Wiley
Journal of Applied Ichthyology
Volume 2025, Article ID 4525085, 9 pages
https://doi.org/10.1155/jai/4525085

WILEY

Research Article

First Records of the Endangered Pallid Sturgeon (*Scaphirhynchus albus*) in the Des Moines River, Iowa: A Significant Potential Range Expansion

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Received 26 August 2025; Revised 25 September 2025; Accepted 2 December 2025

Academic Editor: Georgii Ruban

The pallid sturgeon *Scaphirhynchus albus*, a large, long-lived fish endemic to the Missouri and Mississippi River Basins, was listed as a federally endangered species in 1990 due to population declines driven by profound anthropogenic habitat alterations, including river fragmentation by dams and channelization. In contrast, its congener, the shovelnose sturgeon *Scaphirhynchus platorynchus*, remains common in large rivers and their tributaries, such as the Des Moines River. Historically, the pallid sturgeon's range in Iowa has been limited to the Missouri River along the state's western border. Recovery efforts, as outlined in the National Pallid Sturgeon Recovery Plan, have emphasized habitat restoration and conservation stocking to prevent extirpation and to support natural recruitment. Here, we document the first verified records of wild (nonstocked) pallid sturgeon in the Des Moines River, Iowa. This represents a potential expansion of the species' known contemporary range and occurs within a tributary not previously identified as occupied habitat. This finding underscores the potential for stocked or wild individuals to disperse into novel river systems where previously undocumented habitat may be available. The finding has immediate conservation implications under the Endangered Species Act, prompting a reassessment of the Des Moines River's management strategies and necessitating enhanced, targeted sampling efforts. It also raises concerns under the Act's Similarity of Appearance clause, which governs the legal commercial take of shovelnose sturgeon in the pooled reach of the Upper Mississippi River downstream of the Des Moines River confluence, a potential migration corridor. The presence of pallid sturgeon in the Des Moines River demonstrates that even highly altered river systems can provide essential habitat, such as suitable spawning substrate, needed to support their life cycle, particularly when stream flow is managed to approximate natural hydrologic patterns.

1. Introduction

Documenting the occurrence of species in previously unrecorded locations is a fundamental aspect of understanding shifting ecosystem dynamics and ecological patterns. Range expansions, whether driven by natural processes or anthropogenic environmental changes, are increasingly observed across taxa and ecosystems worldwide [1,2]. These expansions may suggest important shifts in habitat suitability, population connectivity, or species responses to

altered climatic and hydrological regimes [3]. Within freshwater ecosystems, such range shifts have the potential for significant implications for conservation and management, particularly for imperiled species with restricted distributions. Here, we report the detection of two pallid sturgeon *Scaphirhynchus albus* in the Des Moines River, Iowa.

Three species of the sturgeon family (Acipenseridae) inhabit Iowa waters: shovelnose sturgeon *Scaphirhynchus platorynchus*, lake sturgeon *Acipenser fulvescens*, and pallid sturgeon [4]. The shovelnose sturgeon is the most abundant, supporting a commercial fishery in the pools of the Upper Mississippi River (UMR). In contrast, the lake sturgeon is rare and is listed as a state-endangered species, primarily inhabiting the UMR and occasionally its large tributaries [4], as well as the Missouri River along the western border of the state. The pallid sturgeon, recognized as a distinct species in 1905 [5], is one of North America's rarest and largest freshwater fishes and is endemic to the Missouri and Mississippi River Basins [4]. Due to their sensitivity to large river modifications, their populations have declined significantly [6–8], leading to their listing as an endangered species in 1990 [9]. Anthropogenic alterations have negatively impacted their habitat, affecting food resources, spawning conditions, and water flow [6,9–11]. A recovery plan was developed in 1993 [9] and revised in 2014 [12] to address these issues and to define recovery objectives.

Although the range of pallid sturgeon in North America is large, their abundance is low, and the species may be close to extinction [9]. With the exception of the Missouri River along Iowa's western border, records of pallid sturgeon in Iowa are rare [4]. Recent data from the middle Missouri River along the Iowa/Nebraska border indicate a population consisting of a high percentage of hatchery-reared fish (> 87%) with a smaller component of wild-reproduced fish [K. Steffensen, unpublished data]. Interestingly, wild fish are more common in the channelized portions of the river [13], and population estimates for the species are higher along the Iowa/Nebraska border than in the lower Missouri River [14,15]. The species is generally unknown in the UMR along Iowa's eastern border [4]. In 1916, an unvouchered record for a single juvenile pallid sturgeon was reported near Keokuk, Iowa, on the UMR [16]. However, this record was not widely accepted due to a lack of supporting documentation.

