TRIP REPORT

American Fisheries Society 133rd Annual General Meeting

Quebec City, August 10th – 14th, 2003

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The 133rd General Meeting of the American Fisheries Society (AFS) consisted of a plenary session entitled “Worldwide Declines in Wild Fish Populations”, 38 symposia, a poster session, and a trade show. Symposia topics included various technical and policy issues relating to fisheries conservation, management and research. Each symposium included numerous 20-minute talks or presentations. Symposia of particular interest to the project included:

- Human impact on the genetics and ecology of wild populations
- Aquatic protected areas as fisheries management tools: the design, use and evaluation of fully protected areas
- Globalization: Effects on fisheries resources
- Where’s the fish: Traditional and contemporary indigenous management of wild fish
- Use of genetic markers for management and conservation
- Stream simulation – a tool for passage of aquatic organisms at road crossings
- Advancing freshwater fisheries conservation through partnerships
- Physical factors affecting salmon and egg survival to emergence: integrating science and remediation management
- New quantitative methods in fisheries stock assessment
- Passive acoustics as a tool in fisheries
- Intentional pathways for aquatic nuisance species introductions: the risk and response
- Aquaculture: a complement to fisheries and an alternative to their decline
- Cooperative research in marine fisheries
- The evolving science of fish restoration: challenges and opportunities

Further to these symposia, presentations of interest were made on more general topics such as:

- Communities and Ecosystems
- Freshwater Ecology
- Habitat and Water Quality
- Human Dimension

In addition to symposia a display of posters and trade show booths were set up in the Convention Hall. Posters and booths were accessible throughout the first three days of the event and a poster session was held on Wednesday morning. The posters featured projects on a symposia topics as well as a wide variety of themes including: fisheries conservation, fisheries management, habitat and water quality, and human dimensions of fisheries. I was able to speak with a number of researchers and collect information about projects relevant to the CIDA project. The trade show exhibits included a number of companies of interest, including Advanced Telemetry Systems, Envirotel 3000 Inc, Grant Systems Engineering Inc, Hydroacoustic Technology Inc, and Northwest Marine Technology Inc. These companies are working with assessment and monitoring technologies that may be adaptable for use in the São Francisco River, although the high cost of these technologies may be largely prohibitive.

SUMMARIES OF PRESENTATIONS ATTENDED

(Authors' abstracts are available at: http://portaltools.fisheries.org/2003Abs/afsform.cfm)

Invasive Species

Kevin Irons – Status and distribution of non-native fish species in the Upper Mississippi River Basin (Abstract CO-032)

The Illinois Natural History Survey has established a long-term exotic species monitoring program that does extensive fisheries sampling and water quality studies. The Mississippi and Illinois rivers now have 134 native fish species and 12 non-native fish species. Non-native species include: Threadfin Shad, Goldfish, Common Carp, Grass Carp, Bighead Carp, Rudd, Muskellunge, Tiger Musky (hybrid) Rainbow Smelt, Brown Trout, White Perch and Striped Bass (hybrid). Introduction pathways include: intentional stocking, manmade canals, bait buckets and other unintentional movements between systems and unintentional release of bilge water. Of the 10,000 - 20,000 fish sampled each year, up to 45% were non-native.

Maureen Walsh – Effects of Rainbow Trout stocking on the native fish assemblage in an Osark stream (Abstract CO-033)

Due to increased pressure by sport fishing groups to stock with rainbow trout Oklahoma State University conducted an evaluation of the fish assemblage in Bush Creek (without native trout) before and after three years of stocking with rainbow trout. The fish assemblage was evaluated at the stream level, mesohabitat level and individual pool level using seasonal electrofishing. During the study period, 2,500 tagged trout were released every year into the creek. The study found no significant difference in fish assemblage pre- and post-stocking in riffle and glide (shallow) habitats but did find a significant difference in pool habitats. In the pool habitats, large-bodied species showed a small decrease in numbers after 2 years of stocking with rainbow trout. The researchers concluded that it would be extremely unlikely that rainbow trout could establish a naturalized population, but the effects of stocking on native fish may be cumulative. Does this mean stocking should be done? Maureen was unwilling to give her personal opinion.

