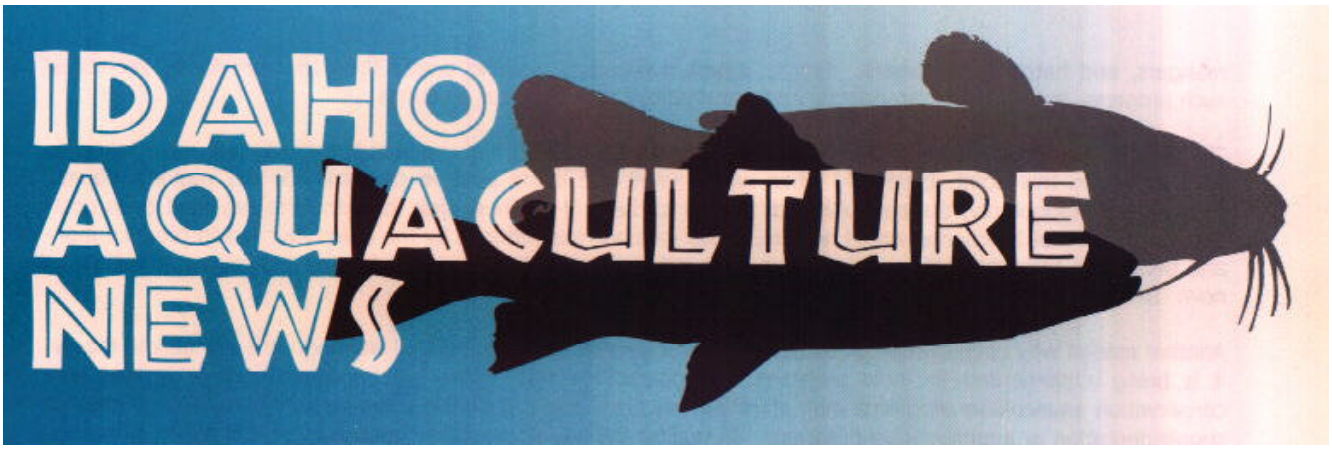

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In This Issue:

Winter 1999-2000

Listing Puget Sound Chinook as Endangered Under the ESA
-- PART II--

Dr. Ernest L. Brannon
Center for Salmonid & Freshwater Species at Risk
University of Idaho

In March of 1999, the National Marine Fisheries Service (NMFS) made the determination that Puget Sound chinook salmon were likely to become endangered in the foreseeable future and listed them as threatened. In the creation of the ESA, Congress intended that species facing risk of extinction be conserved, but they were also concerned about the potential abuse of the federal authority in administering the Act. Has NMFS exercised the rigor necessary to satisfy that directive? Have they demonstrated that the biological evidence warranted such action? Have the public and the state been careful to understand the limitations of that authority with regard to the intent of the ESA? The issue is not the Act, but the manner in which the Act is administered, and the political ramifications that can result from the exercise of questionable judgment in the case of Puget Sound.

In the last issue of this newsletter (Fall 1999) the author provided the background for the Puget Sound chinook salmon determination, and discussed the differences between the wording and the application of the Endangered Species Act (ESA). Part II addresses the following questions: (1) What is the basis for listing chinook as threatened with extinction? (2) Is the Puget Sound chinook listing consistent with the listing criteria?

What is the Basis for Listing Chinook as Threatened with Extinction?

In the Puget Sound region, habitat for wild salmon has been supplanted in large portions of the geographic area to provide the industrial foundation, urban expansion, and supporting utilities of a major population center over the last 100 years. Salmon habitat losses and the concurrent reduction of natural production did not occur from ignorance of salmons' natural reproduction needs, but were changes based on planned major community

developments and expansion. The state responded to these conditions by maintaining salmon resources for public use through artificial propagation at a level in excess of what the remaining habitat could sustain naturally. Over 40 hatcheries and 70 production programs exist in the Puget Sound area. The state salmon fisheries management program included a public sport fishery, Indian and non-Indian commercial fisheries, and natural production recovery in Puget Sound. The Washington Department of Fish and Wildlife (WDFW) developed a wild fish program: they identified the level of genetic diversity within chinook populations and conceived a plan to maintain natural production through the Wild Salmonid Policy and the Wild Stock Restoration Plan.

