The Ichthyogram

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Utah Division of Wildlife Resources

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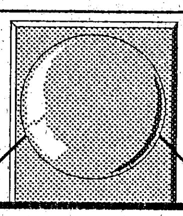
WHIRLING DISEASE COMES TO UTAH

Whirling disease has made it to Utah. The spores of *Myxobolus cerebralis* have been detected and confirmed for the first time in a group of 3 and possibly 4 commercial aquaculture facilities in Wayne county in south-central Utah. These facilities are operated under the management of Road Creek Trout Ranch in Loa, Utah. The parasite was discovered as part of a routine fish health inspection conducted in early May. Most of the facilities were relatively new and had never been previously inspected. The source of the infection has not been discovered and according to the managers, only fish from inspected, pathogen-free sources have been imported. These facilities are located on the Spring Creek and Road Creek tributaries of the Fremont River, which in turn empties into the Dirty Devil and ultimately into the Colorado River. The water in that area is intensively controlled and utilized. Much of it is dewatered during part of the year. The Fremont below this contaminated area is a marginal trout fishery at best with negligible reproduction and deteriorates lower down until it runs into the Dirty Devil where it does not support trout at all.

In addition, there are 4 separately owned aquaculture operations and 2 state trout hatcheries in that drainage complex. When whirling disease was discovered in the watershed, these facilities were all placed on quarantine until they could be checked again. Subsequent tests found no evidence of spores at any of these facilities and the quarantine was immediately lifted. These are all rearing fish for the live-fish market and sales have already suffered. The affected facilities rear trout for the dressed fish market and movement of live fish has been restricted except within their own units. Utah Division of Wildlife Resources (UDWR) biologists collected trout from the free-ranging populations in the area to determine the extent of the infection and to evaluate the prospects of control and elimination of the parasite. Of these early samples only fish in Spring Creek below the contaminated sites and a small fish-out pond draining to Spring Creek above the contaminated sites were positive. At that time indications were that the problem was relatively recent and centered around Spring Creek. The positive finding in the aquaculture facility on Road Creek had possibly just been transferred there with fish from the contaminated sites.

After considerable planning and public meetings, a plan was formulated to attempt to eliminate or control the spread of the disease (see accompanying article). In early August, approximately 50 UDWR workers converged on the site. Rotenone was used to remove salmonid fishes from most of the waters felt to be involved in the problem. A number of zones were defined and fish heads were collected in order that larger samples could further identify the spread of the disease. Remaining carcasses were chemically treated and buried in a landfill. Spores were found lower in



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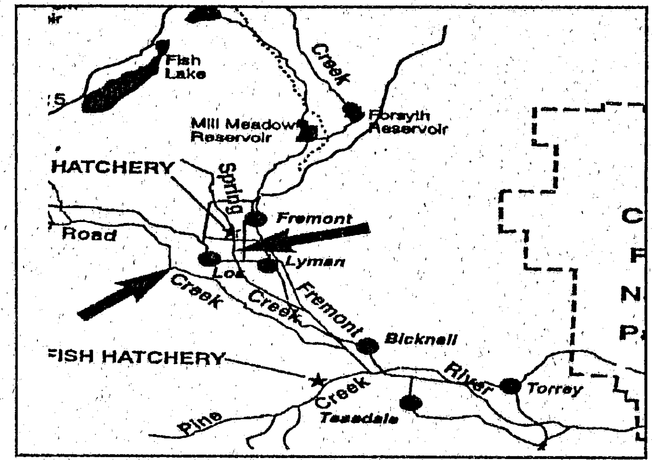
the Fremont River and higher in Road Creek than previously discovered.



This was disappointing but not a surprise and has not altered the general plan. Remaining fish from the affected sites were spared to allow them to be processed into fillets as they mature to market size in the near future. Plans for additional rotenone treatments to treat these depopulated sites later this fall are being worked out now. The waters will all be treated one or two times in the coming two years to assure "fish-free status". In the meantime, fish from a recreational pond at the Tooele Army Depot which received fish from Road Creek Ranch in 1990 have also been diagnosed with whirling disease. Sites of other possible transfers of infected fish are being investigated by UDWR biologists.

