BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

IN THE MATTER OF:	)	
	)	
MARATHON PETROLEUM COMPANY, LP	)	
Petitioner,	)	
v.	)	PCB No. 2018-049
	)	
ILLINOIS ENVIRONMENTAL PROTECTION AGENCY,	)	
Respondent	)	

NOTICE OF FILING

TO:

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(SEE PERSONS ON ATTACHED SERVICE LIST)

PLEASE TAKE NOTICE that I have today filed with the Office of the Clerk of the Illinois Pollution Control Board the ILLINOIS DEPARTMENT OF NATURAL RESOURCES'S REPLY TO THE ILLINOIS ENVIRONMENTAL PROTECTION AGENCY RECOMMENDATION, dated September 10, 2014, a copy of which are herewith served upon you.

Respectfully submitted,

ILLINOIS DEPARTMENT OF NATURAL RESOURCES

By: Virginia I. Yang

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Dated: December 28, 2018
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271-782-1809 (general)
847-608-3107 (direct)

BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

IN THE MATTER:	)	
	)	
MARATHON PETROLEUM	)	
COMPANY, LLC	)	
Petitioner,	)	
v.	)	PCB 2018-049
ILLINOIS ENVIRONMENTAL	)	
PROTECTION AGENCY,	)	
Respondent,	)	

THE ILLINOIS DEPARTMENT OF NATURAL RESOURCES'S REPLY TO THE ILLINOIS ENVIRONMENTALPROTECTION AGENCY RECOMMENDATION

NOW COMES the Illinois Department of Natural Resources (IDNR), an Interested Party to the above referenced proceedings, by and through one of its Attorneys, Virginia I. Yang, and files THE ILLINOIS DEPARTMENT OF NATURAL RESOURCES'S REPLY TO THE ILLINOIS ENVIRONMENTALPROTECTION AGENCY RECOMMENDATION, dated September 10, 2018, as follows:

A. Background

1. On December 15, 2017, Marathon Petroleum Company, LLC (Marathon) file its Petition to Approve Alternative Thermal Effluent Limitation (Petition) in this proceeding.

2. On January 26, 2018, the IDNR reopened its consultation proceeding with the Illinois Environmental Protection Agency (IEPA) pursuant the Illinois Endangered Species Protection Act [520 ILCS 10/110], the Illinois Natural Areas Preservation Act [525 ILCS 30/17], and Title 17 Illinois Administrative Code Part 1075.

3. On March 29, 2018, IDNR issued to the IEPA, with copy to Marathon, its consultation letter with specific recommendation: 1) conducting a bioassay of the upper thermal tolerance limits of the Bigeye Chub (*Hybopsis amblops*), a listed Illinois endangered and threatened species, 2) initiating an Incidental Take Authorization from IDNR regarding the Bigeye Chub, and 3) identifying an alternative compliance measurement point on Robinson Creek.

4. On August 14, 2018, Marathon filed its Response to the IDNR Consultation Letter, March 29, 2018.

5. On September 10, 2018, IEPA filed its Recommendation to Grant Marathon's Petition in this proceeding. Notwithstanding its Recommendation to Grant, IEPA reserved its finding and

rendered no opinion regarding the IDNR March 29, 2018 consultation letter. Additionally, IEPA reserved its findings and rendered no opinion regarding Marathon's Response to the IDNR Consultation Letter.

6. On September 12, 2018, IDNR met with representatives from IEPA and Marathon to advise the parties that the IDNR intended to conduct a bioassay of the Bigeye Chub through IDNR contracted services of Dr. Cory Suski, PhD. at the University of Illinois at Champaign-Urbana, Illinois, Department of Natural Resources and Environmental Sciences (UIUC).

7. Under the authority of an IDNR scientific research permit issued pursuant to 520 ILCS 10/4, the UIUC study included collection of the Illinois Bigeye Chub, as well as Sand Shiners (*Notropis stramineus*) from the Vermilion River basin (Wabash River drainage) with assistance from IDNR Fisheries Unit, holding the collected fish at UIUC laboratory facilities, and testing to determine the non-lethal thermal tolerances of the collected fish.

8. UIUC issued its study findings on December 14, 2018 as "Suski Lab Technical Report Review No. 2018-003 – Interim Report Thermal Tolerance Limits of Bigeye Chub," subject to final peer review and publication, to IDNR for technical review and submittal to the Board for this proceeding. (See Attachment A)

B. Bioassay of the Bigeye Chub, State of Illinois Threatened and Endangered Species

9. Under the Illinois Endangered Species Protection Act, 520 ILCS 10, the IDNR in conjunction with the Illinois Endangered Species Protection Board, is authorized to approve the listing, delisting, or change of listed status of plant or animal species as endangered or threatened, and to authorize regulations for such listings, 17 Ill. Adm. Code 1010 & 1050.

10. The State of Illinois listing of endangered or threatened species automatically includes species or subspecies of animal or plants designated as endangered or threatened by the U.S. Secretary of the Interior pursuant to the federal Endangered Species Act, P.L 93-205. Further, the Illinois Endangered Species Protection Board also "may list, as endangered or threatened, species of animal or plants which have reproduced in or otherwise significantly used...the area which is now the State of Illinois, if there is scientific evidence that the species qualify as endangered or threatened...", 520 ILCS 10/7. The policy rationale for this dual federal and state regulatory mechanism to protect threatened and endangered species recognizes that the differing conditions for ecological habitats throughout the United States, as well as from State to State, requires regional ecological delineations to conserve such animal and plant species. The Bigeye Chub ((*Hybopsis amblops*) is a listed Illinois endangered fish species per 17 Ill. Adm. Code 1010.30(a).

11. Pursuant to the requirements of Subpart K Alternative Thermal Effluent Limitations under Section 316(a) of the Clean Water Act and its regulations 35 Ill. Adm. Code 304.141(c), and more specifically 35 Ill. Adm. Code 106.1130(e)(4), a 316(a) Petition for alternative thermal effluent limitations must include the results of studies conducted under a detailed plan of

study that includes "criteria or methodology used to assess ...(a)...whether balanced indigenous community of shellfish, fish and wildlife will be maintained in the receiving waters...(b)... and the *protection of threatened and endangered species.* (emphasis added)" The Subpart K provisions contain no regulatory language limiting this criterion to only federal listed species, and excluding state listed species.

12. In its September 10, 2018 Recommendation to Grant Marathon's 316(a) Petition, IEPA specifically declined to opine on any issues concerning State listed endangered and threatened species as follows:

    "The Agency is not rendering an opinion regarding the Illinois Department of Natural Resource's (IDNR) March 29, 2018 letter... (to IEPA) ...which offered recommendations for the protection of Bigeye Chub. Additionally, the Agency is not rendering an opinion on Marathon's Response to IDNR's letter and recommendations."

13. IEPA's stated omission in its Recommendation represents an incomplete Recommendation by IEPA to Grant the Marathon 316(a) Petition. This omission also reflects IEPA's deference to the statutory and regulatory authority of IDNR under the Illinois Endangered Species Protect Action, 520 ILCS 10, that prohibits the possession, taking, disposal, or transport of specimens...in danger of extinction and statewide extirpation...". IDNR consequently initiated its review of the Marathon 316(a) Petition and authorized a bioassay for the Bigeye Chub using the research facility at UIUC under Dr. Cory Suski. The results of this bioassay study have been completed and were submitted to IDNR on December 14, 2018. (See Attachment A)

14. IDNR's completed review of the UIUC bioassay and Marathon's technical data has generally concluded that Marathon's thermal discharge numbers were at the point of "harassment" per the statutory definitions under Illinois Endangered Species Protection Act, 520 ILCS 10/2, even given the conservative results of fish acclimated at 26 degrees C (78.8 degrees F), showing avoidance behavior at 33 degree C (91.4 degrees F). Marathon's monitoring and models show that such temperatures were reached several times throughout the year. The UIUC study showed the fish reached thermal critical or "pass-out" at 96.8 degrees F. There were also considered to be "apparent risks" that Marathon's thermal discharge temperature may exceed the level of critical and potentially lethal temperatures (i.e., 96.8 degrees F or higher) given MBI's models predict up to 94.7 degrees F near the Route 1 bridge and effluent temperatures 1.7 miles upstream have been recorded at 100.0 degrees F. It was also noted that unforeseen environmental conditions (e.g. nutrient loading, pesticide applications, and low dissolved oxygen events) can be exasperated by higher water temperatures and reduce the thermal tolerance of fish. (See Attachment B .)