Through those measures, the state has succeeded in providing a public fishery in Puget Sound, with chinook salmon recently numbering in range of abundance from 130,000 to 200,000 fish annually. Many Puget Sound streams showed substantial returns in 1998. For example, 14,000 chinook returned to the Nisqually River last year, and over 20,000 chinook returned to streams in Hood Canal. Hatchery fish in Puget Sound have been integrated into the regional ecosystem since the early 1900s. Over 90% of the chinook returning to Puget Sound are hatchery produced, and contribute to wild spawners throughout the Sound.

Regardless of the relative abundance and diversity of Puget Sound chinook, NMFS made the determination that Puget Sound chinook salmon were likely to become endangered in the foreseeable future and listed them as threatened with extinction. The apparent incongruity between the listing and the actual status of chinook in Puget Sound makes it important to understand the basis of the listing decision. Contrary to what the public have been led to believe, chinook salmon as a taxonomic species is not threatened with extinction. Even Puget Sound chinook salmon are relatively abundant. So extinction of the taxonomic species or subspecies wasn't the issue. So what was the issue? Puget Sound chinook salmon were listed because NMFS determined the dominant presence of hatchery fish are a risk to wild chinook in the Sound. One can conclude that the official NMFS position is hatchery fish do not qualify as a bona fide component of the listed species and are not representative of their wild counterparts.

The contrary position to such a view is that hatchery fish have been part of the population structure that represents the chinook salmon functional ecosystem in Puget Sound for a period of over 90 years. In fact, natural spawners, which are defined by NMFS as wild fish, and which have maintained some level of distinctness from one another for decades, are a mixture of "native" fish and second-generation hatchery fish. Contrary to the NMFS position that only wild fish represent the Puget Sound chinook salmon ecosystem, it is the opinion of this scientist that it is the present ecosystem with hatchery fish that should be preserved. Ecosystems are dynamic and vary among streams, watershed basins and regions. Ecosystems are defined by their membership. The present ecosystem in Puget Sound accommodates the evolution of an integrated system in a geographical area of urban and industrial centers that maintains member species and a fishery. It is this present ecosystem that satisfies the admonition of Congress, "to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved" [ESA, Sec 2(b)]. Hatchery fish are preserving the very taxonomic species that NMFS declared threatened with extinction, and they are functioning to preserve the ecosystem which Congress intended the statute to address. It is not the ESA that excludes hatchery fish from representing the species, but rather a federal policy tailored more to the ideal of wild rivers in time past. An attempt to reintroduce a model no longer functional in the present ecosystem ignores the reality of environmental changes accompanying a developed society, and brings only unnecessary hardship and even chaos to the system, with no resolution.

Congress instructed the federal agency to make the determination of listing "after taking into account those efforts, if any, being made by any state . . . to protect such species, whether by predator control, protection of habitat and food supply, or conservation practices within any area under its jurisdiction" [ESA, Sec 4(b)(1)(A)]. This is especially relevant when the state has had a plan to conserve native chinook and perpetuate natural reproduction, and still provide a fishery supplemented through artificial propagation in a region that is dominated by urban population and industrial centers. NMFS reviewed the Washington State's plan that addresses natural reproduction as well as fisheries for commercial and sporting purposes, and considered the plan insufficient to sustain the population unit at risk. In essence, that decision overshadows the fishery priorities of the state because NMFS has a difference in opinion about the role of hatchery fish in Puget Sound ecology. That determination will require alterations in fisheries management, changes in land use, reduced public fishing, and high public cost, all because hatchery chinook are not considered members of the listed species.

Is the Puget Sound Chinook Listing Consistent With the Criteria?

Regarding the question of the scientific basis for listing chinook salmon in Puget Sound, there is the problem of its justification based on the criteria set forth in the ESA, as well as in the policy developed by NMFS itself. Under the ESA, "species" was identified as "any subspecies of fish or wildlife or plants, and any distinct population segment of any species or vertebrate fish or wildlife ***which interbreeds when mature***" [ESA, Sec 3(16)]. Except for strays, the Puget Sound chinook salmon populations do not interbreed. The various chinook populations in Puget Sound maintain a level of distinctness. By definition, the population units within the listed species do not qualify as a "distinct population segment". The listed unit is too large and includes too many populations to qualify as distinct. Given the criteria set down in the ESA, it is concluded, therefore, that the action of listing Puget Sound chinook is inconsistent with the ESA listing criteria.

