy and then determines whether the benefits to our food supply justify the environmental costs.

A methodology for the first approach was developed during a 1995–96 study at the Moonbeam Salmon Farm in British Columbia. The purpose of this study was to assess how far from a typical salmon farm benthic effects were observed and how long those effects lasted after the fish were harvested.

A total of 1,200,000 kg of salmon were produced at Moonbeam during this production cycle, creating changes in the benthic envi-

ronment to a distance of about 145 meters from the netpens. These changes, or environmental costs if you will, were gone within a few months of salmon harvest and benthic life returned to normal within 4½ months.

The question then becomes whether the production of 1,200,000 kg of salmon, providing 1,000,000 kg of high quality food, is worth the partial loss of benthic production to a distance of 145 meters for perhaps two years while the salmon were being raised and the fish waste was being digested by microbes and opportunistic invertebrate species.

The netpen’s footprint for producing 1,200 tonnes of salmon would likely measure 40 x 100 meters and cover 0.4 hectares. Assuming that significant reductions in benthic production extend 30 meters from the netpen’s footprint leads to an impacted area of 1.6 hectares. Good pastureland where I raise Angus cattle will produce forage capable of supporting 22 animal month units (AMU) per hectare. It takes 36 AMU to produce a slaughter steer weighing 550 kg, which produces about 229 kg of edible meat.

My point is that 1,000,000 kg of edible salmon is equivalent to 4,367 prime steers in terms of human food. It would take the total production from 3,573 hectares of very good pastureland for the same two years it took to raise the salmon in order to provide the same weight in edible beef.

Even assuming that we avoid some of the environmental costs of pasturing the steer by growing and harvesting the hay and feeding the steer on a concrete slab, our streams, rivers, and lakes will still suffer from having to digest 54,310 tons of eroded soil from the cropland. This sand, silt, and clay will take decades to work its way downstream before being deposited in our estuaries.

From an environmental-effects point of view, the efficiency of salmon aquaculture becomes immediately obvious. Similar analysis for other types of terrestrial agriculture would yield similarly startling comparisons. ≈

Dr. Kenneth Brooks has been assessing the environmental effects of agriculture and aquaculture for 23 years. He served Washington State in a policy-making position as chairman of the State Conservation Commission and as an environmental mediator working under a personal services contract with Governor Gardner’s Natural Resources Subcabinet.

Shellfish Farmers Conference

Fish Farming News, September/October 2002 and Ken Chew, Director, Western Regional Aquaculture Center

In September 2002, over 225 people attended the joint annual conference of the Pacific Coast Shellfish Growers Association (PCSGA) and the Pacific Coast section of the National Shellfisheries Association (NSA) in Newport, Oregon.

Sessions included shellfish habitat restoration and protection, interactions of shellfish aquaculture and estuarine ecology, management of public shellfish resources, genetics, invasive species, disease, hatchery and culture technologies, and developments in shellfish farming practices.

One session focused on the Environmental Codes of Practice (ECOP), covering cultivation of every kind of molluscan shellfish farmed on the West Coast. The ECOP, initially published by the PCSGA in June, is the culmination of a three-year effort involving meetings among growers from Alaska to California.

In 2001, the shellfish farmer group adopted a formal environmental policy covering five broad principals described as, "environmental stewardship, environmental excellence, regulatory compliance, waste management, and sharing beach resources." The ECOP represents a step towards implementing these principals on a practical, on-the-farm, level.

According to PCSGA Executive Director Robin Downey, the ECOP includes a number of resources for growers. Its key elements include sections that deal with 1) identification of the potential impacts of shellfish aquaculture on the natural marine environment; 2) a compendium of applicable federal and state regulations and required permits; 3) sets of recommended best management practices for each activity and cultivation method; 4) a research bibliography; and 5) a Farm Management Plan designed to be custom tailored to individual shellfish farming operations.

This winter, Downey plans to contact all PCSGA members to determine how far along they are in the process of adopting the ECOP, "to get their feedback, and to urge them to develop their own farm plans." The details of the ECOP content won't be available to the public, said Downey, "until we can reach a critical mass of growers implementing their own farm plans."

At the conference, the PCSGA's "Best Student Paper" award went to Heather Macrellis, who presented "Role of Culture Practices in Interactions Between Oysters and Eelgrass." NSA awarded two best student paper awards

to Kristin Holsmand (*Patterns in Intertidal Habitat Used by Dungeness Crab*) and P. Sean McDonald (*Biotic Resistance to European Green Crab*).

