

Toward an Indigenous Aquaculture: Meeting Community Development, Food Security and Tribal Needs

March 22-24 2004 Minneapolis, Minnesota

Proceedings



Compiled by Ben Belton

Institute for Agriculture and Trade Policy
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Invocation

The Fish

We turn our minds to all the Fish life in the water. They were instructed to cleanse and purify the water. They also give themselves to us as food. We are grateful we can still find pure water. So, we turn now to the fish to send our greetings and thanks.

Now our minds are one.

Haudenosaunee Thanksgiving Address read by Chaz Wheelock, Oneida Nation
March 21, 2004

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Introduction

With generous support from the Homeland Foundation, the First Nations Development Institute and the Institute for Agriculture Trade Policy have created an “Indigenous Aquaculture Network”. From March 22-24, 2004, the network brought together a diverse set of tribal aquaculturists from different bioregions of North America to discuss the status of tribal aquaculture and how the network can assist members in achieving sustainable development in a manner that meets community needs. These proceedings reflect the scope, standards and spirit of a distinct way of practicing aquaculture that is framed by indigenous concerns, issues and sovereign structures. Network members fully participated in the planning and organizing of this meeting, the content and the proposed set of actions that conclude this document.

Day one involved project presentations and comments from eight participants. This discussion helped to locate aquaculture in an indigenous cultural context. Day two’s wrap-up discussion allowed participants the opportunity to propose a concrete course of action – highlighted in the concluding section of these proceedings. Participants strongly recommended that the network go from “paper to pond”, meaning that real development activities should be embarked upon. It was very clear that the network also has an important educational role to play within indigenous communities as well as in other venues. A proactive response is needed to fully capture the kinds of contributions that aquaculture can make to indigenous communities both locally and internationally.

The network seeks to make its presence known at forthcoming conferences and in further collaborations with a wide range of organizations and institutions. It was very clear that an astounding level of knowledge and expertise is embodied in the participants. This knowledge base can be of great assistance to other Tribes in North America and abroad. Hence, we are now poised to advance this agenda and set of initiatives further within the growing movement to revitalize Native food systems.

How Does Aquaculture Fit Within Tribal Landscapes?
Mike Skladany
Institute for Agriculture and Trade Policy

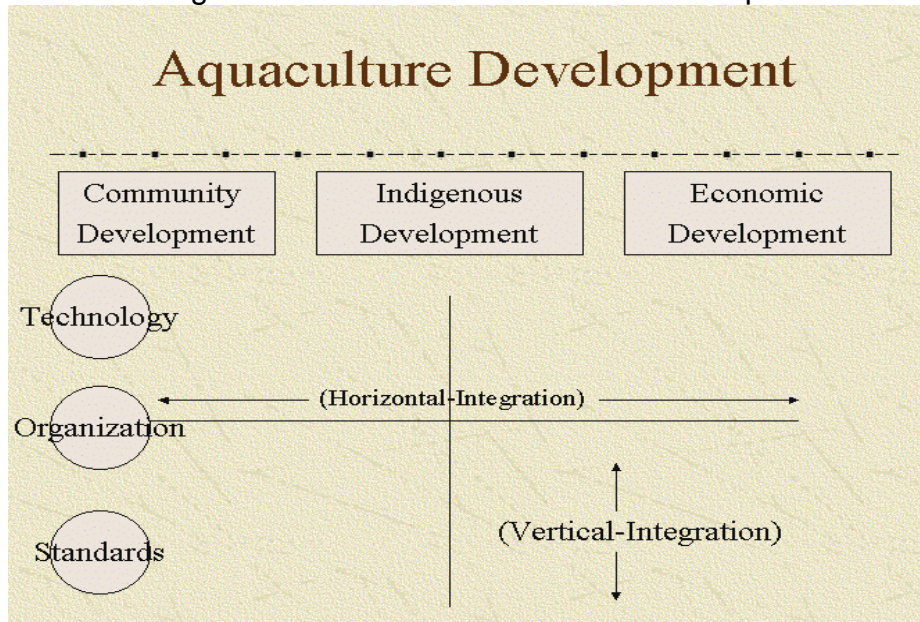
Dr Skladany initiated the conference by giving an overview of the Indigenous Aquaculture Network. The network originated from a workshop held at the 2002 Native Food Summit. The network and was made possible through a grant to the First Nations Development Institute and the Institute for Agriculture and Trade Policy by the Homeland Foundation. The components of the Network, and deliverables from the grant are:

- An Indigenous Aquaculture list serve and website
- A database of North American tribal aquaculture operations
- A series of conference calls leading up to the convening
- The convening, March 22-24, Minneapolis
- Proceedings from the meeting
- A CD Rom containing a number of prescient articles and information

The are currently 40-50 tribal aquaculture operations within the United States consisting of:

- Roughly 50% coastal shellfish. This type of aquaculture is especially prevalent in the Pacific Northwest. There is also some finfish aquaculture in this area.
- Around 20% large operations such as the St Croix re-circulating facility.
- The remainder is composed of some integrated aquaculture on arid lands and small scale finfish operations for food and leisure.

The following schematic was used to describe possible directions for aquaculture development.



Vertical integration is represented along the Y axis and horizontal along the X axis. A vertically integrated system would organize production from seed, through grow out to packaging and distribution. A horizontally integrated system might encompass more value added activities such as education, fee fishing or an in situ restaurant. Bullfrog fish farm in

activities such as education, fee fishing or an in situ restaurant. Bullfrog fish farm in

Menomonee, Wisconsin is an example of a horizontally integrated aquaculture operation. Industrial feedlot style salmon operations such as those found in Washington and British Columbia are instances of vertically integrated production.

Aquaculture offers the possibility of a variety of technological choices, organization of production and are evaluated by standards -- cultural-technical rules for behavior. Standards are of key importance in designing systems for aquaculture that meet the social, cultural, environmental and economic needs of indigenous peoples.

The diagram below represents two critical framing concepts Indigenous standards- sovereignty that come into play when fitting aquaculture into tribal landscapes.



A series of questions were raised for discussion during the meeting

- How can we create a sustainable aquaculture?
- What obstacles are faced by tribal aquaculturalists and communities?
- How can aquaculture contribute to indigenous peoples' wellness and health?
- How can the Indigenous Aquaculture Network assist in the above?

The direction for the meeting was presented as: 'Strengthening food security, health and community development in a way that lives up to *Indigenous* standards and sovereignty.

The presentation concluded with a series of objectives for the meeting:

- To define indigenous aquaculture
- To explore the ecological fit and economic viability of aquaculture in an indigenous setting
- To seek ways in which to practice aquaculture in an indigenous setting while maintaining cultural integrity
- To create a strategic plan for continuing the work of the Indigenous Aquaculture Network.

