

**Kansas Department of Wildlife, Parks & Tourism  
2023 Species Listing Review**

Species being reviewed: \_\_\_\_\_ **Shoal Chub, *Macrhybopsis hyostoma*** \_\_\_\_\_

Reviewer: \_\_\_\_\_ Date: 12/22/2013

(Using your experience and knowledge, please indicate the most appropriate number in each category to help with our evaluation process.)

**Species status:**

1) Populations and Trends

- a) Kansas populations in relation to global populations.
  - Kansas population constitutes <10% of global population and not geographically isolated. **2 X**
  - Kansas population constitutes 10-25% of global population and not geographically isolated. 4
  - Kansas population is geographically isolated and constitutes <25% of global population. 5
  - Kansas population constitutes 25-50% of global population. 6
  - Kansas population constitutes >50% of global population. 8
  - Kansas population is total global population. 10
  
- b) Population trend within **Kansas** during the past 35 years.
  - Population increasing. 0
  - Population stable or cyclic (within 10% of stable mean). 1
  - Population reduced 10-29%. **3 X**
  - Population reduced 30-59%. 6
  - Population reduced 60-90%. 9
  - Population reduced >90%.
  
- c) Population trend within **global range** during the past 35 years.
  - Population increasing. 0
  - Population stable or cyclic (within 10% of stable mean). 1
  - Population reduced 10-29%. **3 X**
  - Population reduced 30-59%. 6
  - Population reduced 60-90%. 9
  - Population reduced near 100%. 10

2) Rarity (density within current range). When considering a migratory species, the evaluation should apply to that period while the animal is within the state.

- a) Within **Kansas**.
  - Common, easily found throughout range. 0
  - Frequently found at many points. **2 X**
  - Frequently found at few points. 4
  - Infrequently found at many points. 6
  - Infrequently found at few points. 8
  - Rarely found at any point, never concentrated. 10

- b) Within **global range**.
  - Common, easily found throughout range. 0
  - Frequently found at many points. 2
  - Frequently found at few points. 4
  - Infrequently found at many points. **6 X**
  - Infrequently found at few points. 8
  - Rarely found at any point, never concentrated. 10
  
- 3) Current Breeding Biology.
  - a) Residency status.
    - Peripheral or casual (no breeding population). 0
    - Regular migrants that do not winter in KS. 3
    - Migrants wintering but not breeding in KS. 4
    - Migrants breeding in Kansas. 8
    - Year-round resident. **10 X**
  
  - b) Reproduction within Kansas.
    - Normal number of young per brood or litter (or does not breed in KS). 0
    - Slight reduction from normal reproduction. **3 X**
    - Reproduction severely decreased from normal. 7
    - Reproduction near zero. 10
  
- 4) Distribution change during the past 35 years.
  - a) Distribution within Kansas.
    - Distribution unchanged or increasing. 0
    - Distribution reduced up to 30%. **3 X**
    - Distribution reduced 30 to 59%. 6
    - Distribution reduced 60 to 90%. 9
    - Distribution reduced >90%. 10
  
  - b) Global range distribution.
    - Distribution unchanged or increasing. 0
    - Distribution reduced up to 30%. **3 X**
    - Distribution reduced 30 to 59%. 6
    - Distribution reduced 60 to 90%. 9
    - Distribution reduced >90%. 10

**Habitat Status**

- 5) Loss of suitable habitat during the past 35 years.
  - a) Within Kansas.
    - No habitat loss or habitat increasing. 0
    - Habitat loss up to 30%. **3 X**
    - Habitat loss 30-59%. 6

- Habitat loss 60-90%. 9
  - Habitat loss >90% . 10
- b) Within global range.
- No habitat loss or habitat increasing. 0
  - Habitat loss up to 30%. **3 X**
  - Habitat loss 30-59%. 6
  - Habitat loss 60-90%. 9
  - Habitat loss >90% . 10

## Vulnerability

- 6) Specialization.
- No limiting specialization, highly adaptable. 0
  - Slightly limiting specialization, moderately adaptable. 4
  - Moderately specialized (narrow niche in regard to habitat or food). **7 X**
  - Highly specialized (very narrow niche, extremely low adaptability). 10
- 7) Sensitivity to Environmental Contaminants. **best guess**
- No problems associated with pollutants or pesticides. 0
  - Slight sensitivity to pollutants or pesticides. 4
  - Moderate sensitivity to pollutants or pesticides. **6 X**
  - High sensitivity to pollutants or pesticides. 8
  - Pollutants or pesticides known to be suppressing population. 10
- 8) Exploitation within Kansas.
- a) Species vulnerability to consumptive uses.
- None current or anticipated. **0 X**
  - Low. 3
  - Moderate. 7
  - High. 10
- b) Habitat exploitation threat.
- None current or anticipated. 0
  - Low. 3
  - Moderate. **7 X**
  - High. 10
- 9) Recovery capacity.
- Recovery not needed, species not in jeopardy. **0**
  - Recovery potential excellent as species responds well to management. 2
  - Recovery potential good; some management difficulty. 4
  - Recovery potential fair due to habitat or management problems. 6
  - Recovery potential poor due to habitat or management problems. 8
  - Recovery potential impossible due to unsolvable population, habitat. 10  
or management problems.

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Using the following definitions and using your best scientific judgment, which category does this species best fit:

Endangered Species: any species of wildlife whose continued existence as a viable component of the state's wild fauna is determined to be in jeopardy (KSA 32-958c).

Threatened Species: any species of wildlife which appears likely, within the foreseeable future, to become an endangered species (KSA 32-958f).

Species-in-Need-of-Conservation: (SINC) those species which are highly specialized, whose habitat is very limited in Kansas, or show population declines that warrant data collection concerning its status in Kansas. Conservation efforts focused on these species can prevent future listing as threatened or endangered.

Unlisted: This species population does not have the characteristics that qualify it for one of the above categories. It has a healthy or recovered population that is either stable or increasing or it no longer can be considered a viable component of the Kansas fauna.

Recommended listing (check one)

Endangered in Kansas

Threatened in Kansas

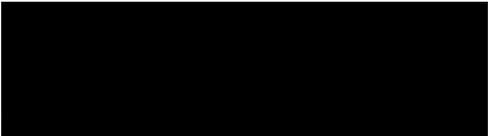
Species-in-need-of-conservation

Unlist (is not or is no longer a viable component of the Kansas fauna)

Unlist (species status is stable to increasing and considered healthy or recovered)

Please provide comments to support recommended listing and any other information you think is pertinent that may have been omitted from the petition (use as much space as needed).

Signature

 12/22/2023 \_\_\_\_\_

Return by January 31, 2024 to: [Jordan.Hofmeier@ks.gov](mailto:Jordan.Hofmeier@ks.gov)

**Kansas Department of Wildlife, Parks & Tourism  
2023 Species Listing Review**

Species being reviewed: Shoal Chub

Reviewer: [REDACTED]

Date: 2-January-2024

(Using your experience and knowledge, please indicate the most appropriate number in each category to help with our evaluation process.)

**Species status:**

1) Populations and Trends

- a) Kansas populations in relation to global populations.
  - Kansas population constitutes <10% of global population and not geographically isolated. 2
  - Kansas population constitutes 10-25% of global population and not geographically isolated. 4
  - Kansas population is geographically isolated and constitutes <25% of global population. 5
  - Kansas population constitutes 25-50% of global population. 6
  - Kansas population constitutes >50% of global population. 8
  - Kansas population is total global population. 10
  
- b) Population trend within **Kansas** during the past 35 years.
  - Population increasing. 0
  - Population stable or cyclic (within 10% of stable mean). 1
  - Population reduced 10-29%. 3
  - Population reduced 30-59%. 6
  - Population reduced 60-90%. 9
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- c) Population trend within **global range** during the past 35 years.
  - Population increasing. 0
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  - Population reduced 10-29%. 3
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  - Population reduced 60-90%. 9
  - Population reduced near 100%. 10

2) Rarity (density within current range). When considering a migratory species, the evaluation should apply to that period while the animal is within the state.