The newly elected president of PCSGA is Mark Schaffel, founder of Northwest Shellfish. A one-time Cape Cod (Massachusetts) shellfish farmer who moved west and became a shellfish biologist for Washington's Squaxin Tribe, he now grows clams, oysters, and mussels in south Puget Sound. Also elected were Brett Bishop, vice-president; Tim Morris, secretary; Nick Jambor, treasurer; and Bill Taylor, at-large.

Next year's conference will be held in Portland, Oregon, on October 8-11, 2003. For information, contact PCSGA at pcsga@pcsga.org, or call 360-754-2744, or check out their website at www.PCSGA.org. ≈



Ken Chew

top: Graham Gillespie, chair, Pacific Coast section of the NSA, and Brett Bishop, vice president of PCSGA

bottom: Elected officers and assigned committee members of the Pacific Coast section of the NSA

l to r: David Fyfe, Aimee Christy, Chris Pearce, Donald Velasquez (secretary/treasurer), Graham Gillespie (chair), Jennifer Whitney (covice-chair), Joe Schumacker (covice chair), Bridget Smith, and Jon Agosti

naa news

Board holds midyear meeting

NAA's midyear meeting is a chance for the Board of Directors to get a close-up view of various farm operations. This year's meeting was held in Seattle.

Highlights of the meeting were a tour of Taylor Shellfish's large and diverse shellfish farming operation and a visit to the National Marine Fisheries Service (NMFS) Manchester Laboratory, which is engaged in endangered species recovery and marine fish hatchery research. Lab director Connie Mahnken is also the acting national aquaculture coordinator for NMFS.

Bill Dewey of Taylor Shellfish, who is also an NAA board member, served as local host and farm tour guide.

NAA directors, who volunteer their time and are not compensated by NAA for travel to the association's meetings, worked their way through an extensive business agenda.

As the national "voice" for aquaculture, NAA has most recently been providing industry input and helping shape policy regarding the forthcoming Environmental Protection Agency effluent guidelines proposed rule; supporting action on Minor Use Minor Species (MUMS) legislation; and making sure aquaculture interests are represented to the Pew Oceans Commission and the US Commission on Oceans Policy.

Following an outbreak of Spring Viremia of Carp (SVC) disease in North Carolina, NAA filled a pivotal role in bringing a panel of scientific experts together to meet with Animal and Plant Health Inspection Service officials toward gaining a better understanding of this disease and its potential impacts.

Fish Farming News, July/August, 2002

For more NAA information, call 304-738-2167; email naa@intrepid.ne, or visit www.natlaaquaculture.org.

Dewey & Carlberg from IAC/WRAC involved in NAA offshore aquaculture committee

A new committee has been created by NAA to respond to federal policy initiatives in the EEZ. Named the NAA Offshore Aquaculture Development Committee, it has been charged with developing comments on the National Marine Fisheries Service's "Rationale for a New Initiative in Marine Aquaculture" and the National Oceanic and Atmospheric Administration (NOAA) Code of Conduct published in the Federal Register in August 2002.

The committee will also develop a second set of comments to be submitted to the US Commission on Ocean Policy, a group charged with developing a policy for the responsible use and stewardship of the nation's ocean and coastal resources. The 16-member commission has been gathering information about relevant coast and ocean activities. It is expected to submit its recommendations to Congress and the President for implementation this year.

At NAA's midyear meeting, NAA President Randy MacMillan announced the appointment of Bill Dewey of Taylor Shellfish to chair the committee. NAA members appointed to the committee include Jim Carlberg, Kent Sea Tech Corporation; Bob Rheault, Moonstone Oysters; Paul Zajice, Florida Division of Aquaculture; and attorney Richard Smith, Robinson & Cole, LLP.

As a matter of policy, comments of the Offshore Aquaculture Development Committee will be reviewed by the NAA Board of Directors prior to submission.

—Fish Farming News, September/October, 2002



Ken Chew

Jim Carlberg



Bill Dewey (at right)

Joint research committee

NAA and the US Chapter of the World Aquaculture Society have formed a joint Research Committee for the purpose of prioritizing US research issues, strengthening research funding efforts, and developing needed white papers, which will be used in efforts to address issues impacting the industry.

