# IOWA'S CURIOUS RECORD FOR LAKE CHUB (*COUESIUS PLUMBEUS*)

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The Lake Chub (*Couesius plumbeus*) is a relatively large, slender-bodied minnow (Family: Cyprinidae) commonly reaching lengths of 4–5 inches and reaching a reported maximum of nearly 9 inches (Figure 1). There is usually a slender barbel near the tip of the maxillary. The Lake Chub is dark olive dorsally and is dusky white ventrally with a dark lateral band extending from the base of the caudal fin to the snout. Although superficially resembling the Creek Chub (*Semotilus atromaculatus*), the Lake Chub lacks the Creek Chub's dark spot at the base of the caudal fin and the dark spot at the anterior base of the dorsal fin. The Northern Pearl Dace (*Margariscus nachtriebi*) also bears a resemblance to the Lake Chub but has a shorter, more blunt snout, has a somewhat less laterally compressed body, and lacks the red streak along the lower side of the body of the large male Pearl Dace (Page and Burr 2011). The Lake Chub has the most northerly and widespread distribution of any North American cyprinid and it ranges from Alaska east to Nova Scotia and south to the Great Lakes of the northern United States with scattered relict populations known from the upper Missouri River basin drainage of Wyoming, Colorado, South Dakota, and Nebraska (Figure 2). In addition, nearly all authors of regional accounts of fishes that include Lake Chub specifically mention that the only known population of Lake Chub in the Upper Mississippi River basin is from Iowa (e.g., McPhail and Lindsey 1970; Scott and Crossman 1973; Becker 1983; Eddy and Underhill 1974; Hubbs and Lagler 1958; and Page and Burr 2011). As described by Bailey (1956; Figure 3), this record is based on a collection made in 1954 just west of Dubuque in northeastern Iowa.

**Figure 1. Lake Chub (*Couesius plumbeus*). (Photo by Konrad Schmidt)**

According to published accounts, the Lake Chub is a habitat generalist, at least within its northern-trending and


**Figure 2. Distribution of the Lake Chub in North America. The arrow indicates the approximate location of the 1954 record from Dubuque County, IA. Figure modified from Page and Burr (2011).**

Photos by the author unless otherwise indicated.

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*Hybopsis plumbea* (Agassiz)—lake chub. Recently (Bailey, 1951: 188) the lake chub was removed from the Iowa faunal list since it was shown that the only record was based on a misidentification. Now through the courtesy of Dr. Royal D. Suttkus of Tulane University, in loaning the specimens, it is possible to report an unquestionable record of occurrence of the species in Iowa. On September 8, 1954, Robert K. Chipman collected 7 specimens (41 to 70 mm. in standard length) in Twin Springs Creek, at Carter Road, northwest of Dubuque, Dubuque County. They are number 10208 in the Tulane University collection. Like *Cottus cognatus*, which lives in the area, the lake chubs occurrence in northeastern Iowa far south of the main body of the range of the species, is explainable as a glacial relict. There exists a strong likelihood that these species resided in the nearby Driftless Area during the Wisconsin glaciation. Persistence of these cool-water species is made possible by the presence of numerous springs in northeastern Iowa.

**Figure 3. Excerpt from Bailey (1956) in Iowa Fish and Fishing (Harlan and Speaker 1956:331) regarding discovery of the Lake Chub in Iowa.**

extensive range in North America. Page and Burr (2011:190) state that this species inhabits "virtually any body of water standing or flowing, large or small and is usually in gravel-bottomed pools and runs of streams and along rocky lake margins."

Prior to its collection near Dubuque, Iowa, in September 1954, the Lake Chub had never been documented in the state, and it has not been reported there since. Despite considerable fish survey activity in recent decades in Iowa and adjacent states, this 1954 record remains the only one for this species in the Upper Mississippi River drainage with the closest populations to Iowa occurring in the Great Lakes drainages of Wisconsin and Minnesota (Lee et al. 1980; Page and Burr 2011) and in the Missouri River Basin in northern Nebraska (Stasiak 1986; 2006, Hrabik et al. 2015). Similar to disjunct populations in Nebraska as described by Stasiak (2006), Iowa's record for Lake Chub is believed to be a glacial relict population (Bailey 1956). Subsequent fish surveys in the vicinity of the 1954 record, including an intensive two-day search in August 2015, have not produced additional specimens. Due to its occurrence far from known populations, and due to the one-time appearance of this species in the state, Iowa's lone Lake Chub record remains somewhat of a mystery.

## ON AND OFF AND ON AND OFF OF IOWA'S LIST OF FISHES

The Lake Chub was included in the Iowa fish fauna prior to 1951 as *Couesius dissimilis* (Osborn 1892; Potter and Jones 1928) but was removed in the early 1950s when ichthyologist Reeve Bailey (1951)—who was at Iowa State College in Ames, IA, from 1938 to 1943—concluded that this species had been added to Iowa's list of fishes due to a misidentification. As described in Bailey's check-list of Iowa fishes (Bailey 1951), this species had been included based on the report by Seth Meek (1892:229) of *Couesius dissimilis* from the Iowa River at Belmond in north-central Iowa. Bailey rejected this record based on (1) the remoteness of the record from the known range of Lake Chub and (2) the dental formula for *C. dissimilis* as reported by Meek. Bailey suggested that what Meek reported as *C. dissimilis* was a hybrid with one parent being Southern Redbelly Dace (*Chrosomus erythrogaster*), which Meek reported as "abundant" at the Belmond location. The Lake Chub, however, had a relatively brief (four-year) absence from Iowa's list of fishes.

As described by Bailey (1956) in his updated check-list of Iowa fishes in the revised (third) edition of *Iowa Fish and Fishing* (Harlan and Speaker 1956:331), this species was added back to the Iowa fish fauna based on a collection near Dubuque in northeastern Iowa in September 1954 by future Tulane University graduate student, Robert K. Chipman:

> Now through the courtesy of Dr. Royal D. Suttkus of Tulane University, in loaning the specimens, it is possible to report an unquestionable record of occurrence of the species in Iowa. On September 8, 1954, Robert K. Chipman collected 7 specimens (41 to 70 mm in standard length) in Twin Springs Creek, at Carter Road, northwest of Dubuque, Dubuque County. They are number 10208 in the Tulane University collection.

Bailey attributed the unusual occurrence of the Lake Chub in Iowa to the "strong likelihood" that this cool-water species which, similar to the Slimy Sculpin (*Cottus cognatus*), had used the numerous springs the Driftless Area ecoregion of northeast Iowa, southeast Minnesota, and southwest Wisconsin as a glacial refugium during the most recent period of continental glaciation (i.e., the Wisconsinan glacial period which ended in Iowa about 12,000 years before present (Prior 1990)). Thus, the Lake Chub was back on Iowa's list (Bailey 1956), at least for a few decades.

