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FINAL REPORT

SECTION 6

ENDANGERED SPECIES ACT

FEDERAL AID PROJECT E-8

STATUS OF THREATENED AND ENDANGERED FISHES IN OKLAHOMA

STUDY 3 - STATUS OF THE SPECKLED CHUB IN THE ARKANSAS RIVER BASIN

SEPTEMBER 1, 1991 - MARCH 31, 1993

FINAL REPORT

STATE: OKLAHOMA PROJECT NUMBER: E-8

PROJECT TITLE: Status of Threatened and Endangered Fishes in Oklahoma

STUDY TITLE: Status of the speckled chub in the Arkansas River Basin

PERIOD COVERED: 1 September 1991 through 31 August 1993

OBJECTIVE NUMBER: 3 JOB NUMBER: 3

ABSTRACT

From 1991 to 1993, we made 223 seine collections at 159 sites to determine the distributional status of the speckled chub in the Arkansas River Basin. A total of 151 speckled chubs were taken in 25 collections at 22 sites. Populations were extant in the Arkansas River in Kansas and Oklahoma, the Cimarron River in Oklahoma, the Salt Fork of the Arkansas River downstream from Great Salt Plains Reservoir in Oklahoma, and the South Fork of the Ninnescah River in Kansas. The species appears extirpated from the Arkansas River in Arkansas and Colorado, the North Canadian and Deep Fork rivers in Oklahoma, the Salt Fork of the Arkansas River upstream of Great Salt Plains Reservoir in Kansas and in Oklahoma, and the South Canadian River from Meredith Reservoir in the Texas Panhandle to Eufaula Reservoir in eastern Oklahoma. The speckled chub has disappeared from about 75% of its former range in the Arkansas River Basin. Stream flow alterations due to reservoir construction and irrigation appear to be responsible for the decline of the species.

REPORT CONTENT

I. OBJECTIVE:

Determine the current status of Arkansas River populations of the speckled chub *Macrhybopsis* (= *Hybopsis*) *aestivalis* by (1) intensively sampling areas of known historic occurrence and (2) using museum records to document any trends of change in abundance.

II. INTRODUCTION:

The speckled chub is a small minnow (family Cyprinidae) that seldom exceeds 76 mm in total length (Wallace 1980). One or two pair of conical barbels at each corner of the mouth and dark dots scattered over the dorsal and lateral surfaces of the body distinguish this species from other minnows. The speckled chub is short lived, with few individuals reaching 1.5 years of age (Starrett 1951). Reproductive success is dependent upon one-year-old individuals.

Speckled chubs inhabit shallow lowland rivers and streams having sand or fine-gravel bottoms, swift, turbulent flows, and frequently high turbidities (Cross 1967, Miller and Robison 1973, Pflieger 1975). They are seldom found outside the main channel (Starrett 1950, Trautman 1957). Most historical records of the speckled chub are from the main stem of large rivers; however, the species has also been recorded from smaller tributaries (Cross 1950, Cross et al. 1985), and once from a reservoir (Echelle et al. 1977).

Spawning begins during May or June and continues sporadically into August (Cross 1967). In the Cimarron River of Oklahoma, speckled chubs spawn semi-buoyant eggs in the "main current" during flood conditions (Bottrell et al. 1964). The eggs drift downstream and hatch in 24 to 28 h. Young speckled chubs drift downstream as they develop. Presumably, these individuals must later return upstream in order to restore abundances for future spawning. If this is true, then successful spawns at a few sites may be sufficient to maintain the species in extensive stream reaches (F. B. Cross, pers. comm.).

Geographic variation in the speckled chub has been widely noted (Metcalf 1966, Miller and Robison 1973, Page and Burr 1991), and six nominal subspecies are recognized (Davis and Miller 1967, Wallace 1980). Whether this "complex" represents several species or one highly variable "plastic species" has not been established (Metcalf 1966, Robison and Buchanan 1988). No systematic review of the species has been published (R. L. Mayden, pers. comm.).

Historically, the range of the speckled chub in the Arkansas River Basin included the Arkansas River and several of its principal tributaries in Arkansas, Colorado, Kansas, New Mexico, Texas, and Oklahoma. Presently, the species is believed extirpated from the Arkansas River in Colorado (Loeffler et al. 1982) and Arkansas (Robison and Buchanan 1988). Decline of the speckled chub and other prairie-stream fishes in the Arkansas River drainage of Kansas has been attributed to declining surface-water flows resulting from increased consumption of groundwater in the western reaches of the basin (Cross et al. 1985).

Our purpose was to document the present status and distribution of the speckled chub in the Arkansas River Basin. We made 223 collections in the Arkansas River Drainage and used these, together with museum collection records, literature sources, and communications with other researchers to characterize changes in distribution and abundance of the species.