Adapting Aquaculture to Ecological and Tribal Needs
George Brooks
Environmental Coordinator
Gila River Pima-Maricopa Indian Community

The Gila River community is located directly south of Phoenix Arizona. Over 10,000 people live on the reservation there. Previous attempts at aquaculture in Arizona (mainly catfish, tilapia and marine shrimp) have failed – largely through inefficient use of water resources which are at a premium in Arizona’s arid climate.

A recent court decision has won back water rights to 600,000 acre/feet of water for the Tribe. This is highly significant, both culturally, and because water is such a finite resource in Arizona. As a result the Tribe is anticipating developing an aquaculture program. In order to be successful, this program needs to achieve cultural, environmental and economic sustainability.

Achieving cultural sustainability:

It has been said that if you return the culture then all else will follow. The culture of the Akimer O’odham was based on water from Keli Akimel, the Gila River, thus; returning the river will also return the culture

Tribes in the area had traditionally utilized water from the Gila River for agriculture for 3000 years, building complex irrigation systems and harvesting large fish such as the Arizona pikeminnow and razorback sucker. Diversion of the Gila River, the source of agriculture and fisheries, led to declines and high rates of Diabetes on the reservation.

Returning agriculture and fish to the Tribes will restore an ancestral legacy. “The vision is of one day providing produce grown at the Gila River to the nation or even the world” (Hon. Richard Narcia, Governor, Gila River Indian Community). Returning fish to the diet may also help to reduce levels of diabetes, currently among the highest in the U.S.

Negotiation for the return of enough water to irrigate 146,330 acres of land has made this vision possible. The Pima-Maricopa irrigation project was set up to build a conveyance system for this water and educate and assist the people in using it.

Education as cultural sustainability:

An educational program is one of the key elements in facilitating culturally sustainable aquaculture. Aquaculture is used as a way of teaching science and engineering in tribal schools. Through an educational program, students and teachers learn hands on construction techniques along with prawn and tilapia culture techniques.

The long term goals of the program are; achieving higher test scores in science and math, sending students to the national science fair (several students from the Tribe have won national awards there with aquaculture projects), fostering a re-appreciation for fish and fisheries, and fostering new skills which will help tribal enterprises. Adults and

students are also encouraged to participate in regional activities beyond the reservation. The Gila River aquaculture program was featured as a cover story in the July/August 2001 issue of *Aquaculture Magazine*.

Achieving economic sustainability:

If economically sustainable aquaculture is to take place at this location, a number of questions must be answerable positively.

- Is there a market?
- Are the necessary physical conditions present?
- Will the species spawn locally?
- Can the spawn be raised to adulthood and then spawned again with viable offspring?
- Will locally hatched and reared animals grow to market size?
- Are locally produced animals marketable and profitable?

Reducing costs:

The freshwater prawn *Macrobrachium rosenbergii* is one of the species being raised in the Gila River community. In order to make its production cost effective it was necessary to challenge conventional wisdom.

Initially, prawns were purchased as post larvae from an outside source at \$0.10 each. They were placed in tanks for nursing until large enough to be stocked. This is standard practice among prawn growers. Mortality during the nursing stage was 50%, followed by a further 25% mortality after stocking.

It was found that by omitting the nursing stage and stocking post larvae directly, total mortality was reduced to 50% - a 25% reduction in stocking costs. Further major reductions in stocking cost would be gained by producing post larvae in situ. This would allow for stocking at a cost of \$0.02 per post larvae, bringing down the original production cost by 70%. These reductions help insulate the Tribe from the price fluctuations of the market.

Achieving ecological sustainability:

Similarly, other questions must also be answered positively before aquaculture can take place

- Will the industry pollute itself out of existence or release 'dangerous' exotic species?
- Will it use up or make excessive use of a scarce natural resource?

Water in Arizona is at a premium (around \$150/acre/foot). This makes farming difficult. This water must be moved from where it is located to where it is needed, adding to the cost. By integrating aquacultural and agricultural water uses, these costs can be brought down, water effectively conserved, and productivity per acre/foot increased.

The O’odham Odiak Demonstration Project

The O’odham Odiak farm is used to demonstrate ways in which to make use of the Tribe’s newly won water rights. A new low technology aquaculture facility was integrated directly into an existing 10 acre demonstration farm.

The specifications are as follows:

- One 150 x 36 x 5.5 ft. rectangular plastic lined semi raceway.
- Two 18 x 4 x 4 ft. net pens and two prawn ladders (stocked at 700 fish/cage and 3000 post larvae.
- Two ½ hp. Blowers for aeration

The setup is basic, being described as ‘home depot’ style construction. Fish were fed at 3% total weight per day. Prawns are not fed, deriving their nutrient intake from fish waste falling from the cages above. Water in the raceway is exchanged only when required for irrigating the land farm, and all water from the pond is used for irrigation. The water is flushed from the pond carrying any unused nutrients from the tilapia and prawns onto the farmland and cleaning the pond itself.

The project is entering its third year of production. It carries low construction costs, low operational costs and is capable of producing 8,400 lbs of fish and 800 lbs of prawns per acre. It utilizes only 5% of the farmland it is sited on.

Potential and Opportunities:

The system could potentially be built out to 7,000 acres – this area would produce 58 million lbs of fish and 5.6 million lbs of prawn per year based on current yields. This seasonally harvested volume of product would require a processing plant, marketing and distribution. Seasonal production will also require a hatchery for prawns and fish to be built, along with a research station for improving husbandry techniques and further lowering costs. All these developments would create jobs for the local indigenous community.

Recreating the Gila River

Another innovative project is underway at the Wild Horse Pass Casino on the Gila River reservation. The Boulevard River is a 2.5 mile water feature which follows the original course of the Gila river. The Pima-Maricopa Irrigation Project has been invited to stock the water course with non-endangered and non-threatened native fish species which were once found in the area. Species currently approved for stocking are the desert sucker, sonora sucker and longfin dace.

This program would provide the following benefits:

- Native Fish are rare and combined with the “Old Gila” landscaping, are an attractive draw for sightseers.
- The act of protecting a rare Arizona / Gila River resource is positive and interesting news that will generate years of good press for the Community and the Resort.

- A native fish refugia is considered a “beneficial use” of water, assisting in the protection of Gila River Indian Community’s water resources.
- A native fish refugia will provide significant educational opportunities.
- Provide an opportunity for cultural activities.
- Provides an alternative biological management methodology for the Boulevard River as opposed to chemical methods or the stocking of non-native fish.

Both desert and sonora sucker have already been introduced to the river.

