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Winter 1998/99

**Conservation genetics meets aquaculture:
A merger for the new millennium**

*By Paul J. Anders, Research Associate
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Discussions at a recent meeting of the Columbia River Basin White Sturgeon Genetics Workgroup in Boise illustrated the importance of genetics to regional fisheries managers, and to their agency and tribal aquaculture programs. More recently, the Oregon Chapter of the American Fisheries Society (ORAFS) held its annual meeting, which included a half-day session on the roles of hatcheries in conservation. At the ORAFS meeting, noted fish geneticist Don Campton mentioned the possibility of using hatcheries as a genetic repository or a genetic refuge. What an about-face from the critics' contentions that all hatcheries can do is to reduce genetic variability! Although the jury is still out on this debate, evidence continues to be collected that suggests a major change in attitude concerning the roles of hatcheries. The point is that Don's suggestion, whether you agree with it or not, is indicative of new thought and innovation being applied to the very old field of aquaculture. The awareness of incorporating genetic monitoring or evaluation into fish management, before a problem is detected, reflects well on area managers and researchers.

Although past zoological, botanical, and agricultural studies have documented the importance of genetics in plants and animals, it doesn't seem all that long ago that certain aspects of fish genetics were just making the scene as the newest buzzwords. "We know we need to do something with genetics, but we're not sure what that something is" became a commonly expressed sentiment among well-intentioned fish managers. Luckily, this sentiment has often resulted in otherwise non-existent archives of valuable genetic material. This material has been used to rebuild populations (cryopreservation of gametes) and to establish historic population reconstructions (phylogenies and phylogeography). Archived genetic material has even helped to reconstruct historical fish stocking records.

At a time when some in the news media have been pointing fingers at aquaculture, assuming that it is not able to be successful, it is encouraging to see behind-the-scenes progress being made between fish geneticists, fish

mangers, and hatchery managers. Frank, honest dialogue is ensuing across lines that previously prohibited such progress, evident from attendance and communication at regional meetings.

This progress and teamwork between previously disparate groups has me wondering why we have taken so long to get to this point. Especially when we all want the same positive outcome for our region's aquatic resources. Undoubtedly, the pendulum has swung to the anti-hatchery side following the pre- and even post-dam promises that hatcheries would not only offset salmon runs reduced by the dams, but would produce more and better fish than the river could without impoundments. Obviously, not all bought that suggestion then or now. In fact, we may now be paying for such irresponsible promises.

Another reason why conservation aquaculture may face some opposition is that although it is not new in theory, it is being implemented for new purposes. Accompanying this subtle but important change is that new conservation aquaculture programs may unfortunately have been evaluated using criteria from more traditional supplementation or augmentation programs. In reality, the two approaches (conservation and supplementation aquaculture) are like apples and oranges. Their goals and, to a large extent, their operations are very different, yet both have laudable goals. So let's be careful to distinguish between apples and oranges, because reporting apple taste test results would presumably not be favorable if the test subject was eating an orange! In other words, if we are evaluating a conservation aquaculture program, let's not evaluate its success by how many fish were produced, or by the most recent trend in high-seas salmon harvest.

Regardless of distractions to progress, and real or imagined reasons why aquaculture isn't perfect, let's focus on the positive results from multi-disciplinary cooperation for the common good of the imperiled resources in which we seem have a common interest. For example, during the past decade there seemed to be a feeling within the white sturgeon research and management communities that aquaculture was something that needed attention, or at least consideration, but due to its controversial nature, was not openly and objectively discussed. After all, if it wasn't working for salmon, why would somebody consider it for white sturgeon? Well, in fact, it hasn't all failed with salmon, and due to the important goal of proactive conservation and management of Columbia Basin white sturgeon, incorporation of conservation genetics may be a focal point to successfully unite the historically pro- and anti-hatchery camps.

To continue with our example, the use of aquaculture as an integral part of white sturgeon conservation and management is being discussed more openly than ever. Whether this constitutes dedication to the cause, a response to a dwindling number of management and conservation options, or both, is unclear. However, the fact that communication and novel, innovative thoughts are being applied to a past scapegoat suggests that more successes lie ahead.