III. MATERIALS AND METHODS:

We determined the historical distribution of the speckled chub by reviewing regional museum records (Appendix B) from the following sources: The University of Kansas, Museum of Natural History (KU); Oklahoma State University, Department of Zoology (OSUS); The University of Michigan, Museum of Zoology (UMMZ); The University of New Mexico, Museum of Southwestern Biology (MSB); The University of Oklahoma, Stovall Museum of Zoology (UOMZ); Northeast Louisiana University, Museum of Zoology (NLU); The Smithsonian Institution, National Museum of Natural History (USNM); The University of Texas at Austin, Texas Memorial Museum Natural History Collection (TNHC); and the State of Kansas Biological Survey, Kansas Natural Heritage Inventory. Museums were selected based on our knowledge of the affiliations of other researchers who had previously sampled the Arkansas River Drainage. The distinctive appearance of the speckled chub suggests a low probability of misidentification by prior workers (F. B. Cross, pers. comm.). Therefore, no attempt was made to verify the identification of museum voucher specimens housed at institutions other than Oklahoma State University.

The status and distribution of the speckled chub was assessed from 1991 to 1993 by making 223 seine collections at 159 sites, with an emphasis on sites of known historical occurrence in Colorado, Kansas, and Oklahoma. We did not sample the Arkansas River main stem in Arkansas or the South Canadian River main stem in New Mexico and Texas, because these stream reaches were recently surveyed by other workers (Robison and Buchanan 1988, Larson et al. 1991).

Early in the study, sampling was conducted in areas where the speckled chub was known to persist. Based on this experience, subsequent sampling was done in the following manner. First, we explored the stream channel to locate the main channel and to search for patches of "pea-sized gravel" substrate. We then typically made four or five downstream seine hauls, over distances of 20 to 30 m, in or adjacent to the main channel. Sampling effort ceased upon capture of the speckled chub. We used 4.0-m or 7.6-m nylon seines (both 1.8-m deep with 3.2-mm mesh), depending on stream size. A nylon bag-seine 9-m long and 1.8-m deep with 3.2 mm mesh (1.8-m x 1.8-m bag) was used at a few sites.

All speckled chubs and other species of interest were fixed in 10% formalin in the field and transported to the laboratory for sorting and identification. Maximum stream depth, water temperature, and qualitative habitat observations (primarily substrate characteristics) were recorded at each collection site. All speckled chubs, and samples of other species, were subsequently stored in 45% isopropyl alcohol and catalogued in the Oklahoma State University Collection of Vertebrates (OSUS).

IV. RESULTS:

HISTORICAL DISTRIBUTION

Historically, the speckled chub occurred in the Arkansas River from eastern Colorado eastward to central Arkansas and in most mainstem reaches of larger western tributaries of the Arkansas River (Figure 2). The species probably was continuously distributed, although it may have been sparse in some reaches. Major physical barriers to dispersal (dams and insurmountable waterfalls) were absent, and habitats were relatively homogeneous over long stretches of river.

With few exceptions, the species was absent from tributaries draining the Ozark and Ouachita plateaus in eastern Oklahoma and western Arkansas. We know of only three records to the contrary, all from eastern Oklahoma. These include a collection of the species from the lower Verdigris River G. A. Moore (unpubl. field notes), a literature record of the species from the lower Poteau River (Moore 1973), and a museum record from the lower Illinois River (OSUS 2417).

There are three major differences between our compilation and previous distribution maps for the speckled chub in the Arkansas River Drainage. First, our compilation shows former occurrence of the species in the Cimarron River Drainage in Kansas, which was not indicated by Cross and Collins (1975) or Wallace (1980). Second, we located a literature record from Colorado (Loeffler et al. 1982). Third, we found museum records indicating the species occurred in the Arkansas River in Arkansas more than 300 km farther east than shown by Wallace (1980) or Robison and Buchanan (1988).

PRESENT DISTRIBUTION

We captured 151 speckled chubs at 22 of the 159 sites we sampled in the Arkansas River Basin (Figure 3). These results, together with collections made by Larson et al. (1991), demonstrate that the speckled chub persists in six stream reaches. These include; 1) the main stem of the Arkansas River from near Wichita, Kansas, downstream to Tulsa County, Oklahoma, 2) the South Fork of the Ninnescah River in Kansas, 3) the Salt Fork of the Arkansas River in Oklahoma downstream from Great Salt Plains Reservoir to the confluence with the Arkansas River, 4) the Cimarron River from near Dover, Kingfisher County, Oklahoma, downstream to Keystone Reservoir, 5) the South Canadian River from below Ute Reservoir in northeastern New Mexico to Meredith Reservoir in the Texas Panhandle, and 6) the South Canadian River below Eufaula Dam.

We made no concerted effort to quantify abundance of the speckled chub. However, at certain sites the species was easily captured in repeated seine hauls, while at other sites the species was either not collected or taken only after intensive seining. Based on these observations, the speckled chub appears to be most abundant in three stream reaches; 1) the Arkansas River between Kaw and Keystone reservoirs in Oklahoma, 2) the Salt Fork of the Arkansas River downstream from Great Salt Plains Reservoir in Oklahoma, and 3) the South Canadian River between Ute Reservoir in New Mexico and Meredith Reservoir in Texas.