" A parasite for instance, is a shocking and a baneful monster, yet still Nature has infused into his blandishments a not unpolished charm. " *PLATO*

WHIRLING DISEASE VERSUS TIME AND TUBIFEX

The detection of whirling disease in Utah necessitated development of a control program. The difficulty of controlling this organism through chemical disinfection and appropriate hatchery management in aquaculture facilities is well documented. These approaches center around destroying the parasite and intermediate host as well as protecting the trout until they are beyond the age at which they are apt to develop a clinical problem. This will not work when the concern is protecting the free-ranging fishes in the natural environs. There is some controversy surrounding consideration of the significance of whirling disease relative to regulations currently in place and the extent of actions designed to control. The position of the Utah Division of Wildlife Resources relative to disposition and the role of diseased and/or carrier stocks in captive and free-ranging fishes is well known. Most regulating entities still prohibit the import of fish from sources contaminated with *Myxobolus cerebralis*. There has never been adequate demonstration of the impact of this disease in the wild. It is felt in many quarters that the impact is negligible. Other biologists would point out that it is very possible that the parasite might serve as a primary stressor which might predispose the fish for other infectious problems. The long-term effects of this parasite on performance, growth, fecundity, disease resistance, vulnerability to predation, etc. has not been clearly established. This latter view is consistent with the Utah position. We need to know more about it before we turn it loose on the free-ranging populations of fish. The Utah Division of Wildlife Resources has taken the position of attempting control.
Review of the technical literature and contacts with other workers around the country has led to a program based on a form of biological control. As far as is known the specific rationale employed here is new or at least the scale of operation intended is new.

It has been known for some time that the spores of this parasite are resistant and environmentally very persistent. The complete life cycle eluded researchers until the work of Ken Wolf and Maria Markiw which demonstrated the role of tubificid worms as intermediate host in which the actinosporean, *Triactinomyxon gyrosalmo* develops. This was an enormous step in understanding *Myxobolus cerebralis* and the elements of its life cycle which would lead to the control proposed by Utah. This information was a "shock" to much of the scientific community because up to that time *T. gyrosalmo* was thought to be a totally separate organism parasitizing oligochetes. It was challenged by numerous workers around the world but has since been supported and is now the accepted "school of thought".

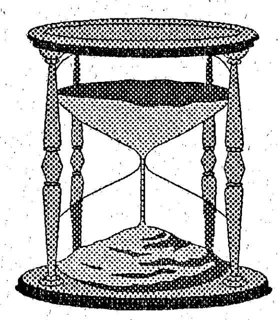
In general, once the fish are infected, the trophozoite stage targets cartilage with particular reference to the cartilage of the head and vertebral column. Considerable damage to the cartilage can be achieved in this stage. This damage can be sufficient to induce deformity and the "whirling" behavior. Within approximately two months the development of spores is complete. At this point the spores are secure until the fish dies or is eaten by a predator. Once the fish decomposes the spores are released and will persist in the wet environment until ingested by a tubifex worm. Once the spores are ingested the development continues. After about 110 days the tubifex gives rise to and releases the actinosporean spores of triactinomyxon form. The release of these spores may peak at 150 - 190 days but traces of spores have been observed for up to nine months. The trout can contract "whirling disease" by ingesting tubificids that contain *Triactinomyxon gyrosalmo* or by brief contact with water borne forms released from the tubificids. At this stage the spores must find an appropriate salmonid host within a few days to two weeks or it perishes. Once infection occurs at this stage the entire process repeats.

The short life-span and the relative host specificity of the actinosporean stage provides a "window of vulnerability". A plan was developed to rid all of the contaminated waters of salmonid fish. The actinosporean spores finding no appropriate host will perish. The intent is to maintain the fish-free status of these waters for a period including three summer seasons to permit time for the spores present in the system to develop up to this vulnerable stage. This applies to the pertinent culture facilities as well as the "wild" environs. Time and tubifex worms will be our allies in this plan.