By the mid-1980s, with the lack of any Iowa records subsequent to the 1954 collection, the Lake Chub was "presumed to be extirpated from Iowa" in the most recent edition of *Iowa Fish and Fishing* (Harlan et al. 1987:95). As a "presumed extirpated" species, the Lake Chub is not on the Iowa's list of threatened/endangered species (IAC 2009), nor is it a "species greatest conservation need" as identified in the state's wildlife action plan (Zohrer 2012).

Despite the lack of subsequent records for the Lake Chub in Iowa and its presumed extirpation from the state, the 1954 record is accepted as valid and is used in published accounts of this species (e.g., Lee et al. 1980; Stasiak 2006; Page and Burr 2011). This isolated record, however, continues to generate interest within the state of Iowa and beyond, and a review of the history of this record raises several questions.

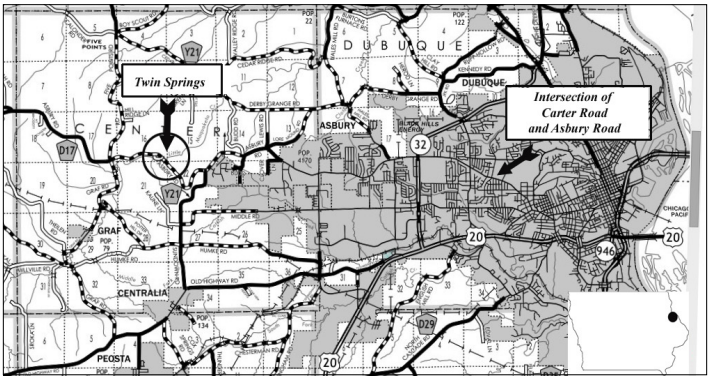


**Figure 4. City of Dubuque, IA, and location of reference points for the 1954 collection of Lake Chub in Iowa: intersection of Carter and Asbury roads in Dubuque and "Twin Springs" approximately 8 air miles west of downtown Dubuque. Map shows Dubuque County's Center and Dubuque townships with square-mile sections indicated. Modified map from Iowa Dept. of Transportation.**

## WHERE, EXACTLY, WAS THE LAKE CHUB COLLECTED IN IOWA IN 1954?

There remains some uncertainty regarding the location of the stream and the site of the September 1954 collection of Lake Chub in Dubuque County. The original 1954 description of the collection location for this record apparently comes from the collector, Robert K. Chipman, then a future student at Tulane University, as this is the exact description used by the Tulane Museum of Natural History to catalog his Iowa specimens of Lake Chub: "Twin Springs at Carter Road 10 mi. NW of Dubuque."

This description, however, appears to be in error. Carter Road runs only for about two miles in a SSW/NNE direction through the city of Dubuque from John F. Kennedy Drive, across Asbury Road, then on to 32nd Street on the north side of Dubuque where Carter Road ends. The 1954 collection, however, may very well have been located about 10 miles NW of Dubuque: it is about 8.5 air miles from downtown Dubuque to an area known as "Twin Springs" in Section 16 of Dubuque County's Center Township, and the distance would have no-doubt been a bit further by driving; so, the description "10 miles NW of Dubuque" [actually, WNW] seems plausible (Figure 4).

According to Tulane University's catalog of fishes (as made available at FishNet2, http://www.fishnet2.net/), Chipman made three fish collections in Dubuque County, Iowa: September 1954, June 1956, and August 1957. Specimens from these collections are catalogued in the Royal D. Suttkus Fish Collection at the Tulane University Biodiversity Research Institute; these specimens are summarized in Table 1. Chipman's descriptions of the June 1956 and August 1957 collections interestingly put these collections in potentially different localities in Dubuque County.

**The June 1956 collection:** Tulane's description of the location of Chipman's second collection ("Twin Spring Creek 7.9 miles NW of Carter Road on Asbury Road") is potentially consistent with that of his first (September 1954) collection. Again, it is about eight driving miles (about 6.5 air miles) from the intersection of Carter and Asbury roads in Dubuque to the Twin Springs area.

**The August 1957 collection:** Presuming that the Iowa Lake Chub was collected in the vicinity of Twin Springs (located in Section 16 of Center Township in Dubuque County), the location description of Chipman's third (August 1957) location ("Twin Springs Creek at Asbury Rd., 4.8 mi. N intersection of Carter Rd.(Dubuque) and Asbury Rd.") seems in error. A point 4.8 miles north of the Carter Road/Asbury Road intersection puts the collection location about eight miles east of the Twin Springs area (Figure 4).

Even in the 1950s, there appears to have been uncertainty regarding exactly where in Dubuque County Chipman had collected the Lake Chub. Based on his time teaching at Iowa State College in the late 1930s and early 1940s, and based on his involvement with the first and second editions of *Iowa Fish and Fishing* (Harlan and Speaker 1951), ichthyologist Reeve Bailey was also involved with preparing the third (1956) edition of this book (Harlan and Speaker 1956). Robert Cleary was a fisheries biologist for the Iowa Conservation Commission who, like Bailey, was heavily involved with preparing the 1956 update of *Iowa Fish and Fishing*. As part of this involvement, there exist copies of several letters between Bailey and Cleary from the mid-1950s related to questionable identifications and unusual records for Iowa fishes. In a letter to Cleary from November 1, 1955, Bailey noted that Lake Chub was taken in September 1954 by a student of Dr. Royal D. Suttkus of Tulane at "Twin Springs Creek at Carter Road, 10 miles northwest of Dubuque, Iowa, in Section 14 of Center Township (T89N, R1E) of Dubuque County." Bailey's letter is the first time a public land survey section number is applied to the Lake Chub collection location. Bailey's description is likely based on Chipman's original location description as "Carter Road" is again given as the stream crossing (even though Carter Road does not exist outside of the city of Dubuque and does not cross any creeks). Interestingly, the Twin Springs area is not located in Section 14 but in Section 16 of Center Township (Figure 4).

There is a subsequent letter from Bailey to Cleary regarding an additional collection possibly made by Bailey from Twin Springs Creek, Dubuque Co., Iowa, Center Township made on July 27, 1956, but this letter identifies the location as being in Section 16 of Center Township and not in Section 14 as described in Bailey's November 1955 letter. This collection may have been an attempt by Bailey to collect Lake Chub.