Based on museum records for the past five years (Figure 2), unpublished field notes made by J. Pigg, and communications with other researchers, the speckled chub appears to have been extirpated from the following major streams or stream

reaches (year of last collection and source of information in parentheses): Arkansas River from near Pueblo, Colorado, to Wichita, Kansas (1958; KU 3938); Salt Fork of the Arkansas River upstream of Great Salt Plains Reservoir (1964; Kilgore and Rising 1965); Cimarron River upstream from Dover (1963; UOMZ 32444), the entire North Canadian River drainage, including the Deep Fork River (1982; J. Pigg, unpubl. field notes, Pigg et al. 1992); and the South Canadian River from Meredith Reservoir in the Texas Panhandle to eastern Oklahoma (1977; J. Pigg, unpubl. field notes). These areas of apparent extirpation represent about 75% of the historical range of the species in the Arkansas River Basin.

V. DISCUSSION:

Absence of the speckled chub in some areas of past occurrence has been well documented. The species was absent in numerous collections made in the past 10 years throughout the North Canadian and South Canadian rivers (J. Pigg, unpubl. field notes; Larson et al. 1991; the present study), and it was absent in a large series of collections made from 1978 to 1991 by J. Pigg (unpubl. field notes) at three sites in the upper portions of the Deep Fork River. All known collection sites of the speckled chub in the Deep Fork River (i.e., museum collection localities) are now inundated by Eufaula Reservoir. Regarding absence of the species from the Arkansas River in Arkansas, Robison and Buchanan (1988) stated that "recent surveys of the Arkansas River . . . [by two different researchers] have failed to produce a single specimen. Numerous collections at Fort Smith during the last 16 years . . . [also failed to produce] speckled chubs."

It is difficult to state with confidence that a species like the speckled chub has been completely extirpated from an area of past occurrence. For example, until 1993, we considered the species extirpated from the Cimarron River. The last known collection of the species from the drainage was made in 1984 (Pigg, 1988; unpubl. field notes), despite extensive recent surveys over most of the drainage by Pigg (1988) and Larson et al. (1991) and our own collections at 14 sites in the summer of 1992. However, in 1992, R. P. Lemmons (pers. comm.) collected the speckled chub from the Cimarron River near Cushing, Payne Co., farther downstream than any of our collections in 1992. In the summer of 1993, we sampled the river at 12 mainstem sites from Oilton (Creek Co.) upstream to Cleo Springs (Major Co.) and collected 1 to 29 specimens at each of the 10 sites sampled from Oilton upstream to near Dover (Kingfisher Co.). Two sites about 25 and 45 km upstream from Dover failed to produce the species.

There are at least three possible explanations for the reappearance of the speckled chub in collections from the Cimarron River: 1) the species may have persisted at low densities and simply went undetected, possibly in downstream areas that were not intensively sampled in the past; 2) it may have been recently introduced into the river by human activities, such as bait transport; and 3) it may have recently re-invaded the Cimarron River from the Arkansas River by way of Keystone Reservoir.

PRESENT STATUS AND POSSIBLE CAUSES OF DECLINE

In general, the range of the speckled chub in the Arkansas River drainage has contracted toward the central portion of its historical distribution (Figures 2 and 3).

The only exception is an isolated population in the South Canadian River in eastern New Mexico and western Texas. Otherwise, the species is now restricted to an area extending from south-central Kansas into north-central and eastern Oklahoma (Figure 3).

The speckled chub is highly adapted for flowing-water conditions and is dependent on episodic floods for completion of its life cycle (Bottrell et al. 1964, Cross 1967, Miller and Robison 1973). Construction of reservoirs and the McClellan-Kerr Navigation System appear to have been major contributors in the decline of the speckled chub in eastern portions of its historical range (Lindsay and Cheek 1973, Robison and Buchanan 1988). One record of the speckled chub exists from a reservoir; 19 specimens of the Red River form were taken from Texoma Reservoir (Echelle et al. 1971). Additionally, a single specimen (OSUS 18363) was collected in 1989 from the McClellan-Kerr Navigation System. These occurrences indicate the speckled chub may occasionally inhabit reservoirs, probably as waifs from elsewhere in the drainage. However, the life history requirements of the speckled chub suggest that impoundments are unsuitable habitat for this species.

In the 1930s and 1940s, the speckled chub was one of the most common species collected in the Cimarron River in Oklahoma (G. A. Moore, unpubl. field notes). However, between 1984 and 1992, the species was absent from Cimarron River collections, possibly as a result of extreme drought conditions in the mid-1980s, a time that coincided with the disappearance of the Arkansas River shiner from the river (Larson et al. 1991). Although the speckled chub reappeared in 1992 and 1993

collections from the Cimarron River, population densities appear to be much lower than they were in the 1930s and 1940s.

