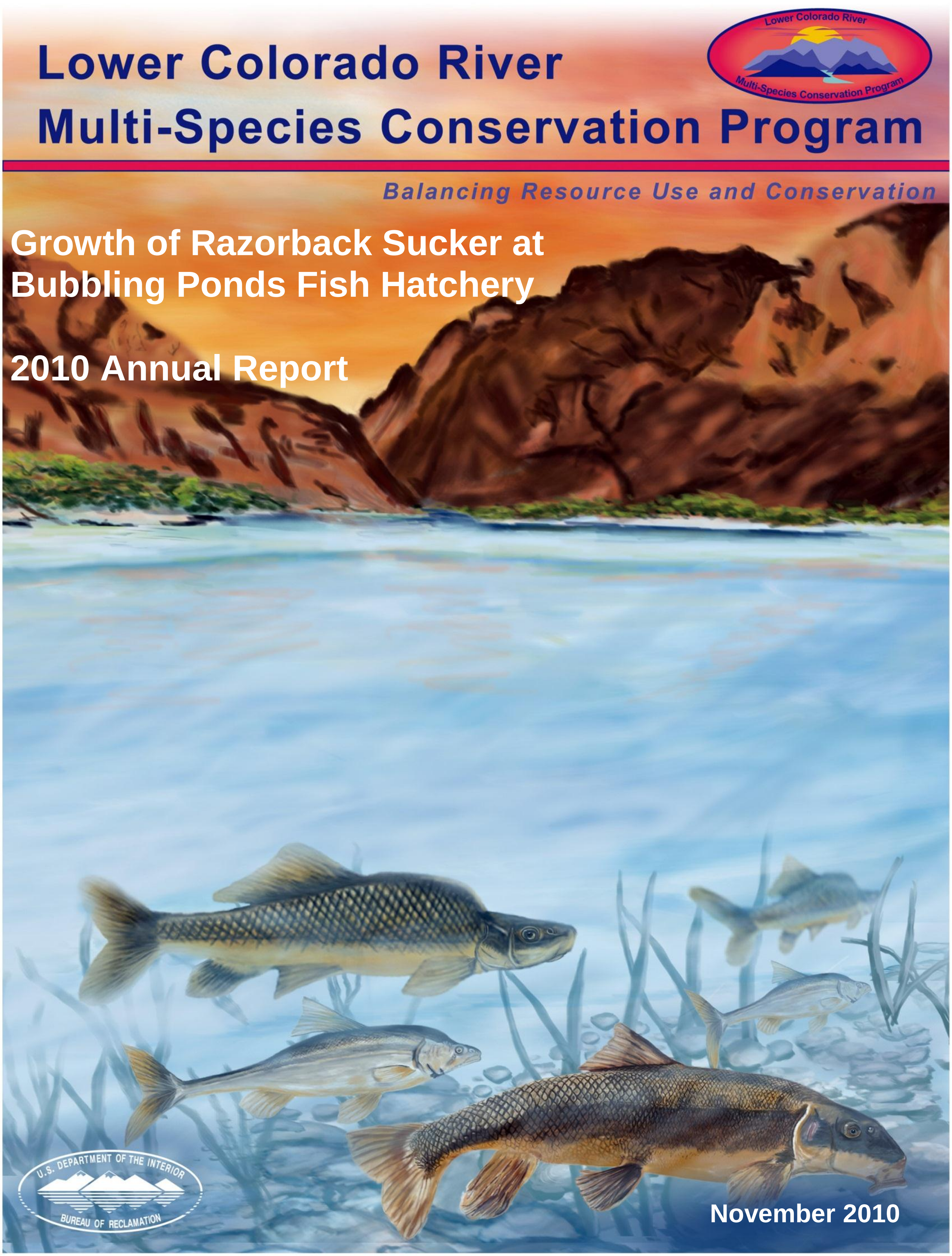
Lower Colorado River Multi-Species Conservation Program

Balancing Resource Use and Conservation



Growth of Razorback Sucker at Bubbling Ponds Fish Hatchery

2010 Annual Report

November 2010

Lower Colorado River Multi-Species Conservation Program
Steering Committee Members

Federal Participant Group

Bureau of Reclamation
U.S. Fish and Wildlife Service
National Park Service
Bureau of Land Management
Bureau of Indian Affairs
Western Area Power Administration