15. Based on this review, IDNR also found that Marathon is at "high risk" for a "take", as follows:

    ""take" in the form of 'harassment' where the fish is forced to evacuate aquatic habitat areas in the thermal effluent of Robinson Creek begins at 33 degrees C (91.4 degrees F.)" and

"'take' in the form of 'harm where the fish is unable to properly swim, avoid predators, and is at increased risk of mortality begins at 96.8 degrees F for fish acclimated to 26 degrees C (78 degrees F)." (See Attachment B at page 3)

As defined by the Illinois Endangered Species Protection Act, 520 ILCS 10/2, " 'Take' means, in reference to animals...to *harm* (emphasis added), hunt, shoot, pursue, lure, wound, kill, destroy, *harass* (emphasis added), gig, spear, ensnare, trap, capture, collect, or to attempt to engage in such conduct."

16. IDNR notes that the Illinois Endangered Species Protection Act (IESPA), 520 ILCS 10/3 (1), prohibits any person "to possess, take ... or otherwise dispose of any animal...which occurs on the Illinois List",17 Ill. Adm. Code 1010.30(a). However, the IESPA authorizes a "taking otherwise prohibited by Section 3...(of the IESPA)... if that take is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity" by means of review and approval of a conservation plan submitted to the IDNR under Section 5.5 of the IESPA and its regulations 17 Ill. Adm. Code 1080.

17. IDNR therefore recommends that Marathon submit a conservation plan to the IDNR in pursuit of an Incidental Take Authorization (ITA) for review and approval by the IDNR, as provided for under Section 5.5. of the IESPA and its regulation 17 Ill. Adm. Code 1080. (See Attachment B at page 4)

C. 106.1160 Burden of Proof for Protection and Propagation of a Balanced, Indigenous Community In and On the Body of Receiving Water

18. Pursuant to 35 Ill. Adm. Code 106.1160, Marathon bears the burden of proof in demonstrating to the satisfaction of the Board that "the otherwise applicable effluents limitations...are more stringent than necessary to assure the *protection and propagation* (emphasis added) of the balanced, indigenous community of shellfish, fish, and wildlife in and on the body of water into which the discharge is made...(i.e. Robinson Creek).

19. Additionally pursuant to 35 Ill. Adm. Code 106.1160, Marathon must show that "the alternative thermal effluent limitation desired by the petitioner, considering the cumulative impact of its thermal discharge, together with all other significant impact on the species affected, will assure the *protection and propagation* (emphasis added) of a balanced indigenous community of shellfish, fish, and wildlife in and on the body of water into which the discharge is to be made...(i.e., Robinson Creek).

20. In defending its application for an alternative thermal effluent limitation, Marathon has consistently stated that Marathon operations would not result in changing the maximum temperature of its effluent discharge into Robinson Creek. Marathon also opines that the presence of Bigeye Chubs currently found in Robinson Creek demonstrates the temperature of the effluent discharge into Robinson Creek as not being harmful to the continued presence of Bigeye Chubs in Robinson Creek. Marathon also commented that fish, including the

Bigeye Chub, will generally swim away to avoid adverse aquatic conditions such as water temperature, dissolved oxygen, chemical constituents, etc.

21. IDNR states that "presence" of a species is not equivalent to "protection and propagation" of a species. At no point has Marathon demonstrated or proven aquatic conditions that would be conducive for "propagation" of Bigeye Chubs, or any other aquatic species in Robinson Creek. To do so, IDNR notes that Marathon would need to document in their Section 106-1120 Detailed Plan of Study, or in their Section 106.1130(e) Results of Studies, the spawning activity and recruitment of individual species to the aquatic population through direct observations, or minimally, through documenting the presence of young-of-the year and/or multiple year classes of individual species.

22. IDNR therefore opines that Marathon's failing to address this issue concerning the "protection and propagation" of a species represents a data deficiency in Marathon's 316(a) Petition as submitted to IEPA on December 15, 2017, with specific regard to the scope of the Detailed Plan of Study and Results of Study. This substantive deficiency implies that unless supplemented with additional technical data, the Marathon Petition does not satisfy its required burden of proof per 35 Ill. Adm. Code 106.1160.

D. Location of Area and Volume of Mixing on Robinson Creek

23. In its Petition, Marathon requests that the Board approve various alternative thermal effluent limitations for discharges from Marathon's Outfall 001 which shall not exceed certain maximum limits outside an area of mixing waters in Robinson Creek (i.e., "mixing zone") as follow:

"Water temperature in Robinson Creek downstream from the MPC 001 outfall *at a point instream in the vicinity of IL Route 1 bridge* (emphasis added) shall not exceed the maximum limits...."

"In lieu of 35 Ill. Adm. Code 302.102(b)(8), the following... (water temperatures in Robinson Creek) ...shall apply: the area and volume of mixing shall extend from the MPC 001 Outfall *to a point instream in the vicinity of* (emphasis added) IL Route 1 bridge." (See Petition at 22)

24. In its Recommendation, the IEPA suggests that Marathon's description for mixing zone as "the language 'in the vicinity of the IL Route 1 Bridge" be changed to "at the IL Route 1 bridge" each time it is used..." (See IEPA recommendation at 4)

25. The IDNR notes that Marathon's mixing zone descriptions (i.e., "at a point instream of" and. "in the vicinity of") for the location for water quality compliance monitoring with the proposed alternative thermal effluent limitations are both vague and indeterminable, and potentially, would produce insufficient water quality data necessary for demonstrating protection of Bigeye Chub species found in Robinson Creek.

26. Further, Marathon has requested a mixing zone that is greater than the area typically allowed for by 35 Ill. Adm. Code 302.102(b)(8), which dictates that "no more than 50% of the volume

of stream flow shall be used in stream where the dilution ration is less than 3:1, to provide for a zone of passage for aquatic life". IDNR notes that Marathon's compliance point for the proposed thermal effluent limitations would be located approximately 1.7 miles downstream of the outfall. By in effect utilizing this entire volume of downstream stream flow in Robinson Creek, Marathon's request for mixing zone on Robinson Creek fails to provide for a "zone of passage for aquatic life", as required, and further substantiating the likelihood of "take" of the Bigeye Chub.

27. The 2018 UIUC bioassay clearly demonstrates the thermal tolerance sensitivity of the Bigeye Chub, an Illinois listed species, in relationship to the thermal data provided in the Marathon petition. This correlation would suggest greater regulatory protections than merely expanding the mixing zone areas for monitoring thermal water quality compliance. Such regulatory exceptions, in the face of the UIUC demonstrated thermal tolerance data, are obviously contrary to the overall environmental protection goals of both the State Clean Water Act, and the State Endangered Species Protection Act.

28. Nevertheless, the IDNR supports the language suggested by IEPA (i.e., "at the IL Route 1 bridge") as a standard regulatory mechanism to identify the compliance point for Marathon's thermal discharge effluent limitations within Robinson Creek.