Aerial photograph of the Pima-Maricopa Irrigation Project



Aquaculture and Community Development
Herby Radmann
Soul Proprietor
Bullfrog Fish Farm

Bullfrog Fish Farm in Dunne County, Wisconsin was founded by Herby Radmann to provide fish for food and recreation. Herby also founded the Society for the Preservation of Rural Character – an organization with aims and values echoing those of the farm. Bullfrog acts as a model for small-scale family oriented aquaculture, and provides a model for indigenous applications.

The farm was built from the ground up after the discovery that the site had a high water table. It was necessary to learn all the skills needed to raise fish, and having written one unsuccessful business plan it took a further year to perfect a second. This process was a valuable learning experience which helped to formulate a coherent direction for development. Each year has “helped to make it at a higher level”. Construction of the farm was not solely profit driven; “there are plenty of good reasons for the farm to be there and money is not one of them”

Adaptation and creative thinking have been key to the farm’s development. In 1999 it was started as a public liability company and a farm crew was incorporated into the plan. The investment scenario for the company is as follows:

“The Bullfrog Fish Farm LLC is an innovative business practice model for small, rural and developing farms and/or business – Advancing opportunities in finance and investment... inclusive to traditional “rural values”, lifestyle choices and community”

This effort initially raised \$40,000, which allowed the farm to continue operating and devise new products. A beer license was acquired. The ‘Hobo Cheffing’ restaurant was set up to cook fish for visitors and anglers. Herby became the sole proprietor (or soul proprietor, as he spells it) and staff members began to take over tasks which he had formerly done. This helped to empower the staff and freed up more time to develop entrepreneurial skills, go on a financial management course and advance the business plan further. A value had to be created within the plan to measure ‘blue sweat’ – a combination of sweat equity or unvalued labor, and blue sky. This enabled people who were investing in the project to track their investment in the venture as a whole, and measure it against the dollar.

Ultimately the farm will be run by the people who live and work there. Grants and bureaucracies often don’t answer the needs of the small farm and are designed for industrial operations. It’s necessary to find people who can appreciate the passion behind the farm, buy into it and help it progress. Because people have bought into the farm it is easier to advocate for the members of the farm while raising funds.

A Limited Liability Company (LLC) needs leadership. Herby retains 55% ownership, and members are, in part, buying into his ability to lead. A key element for the farm is “humanity” – celebrating what makes us human.

There are three categories that are useful in analyzing farm development.

1. **Technology** – Family farms run parallel to indigenous aquaculture because much of the technology employed in industrial operations is too large expensive for their needs. The Department of Agriculture needs to recognize the value of community based businesses and farms, and help to downsize existing technologies for the small farm so that some of the economies of scale work out better. The computer and website have been very valuable. Nearly all fish farmers have access to a computer and they aid flexibility of time management.
2. **Research, grants and policy** - are often unhelpful. When people go out of business their expertise is lost to the fish farming community. The small farmer can survive but not everyone will become part of the corporate world. We have to offer career opportunities where these people can do well and survive. Grants often have low success rates. If these were awarded retroactively this would not be the case. Grants usually do not provide for practical things such as pieces of machinery. It is important for grant providing institutions to distinguish between the industrial model and the small sustainable model.
3. **Finance and investment** – There is unfair competition between the small and large players for the investment dollars which help to develop new ideas. Small farms have a history of failing. This doesn't have to be so. These types of farms are often not treated with the social regard they deserve. Not having adequate healthcare is one of the biggest obstacles to small businesses and farmers.

The small farmer pays a much higher proportionate share for food processing fees. Charges are not stair stepped as is claimed. For example, a multi-million dollar order might cost \$500 a month in processing fees while a much smaller one costs \$300. Multiple licenses are needed for the different activities taking place in diverse horizontally integrated operations. This situation would be greatly improved by offering a single license for smaller businesses.

Regulation is necessary, “but it should be real, and it should be relative”. Because everyone employed on the farm shares varied work, workers comp is paid at the highest rate. This equates to small businesses paying a disproportionately high share. The rural economy used to mean that local people would be prepared to do jobs as favors or at low cost. This is no longer a meaningful rural economy, so the small business is reliant on expensive supportive services, although it is sometimes possible to negotiate for reduced rates.

There is a marketing problem for small farms, but no “silver bullet” to solve it. There is a long way to go in developing niche markets, but it takes a lot of work. When a farm

reaches a certain level there is pressure to join the mainstream marketing arena. Building a central processing house and entering the marketing mainstream doesn't necessarily fit the economics of the Minnesota or Wisconsin farmer. New models need to be developed to link the retailer direct to the farmer.

Networking is important. A lot of people who go into fish farming do it because they are "mesmerized by the fish", and a passion for the job plays a crucial role. Good ideas need to be economically responsible if they are to stand alone. A culture of dependency must be broken. Farmers need to learn independence. "In business there are no excuses. There is no blaming anyone else". It is important to listen to the advice of consultants whether you like it or not.

Joining associations and networking is an important way to share ideas and information. Financial management courses are useful too. "Business savvy will give us independence". Some of the characteristics of sustainable agriculture are that there are lots of unknowns and lots of developing that needs to be done, new models built and success defined in your own terms.

It is very easy for a small business to use up its advertising dollars. Being distinctive helps to get publicity. Word of mouth is key and needs to be actively developed. There is a balancing act between servicing big orders and individual customers when you don't have enough product. It is important to fulfill orders for restaurants to maintain reliability. One of the most important activities at bullfrog is taking visits from schools – there are at least 50 groups that visit every year. This provides a link to the community as well as a source of income.

Community Festivities at Bullfrog Fish Farm



Planning for Aquaculture Development
Dick Hartmann and Barry Bassett
Director and Production Manager
St. Croix Waters Fishery

The St Croix operation started as the result of the exercise of indigenous treaty rights in the early 80's. The Tribe had reaffirmed rights to a number of treaties allowing it to spear walleye, and felt that it needed to put resources back into the surrounding area. As a result, a hatchery for sport fish was developed along with natural restoration programs. The hatchery could not succeed without subsidization, so the fish farm was identified as an alternative.

The St Croix reservation is in Northwest Wisconsin and was created as a result of a congressional act in the 1930's. There are communities in three different counties and the total size of the reservation is 2,500 acres. Given the land base and resources, recirculating aquaculture was settled on because it allows for raising large numbers of fish in a small area and conserves water effectively. Due to economies of scale, the decision was made that the facility should be a large one.

Initially there was "a lot of hunting for soft dollars" – grants from bodies such as the Economic Development Administration and the Northwest Concentrated Employment Program. Feasibility studies were carried out, garnering further monies such as a three year grant from the Administration for Native Americans. Outside expertise on recirculating facilities was also sought.

The Tribe's gaming industry took off around this time, providing revenue that allowed the development to go ahead. There was a point where the Tribe had to decide whether to continue with the potentially costly and time consuming project, and it was given the go ahead.