Arizona Participant Group

Arizona Department of Water Resources
Arizona Electric Power Cooperative, Inc.
Arizona Game and Fish Department
Arizona Power Authority
Central Arizona Water Conservation District
Cibola Valley Irrigation and Drainage District
City of Bullhead City
City of Lake Havasu City
City of Mesa
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City of Yuma
Electrical District No. 3, Pinal County, Arizona
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Mohave County Water Authority
Mohave Valley Irrigation and Drainage District
Mohave Water Conservation District
North Gila Valley Irrigation and Drainage District
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Town of Thatcher
Town of Wickenburg
Salt River Project Agricultural Improvement and Power District
Unit “B” Irrigation and Drainage District
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Yuma County Water Users’ Association
Yuma Irrigation District
Yuma Mesa Irrigation and Drainage District

Other Interested Parties Participant Group

QuadState County Government Coalition
Desert Wildlife Unlimited

California Participant Group

California Department of Fish and Game
City of Needles
Coachella Valley Water District
Colorado River Board of California
Bard Water District
Imperial Irrigation District
Los Angeles Department of Water and Power
Palo Verde Irrigation District
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Nevada Department of Wildlife
Southern Nevada Water Authority
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Hualapai Tribe
Colorado River Indian Tribes
Chemehuevi Indian Tribe

Conservation Participant Group

Ducks Unlimited
Lower Colorado River RC&D Area, Inc.
The Nature Conservancy

Lower Colorado River
Multi-Species Conservation Program

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2010 Annual Report

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Lower Colorado River
Multi-Species Conservation Program
Bureau of Reclamation
Lower Colorado Region
Boulder City, Nevada
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Executive Summary – Experimental studies at Bubbling Ponds Fish Hatchery, AZ have been ongoing for the last 4 years to understand factors that affect razorback sucker growth in captivity and to identify ways to improve growth rates and maximize size at release. In 2010 we conducted 3 separate growth experiments. In the first experiment the ectoparasite Ich (*Ichthiopthirus multifiliis)* was eradicated from the spring and water conveyance ditch which supplies water to the hatchery using Rotenone. Razorback sucker growth rates were then tracked in the absence of this parasite for 4 months and compared with growth rates from previous years when Ich was present. In the second experiment growth rates of larger fish tagged at 300 mm + TL were evaluated to understand how growth rates change as fish get larger, and in the third experiment growth rates of fast versus slow growing fish were evaluated to give insight into how sorting practices may impact growth rates. Growth rates of fish reared without Ich present (0.32 mm/day, 9.7 mm/month) were significantly higher than any other previous growth rates observed at the hatchery over the past few years. Razorback suckers tagged at over 300 mm TL did have reduced growth rates (0.24 mm/day, 7.3 mm/month) as would be expected according to a typical Von Bertalanfy growth curve although growth rates were only slightly less than the average growth rate for the hatchery (0.275 mm/day, 8.25 mm/month). Sorting and separating small fish from large fish after the first year of growth does appear to improve growth rates of smaller fish. Growth rates of sorted small razorback suckers (0.29 mm/day, 8.7mm/month) were equal to that of larger fish (0.28 mm/day, 8.4 mm/month) indicating that sorting may have helped to offset their original slower growth trajectory.

Introduction

Conservation efforts for razorback sucker (*Xyrauchen texanus*) currently depend on captive rearing and stocking programs. Low survival of stocked razorback suckers (Brooks 1986, Marsh and Brooks 1989, Marsh and Pacey 2005) has caused target sizes for stocked fish to steadily increase in efforts to reduce predation mortality (Marsh et al. 2005, Schooley and Marsh 2007). Rearing fish to larger sizes at hatcheries comes with increased costs and creates the need to evaluate husbandry and rearing practices that may affect fish growth. We evaluated growth rates of individual razorback suckers in ponds at Bubbling Ponds Fish Hatchery using Passive Integrated Transponder (PIT) tags to obtain precise growth information for individual fish so that valid comparisons of growth rates as related to rearing practices can be made.