29. However given the demonstrated thermal sensitivity of the Bigeye Chub, IDNR proposes the additional regulatory mechanism for "Incidental Taking", as defined and provided for by the Illinois Endangered Species Protection Act, 520 ILCS 10/2, 10/5 and 10/3, for circumstances where a "taking", otherwise prohibited Section 3 of the IESPA, is authorized if a "taking is incidental to, and not the purpose of carrying out of any otherwise lawful activity." The absence of such alternative regulatory mechanisms as "mixing zone" and "Incidental Take Authorization" would impose a burdensome compliance location for monitoring Marathon's Outfall 001 discharges into Robinson Creek, and/or place Marathon's operations in the constant risk of noncompliance for "taking" the Bigeye Chub found in Robinson Creek. This potential noncompliance risk is evidenced by the presence of the Bigeye Chub upstream and downstream of Marathon Outfall 001.

E. Recommendation for Relief

WHEREFORE, Illinois Department of Natural Resources respectfully recommends the following relief for consideration by the Board:

A. That the Board issue a Finding based upon recommendations by IDNR to deny the Marathon 316(a) Petition based on the above-mentioned deficiencies in burden of proof concerning protection and propagation of a species under 35 Ill. Adm. Code 1160, and protection of

threatened and endangered species under 35 Ill. Adm. Code 106.1130(e)(4), unless otherwise cured by review and approval of additional technical data, as described above, and

B. That the Board issue a Finding based upon recommendations by IDNR that requires Marathon to initiate, obtain and complete an Incidental Take Authorization pursuant state statutory and regulatory authority under the Illinois Endangered Species Protection Act, 520 ILCS 10/5.5, and IDNR administrative rules for Incidental Taking of Endangered or Threatened Species, 17 Ill. Adm. Code 1080, respectively, and

C. That the Board issue a Finding based upon recommendations of the IEPA and IDNR that the proposed mixing zone language be revised from "the vicinity of the IL Route 1 bridge" to "at the IL Route 1 bridge" each time such language is used in the Petition and Order of the Board, and

D. That the Board issue a Finding as based upon its authority for these adjudicatory proceedings pursuant to 35 Ill. Adm. Code 106, Subparts A and K.

Respectfully submitted,

Illinois Department of Natural Resources

By: Virginia I. Yang

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DATED: December 28, 2018

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CERTIFICATE OF SERVICE

I, Virginia I. Yang, Legal Counsel for the Illinois Department of Natural Resources, herein certify that I have served a copy of the foregoing REPLY OF THE ILLINOIS DEPARTMENT OF NATURAL RESOURCES TO THE ILLINOIS ENVIRONMENTAL PROTECTION AGENCY RECOMMENDATION, dated September 10, 2018, via electronic mailing upon:

Dan Brown Clerk of the Board
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Attachment A

Suski Lab Technical Report Review No. 2018-003

Interim Report Thermal Tolerance Limits of Bigeye Chub

Submitted by Dr. Cory Suski, PhD, and Qihong Dai, MS
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Dated: December 14, 2018

SUSKI LAB TECHNICAL REPORT SERIES NO. 2018-003

INTERIM REPORT

THERMAL TOLERANCE LIMITS OF BIGEYE CHUB

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Submission Date: December 14, 2018

Intro & background

Rapid changes in water temperature can result in adverse outcomes for fish. At present, virtually no information exists on the thermal limits of bigeye chub (*Hybopsis amblops*). Comprehensive literature searches revealed only a single study related to thermal tolerance in bigeye chub (Lutterschmidt & Hutchison 1997), and this study used a single fish to identify 30.1° C and 31.7° C as the temperatures at which animals lost equilibrium and experienced spasms (respectively) during a dynamic thermal challenge following acclimation to 10° C. Unfortunately, it is difficult to broadly apply results from this single study and make recommendations related to thermal limits for bigeye chub as (1) results from this single study might not be representative of all animals across the range of this species, (2) the sample size in this single study was 1 individual, meaning there is no replication on fish, and (3) the upper thermal limit of ectotherms is heavily influenced by acclimation temperature, with upper limits increasing with higher acclimation temperature (e.g., both upper and lower lethal temperatures of fishes increase during the transition from winter to summer). As such, additional work is needed with bigeye chub to define thermal limits and ecologically relevant endpoints related to thermal stressors, particularly for animals acclimated to different water temperatures.

Based on this background, the objective of the current study was to quantify the thermal tolerance of bigeye chub acclimated to two different temperatures. Concurrent with studies using bigeye chubs, replicate experiments were also carried out using sand shiners (*Notropis stramineus*), a common species often found sympatrically with bigeye chubs, thereby serving as a replicate species to verify the accuracy and precision of the studies and data.

Materials and Methods:

Fish sampling

Bigeye chub used in a pilot study were collected from the Middle Fork Vermilion River (40.201769, -87.734716) at Kennekuk Cove County Park near Danville, IL. On 10/25/2018, a subset (n = 12) of bigeye chub were collected using a seine net, kept in coolers with aerators, and brought back to Illinois Natural History Survey Aquatic Research Facility at University of Illinois at Urbana – Champaign. These 12 animals were held in a single aerated aquarium to confirm that they would transition to eating artificial food in the laboratory. Within 1 day of arriving in the laboratory, animals had successfully transitioned to consuming commercially available dry fish flakes (Freshwater Flakes, Omega One), and it was determined that fish would be amenable to laboratory holding, and that laboratory holding would not negatively impact their condition or response to thermal challenges. Following this pilot study, a second trip to the same location occurred on 10/31/2018 to collect an additional 28 bigeye chub and 40 sand shiners using techniques identical to those listed above; identification of each fish was conducted by DNR biologists to verify species. These fish were again transported to the Aquatic facility as described above.

Fish holding and acclimation

Thermal acclimation for all 40 bigeye chub (the 12 from the pilot study and 28 from the second collection) occurred in two, identical, 110 L glass aquaria. Each aquarium was filled with dechlorinated, conditioned tap water (AquaSafe Plus, Tetra, Blacksburg, VA) and outfitted with a power filter to

maintain water quality (Top Fin Silent Stream). The 40 sand shiner were placed into two smaller glass aquaria (70 L) with identical equipment used to maintain water quality. Two days after being placed in these acclimation aquaria, the temperature of the water i was increased at the rate of 1 °C per day (Xia et al., 2017) using the settings on a heater/chiller attached to the aquarium chiller (Teco TK- 500, TECO-US, Aquarium Specialty, Columbia, SC, USA) until the two aquaria for each species reached to 21° C and 26 °C. The upper acclimation temperature of 26 °C was selected as it corresponds to the 75th percentile of summer water temperatures for the location where fish collected (Illinois Department of Natural Resources, personal communication), and 21° C was the ambient temperature of the room holding the aquaria. Once the target temperature was reached, 10 bigeye chub were randomly selected and moved to a second, identical aquarium outfitted with the same power filter and heater/chiller held at the identical temperature, thereby providing replication for the holding aquariua for bigeye chub (there was no replication for holding aquarium for sand shiners). Thus, altogether, there were 4 acclimation aquaria used for bigeye chub (2 at 21° C and 2 at 26° C), and 2 acclimation aquaria for sand shiners (one at 21° C and one at 26° C). Fish were then held for 21 days at the target acclimation temperature to ensure thermal acclimation, a duration of time that is common for these kinds of studies (Currie et al., 1998; Carveth et al, 2006; Xia et al., 2017). During this acclimation period, lights were automatically turned on at 6 am and off at 6 pm every day by timers, and fish were fed to satiation daily with dry flakes. Dissolved oxygen was measured daily and remained above 90 % saturation (verified with a YSI oxygen meter), and ammonia-N levels remained lower than 5 ppm (verified with an Ammonia Nitrogen Test Kit # 5864-01, LaMotte Company, Chestertown, Md). Every week, 10 % water in each tank was replaced with fresh dechlorinated tap water, and excess food and feces in the bottom of the tank were removed regularly using a siphon. Additional details on water quality and fish size information is shown in Table 1. During holding, there was no sign of any fungus on the fish, and all animals appeared to be robust, healthy and vigorous.