—*NAA Close-Up, August, 2002*

Hart meets with food network staff

Executive Director Betsy Hart met with the Food Network executive staff to discuss the US aquaculture industry and its products. Encouraging the increased use of aquaculture products in network productions, Hart presented the vice president and chef/manager of Culinary Productions with information packets along with booklets compiled by *Fish Farming News*. The booklets contained published articles on species, production types, and products. The Food Network, located in New York City, produces a variety of food shows, including *Molto Mario*, *From Martha Stewart's Kitchen*, *Emeril Live*, *Sarah's Secrets*, and *Wolfgang Puck*.

—*NAA Close-Up, November, 2002*

Comments to NMFS

NAA has submitted comments to the National Marine Fisheries Service regarding the draft Code of Conduct for Responsible Aquaculture in the US Exclusive Economic Zone (EEZ) stating the proposed Code should be limited in scope to the conduct of aquaculture operations in the EEZ. The Code should not make recommendations for federal funding or modification or expansion of federal agency authority. Such recommendations are inappropriate for a "Code of Conduct." The Code also should not interpret existing state or federal law or the appropriate application of international standards, voluntary or otherwise, within US waters. The Code cannot be both "voluntary" and a framework for agency decision-making in the authorization of offshore facilities. NAA objects to any text that identifies the Code as a regulatory tool.

—*NAA Close-Up, November, 2002*

Effluent Guidelines

Fish Farming News, July/August, 2002

The Environmental Protection Agency (EPA) published proposed effluent limitation guidelines in September 2001, which have different effluent discharge regulations for aquatic animal production facilities with a capacity of 100,000–475,000 pounds from those with a capacity of more than 475,000 pounds.

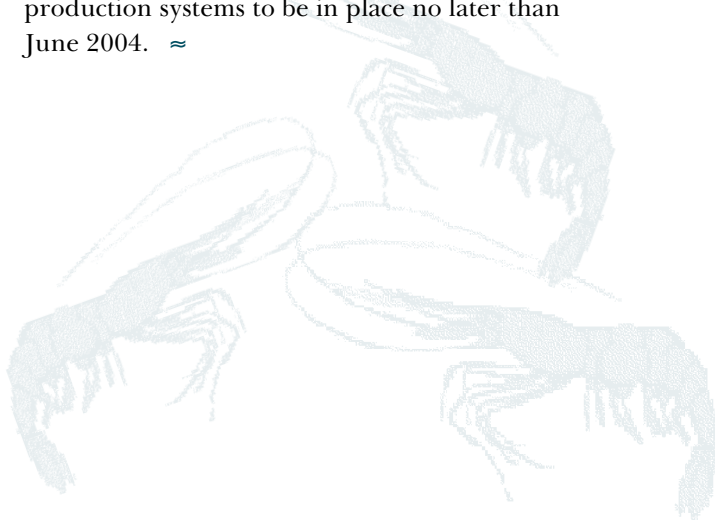
It did not propose regulating closed-pond systems, according to Marvin Rubin, chief of EPA's Office of Water, Environmental Engineering Branch.

This comes as very good news to the US farm-raised catfish industry, which has maintained it should be exempted from the EPA proposed guidelines since the outset. According to Catfish Farmers of America (CFA) Executive Vice President Hugh Warren, it is the CFA's position "that catfish pond culture does not significantly contribute to the pollution of US waters under the Clean Water Act."

Shrimp and hybrid striped bass farmers using pond-based production systems may also view this as a preliminary victory against further burdensome regulation.

The EPA is developing the effluent limitation guidelines to fulfill its obligations under a consent decree stemming from a lawsuit filed in the 1980s by the Natural Resources Defense Council. The lawsuit charged that EPA had failed to comply with the Clean Water Act.

The consent decree requires the final rule establishing effluent standards for aquatic animal production systems to be in place no later than June 2004. ≈



Healthy Eating

Omega-3 from catfish

Technology Park Malaysia (TPM), Kuala Lumpur, has successfully found a new source of omega-3, which is extracted from the keli, *Clarias gariepinus* (catfish), that will help to open up huge commercial markets of freshwater fish locally and abroad.

Dr. Mohamad Salleh Ismail, CEO and president, said that TPM has been undertaking research on high-density keli farming successfully for many years.

The main objective of the research was to investigate the quality of the keli, a freshwater fish, as a potential source of omega-3. At present, the omega-3 fish oil in the market is extracted from temperate-water fish like cod and salmon. Mohamad Salleh said, "Through research done by TPM's scientists, it was found that keli is categorized as fatty fish containing 9–12% total fat, among the higher range comparatively in temperate, tropical, fresh, or marine water fish. It was also found that keli has a higher omega-3 content (0.51g/100g) than salmon (0.20g/100g), mackerel (.1 g/100g), and trout (.45 /100g).