Given the ecological and conservation significance of range expansions, it is imperative that fisheries management and research programs actively monitor changes in species distributions to inform adaptive management strategies [17,18]. For imperiled species, such as the pallid sturgeon, detecting shifts in range may provide critical insights into population dynamics, habitat suitability, and the effectiveness of ongoing recovery and (or) restoration efforts. Our effort aims to document and evaluate the recent detection of pallid sturgeon in the Des Moines River, Iowa, thereby providing an updated account of the species' distribution. This discovery highlights both the value of continued monitoring and the dynamic nature of species distributions across space and time (i.e., adaptive capacity; [19]) in response to ongoing ecological change. This contributes valuable information necessary for refining conservation priorities and advancing the management of one of North America's most endangered fish species by highlighting this potential range expansion.

1.1. Physical Setting of Study Area. The Des Moines River is a major tributary of the UMR, with its headwaters originating in the prairie pothole region of southwestern Minnesota and flowing approximately 845 km southeast across the state of Iowa before its confluence with the Mississippi River at Keokuk, Iowa. The river's watershed is extensive, draining approximately 34,600 km^2 at Ottumwa, Iowa, and nearly 41,000 km^2 at Keokuk, Iowa [20]. The contemporary Des Moines River is a highly modified system. The river's hydrology is fundamentally regulated by two large U.S. Army Corps of Engineers (USACE) flood-control dams: Saylorville Dam (river kilometer [rkm]: 342.8), which forms Saylorville Lake, a 2400-ha flood control reservoir, located just upstream of the city of Des Moines, and Red Rock Dam, which is located approximately 114 rkm downstream of Saylorville Dam and 229 rkm above the confluence with the Mississippi River [21]. Completed in 1969, Red Rock Dam forms Red Rock Lake, a 6282-ha flood control reservoir near Pella, Iowa. Jointly, the 2 dams have profoundly altered the river's flow, sediment transport, and thermal regime in the lower river [22]. Red Rock Dam blocks upstream fish passage, fragmenting the riverine ecosystem, marking the modern upstream limit of the lower Des Moines River, with the lower limit being the confluence with the Mississippi River at Keokuk. An additional, though slightly more porous barrier to upstream fish movement is the Ottumwa Hydropower Dam, 77 rkm downstream from Red Rock Dam and 152 rkm above the confluence with the UMR [21]. This dam was constructed in the early 1960s, forming a 250-ha impoundment for the Ottumwa Hydropower Project. The facility is equipped with nine tainter gates and a single bascule gate which are raised and lowered, depending on discharge and power generation requirements. Upstream fish passage is generally limited to high flow periods associated with flood conditions that necessitate the raising of these gates. A second and larger hydropower facility was constructed at Red Rock Dam and began operation in 2020. Red Rock Dam allows for no upstream migration of any fish species. These hydropower facilities result in downstream alteration of stream flows (including hydropeaking) associated with power generation [23].

The lower Des Moines River has a long-standing history of environmental distress that has resulted in multiple catastrophic fish kills, primarily involving shovelnose sturgeon, over the last 3 decades. Tens of thousands of shovelnose sturgeon have perished during these events. In 2012 alone, estimated losses of shovelnose sturgeon exceeded 37,000 fish [24]. Additional kills in the summer of 2023 and 2024 resulted in the estimated loss of nearly 25,000 adult shovelnose sturgeon [25,26]. These kills have been largely attributed to high water temperatures coupled with relatively low flows. Specifically, Hupfeld et al. [27] determined that

water temperature in excess of 33°C resulted in death among shovelnose sturgeon in a laboratory experiment and suggested this has been the underlying cause of the recurring kills of shovelnose sturgeon within this reach of the Des Moines River. While mortality among lake sturgeon or pallid sturgeon was not directly observed in these events, it is likely that temperature-related mortality events would impact both species in a similar manner.