What's wrong with retail seafood?

In the early 1990s, the staff of the University of Idaho Aquaculture Research Institute attended an Idaho Aquaculture Association Annual Meeting at which the ARI staff and several industry members participated in a round-table discussion on marketing strategies which could be employed to boost sales of Idaho's high-quality food fish products. As a relative newcomer to the world of aquaculture, I had little to offer other than my perceptions as a consumer.

As the parents of 4 growing boys my husband and I were always interested in both healthful and economical sources of protein. As working parents, we were also interested in ease and speed of preparation. My family enjoyed fish and seafood, especially fresh salmon and halibut, fresh crab, shrimp, lobster, and other shellfish, all of which were healthful and easy to prepare. These were often among the seafood products available once a week when the seafood truck came to town with a very fresh supply of products from Seattle. However, they were too expensive for a large family for other than special occasions.

Living in northern Idaho provides opportunities for family fishing adventures, and we always enjoyed the beautiful rainbow trout we caught and cooked over an open fire or pan-fried upon our return home. However, fishing was an occasional, seasonal activity, and frankly, we'd never win any prizes for our angling abilities; therefore, this couldn't be considered a regular or reliable source of fresh fish.

One might suggest that the answer to our quest would be our local retail outlets. Yes, some do have what they call "fresh" seafood counters; and their prices are often affordable for a large family. However, if a consumer can overlook the appearance of the fish long enough to get it home and cook it, the next challenge is to get it past your nose into your mouth. We ate a lot of chicken and hamburger.

Now that we're empty nesters with more available time and money, my husband and I enjoy good seafood at fine restaurants, purchase it from the weekly fish truck guy, or bring it back (on dry ice) from our vacations on the Pacific Coast. I seldom purchase it at the grocery store.

I have now found an ally in my belief that retailers are an unwitting obstacle to consumer acceptance of seafood as a viable food product in America's kitchens. I give you the following article, in which a long-time industry insider offers some opinions on what's wrong with retail seafood.

B. L. Jacobsen, Editor

Wanted: Seafood-Savvy Retailers

By Phil Walsh

(Having bought and sold seafood for 25 years, author Phil Walsh is the director of seafood for Harris Teeter Inc. in Charlotte, NC.)

[reprinted, with permission, from the Retail Report section of *Seafood Leader* 18(6), Nov/Dec 1998. *Seafood Leader* was recently purchased by *Seafood Business* of Portland, Maine.]

For those of you who missed the San Francisco Seafood Show in September, too bad – it was a real beauty. Unlike the Boston show, where the sheer size and numbers can obscure what's really going on in our industry, it's all on display in San Francisco. And amid the gossip and good times, one fact stood out like a 24-point headline in a Sunday paper: Where were all the retailers? At a time when seafood consumption continues to slip, it seems the guys on the front line are increasingly MIA.

The number of big buyers at the show – those who direct retail seafood purchases of \$30 million or more – continued its steep decline. "I can only go to one show a year," is the most common reason given. Yet, in a business where the best and the brightest stay that way because they remain ever teachable, this excuse rings tinny and hollow.

In fact, walking through the various seminars, the message we got from harvesters, packers and processors was loud and clear: "Retailers had better get their act together. Their seafood sales will continue to suffer until they put good help behind the counter. Somebody's got to romance the product."

But who? One night, we had dinner with the senior vice president of one of the country's largest retailers. He spoke about efficiencies, about the reduction of labor and about his stockholders' hard focus on return on investment. Needless to say, there wasn't much discussion about selling the sizzle or promoting new species.

Then, the next night, we talked to a retail seafood director who said his single mission at the show was to find seafood products that were bulletproof in every way: value-added (upstream, of course), high-profit, scan-bar attached, good shelf life... Translation: high-value products that require little handling and no salesmanship.

