The Ichthyogram

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Utah Division of Wildlife Resources

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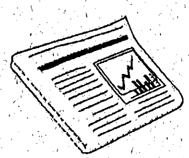
RANGE OF WHIRLING DISEASE EXPANDS IN UTAH



Hopes for early control and elimination of whirling disease from the Fremont River Drainage in Utah were shattered when infected fish were discovered in several new locations. Mill Meadow and Forsyth reservoirs upstream and several miles of the Fremont river downstream from the site of first discovery have been confirmed as having fish positive for *Myxobolus cerebralis*, while Fish Lake and Johnson Reservoir have tested negative. Several species of salmonid fishes including rainbow, cutthroat, brook and brown trout have tested positive for spores. As noted by other researchers, rainbow trout appear to be the most affected species, while brown trout have exhibited very low levels of infection as evaluated by spore counts. In one stretch of river, rotenone treatment produced wild rainbow trout with an estimated 5 - 10% of the population showing gross head and skeletal deformities. These fish showed the highest spore counts from fish in this drainage found to date.

Two state hatcheries and 4 other private aquaculture facilities downstream continue to show negative results after repeated testing. Meanwhile, one aquaculture facility in the adjacent Sevier River drainage associated with the affected aquaculture operation has tested positive. Thus far, extensive testing of wild/feral fish.has failed to detect any further spread of the parasite to this watershed .

Plans for immediate control and eventual eradication of the parasite are continuing to be developed as the range of the parasite changes. Efforts thus far have centered around disruption of the parasite's life cycle by chemical eradication of wild/feral fish hosts from the drainages, especially in the areas close to unaffected facilities. It has not been determined if treatment of the affected reservoirs is achievable. State and private aquaculture facilities in the area which are supplied by spring water are undergoing security measures such as fences, fish screens and treatment of settling ponds to prevent infection of their fish stocks. In the meantime, fish from the affected facilities in the Fremont drainage have been allowed to remain on site until they reach proper market size. UDWR officials are attempting to work with aquaculturists to produce a comprehensive plan which will control the parasite and protect uncontaminated facilities, while minimizing economic impacts on affected facilities.

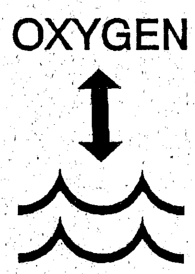
Also In this Issue:

Low Head Oxygen System Evaluation

Eric Wagner

In 1990, Zeigler Bros. bought a patent from Barnaby Watten for an injection unit that makes efficient use of oxygen, while requiring only a small amount of hydraulic head. The device spreads the inflowing water over a perforated distribution plate. The water dripping through the holes is aerated as oxygen flows perpendicularly through a series of "chimneys" or "baffles" with holes drilled in them. The oxygen concentration drops as the gas flows from the first "chimney" to the last, where the remaining gas is vented. The outlet of the off-gas pipe is kept just below the water surface.

Many of the hatchery facilities in Utah have a limited amount of hydraulic head, and a demand for greater production of fish. Oxygen added to the water can increase the production capacity of a hatchery, eliminating oxygen as a limiting factor. Oxygen injection systems of a different sort are already in place at Springville Hatchery and at the Midway Hatchery where the first production scale system in the country was installed. At the request of Joe Valentine, leader of Utah's hatchery program, a project to evaluate the performance of the low-head oxygen injection device and the effects of supersaturation on the fish was initiated.



In one test, the flowmeters were set at a certain point and oxygen concentrations were measured at periodic intervals throughout a 24 hour period. Oxygen in the raceway leaving the injection unit (an average of the oxygen concentration leaving each baffle) varied from 6.3 to 18.5 mg/L. There were fluctuations in incoming dissolved oxygen despite a constant water temperature, but even corrections for this did not explain the differences in the oxygen leaving the injection unit. It appears that the ever-changing variables of temperature and pressure were affecting the flow of oxygen.