- a) Within **Kansas**.
  - Common, easily found throughout range. 0
  - Frequently found at many points. 2
  - Frequently found at few points. 4
  - Infrequently found at many points. 6

• Infrequently found at few points.	8
• Rarely found at any point, never concentrated.	10
b) Within <b>global range</b> .	
• Common, easily found throughout range.	0
• Frequently found at many points.	2
• <b>Frequently found at few points.</b>	4
• Infrequently found at many points.	6
• Infrequently found at few points.	8
• Rarely found at any point, never concentrated.	10
3) Current Breeding Biology.	
a) Residency status.	
• Peripheral or casual (no breeding population).	0
• Regular migrants that do not winter in KS.	3
• Migrants wintering but not breeding in KS.	4
• Migrants breeding in Kansas.	8
• <b>Year-round resident.</b>	10
b) Reproduction within Kansas.	
• <b>Normal number of young per brood or litter</b> (or does not breed in KS).	0
• Slight reduction from normal reproduction.	3
• Reproduction severely decreased from normal.	7
• Reproduction near zero.	10
4) Distribution change during the past 35 years.	
a) Distribution within Kansas.	
• <b>Distribution unchanged or increasing.</b>	0
• Distribution reduced up to 30%.	3
• Distribution reduced 30 to 59%.	6
• Distribution reduced 60 to 90%.	9
• Distribution reduced >90%.	10
b) Global range distribution.	
• <b>Distribution unchanged or increasing.</b>	0
• Distribution reduced up to 30%.	3
• Distribution reduced 30 to 59%.	6
• Distribution reduced 60 to 90%.	9
• Distribution reduced >90%.	10

### Habitat Status

5) Loss of suitable habitat during the past 35 years.	
a) Within Kansas.	
• <b>No habitat loss or habitat increasing.</b>	0

- Habitat loss up to 30%. 3
  - Habitat loss 30-59%. 6
  - Habitat loss 60-90%. 9
  - Habitat loss >90%. 10
- b) Within global range.
- No habitat loss or habitat increasing. 0
  - Habitat loss up to 30%. 3
  - Habitat loss 30-59%. 6
  - Habitat loss 60-90%. 9
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## Vulnerability

- 6) Specialization.
- No limiting specialization, highly adaptable. 0
  - Slightly limiting specialization, moderately adaptable. 4
  - Moderately specialized (narrow niche in regard to habitat or food). 7
  - Highly specialized (very narrow niche, extremely low adaptability). 10
- 7) Sensitivity to Environmental Contaminants.
- No problems associated with pollutants or pesticides. 0
  - Slight sensitivity to pollutants or pesticides. 4
  - Moderate sensitivity to pollutants or pesticides. 6
  - High sensitivity to pollutants or pesticides. 8
  - Pollutants or pesticides known to be suppressing population. 10
- 8) Exploitation within Kansas.
- a) Species vulnerability to consumptive uses.
- None current or anticipated. 0
  - Low. 3
  - Moderate. 7
  - High. 10
- b) Habitat exploitation threat.
- None current or anticipated. 0
  - Low. 3
  - Moderate. 7
  - High. 10
- 9) Recovery capacity.
- Recovery not needed, species not in jeopardy. 0
  - Recovery potential excellent as species responds well to management. 2
  - Recovery potential good; some management difficulty. 4
  - Recovery potential fair due to habitat or management problems. 6
  - Recovery potential poor due to habitat or management problems. 8

- Recovery potential impossible due to unsolvable population, habitat. 10 or management problems.

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Using the following definitions and using your best scientific judgment, which category does this species best fit:

Endangered Species: any species of wildlife whose continued existence as a viable component of the state's wild fauna is determined to be in jeopardy (KSA 32-958c).

Threatened Species: any species of wildlife which appears likely, within the foreseeable future, to become an endangered species (KSA 32-958f).

Species-in-Need-of-Conservation: (SINC) those species which are highly specialized, whose habitat is very limited in Kansas, or show population declines that warrant data collection concerning its status in Kansas. Conservation efforts focused on these species can prevent future listing as threatened or endangered.

Unlisted: This species population does not have the characteristics that qualify it for one of the above categories. It has a healthy or recovered population that is either stable or increasing or it no longer can be considered a viable component of the Kansas fauna.

Recommended listing (check one)

Endangered in Kansas

Threatened in Kansas

Species-in-need-of-conservation

Unlist (is not or is no longer a viable component of the Kansas fauna)

Unlist (species status is stable to increasing and considered healthy or recovered)

Please provide comments to support recommended listing and any other information you think is pertinent that may have been omitted from the petition (use as much space as needed).

The Shoal Chub (*Macrhybopsis hyostoma*) is a small freshwater fish native to North America. It's found in the Mississippi River basin and the West Gulf Slope, ranging from eastern Ohio and southern Minnesota to southern Louisiana and eastern Texas. Specifically to Kansas, the Shoal Chub can be found in the Republican River and Kansas River but likely represents less than 10% of the global population. Range-wide, Shoal Chub population trends appear relatively stable but cyclic depending on habitat availability and water conditions where adults can readily take advantage of favorable conditions and produce a strong year class. Overall and I believe the KDWP Petition supports this statement that Shoal Chub are not a rare fish species and with increased sampling efforts, targeting specific habitats with certain sampling methods will result in the collection of Shoal Chubs. However, the species is specialized to environmental disturbance and sensitive to environmental changes. Increased water temperatures associated with climate changes and water availability will likely be the main stressors for Shoal Chub management, therefore, continued conservation is warranted for the Shoal Chub.

Signature



Date 2-January-2024

Return by January 31, 2024 to: [Jordan.Hofmeier@ks.gov](mailto:Jordan.Hofmeier@ks.gov)

**Kansas Department of Wildlife, Parks & Tourism  
2023 Species Listing Review**

Species by \_\_\_\_\_  
Reviewed by \_\_\_\_\_

*Slender Club*

Date: June 5 2024

(Using your experience and knowledge, please indicate the most appropriate number in each category to help with our evaluation process.)

**Species status:**

1) Populations and Trends

- a) Kansas populations in relation to global populations.
- Kansas population constitutes <10% of global population and not geographically isolated. 2
  - Kansas population constitutes 10-25% of global population and not geographically isolated. 4
  - Kansas population is geographically isolated and constitutes <25% of global population. 5
  - Kansas population constitutes 25-50% of global population. 6
  - Kansas population constitutes >50% of global population. 8
  - Kansas population is total global population. 10

- b) Population trend within **Kansas** during the past 35 years.
- Population increasing. 0
  - Population stable or cyclic (within 10% of stable mean). 1
  - Population reduced 10-29%. 3
  - Population reduced 30-59%. 6
  - Population reduced 60-90%. 9
  - Population reduced >90%.

- c) Population trend within **global range** during the past 35 years.
- Population increasing. 0
  - Population stable or cyclic (within 10% of stable mean). 1
  - Population reduced 10-29%. 3
  - Population reduced 30-59%. 6
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2) Rarity (density within current range). When considering a migratory species, the evaluation should apply to that period while the animal is within the state.

- a) Within **Kansas**.
- Common, easily found throughout range. 0
  - Frequently found at many points. 2
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  - Infrequently found at few points. 8
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3) Current Breeding Biology.

- a) Residency status.
- Peripheral or casual (no breeding population). 0
  - Regular migrants that do not winter in KS. 3
  - Migrants wintering but not breeding in KS. 4
  - Migrants breeding in Kansas. 8
  - Year-round resident. 10

- b) Reproduction within Kansas.
- Normal number of young per brood or litter (or does not breed in KS). 0
  - Slight reduction from normal reproduction. 3
  - Reproduction severely decreased from normal. 7
  - Reproduction near zero. 10

4) Distribution change during the past 35 years.

- a) Distribution within Kansas.
- Distribution unchanged or increasing. 0
  - Distribution reduced up to 30%. 3
  - Distribution reduced 30 to 59%. 6
  - Distribution reduced 60 to 90%. 9
  - Distribution reduced >90%. 10

- b) Global range distribution.
- Distribution unchanged or increasing. 0
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**Habitat Status**

5) Loss of suitable habitat during the past 35 years.