Critical thermal limit testing

Following this 21 day acclimation period, critical thermal limit tests occurred. Prior to testing, all fish were fasted for 24 hours prior to reduce the impact of feeding on any behavioral response. Critical thermal limit testing was carried out in a 75 L plastic storage tote containing 55 L of dechlorinated tap water. The tote contained a 1000 W electric immersion heater (SmartOne), two small aquarium pumps to mix the water (Eheim Universal 600, Germany), and aeration was provided by a small aerator (Tetra Whisper, Blacksburg, VA) attached to an air stone. Preliminary trials indicated that the rate of temperature increase with this heater in this volume of water could accurately be controlled at 0.3 °C per min. The testing tank was outfitted with individually numbered plastic compartments (28 cm long × 15 cm wide × 4 cm high) attached to the side of the tank. These compartments were perforated with holes that allowed water from the tank to enter/leave, but kept fish confined to minimize the likelihood of fish disturbing each other during the test, and making it easier to monitor individuals during the trial. Either 4 or 6 fish were introduced into the compartments in the test tank during each trial, and fish were given 1 hour of acclimation with dissolved oxygen level maintained nearly 100 % saturation (> 7.5 mg/L). The water temperature during this acclimation period was identical to the temperature to which fish were acclimated (either 21 or 26 °C).

After this 1 hour acclimation period, the air stone was removed from the tank, and water temperature was increased at a rate of 0.3 °C per min, a rate that is commonly used (and recommended for) these kinds of studies (Beitinger et al., 2000; Beitinger and Lutterschmidt, 2011). Every fish was closely

observed for two different behavioral responses to increased temperature. First, as temperature increased, fish displayed a number of erratic behaviors including burst swimming and attempts to jump out of their compartment. The temperature when fish showed either of these erratic behaviors was considered the upper incipient avoidance temperature (AT_{max}) (Xia et al., 2017), and this temperature was recorded. Second, the temperature at which fish started to lose body equilibrium was considered to be the critical thermal maxima (CT_{max}) (Beitinger et al., 2000; Xia et al., 2017; Morgan et al., 2018) and was also recorded. Once a fish lost equilibrium, it was quickly removed from its compartment, measured for total length (TL) and total weight (TW), and placed in a nearby holding tank with water at their acclimation temperature. During the trial, temperature was recorded every minute with a YSI handheld meter. Dissolved oxygen was monitored regularly and did not fall below 98 % saturation (> 7.5 mg/L) despite the lack of aeration during observations. Length and weight data for each fish were combined to generate a fish condition score (Fulton's condition factor, K) according to $(TW/(TL^3))*(10^6)$, and data for fish sizes/condition across treatments are shown in Table 1. After the conclusion of all trials, fish were returned to their acclimation aquaria and continued to be fed daily for 72 hours during which time delayed mortality was monitored. Altogether, a total of 8 trials were run for bigeye chubs (4 at each temperature) and 7 trials were run for sand shiners (3 at 26° C and 4 at 21° C). Trials for each temperature group were all run on a single day to minimize the impacts of holding on response to thermal challenges. Total sample size was n = 18 for sand shiner and n = 20 bigeye chub for each acclimation temperature.

Statistical analyses

Comparisons of both CT_{max} and AT_{max} for each temperature were conducted separately for each species using a two-way analysis of variance (ANOVA). The main effects in each model were acclimation temperature (21° C or 26° C), response (either AT_{max} or CT_{max}) and their interaction. If a significant difference was found for any term in the model, *post hoc* analyses to determine differences across factors was performed using a Tukey HSD test. Following the completion of this two-way ANOVA, an additional analysis was conducted to quantify the impacts of TL, TW, trial number, compartment number and holding aquarium (for bigeye chub) on AT_{max} and CT_{max}. For this, a one-way ANOVA was conducted to compare the results of the initial two-way ANOVA (i.e., the model that contained only acclimation temperature, response and their interaction) with the results from the fully parameterized model (i.e., a model that consisted of acclimation temperature, response and their interaction along with terms for TL, TW, trial number, compartment number and holding tank number). All statistical analyses were conducted in R 3.5.1 (R Core Team, 2018) with $p < 0.05$ considered statistically significant.

Results

During the behavioral trials, water temperatures in the tank successfully increased at a rate of approximately 0.3° C per minute. Data showing temperature increase over time for each trial are shown in Figure 1.

Bigeye chub acclimated to 21° C began to show behaviors related to avoidance (AT_{max}) at approximately 30° C, and while bigeye chub acclimated to 26° C displayed avoidance behaviors at approximately 33° C (Figure 2a). Bigeye chub acclimated to 21° C lost equilibrium at approximately 33° C, while individuals acclimated to 26° C lost equilibrium at approximately 36° C (Figure 2a). The temperature that resulted

in equilibrium loss was significantly higher than the temperature that resulted in avoidance behaviors, and the behavioral responses for bigeye chub acclimated to 26° C occurred at temperatures significantly higher than the response of fish acclimated to 21° C (Table 2, Figure 2a).

The behavioral responses of bigeye chub during the thermal tests were not influenced by fish size, fish weight, compartment number or acclimation aquarium (ANOVA, $p > 0.05$). However, the response of bigeye chub to the thermal challenge was significantly influenced by trial number ($p < 0.05$). Inspection of CT_{max} and AT_{max} data across the different trials showed that changes in responses across trials were small, ≤ 1.8° C on average across treatments (Figure 3), but some of the lowest values recorded occurred during the final trial. For example, the AT_{max} for bigeye chub acclimated to 21° C varied from 30.3° C to 28.5° C, with the lowest value recorded during the final trial performed (Figure 3a).

Sand shiners acclimated to 21° C began to show behaviors related to avoidance (AT_{max}) at approximately 28.5° C, and while sand shiners acclimated to 26° C displayed avoidance behaviors at approximately 34° C (Figure 2b). Sand shiners acclimated to 21° C lost equilibrium at approximately 33° C, while individuals acclimated to 26° C lost equilibrium at approximately 37° C (Figure 2a). The temperature that resulted in equilibrium loss was significantly higher than the temperature that resulted in avoidance behaviors, and the behavioral responses for sand shiners acclimated to 26° C occurred at temperatures significantly higher than the response of fish acclimated to 21° C (Table 3, Figure 2b). The behavioral responses of sand shiners during the thermal tests were not influenced by fish size, fish weight, compartment number or trial number (ANOVA, $p > 0.05$).

During the monitoring period that followed the thermal trial, 1 bigeye chub from the 26° C treatment, and 1 sand shiner also from the 26° C treatment, were found to have died. It should be noted, however, that the condition factor for this bigeye chub was 6.12, which is considerably below the average condition factor for fish in the study of approximately 8.5 (Table 1). In addition, the sand shiner that died had a damaged caudal fin that likely occurred during collection.

Discussion

The AT_{max} of bigeye chub in this study was approximately 30° C and 33° C for animals acclimated to 21° C and 26° C (respectively), while CT_{max} was 33° C and 36° C. The lone previous study that quantified thermal tolerance in bigeye chub found that CT_{max} values for fish acclimated to 10° C was 30.1° C (Lutterschmidt and Hutchison 1997); this value was obtained using observations from only a single fish, however. The CT_{max} values generated in the current study are comparable to similar species acclimated to similar temperatures. For example, previous work with creek chubs (*Semotilus atromaculatus)* also acclimated to 26° C showed a CT_{max} value of 35.7° C (Smale and Rabeni, 1995), while the CT_{max} of blackstripe topminnow (*Fundulus notatus*), red shiners (*Notropis lutrensis*) and bullhead minnows (*Pimephales vigilax*) all acclimated to 30.0° C were 41.55, 39.12 and 39.16 ° C respectively (Rutledge and Beitinger 1989).