The speckled chub is one of several fish species that has declined in western reaches of the Arkansas River drainage in the past 20 years (Cross and Moss 1987), the most extreme examples being the plains minnow and the Arkansas River shiner in Kansas (Cross and Moss 1987) and the Arkansas River shiner in Oklahoma (Larson et al. 1991). In general, this area is characterized by low rainfall, high evaporation rates, intense agricultural activity, and, correspondingly, high demands for irrigation water. Stream flows have diminished as a result of the construction of artificial impoundments and over-consumption of groundwater, primarily to satisfy irrigation demands (Cross and Moss 1987, Wahl and Wahl 1988, Larson et al. 1991). The resulting changes in flow regime are considered a major factor in the decline of several prairie-stream fishes (Cross and Moss 1987, Larson et al. 1991).

The spatial pattern of decline of the speckled chub is not concordant with that of the Arkansas River shiner as described by Larson et al. (1991). Historically, the speckled chub and the Arkansas River shiner had essentially the same ranges in the Arkansas River Basin. Presently, however, they occur together only in the South Canadian River between Ute and Meredith reservoirs in New Mexico and the Texas Panhandle, and possibly in the Cimarron River in Oklahoma where a remnant population of the Arkansas River shiner may still persist (Larson et al. 1991).

Differences between species in the patterns of decline result from a variety of factors, including chance and individual species differences in biology. Whereas altered flow regimes may be an ultimate explanation for the general declines in several

species of prairie minnows, the actual pattern of decline may differ from one species to another. For the speckled chub, the present distribution is confined to areas having continual flow and beds of pea-sized gravel. As discussed below, the present absence of the species in some areas of apparently suitable habitat may be due to barriers such as dams and reservoirs that block dispersal from existing populations.

The speckled chub appears to be abundant in the South Canadian River of eastern New Mexico (A. A. Echelle, pers. observ.; Larson et al. 1991). This is an area of frequent midsummer rains and pronounced topographic relief; thus, as suggested for the Arkansas River shiner in this region (Larson et al. 1991), pulses in river discharge may be adequate for successful reproduction. Over 1,000 kilometers of river and two reservoirs (Meredith and Eufaula) separate the New Mexico population from one in the lower Canadian River in eastern Oklahoma.

In August of 1983, personnel from various state and federal agencies drove a vehicle in the streambed of the South Canadian River from Lake Meredith to Ute Reservoir in New Mexico and found no surface flow in the Texas stretch of river (J. Burton, pers. comm.; K. Collins, pers. comm.). Flow from New Mexico apparently was lost by evaporation and seepage. The aquatic habitat in Texas consisted of isolated pools separated by long stretches of dry river-bed. The speckled chub occurred in 17 of 33 sampled pools, possibly as a result of reproduction earlier in the year, or perhaps dispersal from New Mexico.

The once rather continuous distribution of the speckled chub in the Arkansas River Basin now appears fragmented by the presence of reservoirs and the McClellan-Kerr Navigation System (Figure 1). Absence of the speckled chub in the South

Canadian River between Meredith and Eufaula reservoirs and elsewhere in the Arkansas River drainage (North Canadian and Deep Fork rivers, and Salt Fork of the Arkansas River above Great Salt Plains Reservoir) may be due to the presence of large reservoirs and their dams, both of which impede recolonization from extant populations elsewhere in the basin. A similar decline in abundance of the speckled chub (Red River form) occurred in the North Fork of the Red River, upstream of Altus Reservoir, subsequent to the closing of Altus Dam (Winston et al. 1991). Before reservoirs were present, localized extirpation of a population (e.g., due to drought) would have been followed by recolonization from other areas in the drainage. A possible example is the re-appearance, in 1992 and 1993, of the speckled chub in the Cimarron River. The present population may have originated with a small founding population established by waifs from the Arkansas River upstream from Keystone Reservoir. The postulated recolonization might have occurred more rapidly were it not for the presence of Keystone Reservoir.

The presence of Great Salt Plains Reservoir (Salt Plains Dam) on the Salt Fork of the Arkansas River, prevents the speckled chub from recolonizing stream reaches upstream from this impoundment. The species was last collected from this area in 1964, more than 23 years after closure of the Salt Plains Dam. It is possible that a catastrophic event (e.g., the severe drought in 1965) eliminated the population and the presence of Salt Plains Dam prevented recolonization from adjacent downstream populations. The Salt Fork of the Arkansas River upstream from Great Salt Plains Reservoir appears relatively undisturbed and suitable as habitat for the species.

VI. CONCLUSIONS:

1. The speckled chub has been extirpated from about 75% of its historic range in the Arkansas River Basin.

2. The speckled chub persists in six stream reaches: 1) the main stem of the Arkansas River from near Wichita, Kansas, downstream to Tulsa County, Oklahoma, 2) the Ninnescah River in Kansas, 3) the Salt Fork of the Arkansas River downstream from Great Salt Plains Reservoir in Oklahoma, 4) the Cimarron River in Oklahoma, 5) the South Canadian River in eastern New Mexico and western Texas, and 6) the South Canadian River below Eufaula Dam.