—WFGA News, October, 2002

Fatty acids can ward off heart attacks

People with heart disease can lower their risk of a fatal heart attack with a daily helping of salmon or another fatty fish or by taking a daily fish oil supplement, doctors recommend.

The American Heart Association's recommendation, released at its annual meeting in Chicago, is the first time the group has backed the use of a food supplement to sustain the heart. Studies now suggest that components of fish oil, called omega-3 fatty acids, can save the lives of people with heart disease.

"We have evidence that, if heart patients consume about 1 gram a day, they have much better survival rates and fewer heart attacks," says Penny Kris-Etherton of Pennsylvania State University and lead author of the Heart Association's statement. "Some people can't eat fish, won't eat fish, or live in places where they can't get fish. Those people should consider a supplement in consultation with a physician."

The Heart Association also cited recent research indicating that even people with healthy hearts can benefit from a diet rich in salmon, bluefish, Arctic char, mackerel, and swordfish. A study of 22,071 doctors, called the Physicians' Health Study, suggests that fish can reduce a man's risk of dying from a heart attack by 80%. A sister study, called the Nurses' Health Study, found that omega-3 fatty acids can cut a woman's risk of death by heart attack by 33%.

Fatty fish can contain significant levels of mercury, which pose no risk to most adults who eat a balanced diet. But the government advises some women to take precautions. Women who are or could become pregnant should avoid eating more than six ounces of sport-caught fish a week. Pregnant or nursing women and young children should remove shark, swordfish, king mackerel, and golden snapper from their diets.

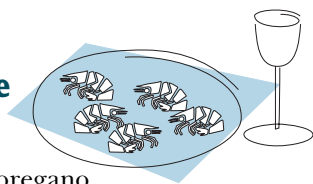
"I hope people don't become confused—those rules are mainly for protecting fetuses," says Bill Harris, a professor of medicine at the University of Missouri in Kansas City. "I hope people don't think we're putting 60-year-old people at risk of mercury intoxication."

—USA Today, November 19, 2002

Shrimp with Feta Cheese

Ingredients

1 onion chopped	1 Tbsp oregano
1 Tbsp oil	3 cloves garlic
juice of 1 lemon	1 Tbsp butter
1½ lb spot prawns	6–8 oz crumbled feta
parsley for garnish	lots of ground pepper
4 tomatoes chopped and drained	
splash of dry white wine	
endive or puff pastry for serving	



Heat butter and oil. Saute onions and garlic. Add wine, lemon, tomatoes, pepper, and oregano. Simmer 5 to 7 minutes. Add shrimp and garnish with the feta cheese. (You may use the shrimp whole or cut up).

—Dorothy Kemp

Publications



Online

<http://www.aquaculture.com.au>

If you are concerned about declining fish stocks, consider subscribing to the *Aquatic International Journal*. The extinction of wild fish stocks and aquaculture sustainability are the focus. Go to the Australian Aquaculture Centre website and follow the links.

<http://www.growfish.com>

The first Internet-based distance-learning course on “*Principles of Health Management in Aquaculture*” (AquaHealth Online). Knowledge and skills needed in fish health management.

<http://www.wsg.washington.edu/pubs/acquisitions.html>

Dr. Faye Dong’s articles “Shellfish: A Healthful Addition to a Balanced, Low-Fat Diet” and “Shellfish Have Some of the Good Fats” are available to download.

www.nal.usda.gov/fnic/foodcomp/Data/SRI5

Those who hunger for more than what they find on a “Nutrition Facts” food label can satisfy their curiosity about everything from soft-serve ice cream to chives. The nutrition reference tool, published by the USDA, is meant to provide a service for a diet-crazed and overfed America.

Called the Nutrient Data Laboratory, it includes more than 6,000 foods and lists 117 nutrient categories—many of which ordinary people might never have heard of—for each. Consumers can look up their lunch, choose a service size, and review all kinds of information about what they’re eating.

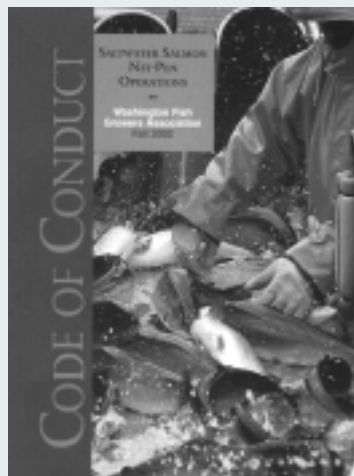
There are a couple of different ways to use the database. Users can search by nutrient, so that if a doctor has recommended a patient get more zinc in his diet, the program will cough up a list of foods that contain the mineral. It is also searchable by food name, listing items alphabetically.