We are confident that our study design is sound and robust, and generated defendable data. For example, previous work by Smale and Rabeni (1995) acclimated sand shiners to 26° C and showed a CT_{max} value of 37.0° C, which is almost identical to results generated in the current study. In addition, previous work has shown that CT_{max} values should correlate positively with acclimation temperature,

such that fish acclimated to higher temperatures should have improved thermal tolerances relative to fish acclimated to lower temperatures (Beitinger et al. 2000), which is a trend that we observed for data with both fish species. While we noted that there was a significant effect of trial number on the behavioral response of bigeye chub to thermal testing, visual inspection of our data did not indicate any strong trends in the data, and variation thermal responses across trials was small. It is possible that this impact did indeed result from a change in thermal responses of bigeye chub across trials. All trials for a were conducted on a single day to eliminate the possibility of a day effect, and, as such, trials performed later in the day were approaching the time when bigeye chubs would have been held in darkness as per the 12 h light/12 h dark photoperiod used during acclimation, which could have been the source of the trial effect that we noted. However, this finding could also be due to random 'noise' in the data that occurred due to chance, and additional studies would be required to corroborate this hypothesis. Note that there was no effect of trial number on the response of sand shiners to thermal challenges. In any case, we feel that the variation in thermal responses across trials is sufficiently small that it is not biologically meaningful in assessing the CT_{max} and AT_{max} of bigeye chubs, and that the data generated in this study are sound, robust and defendable.

We saw very little indication that the thermal testing resulted in mortality for either fish species. There were a total of 2 mortalities during this study, one fish of each species. It is possible, however, that these 2 individuals were not in optimum health prior to the start of the trial, however, and that this poor condition contributed to mortality. More specifically, the sand shiner had a damaged caudal fin, while the bigeye chub that died had a condition factor considerably below the study average, indicating a low weight for its length that could have resulted from reduced food intake. Typically, studies that intentionally target mortality during thermal testing (upper incipient lethal temperature, UILT) to generate data on lethal endpoints will design experiments to identify the temperature at which 50 % of a 'population' experiences mortality (Hasnain et al. 2013). As such, it is difficult to draw conclusions related to mortality from the current data as the level of mortality was quite low (approximately 5 % of the populations), and may have resulted from sub-optimal condition of the test fish.

References

Beitinger, T. L. and W. I. Lutterschmidt. 2011. Measures of thermal tolerance. Pages 1695-1702 in Encyclopedia of Fish Physiology. Edited by A. P. Farrell. Academic Press.

Beitinger, T. L., Bennett, W. A., & McCauley, R. W. (2000). Temperature tolerances of North American freshwater fishes exposed to dynamic changes in temperature. Environmental Biology of Fishes, 58(3), 237-275.

Carveth, C. J., Widmer, A. M., & Bonar, S. A. (2006). Comparison of upper thermal tolerances of native and nonnative fish species in Arizona. Transactions of the American Fisheries Society, 135(6), 1433-1440.

Currie, R. J., Bennett, W. A., & Beitinger, T. L. (1998). Critical thermal minima and maxima of three freshwater game-fish species acclimated to constant temperatures. Environmental Biology of fishes, 51(2), 187-200.

Hasnain, S.S., Shuter, B.J. and Minns, C.K., 2013. Phylogeny influences the relationships linking key ecological thermal metrics for North American freshwater fish species. Canadian Journal of Fisheries and Aquatic Sciences, 70(7), pp.964-972.

Lutterschmidt, W.I. and Hutchison, V.H., 1997. The critical thermal maximum: data to support the onset of spasms as the definitive end point. Canadian Journal of Zoology, 75(10), pp.1553-1560.

Morgan, R., Finnøen, M. H., & Jutfelt, F. (2018). CT max is repeatable and doesn't reduce growth in zebrafish. Scientific reports, 8(1), 7099.

Rutledge, C.J. and Beitinger, T.L., 1989. The effects of dissolved oxygen and aquatic surface respiration on the critical thermal maxima of three intermittent-stream fishes. Environmental Biology of Fishes, 24(2), pp.137-143.

Smale, M.A. and Rabeni, C.F., 1995. Hypoxia and hyperthermia tolerances of headwater stream fishes. Transactions of the American Fisheries Society, 124(5), pp.698-710.

Xia, J., Ma, Y., Fu, C., Fu, S., & Cooke, S. J. (2017). Effects of temperature acclimation on the critical thermal limits and swimming performance of *Brachymystax lenok tsinlingensis*: a threatened fish in Qinling Mountain region of China. Ecological research, 32(1), 61-70.

Table. 1. Water quality parameters and fish sizes for bigeye chub and sand shiners held for 21 days at either 21° C or 26° C prior to behavioral testing. Data are shown as mean ± standard deviation (SD). Sample sizes are 40 bigeye chub and 36 sand shiner.

Species	Acclimation Temperature	Water Temperature (° C)	Total Length (TL) (mm)	Total weight (TW) (g)	Condition Factor (K)
Bigeye chub	21	21.1 ± 0.2	68.5 ± 7.2	2.9 ± 0.9	8.7 ± 0.6
	26	26.0 ± 0.2	68.2 ± 5.7	2.7 ± 0.7	8.3 ± 1.0
Sand shiner	21	21.2 ± 0.3	59.0 ± 4.0	1.8 ± 0.3	8.9 ± 0.7
	26	26.1 ± 0.3	60.2 ± 4.0	1.9 ± 0.4	8.5 ± 0.5

Table 2. Results of a two-way analysis of variance (ANOVA) comparing the effect of acclimation temperature (either 21° C or 26° C), behavioral response (either AT_{max} or CT_{max}), and the interaction of acclimation and behavioral response, on the temperature at which bigeye chub displayed behavioral changes. Data are shown in Figure 2a, and significant factors are shown in the table in bold text.

	DF	Sum of Squares	F	P-Value
Response	1	**180.00**	**162.445**	**< 0.001**
Acclimation Temperature	1	**244.30**	**220.475**	**< 0.001**
Response × Acclimation	1	0.00	0.004	0.949
Residuals	76	84.21		

Table 3. Results of a two-way analysis of variance (ANOVA) comparing the effect of acclimation temperature (either 21° C or 26° C), behavioral response (either AT_{max} or CT_{max}), and the interaction of acclimation and behavioral response, on the temperature at which sand shiner displayed behavioral responses. Data are shown in Figure 2b, and significant factors are shown in bold text.

	DF	Sum of Squares	F	P-Value
Response	**1**	**269.9**	**77.2**	**< 0.001**
Acclimation Temperature	**1**	**359.1**	**102.7**	**< 0.001**
Response × Acclimation	1	7.7	2.231	0.949
Residuals	68	237.7		