3. The most isolated population is in the South Canadian River in New Mexico and Texas. This population is separated from the nearest downstream population by two reservoirs and more than 1,000 kilometers of river.

4. The speckled chub appears to be less abundant at many localities of present occurrence than it was historically. The species appears to be most abundant in the Arkansas River between Kaw and Keystone reservoirs in Oklahoma, the Salt Fork of the Arkansas River downstream from Great Salt Plains Reservoir in Oklahoma, and the South Canadian River between Ute and Merdith reservoirs in New Mexico and Texas.

5. Lentic conditions resulting from the construction of reservoirs and the McClellan-Kerr Navigation System probably were the major cause of the decline of the speckled chub in eastern portions of its range. The decline in western areas has been associated with diminished stream flows resulting from artificial impoundments and over-consumption of groundwater, primarily to satisfy irrigation demands.

6. Reservoirs and their associated dams represent barriers to dispersal that may contribute to the absence of the speckled chub in some areas of past occurrence. These areas include the South Canadian and North Canadian rivers in Oklahoma upstream from Eufaula Reservoir, and the Salt Fork of the Arkansas River in Kansas and Oklahoma upstream of Great Salt Plains Reservoir.

VII. RECOMMENDATIONS:

1. The speckled chub should be re-introduced into areas of historical occurrence where it has been extirpated. Attempted re-introductions should be carefully controlled and monitored. Efforts should be limited to stream reaches where the habitat has been determined to be suitable for the species.

2. A study should be done on habitat requirements of the speckled chub and the distribution of such habitats in areas where the species has been extirpated. This study should precede re-introduction attempts. Knowledge of habitat requirements will increase the success of re-introduction attempts and expedite the recovery of the species.

3. A study of the distribution of genetic diversity among populations of the species should be conducted. Of particular interest in this respect is a comparison of the isolated population in western reaches of the South Canadian River with other populations in the basin. The results of such a study would be essential in choosing stocks for re-introduction.

4. The taxonomic status of the speckled chub in the Arkansas River Basin needs clarification. While generally recognized as a separate subspecies, the

geographic limits of the taxon are unclear and it is possible that the form is sufficiently distinct to be considered a separate species. Clarification of taxonomic status should include both biochemical and morphological studies.

5. The life history of the speckled chub needs to be documented. Present knowledge is based primarily on anecdotal observations and one brief study of breeding biology.

6. Monitoring of extant populations should continue.

7. New water resource developments that reduce stream flows or otherwise alter the natural flow regime should be carefully evaluated for potential adverse effects on the species.

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IX. Date: 15 October 1993

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Figure 1. Major rivers and reservoirs within the historical range of the speckled chub in the Arkansas River Basin. Also included is the extent of the McClellan-Kerr Navigation System. Two small reservoirs in the Ninnescah River Drainage are not shown.

