IPRenewal NPEmails

From: Julie.Crocker@Noaa.Gov
Sent: Wednesday, June 29, 2011 12:09 PM
To: dgrey@entergy.com
Cc: Imboden, Andy; Julie.Williams@noaa.gov
Subject: information on thermal tolerances - shortnose sturgeon
Attachments: temps sns.docx

Hi Dara -

Please find attached some general information prepared by our shortnose sturgeon recovery coordinator on the thermal tolerances of shortnose sturgeon. I have attached the Ziegeweid et al. (2007 and 2008). I am sending the Niklitchek paper in a seperate email as it is a large file. Please let me know if you need copies of any of the other references. As indicated in the timeline Andy emailed yesterday, NMFS is currently preparing a list of questions re. thermal impacts/thermal study and will be distributing by the end of the week.

Julie

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Subject: information on thermal tolerances - shortnose sturgeon
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Recipients:
"Imboden, Andy" <Andy.Imboden@nrc.gov>
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The temperature preference for shortnose sturgeon is not known (Dadswell et al. 1984) but shortnose sturgeon have been found in waters with temperatures as low as 2 to 3ºC (Dadswell et al. 1984) and as high as 34ºC (Heidt and Gilbert 1978). Foraging is known to occur at temperatures greater than 7°C (Dadswell 1979). Temperatures above 28ºC are thought to be stressful to shortnose sturgeon. In the Altamaha River, temperatures of 28-30ºC during summer months are thought to trigger movements to deep cool water refuges. Ziegewald et al. (2007) conducted studies to determine critical and lethal thermal maxima for young-of-the-year (YOY) shortnose sturgeon acclimated to temperatures of 19.5 and 24.1°C. Lethal thermal maxima were 34.8°C (±0.1) and 36.1°C (±0.1) for fish acclimated to 19.5 and 24.1°C, respectively. The study also used thermal maximum data to estimate upper limits of safe temperature, final thermal preferences, and optimum growth temperatures for YOY shortnose sturgeon. Visual observations suggest that fish exhibited similar behaviors with increasing temperature regardless of acclimation temperature. As temperatures increased, fish activity appeared to increase; approximately 5–6°C prior to the lethal endpoint, fish began frantically swimming around the tank, presumably looking for an escape route. As fish began to lose equilibrium, their activity level decreased dramatically, and at about 0.3°C before the lethal endpoint, most fish were completely incapacitated. Estimated upper limits of safe temperature (ULST) ranged from 28.7 to 31.1°C and varied with acclimation temperature and measured endpoint. Upper limits of safe temperature (ULST) were determined by subtracting a safety factor of 5°C from the lethal and critical thermal maxima data. Final thermal preference and thermal growth optima were nearly identical for fish at each acclimation temperature and ranged from 26.2 to 28.3°C. Thermal maxima ranged from 33.7 to 36.1°C and varied with acclimation temperature and designated endpoint. Ziegwied et al. (2008) used data from laboratory experiments to examine the individual and interactive effects of salinity, temperature, and fish weight on the survival of young-of-year shortnose sturgeon. Survival in freshwater declined as temperature increased, but temperature tolerance increased with body size. The temperature lethal to 50% of the test fish after 48 h ranged from 28.2°C to 30.7°C. The authors conclude that temperatures above 29°C substantially reduce the probability of survival for young-of-year shortnose sturgeon. However, previous studies indicate that juvenile sturgeons achieve optimum growth at temperatures close to their upper thermal survival limits (Mayfield and Cech 2004; Allen et al. 2006; Ziegeweid et al. 2007), suggesting that shortnose sturgeon may seek out a narrow temperature window to maximize somatic growth without substantially increasing maintenance metabolism. For shortnose sturgeon, dissolved oxygen (DO) also seems to play a role in temperature tolerance, with increased stress levels at higher temperatures with low DO versus the ability to withstand higher temperatures with elevated DO (Niklitchek 2001).