This is the fourth year of ongoing studies related to razorback sucker growth at Bubbling Ponds Hatchery, AZ. In 2010 we conducted 3 separate growth experiments. In the first experiment we evaluated growth rates of razorback sucker in the absence of the ectoparasite Ich (*Ichthiopthirus multifiliis)*. Ich, causes direct mortality to razorback suckers as well as secondary bacterial infections. The open spring and ditch which provide water to the Bubbling Ponds Hatchery have long been infested with mosquitofish (*Gambusia affinis*) which harbor the Ich parasite and allow it to enter the hatchery with incoming water. The solution to the ich problem was to remove the mosquitofish host using Rotenone. Razorback sucker growth rates were then tracked in the absence of this parasite for 4 months and compared with growth rates from previous years. In the second experiment growth rates of larger fish tagged at over 300 mm TL were evaluated to understand how growth rates change as razorback suckers get larger, and in the third experiment growth rates of fast versus slow growing fish were evaluated to give insight into how sorting practices may impact growth rates.

Methods

Effects of Ich on razorback sucker growth rates

Bubbling Ponds spring was treated with Rotenone (CFT Legumine, 5%) at a concentration of 2 ppm to remove all mosquitofish from the spring. The treatment consisted of two treatments, 6 hours in duration, on two consecutive days (April 12 - 13) using drip stations and backpack sprayers, followed by an additional 6 hours of detoxification using sodium permanganate. Although 12 mosquitofish were captured in the spring pond the week following the treatments, subsequent minnow trapping (20 traps checked daily for 3 weeks) did not capture any additional fish until August 11, 2010 when juvenile mosquitofish were again detected in the spring pond. Minnow traps have subsequently been set daily with several hundred individuals removed. To evaluate if Ich was also again present in the spring we captured 15 mosquitofish from the spring pond on three separate days and placed them in an aquaria at 25 °C with 5 longfin dace known to be free of Ich. These fish were monitored for 2 weeks with no signs of Ich developing. This indicates that even though mosquitofish have returned to the spring pond the parasite is no longer present, although how long this condition will persist is unknown.

On May 11, 2010, 200 juvenile razorback suckers were harvested out of pond 5 upper (2009 year Class from Dexter National Fish Hatchery) and were PIT tagged and placed into Pond 8 to evaluate if growth rates at bubbling ponds hatchery have improved following the renovation of the spring and the removal of the Ich parasite. Unfortunately, on Sept. 8, 2010, Ich was again detected in pond 8 and the pond was immediately seined and 74 tagged fish were measured to obtain growth information for the 4-month period during which the pond was Ich-free.

Adult razorback sucker growth rates

Two hundred and ten razorback suckers were PIT tagged on May 14, 2009 and placed into pond 3 upper to evaluate growth rates of larger razorback suckers at Bubbling Ponds Hatchery under current rearing conditions. Size of these fish at tagging was (mean = 285 mm, range = 205 – 396 mm). These fish remained in the pond for 257 days and were harvested on Jan 25, 2010 to provide information on growth rates of larger razorback suckers under current rearing conditions.

Effects of sorting practices on growth rates

Razorback suckers are currently sorted after their first year of growth. They are typically removed from one of the upper earthen ponds and split into two lined ponds for subsequent grow-out. The larger fish are placed into one pond and the smaller individuals in another. On March 11, 2009, pond 5 upper was harvested and split into two separate groups. Two hundred of the smaller fish (average size = 122 mm TL) were PIT tagged and placed into pond 7 upper and 200 of the larger fish (average = 160 mm TL) were PIT tagged and placed into pond 8 upper. Density in pond 7 was 4,500 fish and in pond 8 there were 6,500 fish. These ponds were then harvested after 1 year and growth rates were compared to give information on the effects of current sorting practices. Hobotemp® temperature loggers were installed in pond 7 and 8 during the grow-out period with water temperature recorded every 2 hours (Figure 4).

Results and discussion

Effects of Ich on razorback sucker growth rates

Seventy four tagged razorback suckers were recovered from pond 8 on September 15, 2010. These fish had been in the pond for 4 months and experienced a growth rate of 0.32 mm/day or 9.6 mm/month (Table 1). This growth rate is significantly higher (p = 0.0003, two sample, t-test) than the mean growth rate from all other growth studies at the hatchery (0.27 mm/day, 8.1 mm/month, n=558) and any other individual growth rates observed to date at Bubbling Ponds Hatchery (Figure 1). If this growth rate was extended throughout the entire year, fish on average from an Ich-free ponds would be 16 mm longer than fish from ponds infested with Ich. Studies conducted at Bubbling Ponds hatchery in 2008 (Ward 2008) did not reveal any effects of the treatment chemicals on razorback sucker growth rates, so it is likely that the parasite outbreaks themselves are causing reducing growth rates rather than the chemicals used to treat the parasites.