In response to these mortality events, and to better understand the characteristics of this population, the Iowa Department of Natural Resources began an annual mark-recapture study of shovelnose sturgeon in the lower Des Moines River, beginning in 2014. Most sampling was conducted within a region from the Ottumwa Hydropower Dam downstream approximately 16 km to Cliffland, Iowa. Sampling was primarily directed at shovelnose sturgeon. However, incidental catches of lake sturgeon have also been documented during this time. No previously documented records of pallid sturgeon, either historical or recent, exist for the Des Moines River [4].

Across its range, decades of pallid sturgeon population declined, driven primarily by extensive anthropogenic alteration of its riverine habitat, leading to the listing of the pallid sturgeon as a federally endangered species in 1990 under the U.S. Endangered Species Act [9]. The primary threats to the species are rooted in the modification of its native large-river ecosystems. Widespread construction of dams, levees, and river training structures for flood control, navigation, and power generation has fragmented historical populations, blocked essential long-distance spawning migrations and necessary larval drift distances, and fundamentally altered the natural hydrograph, thermal regime, and turbidity patterns that are critical for all life stages [9]. These alterations have destroyed or degraded essential spawning and rearing habitats, leading to a widespread lack of successful natural recruitment throughout its entire range. This issue has been partially mitigated by the adoption of a large-scale pallid sturgeon captive propagation program; however, increases in natural reproduction have not occurred [9]. Introgressive hybridization with the more common shovelnose sturgeon is a threat to the continued persistence of pallid sturgeon, especially in the lower Missouri and Mississippi Rivers, where hybrids outnumber pure pallid sturgeon [28].

Compounding the effects of habitat loss is the significant threat of incidental capture (bycatch) in commercial fisheries targeting shovelnose sturgeon. Such losses have been documented to cause substantial mortality and impede recovery efforts [29], necessitating the closure of shovelnose sturgeon commercial fisheries where the two species occur sympatrically.

2. Methods

2.1. Specimen Capture and Processing. Beginning in 2014, the Iowa DNR began conducting an annual mark-recapture study of shovelnose sturgeon in the lower Des Moines River. Sampling was conducted in the reach extending approximately 16 rkm downstream from the Ottumwa Hydropower Dam. The primary sampling gear was pulsed-DC (60 Hz) boat electrofishing with a 25%–30% duty cycle. Sampling was conducted while moving downstream, and fish were collected and held in a livewell until data collection. Electrofishing sampling station duration varied across years and stations, but typically did not exceed 15 min of energized field per station. While sampling primarily concentrated on shovelnose sturgeon, any sturgeon species encountered were collected and processed. This sampling took place from mid-April through mid-May annually. Sampling in 2025 began on 21 April 2025 at Ottumwa, Iowa. The sampling area is located below all three of the major Des Moines River dams (Saylorville Dam, Red Rock Dam, and the Ottumwa Hydropower Dam), approximately 151 rkm above the confluence of the Des Moines River with the UMR. Total electrofishing time over 7 days of sampling was 7.61 h.

Upon capture, all sturgeons were measured to the nearest millimeter (FL) and weighed to the nearest gram. The relative condition factor (K_n) was calculated for pallid sturgeon based on the equation developed by Keenlyne and Evenson [30] for fish collected from the Missouri and Mississippi Rivers. All fish were scanned for existing passive integrated transponder (PIT) tags using a portable reader. In shovelnose sturgeon, individuals without a preexisting PIT tag were implanted with a new 10-mm 134.2-kHz full-duplex tag. The tag was injected into the musculature of the left operculum, a location known for high retention rates in *Scaphirhynchus* spp. [31]. Pallid sturgeon were handled and tagged using the same procedure, despite a recommendation by the U.S. Fish and Wildlife Service [32] to insert tags into the dorsal musculature.

2.2. Morphological Identification. Collection of pallid sturgeon in the Des Moines River occurred incidentally to survey work that targeted shovelnose sturgeon. As pallid sturgeon were unknown in the Des Moines River, nor were they believed to inhabit contiguous pools of the UMR [9], we were not prepared to conduct detailed morphological comparisons of suspected pallid sturgeon as identified by Wills et al. [33]. On 28 April 2025, a suspected pallid sturgeon was collected during this sampling. Approximately one week later, on 6 May 2025, a second suspected pallid sturgeon was collected within 300 m of the first collection. Initial identification was based on the specimens exhibiting classic morphological characteristics of pallid sturgeon, including a distinctly long, sharpened rostrum, a pale grayish-white coloration, long filamentous outer barbels that extended posteriorly well beyond the inner barbels and mouth, and a lack of ventral scales. Suspected pallid sturgeon were handled in the same way as other sturgeons; however, extensive attention to photographing each fish was given, and a small (≈1 cm^2) tissue sample was excised from the anal fin and preserved in 95% ethanol for later genetic verification.