The chosen location was leased by the Tribe, but not held in trust, so was subject to all State regulations. The Voigt decision (which reaffirmed the rights of tribal members to spear fish on lakes within ceded territories but off reservation) made the situation more difficult vis a vis the Department for Natural Resources (DNR).

Multiple layers of government were dealt with – the National Parks Service, US Fish and Wildlife, Environmental Protection Agency, DNR, the Department of Agriculture. Eventually permission for the operation was given dependent upon on stringent standards being met. The various limits placed upon the Tribe were "next to impossible to meet". The requirements on the discharge permit were the most demanding of these.

An engineering firm was hired to provide complicated water treatment services, including those needed to meet thermal discharge requirements. Operations started in October 2001. Projections are that the facility will turn a profit in 2005. It was always known that this would be a lengthy process. Initially the facility was designed to grow Atlantic

salmon, but the market collapsed following the growth of salmon production in Chile. As a result, yellow perch and hybrid striped bass were selected instead.

Perch are enormously popular in the Great Lakes basin and the fishery in Lake Michigan had collapsed, meaning that they had good market value and represented a local niche. There is also an existing metropolitan Asian market for striped bass. Marketing bass has been ongoing for six months and has focused on the East coast.

The facility has 35 employees of which around 50% are tribal members. The site itself is 50 acres. The 170,000 square foot building contains 2.2 million gallons of water and 1.5 million fish. All fish are purchased as fingerlings from a varied quality of sources. The next step towards vertical integration will be developing an on site hatchery. Two inch fingerlings are purchased from 8 different locations around the country. Building a hatchery will significantly lower costs and check the entry of diseases. Fingerlings currently cost around \$0.25 per fish. This price would fall to around \$0.08 if produced in situ. Market size is 0.33 lb for perch and 1.5 lb for bass. Each species takes ten to thirteen months to reach this size. At full capacity, 3 – 5 million fish will be produced in the building per year.

Fish are nursed for 30 – 90 days when they come in, before being placed on growout tanks. Currents in the tanks tone the fish and help to remove solids. There is a density of 6 lbs fish/gallon. One growout room contains 900,000 gallons of culture volume, and the other, 600,000 gallons. Each tank turns over its water every 1.5 hours.

St. Croix has an advanced and probably overbuilt water treatment component. As part of a multi-step water treatment process, ozone is injected into the water to break down organic materials. Eventually this waste will be stored and utilized as fertilizer. UV lights break down ozone and kill pathogens. Bio-filtration is the final step of the water treatment, and is used to remove ammonia. Oxygen is then injected into the water.

The huge amount of biological activity in the building requires that the water temperature be lowered by a cooling system. Drum screens provide additional solid removal. Part of the discharge system was removed and upgraded because it was not cost effective.

Salt is the major therapeutant used at the facility and other therapeutants are minimized. Air in the building is dehumidified. There are eight feed silos, each holding twenty tons, each of which will be filled once a month when full production is reached. This equates to 4,000 lbs feed per day. Fish are fed by an automated cable based system, but there is some hand feeding. There are dissolved oxygen checks on the tanks once every three hours. Back up is a generator which runs the oxygen, some lights and some computers. There have been power outages of up to three days and over this period the tanks have been successfully self supporting.

This system is highly intensive and is monitored daily for changing parameters such as pH. There is a fully equipped lab where all internal pathology is carried out, as is internal

water chemistry for the discharge permit. Bio-security is a priority, and because of the food processing that takes place at the facility, hygiene is paramount.

There is a large processing room with two lines which will count batches of fish, scale, de-head, gut and fillet perch. Fillets are then packaged and boxed at the end of the line. The line can process 40 fish per minute. Bass are cleaned and sold whole. There is some hand trimming and additional quality control at the end. During spear fishing season, smaller walleyes can also be processed in this way for tribal members. There is large freezer storage capacity which can be utilized if the market softens. Otherwise, the product can be delivered and sold the same day it is killed.

This system is the second largest in the country volume wise. 99.998% of the water is re-circulated. There are many, many options in terms of components, water quality etc, so individual re-circulating facilities can vary widely. This type of system could also be scaled down a great deal. Several small systems would be easier to maintain and carry less risks than one large one

The electricity costs are \$50,000 per month. The Department of Energy has recently given the facility a grant to investigate generating energy from renewable sources such as local biomass. The feasibility study suggest that energy can be generated from this source at \$0.055/Kwhr, which seems to be an acceptably low cost. Potentially this energy could be sold to cover the costs of energy used at the facility and generate a 12% margin for the Tribe.

Ways to utilize organic waste as a fertilizer for farmers are also being investigated, but the process is a complicated one. Farmers are anxious to try out the manure. At some point this will become a value added product and save a significant percentage of the operation's costs.

The Tribe has recently purchased a 320 acre tract of land which was once a minnow operation and has "tremendous resources" for raising better strains and new species of fish for the facility, and for restocking local species into the surrounding lakes. This would be important if the market price of perch drops, as it potentially could. The facility does offer opportunities for flexibility. Some work is being done with bluegills and largemouth bass. There are very few possibilities for escapes because the system is completely closed.

An import permit and health checks are needed in Wisconsin because some fish fingerlings come from other states. No fish is sold that has not been withdrawn entirely from antibiotics, and antibiotic emissions are addressed by the discharge permit. Pharmaceutical pollution is a new area which is only beginning to come under scientific scrutiny. Only two antibiotics are currently approved for use in aquaculture.

There are statewide DNR standards for salt emissions, which it classes as a therapeutant even though the EPA does not recognize it as such. Referring to the stringent conditions of the permit, Barry says, "I think we got put under the microscope because it's a new