- a) Within Kansas.
- No habitat loss or habitat increasing. 0
  - Habitat loss up to 30%. 3
  - Habitat loss 30-59%. 6

- Habitat loss 60-90%. 9
  - Habitat loss >90%. 10
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**Vulnerability**

- 6) Specialization.
- No limiting specialization, highly adaptable. 0
  - Slightly limiting specialization, moderately adaptable. 4
  - Moderately specialized (narrow niche in regard to habitat or food). 7
  - Highly specialized (very narrow niche, extremely low adaptability). 10

- 7) Sensitivity to Environmental Contaminants.
- No problems associated with pollutants or pesticides. 0
  - Slight sensitivity to pollutants or pesticides. 4
  - Moderate sensitivity to pollutants or pesticides. 6
  - High sensitivity to pollutants or pesticides. 8
  - Pollutants or pesticides known to be suppressing population. 10

- 8) Exploitation within Kansas.
- a) Species vulnerability to consumptive uses.
- None current or anticipated. 0
  - Low. 3
  - Moderate. 7
  - High. 10

- b) Habitat exploitation threat.
- None current or anticipated. 0
  - Low. 3
  - Moderate. 7
  - High. 10

- 9) Recovery capacity.
- Recovery not needed, species not in jeopardy. 0
  - Recovery potential excellent as species responds well to management. 2
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Recommended listing (check one)

Endangered in Kansas

Threatened in Kansas

Species-in-need-of-conservation

Unlist (is not or is no longer a viable component of the Kansas fauna)

Unlist (species status is stable to increasing and considered healthy or recovered)

Please provide comments to support recommended listing and any other information you think is pertinent that may have been omitted from the petition (use as much space as needed).

Shoal club surveys must include a benthic gear (i.e., seine, trawl) in order to provide accurate assessment. Smaller (i.e., order less than 4) should be included in surveys with benthic gear to not exclude less common benthic fishes. Resiliency/Redundancy should include a positive measure of 'range-wide' genomic structure to best assess Shoal club "population".  
Thank you for providing opportunity for external review.

Signature

Date

5 Jan 2024

Return by January 31, 2024 to: [Jordan.Hofmeier@ks.gov](mailto:Jordan.Hofmeier@ks.gov)

**Kansas Department of Wildlife, Parks & Tourism**  
**2023 Species Listing Review**

Species being reviewed: Shoal Chub *Nocomis biguttatus*

Reviewer: [REDACTED] Date: 1/18/2024

(Using your experience and knowledge, please indicate the most appropriate number in each category to help with our evaluation process.)

**Species status:**

1) Populations and Trends

- a) Kansas populations in relation to global populations.
- Kansas population constitutes <10% of global population and not geographically isolated. 2
  - Kansas population constitutes 10-25% of global population and not geographically isolated. 4
  - Kansas population is geographically isolated and constitutes <25% of global population. 5
  - Kansas population constitutes 25-50% of global population. 6
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- b) Population trend within **Kansas** during the past 35 years.
- Population increasing. 0
  - Population stable or cyclic (within 10% of stable mean). 1
  - Population reduced 10-29%. 3
  - Population reduced 30-59%. 6
  - Population reduced 60-90%. 9
  - Population reduced >90%. 9

- c) Population trend within **global range** during the past 35 years.
- Population increasing. 0
  - Population stable or cyclic (within 10% of stable mean). 1
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2) Rarity (density within current range). When considering a migratory species, the evaluation should apply to that period while the animal is within the state.

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- a) Distribution within Kansas.
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### Habitat Status

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- a) Within Kansas.
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**Vulnerability**

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Recommended listing (check one)

Endangered in Kansas

Threatened in Kansas

Species-in-need-of-conservation

Unlist (is not or is no longer a viable component of the Kansas fauna)

Unlist (species status is stable to increasing and considered healthy or recovered)

Please provide comments to support recommended listing and any other information you think is pertinent that may have been omitted from the petition (use as much space as needed).

The species was known from the Arkansas River of Kansas prior to 1991 (Fishes of KS book), but was probably not abundant and moved from Oklahoma prior to construction of Kaw Reservoir. Among *Macrhybopsis* species, shoal chub is among the most broadly distributed and least threatened.

Signature

Date

1/18/2024

Return by

[r@ks.gov](mailto:ks.gov)

**Kansas Department of Wildlife, Parks & Tourism  
2023 Species Listing Review**

Species being reviewed:   Shoal Chub  

Reviewer: [REDACTED] Date:   11 January 2024  

(Using your experience and knowledge, please indicate the most appropriate number in each category to help with our evaluation process.)

**Species status:**

1) Populations and Trends

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- 3) Current Breeding Biology.
  - a) Residency status.
    - Peripheral or casual (no breeding population). 0
    - Regular migrants that do not winter in KS. 3
    - Migrants wintering but not breeding in KS. 4
    - Migrants breeding in Kansas. 8
    - **Year-round resident. 10**
  
  - b) Reproduction within Kansas.
    - Normal number of young per brood or litter (or does not breed in KS). 0
    - Slight reduction from normal reproduction. 3
    - **Reproduction severely decreased from normal. 7**
    - Reproduction near zero. 10
  
- 4) Distribution change during the past 35 years.
  - a) Distribution within Kansas.
    - Distribution unchanged or increasing. 0
    - Distribution reduced up to 30%. 3
    - **Distribution reduced 30 to 59%. 6**
    - Distribution reduced 60 to 90%. 9
    - Distribution reduced >90%. 10
  
  - b) Global range distribution.
    - Distribution unchanged or increasing. 0
    - Distribution reduced up to 30%. 3
    - **Distribution reduced 30 to 59%. 6**
    - Distribution reduced 60 to 90%. 9
    - Distribution reduced >90%. 10

**Habitat Status**

- 5) Loss of suitable habitat during the past 35 years.
  - a) Within Kansas.
    - No habitat loss or habitat increasing. 0
    - Habitat loss up to 30%. 3
    - Habitat loss 30-59%. 6

- Habitat loss 60-90%. 9
  - Habitat loss >90% . 10
- b) Within global range.
- No habitat loss or habitat increasing. 0
  - Habitat loss up to 30%. 3
  - Habitat loss 30-59%. 6
  - Habitat loss 60-90%. 9
  - Habitat loss >90% . 10

## Vulnerability

- 6) Specialization.
- No limiting specialization, highly adaptable. 0
  - Slightly limiting specialization, moderately adaptable. 4
  - Moderately specialized (narrow niche in regard to habitat or food). 7
  - Highly specialized (very narrow niche, extremely low adaptability). 10
- 7) Sensitivity to Environmental Contaminants.
- No problems associated with pollutants or pesticides. 0
  - Slight sensitivity to pollutants or pesticides. 4
  - Moderate sensitivity to pollutants or pesticides. 6
  - High sensitivity to pollutants or pesticides. 8
  - Pollutants or pesticides known to be suppressing population. 10
- 8) Exploitation within Kansas.
- a) Species vulnerability to consumptive uses.
- None current or anticipated. 0
  - Low. 3
  - Moderate. 7
  - High. 10
- b) Habitat exploitation threat.
- None current or anticipated. 0
  - Low. 3
  - Moderate. 7
  - High. 10
- 9) Recovery capacity.
- Recovery not needed, species not in jeopardy. 0
  - Recovery potential excellent as species responds well to management. 2
  - Recovery potential good; some management difficulty. 4
  - Recovery potential fair due to habitat or management problems. 6
  - Recovery potential poor due to habitat or management problems. 8
  - Recovery potential impossible due to unsolvable population, habitat. 10  
or management problems.

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Using the following definitions and using your best scientific judgment, which category does this species best fit:

Endangered Species: any species of wildlife whose continued existence as a viable component of the state's wild fauna is determined to be in jeopardy (KSA 32-958c).

Threatened Species: any species of wildlife which appears likely, within the foreseeable future, to become an endangered species (KSA 32-958f).