2.3. Genetic Verification. We isolated genomic DNA from fin clips using the DNeasy blood and tissue kit (Qiagen Inc., Germantown, MD). We genotyped each sample at 19

microsatellite loci [34] using an Applied Biosystems (Foster City, CA) SeqStudio DNA analyzer. We determined species identification using NewHybrids [35] software using baselines of previously identified pallid and shovelnose sturgeon as described in [28]. The same microsatellite genotypes were used to determine whether they were offspring of known hatchery crosses using Cervus [36] software as described in Steffenson et al. [37].

3. Results

3.1. Capture and Physical Description. The first suspected pallid sturgeon was captured on 28 April 2025 and was slightly larger and heavier (812 mm, 1870 g, $K_n = 0.76$) than the second, which was captured on 6 May 2025 (784 mm, 1680 g, $K_n = 0.77$). Both pallid sturgeon exceeded the maximum length of all shovelnose sturgeon collected during this survey. We were unable to determine the sex of either individual at the time of capture. The first fish was captured during the peak of a high discharge event (maximum flow = 560 cms), whereas the second fish was captured approximately 1 week later on the descending limb of this release event, when flows had declined by more than 50%. Median flow for this date over 55 years of data was 425 CMS (Figure 1). A total of 549 shovelnose sturgeon (CPUE = 72.14 fish/hour) and two suspected pallid sturgeon (CPUE = 0.26 fish/hour) were collected during sampling. The ratio of shovelnose sturgeon: pallid sturgeon was 276:1. Neither fish was previously PIT tagged or missing scutes, which would indicate previous capture or perhaps an origin resulting from conservation stocking efforts.

3.2. Morphological Analysis. Both fish identified in the field as pallid sturgeon exhibited all characteristics outlined previously for gross field identification of pallid sturgeon. Figure 2 demonstrates the comparative morphology of shovelnose sturgeon collected at the same time suspected pallid sturgeon were collected.

3.3. Genetic Verification. NewHybrids assignments to the pure pallid sturgeon category for the two Des Moines River sturgeon were 0.999 and 0.998 (out of 1.000), confidently identifying both as pure pallid sturgeon. Neither sturgeon had a microsatellite genotype consistent with hatchery origin. Thus, we concluded that both were wild pallid sturgeon.

4. Discussion

4.1. Potential Range Expansion. The combination of gross identification of pallid sturgeon morphological traits, in conjunction with a highly confident genetic assignment, provides unequivocal evidence that the specimens captured in the Des Moines River were pure-strain pallid sturgeon. Furthermore, these fish were identified to have wild parentage and were not the product of conservation propagation and stocking efforts. This finding constitutes the first scientifically verified record of pallid sturgeon in the Des Moines River and represents a potential expansion of the species' known occupied range (Figures 3(a) and 3(b)). While pallid sturgeon are known from the Mississippi River mainstem, their presence in the UMR is not heavily documented, and their verified presence 151 rkm upstream from the confluence of the Des Moines River with the UMR was previously undocumented and largely unexpected.

The historical range of pallid sturgeon theoretically included the UMR upriver to Keokuk, Iowa [12]. The addition of the UMR in this historic range is largely based on a single report of a pallid sturgeon in 1916 near what is now the area of Lock and Dam 19 at Keokuk, Iowa, as described by Coker [16] and is further supported by more recent telemetry data collected by the Missouri Department of Conservation from 2002 to 2010 [38]. During that study, eight of 131 pallid sturgeon equipped with acoustic transmitters in the Middle Mississippi River (MMR) moved into the pooled portion of the UMR as far upstream as Lock and Dam 22 near Saverton, MO. No additional records of pallid sturgeon in Missouri above this location were noted [38]; however, this suggests pallid sturgeon may use the UMR and its tributaries more than previously believed and represents a pattern of movement consistent with pallid sturgeon that may enter the Des Moines River.