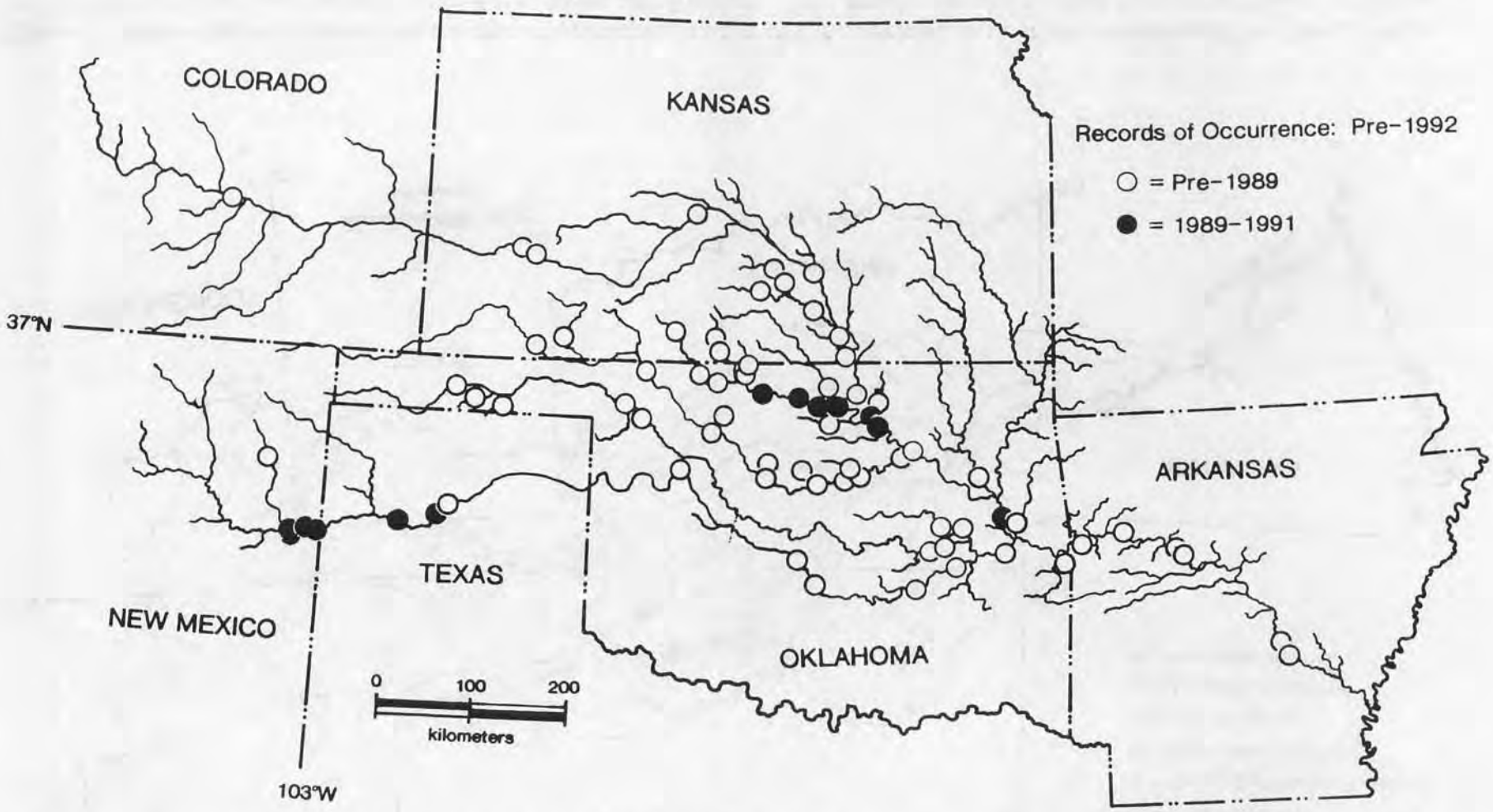

Figure 2. Records of past occurrence of the speckled chub in the Arkansas River Basin. Circles indicate museum records except for those on the Arkansas River in Colorado (Loeffler et al. 1982), the Verdigris (G. A. Moore, unpubl. field notes) and Poteau (Moore 1973) rivers in Oklahoma, and Ute Creek in New Mexico (Sublette et al. 1990). Closed circles indicate sites where the speckled chub was collected from 1989 to 1991. Open circles represent collection records for the species prior to 1989. Some localities were too close together to be indicated by separate circles.