Species-in-Need-of-Conservation: (SINC) those species which are highly specialized, whose habitat is very limited in Kansas, or show population declines that warrant data collection concerning its status in Kansas. Conservation efforts focused on these species can prevent future listing as threatened or endangered.

Unlisted: This species population does not have the characteristics that qualify it for one of the above categories. It has a healthy or recovered population that is either stable or increasing or it no longer can be considered a viable component of the Kansas fauna.

Recommended listing (check one)

Endangered in Kansas

Threatened in Kansas

Species-in-need-of-conservation

Unlist (is not or is no longer a viable component of the Kansas fauna)

Unlist (species status is stable to increasing and considered healthy or recovered)

Please provide comments to support recommended listing and any other information you think is pertinent that may have been omitted from the petition (use as much space as needed).

*Kansas Department of Wildlife and Parks, specifically Ryan Waters, has done an excellent job surveying the Kansas River basin in recent years and have documented the continued existence of populations above Milford Reservoir and throughout the Kansas River from the junction with the Smokey Hill River and the confluence with the Missouri River. This is promising data, suggesting the species is stable in this part of their historic range. Unfortunately, I cannot support downlisting shoal chub in Kansas for several reasons. First, the fish is still absent from much of its historic range, which included the Big Blue River, Arkansas River and Maris des Cygne (see Eisenhour 2004, Lutrell et al. 1999, Hoagstrom and Echelle 2022). Second, while there is potential to recover shoal chub in its historic range (e.g., the Big Blue River), there is no evidence this will work. It seems prudent to first demonstrate the success of hatchery or translocation programs before considering downlisting. Finally, I worry even the existing populations in the Kansas River are vulnerable to drought, combined with the currently fragmented river. The extensive work by Perkin et al. (2015), Hoagstrom (2014) and others, show how fragmented river systems combined with climate variability have caused the extirpation of pelagic broadcast spawning species. While this fish has withstood extreme droughts*

*I'm not convinced that the stability of these populations isn't highly susceptible to future events, such as those that occurred on the Arkansas and Ninnescah rivers. Specifically, consecutive years of drought might be particularly harmful to this species. The recent drought of 2018, for example, was followed by a very high-water year in 2019. What if there were two or three years of consistent drought?*

*In summary, increased sampling effort has revealed a persistent population of shoal chub in the Kansas River, but population sizes are not extensive (relative to the effort), particularly when compared to other species such as red shiner and sand shiner. No demonstrated recovery activities have occurred and potential for extreme drought in this region make me believe this fish is not out of the woods. An extensive recovery plan that establishes at least one more redundant population in the historic range would go a long way toward assuring the persistence of this fish in Kansas and elsewhere.*

*Note: I'm concerned about the focus on the previous 35 years to make these evaluations. This is problematic as it succumbs to the problem of a shifting baseline. Most reservoirs in Kansas were constructed in the 60s and 70s. Dewatering of rivers through groundwater withdrawals also began in the 70s. If we accept that only the last 35 years (i.e., since 1988) is our baseline, this ignores the needs of species that persisted and were widespread in the rivers of Kansas prior to these major modifications. Moreover, if we use a short time period, such as 35 years, the solution to solving species threats now is just a waiting game – wait 35 years following extirpations and then we can conclude the species range has not changed. The Big Blue, Arkansas and Maris des Cygenes river populations of Shoal Chub seems to fall victim to this problem.*

## *References*

- Eisenhour, D.J. 2004. Systematics, variation, and speciation of the *Macrhybopsis aestivalis* complex west of the Mississippi River. Bulletin Alabama Museum of Natural History 23:9-48.*
- Hoagstrom CW. 2014. Habitat loss and subdivision are additive mechanisms of fish extinction in fragmented rivers. Global Change Biology 21:4-5.*
- Hoagstrom CW, Echelle AA. 2022. Biogeography of the *Macrhybopsis aestivalis* complex (Teleostei: Cyprinidae): emphasis on speciation and ancient heterospecific mitochondrial transfer. Environmental Biology of Fishes 105:261-287. [link to view-only version]*
- Luttrell, G.R., A.A. Echelle, W.L. Fisher, and D.J. Eisenhour. 1999. Declining status of two species of the *Macrhybopsis aestivalis* complex (Teleostei: Cyprinidae) in the Arkansas River Basin and related effects of reservoirs as barriers to dispersal. Copeia 1999: 981-989*
- Perkin, J.S., K.B. Gido, A.R. Cooper, T.F. Turner, M.J. Osborne, E.R. Johnson and K.B. Mayes. 2015. Fragmentation and dewatering transform Great Plains stream fish communities. Ecological Monographs 85:73-92.*

Signature



Date \_\_\_\_ 22 January 2024

Return by January 31, 2024 to: [Jordan.Hofmeier@ks.gov](mailto:Jordan.Hofmeier@ks.gov)

**Kansas Department of Wildlife, Parks & Tourism  
2023 Species Listing Review**

Species being reviewed: **Shoal Chub**

Reviewer: [REDACTED] Date: 1/23/24

(Using your experience and knowledge, please indicate the most appropriate number in each category to help with our evaluation process.)

**Species status:**

1) Populations and Trends

- a) Kansas populations in relation to global populations.
- Kansas population constitutes <10% of global population and not geographically isolated. 2
  - Kansas population constitutes 10-25% of global population and not geographically isolated. 4
  - Kansas population is geographically isolated and constitutes <25% of global population. 5
  - Kansas population constitutes 25-50% of global population. 6
  - Kansas population constitutes >50% of global population. 8
  - Kansas population is total global population. 10

- b) Population trend within **Kansas** during the past 35 years.
- Population increasing. 0
  - Population stable or cyclic (within 10% of stable mean). 1
  - Population reduced 10-29%. 3
  - Population reduced 30-59%. 6
  - Population reduced 60-90%. 9
  - Population reduced >90%. 9

- c) Population trend within **global range** during the past 35 years.
- Population increasing. 0
  - Population stable or cyclic (within 10% of stable mean). 1
  - Population reduced 10-29%. 3
  - Population reduced 30-59%. 6
  - Population reduced 60-90%. 9
  - Population reduced near 100%. 10

2) Rarity (density within current range). When considering a migratory species, the evaluation should apply to that period while the animal is within the state.

- a) Within **Kansas**.
- Common, easily found throughout range. 0
  - Frequently found at many points. 2
  - Frequently found at few points. 4
  - Infrequently found at many points. 6
  - Infrequently found at few points. 8
  - Rarely found at any point, never concentrated. 10

- b) Within **global range**.
  - Common, easily found throughout range. 0
  - Frequently found at many points. 2
  - Frequently found at few points. 4
  - **Infrequently found at many points. 6**
  - Infrequently found at few points. 8
  - Rarely found at any point, never concentrated. 10
  
- 3) Current Breeding Biology.
  - a) Residency status.
    - Peripheral or casual (no breeding population). 0
    - Regular migrants that do not winter in KS. 3
    - Migrants wintering but not breeding in KS. 4
    - Migrants breeding in Kansas. 8
    - **Year-round resident. 10**
  
  - b) Reproduction within Kansas.
    - Normal number of young per brood or litter (or does not breed in KS). 0
    - Slight reduction from normal reproduction. 3
    - Reproduction severely decreased from normal. 7
    - **Reproduction near zero. 10**
  
- 4) Distribution change during the past 35 years.
  - a) Distribution within Kansas.
    - Distribution unchanged or increasing. 0
    - Distribution reduced up to 30%. 3
    - Distribution reduced 30 to 59%. 6
    - Distribution reduced 60 to 90%. 9
    - **Distribution reduced >90%. 10**
  
  - b) Global range distribution.
    - Distribution unchanged or increasing. 0
    - Distribution reduced up to 30%. 3
    - **Distribution reduced 30 to 59%. 6**
    - Distribution reduced 60 to 90%. 9
    - Distribution reduced >90%. 10

**Habitat Status**

- 5) Loss of suitable habitat during the past 35 years.
  - a) Within Kansas.
    - No habitat loss or habitat increasing. 0
    - Habitat loss up to 30%. 3
    - Habitat loss 30-59%. 6