Moreover, NMFS defined a population as distinct if it represents an ESU of the biological species, and qualified an ESU as a population or group of populations reproductively isolated from other population units. Spring and fall chinook in the listed unit do not represent a single isolated population. Rather, they are isolated from one another by separation in time of spawning and in spatial distribution, and therefore should be classified as separate ESUs. Puget Sound chinook salmon do not qualify as a single population unit, and, therefore, the action of listing is inconsistent with the NMFS listing criteria.

Furthermore, identifying the ESU as a group of populations for listing over a wide geographic area embraces the very abuse that Congress was concerned about when instructing the administrating unit to "use their ability to list sparingly and only when the biological evidence warranted such action" (96th Congress, 1st Session, 1979 Senate Report 151). The admonition "to use sparingly" was meant to prevent the gross listing of species for which biological evidence to warrant such action was tenuous. NMFS listed every wild population of chinook in Puget Sound. Listing all natural populations in the whole of the Puget Sound system can only be viewed as inconsistent with the instructions of Congress to list sparingly.

Finally, NMFS takes the position that the administrative objective under the ESA is to conserve the genetic diversity of species. However, that is not the stated purpose of the statute, but rather "to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved". It is WDFW that is accountable for the preservation of genetic diversity of chinook salmon populations in Washington. NMFS is accountable for the conservation of endangered or threatened salmon species. The two responsibilities are markedly different. If we were to conclude it was NMFS's responsibility to conserve the genetic diversity of anadromous salmonids, there would be no limit to the number of populations included under such a jurisdiction. If Congress intended that such authority should be assumed under the ESA, it would never have admonished the agencies to use the ability to list sparingly. The definition of responsibility by NMFS can only be viewed as inconsistent with the intent of the ESA.

Therefore, based on the opinion of this reviewer, it is concluded that listing Puget Sound chinook erred by two major oversights. Firstly, the listing is inconsistent with the ESA listing criteria and the Congressional instructions. The listing is considered too broad geographically, and it includes far too many segregated distinct populations as a single unit. Even on technical grounds, an excess of 30 chinook populations in the ESU does not qualify as a "distinct population segment . . . which interbreeds when mature". Secondly, there is the problem that NMFS is excluding hatchery fish from the population considered for listing. The public is being asked to accept that determination with the cost, depravation of fishing, and the very long-term program to recover natural spawners, when in fact hatchery fish have been part of the ecosystem and have been contributing to wild production over the last 90 years. If the wild fish and their association membership from hatchery populations are considered together as stream units, listing across the whole of Puget Sound is unwarranted. The numerous populations across the broad Puget Sound chinook ESU, the manner in which NMFS has interpreted federal responsibility under the ESA, and the accompanying encroachment on state fisheries management, combine in a manner that Congress may feel represents the abuse that it was explicit in cautioning against. NMFS's listing of Puget Sound chinook, although well intended, exceeds the intent of the ESA.

Recommendation

Consequently, NMFS has demonstrated its inability to consider priorities unique to urban and industrial centers where salmon habitat has understandably diminished and viable enhancement programs have been developed to address the needs of the species. These issues are of such importance that Congress should be asked to revise the wording of the legislation to resolve the uncertainty inherent in the interpretation of the ESA, and to limit the extent that federal agencies can expand the application of the Act through policy memoranda. Even further action is justified when the taxonomic species is not at risk of extinction, such as in Puget Sound. A request should be made of Congress to create an exemption clause in the ESA that allows the state to manage resources at the exclusion of federal emphasis on natural salmon production in those areas of the state where development of population and industrial centers precludes reasonable attention to wild fish, and where hatcheries are sustaining the "distinct population segment". This is an action that in no way diminishes the intent or function of the ESA, but it puts into perspective the fact that man also is part of regional ecosystems, and his population needs are defined by parameters of present human society, its culture, and its industry.