Adult razorback sucker growth rates

On Jan 25, 2010, 156 adult fish with PIT tags were recovered from pond 3 upper. These fish were in the pond for 257 days and experienced an average growth rate of 0.24mm/day or 7.3 mm/month (Figure 2). This growth rate is slightly lower than the average growth rate observed at bubbling ponds hatchery in other studies (0.275 mm/day, 8.25 mm/month but may not be biologically meaningful. We would expect larger fish to have reduced growth rates according to a typical Von Bertalanfy growth model (Bertalanffy 1957), but it appears that over the size range we evaluated (300 - 450 mm TL) growth rates have not slowed significantly compared to that of smaller fish grown at Bubbling Ponds Hatchery. Growth of razorback suckers is known to slow as fish reach larger sizes but it appears this reduced growth rate may not really start to be biologically meaningful at Bubbling Ponds Hatchery until razorback suckers exceed 450 mm TL.

Effects of sorting on growth

One hundred and seventy five tagged razorback suckers were recovered from pond 8 upper on March 24, 2010 (Table 1). These were the larger fish (>140 mm TL) that came out of pond 5 on March 11, 2009. One hundred and twenty two tagged razorback suckers were also recovered from pond 7 upper on March 31, 2010. No significant differences in growth rate (mm/day) were observed among larger fish in pond 8 and smaller fish in ponds 7 (p>0.05, ANOVA) (Figure 3) indicating that sorting may have helped to offset the original slower growth trajectory of the smaller fish.

Results to date suggest that under typical hatchery operations (maximizing number of fish produced) the growth rate of razorback suckers is relatively consistent at Bubbling Ponds hatchery (0.2-0.3 mm/day, 6-9 mm/month), and to achieve growth rates substantially higher than this will likely require large changes in rearing practices that may not be practical in order to reach production goals.

Tagged fish still in ponds and future work

There are currently 482 tagged fish that remain in 2 separate ponds at Bubbling Ponds Fish Hatchery (Table 2). As those fish will be harvested in 2011 to obtain additional information on razorback sucker growth. The tagged fish that are currently in pond 8 will give information on growth of razorback suckers now that Ich is again present and may be informative depending on how prevalent the parasite is over the next few months. The tagged fish that are currently in pond 1 will give information on growth rates of razorback suckers in the shallow earthen ponds compared to the deep lined ponds. This information will allow for assessments of the effects of pond depth and substrate on growth rates of razorback suckers at Bubbling Ponds Hatchery. One question that still remains is the effect that rearing density has on growth rates. The logistics of meeting production goals while conducting growth research has limited our ability to evaluate this question until this year. In January of 2011, pond 1 lower which currently contains over 6,000 razorback suckers (a very high density for Bubbling Ponds Hatchery) will be harvested and a much more typical density of 2-3 thousand fish will be placed into the pond. We will tag 200 fish in January 2011and put them into pond 1 lower in January to evaluate growth of razorback suckers at normal densities in the earthen ponds compared to the previous year when densities were approximately double.

Acknowledgements

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Table 1. Number and sizes of razorback suckers used in studies to evaluate growth at Bubbling Ponds Fish Hatchery in 2010.

Pond #	Growth rate mm/day	# of fish tagged	# of fish Recovered	Days in pond	Initial TL, mm		Final TL, mm	
					Mean	(Range)	Mean	(Range)
3	0.24	215	156	257	286	(205 – 396)	358	(273 – 452)
7	0.29	200	120	386	122	(71 – 151)	234	(119 – 372)
8	0.27	200	171	379	160	(115 – 260)	265	(162 – 421)
8 (PRT)	0.32	191	74*	119	185	(130 -257)	224	(162 – 334)

PRT = post rotenone treatment * partial pond harvest

Table 2. Number and sizes of tagged razorback suckers that still remain in ponds at Bubbling Ponds Fish Hatchery that will be recaptured in 2011 as part of future growth assessments.