- Habitat loss 60-90%. 9
  - Habitat loss >90%. 10
- b) Within global range.
- No habitat loss or habitat increasing. 0
  - Habitat loss up to 30%. 3
  - Habitat loss 30-59%. 6
  - Habitat loss 60-90%. 9
  - Habitat loss >90%. 10

## Vulnerability

- 6) Specialization.
- No limiting specialization, highly adaptable. 0
  - Slightly limiting specialization, moderately adaptable. 4
  - Moderately specialized (narrow niche in regard to habitat or food). 7
  - Highly specialized (very narrow niche, extremely low adaptability). 10
- 7) Sensitivity to Environmental Contaminants.
- No problems associated with pollutants or pesticides. 0
  - Slight sensitivity to pollutants or pesticides. 4
  - Moderate sensitivity to pollutants or pesticides. 6
  - High sensitivity to pollutants or pesticides. 8
  - Pollutants or pesticides known to be suppressing population. 10
- 8) Exploitation within Kansas.
- a) Species vulnerability to consumptive uses.
- None current or anticipated. 0
  - Low. 3
  - Moderate. 7
  - High. 10
- b) Habitat exploitation threat.
- None current or anticipated. 0
  - Low. 3
  - Moderate. 7
  - High. 10
- 9) Recovery capacity.
- Recovery not needed, species not in jeopardy. 0
  - Recovery potential excellent as species responds well to management. 2
  - Recovery potential good; some management difficulty. 4
  - Recovery potential fair due to habitat or management problems. 6
  - Recovery potential poor due to habitat or management problems. 8
  - Recovery potential impossible due to unsolvable population, habitat, or management problems. 10

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Using the following definitions and using your best scientific judgment, which category does this species best fit:

**Endangered Species: any species of wildlife whose continued existence as a viable component of the state's wild fauna is determined to be in jeopardy (KSA 32-958e).**

Threatened Species: any species of wildlife which appears likely, within the foreseeable future, to become an endangered species (KSA 32-958f).

Species-in-Need-of-Conservation: (SINC) those species which are highly specialized, whose habitat is very limited in Kansas, or show population declines that warrant data collection concerning its status in Kansas. Conservation efforts focused on these species can prevent future listing as threatened or endangered.

Unlisted: This species population does not have the characteristics that qualify it for one of the above categories. It has a healthy or recovered population that is either stable or increasing or it no longer can be considered a viable component of the Kansas fauna.

Recommended listing (check one)

**Endangered in Kansas**

Threatened in Kansas

Species-in-need-of-conservation

Unlist (is not or is no longer a viable component of the Kansas fauna)

Unlist (species status is stable to increasing and considered healthy or recovered)

Please provide comments to support recommended listing and any other information you think is pertinent that may have been omitted from the petition (use as much space as needed).

**The species has been extirpated from several stream segments due to navigation systems, impoundments, and other forms of fragmentation- which are exacerbated by both drought and extensive water withdrawals (e.g., groundwater pumping). Luttrell et al (1999) show comparison of the historical and late 1990s distributions relative to Kansas populations. I am uncertain about my response relative to pollution as I don't think this is an area where much work has been done. For this and other chubs, most of the work has identified concerns with habitat fragmentation and water flow (though recent evidence and some historical do show relationships with salinity levels and chub success-see Brewer et al. 2021, [https://www.fws.gov/sites/default/files/documents/CSS\\_138\\_Brewer\\_etal\\_2021\\_doi.pdf](https://www.fws.gov/sites/default/files/documents/CSS_138_Brewer_etal_2021_doi.pdf)).**

Signature



Date 1/23/2024

Return by January 31, 2024 to: [Jordan.Hofmeier@ks.gov](mailto:Jordan.Hofmeier@ks.gov)

**Kansas Department of Wildlife, Parks & Tourism  
2023 Species Listing Review**

Species being reviewed: **Shoal Chub – *Macrhybopsis hystoma***

Reviewer: \_\_\_\_\_ Date: 15.Jan.2024

(Using your experience and knowledge, please indicate the most appropriate number in each category to help with our evaluation process.)

**Species status:**

1) Populations and Trends

- a) Kansas populations in relation to global populations.
- Kansas population constitutes <10% of global population and not geographically isolated. 2
  - Kansas population constitutes 10-25% of global population and not geographically isolated. 4
  - Kansas population is geographically isolated and constitutes <25% of global population. 5
  - Kansas population constitutes 25-50% of global population. 6
  - Kansas population constitutes >50% of global population. 8
  - Kansas population is total global population. 10
- b) Population trend within **Kansas** during the past 35 years.
- Population increasing. 0
  - Population stable or cyclic (within 10% of stable mean). 1
  - Population reduced 10-29%. 3
  - Population reduced 30-59%. 6
  - Population reduced 60-90%. 9
  - Population reduced >90%. 9
- c) Population trend within **global range** during the past 35 years.
- Population increasing. 0
  - Population stable or cyclic (within 10% of stable mean). 1
  - Population reduced 10-29%. 3
  - Population reduced 30-59%. 6
  - Population reduced 60-90%. 9
  - Population reduced near 100%. 10

2) **Rarity (density within current range).** When considering a migratory species, the evaluation should apply to that period while the animal is within the state.

- a) **Within Kansas.**
- Common, easily found throughout range. 0
  - Frequently found at many points. 2
  - Frequently found at few points. 4
  - Infrequently found at many points. 6
  - Infrequently found at few points. 8
  - Rarely found at any point, never concentrated. 10

b) Within <b>global range</b> .	
• Common, easily found throughout range.	0
• Frequently found at many points.	2
• Frequently found at few points.	4
• Infrequently found at many points.	<u>6</u>
• Infrequently found at few points.	8
• Rarely found at any point, never concentrated.	10
3) Current Breeding Biology.	
a) Residency status.	
• Peripheral or casual (no breeding population).	0
• Regular migrants that do not winter in KS.	3
• Migrants wintering but not breeding in KS.	4
• Migrants breeding in Kansas.	8
• Year-round resident.	<u>10</u>
b) Reproduction within Kansas.	
• Normal number of young per brood or litter (or does not breed in KS).	0
• Slight reduction from normal reproduction.	3
• Reproduction severely decreased from normal.	<u>7</u>
• Reproduction near zero.	10
4) Distribution change during the past 35 years.	
a) Distribution within Kansas.	
• Distribution unchanged or increasing.	<u>0</u>
• Distribution reduced up to 30%.	3
• Distribution reduced 30 to 59%.	6
• Distribution reduced 60 to 90%.	9
• Distribution reduced >90%.	10
b) Global range distribution.	
• Distribution unchanged or increasing.	<u>0</u>
• Distribution reduced up to 30%.	3
• Distribution reduced 30 to 59%.	6
• Distribution reduced 60 to 90%.	9
• Distribution reduced >90%.	10

### Habitat Status

#### 5) Loss of suitable habitat during the past 35 years.

##### a) Within Kansas.

• No habitat loss or habitat increasing.	<u>0</u>
• Habitat loss up to 30%.	3
• Habitat loss 30-59%.	6

- Habitat loss 60-90%. 9
  - Habitat loss >90%. 10
- b) Within global range.
- No habitat loss or habitat increasing. 0
  - Habitat loss up to 30%. 3
  - Habitat loss 30-59%. 6
  - Habitat loss 60-90%. 9
  - Habitat loss >90%. 10

### Vulnerability

- 6) Specialization.
- No limiting specialization, highly adaptable. 0
  - Slightly limiting specialization, moderately adaptable. 4
  - Moderately specialized (narrow niche in regard to habitat or food). 7
  - Highly specialized (very narrow niche, extremely low adaptability). 10
- 7) Sensitivity to Environmental Contaminants.
- No problems associated with pollutants or pesticides. 0
  - Slight sensitivity to pollutants or pesticides. 4
  - Moderate sensitivity to pollutants or pesticides. 6
  - High sensitivity to pollutants or pesticides. 8
  - Pollutants or pesticides known to be suppressing population. 10
- 8) Exploitation within Kansas.
- a) Species vulnerability to consumptive uses.
- None current or anticipated. 0
  - Low. 3
  - Moderate. 7
  - High. 10
- b) Habitat exploitation threat.
- None current or anticipated. 0
  - Low. 3
  - Moderate. 7
  - High. 10
- 9) Recovery capacity.
- Recovery not needed, species not in jeopardy. 0
  - Recovery potential excellent as species responds well to management. 2
  - Recovery potential good; some management difficulty. 4
  - Recovery potential fair due to habitat or management problems. 6
  - Recovery potential poor due to habitat or management problems. 8
  - Recovery potential impossible due to unsolvable population, habitat, or management problems. 10

Using the following definitions and using your best scientific judgment, which category does this species best fit:

Endangered Species: any species of wildlife whose continued existence as a viable component of the state's wild fauna is determined to be in jeopardy (KSA 32-958c).