Of course, when it comes to salesmanship, the seafood industry is not without blame, either. At the show, for example, Atlantic salmon was everywhere and nowhere. Where you used to see pavilions of Atlantic salmon proudly staffed by citizens of whatever nation was being represented – each one convinced theirs was the best – now the fish is just...there. Given the declines in so many ocean-caught species, one shudders to think of what the mid-range seafood distributor would do without it.

But no one's going to champion it. Not anymore. Not since the Mainers tried to run the Chileans out of the country on the pretext of "dumping." The fish is just there now, never mind from where, holding the whole finfish game together. The only problem is that the big boys are keeping their heads down because the trade winds blow cold in America and because Washington is a funny place where anything can happen.

So, what are you gonna do? At one point in San Francisco, there was another discussion among seafood-industry executives lamenting the deteriorating state of customer service in retail seafood. There was talk of sending seafood clerks to the Culinary Institute of America for a two-week seafood course. "That's what retailers need to do!" they cried.

Don't hold your breath. That night, there was another big reception. All the movers and shakers were there – harvesters, processors, distributors, foodservice operators and retailers – and it was great. It was loud. Everyone was talking. At once. All of them. Every mouth in the room was open at the same time.

And suddenly we noticed it. Realization dawned slowly at first, then crashed like a thunderclap... No one was listening.

Aquaculture at The University of Idaho

excellence, situated as it is, in the heart of fish culture and salmonid conservation in North America. It is good to see their recognition of Ron Roberts' work, which will, I am sure, have a beneficial spin-off on both sides of the Atlantic."

Kudos From Scotland

In the July/August 1998 issue of *Fish Farmer*, Hugh Horrex, author of an article ("Can Any Good Come From ISA?") in the Independent View section of the publication, notes the affiliation of a fellow Scotsman with the University of Idaho's Hagerman Fish Culture Experiment Station's Center for Sustainable Aquaculture, and recognizes the potential of the center to help resolve aquaculture issues of global interest:

"American research is well funded, but quite properly it is based on commercial realism and those involved require an adequate market size to justify their investment. Fish farming is just now qualifying, and I am sure this new interest from larger companies will soon bring sensible results.

"One industry 'ambassador' from this country [Scotland] who can be counted on to stimulate American interest is Professor Ron Roberts who has recently been appointed Distinguished Visiting Professor to the University of Idaho's Hagerman Sustainable Aquaculture Center.

"This new centre, which has decided to call upon the experience of one of our most prestigious academic experts, will, I predict, quickly become a centre of

More About Dr. Ron Roberts

Dr. Roberts retired from the University of Stirling in Scotland, after presiding for over 25 years over the development, into world renown, of the Institute of Aquaculture. Since then he has been offered a number of senior jobs, including a vice chancellorship in Australia. He eventually accepted a directorship with Landcatch – the largest independent salmon egg and smolt producer in the United Kingdom – where he continues to be involved with the development of their genetic fingerprinting program.

Dr. Roberts holds numerous international awards, including the Queen's Award and the Buckland Medal as well as citations for the UNESCO Science Prize. In 1992 he was awarded the Order of the Crown by his majesty the King of Thailand for his contribution to Asian aquaculture.

In 1998, Dr. Roberts accepted a part-time appointment as Distinguished Visiting Professor at the University of Idaho's Hagerman Fish Culture Experiment Station Center for Sustainable Aquaculture. Dr. Roberts serves in that capacity part of each year, advising on international aquaculture and overseeing research on fish pathology and microbiology.

Hagerman Land Transfer Bill Signed Into Law

A federal bill transferring ownership of the Tunison Lab Hagerman Field Station in Gooding County from the US Fish and Wildlife Service (USFWS) to the University of Idaho (UI) has been signed into law by President Bill Clinton. The bill was sponsored by Idaho Senators Larry Craig and Dirk Kempthorne. The Idaho Aquaculture Association played a significant role in emphasizing to the Idaho Congressional delegation the importance of this legislation.

Under a Memorandum of Understanding with the USFWS, the UI aquaculture program has been conducting fish nutrition and conservation research at the four-acre Hagerman facility for the past few years. University-funded improvements to the property required UI to own the property, and the USFWS supported the land transfer. The transfer allows the UI to make a \$1.7 million investment in the facility, now named the University of Idaho Hagerman Fish Culture Experiment Station, including a state-of-the-art gene bank to store genetic material from native fish.