## FROM WHAT STREAM IN DUBUQUE COUNTY WAS THE LAKE CHUB COLLECTED IN 1954?

Beginning with Bailey's (1956) report of "an unquestionable record of occurrence of the species [Lake Chub] in Iowa...in Twin Springs Creek northwest of Dubuque, Dubuque County [IA]," the presumed stream from which the Lake Chub was collected has been "Twin Springs Creek." This presumption has been carried through most accounts regarding the distribution of this species (e.g., Becker 1983:463; Menzel 1987; Stasiak 2006:15; and Page and Burr 2011:190). Although there is an area known since Iowa's pioneer days as "Twin Springs" about 10 miles west-northwest of Dubuque, there are no named steams in this area or in Dubuque County identified as "Twin Springs Creek."

Interestingly, Chipman's 1954 collection location description ("Twin Springs at Carter Road 10 mi NW of

**Table 1. Summary of fish collections made by Robert K. Chipman at Twin Springs in Dubuque County, IA, from 1954–1957. The number of specimens in the table is the number cataloged by the Tulane University Museum of Natural History. Information from the Tulane University Biodiversity Research Institute as entered into the Iowa Rivers Information System fish database (IRIS 2002).**

| Species Collected | Common Name | Sep. 8, 1954: *Twin Springs at Carter Road, 10 miles NW of Dubuque* | June 13, 1956: *Twin Springs Creek, 7.9 miles NW of Carter Road on Asbury Road* | August 30, 1957: *Twin Springs Creek at Asbury Rd., 4.8 mi. N intersection of Carter Rd. & Asbury Rd., in Dubuque* |
|---|---|---|---|---|
| **Cyprinidae** | | | | |
| *Campostoma anomalum* | Central Stoneroller | 1 | 8 | 11 |
| *Couesius plumbeus* | Lake Chub | 7 | | |
| *Cyprinella lutrensis* | Red Shiner | | 18 | 1 |
| *Luxilus cornutus* | Common Shiner | | 44 | 60 |
| *Nocomis biguttatus* | Hornyhead Chub | 43 | 6 | 2 |
| *Notropis dorsalis* | Bigmouth Shiner | 4 | | 32 |
| *Notropis percobromus* | Carmine Shiner | 27 | 3 | 1 |
| *Notropis stramineus* | Sand Shiner | 11 | 16 | |
| *Phenacobius mirabilis* | Suckermouth Minnow | 8 | 3 | 18 |
| *Rhinichthys atratulus* | Blacknose Dace | 7 | | |
| *Rhinichthys cataractae* | Longnose Dace | 4 | | |
| *Semotilus atromaculatus* | Creek Chub | | | 2 |
| **Catostomidae** | | | | |
| *Catostomus commersonii* | White Sucker | 4 | 3 | 1 |
| **Ictaluridae** | | | | |
| *Ameiurus melas* | Black Bullhead | 1 | | 2 |
| *Noturus flavus* | Stonecat | 1 | 1 | |
| **Salmonidae** | | | | |
| *Salmo trutta* | Brown Trout | 1 | | |
| **Centrarchidae** | | | | |
| *Lepomis cyanellus* | Green Sunfish | | 2 | |
| *Micropterus dolomieu* | Smallmouth Bass | 3 | | |
| **Percidae** | | | | |
| *Etheostoma nigrum* | Johnny Darter | 1 | 1 | |
| | **Total species collected** | **15** | **11** | **10** |

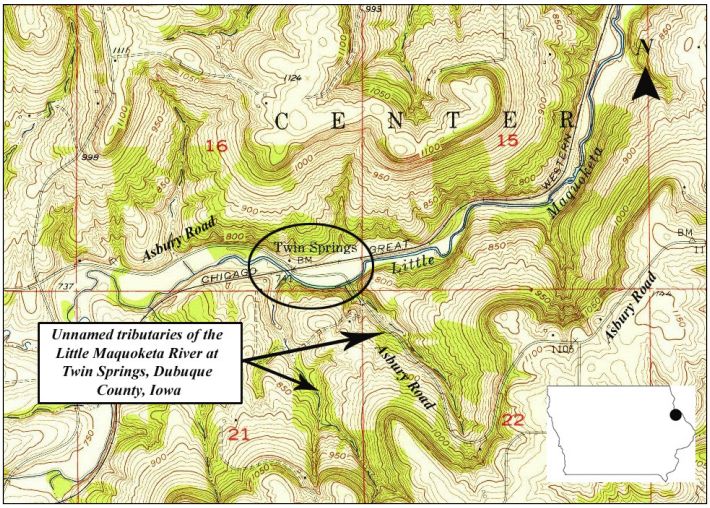


**Figure 5. Unnamed tributaries at Twin Springs in Section 16 of Center Township, Dubuque County, IA. The western unnamed tributary was sampled in August 2015. The eastern tributary was not flowing during the August 2015 foray. Modified excerpt from the US Geological Survey's 1956 Sherrill Quadrangle (1:24,000-scale; 7.5-minute series).**

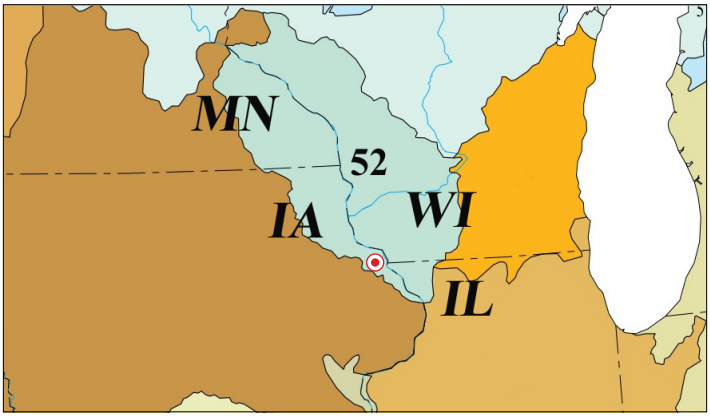


**Figure 6. Level III ecoregion 52: the Driftless Area of NE Iowa, SE Minnesota, SW Wisconsin, and NW Illinois. Dot indicates approximate location of Twin Spring area in Dubuque County, IA. This ecoregion shows a general lack of glacial effects and is characterized by a high-relief and bedrock-dominated terrain with steep slopes, high bluffs, dense forests and rock outcrops. The area is known for unique boreal microhabitats (Griffith et al., 1994). Map modified from US EPA (2003).**

Dubuque") does not identify a stream but only a location: "Twin Springs." A mid-sized stream, the Little Maquoketa River (drainage area of about 50 square miles at the Twin Springs area), flows through the Twin Springs area (Larimer1957). Several unnamed tributaries of the Little Maquoketa River in Dubuque County are cold water and support populations of stocked salmonids (i.e., Brown Trout (*Salmo trutta*), Rainbow Trout (*Oncorhynchus mykiss*), and Brook Trout (*Salvelinus fontinalis*)). Two of these tributaries flow to the northwest toward the Twin Springs area and their confluence with the Little Maquoketa River. These streams are shown on the 1956 US Geological Survey topographic map for the Twin Springs area (Figure 5). One of these streams closely follows Asbury Road as it descends into the valley of the Little Maquoketa River toward the settlement of Twin Springs.