Pond Number	# of fish tagged	Tagging Date	Initial TL, mm	
			Mean	(Range)
1 lower	229	Feb. 3, 2010	277	(195 – 386)
8	191	May 13, 2010	160	(115 – 260)

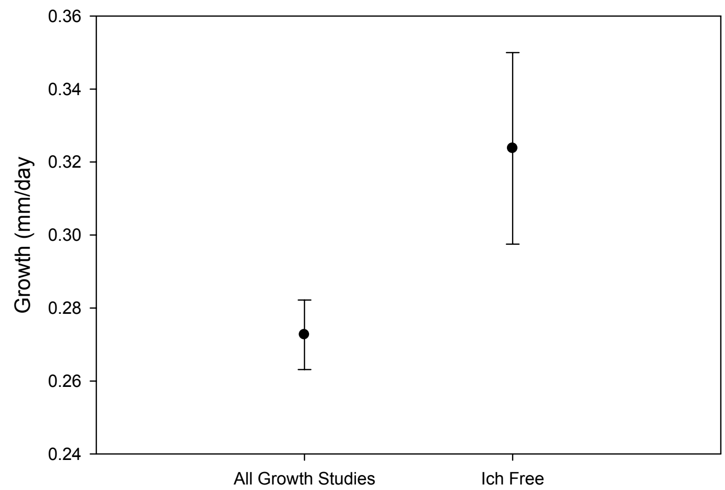


Figure 1. Average growth rate (mm/day) of razorback suckers in pond 8 in the absence of Ich during a 4-month period compared to the average growth rate of razorback suckers at bubbling ponds hatchery from all other studies during the last 4 years. Error bars represent 95% confidence intervals.

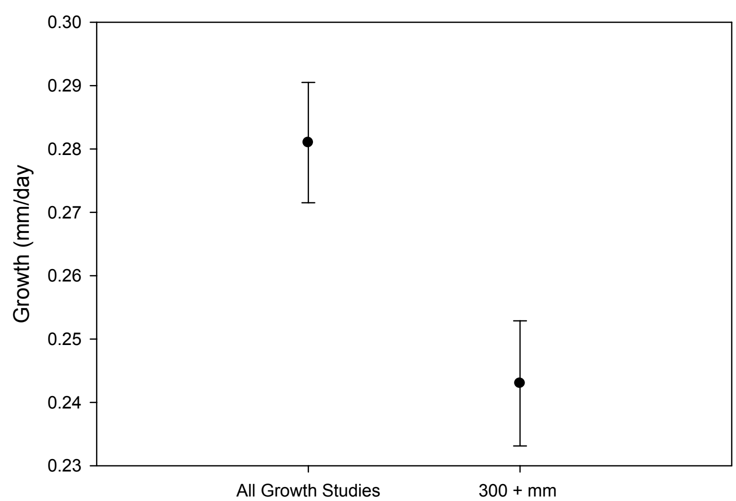


Figure 2. Average growth rate (mm/day) of adult razorback suckers (tagged at 300 + mm TL) in pond 3 compared to the average growth rate of razorback suckers at Bubbling Ponds Hatchery during the last 4 years. Error bars represent 95% confidence intervals.