Or one can choose the type-in option: Type “cake” and get a rather large listing—100 items, in fact—from which one can make selections such as crab cakes, rice cakes, pancakes, plain old white cake or Betty Crocker Super Moist Party Cake. If time is a concern, being specific will speed up the process.

People can also look up little-known nutrition facts on brand-name breakfast cereals, such as Raisin Bran, which has 100 micrograms of folate, or candies, such as M&Ms which have 80 milligrams of potassium.



In March 2002, industry leaders, researchers, technicians, and regulators gathered in Sequim, Washington, to discuss the issues facing aquaculture on the West Coast. The findings are described in this publication. Available through the PAC secretary at PO Box 888, Manchester, WA 98353 (www.pacaqua.org), or the Pacific Shellfish Institute, 120 State Ave NE #142, Olympia, WA 98501 (psi@pacshell.org).



Published by the Washington Fish Growers Association with support from Washington Sea Grant and NOAA, this publication details the code of conduct for saltwater salmon netpen operations. To order, Washington Fish Growers Association, 10420 173rd Ave. SW, Rochester, WA 98579, 360-273-5890; www.wfga.net or email: inquiries@wfga.net.

Calendar



April

- 7-11 National Aquaculture Extension Conference***
Tucson, Arizona
Contact: Kevin Fitzsimmons,
Conference Chair
phone: 520-626-3324
email: kevfitz@ag.arizona.edu
web: <http://ag.arizona.edu/azaqua/extension/National/extensionconf.html>
- 13-16 National Conference on Coastal & Estuarine Habitat Restoration**
Baltimore, Maryland
Contact: Heather Bradley,
Conference Coordinator
ph: 703-524-0248
email: hbradley@estuaries.org
web: <http://www.estuaries.org>
- 13-17 National Shellfisheries Association 95th Annual Meeting**
New Orleans, Louisiana
Contact: Lou D'Abramo
ph: 601-325-7492
fax: 662-325-8726
email: ldabrama@cfr.msstate.edu

- 23-29 14th International Pectinid Workshop**
St. Petersburg, Florida
Contact: Beth Miller-Tipton, Conf. Coordinator
ph: 352-392-5930
fax: 352-392-9734
email: bmiller-tipton@mail.ifas.ufl.edu
web: <http://conference.ifas.ufl.edu/scallops>
- 27-30 Sea Grant Week 2003**
Galveston Island, Texas
Current urban coastal issues
Contact: Texas Sea Grant College Program,
2700 Earl Rudder Freeway South,
Suite 1800, College Station, TX 77843

May

- 5-8 Culture of Copepods and Applications to Marine Finfish Larval Rearing**
Honolulu, Hawaii
Aquaculture Interchange Program,
The Oceanic Inst., 41-202 Kalaniana'ole Hwy,
Waimanalo, HI 96795
fax: 808-259-8395
email: pobroven@oceanicinstitute.org
- 19-23 World Aquaculture '03**
Salvador, Brazil
International annual conference and
exposition of World Aquaculture Society.
ph: 760-432-4270
fax: 760-432-4275
email: worldaqua@aol.com

July

- 20-24 3rd International Percid Fish Symposium**
Madison, Wisconsin
Contact: Jeffrey A. Malison, Director,
Aquaculture Program, Dept. of Food Science,
University of Wisconsin-Madison, 1605 Linden
Drive, Madison, WI 53706
ph: 608-263-1242
fax: 608-262-6872
email: jmalison@facstaff.wisc.edu

August

- 8-12 Aquaculture Europe 2003**
Trondheim, Norway
Theme: Beyond Monoculture
Contact: Alistair Lane,
EAS Executive Director
ph: +32-59-32-38-59
email: ae2003@aquaculture.cc
web: <http://www.easonline.org>

*National Aquaculture Extension Conference

April 7-11, 2003

The third National Aquaculture Extension Conference and will be hosted by the University of Arizona and the Western Regional Aquaculture Center in Tucson. The conference is sponsored by the USDA CSREES's five Regional Aquaculture Centers, the National Sea Grant College Program, and the National Association of County Agriculture Agents.