To add to the confusion, Iowa DNR Fisheries biologists report that there are several unnamed streams in the Little Maquoketa watershed of Dubuque County locally known as "Twin Springs Creek." The variety of collection location descriptions and the lack of a named stream from which the Lake Chub was collected creates considerable uncertainty regarding the Iowa stream and location from which the Lake Chub was collected.

## IS THE IOWA LAKE CHUB RECORD VALID?

To describe Iowa's record for Lake Chub as "curious" approaches understatement. Certainly, glacial relict species of fish and other faunal groups exist in Iowa. For example, the Iowa Pleistocene Snail (*Discus macclintocki*) occurs at algific talus slopes in Iowa's Driftless Area (Henry 2003) and, as suggested by Bailey (1956), Iowa's sculpin species (Mottled Sculpin, *Cottus bairdii* and Slimy Sculpin, *C. cognatus*) also occur in this ecoregion. Typically, however, these glacial relicts have a broader distribution in the Driftless Area ecoregion than a single locality. For example, the Iowa Pleistocene Snail is distributed in portions of five northeastern Iowa counties (INAI 2016), and Iowa's sculpin species are found in coldwater streams in approximately the same area (Harlan et al. 1987). Also, the lack of Lake Chub records either currently or historically from Driftless Area of Wisconsin, Minnesota, or Illinois (Figure 6)—and moreover from the remainder of the entire Upper Mississippi River Basin—seems to cast doubt on the validity of the Iowa record. The lack of records for Lake Chub in Chipman's subsequent collections at the Twin Springs area in 1956 and 1957 (Table 1) adds uncertainty regarding the validity of Iowa's 1954 Lake Chub record.

Sample cross-contamination, whether in the field or lab, is always a concern when collecting, sorting, or cataloging fishes. Lake Chub specimens were at Tulane that were collected from four locations during 1940s and 1950s prior to Chipman's collection near Dubuque on September 8, 1954, including a collection from British Columbia made on August 1, 1954 (TU 11189) (FishNet2 query of April 15, 2016). The possibility that sample contamination was responsible for the 1954 Lake Chub record for Iowa is at least worth considering.

The possibility exists, of course, that a relict population of Lake Chub did occur at Twin Springs. The occurrence of the Lake Chub as glacial relict populations in north-central Nebraska (Stasiak 1986; Hrabik et al. 2015) at approximately

**Table 2. Summary of fish species collected from Little Maquoketa River at/near Twin Springs, Dubuque County, IA, in July 1982 and as part of four samplings conducted from 1995 to 2012 as part of Iowa DNR's biological monitoring program.**

| | Collected by Iowa State University, July 1982 | Number of biomonitoring occurrences 1995–2012 |
|---|---|---|
| **Cyprinidae** | | |
| *Campostoma anomalum,* Central Stoneroller | X | 4 |
| *Cyprinella lutrensis,* Red Shiner | X | 1 |
| *Cyprinella spiloptera,* Spotfin Shiner | | 3 |
| *Luxilus cornutus,* Common Shiner | X | 4 |
| *Nocomis biguttatus,* Hornyhead Chub | X | 4 |
| *Notropis dorsalis,* Bigmouth Shiner | X | 3 |
| *Notropis percobromus,* Carmine Shiner | X | 4 |
| *Notropis stramineus,* Sand Shiner | X | 4 |
| *Phenacobius mirabilis,* Suckermouth Minnow | X | 4 |
| *Pimephales notatus,* Bluntnose Minnow | X | 4 |
| *Rhinichthys cataractae,* Longnose Dace | X | 4 |
| *Semotilus atromaculatus,* Creek Chub | X | 4 |
| **Catostomidae** | | |
| *Catostomus commersonii,* White Sucker | | 4 |
| *Hypentelium nigricans,* Northern Hog Sucker | | 1 |
| *Moxostoma erythrurum,* Golden Redhorse | | 4 |
| *Moxostoma macrolepidotum,* Shorthead Redhorse | | 1 |
| **Ictaluridae** | | |
| *Noturus flavus,* Stonecat | | 4 |
| **Centrarchidae** | | |
| *Lepomis cyanellus,* Green Sunfish | | 1 |
| *Lepomis macrochirus,* Bluegill | | 2 |
| *Micropterus dolomieu,* Smallmouth Bass | | 4 |
| *Micropterus salmoides,* Largemouth Bass | | 2 |
| **Percidae** | | |
| *Etheostoma flabellare,* Fantail Darter | X | 4 |
| *Etheostoma nigrum,* Johnny Darter | | 4 |
| *Percina phoxocephala,* Slenderhead Darter | | 1 |

the same latitude (approximately 42°30') as the Twin Springs area in Dubuque County, Iowa, suggests the possibility that Iowa's Lake Chub record from Twin Springs is valid. In addition, the small coldwater tributaries to the Little Maquoketa River at Twin Springs appear to match the type of habitat described by Stasiak (2006) for populations of Lake Chub in the Great Plains:

> The habitat of the isolated populations of Lake Chub in the northern Great Plains is quite different [than habitat in Canada and the Great Lakes]; here populations are often confined to small first order streams and cool spring seeps. Headwater streams where Lake Chubs are present in the Great Plains share the following characteristics: spring-fed with perennial flow regimes; clear and cool water quality; substrate composed of large sand or gravel, not mud; absence of large species of predacious fishes.

If an isolated population of Lake Chub historically occurred at Twin Springs, a variety of post-1954 events such as habitat alterations or fish kills could have eliminated this population. For example, a major reconfiguration of the road (Asbury Road) that crosses the Little Maquoketa River at Twin Springs occurred in 1957—just a few years after Chipman's 1954 collection of Lake Chub—following the 1956 collapse of the bridge deck of the old (circa 1888) bridge (Dubuque Telegraph Herald, November 29, 1956). Whereas the original route of Asbury road (which existed during Chipman's visit to Twin Springs in September 1954) passed through the Twin Springs area along the banks of the Little Maquoketa River, the reconfigured roadway was routed away from the river (to the north) to avoid problems with flooding and to eliminate a right-angle turn at the west approach to the bridge (Dubuque Telegraph-Herald, January 19,1958). Construction activities associated with bridge construction and roadway relocation could certainly have negatively impacted locally important aquatic habitats for the Lake Chub (e.g., the springs at Twin Springs). These changes at the Twin Springs area are consistent with the statement of Menzel (1987) that the Iowa Lake Chub collection site "has been destroyed."