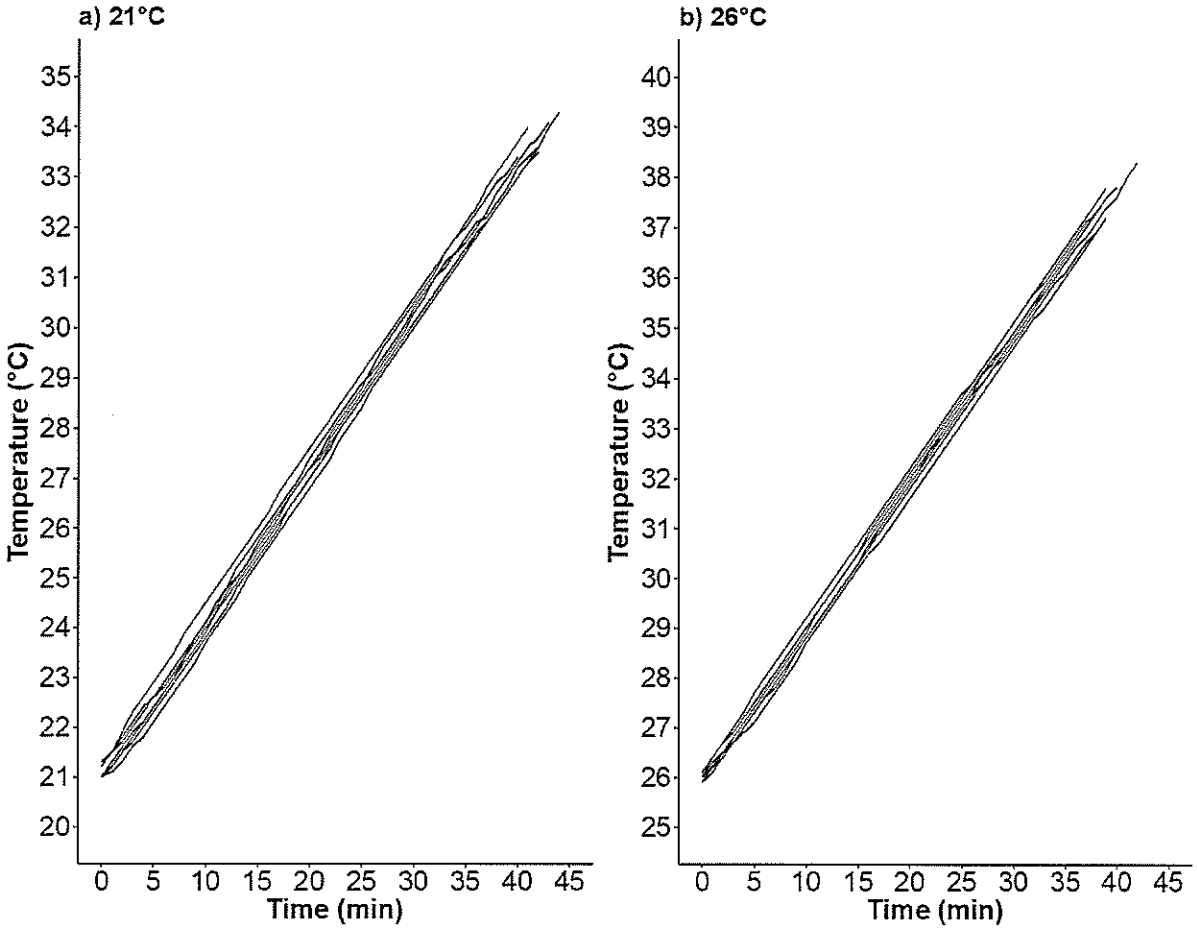

Figure 1. Change in water temperature over time during thermal tests for bigeye chub and sand shiner acclimated to (a) 21° C and (b) 26° C. Water temperature was recorded every minute from the test tank using a handheld YSI oxygen meter. Each panel contains shows trials for both bigeye chubs and sand shiners combined. There were a total of 7 trials run at 26° C (4 for bigeye chub and 3 for sand shiner) and 8 trials run at 21° C (4 for each species).

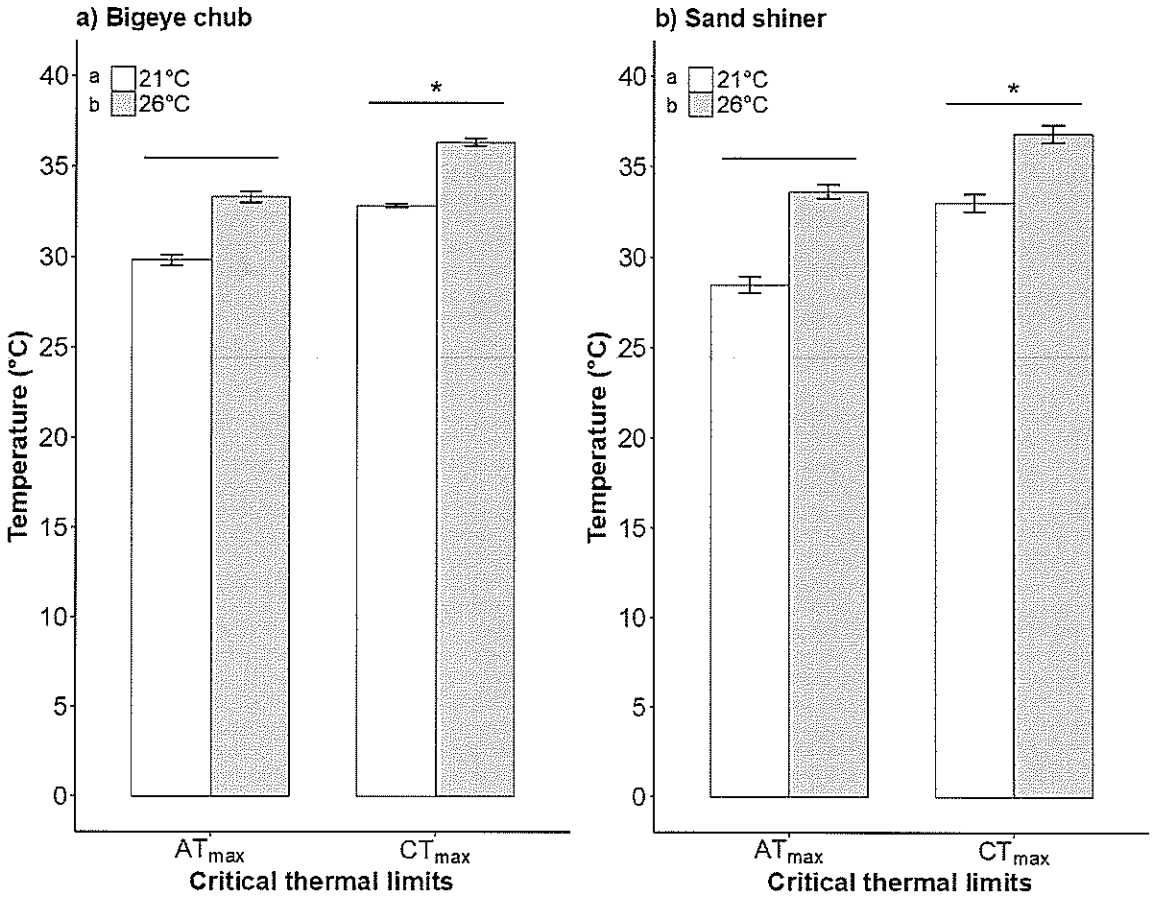

Figure 2. Temperature at which bigeye chub (a) and sand shiner (b) showed either avoidance behaviors (AT_{max}) or lost equilibrium (CT_{max}) after being acclimated to either 21° C (open bars) or 26° C (shaded bars). Results from statistical tests are shown in Tables 2 and 3. The asterisk (*) indicates a significant difference between CT_{max} and AT_{max}, while letters in the legend denote differences across acclimation temperatures. Data are presented as the mean ± se, and sample sizes are n = 36 sand shiners (18 fish per acclimation temperature) and n = 40 bigeye chubs (20 fish per acclimation temperature).