To get an accurate measure of oxygen flow, another approach was taken. The oxygen tank was weighed before and after 1 h to provide a value for the mass of oxygen consumed per unit time. Before the beginning weight was recorded, the injection units were allowed to equilibrate for 1 h after the oxygen flow was adjusted with a rotameter. The absorption efficiencies were best at the lowest oxygen flow rates, and ranged from 22 to 73%. It should be noted that the calculation of absorption efficiency was done on a mass basis, i.e., g/min absorbed / g/min supplied * 100. This method circumvents the temperature and pressure considerations that must be incorporated into volume and flow calculations. It should also be noted that the oxygen concentration of the water leaving the unit was measured at the *end* of the hour, rather than *during* the hour. Thus the calculations for absorption efficiency assume a constant oxygen concentration during the hour.

Health-Condition Profiles were observed both in controls and in fish receiving supplemental oxygen. There were no significant differences in any of the parameters with the exception of plasma protein during the last sample (control > LHO). Growth was not enhanced by supplemental oxygen as other researchers have noted.

The injection device was successful in reducing the nitrogen supersaturation to levels below saturation. Fins were still in poor condition in both groups, indicating that nitrogen supersaturation was not responsible for the fin erosion observed. In about half of the monthly samples, the fin erosion was actually worse in the raceways with LHO units.

To further address the problem of accurate measurement and control of oxygen flow, mass-flow controllers are being purchased. These devices meter the amount of oxygen based on mass rather than volume. Hopefully this will provide more accurate control of oxygen flow.

Parasites of Endemic Fish in Bear Lake. Utah-Idaho

Cheryl Courtney, Ph. D., Weber State University

Bear Lake is a large oligotrophic lake with a surface area of 282 km^2 and a maximum depth of 63 meters. It lies on the Utah-Idaho state line and is managed jointly by the Utah Division of Wildlife Resources and the Idaho Department of Fish and Game. Four endemic fish species in the lake were examined for intestinal helminths and gill monogeneans. Over 400 fish were collected at five locations in the lake from August 1989 to November 1990. The fish species sampled were: Bonneville cisco (*Prosopium pemmiferum*), Bonneville whitefish (*P. spilonotus)*, Bear Lake whitefish (*P. abyssicola*), and Bear Lake sculpin (*Cottus extensus*). Bonneville and Bear Lake whitefish are indistinguishable when they are small, thus the parasite data from these 2 species were combined.

Seven parasite species (2 acanthocephala, 3 cestoda, 1 monogenea, and 1 nematoda) were recovered from the Bear Lake fish sampled (Table 1). Cestodes were the most common helminths encountered in these fish occurring in almost 50% of the fish sampled. Bonneville cisco and Bear Lake sculpin had the highest mean *Proteocephalus* intensities, 8.3 and 5.0, respectively The combined whitefish group (Bonneville and Bear Lake whitefish) were infected more often with the nematode *Truttaedacnitis* that the other two species of fish. Only whitefish < 300 mm harbored the gill parasite *Tetraonchus*.

Additional statistics were applied to the whitefish group because of the completeness of the data set on host length and age. A significant correlation between intensity and fish length was found for both *Proteocephalus* and *Truttaedacnitis*. Whitefish between 100 and 150 mm were more heavily infected with *Proteocephalus*. whereas fish between 200 and 250 mm possessed higher intensities of *Truttaedacnitis*. The only significant correlation between whitefish age and helminth intensity was for *Truttaedacnitis*. Three-year-old fish were the most heavily parasitized, and this nematode was not present in young-of-the-year fish.

Two of the helminth species recovered in this study may be helpful in taxonomically distinguishing Bear Lake and Bonneville whitefish. Further collection of hosts is necessary to adequately assess the feasibility of using these helminths. Research on the parasite fauna of 6 other fish species in Bear Lake is currently underway. Future studies on Bear Lake parasite communities will include: 1) determining if any helminth species can be used to monitor fish food habits; 2) describing the structure of helminth infracommunities and component communities; 3) studying parasite population dynamics in invertebrate host populations, and 4) constructing a food web for parasites to examine possible fish-parasite interactions.

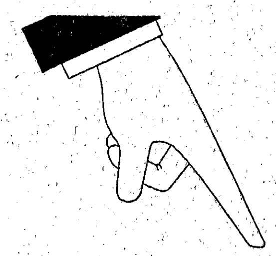
Table 1. Parasites found in endemic fish from Bear Lake, Utah - Idaho.