"We're very grateful to our entire congressional delegation, and to Senators Craig and Kempthorne in particular, for their efforts in gaining approval of this land transfer," said UI President Bob Hoover. "We can now move forward in our efforts to expand aquaculture research and outreach to support Idaho's fish industry."

The UI Hagerman facility currently houses two research centers of excellence: The Center for Salmonid and Freshwater Species at Risk, and the Center for Sustainable Aquaculture. Improvements to the facility, located on the Snake River near Hagerman, Idaho, are part of the University's \$16 million investment in biotechnology, most of which will be spent on the Moscow campus, where ground was broken October 23 for a new biotechnology laboratory.

The USFWS will continue to operate a steelhead hatchery adjacent to the Hagerman field station. The USFWS and the UI Aquaculture Research Institute have collaborated on the development of a kiosk to educate the public on their respective roles in conservation fisheries efforts and in supporting Idaho's commercial aquaculture industry.

Recent Grants and Contracts Awarded to the Aquaculture Research Institute

During the 1998 calendar year, the ARI was awarded over \$1,600,000 in grants and contracts. The activities covered by these awards include:

- Evaluation of various products as feed ingredients for fish meal;
- Salmonid nutrition and diet formulation studies;
- Assessing genetic variation among Columbia Basin white sturgeon;
- White sturgeon restoration and enhancement in the Columbia and Snake Rivers;
- Continuing work on the genetic analysis of sockeye salmon;
- An Idaho water quality initiative to establish new methods of wastewater treatment of Idaho's aquaculture and combined animal industries;
- An aquaculture effluent pollution control workshop; and
- A teacher training workshop to infuse aquaculture in secondary school classrooms.

With the two research centers at the Hagerman Fish Culture Experiment Station and the interdisciplinary activities of the Institute's campus program, we are looking forward to an equally successful 1999.

Statewide News...



Jim Parsons to Troutlodge. Jim Parsons, most recently Research and Technical Director at Blue Lakes Trout Farm, Twin Falls, ID, has been appointed as Director of Technical Services, Troutlodge, Inc., in Sumner, Washington. He will direct Troutlodge's genetic breeding program and animal health program, and will provide technical support for customers. Additionally, Jim will represent the company in matters of fish health, export certification, and environmental issues with various local, state and federal agencies.

ESA Revision Bill Dies. Outgoing Idaho Senator Dirk Kempthorne had hoped his proposed revisions to the 25-year-old Endangered Species Act would help push the 907 nearly extinct American plants and animals toward long-awaited recovery. With Congress' completion of business October 21, it became clear the measure was dead.

The bipartisan coalition supporting the revisions proved too fragile during the final weeks of the 105th Congress. Property-rights advocates and environmentalists had attacked the proposal from both sides. Future attempts at revisions of the Act are speculative at this time.

Idaho aquaculturists are affected by the Act; as the Bliss Rapids snail is listed as "threatened;" and the Banbury Springs limpet, Snake River physa snail, Utah valvate snail, Bruneau Hot Springs snail and Idaho Springs snail are listed as "endangered."

New Product from Clear Springs

New Rainbow Trout Tenders from Clear Springs Foods Inc. of Buhl, Idaho, combine premium skinless/boneless trout with contemporary flavors and breeding. Packed in two 5-lb. bags per case, they're available in Original Recipe, Buffalo, Southern and Cajun styles. [*Seafood Leader* 18(6), Nov/Dec 1998.]

CSI Fish Technology Students Receive Scholarships. Twin Falls, ID – Four College of Southern Idaho (CSI) Fisheries Technology students have received scholarships to apply toward their tuition at CSI. DeAnna Hruza of Rupert, Idaho; Owen Thomas From British Columbia, Canada; Amber Overholser of Carlin, Nevada; and Nathen Jensen of Madison, Wisconsin, were each awarded a \$1,000 scholarship based on their academic achievement, involvement in the fisheries program, and their commitment to pursuing a career in the Fisheries Technology field.