Scott Bonar – Predicting the distribution and impact of exotic fish species in the American west (Abstract C0-034)

A large study was conducted by the Arizona Fish and wildlife Cooperative Research Unit to determine the status of non-native fish species in the western US and to study how their presence and abundance is affected by land-use practices and biotic and abiotic factors. Standardized data from 689 randomly selected Environmental Protection Agency (EPA) and Environmental Monitoring and Assessment Program (EMAP) sites in 12 western states was analyzed. Data included: geographical location, habitat, land-use, riparian structure, human impact, water quality and fish assemblage (species present, abundance and density). 180 fish species (including hybrids) were identified, 28 of which were non-native. Non-natives were found

in 50% of streams. Most common non-native species were trout, common carp and mosquito fish. The study also found that the abundance of non-native species increased with stream integrity (more pristine areas had higher numbers of non-native species).

Christine Mayer – Zebra Mussels: Benthic ecosystem engineers (Abstract CO-035)

Researchers at Syracuse University and Cornell University studied "benthification" of four lakes in the Great Lakes region with zebra mussel infestations. Increased water clarity (caused by zebra mussels) and increased nutrients (a human impact) has lead to increased benthic production, increased benthic foraging by fish, and decreased pelagic primary production. Lab studies confirmed a clearly significant increased benthic foraging efficiency of fish in the presence of zebra mussels, but that increasing light intensity improved foraging efficiency only when zebra mussels were not present.

Heidi Swanson – Time Since Invasion and Lake Productivity as Determinants of the Effects of Rainbow Smelt Invasion (Abstract CO-036)

The University of Alberta conducted a study of lakes in Manitoba, Ontario and Quebec to determine why no increase in predator mercury levels are seen post-invasion of rainbow smelts. Increased mercury levels in top predators would be expected, as smelts feed at a higher trophic level than most native forage fishes and thus lengthen the trophic food-chain. The top 6 fish species (yellow perch, cisco, emerald shad, rainbow smelt, spot-tail shiner and trout-perch) were collected and characterized biologically (weight, length, age, etc.), and biochemically (carbon:nitrogen ratios and mercury concentrations). The study found that rainbow shad and trout-perch had elevated trophic levels and that emerald shad had the highest Mercury concentrations but the lowest growth levels. They concluded that growth rate is more important than trophic level in determining mercury concentration in forage fish communities and that predators feeding on slow growing species should therefore have higher mercury concentrations than those feeding on faster growing species.

Kristen Holeck – Globalization, exotics and ecosystem changes in North America's Great Lakes (Abstract SO-04-13)

162 exotic species are established in the Great Lakes. 60% of these invasions have been identified as being introduced through shipping vectors. Studies have found a strong relationship between concentrations of nuisance invasive species and shipping tonnage. In 1989 Canada introduced voluntary ballast water guidelines, to which about 90% of ships comply. In 1993 the US introduced mandatory guidelines that included ballast water exchange at sea. Invasion rate by exotic species continues to increase despite this legislation and increased efforts to detect invadors. This is due in part to the time lag of getting legislation implemented and increased invasive pressure from increasing ship traffic.

The University of Windsor and the Cornell Biological Field Station conducted a study of shipping traffic, ballast water releases and incidents of introduction of exotic species in the Great Lakes

and identified 4 invasion hotspots. The study found that vessels with small volumes of ballast water (unregulated) dominated inbound traffic, and that Lake Superior receives the most ballast water releases from these ships. They concluded the current ballast water controls are not sufficient to control introduction of exotics. Further prevention methods, such as improved operational management, treatment techniques (ozone, etc.) and refitting of ballast water systems of ships, need to be considered.

Aquatic Protected Areas

Trevor Ward – Marine Protected Areas in fisheries: design and performance issues (Abstract SO-15-05)

Divergent views exist, as to the usefulness of MPAs in fisheries, due to differing expectations and different use of terms. Dr. Ward feels they can, nevertheless, be useful in sustainable fisheries management by assisting stock management and environmental issues arising from ecosystem based fisheries. The benefits of introducing MPAs into fisheries can be both biological and non-biological. Successful MPAs should contribute to multiple objectives such as stock management, improved socio-economic benefits, improved biodiversity benefits, enhanced fisheries stability, and predictability. These factors must be planned into the design of MPAs, or they won't flow out of the process. In order to capture the benefits, a strong emphasis must be put on establishing a network of MPAs designed specifically for multiple objectives. Because some of these objectives may be competitive, a careful and systematic design and a thorough assessment of MPA enforcement are needed.