Bailey and Cross [39] referred to the Coker [16] observation as "dubious" but did not outright dismiss this record. Rather, they stated the record required verification. The collection of two wild pallid sturgeon in the Des Moines River, which enters the UMR at Keokuk, provides additional support for the 1916 record. The significance of these data points potentially has cascading implications for the National Pallid Sturgeon Recovery Plan and the Endangered Species Act Similarity of Appearance (SOA) clause provisions, suggesting value in the expansion of the geographic scope of monitoring, habitat assessment, and threat analysis for the species. The effectiveness of the recovery plan and SOA is predicated on an accurate understanding of the species' distribution, population status, and habitat use [12]. Our discovery demonstrates that the current understanding may be incomplete and that the UMR, Des Moines River, and potentially other large, unmonitored Mississippi River tributaries have been overlooked as part of the species' occupied range. Figure 3(a) is based on the historical range of pallid sturgeon in North America but reflects the recent collections from the Des Moines River and includes the 1916 record from the UMR at Keokuk, Iowa ([16], Figure 3(b)).

4.2. Potential Origin and Habitat Use. The presence of adult pallid sturgeon far upstream in the Des Moines River, a major yet highly modified tributary, challenges conventional views of the species' habitat requirements, which emphasize large, free-flowing, turbid rivers with diverse physical habitats [12]. One explanation for their presence is natural dispersal from the Mississippi River mainstem population, as pallid sturgeon are highly mobile and capable of long-distance movements in search of suitable habitats [40]. The lower Des Moines River contains spawning habitat sufficient to attract large numbers of shovelnose sturgeon [41] and is also utilized by other migratory species such as

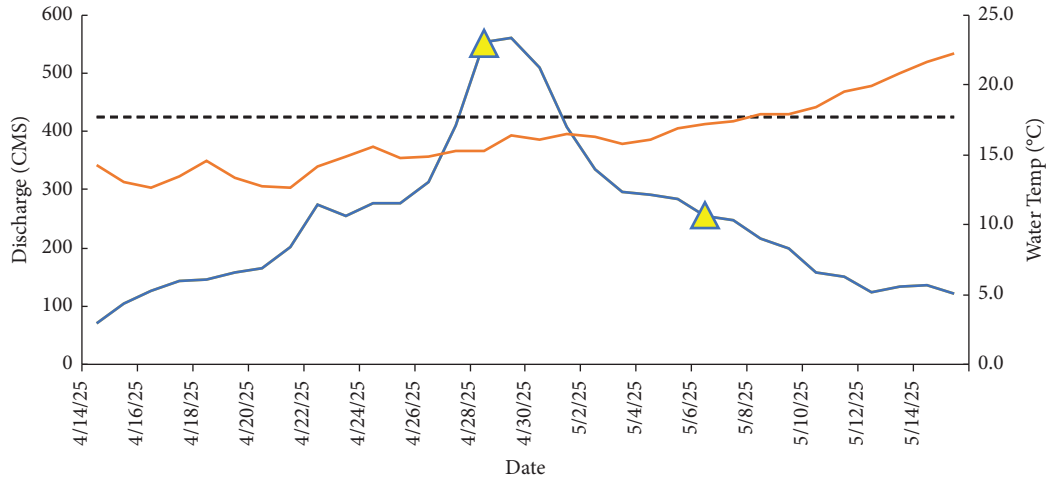

FIGURE 1: Discharge (blue line) in cubic meters per second (CMS) and water temp (orange line [°C]) in the Des Moines River at Ottumwa, Iowa, during sturgeon sampling in 2025. The dashed line represents the median flow for 55 years of data from this time series. Data are from a USGS gaging station within 0.5 km of the collection site. Triangle markers indicate the date of collection for both pallid sturgeon.