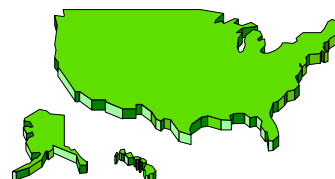
Thorleif Rangen of Buhl, Idaho, presented Hrusa and Thomas with the Rangen "Growth is a Promise" scholarships, which are co-sponsored by BASF. CSI Fisheries Technology professor and hatchery manager Terry Patterson presented Overholser and Jensen with the Silver Cup Fish Food scholarships sponsored by the Murray, Utah, company of the same name.

All are first-year fisheries students working toward degrees in the fisheries industry. The scholarships will be used toward their tuition and fees at CSI, which is the only college in America that owns and

operates a full-sized hatchery in connection with its Fisheries Technology program.

Congratulations to these students for their academic achievements and for their dedication to the field of aquaculture.

Across the Nation



State Aquaculture Coordinators Address EPA Water Issues.

In May 1998, the National Association of State Aquaculture Coordinators (NASAC) held its annual conference in Palm Springs, where the focus of the meeting was aquaculture production in areas of limited water availability.

A hot topic at the meeting was the National Pollution Discharge Elimination System (NPDES) general permit proposal put forward by the EPA for the State of Idaho. Tom Ellis, newly elected NASAC president and North Carolina state aquaculture coordinator, said, "In a nutshell, EPA (and Idaho) are asking way too much of the Idaho industry. The general permit proposal is confusing and can place requirements on people who don't need them. There's too much in one document."

Specifically, NASAC is concerned that the EPA proposal would levy not only monitoring requirements on the industry, but would require businesses to carry out studies to identify any environmental impact of their water discharges. "The studies should have been conducted before the permit proposal came out," Ellis said. "We don't want to see a bad precedent set for setting regulations without the need for them. We want to emphasize that aquaculture and a clean environment are compatible." At the request of the US Trout Farmers Association, NASAC has provided extensive comments to EPA. [*From Fish Farming News* 6, July/August 1998.]

Europe may not be catching as much fish as it used to, but it's still worth watching when it comes to the equipment used to turn that fish into seafood products. Among the machines recently unveiled:

- A computerized fish-harvesting machine designed to stun and bleed farmed fish automatically, thus minimizing stress and maximizing quality.
- A fish-washing unit designed to remove slime, blood and bacteria before or after gutting and filleting.
- A salmon-skinner with an adjustable blade designed for removing the fat layer.

[From *Seafood Leader* 18(5), Sept/Oct 1998, p 70.]

SBA Disaster Assistance Loan Program Does Not Include Aquaculture.

The final ruling of September 2, 1998 states the following: "In administering the disaster loan program, SBA is precluded from assisting agricultural enterprises." As defined in the Act, "an agricultural enterprise is a business engaged in the production of food and fiber, ranching, and raising of livestock, aquaculture, and all other farming and agricultural-related industries." [NAA *Close-Up*, November 1998, National Aquaculture Association.]

Rainbows in Wisconsin. Rushing Waters in Palmyra, Wisconsin, north of Lake Geneva, is a leading supplier of trout to the Chicago area. Says operations manager Scott Barnes, "We sell every pound we can grow." Sales at Rushing Waters have more than doubled since 1995, and as of last summer, the population in 53 cold-water ponds stood at 800,000.

Their optimism is based on a new processing and smoking facility with machines that can bone and fillet 160 trout per minute. Barnes says, "We're smoking trout – plus salmon and catfish that we buy – in a variety of flavors. The potential is almost unlimited. The rainbow industry is a sleeping giant."