ANCIENT FISH NEED MODERN PROTECTION

Paul J. Anders
Research Associate, University of Idaho Aquaculture Research Institute
Ph.D. Student, UI Department of Fish and Wildlife Resources

Jurassic Park: The words conjure up images of fierce predatory dinosaurs, *T. Rex*, and other scary life forms that we luckily don't have to compete with for parking spaces today. Despite spending millions of dollars on realistic mechanical models of these ancient monsters, Hollywood overlooked a humble, unique creature from the same period some 200 million years ago – the white sturgeon, *Acipenser transmontanus.* In fact, the white sturgeon is thought to have been 50 million years old at the onset of the Jurassic Period, thus pre-dating the evolutionary proliferation of the modern-day bony fishes, know as teleost fishes. Based on their ancient history, today's sturgeons are literally swimming dinosaurs, appearing much as they did for millions of years.

How ironic then, that these swimming dinosaurs, surviving for over 200 hundred million years and successfully evading countless natural disasters the world over, are now considered among the most globally endangered or threatened fishes. In a recent report in the American Fisheries Society's *Fisheries* Magazine, 67% of North American sturgeon species were listed as endangered, threatened, or as a species of special concern. This statistic illustrates the magnitude of problems currently facing these ancient fishes. It also points toward unexpected repercussions of interacting with another formidable species, *Homo sapiens.*

Following decades of research and recent meetings of the American Fisheries Society, the International Congress on the Biology of Fishes, and other professional fisheries science organizations around the world, factors responsible for the unhealthy status of the world's sturgeons have been clarified. Sturgeons throughout the world are holoarctic, meaning they inhabit the northern tier of the northern hemisphere around the globe. They inhabit large rivers and spend varying amounts of time in the coastal areas of oceans, depending on species and their proximity to salt water. Unfortunately, pollution, destruction and alteration, (damming) of many large rivers (home to native sturgeons), along with over-fishing, are increasingly cited causes of the global demise of sturgeons.

Given collapses of sturgeon populations around the world, modern protection is being applied to these ancient fish. A little closer to home, efforts to develop a comprehensive conservation and management plan for white sturgeon are underway by fisheries researchers at the University of Idaho's Center for Salmonid and Freshwater Species at Risk. Drs., Madison Powell and Ernie Brannon (University of Idaho), Dr. Don Campton (U.S. Fish and Wildlife Service), and UI Research Associate and doctoral student Paul Anders have teamed up with numerous state, federal and Tribal fisheries researchers and managers and launched the first exhaustive white sturgeon genetics study to define and characterize white sturgeon in Washington, Oregon, Idaho, California, and British Columbia.

White sturgeon, or *Acipenser transmontanus*, whose scientific name means "the sturgeon across the mountains", are the largest of the North American sturgeon species, and the largest North American freshwater fish. White sturgeon are endemic or native to large rivers of western North America, from California to the Gulf of Alaska, west of the Rocky Mountain Continental Divide. Individuals of this ancient species reportedly reach nearly 20 feet in length, weighing 1,800 pounds, and have been estimated to live well over 100 years.

Using state-of-the-art molecular genetic techniques to study these ancient fish, the University of Idaho research team will enable fisheries managers to understand what constitutes individual white sturgeon populations. Defining the genetic structure, relatedness, and geographic ranges of individual white sturgeon populations is crucial to their protection and persistence. This is especially true in many areas of historically free-flowing rivers that are now largely fragmented by dozens of dams that either restrict or totally block the fishes historical migration patterns. Because these fish may have been separated into unnatural groups by hydroelectric dams, researchers fear that gene flow (the sharing and distribution of important locally adapted genetic material called genes) and other population characteristics responsible for the fishes' long successful history have been disrupted. Thus, information about the evolutionary history of white sturgeon, gained from genetic analysis, may ultimately reveal mechanisms responsible for sturgeons' long-term success. University of Idaho researchers look forward to participating in the development of conservation and management actions designed to ensure that these unique swimming dinosaurs will thrive well into the new millennium.

The University of Idaho in the News

UI Reels in Top Fish Research Facility

[Reprint of an article by Diane Noel, Programs & People, Winter 2000, UI College of Agriculture.]

Ending three years of occupancy under a lease, the University of Idaho has gained ownership of the Hagerman Fish Culture Experiment Station [in Hagerman, Idaho]. A July 1999 ceremony at the station celebrated the transfer of the 4-1/2 acre facility from the U.S. Fish and Wildlife Service to the UI.