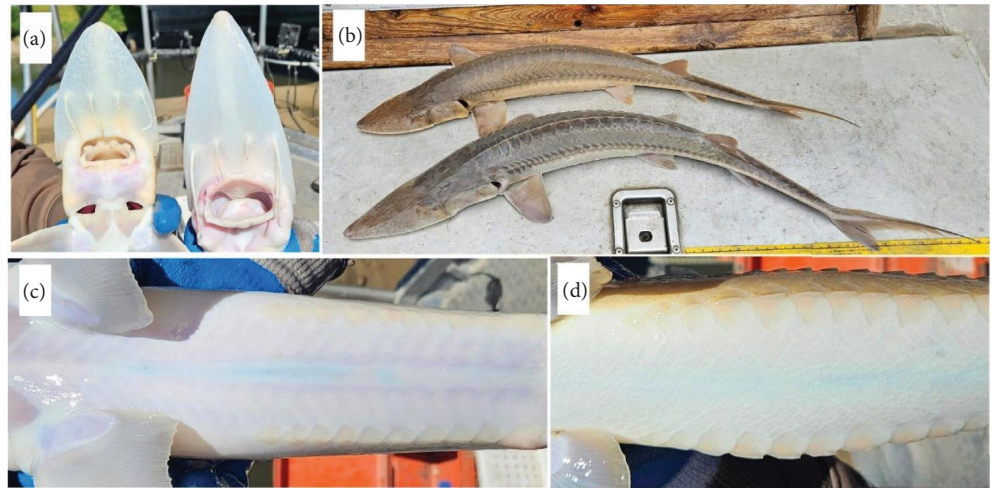

FIGURE 2: (a) Anterior ventral view of shovelnose sturgeon (left) and pallid sturgeon (right) (note the outer barbels that extend posteriorly, beyond the inner barbels of the mouth on the pallid sturgeon). (b) Dorsolateral view of verified pallid sturgeon (bottom) with shovelnose sturgeon (top) (note the distinctly long, sharpened rostrum and grayish-white coloration of the pallid sturgeon). (c) Ventral view of pallid sturgeon (note lack of scales on belly). (d) Ventral view of shovelnose sturgeon (note scaled belly). Fish were collected at Ottumwa, Iowa.

lake sturgeon and blue sucker *Cycleptus elongatus* [42], suggesting the presence of attractive migratory cues. It is likely that the pallid sturgeon collected here moved from the Mississippi River into the Des Moines River during the increased flows observed at the time of capture (Figure 1) and continued upstream until their migration was effectively blocked by the Ottumwa Hydropower Dam. Their presence implies that despite significant degradation from impoundment, channelization, and agricultural runoff [22], the river retains sufficient functional attributes to attract a large, predatory, benthic fish. For instance, both pallid sturgeon were collected within 300 m of each other over a hard bottom with extensive limestone boulders, a substrate with substantial use by the species in the MMR [43]. Furthermore, other important habitat structures, such as island tips [43,44], still exist in the lower Des Moines River. This discovery demonstrates that the UMR and its large tributaries, even when highly altered, may provide attractive habitats and serve an important function for the species, and are managed in a way consistent with a more natural hydrograph.

While the recent collection of pallid sturgeon in the lower Des Moines River is suggestive of a potential range expansion, major challenges still exist. Dams have disrupted natural river flows, limiting seasonal flood pulses that once triggered upstream migration and spawning [9]. High water temperature, often associated with low flows, has been identified as a major stressor for adult sturgeon in this river reach and a driver of catastrophic mortality events [27] and would likely negatively affect other life stages. Sturgeon larvae, which passively drift, depend on consistent, sustained flows to drift downstream to nursery habitats. Altered flow