The conference will focus on innovative techniques, current issues, and emerging technologies of interest to Extension educators who work with diverse aquaculture clientele. The program includes two days of technical presentations, a full day for participation in several hands-on workshops, and a day devoted to field tours of various aquaculture operations and facilities in Arizona.

<http://ag.arizona.edu/azaqua/extension/National/extensionconf.html>

Aquaculture Extension Contacts



Alaska

Donald E. Kramer
University of Alaska Fairbanks
2221 E. Northern Lights Blvd, #110
Anchorage, AK 99508-4140
phone: (907) 274-9691
fax: (907) 277-5242
email: afdek@uaa.alaska.edu

Raymond RaLonde
Marine Advisory Program
University of Alaska Fairbanks
2221 E. Northern Lights Blvd, #110
Anchorage, AK 99508-4140
phone: (907) 274-9691
fax: (907) 277-5242
email: afrr@uaa.alaska.edu

Arizona

Kevin Fitzsimmons
Environmental Research Lab
University of Arizona
2601 East Airport Drive
Tucson, AZ 85706-6985
phone: (520) 741-1990
fax: (520) 573-0852
email: kevfitz@ag.arizona.edu

California

Fred S. Conte
Department of Animal Science
University of California-Davis
Davis, CA 95616
phone: (530) 752-7689
fax: (530) 752-0175
email: fsconte@ucdavis.edu

Colorado

W. Dennis Lamm
Cooperative Extension
Colorado State University
1 Administration Building
Ft. Collins, CO 80523
phone: (970) 491-6208
fax: (970) 491-5541
email: w.dennis.lamm@colostate.edu

Christopher Myrick
Fishery & Wildlife Biology
Colorado State University
239 Waggar Building
Ft. Collins, CO 80523-1474
phone: (970) 491-5657
fax: (970) 491-5091
email: camyrick@cnr.colostate.edu

Idaho

Ron Hardy
Aquaculture Research Institute
University of Idaho
Moscow, ID 83332
phone: (208) 837-9096
fax: (208) 837-6047
email: rhardy@uidaho.edu

Gary Fornshell
Twin Falls County Extension
University of Idaho
246 3rd Avenue East
Twin Falls, ID 83301
phone: (208) 734-9590
fax: (208) 733-9645
email: gforsh@uidaho.edu

Montana

Martin Frick
Agricultural Education
116 Cheever Hall
Montana State University
Bozeman, MT 59717-0374
ph: (406) 994-3201
fax: (406) 994-6696
email: uadmf@montana.edu

Nevada

Michael Collopy
University of Nevada-Reno
Dept. of Env. & Resource Science
Reno, NV 89512
phone: (775) 784-4773
fax: (775) 784-4583
email: mcollopy@cabnr.unr.edu

New Mexico

Jon Boren
Extension Wildlife
New Mexico State University
Box 30003, Dept. 3AE
Las Cruces, NM 88003-8003
phone: (505) 646-1164
fax: (505) 646-5441
email: jboren@nmsu.edu

Byron Wright
New Mexico State University
P.O. Box 30003, Dept. 4901
Las Cruces, NM 88003
phone: (505) 646-7931
fax: (505) 646-5975
email: bywright@nmsu.edu

Oregon

John Faudskar
Sea Grant Program
Oregon State University
2204 Fourth Street
Tillamook, OR 97141
phone: (503) 842-3433
fax: (503) 842-7741
email: john.faudskar@orst.edu

Utah

Terry Messmer
College of Natural Resources
Dept. of Fish & Wildlife
Utah State University
Logan, UT 84332-5210
phone: (435) 797-3975
fax: (435) 797-1871
email: terrym@ext.usu.edu

Washington

Steve Harbell
Cooperative Extension
Washington State University
P.O. Box 88
1216 Robert Bush Drive
South Bend, WA 98586
phone: (360) 875-9331 x633
fax: (360) 875-9304
email: sharbell@u.washington.edu

Sandra Ristow
Washington State University
Animal Sciences
411 Hulbert Hall
Pullman, WA 99164-6332
phone: (509) 335-0165
fax: (509) 335-1074
email: ristow@wsu.edu

Wyoming

Jim Bennage
Sheridan College
3059 Coffeen Avenue
Sheridan, WY 82801
phone: (307) 674-6446 x6164
fax: (307) 674-4874
email: jbennage@radar.sc.whecn.edu

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School of Aquatic & Fishery Sciences
University of Washington
Box 355020
Seattle, WA 98195-5020
phone: (206) 685-2479
fax: (206) 685-4674
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