## WHY HAS RECENT SAMPLING AT/NEAR TWIN SPRINGS FAILED TO PRODUCE ADDITIONAL RECORDS FOR LAKE CHUB?

Several fish surveys have been conducted since 1980 in the vicinity of the presumed 1954 Lake Chub collection area at Twin Springs. The Little Maquoketa River at Twin Springs was sampled in July 1982 as part of a statewide fish survey under the direction of Bruce Menzel then at Iowa State University. Also, Iowa DNR/State Hygienic Laboratory (DNR/

SHL) biomonitoring crews have sampled the Little Maquoketa near Twin Springs (a Driftless Area ecoregion reference site) four times: 1995, 2001, 2008, and 2012 (see Iowa DNR's biomonitoring database, BioNet (https://programs.iowadnr.gov/bionet/)). The species sampled during the 1982 survey and the four Iowa DNR biomonitoring surveys are summarized in Table 2. No Lake Chubs have been reported from these surveys.

The sampling conducted by DNR/SHL biomonitoring crews is quite thorough. For streams the size of the Little Maquoketa River near Twin Springs, crews of from four to six biologists use a towed barge electrofisher with three electrodes. Fish specimens are identified and counted in the field, and voucher specimens are preserved for lab verification. Despite this rigorous protocol, no specimens of Lake Chub have been reported from recent sampling of the Little Maquoketa River near Twin Springs. The absence of the Lake Chub in these surveys suggests the following possibilities:

- The 1954 record for Lake Chub is erroneous: the species never occurred in Iowa.
- The Lake Chub did occur at Twin Springs but, due to changes in habitat and/or water quality, has been eliminated from that location.
- The 1954 record came from a small segment of the Little Maquoketa River, probably under the influence of spring flow, which has not been sampled during recent surveys.
- Even in the 1950s, the Little Maquoketa River did not provide favorable habitat for the Lake Chub, and the 1954 record at Twin Springs was due to its occurrence in coldwater tributaries of the Little Maquoketa River at/near Twin Springs.

## FORAY INTO THE WILDS OF DUBUQUE COUNTY, IOWA

Iowa's lone record for Lake Chub has long been a question mark in the story of fish distribution in the state. That is, how did this species, which has gone undetected in all Iowa fish surveys past and present but one, and which occurs nowhere else in the Upper Mississippi River basin, come to be documented in Iowa in the mid-1950s via Royal Suttkus at Tulane University? One theory is that Royal Suttkus and a group of his graduate students visited northeast Iowa during a fish collecting trip that included sites in the Great Lakes basin where the Lake Chub commonly occurs, and subsequent sample contamination resulted in the Iowa record for Dubuque County. This theory was my long-held explanation for the very isolated and curious occurrence of Lake Chub in northeast Iowa. A competing theory, of course, is that the Lake Chub is a glacial relict species that, at least until the

**Figure 7. The crew for the 2015 attempt to collect the Lake Chub from streams in Dubuque County. From left: Scott Gritters, Dan Kirby, John Olson, George Cunningham, Konrad Schmidt, Randall Scheiner, and Ken Glackin.**


**Figure 8. Pre-foray planning session at Swiss Valley Park near Dubuque. From left: Scott Gritters, Randall Scheiner, John Olson, Dan Kirby, and George Cunningham. (Photo by Konrad Schmidt)**

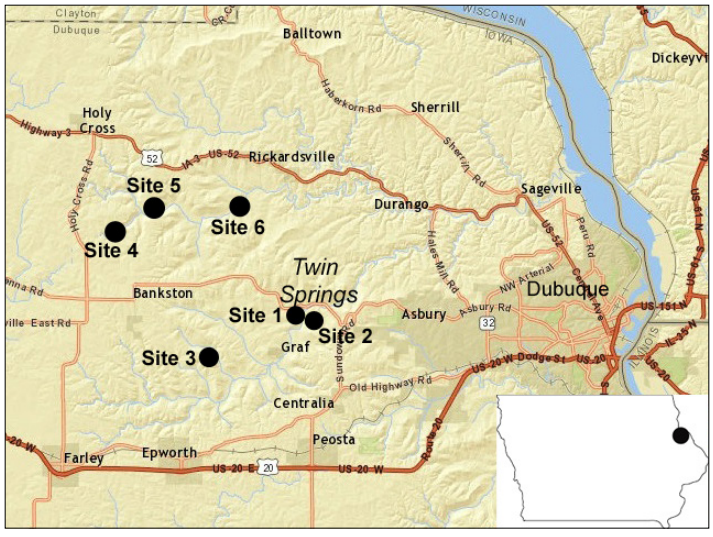


**Figure 9. Locations of sites sampled for fish as part of the August 6–7, 2015, Lake Chub foray in Dubuque County. Site numbers refer to Table 3.**

mid-1950s, occurred in a cool-water or coldwater microhabitat at Twin Springs in Dubuque County, Iowa.

In 2013, in part due to my participation in a multi-agency committee tasked with updating the list of Iowa fish species of greatest conservation need (SGCN) in Iowa's wildlife action plan (Zohrer 2012), I began a review of the documentation for Iowa's 1954 record for Lake Chub. Based on this review and based on input from NANFA members Konrad Schmidt (MN), Bob Hrabik (MO), and George Cunningham (NE) as well as from Iowa DNR fisheries biologists Scott Gritters (Bellevue Office) and Dan Kirby (Manchester Office) in northeast Iowa, I began developing hypotheses for where, exactly, the Lake Chub may have been collected in 1954 in Dubuque County. Based on the information available at that time, my best hypothesis—best guess—was that the Lake Chub had been collected in something called "Twin Springs Creek" near the long-dormant village of Twin Springs approximately eight air miles west/northwest of Dubuque, Iowa.

Although several fish surveys had been conducted in the Little Maquoketa River at the Twin Springs area in Dubuque County since the 1954 report of Lake Chub (Table 2), there had been no known targeted attempts to find this species at or near its poorly defined original collection location. Thus, in August 2015, I, along with my "foray into the wilds of Iowa" cohorts, NANFA members Schmidt and Cunningham, met in Dubuque County and spent two days sampling streams at the Twin Springs area and at other locations in the Little Maquoketa River watershed in Dubuque County in hopes of collecting Lake Chub. We were joined in our foray by NANFA members Ken Glackin and Randal Scheiner of Cedar Rapids, Iowa, and by Iowa DNR fisheries biologists Gritters and Kirby (Figure 7).