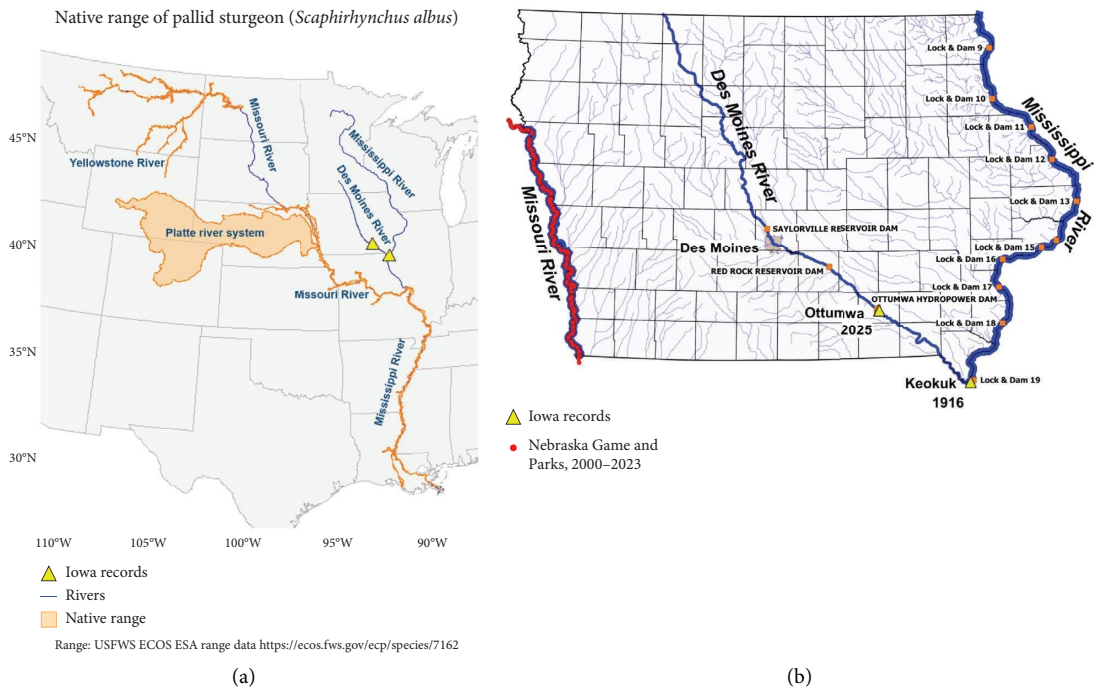

FIGURE 3: Panel (a) map is a representation of the current pallid sturgeon (*Scaphirhynchus albus*; orange shading) range within the Mississippi River Basin, adapted from USFWS ECOS ESA range data (https://ecos.fws.gov/ecp/species/7162) with the addition of recent captures from the Des Moines River and a historic collection from the Upper Mississippi River (UMR) near Keokuk, Iowa (yellow triangles). Panel (b) shows documented captures from 2000 to 2023 by the Nebraska Game and Parks Commission from the Missouri River (red circles; $n = 3967$; K. Steffensen, Nebraska Game and Parks Commission, unpublished data) and recent/historical captures from the Iowa Department of Natural Resources in 2025 and Coker [18] from the upper UMR (yellow triangles). Major rivers are dark blue. Orange squares represent barriers to fish movement.

regimes can interrupt this critical phase, reducing survival and limiting natural reproduction [8,41]. For example, Kappenman et al. [45] identified an acceptable thermal niche for pallid sturgeon embryos between 12°C and 24°C. However, water temperatures in this river consistently approach or exceed these levels, even during May (Figure 1; [27]), which would likely result in mortality for embryonic *Scaphirhynchus* spp. The Iowa Department of Natural Resources is a principal cooperator for the implementation of the Des Moines River Monitoring and Adaptive Management Plan (MAMP; [23]). Within the framework of the Sustainable Rivers Program (SRP), MAMP represents an environmental flow program aimed at more closely mirroring a naturally established hydrograph downstream of Red Rock Dam. Flow pulses resulting from the MAMP have been associated with *Scaphirhynchus* spp. spawning and larval production [41,46].

Habitat improvement was specifically identified as another potential need by the SRP [21]. These projects can be explicitly designed and prioritized to create or enhance specific habitat types known to be used by both shovelnose sturgeon and pallid sturgeon, such as side-channel complexity, downstream island tips, and areas with diverse flow and substrate [43,44,47]. Hopefully, the eventual implementation of these habitat improvements, coupled with the MAMP, can be used to reduce the frequency of, and as a response to, any ongoing sturgeon kills. This is now especially important as wild pallid sturgeon have been observed to use the very reach where these kills are known to originate.

These collections suggest that a reevaluation of management responses is appropriate. First, a standardized, targeted sampling program should be considered to actively search for additional pallid sturgeon, which would lend credibility toward the concept of a range expansion for the species. To accomplish this, changes to better reflect the methodology employed by the Multiagency Population Assessment Project [48] (e.g., use of trotlines) should be considered. The primary goal would be to determine if these captures represent solitary, transient individuals or if the river supports more regular use that may represent a range expansion. In the event other individuals are found, the abundance, size structure, and condition of the Des Moines River (and by necessity the UMR to pool 20) population should be characterized. To date, larval collections in the lower Des Moines River have not yielded any pallid sturgeon larvae [46]. It is important to note; however, that the larval sampling sites did not spatially correspond with the areas where adult pallid sturgeon were collected. Should additional pallid sturgeon be captured, we recommend increasing larval sampling effort near these specific capture locations. This would facilitate the confirmation of potential spawning behaviors and/or locations, while also allowing for a more thorough investigation of potential spatiotemporal