Threatened Species: any species of wildlife which appears likely, within the foreseeable future, to become an endangered species (KSA 32-958f).

Species-in-Need-of-Conservation: (SINC) those species which are highly specialized, whose habitat is very limited in Kansas, or show population declines that warrant data collection concerning its status in Kansas. Conservation efforts focused on these species can prevent future listing as threatened or endangered.

Unlisted: This species population does not have the characteristics that qualify it for one of the above categories. It has a healthy or recovered population that is either stable or increasing or it no longer can be considered a viable component of the Kansas fauna.

Recommended listing (check one)

Endangered in Kansas

Threatened in Kansas

Species-in-need-of-conservation

Unlist (is not or is no longer a viable component of the Kansas fauna)

Unlist (species status is stable to increasing and considered healthy or recovered)

Please provide comments to support recommended listing and any other information you think is pertinent that may have been omitted from the petition (use as much space as needed).

Signature



Date 30-Jan-2024

Return by January 31, 2024 to: [Jordan.Hofmeier@ks.gov](mailto:Jordan.Hofmeier@ks.gov)

**Kansas Department of Wildlife, Parks & Tourism  
2023 Species Listing Review**

Species being reviewed: *Macrhybopsis hyostoma*

Reviewer: [REDACTED] Date: **31 January 2024**

(Using your experience and knowledge, please indicate the most appropriate number in each category to help with our evaluation process.)

**Species status:**

1) Populations and Trends

a) Kansas populations in relation to global populations.

- Kansas population constitutes <10% of global population and not geographically isolated. 2 ◀
- Kansas population constitutes 10-25% of global population and not geographically isolated. 4
- Kansas population is geographically isolated and constitutes <25% of global population. 5
- Kansas population constitutes 25-50% of global population. 6
- Kansas population constitutes >50% of global population. 8
- Kansas population is total global population. 10

b) Population trend within **Kansas** during the past 35 years.

- Population increasing. 0
- Population stable or cyclic (within 10% of stable mean). 1 ◀
- Population reduced 10-29%. 3
- Population reduced 30-59%. 6
- Population reduced 60-90%. 9
- Population reduced >90%. 10

c) Population trend within **global range** during the past 35 years.

- Population increasing. 0
- Population stable or cyclic (within 10% of stable mean). 1
- Population reduced 10-29%. 3 ◀
- Population reduced 30-59%. 6
- Population reduced 60-90%. 9
- Population reduced near 100%. 10

2) Rarity (density within current range). When considering a migratory species, the evaluation should apply to that period while the animal is within the state.

a) Within **Kansas**.

- Common, easily found throughout range. 0
- Frequently found at many points. 2
- Frequently found at few points. 4 ◀
- Infrequently found at many points. 6
- Infrequently found at few points. 8
- Rarely found at any point, never concentrated. 10

- b) Within **global range**.
  - Common, easily found throughout range. 0
  - Frequently found at many points. **2** ◀
  - Frequently found at few points. 4
  - Infrequently found at many points. 6
  - Infrequently found at few points. 8
  - Rarely found at any point, never concentrated. 10
  
- 3) Current Breeding Biology.
  - a) Residency status.
    - Peripheral or casual (no breeding population). 0
    - Regular migrants that do not winter in KS. 3
    - Migrants wintering but not breeding in KS. 4
    - Migrants breeding in Kansas. 8
    - Year-round resident. **10** ◀
  
  - b) Reproduction within Kansas.
    - Normal number of young per brood or litter (or does not breed in KS). 0
    - Slight reduction from normal reproduction. **3** ◀
    - Reproduction severely decreased from normal. 7
    - Reproduction near zero. 10
  
- 4) Distribution change during the past 35 years.
  - a) Distribution within Kansas.
    - Distribution unchanged ~~or increasing~~. **0** ◀
    - Distribution reduced up to 30%. 3
    - Distribution reduced 30 to 59%. 6
    - Distribution reduced 60 to 90%. 9
    - Distribution reduced >90%. 10
  
  - b) Global range distribution.
    - Distribution unchanged or increasing. 0
    - Distribution reduced up to 30%. **3** ◀
    - Distribution reduced 30 to 59%. 6
    - Distribution reduced 60 to 90%. 9
    - Distribution reduced >90%. 10

## Habitat Status

- 5) Loss of suitable habitat during the past 35 years.
- a) Within Kansas.
- No habitat loss or ~~habitat increasing~~. 0 ◀
  - Habitat loss up to 30%. 3
  - Habitat loss 30-59%. 6
  - Habitat loss 60-90%. 9
  - Habitat loss >90%. 10
- b) Within global range.
- No habitat loss or habitat increasing. 0
  - Habitat loss up to 30%. 3 ◀
  - Habitat loss 30-59%. 6
  - Habitat loss 60-90%. 9
  - Habitat loss >90%. 10

## Vulnerability

- 6) Specialization.
- No limiting specialization, highly adaptable. 0
  - Slightly limiting specialization, moderately adaptable. 4
  - Moderately specialized (narrow niche in regard to habitat or food). 7 ◀
  - Highly specialized (very narrow niche, extremely low adaptability). 10
- 7) Sensitivity to Environmental Contaminants.\*
- No problems associated with pollutants or pesticides. 0
  - Slight sensitivity to pollutants or pesticides. 4
  - Moderate sensitivity to pollutants or pesticides. 6 ◀
  - High sensitivity to pollutants or pesticides. 8
  - Pollutants or pesticides known to be suppressing population. 10
- 8) Exploitation within Kansas.
- a) Species vulnerability to consumptive uses.
- None current or anticipated. 0 ◀
  - Low. 3
  - Moderate. 7
  - High. 10
- b) Habitat exploitation threat.
- None current or anticipated. 0
  - Low. 3
  - Moderate. 7
  - High. 10 ◀

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\* Shoal Chub not specifically tested but generally considered moderately sensitive.

- 9) Recovery capacity.
- Recovery not needed, species not in jeopardy. 0
  - Recovery potential excellent as species responds well to management. 2
  - Recovery potential good; some management difficulty. 4
  - Recovery potential fair due to habitat or management problems. **6** ◀
  - Recovery potential poor due to habitat or management problems. 8
  - Recovery potential impossible due to unsolvable population, habitat, or management problems. 10

Using the following definitions and using your best scientific judgment, which category does this species best fit:

Endangered Species: any species of wildlife whose continued existence as a viable component of the state's wild fauna is determined to be in jeopardy (KSA 32-958c).

Threatened Species: any species of wildlife which appears likely, within the foreseeable future, to become an endangered species (KSA 32-958f).

Species-in-Need-of-Conservation: (SINC) those species which are highly specialized, whose habitat is very limited in Kansas, or show population declines that warrant data collection concerning its status in Kansas. Conservation efforts focused on these species can prevent future listing as threatened or endangered.

Unlisted: This species population does not have the characteristics that qualify it for one of the above categories. It has a healthy or recovered population that is either stable or increasing or it no longer can be considered a viable component of the Kansas fauna.

Recommended listing (check one)

Endangered in Kansas

Threatened in Kansas

Species-in-need-of-conservation

Unlist (is not or is no longer a viable component of the Kansas fauna)

Unlist (species status is stable to increasing and considered healthy or recovered)

Please provide comments to support recommended listing and any other information you think is pertinent that may have been omitted from the petition (use as much space as needed).