Barnes admits that fresh trout reached a plateau in demand and production over the past decade. He recognizes that his company needs to build a niche to take some business from the Idaho producers who control 70 percent of the domestic trout market. Idaho's ideal water temperature helps trout mature in about a year. In Wisconsin, they need 18 months,

which means Barnes can't undersell the competition. Instead, he is counting on consistent high quality and fresher product due to proximity to the Chicago market. In some cases, Rushing Waters trout processed in the morning are in Chicago restaurant kitchens for use that evening. [From "A Rainbow of Trout" (source: Chicago Tribune), *The Creel* 31(2), Summer 1998; Wisconsin Aquaculture Association, Inc.]

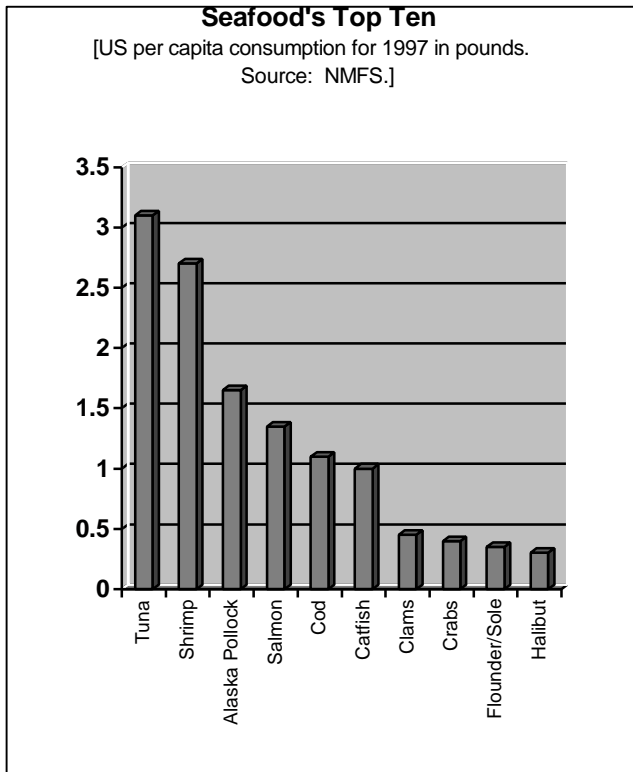
Aquaculture Outlook

Record-Breaking Chocolate Tilapia. Tilapia Aquaculture International (TAI) reports it has outperformed previous world growth records for tilapia growth and total yield with its new Chocolate Hybrid(TM), a cross between Red *T. nilotica* and improved yield *T. hornorum*. Released to growers in 1997, the species has shown remarkable growth rates in outdoor cages compared with fingerlings from several other suppliers. It grew 45% faster than the Pennyfish(TM) which is also distributed by Tilapia Aquaculture International and which previously held all of the world records for tilapia growth and total yields. Mike Sipe, TAI president, said, "In the six months of growing, the 600 Chocolate Hybrids(TM) showed very impressive uniformity of growth, high fillet yields, disease resistance and cold resistance. It makes it possible for farmers to produce three or four crops per year in the same space in which they are currently producing only one." [From "Chocolate Tilapia Is Record Breaker," *Aquanews* 13(4), Fall 1998, Oregon State University, reprinted with permission from Fish Info Service, www.sea-world.com.]



U.S. Meat Protein Consumption (lbs per capita per year)

	1996	1970
Beef	64.4	79.8
Broilers (chicken)	49.2	25.3
Pork	46.2	48.5
Turkey	14.6	6.4
Wild Seafood	11.8	11.6
Farmed Seafood	3.0	0.0
Other	2.4	6.6
Total	191.6	178.2



The Underappreciated Rainbow Trout. "Rainbows are by far the most popular trout for domestic production," says Peter Raffle of Trout Unlimited, because of their yield size (a dressed weight of 8 to 10 ounces from a 1-pound fish), because they do well in a hatchery, and because they taste good. However, they are not one of the most popular fish on the market. In 1997, trout purchases approached 57 million pounds (USDA), but that was barely 10 percent of the farmed catfish harvest. Consumers prefer higher-priced fish such as salmon, tuna, mahi-mahi and sea bass. Says Dave Cooper of the Plitt Co. in Wisconsin, "Trout is not as popular as it should be. It's mild tasting, versatile, simple to cook and reasonably priced." However, merchants suggest the look of whole trout (with head, tail and fins intact) is repulsive to consumers. In response, trout farmers and chefs are boning or partly boning the fish, improving the texture through feed and controlled water temperature, and offering value-added products such as cured and marinated fillets.