MPA design elements should include correctly set objectives, carefully planned site criteria (character, size, placement, etc.) to meet objectives, compliance rules, a systematic approach to design and a plan to deal with displaced effort. MPAs should be integrated with existing fisheries management tools and should have a strong underpinning of biophysical data and an effective fisheries management system. Fisheries objectives that should be considered include stock assessment, socio-economic conditions, biodiversity effects and fisheries stability. The biggest problem with current MPA design is the lack of a systematic approach. To make MPAs successful you must work to a predetermined set of decisions, rules and guidelines that reflect these objectives.

MPAs must be properly monitored for performance using set indicators and targets with predetermined limits for detectable and acceptable change. The challenges to designing successful MPAs include: identifying ecosystem surrogates, incurring stock benefits, determining cause and effect, optimizing and setting criteria that deal with multiple costs (including development costs), cost-effectiveness and improving data.

Daniel Pauly – On the need for a global network of large marine reserves (Abstract SO-15-06)

Dr. Pauly feels that we need to think of permanent ocean structures (such as reefs), as forested park and then think of the right to fish as the right to carry a chainsaw. If we restrict the right to carry a chainsaw to every second Sunday we will still have no trees in the park.

Robert Shipp – Harvest benefits: marine reserves or traditional fishery management tools (Abstract SO-15-10)

16% of managed fish stocks are overfished. Marine reserves (or no take zones) can be used as management tools to increase and preserve fish stocks that are overfished. The two main problems with marine reserves are keeping harvesters out (enforcement issues) and keeping fish in (spillover issues). Only about 2% of fish species are both sedentary and overfished and are therefore good candidates for marine reserves (mostly reef species). The 5 species identified in the Gulf of Mexico that could benefit from the establishment of marine reserves are red snapper, gray triggerfish, gap grouper, goliath grouper, bocaccio and canary rockfish. WE need to look outside the box - offshore oil wells provide tremendous habitat for groupers and triggerfish. People must realize that spillover can never match recruitment from a properly managed stock. While marine reserves may not fix everything they can be a very effective management tool when used correctly.

Janet Ley – Effectiveness of fishing closures in estuaries of tropical Australia: a case study (Abstract SO-15-17)

Researchers at the Australian Maritime College, in partnership with government agencies, conducted fisheries-independent sampling to determine if commercial fishing closures were effective in improving biodiversity and target stocks of Barramundi the Great Barrier Reef and in tropical rain forest estuaries in Australia. The study included 3 pairs of estuaries, one open and one closed to commercial fishing in each pair. All estuaries were open to recreational fishing and closures resulted from conflicts between recreational and commercial fisheries. The study found that the biomass of Barramundi was 3½ times greater in closed areas than open areas and that commercial fishing in open areas removed biomass of target species in both legal and sub-legal size classes. Barramundi populations in open areas consisted mostly of males with very few female present and little to no egg production occurring. Given these results it is hard to imagine how these fisheries have remained sustainable. One possible explanation is that dispersals from closed areas are sustaining them. The study concluded that stocks were conserved in closed areas but not in open areas.

Aquaculture/Stocking

E.T. Baum – Interactions between farmed and wild Atlantic Salmon in Maine rivers (Abstract SO-37-11)

Farmed Atlantic Salmon first escaped into rivers in Maine in 1990. Escapes have now been found in 10 rivers and a 1994 survey found that the number of escaped Atlantics often out-numbered wild salmon. In addition, sexually mature formed Atlantics have been found. Measures to reduce escapes from hatcheries include strengthening of containment measures (containment management system, audit policy, improved marking, weir and fish traps on 3 rivers and additional screens and filters at hatcheries), permit measures (new state and federal standards, monitoring requirements, phase out of European stocks, etc.) and fish health measures (aggressive biosecurity). Research programs being conducted to combat escapes includes studies of seal and predator distribution, pit tagging and genetic screening programs, sterilization and escapee movement studies, and an adult stocking program to augment wild populations.