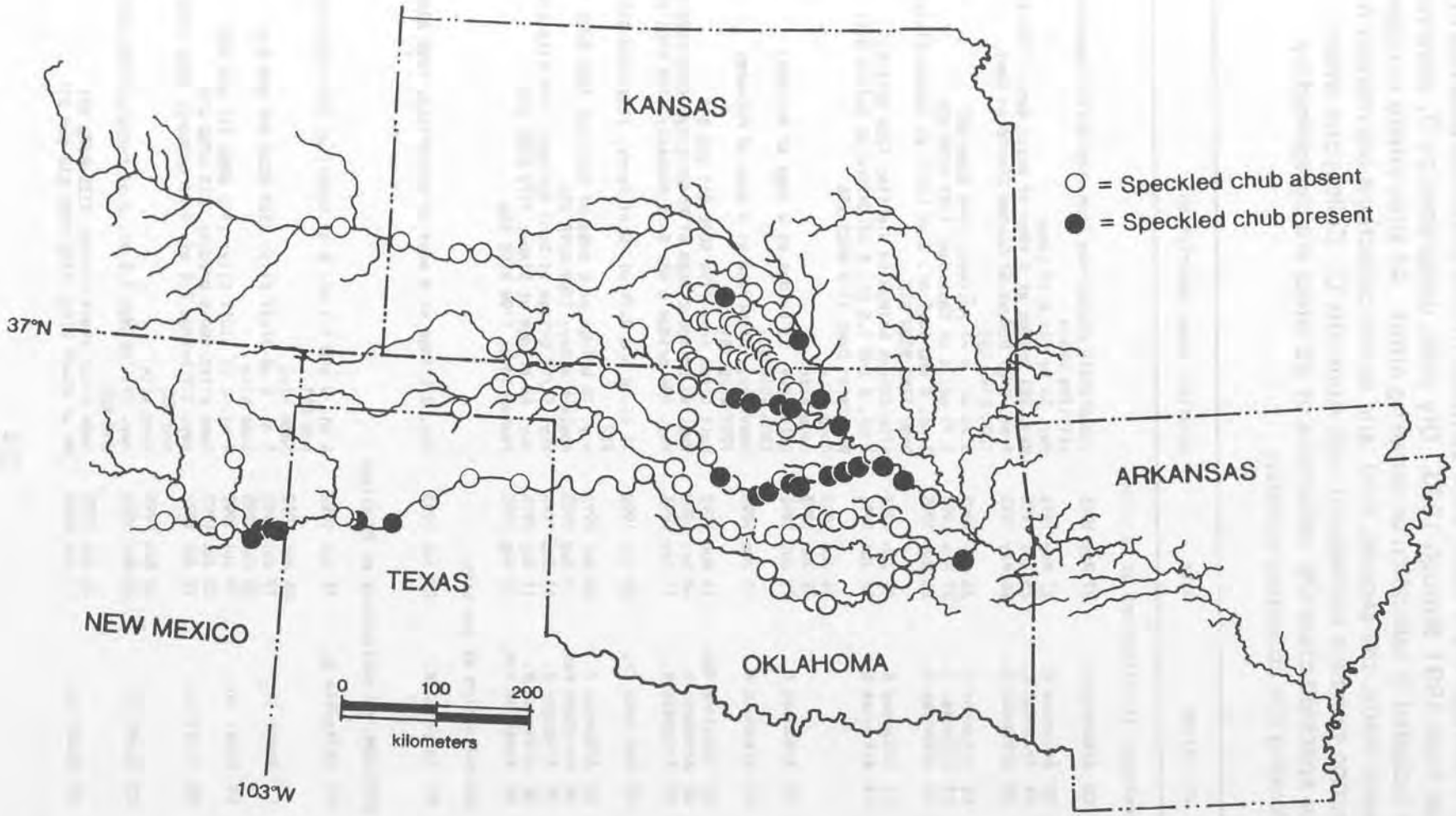

Figure 3. Presence-absence of the speckled chub at 159 sites sampled during the 1991-1993 survey of the Arkansas River Basin. Also included are 15 sites in the South Canadian River, New Mexico and Texas, sampled in 1990 by Larson et al. (1991). Some sites were too close together to be indicated by separate circles; when the species was taken at one such site but not the other, the former site is represented on the map.

Appendix A. Arkansas River Basin sites sampled for the presence-absence of the speckled chub from 1991 through 1993. Dry sites, designated by D, were not numbered or included in tabulation of sampling effort. At sites where multiple collections were made, the second, third, and fourth collections are marked b,c, and d. Collection numbers correspond with Appendix C. Collections which contained the speckled chub (25 collections at 22 sites) are designated by asterisks following the collection number.

No.	County	St.	Stream	Date	Location; legal description
Arkansas River Drainage, 21 collections at 18 sites:					
1	Bent	CO	Arkansas R.	27 May 1993	Immediately downstream from John Martin Reservoir stilling basin
2	Prowers	CO	Arkansas R.	27 May 1993	Hwy. 50 bridge N of Lamar
D	Barton	KS	Arkansas R.	23 Jul 1992	Hwy. 281 bridge at S edge of Great Bend; T19S R13W S33
3	Barton	KS	Arkansas R.	26 May 1993	1 mi. S of Dundee at Dundee Diversion Dam; T20S R14W S20
4	Finney	KS	Arkansas R.	26 May 1993	0.75 mi. S of Holcomb; T24S R34W S07
5	Hamilton	KS	Arkansas R.	27 May 1993	0.75 mi. S of Coolidge; T23S R43W S26
6	Kearny	KS	Arkansas R.	26 May 1993	3 mi. S and 10.5 mi. W of Lakin at Amazon Diversion Dam; T25S R38W S12
7	Sedgwick	KS	Arkansas R.	15 Jun 1993	47th Street bridge in Wichita; T28S R01E S15
8*	Sumner	KS	Arkansas R.	22 Jul 1992	2 mi. N and 0.5 mi. E of Oxford at Oxford Mill Diversion Dam; T31S R02E S36
8b*				14 Jun 1993	Same site
8c				15 Jun 1993	Same site
9	Sumner	KS	Arkansas R.	22 Jul 1992	Below Hwy. 53 bridge at W edge of Mulvane; T30S R01E S01
9b	Sedgwick	KS	Arkansas R.	15 Jun 1993	Above Hwy. 53 bridge at W edge of Mulvane; T29S R02E S31
10	Creek	OK	Keystone Res.	13 Aug 1993	Salt Creek Arm; T19N R09E S11 and S14
11*	Kay/Osage	OK	Arkansas R.	06 Oct 1992	Hwy. 60 bridge E edge of Ponca City; T25N R02E S02
12	Muskogee/ Wagoner	OK	Arkansas R.	11 Sep 1993	Hwy. 104 bridge 2 mi. E of Haskell; T16N R16E S32
13	Noble	OK	Red Rock Cr.	28 Jul 1992	11 mi. N and 0.75 mi. W of Perry; T23N R01W S15 and S22
14*	Pawnee	OK	Arkansas R.	06 Oct 1992	Hwy. 18 bridge at E edge of Ralston; T23N R05E S01
15	Pawnee	OK	Keystone Res.	13 Aug 1993	Apalachia Bay; T20N R09E S24
16*	Tulsa	OK	Arkansas R.	11 Sep 1993	Hwy. 51/97 bridge at Sand Springs; T19N R11E S14
17*	Tulsa	OK	Arkansas R.	11 Sep 1993	Hwy. 64 bridge at Bixby; T17N R13E S13
18	Tulsa	OK	Keystone Res.	13 Aug 1993	Pawnee Cove; T19N R10E S06
Canadian River, one collection at one site:					
19*	Haskell/ Muskogee	OK	Canadian R.	27 Jul 1993	Hwy. 2 bridge at N edge of Whitefield; T09N R20E S07
Chikaskia River Drainage, 69 collections at 39 sites:					
20	Harper	KS	Chikaskia R.	15 Jun 1992	4 mi. N and 1.5 mi. E of Danville; T31S R05W S16 and S21
20b				06 Jul 1992	Same site
21	Harper	KS	Baehr Cr.	19 Jul 1992	1 mi. N of Bluff City; T34S R05W S09 and S16
21b				20 May 1993	Same site
22	Harper	KS	Bluff Cr.	19 Jul 1992	1 mi. E of Bluff City; T34S R05W S15 and S22
22b				22 Jul 1993	Same site; above bridge; T34S R05W S15
23	Harper	KS	Bluff Cr.	19 Jul 1992	Hwy. 179 bridge 2.5 mi. S of Anthony; T34S R07W S01 and S02
23b				20 May 1993	Same site
24	Harper	KS	Bluff Cr.	20 May 1993	Hwy. 2/14 bridge 2.5 mi. W of Anthony; T33S R07W S21 and S28
24b				16 Jun 1993	Same site; above bridge; T33S R07W S21
25	Harper	KS	Bluff Cr.	19 Jul 1992	NW of Bluff City; T34S R06W S10 and S11