In the kitchen, fresh trout's versatility is uncontested. Left whole, it can be poached, pan-fried, grilled, baked, broiled, or roasted with a stuffing. As fillets it may be sautéed, broiled or wrapped around a stuffing and poached or baked. Butterflied trout may be broiled or grilled with or without a topping.

Cooked trout can be served hot or at room temperature. With a profile like that (and a lot of consumer marketing), trout's return to the main stage may just be through America's home kitchens. [From "A Rainbow of Trout" (source: Chicago Tribune), *The Creel* 31(2), Summer 1998; Wisconsin Aquaculture Association, Inc.]

Calendar of Events

7th Annual Farmed Fish Health Workshop. April 9, 1999; Washington County Technical College Marine Technology Center, 16 Deep Cove Rd., Eastport, ME 04631-9618. For further information, contact University of Maine Cooperative Extension; Dept. of Animal, Veterinary & Aquatic Sciences; 5735 Hitchner Hall, Room 332; Orono, ME 04469-5735; phone 207-581-2786; fax 207-581-4430 or 581-2729.

Fish Feed & Nutrition Workshop. September 19-22, 1999; Hosted by the Abernathy Salmon Culture Technology Center; held at The Riverside, 50 SW Morrison, Portland OR 97204. For more information, phone 503-221-0711; fax 503-274-0312.

Aquaculture Marketing Seminar 1999. September 22-25, 1999; The Radisson Hotel – Asheville, North Carolina, USA. For further information, contact Aquaculture Magazine, PO Box 2329, Asheville, NC 28802; phone: (828) 254-7334; Fax: (828) 253-0677; Email: aquamag@ioa.com

Marketing & Shipping Live Aquatic Products '99 – 2nd International Conference & Exhibition. November 14-17, 1999; immediately preceding FISH EXPO in Seattle; DoubleTree Hotel – SeaTac Airport – Seattle, Washington, USA. For further information about the conference and suppliers exhibition, visit the website: www.alaska.net/~mpaust or contact: Conference Manager John B. Peters, 5815 NE Baker Hill Road, Nor'Westerly Food Technology Services, Bainbridge Island, Washington 98110; Fax: 360-394-3760; E-mail: JohnBPeters@compuserve.com



"We eat salmon once a week at our house, so I have many recipes for our anadromous friends, the Pacific salmon. Hopefully you all have caught a few to experience how delicious really fresh fish can be. You will be pleasantly surprised if it is cared for and cooked properly." (Charlie Martin, The Reel News.)

CINDY'S SALMON BURGERS

[From "Stirring the Pot," by Charlie Martin, in *The Reel News*, October 1998]

- 1 ½ cup cooked salmon (steamed)
- ½ cup dry bread crumbs
- ½ cup chopped onions
- 2 eggs (beaten)
- ¼ cup chopped parsley
- 1 teaspoon dry mustard
- ½ teaspoon salt
- 1 teaspoon cumin
- ½ cup liquid from steamed fish pan
- ¼ cup clarified butter
- ¼ cup non-saturated fat cooking oil
- ½ cup additional bread crumbs

Steam some of your freshly-caught salmon and let cool. Carefully remove as many bones as possible. Transfer to a medium size bowl. In a skillet cook the onion and butter until translucent. Remove from the pan and put into the mixing bowl with the cooked salmon. Add the salmon juice, bread crumbs, beaten eggs, parsley, dry mustard, salt, and cumin. Mix well and form into 4-inch-wide patties about ¾-inch thick. Dredge the patties in the additional crumbs and fry in your hot oil about 3 minutes per side. Serve on a toasted bun with your favorite condiments and you will be in salmon burger heaven.



Web Sites . . .