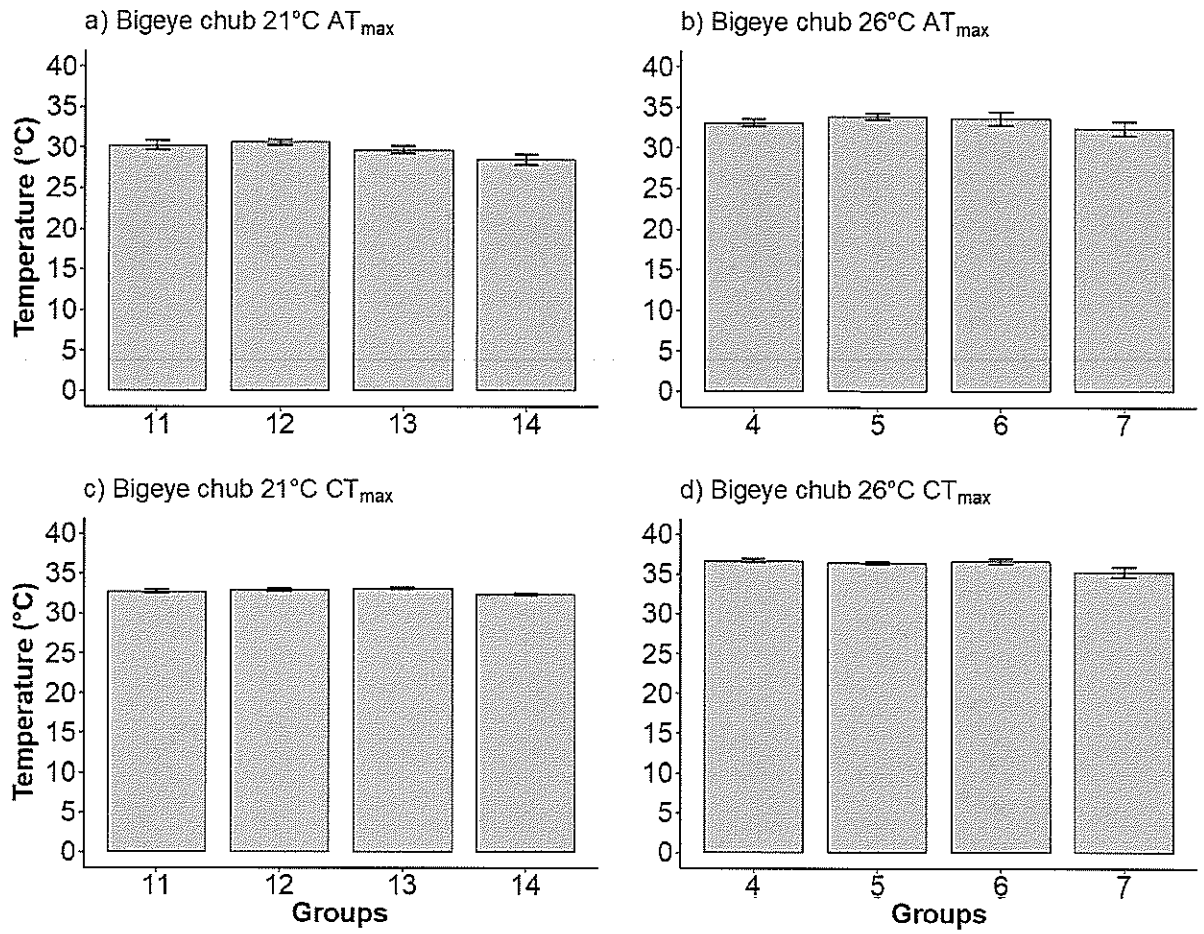

Figure 3. Temperature at which bigeye chub showed either avoidance behaviors (AT_{max}, panels a and b) or lost equilibrium (CT_{max}, panels c and d) after being acclimated to either 21° C (panels a and c) or 26° C (panels b and d). For each temperature/response combination, data were generated across 4 replicate trials (groups), with each bar in the figure corresponding to 1 trial. Six fish were observed in each trial (group).

Attachment B

IDNR EcoCAT Consultation No. 1808455,

IDNR Letter to IEPA, dated December 28, 2018

ILLINOIS DEPARTMENT OF NATURAL RESOURCES

Illinois Department of
Natural Resources

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Bruce Rauner, Governor
Wayne A. Rosenthal, Director

December 28, 2018

Mr. Scott Twait
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RE: Alternative Thermal Effluent Limitations, Section 316(a) of the Clean Water Act and 35 Ill. Adm. Code 304.141(c). Marathon Petroleum Company LP Refinery, and Technical Review of UIUC Study of Thermal Tolerance Limits of Bigeye Chub EcoCAT Review #1808455

Dear Mr. Twait:

This letter serves as a follow-up to our previous letter[1] submitted on March 29, 2018 pursuant to the *Illinois Endangered Species Protection Act* [520 ILCS 10/11], the *Illinois Natural Areas Preservation Act* [525 ILCS 30/17], and Title 17 *Illinois Administrative Code* Part 1075. New information has become available regarding potential impacts to state-endangered Bigeye Chub (*Hybopsis amblops*) which necessitated the consultation be re-opened. The new information in reference is a study by Dr. Cory Suski and Qihong Dai of the University of Illinois at Urbana-Champaign (UIUC) titled "Thermal Tolerance Limits of Bigeye Chub" (attached).[2] This letter also serves as a technical review by the Department of the UIUC study.

The proposed action being reviewed is a petition by the Marathon Petroleum Company (Marathon) to the Illinois Pollution Control Board (Board; Case PCB 2018-049) requesting *Alternative Thermal Effluent Limitations* pursuant to Section 316(a) of the *Clean Water Act* for its petrochemical refinery plant in Robinson, Illinois. The Illinois Environmental Protection Agency (IEPA) submitted its recommendation to the Board to grant the petition on September 10, 2018. The IEPA rendered no opinion on the Department's March 29, 2018 consultation letter.[1]

The Department recommended in the March 29, 2018 letter[1] that a bioassay of the upper thermal limits of the state-endangered Bigeye Chub be completed to determine whether "take," (as defined in the *Illinois Endangered Species Protection Act* [520 ILCS 10/2] to include *"...harm, wound, kill, destroy, harass..."*) is, or is not, occurring as a result of Marathon's thermal effluent. The Bigeye Chub is known to occur in the immediate vicinity of Marathon's outfall in Robinson Creek (RC05), as well as upstream (RC02) and downstream (RC09) of the outfall.[3] Prior to the recent UIUC study, the only scientific research on the thermal tolerance of the Bigeye Chub was limited to one test performed on a single

animal (n = 1) acclimated to 10° C (50.0° F) where 30.1° C (86.2° F) and 31.7° C (89.1° F) were the temperatures where the fish lost equilibrium and experienced spasms, respectively (Lutterschmidt and Hutchison 1997).[4]

The Lutterschmidt and Hutchison study,[4] serving as the only available information at the time, suggested that the *Alternative Thermal Effluent Limitation* requested by Marathon may cause "take" of the Bigeye Chub. This concern was the basis for the recommendation in the Department's March 29, 2018 letter[1] for Marathon to pursue an Incidental Take Authorization (ITA) for the species. However, the Department, along with Marathon and their consultants, also agreed that the study[4] could be criticized on several grounds (e.g. low acclimation temperature, geographic differences, and use of only one specimen). Therefore, the Department also recommended a *bioassay of the upper thermal tolerance limits of the Bigeye Chub* be completed using specimens from the Wabash Valley in Illinois.[1] Marathon declined to complete, or cause to be completed, the bioassay study or pursue the ITA in their response[5] filed with the Board dated August 14, 2018 and IEPA rendered no opinion on the Department's letter[1] in their September 10, 2018 filing with the board.[6] In anticipation of these decisions, the Department executed a contract with the UIUC to complete the bioassay study on the Bigeye Chub.

UIUC Study Summary:

In cooperation with Midwest Biodiversity Institute (MBI; Marathon's consultant), the original intent of the UIUC study was to include a lethal endpoint so that the data could be easily applicable to a Fish Temperature Modeling System (FTMS) used to determine protective temperatures for representative fish species. However, the UIUC's Institutional Animal Care and Use Committee unexpectedly declined to approve a subset of Bigeye Chubs to be taken to a lethal endpoint. Therefore, the study was limited to non-lethal thermal tolerance of the upper incipient avoidance temperature (AT_{max}) where the fish show erratic behaviors, and critical thermal maxima (CT_{max}) where the fish started to lose body equilibrium.[2] It is the Department's opinion that while a lethal endpoint would be useful to advance this area of science and be applicable to FTMS models, it is not necessary for the Department to determine the likelihood of "take," which includes non-lethal "harm and harassment."

The results of the UIUC study[2] indicate:

- Bigeye Chubs (n = 20) acclimated to 21° C (69.8° F) show avoidance behaviors at approximately 30° C (86.0° F) and lost equilibrium (CT_{max}) at 33° C (91.4° F).

- Bigeye Chubs (n = 20) acclimated to a higher temperature of 26° C (78.8 ° F) show avoidance behaviors at 33° C (91.4° F) and lost equilibrium (CT_{max}) at 36° C (96.8° F).