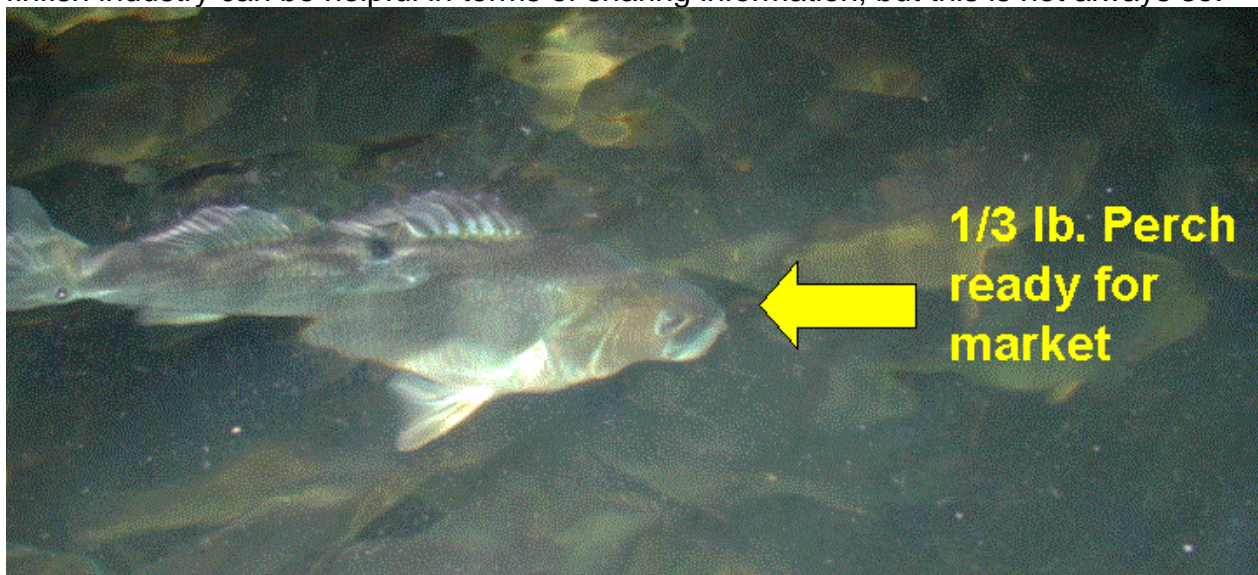
industry". It can be hard to get a straight answer from the DNR regarding details like who wrote a discharge permit. The facility has been warned over a minor discharge temperature violation, and for emitting discharge which contained too much dissolved oxygen! No water has been discharged for the last eight months. When the system reaches full capacity only 20 gallons of treated system water will be discharged per hour.

Suppliers to the industry should be used as resources. When the issue of dioxins in feed came up, the suppliers were contacted. As a result, these suppliers now test all the ingredients that go into the feed and send back the results. This means that customers can be confidently contacted in advance and the quality of the fish becomes a selling point.

The system used largely bypasses the difficulties associated with industrial salmon farming. In fact, many anti-salmon farming campaigns in the Pacific Northwest recommend exactly this type of re-circulating facility as an ecologically sustainable method of rearing salmon. Dick says that, "people are looking to us to get this thing to work because it's the future of fish.... This thing is like a feedlot for fish but it conserves water, conserves the natural fishery"

Other Tribes thinking of going into re-circulating aquaculture would need to assess whether it was something that provided a good fit for them. There is a lot of freely available information which should be consulted before embarking on such a project. "Consultants are a dime a dozen in the aquaculture business and are all willing to take your money". A fuller investigation might have avoided the necessity of going through this.

It is hard to identify your market before you start in practice, because fish take a long time to grow. Networking is important and universities and the internet are a good source of information and contacts. All costs need to be thoroughly investigated. The finfish industry can be helpful in terms of sharing information, but this is not always so.



A market ready St Croix perch

Wampanoag Shellfish Hatchery: New Life for Environment, People, and Economy
David Vanderhoop, Aquaculturalist
Wampanoag Aquinnah Shellfish Hatchery

The Wampanoag Tribe has 500 acres of trust land on the island of Martha's Vineyard, Massachusetts and was officially recognized in 1987. The Natural Resource Office provided funding for the shellfish hatchery there in 1999. The hatchery building was up by the beginning of February 2001. It was endorsed by the tribal community as a source of economic development. The Wampanoag has a 150 acre estuary where they have fished "forever", but there have been no scallops there for many years and the fishing community has dwindled down to only a couple of people.

Seed was bought and planted in the 'pond' where shellfish growout takes place. This body of water is connected to the sea by a channel. There are no problems with gasoline or other pollution because few boats enter the pond and there is limited access to the water there. An initial shellfish crop was seeded, but eaten by crabs. Oysters were raised in deepwater cages in an area leased from the town but they sunk into the silt and also failed.

The pond is on town property so a lease was required. Before the site was leased, the state performed a survey to determine whether the area was productive and whether there was eel grass there. Part of the area was deemed unproductive and no eel grass was present so the operation given the go ahead. The deep water area was also leased following a similar process.

After the two early shellfish failures a floating system was developed, utilizing 1.5 million seed. These were placed in bags and did well until the winter. The pond area became frozen solid during winter, and a high tide moved the ice and bags a mile away. The bags were recovered and put back in place, and 95% of the oysters survived. 800,000 will be ready for market this year. Samples have been sent to New York where "they have been fighting over them".

The operation has been expanded to 7.5 acres and 8000 bags, with 2.7 million oysters in production in total. The goal is to sell 1 – 1.3 million oysters each year. If this goal is attained the Wampanoag will be the largest growers of shellfish in the Northeast.

Young oysters are raised in an upwelling system where they are fed algae until they are ready to be placed in cages. The bag system of growing lends good shape, individual shells, and makes it unnecessary to clean, pressure wash or prepare them. The Tribe were the first growers on the East coast to utilize this system of oyster growing. The system was also relatively cheap to build.

A video of the operation was shown:

The hatchery is significant because the Tribe has always been a fishing nation. It provides employment, economic development and which relates to this history.

Restocking this area where shellfish had always been harvested has been made possible by introducing seed from the hatchery. As a result aquaculture provides a good fit for the need of the Tribe. The main effort is to get a commercial operation going to provide an economic return for the Tribe. This has meant concentrating on oysters.

Techniques for growing shellfish are constantly evolving. The Wampanoag uses different sized nets designed to encourage feeding and growth in their oysters. The oyster bags float on the surface. Oysters are constantly sorted by size using a tumbler/grader machine. Smaller ones fall through the mesh and can then be stocked in bags at the appropriate density. The oysters grow from mid April to November. Once they reach market size they are hand sorted for sale. The work is important because it maintains the link between the people of the Tribe and the water, and will help sustain this link for future generations.

The video also shows an innovative integrated operation in the town of Amherst, Western Massachusetts. Which combines hydroponically grown basil with tilapia. Nutrients from the tilapia are utilized by the basil. The whole operation takes place in a greenhouse and the water is heated by the sun. The plants clean the water for the fish, and the operation employs 30 people, many of whom are handicapped. The whole system is designed so that handicapped people can perform all the functions and is both environmentally and socially responsible.

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An article from March 14 2004 Boston Globe was read describing the court case between the town of Aquinnah and the Tribe.

The case arose when the Aquinnah – Gay Head Community Association and a neighboring land trust decided to sue the Wampanoag Tribe over its decision to build a small shed needed for the shellfish hatchery without first gaining permission from the town. Permission was not sought because an earlier court decision had ruled that that the Tribe’s sovereign immunity and right to self governance protects it from zoning regulations. The Tribe had already adopted town bylaws and made them more stringent and, had permission from the town been sought, the shed would have in all likelihood, been given the go ahead.