Species of Fish	Species of Parasite	Prevalence	Mean Intensity±SD
Prosopium gemmiferum (n=41)	*Proteocephalus* sp. (Cestoda)	80.5%	8.3±7.7
	Truttaedacnitis sp. (Nematoda)	2.4%	----
Cottus extensus (n=165)	*Proteocephalus* sp. (Cestoda)	50.0%	5.0±4.9
	Ligula intestinalis (Cestoda)	0.6%	----
	Neoechinorhynchus sp. (Acanthocephala)	1.2%	1.0±0.0
Prosopium spp.* (n=202)	*Tetraonchus* sp. (Monogenea)	7.9%	1.8±0.7
	Glaridacris terebrans (Cestoda)	1.0%	4.5±4.9
	Proteocephalus sp. (Cestoda.)	39.6%	3.2±3.6
	Truttaedacnitis sp. (Nematoda)	32.7%	1.9±1.9
	Neoechinorhynchus tumidus (Acanthocephala)	0.5%	----
	Neoechinorhynchus sp. (Acanthocephala)	1.0%	1.0±0.0

* represents the combined parasite data for *P. spilonotus* and *P.abyssicola*.

PROPER CARE AND FEEDING OF pH PROBES

by Eric Wagner



Digital pH Probe

Stocking of fish this fall into Panquitch Reservoir in southern Utah was complicated by high pH, accentuating the importance of pH measurement. These data can then be used to manage around the problem by stocking at different times of the year, different times of the day, or not stocking at all. Good data requires good equipment that is cared for properly.

If your pH meter is not working properly now (numbers drift, inaccurate readings, etc), the problem is likely the probe. If it doesn't work, throw it out and buy a new one. If there are crystals in the probe, this does not always indicate a faulty probe. Probe manufacturers claim this is not a problem. The crystals are potassium chloride (KCl). Be sure to maintain the appropriate level of KCl in those probes which have the capability to add solution.

To make your new probe last as long as possible follow two easy steps:

1. KEEP IT CLEAN

After each measurement, rinse your electrode thoroughly with distilled water. Do not wipe the glass membrane dry as this may scratch it.

2. KEEP IT WET

The glass membrane at the tip of the electrode should not be allowed to dry out as this will cause dehydration, a sluggish response, and may eventually render the electrode about as useful as a politician. Store the electrode in a pH 4 buffer solution or in saturated KCl that has been adjusted to a pH 4.0 buffer. Do not use distilled or deionized water, nor buffers higher than pH 4. Why? The glass membrane has a "memory" and will respond slowly to a lower sample pH if the electrode has been stored in a higher pH value.

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℞ Cold Facts about Formalin?

Formalin is one of the few remaining compounds approved by the FDA for use with food fish. It is approved for use as an external parasiticide for fish and a fungicide for fish eggs. Formalin is a suspected carcinogen and many individuals develop a sensitivity to the potent fumes. The conventional wisdom states that formalin solutions must be kept warm (above 40° F) to prevent formation of paraformaldehyde, a polymer which has been considered significantly more toxic to fish. For this reason, formalin solutions which showed a white precipitate are often discarded.

A recent report of preliminary research at the National Fisheries Research Center at LaCrosse, Wisconsin suggests this information may be incorrect. Rainbow trout were exposed to the top, bottom and a mixture of the fractions of a formalin solution which was exposed to freezing temperatures. The lethal concentrations of the solutions were all very similar and were no more toxic than fresh formalin solution. In addition, the amount of active ingredients in the solution with white precipitate was determined to be the same as clear solutions. No mention was made of the effects of these solutions on warm water fish or their demonstrated effectiveness as a parasicitide or fungicide.

While this research is preliminary, it has the potential to significantly change methods of storage and use of this important chemotherapeutant. If the compound can utilized in a cold state, the amount of noxious fumes could be reduced. In the meantime, there is considerable interest on the part of fish culturists in development of alternative compounds for use in the treatment of fungus on fish eggs.
Chris Wilson

Season's Greetings from all the Folks at FES!

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