"This station positions us right in the center of the aquaculture industry to address their specific needs," said Ernie Brannon, director of the UI Aquaculture Research Institute. Idaho ranks first in the nation in production of food-size trout, producing three-quarters of the nation's supply at about 30 fish farms along the Snake River near Hagerman. Like the nearby fish farms, the station receives a continual supply of cold, clean spring water.

Besides aquaculture research, the laboratory supports research to aid recovery measures for Idaho's threatened and endangered fish species.

"It's a marvelous facility and it's going to be a heck of a lot better after we expand the infrastructure," said Dick Heimsch, director of the Idaho Agricultural Experiment Station. Having gained ownership of the station thanks to federal legislation sponsored by Senator Larry Craig, the UI is now committed to spend $1.75 million of agricultural biotechnology funds on improvements.

"I think this will be, if it's not already, an internationally known center of excellence," said Heimsch.

Over the past three years, university scientists, graduate students, and undergraduate students working at the station have sought ways to improve the genetics of farmed fish, prevent disease outbreaks, produce cleaner fish-farm effluents, and develop economical fish feeds. But, as lessees, they have been unable to make improvements to the facility or even some basic repairs.

Planned expansions include facilities for conducting research on fish disease, a tissue and gene bank for threatened and endangered species, a distance learning center, and a wet lab with tanks capable of rearing fish to maturity. The additional wet lab will allow scientists to further improve the genetics of farmed fish. According to station director Ron Hardy, "Genetic improvement of commercial fish strains is the area where the main advances in aquaculture are going to be over the next 20 years."

The station offers fee-based services in research related to sustainable aquaculture and conservation fisheries. Contact Dr. Ron Hardy at (208) 837-9096 or e-mail rhardy@micron.net for more information.

UI's Fish Experiment Station Goes High Tech

[Condensed from an article by Cindy Snyder, Ag Weekly Correspondent, Ag Weekly, Twin Falls, Idaho, Saturday, December 4, 1999.]

The University of Idaho's Hagerman Fish Culture Experiment Station has become one of only three labs in the Pacific Northwest to have the capability to measure RNA (protein) at lightening speed. A new machine, known as a quantitative DNA/RNA detector, enables researchers to process 96 tissue samples in two hours.

Dr. Madison Powell, a UI research scientist at the station and director of the Center for Salmonid and Freshwater Species at Risk, knows that the sheer volume of data generated from the RNA detector will be overwhelming. He has seven work study students on the Moscow campus managing data files. Yet, the possibilities for using the data are nearly endless. Some of the uses to which Powell and Ron Hardy, director of the station and the Center for Sustainable Aquaculture, will put the technology are finding cures for diseases, improving the performance of farmed trout, and aiding in the recovery of threatened or endangered wild fish species.

In August 1998, the station acquired a DNA sequencer, considered at the time to be world class technology. Researchers will use the DNA sequencer and the RNA detector together to unravel if and how genes are related to what is happening with a fish. The DNA sequencer can be used to establish family lines and identify genetic markers – genes associated with a desired trait, such as fast growth or disease resistance. The RNA detector can then provide information about whether or not a gene is "turned on" by the amount of protein produced as the DNA unravels.

The RNA detector was purchased for the station by the USDA Agricultural Research Service with the hope that a new federal geneticist will soon be on board to use it. Powell is well-trained in the use of both the DNA sequencer and the RNA detector. This capability will enable the station to serve the genetic analysis needs of researchers nationwide.

The center provides fee-based services in genetic research. Contact Dr. Matt Powell at 208-837-9096 or e-mail fishdna@micron.net for more information.

BST and Fish Growth

University of Idaho researchers have found that bovine growth hormone (bovine somatotropin, BST) the same substance used to boost milk production in cows, affects fish growth. Studies have shown increased growth rates in trout, catfish and now sturgeon. In sturgeon, measurements showed growth rates boosted by 373 percent. Growth rates in trout and catfish only doubled or tripled. This finding could have a dramatic effect on the commercial sturgeon caviar efforts since older and larger sturgeon produce the best caviar.

This is good news. Although the marketability of sturgeon meat is well demonstrated, the potential value of caviar is much greater. Most of the world's species of sturgeon are now threatened or endangered. In light of the present political and economic state of Russia, the great sturgeon (*A. gueldenstaedti*) and beluga (*Huso huso*), long the sources of the world's most sought-after caviar, seem bound for extinction in the very near future.