  **The higher acclimation temperature of 26° C (78.8 ° F) was selected in the study as it corresponds to the 75th percentile of summer water temperatures in the Middle Fork of the Vermilion River where the fish were collected and is also representative of Robinson Creek where 25° - 27° C were used in MBI's FTMS models.*[3]

Using a conservative approach and considering only AT_{max} and CT_{max} for Bigeye Chubs acclimated to 26° C (78.8 ° F), the UIUC study results suggest that:

- "take" in the form of "harassment" where the fish is forced to evacuate aquatic habitat areas in the thermal effluent of Robinson Creek begins at 33° C (91.4° F), and

- "take" in the form of "harm" where the fish is unable to properly swim, avoid predators, and is at increased risk of mortality begins at 36° C (96.8° F).

Comparing the UIUC study results to Marathon's effluent temperature monitoring and modeling in Robinson Creek:

- Temperature monitoring immediately downstream (RC05) of the Marathon outfall (MPC 001) reached 92.0 to 92.3 in July and August, 2016, respectively.[3] This exceeds AT_{max} (91.4° F) according to the UIUC study.[2]

- A Datasonde continuous monitor deployed at the compliance point (RC07; located 1.7 miles downstream of MPC 001 at the IL Rt. 1 bridge) showed temperatures reached 91.6 in June, 2016.[3] This exceeds AT_{max} (91.4° F) according to the UIUC study.[2]

- Environmental Fluid Dynamics Code (EFDC) modeling by MBI for the period 2011 – 2016 at compliance point RC07 located 1.7 miles downstream indicate temperatures could be reaching up to 94.7° F (Table 4),[3] which is only 2.1° F from the point of physical harm (96.8° F) to the Bigeye Chub.[2]

- Effluent temperatures at the MPC 001 outfall recorded from 2002 -2016 averaged 97° F and reached a maximum of 100.0° F on two occasions during summer peak temperatures (Exhibit 3).[7] Although, it is not clear why EFDC modeling at RC05 located immediately downstream of the effluent show temperatures less than RC07 (up to 92.6° F). The temperature would be expected to have an increasing gradient moving from downstream to upstream towards the discharge point.

- If modeling suggests temperatures could reach 94.7° F at the RC07 compliance point and effluent monitoring at the MPC outfall 1.7 miles upstream has reached 100.0° F, it is therefore reasonable to derive that temperatures in the 1.7 mile section of Robinson Creek (the "mixing zone") could reach between 94.7 and 100.0°F during the summer, exceeding the *Alternative Thermal Effluent Limitation.*

- While the UIUC study did not include a lethal endpoint, Table 10 of the MBI report[3] reveals species in the same family with a similar AT_{max} as Bigeye Chub to have an Upper Incipient Lethal Temperature (UILT) of approximately 96.8° F (e.g. Spotfin Shiner *Cyprinella spiloptera* and Bluntnose Minnow *Pimephales notatus*), suggesting the Bigeye Chub in the UIUC study were likely "near" their UILT.

- The UIUC study[2] and MBI report[3] do not account for all unforeseen environmental variables that stress aquatic life and can be further exasperated by increased water temperatures. These variables include, but are not limited to: nutrient loading via agriculture and wastewater treatment (a wastewater treatment facility is located upstream of the Marathon outfall), pesticide applications, algae blooms, decomposition processes, and disease. All these variables can: reduce dissolved

oxygen, stress fish and reduce their tolerances, be influenced by increased water temperatures, and result in fish kill events. Evidence of fish stress already exists in Robinson Creek given the high number of Deformities, Eroded fins, Lesions, and Tumors (DELTs) noted by MBI and discussed in our previous letter.[1]

Based on the circumstances discussed in this letter, it is the Department's opinion that Marathon's *Alternative Thermal Effluent Limitation* is at "high risk" of causing "take" in the form of harassment during peak summer temperatures. Further, there are also "apparent risks" of "take" through physical harm and possible mortality due to Marathon's effluent temperatures that may also be further exasperated by other environmental variables occurring in Robinson Creek.

Therefore, to avoid liabilities and maintain compliance with the *Illinois Endangered Species Protection Act,* [520 ILCS 10/] the Department recommends:

- Marathon submit a conservation plan to our Office of Resource Conservation in pursuit of an ITA for the state-endangered Bigeye Chub. All matters pertaining to ITA should be directed to the ITA coordinator, Jenny Skufca (jenny.skufca@illinois.gov). Information on applying for an ITA can be found at:
  https://www.dnr.illinois.gov/conservation/NaturalHeritage/Pages/ApplyingforanIncidentalTakeAuthorization.aspx

- The Department also recommends the IEPA consider, in their regulatory decisions, Section 11(b) of the *Illinois Endangered Species Protection Act* [520 ILCS 10/11], which states:

  "... such State or local agency shall be deemed to have complied with its obligations under the "Illinois Endangered Species Act", provided the agency action shall not result in the killing or injuring of any Illinois listed animal species, or provided that authorization for taking a listed species has been issued under Section 4, 5, or 5.5 of this Act."

Consultation on the part of the Department is closed unless the IEPA desires additional information or advice related to these recommendations. Pursuant to 1075.40(h), please notify the Department of the IEPA's decision regarding these recommendations. Consultation for Part 1075 is valid for two years unless new information becomes available which was not previously considered; the proposed action is modified; or additional species, essential habitat, or Natural Areas are identified in the vicinity. If the recommended action has not been implemented within two years of the date of this letter, or any of the above listed conditions develop, a new consultation is necessary.

The Department's natural resource review reflects the information existing in the Illinois Natural Heritage Database at the time of the project submittal, and should not be regarded as a final statement on the project being considered, nor should it be a substitute for detailed site surveys or field surveys required for environmental assessments. If additional protected resources are unexpectedly encountered during the project's implementation, the applicant must comply with the applicable statutes and regulations.

Please contact me with any questions about these recommendations.

Sincerely,

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ATCH. Suski Lab Technical Report Series No. 2018-003. Interim Report: Thermal Tolerance Limits of Bigeye Chub. December 14, 2018.

cc: Katherine Hodge, Heplerbroom, LLC – Representing Marathon Petroleum Company LP
Chris Yoder – Midwest Biodiversity Institute
Marty Sneen – EA Engineering
IDNR, Legal
IDNR, ORC

References

[1] Illinois Department of Natural Resources Consultation letter dated March 29, 2018 to the Illinois Environmental Protection Agency. EcoCAT # 1808455

[2] Suski Lab Technical Report Series No. 2018-003. Interim Report: Thermal Tolerance Limits of Bigeye Chub. December 14, 2018

[3] Midwest Biodiversity Institute (MBI). 2017.Exhibit 4: Technical Support Documentation for Alternative Thermal Effluent Limitations under Section 316(a) of the Clean Water Act and 35 Ill. Adm. Code 304.141(c) for the Marathon Petroleum Company LP Refinery located in Robinson, Illinois. Illinois Pollution Control Board, Case # PCB 2018-049

[4] William I. Lutterschmidt and Victor H. Hutchinson. 1997. The Critical Thermal Maximum: Data to Support the Onset of Spasms as the Definitive Endpoint. Canadian Journal of Zoology. pp.1553-1560.

[5] Marathon Petroleum Company LP's Response dated August 14, 2018 to the Illinois Department of Natural Resources' Consultation Letter, Dated March 29, 2018. Illinois Pollution Control Board, Case # PCB 2018-049

[6] Recommendation of the Illinois Environmental Protection Agency and appearance of Sara G. Terranova on behalf of the Illinois Environmental Protection Agency. September 10, 2018. Illinois Pollution Control Board, Case # PCB 2018-049

[7] Midwest Biodiversity Institute (MBI). 2017.Exhibit 3: Effluent Temperatures. Petition to Approve Alternative Thermal Effluent Limitations. Marathon Petroleum Company LP Refinery located in Robinson, Illinois. Illinois Pollution Control Board, Case # PCB 2018-049