Our foray began on August 6th with a midday planning session at Dubuque County's Swiss Valley Park to identify potential collection sites (Figure 8). Maps of varying vintages were reviewed. As we were under the impression that

**Table 3. Summary of sites sampled for fish as part of the August 6–7, 2015, Lake Chub foray in Dubuque County, IA.**

| Stream | Site | Date | General Location | Latitude | Longitude |
|---|---|---|---|---|---|
| Little Maquoketa R. | 1 | Aug. 6 | at Twin Springs, 2.1 miles NE of Graf | 42.5149 | -90.8435 |
| Little Maquoketa R. tributary | 2 | Aug. 6 | at Twin Springs, 1.8 miles NE of Graf | 42.5134 | -90.8409 |
| Little Maquoketa R. tributary | 3 | Aug. 6 | Camp Little Cloud Girl Scout Camp - 2.1 miles west of Graf | 42.49512 | -90.9113 |
| Middle Fork Little Maquoketa R. tributary | 4 | Aug. 7 | 2.2 miles north of Bankston | 42.54876 | -90.9701 |
| Middle Fork Little Maquoketa R. | 5 | Aug. 7 | County Park - 2.7 miles north of Bankston | 42.55764 | -90.9526 |
| Middle Fork Little Maquoketa R. | 6 | Aug. 7 | 1.5 miles south of Rickardsville | 42.56295 | -90.8937 |

**Table 4. Summary of the 22 fish species collected from Little Maquoketa River and tributaries in Dubuque County, IA, during the August 6–7, 2015 foray. A total of six sites were sampled, five of which contained fish.**

| | Number of sites containing the species: |
|---|---|
| **Cyprinidae** | |
| *Campostoma anomalum,* Central Stoneroller | 4 |
| *Chrosomus erythrogaster,* Southern Redbelly Dace | 2 |
| *Luxilus cornutus,* Common Shiner | 3 |
| *Nocomis biguttatus,* Hornyhead Chub | 2 |
| *Notropis dorsalis,* Bigmouth Shiner | 2 |
| *Notropis percobromus,* Carmine Shiner | 3 |
| *Notropis stramineus,* Sand Shiner | 2 |
| *Phenacobius mirabilis,* Suckermouth Minnow | 2 |
| *Pimephales notatus,* Bluntnose Minnow | 4 |
| *Pimephales promelas,* Fathead Minnow | 1 |
| *Rhinichthys cataractae,* Longnose Dace | 2 |
| *Rhinichthys obtusus,* Western Blacknose Dace | 3 |
| *Semotilus atromaculatus,* Creek Chub | 4 |
| **Catostomidae** | |
| *Catostomus commersonii,* White Sucker | 1 |

| | Number of sites containing the species: |
|---|---|
| **Ictaluridae** | |
| *Noturus flavus,* Stonecat | 1 |
| **Salmonidae** | |
| *Oncorhynchus mykiss,* Rainbow Trout | 1 |
| *Salmo trutta,* Brown Trout | 2 |
| *Salvelinus fontinalis,* Brook Trout | 1 |
| **Gasterosteidae** | |
| *Culaea inconstans,* Brook Stickleback | 1 |
| **Centrarchidae** | |
| *Micropterus dolomieu,* Smallmouth Bass | 1 |
| **Percidae** | |
| *Etheostoma flabellare,* Fantail Darter | 4 |
| *Etheostoma nigrum,* Johnny Darter | 4 |

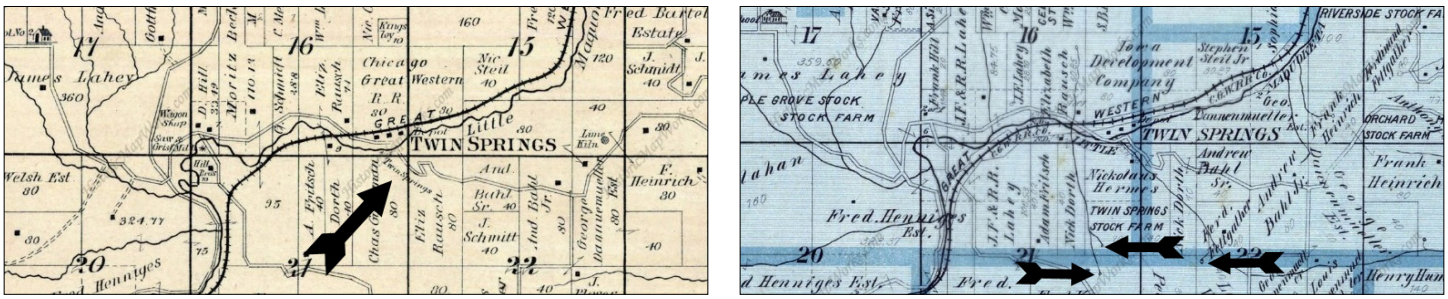


**Figure 10. Historic plat maps of the Twin Springs area from 1892 (left) and 1906 (right). The 1892 map shows what might be a watercourse labeled "Twin Springs" in sections 21 and 22. The 1906 map shows symbols for springs (small circles) on the tributaries of the Little Maquoketa River at Twin Springs. Modified excerpts from plat maps (North West Publishing Co. 1892 and Iowa Publishing Co. 1906) at Historic Map Works (http://www.historicmapworks.com/).**

the Lake Chub had been collected from a smaller waterbody (a "creek") at or near the Twin Springs Access, and not the larger stream at Twin Springs Access—the Little Maquoketa River—we reviewed the maps with the goal of locating what might have been Robert Chipman's "Twin Springs Creek." We focused on a pair of tributaries that flowed to the northwest and joined the Little Maquoketa at Twin Springs Access (see Figure 5).

Six sites were sampled in east-central Dubuque County over the two days of our foray (Table 3, Figure 9). The fish species collected are summarized in Table 4: no Lake Chubs were collected.

We began our survey at the presumed vicinity of the September 1954 collection of Lake Chub: the Twin Springs area on the Little Maquoketa River. Public access to the portion of the Twin Springs area that borders the Little Maquoketa River is along what is now known as Twin Springs Drive, the former roadway of Asbury Road before its relocation to the north in 1957 (see Dubuque Telegraph-Herald, January 19, 1958). Because we were looking for a smaller creek (the so-


**Figure 11. The "Twin Springs" area. Top right: Little Maquoketa River at Twin Springs (site no. 1), August 6, 2015. The bottom two photos show what remains of the eastern tributary ("Twin Springs?") to the Little Maquoketa at Twin Springs (see also Figure 10). Bottom left: what remains of the stream channel as it flows along Asbury Road. Bottom right: near the confluence of the channel with the Little Maquoketa River. (Photos by Konrad Schmidt)**

**Figure 12. Site No. 2: unnamed tributary to the Little Maquoketa River at Twin Springs sampled on August 6, 2015. This is the western tributary as indicated on Figure 5. There was no flow at the tributary's mouth (left) but flow was encountered further up the stream valley.**

called "Twin Springs Creek"), we did not spend much effort sampling the larger Little Maquoketa River (Site No. 1).