At some point sentinel fish will be placed in live cages in these waters to see if they acquire the spores. Aquaculture facilities within the suspect geographic area but negative thus far are to be checked for spores several times per year until we are satisfied that they are, in fact, negative.

This is a new approach but we feel that the rationale is sound and that the action is feasible. We'll provide the time. We have to hope that the tubificids will do their part.

RON GOEDE



JUNE SUCKER PROJECT BEGINS AT EXPERIMENT STATION

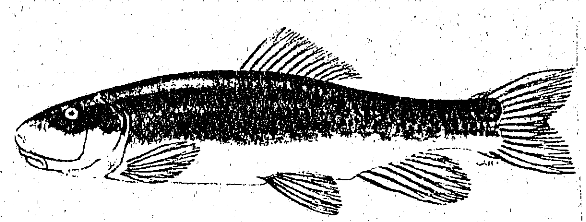
In a cooperative effort to save the June sucker, a native Utah endangered species, Utah Division of Wildlife Resources and Utah State University (USU) have joined forces in Logan. In July a holding and rearing facility was completed at the Fisheries Experiment Station (FES) for culturing June sucker fingerlings. The facility is a greenhouse type Hansen Weatherport structure with four 54 cubic foot circular tanks. The project is supported primarily by Wallop-Breaux funds. FES is providing the property and water to maintain the project, while the university is providing a full time technician (Dwight Aplanalp) and the funding for the cost of food for the June suckers.

On August 2, approximately 4000 fingerling June suckers approximately 2 years old were moved from the USU laboratories to the June sucker facility. Here they will be reared for brood stock. So far the fish are doing fine in their new home.

The average person may question, "What's so important about a June sucker? Isn't a sucker a sucker?" In fact, June suckers are quite different from other bottom feeding suckers. They have a terminal mouth and are primarily planktivores. The June sucker evolved in Utah Lake located near Provo. This is the only natural water where they can be found today. Their numbers are quite small, with remaining numbers in the wild estimated between 30 and 1000 fish. Habitat destruction and introduction of exotic species are felt to be major causes for their disappearance. These adult fish are all 30 years old or older and no natural recruitment is occurring. USU collects eggs from a few individuals each June.

A formal recovery plan has not been written, but experimentation and management strategies are being conducted. The Experiment Station's part in saving this unique fish by caring for this captive brood stock is an important piece of the puzzle toward saving this endangered species.