As the newspaper puts it:

’Nearly everyone agrees that the little shed at the center of the controversy , built to protect electrical equipment at the Wampanoag’s new shellfish hatchery, is inoffensive.

If the Tribe had requested a town permit to build the shed, officials say, it would probably have been granted. The case is less about the shed than about who controls the use of Wampanoag’s 500 acres here and any other land the Tribe might eventually buy.

“We are a sovereign government and we have the ability to create a land use commission” said tribal chairwoman Beverly M. Wright, referring to the Tribal Land Use Ordinance adopted in 1999. “It’s just part of the Wampanoag Tribe growing as a nation.”

She argues that the Tribe has been a careful steward of Martha’s Vineyard for 10,000 years. Recent development on the island, has not come from her people, she said. “We’re cognizant with the fact that the Great Spirit has only made so much land.”

The case was ruled in favor of the Tribe as without clear consent from the Tribe, the town had no right to apply zoning laws to the Tribe’s sovereign lands.

A second article from the December 2003 issue of aquaculture magazine was read, detailing the intricacies of the case in a transcript of the court judgment.

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Litigation lasted for nearly three years and held up development of the hatchery. Every time an electrician was called to do work on the pumps in the shed, someone would call the building inspector. The inspector would stand on the boundary between the public and tribal land, and shout at the electrician from 75 feet away, threatening to take away his license if he continued with the work. Legal action to close down the entire aquaculture project was attempted by a community association during the planning litigation, but this was quashed early on before it ever went to court, as the operation is entirely legal.

In May of 2003 water for the hatchery finally came on line. Oysters, scallops and quahogs were spawned. Of the 3 million oysters, 1.5 million were sold to other growers on the island. 100,000 scallops were experimented with and 500,000 quahog seed were given to other growers to experiment with. Six or Seven staff are being taken on for the summer oyster season.

There have been no disease problems so far. Some of the oysters sold to other growers died, probably due to the higher water temperatures found elsewhere on the island. A facility is being leased to process the oysters, and scallops are being seeded in the pond. Scallop gathering provides interaction and socializing among tribal members. Wholesale value for oysters varies from \$0.45 each to \$1.25 each at Christmas, making the operation potentially very lucrative.

There is an internship program. Two tribal members in 2002, and four in 2003 were taken on for training in high school. They have been shown how to raise algae, spawn shellfish, put them out in cages and grade them. The program has been well attended, both tribally and non-tribally by young people with backgrounds in biology. A grant from the EPA enabled the Tribe to install a laboratory which allows water quality to be monitored.

Cultural Revitalization Through Shellfish Enhancement
Viviane Barry, Shellfish Biologist
Suquamish Tribe.

The Suquamish shellfish program has been running for over 10 years. Part of the program is assessing and managing stock levels for macro invertebrates such as geoduck, spot shrimp, Dungeness crab and clams in Puget Sound, Washington.

The Suquamish Tribe and most of the Tribes in Washington State share shellfish resources with the state. The Rafeedie shellfish case in 1994 recognized the Tribes' treaty rights to shellfish resources. Most of the program's work is managing quotas with the state and other Tribes. A grant proposal to the Administration for Native Americans (ANA) three years ago secured funding to experiment with growing different types of shellfish using a variety of techniques. Part of the purpose was to restore traditional cultural linkage to the tidelands which were being lost through over-harvest, pollution, lack of access, private ownership and contaminated beaches. Many beaches were sold pre-existing Treaty claims by the state to private owners.

The Rafeedie case gave the Tribes rights to half the biomass of all shellfish, including those on private tidelands, however, gaining permission to harvest them is a complicated process. Everyone must be notified in advance, letters must be written, any area to be harvested must be thoroughly surveyed in advance and results from the surveys must be given to the landowners upon request. Tideland owners have the right to conduct their own surveys for comparison if they see fit. Surveys must be repeated every two years or so depending on how much is known about rates of recruitment in the area and the harvest rate that has been set. This means that in reality there is little harvesting on private tidelands by the Tribe.

When the reservation was created there were no tidelands included, despite the fact that the Tribe had always depended on shellfish. Gradually tidelands are being purchased or swapped for others. The state 'owned' the tidelands directly in front of the Tribe's community center, but because of all the previous mistakes that had been made in selling tidelands, the state's policy is to no longer sell any more, so the area was swapped for another area in the Tribe's possession.

This process took around six years, as it was the first time such an exchange had taken place. The aim is to have any lands purchased by the Tribe recognized as trust property. More tideland acreage is available to work with now, and the area is used for the ANA project experimenting with different techniques for raising and reintroducing shellfish. The next step could be to begin a commercial operation, but for the time being production will remain at its present level, which is low maintenance and self sustaining. Now that growth rates, costs and harvests are known it would not be difficult to construct a business plan.

Various techniques are used for growing oysters and clams. Pacific oyster larvae are brought in from local shellfish hatcheries and are initially dormant, but begin to swim and

aggregate together when put in warm water. When this happens, the larvae are placed in tanks containing bags of empty oyster shells. Larvae latch onto the shells. This technique is used as larvae will not set on the local beaches independently due to the low temperature and strong hydrodynamics.

If the larvae have taken, the bags are moved onto the beach where the oysters slowly begin growing. Placing bags on the beach helps to stabilize it and attracts littleneck clams which also help limit predation. The seed are triploid so they will not reproduce and will have a high meat yield year-round. Once the bags have sat on the beach for a while they are distributed to other beaches using a floating barge. This is a simple process. Millions of this type of oyster are produced. They grow in clumps so have a lower market value than those grown by the Wampanoag, but they can be broken up and cooked and taste as good as single oysters.

Other tidelands are being purchased along the waterfront of the reservation. The reservation is just across the water from Seattle and there is a casino quarter of a mile away from the beach where the shellfish are grown. There can be some conflict within the Tribe over waterfront use. The casino developers would like to have a marina and foot ferry from Seattle. Building a marina would have a negative impact in terms of space available and water quality to grow shellfish, but there is an existing dock in a prohibited shellfish harvest zone which could be used.

Other techniques are also employed for growing oysters and other shellfish. Old net-pens from the Tribe's coho salmon hatchery program have been utilized for this. The pen area used is 60 square feet, and there are 40 stacks of 10 trays inside it. Clams, mussels and other species have been grown there. Line and anchors need to be maintained to sustain the strong current but the system works well. The current aids productivity, making it ideal for a potential commercial operation.

An oyster can be grown to market size in six months, but they are used largely for ceremonial and subsistence purposes. European flat oysters have been tried out with commercial ends in mind. They could be sold to the casino or other local businesses. There is also a 'Suquamish seafood' company which currently sells around 350,000 lbs of geoduck a year and is looking to diversify into other products. Geoducks are harvested underwater by divers with high pressure hoses which dig them out of the sand.