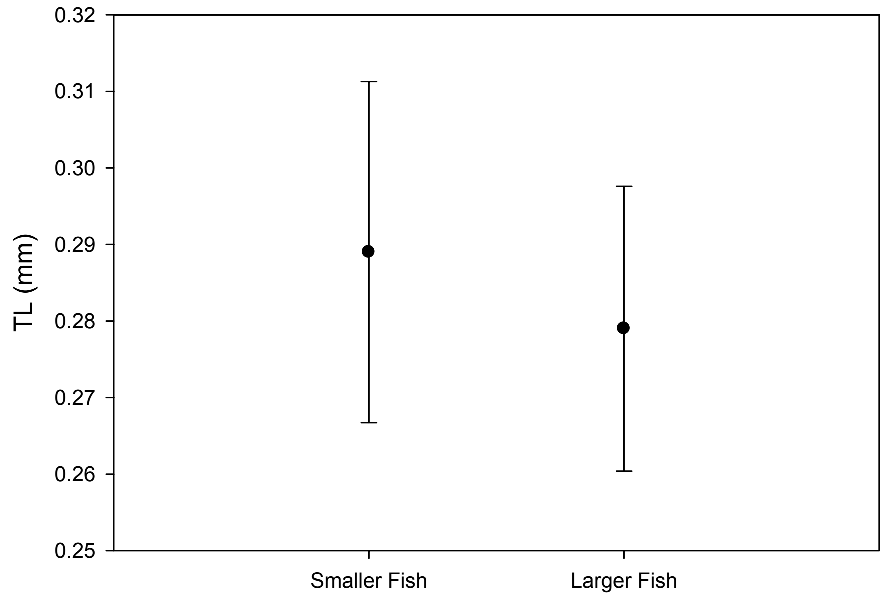
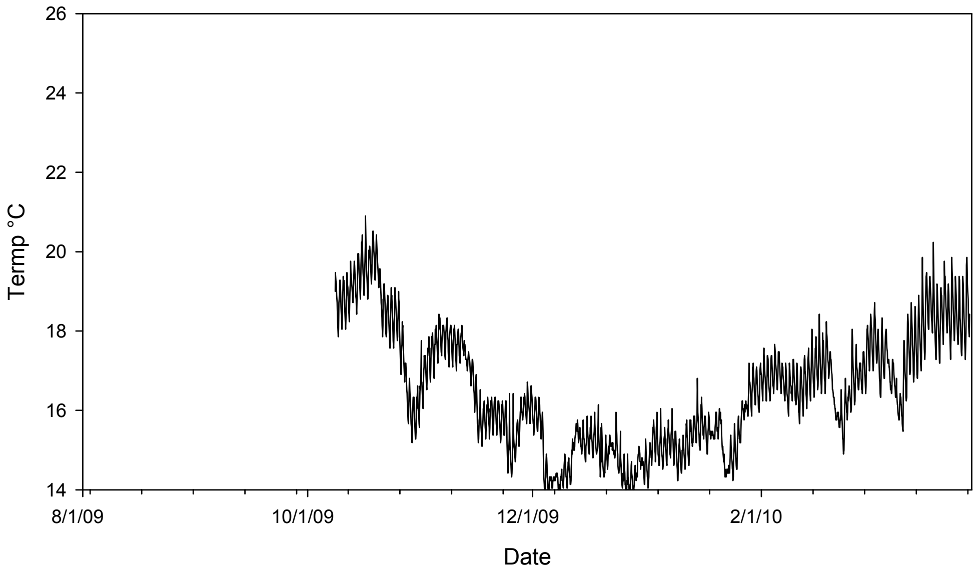


Figure 3. Average growth (mm/day) of sorted razorback suckers in ponds 7 and 8. Error bars represent 95% confidence intervals. Fish in pond 7 were the smaller fish and fish in pond 8 were the larger fish. Fish were in both ponds for 1 year (March 2009 – March 2010). Error bars represent 95% confidence intervals.



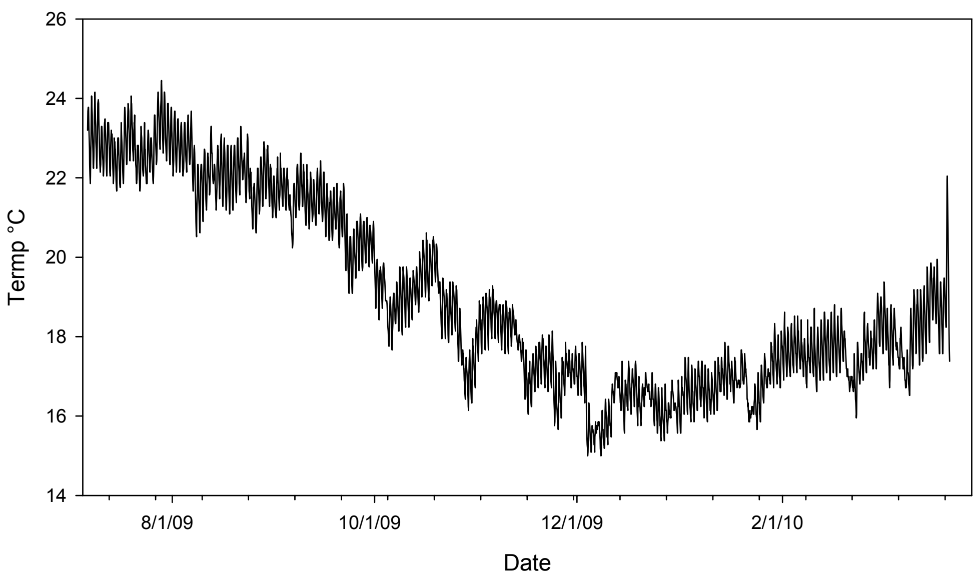


Figure 4. Temperatures (°C) in rearing ponds 7 and 8 at Bubbling Ponds Hatchery from March 2009 – March 2010, pond 7 (top graph) and pond 8 (Lower graph). Temperatures recorded with a Hobotemp® remote data logger every 3 hours.

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