

DRAFT Spotted Bass (*Micropterus punctulatus*) Thermal Tolerance Analyses – Juvenile and Adult, Summer
March 2016

Introduction

Recommended summer chronic and acute thermal tolerance values for juvenile and adult spotted bass and their justification are discussed below. The recommended tolerance values were developed in accordance with the “*DRAFT Methodology for Developing Thermal Tolerance Thresholds for Various Fish in Nevada – Juvenile and Adult, Summer*” (September 2015).

Chronic Thermal Tolerance Thresholds

Table 1 provides a summary of the range of chronic temperature tolerance values for spotted bass for various lines of evidence. These values are based upon a review of 4 papers and publications, the details of which are summarized in Attachment A.

There is obviously a wide range of temperatures from which to select an appropriate value and best professional judgment is called for. NDEP’s approach is to accept the EPA recommendations from Brungs and Jones (1977) unless the literature review provides a compelling reason to utilize other values. However in the case of spotted bass, EPA did not recommend a chronic thermal threshold for striped bass. Based upon the available information, NDEP recommends a chronic value of 32°C which is within the upper range of the tolerances and the final preferendum taken from the literature.

Table 1. Summary of Chronic Temperature Tolerances

Category	Temperature (°C)
Laboratory Temperature Preference Studies	
Average Preferences	16.9 – 32.2
Upper Preferences	19.5 – 36.8
Final Preferendum	32
Laboratory Upper Temperature Avoidance Studies	34 – 39
Temperature Preference Field Studies	28 – 30
Recommended Chronic Temperature Tolerance (MWAT)	32

Acute Thermal Tolerance Thresholds

Table 2 provides a summary of the range of acute temperature tolerance values for spotted bass for various lines of evidence. These values are based upon a review of 2 papers and publications, the details of which are summarized in Attachment B. As discussed in the methodology document, only the UILT values for acclimation temperature near the recommended chronic criterion (32°C) are to be included in the acute criterion development process. However, no UILT studies were performed for acclimation temperatures near 32°C. Therefore, no acute thermal tolerance is recommended for spotted bass at this time.

Table 2. Summary of Acute Temperature Tolerances

Category	Temperature Tolerances (°C)	Potential Acute Criteria (°C)
Laboratory Lethal Studies – UILT		
Acclim. = 10°C	30.8 – 34.2	
Recommended Acute Temperature Tolerance (MDMT)		None

References

Brungs, W.A. and B.R. Jones. 1977. Temperature Criteria for Freshwater Fish: Protocol and Procedures. EPA-600/3-77-061. Environmental Research Laboratory, Duluth, Minnesota.

Cherry, D.S., K.L. Dickson, and J. Cairns. 1975. Temperature selected and avoided by fish at various acclimation temperatures. *Jour. Of the Fish. Res. Board of Canada* 32:485-491.

Cherry, D.S., K.L. Dickson, J. Carns, Jr., and J.R. Stauffer. 1977. Preferred, avoided, and lethal temperatures of fish during rising temperature conditions. *Jour. Of the Fish. Research Board of Canada* 34:239-246.

Gammon, J.R. 1973. The effect of thermal inputs on the populations of fish and macroinvertebrates in the Wabash River, Tech. Rep. No. 32. Purdue University Water Res. Res. Center.

Lutterschmidt, W.I. and V.H. Hutchison. 1997b. The critical thermal maximum: data to support the onset of spasms as the definitive end point. *Can. J. Zool.* 75: 1553-1560.

Stauffer, J.R., K.L. Dickson, J. Cairns Jr. and D.S. Cherry. 1976. The potential and realized influences of temperature on the distribution of fishes in the New River, Glen Lyn, Virginia. *Wild. Monogr.* 50: 4-40.

ATTACHMENT A

Detailed Summary of Chronic Thermal Tolerance Values for Spotted Bass, Juvenile and Adult, Summer

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Table A-1. Chronic Temperature Tolerances – Laboratory Preference Studies

Reference	Age or Size	Acclim. Temp. (°C)	Average Preference Temperature		Upper Preference Temperature		Final Preferendum	
			Temp. (°C)	Comment	Temp. (°C)	Comment	Temp. (°C)	Comment
Cherry et al. (1975)	<1 year	6 - 30	16.9 – 32.2		19.5 – 36.8	Upper 95% confidence limits on averages		
Cherry et al. (1977)	<1 year	15 - 36	24.8 – 31.4		24.4 – 33.9	Upper 95% confidence limits on averages	30.8 – 31.4	
Stauffer et al. (1976)	Unknown ¹	na					32	

¹Fish were seined from New River in Virginia

Table A-2. Chronic Temperature Tolerances – Laboratory Upper Temperature Avoidance Studies

Reference	Age or Size	Acclim. Temp. (°C)	Temperature (°C)	Comment
Cherry et al. (1975)	<1 year	6 - 30	18 – 34	
Cherry et al. (1977)	<1 year	18 - 36	33 - 39	
Stauffer et al. (1976)	Unknown ¹	18 - 33	30 - 39	

¹Fish were seined from New River in Virginia

Table A-3. Chronic Temperature Tolerances – Field Studies

Reference	Temperature (°C)	Comments
Gammon (1973)	28 - 30	Based upon instantaneous temperature readings during electroshocking

ATTACHMENT B

Detailed Summary of Acute Thermal Tolerance Values for Spotted Bass, Juvenile and Adult, Summer

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Table B-1. Acute Temperature Tolerances – Laboratory Lethal Temperatures, Critical Thermal Maximum

Reference	Size or Age	Acclim. Temp. (°C)	Rate	Temperature (°C)	Endpoint
Lutterschmidt and Hutchison (1997)	Not reported ¹	10	1°C/min (60°C/hour)	30.8	Loss of righting response
				34.2	Onset of spasms

¹Collected by seining streams and reservoirs in Oklahoma

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