Our initial focus was on the pair of tributaries of the Little Maquoketa River at Twin Springs (Figure 5). An 1892 plat map of the area (North West Publishing Co. 1892) suggests that one of the tributaries might have been called "Twin Springs Creek", and a 1906 plat map (Iowa Publishing Co. 1906) shows springs occurring along these tributaries (Figure 10).

Unfortunately, during our survey, the tributary labeled as "Twin Springs" on the 1892 plat map was a rock-filled ditch along Asbury Road with no observable flow (Figure 11).

Instead, we sampled the small coldwater tributary (Site No. 2) that flows across the northeast quarter of Section 21

**Figure 13. Stream sites visited during the August 6–7, 2015 Lake Chub foray. Site 3 (top left): tributary of Little Maquoketa River west of Graf. Ken Glackin at Site 4 (top right): tributary of Middle Fork Little Maquoketa River, NNW of Bankston. Site 5 (bottom left): Middle Fork Little Maquoketa River north of Bankston. Site 6 (bottom right): Middle Fork Little Maquoketa River near Rickardsville. See Table 3 and Figure 9 for site location information.**

of Center Township and that joins the Little Maquoketa River at the Twin Springs Access (this is the western tributary shown in Figure 5). This tributary flows in a partially wooded valley that is primarily used as pasture. There was no flow in this tributary at its confluence with the Little Maquoketa, but flow did occur further up the stream valley. This tributary showed almost no development of pool habitat (Figure 12). Nonetheless, we used the backpack electrofisher through about one-half mile of stream: no fish were collected or seen.

Failing to find the Lake Chub at the Twin Springs area, we broadened our search to include four additional sites on streams in the Little Maquoketa and Middle Fork Little Maquoketa drainages near the towns of Graf and Bankston, respectively (Figure 13) that were believed to be candidates for Lake Chub. We sampled streams that ranged from coldwater/trout-only (Site 4) to warm water (Site 6).

Although not providing conclusive evidence, the failure of our survey to repeat the 1954 collection of Lake Chub is yet another indication that this species has been eliminated from Iowa, if it ever occurred in the state.

## FINDING THE COLLECTOR OF THE LAKE CHUB

Having failed to collect the Lake Chub at/near its presumed 1954 location in northeast Iowa, I next turned my attention to finding the collector of the Lake Chub: Robert K. Chipman. Whether for the good or otherwise, the internet has made finding anything today considerably easier than in the pre-internet world. Fortunately, the surname "Chipman", although not uncommon, is certainly less common than some other names (e.g., "Olson"), and I developed a relatively short list of "Robert K. Chipmans" to contact. In early 2016, after first bothering a "Robert K. Chipman" in Florida who was not the collector of the Lake Chub (but who was kind enough to respond to my out-of-the-blue letter), I found "the" Robert K. Chipman" who made the 1954 collection of Lake Chub in Dubuque County. After the failed attempt to find the Lake Chub in Iowa, finding the collector of the Iowa Lake Chub was quite gratifying. Dr. Chipman had a long career of teaching mammalogy at several universities. At the time of our correspondence (early 2016), he was 84. Through written correspondence and several e-mails (Chipman 2016a, 2016b, 2016c), Dr. Chipman was very cooperative and generous with his time in trying to help answer some of the questions regarding this curious 1954 record.

I had long presumed that the Iowa record for Lake Chub, which was first reported by Dr. Royal D. Suttkus of Tulane University, somehow resulted from one of Dr. Suttkus's many collecting trips made throughout North America with his graduate students. See http://www.tubri.org/suttkus/memorial/career_synopsis.html (Collecting Effort) for an interesting summary of those collecting trips. In his correspondence of February 21 and February 29, 2016, however, Dr. Chipman informed me otherwise.

Robert K. Chipman's interest in native fishes began in 1952 when he spent a summer at the Mountain Lake Biological Station near Blacksburg, Virginia, and took a course in "animal ecology" taught by ichthyologist Dr. Edward C. Raney of Cornell University. As Chipman said in his e-mail of February 29, 2016, "it was largely a course in collecting fish with very few discussions of ecology, but I caught the [fish collecting] bug." He graduated from Amherst College in 1953 and tried to get into graduate school at Cornell but was turned down. Raney suggested that he try Tulane and study under one of Raney's former students, Royal D. Suttkus. Chipman was accepted at Tulane, but he was drafted in the fall of 1953. He was stationed at an army hospital at El Paso, Texas, which is where he met his wife-to-be, Geraldine Ann Dietl from Dubuque, Iowa, who was a nurse at the hospital. They eloped in July 1954.

At this time (mid-1950s), Chipman was very much into collecting fishes. He said that he always traveled with nets, jars, and formaldehyde in the car. In September 1954, he and his wife drove to Dubuque to meet his new in-laws. He says that "he was not received very well" by his new mother-in-law, and he and his wife decided to get away for a few hours and collect fish, a hobby which, he says, his in-laws never quite understood or appreciated. He was unfamiliar with the Dubuque area and its streams. He said that the selection of the Twin Springs area was simply based on finding a stream near Dubuque with access (letter of February 21, 2016). He added that "the river was shaded at the time, and collecting was a pleasant and cool experience" (e-mail of February 29, 2016). When I informed him that the stream that flows through the Twin Spring area is the Little Maquoketa River, he responded that he did not know that name. He says that he probably "got the name [Twin Springs] off of a road sign" (letter of February 21, 2016).

I asked Dr. Chipman about his reference to "Carter Road" in the recorded descriptions of his collection sites. He said that he probably got this name from a road sign as well. When I mentioned that Asbury Road is the road that leads west from Dubuque to Twin Springs (see Figures 4 and 5), he said that his use of "Asbury Road" as a reference point in his later (1956 and 1957) collection descriptions probably reflected his improving knowledge of the roads in and near Dubuque. His only specific memories of his collections at Twin Springs seem to be that there was another stream entering the river at that location. As he says,

"the site was at the intersection of a running stream, easily accessible, and not very deep" (letter of February 21, 2016). Although there are confluences of unnamed tributaries with the Little Maquoketa River at the Twin Springs area, none of those tributaries were flowing during our August 2015 visit. I sent him photos of the Little Maquoketa River at Twin Springs where sampling was conducted in August 2015, but he said that the stream in the photos did not look familiar.

