DRAFT Wiper[1] (*Morone saxatilis* x *Morone chrysops*) Thermal Tolerance Analyses – Juvenile and Adult, Summer
March 2016

Introduction

Recommended summer chronic and acute thermal tolerance values for juvenile and adult wiper 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 wiper for various lines of evidence. These values are based upon a review of 2 papers, 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 wiper, EPA did not recommend a chronic thermal threshold for wiper. As discussed in the methodology, chronic temperature criteria are generally not set to ensure the most optimum conditions. In fact, Brungs and Jones (1977) recommends chronic criterion for a given fish species that is between the optimum temperature and the UUILT. Therefore, NDEP recommends a chronic value of 30°C which is within the upper range of the tolerances taken from the literature and is consistent with the NDEP recommendations for striped bass and white bass.

Table 1. Summary of Chronic Temperature Tolerances

Category	Temperature (°C)
Laboratory Optimal Growth Studies – Constant Temperature	
Optimum	21 – 26.8
Upper Optimum	29 - 32
Temperature Preference Field Studies	<27
Recommended Chronic Temperature Tolerance (MWAT)	**30**

[1] Wiper are hybrid bass (female striped bass *Morone saxatilis* x male white bass *M. chrysops*)

Acute Thermal Tolerance Thresholds

No professional papers or publications were found that identified acute thermal tolerances for wiper. However, NDEP has recommended acute thermal tolerances values for both striped bass (32°C) and white bass (31°C). Since the wiper is a hybrid of these 2 fish, NDEP recommends an acute thermal tolerance value of 31°C (the most restrictive of the striped bass and white bass acute thresholds).

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.

Douglas, D.R. and L.A. Jahn. 1987. Radiotracking hybrid striped bass in Spring Lake, Illinois, to determine temperature and oxygen preferences. North American Journal of Fisheries Management 7:531-534.

Woiwode, J.G., and Adelman, I.R. 1991. Effects of temperature, photoperiod and ration size on growth of hybrid striped bass X white bass. Trans. Amer. Fish. Soc. 120:217-229.

Yeager, D.M. 1982. Ultrasonic telemetry of striped bass x white bass hybrids in the Escambia River, Florida. In Proceedings of the Annual Conference Southeastern Association of Fish and Wildlife Agencies (Vol. 36, pp. 62-73).

ATTACHMENT A
Detailed Summary of Chronic Thermal Tolerance Values for Wiper, Juvenile and Adult, Summer

Table A-1. Chronic Temperature Tolerances – Laboratory Optimal Growth Studies

Reference	Age or Size	Acclim. Temp. (°C)	Optimum Growth Temperature		Upper Optimum Growth Temperature	
			Temp. (°C)	Comment	Temp. (°C)	Comment
Woiwode and Adelman (1991)	Juvenile	Unknown	21 (30% ration)	Optimum growth temperature	29	Growth rate = 80% of optimum
			22.9 (60% ration)		30	
			26.8 (100% ration)		32	

Table A-2. Chronic Temperature Tolerances – Field Studies

Reference	Temperature (°C)	Comment
Douglas and Jahn (1987)	<27	Temperatures of 27 or higher were avoided by radiotracked fish in Illinois lake