Matt Campbell – Empirical results on the impact of cryopreserved milt and breeding matrices on captive, threatened and endangered population (Abstract SO-37-12)

The Idaho Department of Fish and Game and the University if Idaho's experimental fish culture station have been cryopreserving milt from the Upper Salmon River Basin since 1995. Two of their programs that include cryo techniques are the Redfish Lake Sockeye Salmon Captive Broodstock Program (since 91) and the Salmon River Spring Chinook Captive Rearing Program (since 95). They use cryopreserved milt primarily to maximize founder numbers. Their cryo techniques are still being developed (use small straws) but they have found that cryopreserved milt is very useful in improving effective population size.

Rosamond Naylor – Salmon farming in the Pacific Northwest: a global industry with local impacts (Abstract SO-04-04)

7 out of 10 salmon coming out of BC and Washington commercially are farmed. Interactions between farmed and wild salmon include economic (local, regional and global), biological (escapes, disease, wastes, feed, mammals, etc.) and institutional (fisheries vs. aquaculture, state vs. federal, etc.). The 5 main aquaculture companies in BC (Heritage Aquaculture, Marine Harvest, Pan Fish, Stolt Sea Farms and Mainstream) are largely internationally owned (Norway) and use fish from the US and Europe. The fishing industry in the Pacific Northwest has seen substantial decreases in the price of wild-caught fish (60% decrease in price of sockeye from 1990 to 2002) and the market value of fishing licenses and permits.

A large study conducted out of Stanford University surveyed fisherman in Alaska, BC and Washington to get their perspective on the aquaculture industry and its impacts to the fishing industry. When asked about the impacts to their livelihoods, 47% of fisherman reported decreased income from salmon farming, 61% have had to seek alternate employment, 56% now

participate in other fisheries and 29% have tried direct marketing to improve their profit margin. 84% of fisherman surveyed felt the fishing industry was in crisis, but 70% of these felt the situation will improve and 97% of fisherman plan to continue fishing. When asked to rank the problems facing the fishing industry from most important to least important they listed low prices, salmon farming, over capitalization, management and low run size. When asked to rank their policy preferences to deal with these issues they listed quality and marketing, buy backs, disaster relief, quotas and co-ops. When asked specifically about the fish farming industry, 94% said they were opposed to the industry, 93% said they were aware of the ecological consequences and 98% said they were aware of the relationship between the increases in the salmon farming industry and the decreases in price for wild-caught salmon.

The Norwegian salmon farming industry is currently producing untreated wastes annually (N & P) equivalent to that produced by 3 to 3.7 million people. Over 400,000 Atlantic salmon escapes were reported in 2002, most of which were noticeable escapes of large numbers of fish. The unreported escapes of small numbers of individuals or leakage from the nets probably also amount to very significant number. Escaped Atlantics have been found in 78 rivers in BC and three feral juvenile populations have been found. This poses a serious risk to native salmon populations.

Globalization

Jerry Mander – In the absence of the sacred – the failure of technology and the survival of the Indian nations (Abstract SO-14-03)

In the opinion of traditional and native fisherman the main problem facing fisheries is the flooding of international markets with cheap farm raised fish and the large international trawl fleets. These are both the result of globalization. The World Trade Organization, North American Free Trade Agreement and other free trade agreements have broken down the ability of local people to control their resources and have allowed for the invasion of multinational corporate interests. The International Forum on Globalization Indigenous Peoples' Project conducted a massive global survey of impacts to indigenous people caused by economic globalization, including industries and issues such as: industrial agriculture, biopiracy, cattle, dams, transmigrations, fisheries, water, drug interdiction, loss of land, mining, nuclear, oil, roads, shipping, logging, tourism, militarization, pollution and energy. The forum has found thousands of examples of native communities that are faced with development that threatens their livelihoods, cultures, environments and resources on which they depend. These communities need to get together in some way so that they can combat this trend in concert. This conflict is due to two contradicting and deeply ingrained worldviews and philosophies and will therefore be very difficult to resolve.

As a result of the recently signed US-Chile Free Trade Agreement, 122 new licenses will be given to fish farms in Chile and all trade barriers to the export of fresh, frozen and smoked salmon will be immediately wiped out. Within four years this will also apply to canned salmon.

Chilean farmed salmon use 75% more chemicals than do similar sized farms in Norway. This will have enormous environmental and economic impacts on small communities in Chile.