DWIGHT APLANALP



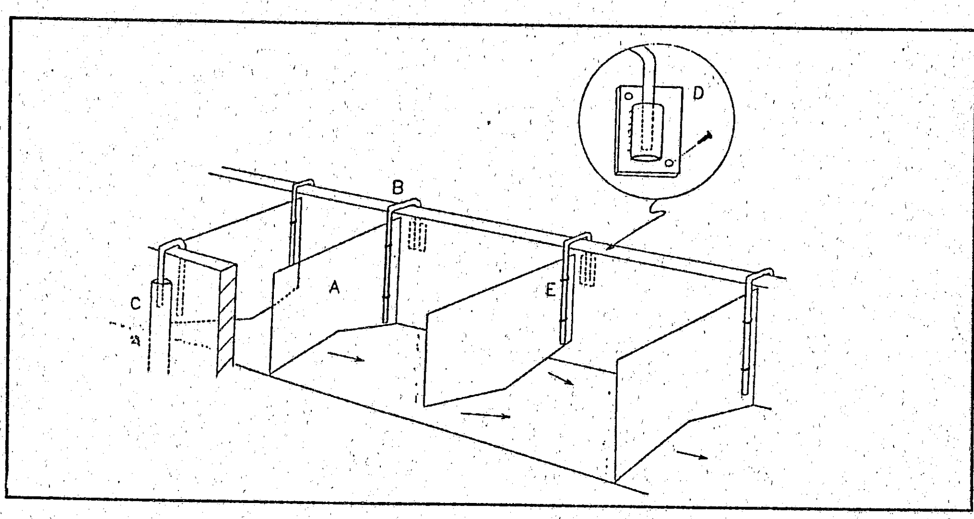
June sucker
Chasmistes liorus Jordan

EVALUATION OF A NEW BAFFLE DESIGN FOR SOLID WASTE REMOVAL FROM HATCHERY RACEWAYS

In 1986, Boersen and Westers presented a design in the *Progressive Fish-Culturist* for removing waste feed and feces from hatchery raceways. The design uses a series of physical barriers (baffles) across the width of the raceway, with a space between the barrier and the raceway floor to increase the velocity of the inflowing water. At low flows, a square opening between the bottom edge of the baffle and the floor isn't big enough to permit movement of the fish between compartments and still achieve the velocity required.

We devised a different design to move the waste and still allow for fish movement. We modified the bottom margin of the baffle to have the same area required for the optimum velocity, but made triangular openings instead of square ones.

To retrofit an existing raceway as the authors suggested, with slots or drilling holes in the wall below the water line was not acceptable for several reasons. Water in the holes when the raceway was not in use would freeze during the winter and cause the concrete to deteriorate. Slots mounted in a raceway would interfere with crowding screens and are costly and time consuming to install. Slots would be more appropriate when recessed in a raceway wall during construction.



We found that re-bar (13 mm diameter) bent to form a squared-off "J" and wired upside-down to the sides of aluminum sheets worked well. This formed two hooks on each side of the baffle to fit over the raceway walls. To hold the baffles rigidly in place, one of two designs were used. The simplest is to drive a steel pipe into the ground next to the baffle into which the re-bar fits. The other design was a metal plate with a short section of steel pipe welded to it, bolted to the outside of the raceway. The short section of pipe needs to have an inside diameter large enough to insert the re-bar easily.

Boersen and Westers report that no adverse affects on fish were observed, but no tests were actually conducted. In our experiments we evaluated the effect of baffles on growth and other physiological parameters of the Health and Condition Profile developed by Goede and Barton (1990), retention time, oxygen concentrations in different portions of the raceway, behavior and movement of fish.

Mean weight and parameters of the health and condition profile did not differ between fish in baffled raceways and raceways without baffles. Fin condition was equally poor in fish raised by either system. The alternating bottom profile of the baffle was effective in moving waste out of the raceway.

Retention time and dissolved oxygen

The retention time was shorter in the baffled raceway, and the dye reached the lower end of the raceway sooner. The shorter retention time (8 to 12 min) would have an impact on disease treatments where duration of the treatments is critical.

NEW BAFFLE DESIGN - continued

Dissolved oxygen concentrations were measured in three different locations at two depths in each of the four raceways. Dissolved oxygen did not differ between depths in raceways with baffles or without. At different portions of the raceway, dissolved oxygen concentrations did not differ between baffled raceways and raceways without baffles.

Fish movement and territorial behavior

Several attempts were made to mark individual fish to determine fish movement in the compartments created by the baffles. Tying bright strike indicator bubbles to the dorsal fin proved ineffective due to the penchant of fish to strike the bubble. Floy tags had the same problem, particularly the orange colored tags. The movement of the tagged fish indicated a fair amount of mixing and travel from one compartment to the next. It is possible however, that tagged fish were harassed enough that they sought other compartments to escape the harassment. Observations with the video camera indicated that movement between compartments was commonplace.

A video camera was used to film fish in both the baffled raceways and raceways without baffles. Behavioral observations were made to determine if baffled raceways influenced territorial behavior. There was no territorial behavior or aggressive interactions observed in either baffled or un-baffled raceways. There was fairly random mixing of the fish with no territories observed being defended. It was also observed that fish tended to congregate in the compartment downstream from the baffle with the apex of the opening in the middle.