After their September 1954 visit to Dubuque, and with the Iowa Lake Chubs presumably in his collection jar, Chipman and his wife drove to New Orleans to meet Suttkus. Chipman guesses that the 1954 fish specimens from the Twin Springs collection were given to Suttkus either at the time of their Tulane visit in September 1954 or in July 1955 when Chipman was discharged from the military and he became a graduate student at Tulane. At some point thereafter, Suttkus found the Lake Chub specimens in Chipman's 1954 collection from Twin Springs and notified Reeve Bailey, formerly at Iowa State College but by the mid-1950s well-established at the University of Michigan. I asked Chipman whether he realized that his Iowa collection contained Lake Chub: he did not. Chipman began his graduate studies at Tulane under Suttkus but switched to the study of mammals in the fall of 1957. Based on our correspondence, Chipman had apparently never been asked about his 1954 collection of the Lake Chub in Iowa. As he stated in his letter of February 21, 2016, he didn't "recall anything unusual about collecting the Lake Chub there" [at Twin Springs]. He added that there were no field notes for his Iowa collections.

## A MODIFIED HYPOTHESIS REGARDING THE COLLECTION LOCATION

I began the investigation into Iowa's lone record for Lake Chub assuming, as do the published accounts for this species, that "Twin Springs Creek" was the Iowa stream from which this fish species was collected in September 1954. Based, however, on the historical information for Iowa's Lake Chub record, information from Dr. Chipman, and a review of the history of the Twin Springs area, I have modified my hypothesis regarding the stream where the 1954 collection of the Iowa Lake Chub was made. The most likely candidates are (1) the Little Maquoketa River at or near the one-time settlement of Twin Springs west/northwest of Dubuque, Iowa or (2) one of the two small unnamed tributaries that meet the Little Maquoketa at Twin Springs (see Figure 4). The following seem to support this modified hypothesis:

- The original (1954) collection location description from Robert Chipman places the collection at Twin Springs. Chipman was unfamiliar with the names of local streams, and he says that he likely got the name "Twin Springs" from a road sign.
- As Chipman noted, he and his wife were looking for a stream with access for their September 8, 1954, fish collection. As documented in the Dubuque Telegraph Herald of June 24, 1956, the Twin Springs area was a long-time and well-known public area well into the 1950s. Also, there was/is easy access to the Little Maquoketa River at this location as the road (formerly Asbury Road; now Twin Springs Drive) follows the low-banked inside bend of the Little Maquoketa River.
- The June 24, 1956 Dubuque Telegraph-Herald also mentions that Twin Springs was named "by settlers who found two great springs pouring out of the hillside." These springs may have provided coolwater habitat that could have served a localized refuge for a relict population of Lake Chub.

## CONCLUSIONS

This investigation into the history of Iowa's lone record for Lake Chub and the August 2015 attempt to find this species at/near its 1954 collection location leave me with the following conclusions:

- The exact location of Robert K. Chipman's September 8, 1954 collection of the Lake Chub in Dubuque County, Iowa, will remain unknown. Even in the mid-1950s following Chipman's 1954 collection, there appears to have been uncertainty regarding just where that collection was made.
- Based on recent (2016) information from Chipman, future reference to the collection location for this record should be restated as "creek at Twin Springs." In his recent (2016) correspondence, Dr. Chipman was quite clear that he was unfamiliar with Dubuque County and with Iowa stream names during his 1950s fish collections in Iowa. Thus, his mention of "Twin Springs" was very likely a reference to the name of a place rather than the name of a stream. Also, other than local names, there are no streams named "Twin Springs Creek" in Dubuque County.
- Contrary to my long-standing presumption, Chipman's additional fish collections in Iowa in 1956 and 1957 were not attempts to confirm the presence of Lake Chub in the state. Based on our correspondence in 2016, Chipman was not aware of any special interest or concern regarding his 1954 Iowa record for Lake Chub. When in graduate school at Tulane University in the mid-1950s, Chipman and his wife made annual trips

to Dubuque to visit his in-laws. While visiting Dubuque in 1956 and 1957, he was simply indulging in a hobby that he found most enjoyable: collecting native fishes.

- At least some uncertainty remains whether the Lake Chub once occurred in northeast Iowa and was collected in Dubuque County, Iowa, in September 1954. The lack of historical or current Lake Chub records for any other locale in the Driftless Area Ecoregion or in the entire Upper Mississippi River Basin would indicate an extreme case of isolation of a relict population in Iowa. Despite this uncertainty, relict populations of Lake Chub exist in Nebraska at similar latitudes and in similar habitats (headwater springs) that occur at the Twins Spring area of Dubuque County, Iowa (see Stasiak 2006, 1986; Hrabik et al. 2015). Thus, the 1954 Iowa record for Lake Chub should not be dismissed as erroneous.
- If the Lake Chub did occur in the 1950s in Dubuque County, Iowa, the relatively large amount of subsequent sampling for fishes in the vicinity of the 1954 collection and throughout Iowa's portion of the Driftless Area Ecoregion suggests that any glacial relict populations of Lake Chub that did inhabit Iowa waters have been long ago been extirpated.
- Without conclusive evidence that Iowa's 1954 record for Lake Chub is erroneous, this species should remain on Iowa's list of fishes and remain included with state's group of extirpated fishes. The Lake Chub should be accorded mention in Iowa's wildlife action plan (Zohrer 2012) as a species of greatest conservation need (SGCN).
- And given the nature of searches for very rare fishes (the "relicts"), there is always the possibility that the fish surveys conducted to date have missed an extant population of Lake Chub in Iowa. Thus, future forays into the wilds of Iowa just might produce a new record for the Lake Chub.

## ACKNOWLEDGEMENTS

Sincere thanks is due to Dr. Robert K. Chipman for delving into his memories from 60+ years ago to the time when he and his wife collected fishes near Dubuque, Iowa, and for generously responding to my letters and e-mails. As always, these forays into the wilds of Iowa wouldn't happen without the exceptional interest in native fishes of my foray co-conspirators Konrad Schmidt, George Cunningham, and Bob Hrabik (who couldn't make our August 2015 Lake Chub survey in Iowa; something about writing a fish book). Also thanks to NANFA members Ken Glackin and Randall Scheiner for help with the survey. And no less interested and dedicated to Iowa's fishes are Iowa DNR fisheries biologists Scott Gritters and Dan Kirby. Scott and I had discussed a Dubuque County search for the Lake Chub for years, and it was he who decided that we were going to make the survey happen in 2015; and it did. Scott and Dan provided invaluable support for our 2015 survey, both in terms of looking into the history of the 1954 Lake Chub record and in terms of obtaining permission for us to sample streams on private property. Special thanks is due to Konrad Schmidt for assistance with preparing this article.

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