The World Trade Organization is currently attempting to, and will probably accomplish, the following: no restrictions to foreign investment in fisheries quotas, ban labeling of fisheries products as wild vs. farmed or country of origin, stop prejudice against GMOs and prevent banning or labeling of GMOs, and assert priority over all other environmental agreements including the Kyoto Accord, the CBD, the Migration First Treaty, etc.

On a brighter note, optimism and awareness is increasing with millions of people worldwide protesting and fighting global development. The world has seen substantial political change recently with politicians, such as Lula in Brazil, running on anti-globalization platforms. The forum encourages participation in the World Forum of Fish Harvesters and Fishworkers conference to be held in Cancun, Mexico in parallel to WTO meeting being conducted on September 10-14th.

Tracy Dobson – Lets get our values and ethics clear and ordered properly (Abstract SO-04-14)

Researchers at Michigan State University and the University of Waterloo ask: Where are we now? Fish stocks are crashing, we are losing marine mammal populations, our water is contaminated, countless water bodies and critical habitats are being destroyed and politicians continue to dither. How did this happen? Science and our focus on quantitative data and disregard of qualitative data, flawed methods of risk assessment, early simplistic perspectives (Laplacian, Cartesian, Domination, etc.) and Maximum Sustainable Yield still holds way. Also the dominance of the free market system and felonious capitalism has lead to a culture of "enlightened self-interest".

Risk assessment can be broken into the four categories of risk, uncertainty, ignorance and indeterminacy. Current risk assessment methodologies lump these all together into the first category, risks. These need to be considered separately. We need to decide to conserve the fisheries and 5 guiding principles to help accomplish this are: 1) precautionary approaches and principles, 2) public trust doctrine, 3) governing of the commons, 4) women as effective protection role models and 5) FAO codes of conduct for responsible fisheries.

Management and Conservation

Terry Beacham – Individual identification of Sockeye salmon in conservation, management and enforcement applications (Abstract SO-05-11)

DFO's lab at PBS in Nanaimo has developed DNA fingerprinting techniques that allow them to identify individuals as belonging to specific stock assemblages and in some cases to a specific stock. They conducted studies for the Pacific Fisheries Research Council PFRCC and LGL Research Associates, designed to test methodologies. They were given samples of known origin and were asked to identify them. They were able to correctly identify 100% of the samples as

belonging to a specific stock assemblage (Barkley Sound, Fraser River, etc.) and 86% as belonging to a specific stock or lake in that assemblage (Babine Lake, etc.). They believe that sockeye allow for a particularly consistent and reliable stock identification by rearing lake due to high levels of homing fidelity than other species.

Patrick Christie – The search for integrated coastal management sustainability: results from a multidisciplinary examination in the Philippines and Indonesia (Abstract C0-152)

The major factors effecting the inability of these management systems to effectively manage are: devolution of authority and a lack of local capacity, enforcement issues, a lack of equitable sharing and flawed project design.

David Cannon – Human nature – human influences: are Alaska's fisheries resources really that different? (Abstract CO-153)

A recent survey of Alaskan rivers identified 175 documented dams, but felt the real number was more like 500. More than 100 new hydro projects are planned and more than 750 migration barriers have been found on one river. Many rivers have populations of introduced pike and yellow perch and the state stocks many rivers with a pink-spring hybrid salmon. These issues are the same as those faced all over the US. Alaska is just 15 years behind, but heading in the same direction. You can fish in Yellowstone National Park, but you can't hunt. Why?

Brian Cheuvront – Assigning responsibility for North Carolina's declining stocks (Abstract CO-154)

The North Carolina Division of Marine Fisheries conducted a study in 2002, using socio-psychological analysis, of commercial license holders to help inform fisheries managers and guide future management. The study included interviews of 527 commercial fisherman as well as the collection of data on fisheries rates, catch etc. 53% of fisherman interviewed said that it took more effort to catch the same amount and cited reasons such as poor management practices, activities of other commercial fisherman, political influences, environmentalists, increasing coastal populations and local and upstream impacts such as pollution and industry. No fisherman took personal responsibility. Outside of the commercial fishing industry people commonly blame over-harvesting. So who is at fault? Attribution Theory explains the tendency to blame people you don't know or don't like. People tend to explain positive outcomes as luck and negative outcomes as other peoples fault. Four approached can be taken when assigning blame: 1) the Medical Model – people are not to blame and are not responsible to fix it, 2) the Enlightenment Model – it is your fault but your are not responsible to fix it (ex. Alcoholics Anonymous), 3) the Moral Model – it is you fault and you are responsible to fix it (ex. fisheries management) and 5) the Compensatory Model – it is not your fault but you are responsible to fix it. They recommend that fisheries managers adopt the Compensatory Model.