White sturgeon are currently being artificially spawned in the U.S. for commercial purposes. As the first generation of captive white sturgeon reaches spawning age, domestic caviar should hit world markets just as the last of the traditional Russian sources disappears. If the quality of the U.S. product is high, the resulting profits are likely to be enormous. BST could play an important role in the production of this highly-prized commodity.

[From "The Fish Pathologists Corner" by Pete Walker, and "Fish Bits", *The Fishline* XI(4), February 2000, Colorado Aquaculture Association.]

IAA News & Notes

Gary Fornshell
Aquaculture Extension Educator

Going to Washington . . . Based on a proposal written by Dr. Ron Hardy and Gary Fornshell, they were invited to exhibit at the 2000 University Science Exhibition and Reception on Capitol Hill on March 7, 2000. The exhibit highlighted the University of Idaho's efforts in aquaculture research.

FY 2000 IAA Goals include emphasis on communicating issues and information of importance to the membership; continued active participation in

the Idaho Water Alliance, pursuing managed aquifer recharge; IAA President Mark Daily's active involvement with the Mid-Snake River Watershed Advisory Group as the aquaculture representative; close cooperation with the University of Idaho Hagerman Fish Culture Experiment Station; and continued dialogue with EPA and DEQ on matters pertinent to the Idaho Aquaculture General NPDES Discharge Permit.

The Idaho Aquaculture Association Annual Meeting will be held on June 10, 2000. Contact Gary Fornshell (208-734-9590) or Dave Bruhn, IAA Executive Secretary (208-543-4898), for information.

Water Rights Ruling in Favor of Idaho Aquaculture . . . A Judge in a District Court ruled in favor of aquaculture in a recent water rights issue. For years the Department of Water Resources has wanted to add facility volume as a condition of a fish propagation water right. In this ruling, the Judge ruled that facility volume is not a condition for a water right for aquaculture.

Proposed ESA Listing for Atlantic Salmon

The U.S. Fish and Wildlife Service and the National Marine Fisheries Service announced on November 17 that the federal government was beginning the procedure to list Atlantic salmon as an endangered species.

The agencies claim that fish in eight Maine rivers are genetically distinct from other Maine Atlantic salmon and that these particular fish face extinction. The listing could prohibit the use of European strains of salmon which are genetically superior to North American strains. The industry fears the federal government might mandate that they get rid of the fish they have.

The industry will challenge the government's right to take private property. Joe McGonigle, head of the Maine Aquaculture Association, said "We believe it would be a tremendous extension of ESA authority. It's never been used to close an industry down. We don't believe they'll be able to make it stick in court."

[Condensed from "US government formally proposes Endangered Species listing for Atlantic salmon," by Muriel L. Hendrix, *Northern Aquaculture* 5(12), December 1999, p. 3.]

Aquaculture Tidbits

- Demand for aquaculture products in North American and European markets is increasing at 10-15% per year. One out of every four fish eaten in the world is produced from aquaculture with one out of five in the U.S.
- More fish is eaten worldwide than any other type of animal protein, making up 15-20% of all animal proteins. Of the 30 countries most dependent on fish as a protein source, all but four are in the developing world.
- In 1996 an estimated 30 million men and women were deriving an income from fisheries, of which 95% of them were in developing countries.

[Florida Aquaculture Association Newsletter, January 2000.]

PET FISH TIDBITS

- According to researchers at Purdue University, aquariums with brightly colored fish could curtail disruptive behaviors and improve eating habits of patients with Alzheimer's disease. Patients exposed to aquariums were more relaxed and ate up to 21% more food and showed a decrease in disruptive behavior. Short-term memory seems to be stimulated as well.
- A survey says 6 out of 10 Americans own a pet of some kind, with 9% owning freshwater fish and 0.5% owning saltwater fish in 1998.
- 71% of retail establishments carry freshwater fish, 41% saltwater fish.
- The average pet owner spends $260 annually if they own saltwater fish, but only $60 if they own freshwater fish.
- Fish owners tend to buy most of their products from discount stores and pet/fish stores, followed by pet superstores. For saltwater fish owners, pet stores are the top ranked source.
- Retailers report that aquarium supply sales grew 20% over last year, but fish sales increased only 7%.

[Florida Aquaculture Association Newsletter, January 2000.]