Mussels also grow very well but there is no point in buying seed, as there is a company which grows them up-tide and spawn drifts down on the current and sets naturally. Manila clams were grown in the trays and did very well, before being seeded on the beach on the incoming tide under predator nets which protect them from crabs and birds. Nets are later removed to prevent them from getting too clogged or buried. There is some predation from native oyster drills, but thus far the more dangerous, invasive Japanese oyster drill has not been a problem. Mesh from crab and shrimp traps is used to make cages for hardening oysters.

Shellfish were supplied for a recent tribal general council meeting, the first time that the Tribe had not needed to purchase shellfish from outside for a large event. The annual ceremonial canoe journey is another one of many events at which the shellfish are eaten. There are often days for children to visit the beach and learn about its ecology and the aquaculture taking place there. There are always children around in the summer time and the office is very 'kid friendly'.

An education program was also a component of the ANA grant. Nineteen tribal members and staff were interested in learning more about shellfish aquaculture and biology, and were taught about water quality, basic bivalve biology and aquaculture techniques. They are then able to help out with the projects.

There have been various internships and seasonal job openings, for both tribal and non-tribal people, and the Tribe is attempting to attract college students to this program. Few tribal students study sciences, so this is a good way to encourage them to do so. Many more tribal members and children now visit the beach and harvest shellfish there as a result of the shellfish growing.

The Fruits of Labor –

Shellfish grown by the project being cooked by the Tribe at a traditional shellfish bake



Bob Shimek
Indigenous Environmental Network
Thoughts on the Proceedings

Indigenous aquaculture development is happening all across North America. The questions from the introductory talk are well articulated and conceived.

- How can we create a sustainable aquaculture?
- What obstacles are faced by aquaculturalists and communities?
- How can aquaculture contribute to indigenous peoples' wellness and health?
- How can the Indigenous Aquaculture Network assist in the above?

The spread of discussion across the sessions has gone a long way towards answering the first three of these.

One of the key points that has been evident in the majority of these presentations is the “incredible amount of racism which Tribes and tribal programs faced as they were going about the business of setting up their shop”. The managers and tribal councils deserve praise for holding out in the face of this behavior. There are many barriers in terms of funding, permitting and infrastructure which all aquaculturalists must face, but the element of racism makes development even more difficult.

Maybe one of the first steps toward developing the network should be an “undoing racism workshop” to help people to start getting past some of these issues and avoid some of the trauma on both sides, which is destructive to the long term viability and success of entire communities. Scientific and funding issues clearly need to be worked out, but it is some of the social issues which need addressing more thoroughly.

The City of Phoenix is totally oblivious that they live adjacent to a large Indian reservation, and has chosen to exclude these people for their social and professional and business interactions. The story from Massachusetts was very bleak. The racism experienced there wasn't even subtle. The 1983 Voigt decision to reaffirm indigenous treaty rights affected the permitting process at St. Croix, making requirements much more difficult to meet. These are all incidences of racism.

The state of Wisconsin, the Department of Natural Resources and many citizens were angry with the Tribes because their treaty rights were reaffirmed in the supreme court. This is no different to the Boldt decision in 1974 – terrible things happened to tribal fishermen following this ruling.

This is about power and control and about who gets to exercise it. There are operational dynamics of racism all the way from the subliminal, and covert to the blatant and unashamed, such as was experienced by those in Wisconsin when they were confronted on the boat landings after beginning to exercise treaty rights to spear walleye.

There is a tendency to avoid using the word racism and brand it as something else, but it needs to be understood for what it is

In some areas aquaculture has earned itself a bad reputation over a range of issues including contaminated feed, GMO's, disrupted nutrient cycles etc, meaning that there are a lot of difficulties to overcome already. The question of how aquaculture can contribute to the wellness and health of indigenous communities has environmental elements, but there is also a social aspect to be addressed which needs more work.

It could be valuable for Tribes who have gone down this road already to share their experiences with other Tribes. There is clearly a role for aquaculture in today's world. Maybe some of the problematic issues which assail it at present can be overcome as its development progresses.

It is essential that we take care of natural resources first and foremost – these have always delivered food, cultural sustainability and identity to indigenous peoples. In the Pacific Northwest some of the salmon Tribes would cease to exist without wild salmon, but aquaculture must also supplement wild food sources because there are so many people that need feeding.

The Suquamish Tribe is an excellent example of how a project was born out of a community need. This is multi-generational. Families are coming back to the beach there. The family harvest of certain resources has always been a central tenet of many cultural, spiritual and social activities. There used to be wild rice camps in Northern Minnesota which no longer take place. Every indigenous culture has stories about these shared times and experiences.

The Pima-Maricopa project is a good example of a hybrid of goals. It reintroduces an injured cultural aspect to the community but also offers the prospect of economic growth. In the final analysis this is about the land, the people, the culture and the spiritual aspects, and these projects can be sustainable only if they sustain these things.

Discussion:

There are many success stories in aquaculture where it is practiced positively, but these are rarely heard. The network can help to promote these success stories as a way of bucking the trend. The '*Renewing the Countryside*' books from the Mid-West states offer an example of how this can be done. It may be helpful to write up examples of how regulatory and bureaucratic hurdles have been overcome for reference by other Tribes.

The flipside of the racism coin is that every legal judgment mentioned today has reaffirmed sovereign rights and control of indigenous community assets. It is essential to be proactive in securing these rights and using statutes according to one's own needs. The example given is the Endangered Species Act, which is often seen as problematic. The White Mountain Apache have restored the apache trout, once on the endangered

species list, to its streams. The fish is now no longer on the list and fee fishing provides a source of income to the Tribe, affording a win win situation.

Projects that are solidly conceived, and designed to achieve a well defined set of ends are much better received and stand a far higher chance of receiving funding than more nebulous plans. Modern aquaculture as a science is relatively new and is constantly evolving. Aquaculture is more than just a technical matter. It is social and political too.

There is a wealth of technical information available on aquaculture which is not widely utilized by indigenous people as they frequently lack technical training or expertise. As a result they tend to be over-reliant on consultants from outside the Tribe to visit conferences etc and bring back information, leaving them dependent on judgments made by non-tribal members. It would be empowering for tribal members to attend these forums and make their own decisions based on what they learn there. There is a need to find a way to make these “techno heavy” conferences palatable, and attractive for community members to attend.

Every operation discussed during these proceedings has some sort of mentoring program or educational component. Education is an important element in working to ensure self reliance. Visiting a fish farm makes education more real for children who might be excluded by conventional academic practices.

There is a social paradigm under which Indians have become “disconnected”, and are now in the process of reconnecting as Tribes to traditional culture and society. Language revitalization and the development of food systems involves an educational component which parallels that underway in aquaculture.