Assessment

Grant Gilmore – Functional variation of fish call behavior: a comparison between Serranids and Sciaenids (Abstract SO-26-04)

Dynamac Corporation is conducting studies at the Kennedy Space Center using passive acoustics to investigate spawning aggregations of Sciaenids and Serranids off the east coast of Florida. Their studies on Sciaenids (black drum, freshwater drum, red drum, silver perch and spotted sea trout), conducted using hydrophones towed by boats, have allowed them to develop life cycles based on the sounds they make and identify spawning aggregations. They are able to determine the % of females and males in the spawning aggregates based on their recordings. Their studies on Serranids (scamp, speckled hind, goliath and Nassau groupers), conducted using specially designed remote hydrophones places on reefs and shelves, have allowed them to identify spawning and sex reversal sites, distinguish between mating strategies and identify complex social interactions. Questions they would like to answer about these intraspecific communications are: 1) How does climate and oceanographic conditions effect sounds? 2) What do predator prey interactions sound like? 3) Why do we see multispecies aggregations in coral reefs? 4) How is female choice linked to sound production and behavior? and 5) What do some of these sound linked to mating strategies look like? Visual record of behavior while making sounds will be required to answer some of these questions.

Don Baltz – Seatrout spawning requirements and essential fish habitat: a microhabitat approach using hydrophones (Abstract SO-26-08)

The Coastal Fisheries Institute at Luisiana State University conducted a passive acoustics study of seatrout spawning habitat in Florida's Tampa Bay and Charlotte Harbour using a microhabitat approach, which is defined as the study of habitat sites occupied at any given time to define larger scale population responses to habitat. Based on their passive acoustic data they discovered shifts in spawning sites of up to 30 Km that seemed to be related to salinity and that environmental conditions seemed to be most important in determining the specific location of spawning sites. Pitfalls of this type of investigation are: non-linear effects, non-representative sampling design, sampling bias, misidentification of drumming sounds, interference of crew, boat and traffic noise, non-verification of spawning and stratified water columns. In this kind of work it is important to know sound intensity and source level when determining the size of spawning aggregations.

Scott Holt – Mapping Red Drum spawning sites using a towed hydrophone array (Abstract SO-26-10)

A study, conducted by the Marine Science Institute at the University of Texas, identified a knock, accelerated knock and drumming calls made by the red drum by towing a hydrophone array through spawning sites in the western Gulf of Mexico. The drumming call occurs more than the

knock during prime spawning time of 1 to 2 hours after sunset and can therefore be used to identify spawning.

Sherry Lynne Rowe – Sound production by Atlantic cod during spawning (Abstract SO-26-13)

A study conducted a Dalhousie University Collected Atlantic Cod from two different spawning areas (4X and 4T) and conducted lab experiments, including sound and visual recording of spawning behavior in tanks as well as dissections. Cod make calls using three drumming muscles, they spawn at depths of 10 – 100 m depth and display complex spawning behaviours including dominance hierarchies, female choice and sneaky fuckers. The study recorded behaviour of possible male and female choice that seemed to be guided by acoustic displays. They found a that spawning males had 16% larger drumming muscles than non-spawning males indicating that the functional significance of drumming muscles may relate to mate quality and therefore guide female choice. 4X fish were 8 times more vocal than 4T fish and had larger drumming muscles. 4T fish showed strong dominance, hierarchy and aggression behaviour compared to 4X fish indicating intra population differences. The study also found significant within population behavioural and acoustic differences.

Cliff Goudey – Locating Cod and Haddock using low-cost underwater recorders (Abstract SO-26-14)

Rolling closures are used along the northeast coast of the US to protect spawning areas of cod and haddock. Management and industry want these closures to be effective without restricting economic benefits of the fishery. Research conducted at the MIT Sea Grant College Program has developed a non-invasive technique to determine times and locations of groundfish spawning to guide these closures. Their method involves encasing a Nomad (10 GB hard drive with variable sample rate) in a watertight unit welded to an aluminum base that can be lowered to spawning grounds. The units are low cost (approximately $1,300 each) and durable. They have been editing recordings manually using Cool Edit but are developing an automated system using Ishmael software.