<http://ag.ansc.purdue.edu/aquanic/jsa> – Established by the Joint Sub committee on Aquaculture (JSA) to increase access to information and an awareness of activities associated with the subcommittee. Information and items that can be accessed: Directory of Federal Members, Task Forces and Working Groups, Reports to Congress, Draft Revision of the National Aquaculture Development Plan, Guide to Federal Aquaculture Program and Services, U.S. Aquaculture Production for 1990 –1996, and upcoming meetings.

www.ustfa.org – The US Trout Farmers of America have launched an Internet site to serve the industry by bringing trout and trout farming information to the public. It's goals are to help promote consumption of trout, increase acceptance of fish farming, and provide information for existing and potential USTFA members.

[PubList.com](http://www.publist.com) – A new, easy way to search the web for publications. PubList.com is a free online service that gives you access to the most complete collection of information on the world's periodicals (over 150,000). It is a centralized source that links you to publishers' websites and numerous periodicals. You can order both current and backdated articles from this service. You can search for publication information by title, subject or keyword. They also provide information on how to contact publishers, obtain rights and permissions, and receive documents. PubList.com obtains their data from R.R. Bowker's "Ulrich's International Periodicals Directory" and "Editor & Publisher International Yearbook." For more information, visit their website at <http://www.publist.com>

www.riverdale.k12.or.us/salmon.htm – Sub-titled "Dedicated to All Things Salmon," this site is run by students at the Riverdale School in Portland, Oregon, and offers a lot of salmon-specific information, including catching, buying, cooking, videos, fish art produced by the students, an e-mail discussion group and a great list of links to government agencies, research groups and other cyber-salmon information.

www.nfi.org – National Fisheries Institute is the largest trade association serving the US seafood industry. NFI has always been a clearinghouse of business-related information. This website offers dozens of links to government statistics, seafood companies and other web resources. A members-only section adds promotional materials, HACCP information and the latest news on import alerts, legislative updates and more.

www.stir.ac.uk/aqua/fishing – Run by Scotland's University of Stirling, this site, called "Fishing for Info," is a guide to other on-line resources. It encompasses everything from marine science and fisheries management to processing and product marketing. Fishing for Info offers links to thousands of seafood/fishing sites around the globe.

www-seafood.ucdavis.edu/home.htm – Hosted by the Sea Grant Extension Program at UC Davis, the Seafood Network Information Center, or Seafood NIC, is an on-line home to the HACCP Alliance. It offers page after page of seafood-safety information, as well as training materials, seminar schedules and the FDA's official fishery hazard and control guides. The site provides generic HACCP plans for scores of seafood products and processes.

seafood@ucdavis.edu is an e-mail address rather than a website. However, it is an excellent resource for anyone with seafood-related questions.

www.shrimp-com.com – Maintained by long-time shrimp analyst Bill Chauvin, this site features monthly market reports, weekly price updates and a compendium of recent shrimp-related news articles.

www.keckco.com – A California company, Keck & Co. Business Consultants, is marketing an online directory of packaging and processing organizations and publications. Designed to provide links to websites worldwide, the site offers users easy access to domestic and international information on trends and developments in packaging and processing.

Publications



Trout Producer Quality Assurance Program. 1994. US Trout Farmers Association, 111 W. Washington Street, Suite 1, Charles Town, WV 25414-1529, phone 304-728-2189. (\$50 fee for non-members).

Total Quality Assurance and Hazard Analysis Critical Control Point Manual for the Trout Processing Industry. 1996. By Flick, Knobl, Hood, Ward, Wilson, MacMillan, Marshall, Parsons, White, Colantuno, Swank, Sloan, McNamara, Bonato, and Neraas. Virginia Sea Grant College Program Publication

No. VSG-95-09. Sea Grant, Virginia Tech, Food Science & Technology Bldg., Blacksburg, VA 24061-0418. (\$30, payable to Treasurer of Virginia Tech.)

Aquaculture Magazine Buyer's Guide '98 & Industry Directory. 1998. Aquaculture Magazine, PO Box 2329, Asheville, NC 28802. (\$18; \$20 foreign.)

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Literature Search Services

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