The lack of any effect of the baffles on growth or parameters of the health and condition profile (Goede and Barton 1990) indicates that baffles could be a useful tool for fish culturists for elimination of wastes. It was our experience that waste removal was not a problem in the control raceways with the densities of fish used. Higher densities of fish would produce more waste, but additional fish would displace more water, increasing the water velocity. Therefore, baffles would be beneficial for situations where fish densities or flows were relatively low or in rearing units where the design is inadequate for moving wastes. ERIC WAGNER

NEW FACES/FACELIFTS AT EXPERIMENT STATION

Recently the Fisheries Experiment Station has been undergoing a number of facelifts and new additions to the facilities. The June sucker facility was recently constructed (see accompanying article). Wire covers have been placed over several of the raceways to protect research fish from bird depredation. A large chilling unit has been installed along with an insulated building to house it. *Finally*, construction has begun on the long delayed superintendant's house, which is scheduled to be completed in October.

We've also seen a number of new faces as we've said goodbye to old friends. Wildlife technician **Todd Graham** left the Station in the spring to return to his native Laramie to work with Wyoming Game and Fish Department.

Taking Todd's place as wildlife technician is **Bart Burningham.** Bart is a 1991 wildlife and fisheries graduate of USU and has worked several years at Hardware Ranch while in school. Bart lives in Wellsville along with his wife Aleene and son Hunter.

Joining Bart at the station is **Dwight Aplanalp.** Dwight has been hired through Utah State University to work on the cooperative June Sucker project. Dwight was active in the design and preparation of the facility and is taking care of the fish now that they are in their new home. Dwight is a fisheries student at USU, working on his bachelors degree. He worked previously with Nevada Game and Fish Department doing stream surveys. He and his wife Kelli and daughters Megan and Natalie live in Logan.

The only thing that hasn't changed is our location, so if/when you are traveling through Logan come by and check us out!

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HATCHERY WORKERS TRAINED FOR FISH HEALTH INSPECTIONS

Members of Fish Health Training Course at FES. From left to right: Chris Wilson, Karen Roenner, Joey Comp, Pat Lakin, Dennis Hiskey, Ben Giles, Terry Howlick, Ed Parsons, Ed Hanson, Kirk Smith, Ben Giles.

In response to the rapidly expanding requests for fish health inspections, employees from state fish hatcheries recently attended a training session in inspection techniques at the Fisheries Experiment Station. On April 10 - 11, one representative from each of 10 state hatcheries received instruction in techniques pertaining to fish health inspections, including virology, bacteriology, hematology, histology and parasitology. In addition, methods for proper storage and transport of samples as well as biolegal aspects were discussed.

So far, the program seems to be an outstanding success. The additional manpower has allowed establishment of 2 inspection crews and has cut down on the road travel of FES biologists. In addition, it has allowed aquaculturists to meet fish hatchery workers from their locale. Teaching the course were Chris Wilson, Ron Goede, Ernie Dean, Nelma Gates and Kent Thompson.

SPELL A FISH

Every so often, some smartass newpaper columnist points out that *ghoti* spells fish, and makes it abundantly clear that he thinks he is clever as all billy damn in so doing. BAH.

Forty-seven years back, George Bernard Shaw figured out that ghoti spells fish. Pronounce the GH as in LAUGH, the O as in WOMEN, the TI as in NATION. It fall adds up to FISH. Mr. Shaw used this as an example of the absurdities of the English language.

There are, of course, lots of other swell ways to spell fish.

For example:

PHUSI:pronounce the PH as PHYSIC, the U as in BUSY, and the concluding SI as in PENSION.

FFESS:pronounce the FF as in OFF, the E as in PRETTY, and the double S as in PASSION, which you are doubtlessly filled with by now.

UGHYCE:pronouce the UGH as in ENOUGH, the Y as in HYMN, and the CE as in OCEAN. The ocean is full of ughyces.

So next time you see some lard-brained newspaper columnist taking credit for discovering that *ghoti* spells fish, you may want to write a letter and remind him of the homey backwoods wisdom my grandmother taught me many years ago when she dandled me on her knee: *Nobody likes a smartass.*