The downlisting of the Shoal Chub, *Macrhybopsis hyostoma*, might be warranted, but I think it is too soon to make that change. The numbers of chubs collected recently are certainly encouraging, but the species suffered substantial reductions in distribution and numbers after the 1950s. These losses occurred more than 35 years ago, but they inform concerns that additional losses can occur. The potential remedies for future (or past) losses are presently only plans and proposals in the works, and they should be vetted prior to downlisting. In addition, the encouraging numbers of chubs have not been assessed scientifically in the context of the biology of the species to provide a more sustainable view of its status.

The following text presents the concerns I have with downlisting the Shoal Chub at this time, along with relevant background information. I appreciate that not all members of the committee are familiar with the Shoal Chub and other river minnows, so I have tried to provide enough information to make it easier to understand and evaluate my concerns.

I have also invoked a caveat for my choice of sources. *Macrhybopsis hyostoma* is a widespread species, a remnant of the formerly more widely distributed *M. aestivalis*, and systematics studies continue to identify species within the *M. aestivalis* complex. Of course, only the currently accepted concept of *M. hyostoma* can be considered in designating the status of the species in Kansas. However, *M. hyostoma* currently represents a group of cryptic species, especially west of the Mississippi River (Underwood et al. 2003; Eisenhour 2004, page 34; Gilbert et al. 2017; Echelle et al. 2018).

Currently, the populations in northeastern Kansas are considered part of the “Northern Plains Group.” This group consists of populations in the Missouri River basin, Des Moines River basin, Iowa River basin, and the Mississippi River downstream from the mouth of the Missouri River (Eisenhour 2004, page 33). Given the ongoing systematics studies, information presented here will focus on populations west of the Mississippi River and, as much as possible, within the distribution of the Northern Plains Group. However, some aspects of Shoal Chub biology are unstudied, but they are likely the same as those of closely related congeners, which are clearly noted in the following text.

### **Distribution and Status**

Finding reliable information on the status of the Shoal Chub throughout its range is challenging. I could find no summary that incorporated all of the latest information. Recent surveys outside Kansas but within the boundaries of the Northern Plains Group suggest that Shoal Chub populations are reasonably persistent where the species still exists within its historic range, but its range has diminished. Populations trends are poorly understood.

In Nebraska, the Shoal Chub is extant in the lower Platte, Loup, and Elkhorn Rivers (Steffensen et al. 2014; Schainost and Peters 2017, pages 108–109), but no recent detailed assessment of its status in the interior rivers of the state has been conducted. In annual monitoring of eight native minnows in the Missouri River from 2005 to 2012, the

Shoal Chub was absent upstream from Gavins Point Dam and rare (0.3% of all fish collected in trawls) downstream from the dam in the unchannelized reach south to the Big Sioux River (Sioux City). The species was more prevalent in the channelized reach from the Big Sioux River downstream to the mouth of the Platte River (1.7%) and most abundant in the channelized reach downstream from the Platte River (4.1%). However, the numbers of specimens declined after a peak in 2006 and 2007 in both unchannelized reaches (Steffensen et al. 2014). (More information on population volatility later.)

In Missouri, the species apparently tends to continue to increase in abundance downstream in the Missouri River, although the assessments are more than 25 years old (Pflieger and Grace 1987; Pflieger 1997, page 134). Within the Northern Plains Group, the Shoal Chub is considered most abundant in the Mississippi River downstream from the mouth of the Missouri River (Etnier and Starnes 1993; Ross 2001; Robinson and Buchanan 2020).

No information was found on the current status of the Shoal Chub in the Des Moines and Iowa river basins in Iowa, but the species still occurs in both basins, which drain into the upper Mississippi River (Parks et al. 2014).

There are two sources of information regarding the status and distribution of the Shoal Chub that the committee should be aware of. First: Information in NatureServe for *M. hyostoma* has not been updated in two decades, including the status for several states, and the information is, in some instances, incorrect. As an example, the Shoal Chub is not “secure” in Alabama, where it only occurs in the Tennessee River basin near the border with Tennessee after other species in Gulf Coast drainages east of the Mississippi River were split from *M. hyostoma* (Shepard et al. 2006, page 23; Gilbert et al. 2017). The need for an update is acknowledged on the [NatureServe webpage for the Shoal Chub](#).

Second: I do not know the source of the data used in the global distribution map on page 2 of the petition (FishBase?), but it contains errors and omissions that I assume were present in the original source and imported into the map in the proposal. I wanted to be sure everyone realizes it is not a representation of the current distribution of the species (i.e., the last 35 years). For example, it includes dots in the upper Republican River in Nebraska and the Blue River basin, where the Shoal Chub has been extirpated for 50+ years (described later). The dot in the Nebraska panhandle is a mystery to me and was not included in the thorough records of collections reported by Johnson (1942, page 37, map 18) and Hrabik et al. (2015, pages 211–2013). Conversely, populations of the Shoal Chub in the Des Moines and Iowa river basins in Iowa (Parks et al. 2014), which are considered part of the Northern Plains Group, are not shown on the map. There are additional such errors in other parts of its distribution. However, the Kansas maps that follow in the proposal clearly illustrate the past and current distributions of the Shoal Chub in the state.

### **Biology and Ecology**

Presently, the most important aspects of the biology of the Shoal Chub essential to assessing its status in Kansas are spawning and recruitment. The substrate typically occupied by the Shoal Chub (sand or gravel) and the principal food consumed by the species (benthic aquatic insects) are not known to be limiting factors in the Kansas, Republican, and lower Smoky Hill Rivers. The Shoal Chub inhabits water of various levels of turbidity but is more of a sight-feeder than its congeners.

The Shoal Chub can spawn throughout the summer and potentially produce multiple cohorts (Starks et al. 2016). Assessments of recruitment are even more important than assessments of spawning activity alone. The Shoal Chub will spawn in less-than-ideal flow conditions, and the resulting recruitment will be minimal or nonexistent. In the Brazos River in Texas (Southern Plains Group, south of the Kansas River basin), the best recruitment for the Shoal Chub occurred during baseflow after spawning occurred on minor ascending flows. In addition, brief pulses followed by base flows might allow Shoal Chub eggs and larvae to not drift as far downstream, increasing the likelihood that the population will be maintained throughout a longer portion of a river (Rodger et al 2016; Perkin et al. 2022). Thus, analyzing both population and streamflow data is essential for accurately assessing the status of the Shoal Chub.

Based on laboratory observations, the eggs of the Peppered Chub, *Macrhybopsis tetranema*, a close congener of *M. hyostoma* from the Cimarron River, hatch within 24–28 hours at water temperatures of 23.9–28.3°C (75–83°F). For about two days after hatching, the larvae swim upward in a spiral path, sink, and repeat the movements. On day two or three after hatching (three or four days after the spawn), the young fish swim normally and begin to eat. They grow rapidly, reaching about 16–19 mm (0.6–0.75 inches) in length in three to four weeks. The juveniles do not form schools and exhibit secretive behavior (Bottrell et al. 1964). Taken as a whole, this suggests that the young fish drifting downstream can begin to settle reasonably quickly onto the substrate to feed or move into slower water. As with the Peppered Chub, the growth rate of the Shoal Chub in the mainstem of the Missouri River in Missouri was rapid—1.24 mm per day (Starks et al. 2016).

In addition, as noted in the proposal, the Shoal Chub is largely an annual species—mostly age-1 spawners and a lesser number of age-2 spawners (Starrett 1951; Becker 1983, page 497). The same is true for the Peppered Chub in the Arkansas River basin (Perkin et al. 2019). This short lifespan lends itself to highly variable population sizes among years in which environmental conditions vary, particularly streamflow patterns (Starrett 1951; Steffensen et al. 2014). Data and statistical tools are now available to better assess Shoal Chub numbers in relation to streamflow patterns, which would provide a more accurate assessment to sustain a designation of its status.