Scott Aalbers – Spawning activity and associated sound production of White Seabass (Abstract SO-26-15)

Dr. Aalbers, from California State University, conducted a study to describe the spawning behaviour, timing and periodicity of White Seabass to better understand natural spawning aggregations. The study was conducted at a net pen site and included video and acoustic behavioural recordings. Dr. Aalbers identified a variety of sound productions including a drum, a drum roll, a rapid chatter, a three-pulse drum and a thump. Based on his observations it appears that the drum is an every day background call, the drum roll is made just prior to spawning, the rapid chatter is made during spawning and the three-pulse drum is made after spawning. He is unsure about the thump, but thinks that it is perhaps related to bladder release.

Restoration

Amy Harig – Factors contributing to successful partnerships in coldwater resource conservation (Abstract SO-33-07)

Watershed scale restoration is not possible without strong partnerships. Trout Unlimited has an internal program called Strategies for Restoring Native Trout that adds money to completed restoration projects to allow for monitoring that provides much needed information and lessons learned to future restoration efforts.

David Sear – Approaches to Salmon habitat remediation in the UK (Abstract SO-08-21)

Declines in Atlantic salmon stocks in Britain have lead to recent efforts to restore physical habitat, specifically spawning habitat. Habitat rehabilitation in the UK to this point has been ad hoc, small scale, expensive and very poorly monitored. Key information that is needed to restore these small creeks and rivers is identification of the source problem (lack of spawning habitat, poor juvenile survival, ocean survival, etc.), the source of fine sediment and the location of spawning habitat.

Dudley Reiser – Comparison of salmonid spawning habitat quality, quantity and utilization before and after channel reconstruction at a Superfund site (Abstract SO-08-22)

A 3.5 mile straight section of the Mill-Willow Bypass channel (northwest of Bute Montana) was replaced with a 5.1 mile sinuous channel as part of a Superfund project in 1995. R2 Resource Consultants conducted a pre and post restoration study to assess the effectiveness of the restoration. The study objectives included assessing: habitat quality, gravel quality, spawning abundance, quantity of spawning and rearing habitat, as well as fish and redd abundance. The study found a 5-fold increase in the number of redds from 1989 to 2001, but by 2001 only about 25% of available habitat was being used. If you build it will they come? In this case yes, but this is still only snapshot monitoring not long-term monitoring, which is dearly needed. Spawning habitat is only one element in salmon survival and it is important to consider all life history stages in habitat restoration. Monitor, Monitor, Monitor!

Piotr Parasiewicz – Defining measures to reduce fish habitat degradation in the Quinebaug River, New England (Abstract CO-273)

A study conducted at Cornell University looked at a section of the Quinebaug River between two dams to determine the effects of flow regimeson fish. They conducted biological and hydrological studies of the area and compared their results to simulated conditions with no human impact. They found very low densities of fish fauna in the test area. Fish species encountered were largely pond species, with no pollution intolerant or anadromous species discovered. When compared to simulated best-case conditions they found that flows were too low, pollution levels were too high and water temperatures were too high. The high number of impoundments on the mainstem and tributaries were found to cause very rapid changes in flow

that are potentially very disruptive. They recommended a set of pulse flow augmentation rules to regulate flow, slow the loss of habitat and improve environmental conditions.

Jane Marshall – If you build it will they come? Lessons learned and a look into the future of restoration design (Abstract SC-08-29)

CALFED Bay Delta program conducted a massive Environmental Restoration Program to protect and restore the Bay Delta ecosystem, spending $400 million from 1995-2002. Although many of the projects funded through the program were innovative and thorough, large gaps existed in applying an ecosystem, watershed and interdisciplinary approach. Projects tended to be conducted in an individual manner with little to no coordination and integration between projects. An adaptive Management Panel was formed to review the program and they recommended, among other things, improved project integration and the integration of experimental questions and monitoring into project planning and conceptual models. Designing for experimentation and including long-term monitoring into project planning will allow large-scale restoration efforts such as this to guide improved future restoration efforts.