overlap with successful shovelnose sturgeon spawning. Second, the documented threat of incidental take in commercial and recreational fisheries may now be considered in portions of the UMR where commercial harvest of shovelnose sturgeon flesh and roe is allowed (UMR pools 20–26). There is evidence that illegal harvest of pallid sturgeon by commercial anglers poses a threat to pallid sturgeon restoration. Bettoli et al. [29] observed illegal harvest of pallid sturgeon in the Tennessee waters of the Mississippi River, and nearly 2% of the harvest of sturgeons was composed of the illegal take of pallid sturgeon, either through improper identification by commercial anglers or by intentional illegal harvest. This risk, a potential impediment to recovery elsewhere [29], was previously not recognized for the lower pools of the UMR and its tributaries (Federal Register, 74 FR48215 2009). In light of these collections, and with the added observations of Herzog [38] in the UMR, support for SOA concerns from Pool 20 of the UMR, downstream to areas already closed to shovelnose sturgeon commercial harvest, should be considered. In addition, proactive engagement with recreational anglers and commercial fishers is essential to implement angler education programs about sturgeon identification and to review existing regulations for the legal harvest of shovelnose sturgeon to minimize the potential for accidental capture and mortality of endangered pallid sturgeon. Third, in the event additional pallid sturgeon are collected, a detailed habitat assessment, coupled with an evaluation of habitat use (e.g., pallid sturgeon telemetry) similar to the study by Delonay et al. [7], should be considered. Given the existing passive telemetry infrastructure in the lower Des Moines River [41], this assessment would quantify critical habitats and provide support for ongoing and future habitat restoration efforts, such as those being explored under the USACE's SRP [21] for this river reach.

5. Conclusion and Future Directions

The discovery of two wild pallid sturgeon in the Des Moines River is a significant event that potentially reshapes our understanding of this endangered species' contemporary distribution. It serves as a reminder that even within human-dominated landscapes, significant conservation opportunities and biological surprises can exist. The hope generated by this discovery is made even more poignant by the Des Moines River's long-standing history of environmental distress, caused by the highly perturbed nature of the system that has experienced multiple catastrophic fish kills in the last 3 decades. Tens of thousands of shovelnose sturgeon have perished due to extremely low river flows and lethally high water temperatures as a result of these environmental challenges. The ongoing evaluation into the abundance of shovelnose sturgeon in the lower Des Moines River will continue; however, recapture numbers remain very low (< 1% of captured fish) after 12 years of effort. While abundance estimates are not possible, the lack of recaptured shovelnose sturgeon suggests that the population is large, especially when compared to the very low capture frequency of pallid sturgeon, which were just verified in 2025. It is possible, but unlikely, that pallid sturgeon were collected and misidentified during previous efforts. Regardless, the presence of pallid sturgeon in the lower Des Moines River is low compared to the more common cogener. However, this finding may act as a catalyst for a new phase of focused research and adaptive management within the lower Des Moines River, which has already been targeted through the SRP MAMP with the overarching mission of improving habitat within this reach. In order to better understand the significance of these collections, increased cooperation among nearby state and federal management agencies is imperative. The presence of pallid sturgeon in the lower Des Moines River suggests that even highly perturbed systems may provide sufficient habitat for at-risk populations when critical habitat variables, such as stream flows, are managed in a way consistent with a more natural hydrograph.

Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Conflicts of Interest

The authors declare no conflicts of interest.

Funding

Iowa Fishing License Sales funded this study.

Acknowledgments

We would like to thank Dave Herzog and Joshua Abner of the Missouri Department of Conservation for their continued collaborations and acoustic telemetry data sharing across species and river reaches; their assistance is key to a better understanding of fish community movements within these systems. We wish to thank Kirk Steffensen of the Nebraska Game and Parks Commission for his sharing of pallid sturgeon capture data from the Missouri River along the Iowa/Nebraska border, which provided our foundation for the species range along Iowa's western border. We thank B. Ellison and B. Wilson for their assistance in the field. Funding for this project was provided by the Iowa Department of Natural Resources through Iowa fishing license sales.

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