Aquaculturalists have to bring their technical voice to bear on education, as do indigenous schools of thought. Interfacing traditional knowledge with technical and scientific belief systems could help to create a hybrid which goes further than either on its own. In order for this sort of interaction to take place tribal members need to attend forums where aquacultural discourse is being constructed.

Paul Smith
Native Food Security and Projects in Indian Country
Heifer Project International
Indian Nations Coordinator

There is an emotional lineage from the time of colonialism that took indigenous peoples from self sufficiency to a state of dependency over food. Various efforts that have been referred to during this meeting are helping overcome this dependency, specifically gaming (casinos) and legislation.

Paul was raised to understand that fishing was very important, but today he cannot eat any fish from the area where he grew up because it is contaminated. Growing up, it would have been difficult to survive without fish. Most of the meat in the diet came from fish because hunting, trapping and clear cutting had eroded the ability of the Oneida to feed themselves in other ways.

Native people are facing an erosion of jurisdiction. Some would refer to this as sovereignty, but jurisdiction is a more appropriate term. Conferences and institutions work in terms of policy, but policy changes from state to state, region to region, state to federal, Tribe to Tribe. This means that any papers to come out of this meeting providing policy overviews, would be of limited practical use.

There is a tendency to turn to lawyers for direction on what to do. Using the example of tribal fishing rights in Wisconsin Paul says, "the attorneys told me and everyone else in the community, 'you can't fish no more'. And it wasn't because all the fish were totally contaminated, it was because Wisconsin DNR said 'you can't do it no more or we'll arrest you'". The Tribe had been returning game fish and only keeping fish such as suckers despite having the right to all of those fish. As a result some of the Tribe challenged the law. It was contested because it was not right for the DNR or tribal government to tell them they could no longer do what was a god given inherent right.

Fish that were caught were prepared and preserved and all the waste was buried in a hole with soil heaped on top. Then "our three sisters, corn, bean and squash" would be planted, and thrive on the fish fertilizer. "Ultimately, we all come from fish cultures, because we all live near waters – where there is water there is fish". This culture has been eroded today to the point where the Menominee are allowed two sturgeon a year for their ceremonies. All of these cultures have ceremonies which revolve around fish. The whole lunar calendar is filled with ceremonies for the living, for everything that there is.

In working for Heifer International Paul is trying to build strategies on how to recreate food systems within Indian territories. This is highly challenging. Especially so in Canada where there are 2,700 reserves, almost all of which are totally dependent on the welfare system. This dependency has been deliberately created. Only recently in Saskatchewan native people were outlawed from even farming. There are even greater problems with

racism towards Indians in Canada than in the U.S.. In Mexico there are 30 million distinct indigenous people.

Paul's work is to help these groups move away from their dependencies by reestablishing food systems and using methods that are more sustainable than some of the industrial models of agriculture which have been a cause of rural poverty. Working with tribal government is difficult because of the transitional nature of the administrations. This means that it is hard to maintain continuity and follow projects through to their conclusion. Collaborating with community groups and using resources such as livestock to create organization is a more successful approach.

Three year projects are "scary" in Indian country. The first year or two has to be devoted solely to training and education in order to reach a point where there is the capacity to manage whatever the project set out to do. Over this time relationships with members of the community groups will be developed, helping to establish what can be done within the parameters of the project.

There are various entities that money can be solicited from for indigenous aquaculture projects, whether they be tribal government itself, foundations or institutions, Heifer will try to facilitate collaborations to make these projects work. Collaboration is the big word in the world of funding and foundations.

Fishing was once a central part of Indian culture. Indians understand the value of it, and their ceremonies are still linked to it. Many times now, waters are poisoned or there are other factors such as cost that prohibit access to fish. This means denying a food which is very culturally appropriate.

Paul's wife is from the Pacific Northwest, from a people who are "salmon people", but she is eligible to receive only a token case of salmon per year which is the amount that the government deems 'subsistence'.

Many native communities have bought into the Western ideology of development to an extent where economics take precedence over cultural and environmental sustainability. It is important to continue to teach children that the cultural "heart is really, really important".

Bioregional development is key. Indian people have to start creating "career descriptions" and fund people to learn whatever is seen as necessary for the future. Job descriptions are written hastily and people from outside are brought in to fill them. These people are "technocrats". They visit all the meetings etc and report back to the Tribe, and the Tribe accepts this. Why are Tribes hiring them at great expense when they could be doing the work themselves?

Concluding Remarks: Indigenous Aquaculture Standards, Food and Sovereignty

Aquaculture, the controlled cultivation of aquatic organisms, is a food production practice. As a food production practice, aquaculture takes the form of a set of social relations, enmeshed in the cultural interconnectedness of Nature and Society.

At the conclusion of this meeting, participants unanimously saw aquaculture as a way to establish self-reliance for indigenous communities, as well as generating employment, income and educational opportunities for tribal members.

Much of the discussion centered on practicing aquaculture in a way that reaffirms the cultural integrity of tribal communities over generations, past, present and future. Only when sovereign rights are asserted and institutional racism is effectively challenged, can the relatively recent food practice of aquaculture advance in a way that meets community development, food security and tribal needs.

Clearly aquaculture is no panacea to cure all ills but, when practiced in a manner that is sustainable in the true and holistic sense of the word, can provide a solution to some of the food security issues that afflict Native communities. In every case presented, the establishment of aquaculture was characterized by struggle, and advanced only when fundamental sovereign concerns were addressed and traditional practices re-imagined or revitalized. Participants in tribal aquaculture act as “development workers”, bringing forth the wisdom, knowledge and tenacity needed to accomplish this particular type of food practice.

The event provided an excellent forum for networking and information sharing, and a starting point for many new and exciting activities and projects. Some of the initiatives recommended by the meeting were as follows:

- To encourage tribal aquaculturists to participate in the World Aquaculture Society
- To advise other Tribes on the promises and pitfalls of aquaculture development
- To conduct outreach by further developing mentoring programs, and working closely with Native Land Grant Colleges and other appropriate institutions
- To investigate setting up bio-regional indigenous aquaculture demonstration projects
- To establish an aquaculture presence at the next Native Food Summit
- To build strategic planning and institutional capacity for sustainable aquaculture development

In closing, the meeting was heralded as a “first of its kind”. Discussion prioritized the creation of meaningful standards in aquaculture as a part of indigenous sovereignty. From within Indian Country, it is not only the mechanics of “raising fish”, but broader spirituality, personal efficacy, kinship and control of assets, that are important, indeed

essential for the wellness of both communities and their individual members. Other values such as environmental balance, income, health and well being are also embodied in this interconnected vision of aquaculture. Hence, raising fish in an indigenous context is part of a wider set of environmental, social and cultural relations that are rooted in an understanding of the interconnectedness of all things.