### **Potential Threats and Restoration**

The potential loss of the Shoal Chub population in the Republican River upstream from Milford Reservoir (closed in 1967) is a concern because it is isolated from the remainder of the populations in the Kansas (Missouri) River. Thus, it is at the greatest risk of extirpation from dewatering of the river, especially in view of the short lifespan of the species. A multiyear drought could have a devastating effect on the survival of the Shoal Chub (Starrett 1951), as occurred with severe declines for the population of the closely related Peppered Chub in the Ninescah River and the associated reach of the Arkansas River in Kansas in 2011–2012 (Perkin et al. 2019). These extirpation events for the Shoal Chub have already occurred twice in the Kansas River basin.

The Shoal Chub was extirpated from the Republican River upstream from Harlan County Reservoir, where it formerly occurred “most abundantly in the entire length of the Republican River” in Nebraska during statewide stream surveys conducted in 1939–1941 (Johnson 1942, page 37, map 18). Harlan County Reservoir was completed in 1952,

which was followed by a multiyear drought in the mid-1950s. The combination of drought and barrier likely caused the species to be extirpated shortly thereafter (records reported by Hrabik et al. 2015, pages 211–213). The river upstream from Harlan County Reservoir has also been impacted by numerous federal impoundments and irrigation withdrawals (Schainost and Peters 2017) to the point that repatriation of a self-sustaining population of the Shoal Chub in this river segment is doubtful.

In addition to drought, the likelihood of a severe dewatering event in the lower Republican River is increased by interstate politics. Downstream from Harlan County Reservoir, the Republican River is mined for surface water to irrigate crops. In addition to Harlan County Dam, additional surface water is diverted from the river channel at a dam about 44 airmiles downstream, near Guide Rock, Nebraska. Irrigation from alluvial groundwater also occurs on both sides of the state line. Consumptive use of the water in the Republican River basin is regulated under the Republican River Compact agreed to by Colorado, Kansas, and Nebraska in 1943. Charges of water use violations in the basin brought by Kansas have recently been settled twice by the US Supreme Court: *Kansas v. Colorado and Nebraska* (2002) and *Kansas v. Nebraska* (2016). The first case centered on the effects of groundwater withdrawals in Colorado and Nebraska on streamflow, which had not been included in the original agreement. The compact was amended after settlement of the suit. In the second case, Nebraska was found liable for using more water than allocated during a drought and paid partial restitution to Kansas (Brown 2016).

A framework has been developed to predict the likelihood of breaches of water compacts. It considers two sets of metrics: the predicted effects of climate change in the basin and the adaptability of the interstate water compact to climate change. An analysis published in 2016, following the decision in *Kansas v. Nebraska*, predicted future breaches of the Republican River Compact by Nebraska (Brown 2016). If true, a breach of the reduced allocation limits imposed during a drought would almost certainly exacerbate the negative impacts of the legal mining of groundwater and surface water on streamflow in the Republican River in Kansas.

To add to the information mentioned in the proposal for the reach between Harlan County Dam and the diversion dam near Guide Rock, two specimens of the Shoal Chub were collected by the Nebraska Department of Environmental Quality (now the Nebraska Department of Energy and Environment) from a site on the Republican River near Inavale, Nebraska on 12 September 2012. Inavale is about 30 airmiles downstream from Harlan County Reservoir. On 13 September 2018, the site was sampled again by NDEE as part of a regular sampling program, but the Shoal Chub was not collected. Both samples consisted of 20 species. (The specimens were identified by me and are housed at the Sternberg Museum of Natural History.) The status of the Shoal Chub between Harlan County Dam and the diversion dam is uncertain.

As noted in the proposal, the second extirpation event in the Kansas River basin occurred in the Blue River basin upstream from Tuttle Creek Reservoir following completion of the dam in 1959 (Johnson 1942, page 37, map 18; Minckley 1959; Gido et al. 2002; Hrabik et al. 2015, pages 211–213). Records of the Shoal Chub in Kansas were only from the mainstems of the Big Blue and Little Blue Rivers prior to the initiation of water storage (Minckley 1959). The only known record from Nebraska was reported in 1894 (Johnson 1942, page 37, map 18; Hrabik et al. 2015, pages 211–213). Thus, the

extent of any potential repatriation of the Shoal Chub in the Blue River basin, given the extensive reach of the Big Blue River inundated by Tuttle Creek Reservoir, is unknown.

The proposal implied that culture of the Shoal Chub in the facility at Farlington in numbers sufficient for stocking has not yet been attempted. An event such as a multiyear drought that could dewater the Republican River and increase demands for irrigation withdrawals in the basin could also have a negative impact on streamflows and the Shoal Chub in the Kansas River, so it would be prudent to vet the propagation of the Shoal Chub in the near future and before downlisting the species. In addition, appropriate assessments of flow and habitat quality in the Blue River basin have not been conducted and would be valuable in predicting the likelihood of success for any effort to return the Shoal Chub to the basin. At this point, we do not know if it would be feasible, but one potential impediment was recently removed by the river itself.

In plains streams fragmented by dams or dry segments, population persistence of several big-river minnows, including the Shoal Chub, is associated with the lengths of intact river segments. For example, the length of the Republican River from Harlan County Dam in Nebraska to Milford Reservoir in Kansas is 332 km (206 miles). Assuming suitable streamflow and streambed habitat, this theoretically provides an ample stream length for population persistence of the Shoal Chub, estimated to be 103 km (64 miles). In contrast, the distance from the Marysville Dam on the Blue River downstream to Tuttle Creek Reservoir was only 66 km (41 miles) (Perkin and Gido 2011). However, the Marysville Dam, built in 1864 and remodeled in 1929, had become unstable, and most of the structure collapsed during a high-flow event on 4 May 2018 (Kopp 2018).

Lastly, the association of *Macrhybopsis* species with only upstream spawning movements probably needs to be refined. *Macrhybopsis* chubs are capable of substantial movements, but recent data for the Prairie Chub, *M. australis*, a close congener of *M. hyostoma* in the upper Red River basin of Oklahoma and Texas, indicated that the fish moved both upstream and downstream during the summer—June through mid-August (Steffensmeier et al. 2022). This consideration could influence any plans for effectively and efficiently stocking the Shoal Chub in the Blue or Republican Rivers.

## Summary

My concerns about downlisting the Shoal Chub at this time are twofold but easily addressed. One concern is that the encouraging numbers of chubs recently collected and any data from upcoming samples should first be assessed in the context of streamflow data. This could help provide a basis for establishing a target population estimate and better support an appropriate status designation for the species in Kansas. Relying solely on the higher numbers relative to earlier surveys is insufficient. The use of trawls has undoubtedly improved capture success, but it is equally true that the higher numbers also reflect a much greater sampling effort, some specifically targeting the Shoal Chub, compared with the earlier surveys of the general fish community. Thus, the higher numbers recently obtained can offer no meaningful indication of long-term population trends. In addition, the recent numbers were not obtained by sampling a population subjected to a multiyear drought that reduced flows to a shallow, narrow channel or isolated pools, as occurred in the Republican River prior to the initiation of the regular KDWP stream surveys in the mid-1990s. As encouraging as the recent numbers are, all that might be concluded is that the population appears to be stable when streamflows are

reasonably stable. However, the population of the Shoal Chub can quickly crash. More droughts will occur and pose serious threats to the Shoal Chub, which leads to my other concern.

A protocol to deal with the threat that dewatering poses to the isolated population in the Republican River, in particular, should be fully developed and vetted before downlisting. A multiyear drought could come at any time and potentially reduce the distribution of the Shoal Chub in Kansas by about 50%. The protocol should include regular monitoring and assessment of the status of the Shoal Chub that is frequent enough to account for its short lifespan and variable population size. This was mentioned in the petition as a planned activity, so I hope the plans are not curtailed. Doing this in conjunction with the monitoring of other native species in the lower Kansas River basin (including the Republican and lower Smoky Hill Rivers) would make it all the more valuable. Ryan Waters and his KDWP crews have clearly demonstrated the ability to effectively sample the rivers, but an assessment protocol needs to be developed prior to downlisting to quantify trends and monitor the success of any restored populations in the Blue River, Republican River, or elsewhere in Kansas.

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Signatur 

Date: 31 January 2024

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