Calendar of Events

Aquaculture Canada 2000, May 28-31, 2000, Moncton, NB, Tel. 506-858-4321.

The Idaho Aquaculture Association Annual Meeting, June 10, 2000, Twin Falls, ID. Contact Gary Fornshell (208-734-9590) or Dave Bruhn, IAA Executive Secretary (208-543-4898), for information.

Atlantic Aquaculture Exposition, Conference & Fair, June 20-25, 2000, St. Andrews, NB, Tel. 1-888-454-7469.

The 41st Western Fish Disease Workshop, June 28 and 29, 2000, Gig Harbor, WA. Contact Steve Roberts (509-255-5907).

Aquaponics and Tilapia Aquaculture Short Course, June 25 – July 1, 2000, St. Croix, USVI. The development of an aquaponic system for the production of tilapia and vegetables has been underway for several years at the University of the Virgin Islands. They now have a tested commercially viable system, as well as a less intensive tank culture system that is algae based. These and other model recirculating systems using rotating biological contractor technology will be studied in the course. Contact Dr. James Rakocy, RR 2, Box 10,000, Kingshill, VI 00850; Phone 340-692-4031; E-mail jrakocy@uvi.edu or Visit their website: http://rps.uvi.edu/AES/Aquaculture/UVIShort Course.html

National Recirculation Aquaculture Workshop, July 13-15, 2000, Lethbridge, Alberta, Tel. 403-382-6991.

Third International Conference on Recirculating Aquaculture Systems, July 20-23, 2000, Roanoke, Virginia.

Fish Biology Congress 2000, July 23-26, 2000, Aberdeen, Scotland, Tel. 604-666-3520.

Aquaculture Pacific Exchange, October 26-27, 2000, Campbell River, BC, Tel. 1-888-454-7469.

Marketing Live Aquatic Products, November 1-4, 2000, Radisson Hotel, Annapolis, Maryland. Contact John Ewart, Delaware Sea Grant Marine Advisory Service, College of Marine Studies, University of Delaware, 700 Pilottown Road, Lewes, Delaware 19958; Phone 302-645-4060; Fax 302-645-4007; E-mail ewart@udel.edu.

Northeast Aquaculture Conference & Exposition, December 7-9, 2000, Portland, Maine, Tel. 1-888-454-7469.

Cook's Corner

Herbed Trout With Sour Cream

Ingredients:

- 4 fresh trout fillets (4-6 oz each)
- 1 tablespoon chopped parsley
- 1/4 cup dry white wine
- 2 tablespoons butter
- 1/3 cup sour cream
- 1 tablespoon chopped onion
- pinch of chervil
- 1/4 cup soft buttered bread crumbs
- pinch of tarragon
- salt, pepper

Directions:

- Rinse fillets, pat dry with paper towels and sprinkle lightly with salt and pepper.
- Grease four pieces of heavy aluminum foil.
- Place a trout fillet on each.
- Melt butter and sauté onion 2 minutes.
- Add wine, parsley, chervil and tarragon.
- Divide mixture evenly over each trout.
- Wrap tightly and place packages on a raised rack in a greased baking pan.
- Bake at 450 degrees F for 15 minutes or until fish flakes easily when tested with a fork.
- Carefully open packages and gently remove the fillets and topping, allowing the liquid to drain away.
- Remove the racks, discard any liquid remaining in the baking pan, and return the fillets to the pan.
- Spread 1/4 of sour cream over each trout fillet and sprinkle with bread crumbs.
- Broil until lightly browned.
- Serve with baked potatoes, broccoli laced with sugar and lemon, and your favorite dinner rolls.

(Adapted from a recipe in "Canadian Fish… a Good Catch!", Fisheries and Oceans Canada,1980, by UW Sea Grant Advisory Services – AquaNIC web site.)

Information Transfer

Web Sites . . .

The ***Aquafind*** website has been redesigned with several new additions that may be of interest to you. There is now a searchable "Supplier Directory" accessible on the site in addition to the searchable "Species/producer database". The registration process is user friendly and searches are just as easy. Pages have been added for new products and articles as well as many link pages to everything from auctions to weather. There are also trading boards to accommodate aquarists, ornamental fish farmers, and commercial fisheries. All of the Aquafind pages are available for you to view or to conduct your own searches on at no charge. The Internet address is:

http://www.aquafind.com

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