Appendix A. Continued.

No.	County	St.	Stream	Date	Location; legal description
25b				20 May 1993	Same site; above bridge; T34S R06W S10
25c				16 Jun 1993	Same site; above bridge; T34S R06W S10
26	Harper	KS	Bluff Cr.	16 Jun 1993	N edge of Bluff City; T34S R05W S16
26b				22 Jul 1993	Same site
27	Harper	KS	Rock Cr.	19 Jul 1992	SE of Anthony; T34S R06W S04 and S09
27b				20 May 1993	Same site
28	Harper	KS	Unnamed Cr.	19 Jul 1992	SE of Anthony; T34S R06W S05 and S08
28b				20 May 1993	Same site
29	Harper	KS	Sandy Cr.	15 Jun 1992	Near confluence with Chikaskia River; T31S R05W S22
29b				06 Jul 1992	Same site
30	Harper	KS	Silver Cr.	19 Jul 1992	NW of Bluff City; T34S R06W S01 and S12
30b				20 May 1993	Same site
31	Harper	KS	Spring Branch	19 Jul 1992	2 mi. E of Bluff City; T34S R05W S14 and S23
31b				20 May 1993	Same site
32	Kingman	KS	Chikaskia R.	23 Jul 1992	Hwy. 42 bridge 1.75 mi. W of Spivey; T30S R08W S09
32b				21 May 1993	Same site
33	Sumner	KS	Argonia Cr.	15 Jun 1992	0.75 mi. W of Argonia; T32S R04W S17 and S20
33b				06 Jul 1992	Same site
34	Sumner	KS	Beaver Cr.	15 Jun 1992	3 mi. E of Milan; T32S R03W S15 and S22
34b				06 Jul 1992	Same site
35	Sumner	KS	Beaver Cr.	06 Jul 1992	Spring outlet near railroad bridge; T32S R03W S15
36	Sumner	KS	Bluff Cr.	19 Jul 1992	WSW of Caldwell; T35S R03W S15 and S16
36b				22 Jul 1993	Same site; above bridge; T35S R03W S16
37	Sumner	KS	Fall Cr.	19 Jul 1992	SW of Caldwell; T35S R03W S02 and S03
37b				16 Jun 1993	Same site
38	Sumner	KS	Chikaskia R.	06 Jul 1992	Near Drury ca. 0.75 mi. downstream of low-water dam; T35S R02W S01
38b				19 Jul 1992	Same site
39	Sumner	KS	Chikaskia R.	17 Jun 1993	Drury directly below low-water dam; T35S R02W S01
40	Sumner	KS	Sand Cr.	15 Jun 1992	2 mi. W of Milan; T32S R04W S13 and S24
40b				06 Jul 1992	Same site
41	Sumner	KS	W. Prairie Cr.	15 Jun 1992	Hwy. 160 bridge near Mayfield; T32S R02W S07 and S18
41b				06 Jul 1992	Same site
42	Sumner	KS	W. Prairie Cr.	15 Jun 1992	1 mi. W of Mayfield; T32S R02W S17 and S20
43	Grant	OK	Chikaskia R.	08 Jul 1992	KS/OK border; T29N R03W S13
43b				17 Jun 1993	Same site
44	Kay	OK	Chikaskia R.	28 Jul 1992	1.25 mi. E of Tonkawa; T25N R01W S01
45	Kay	OK	Chikaskia R.	27 Jul 1992	Near confluence with Salt Fork of the Arkansas River; T25N R01E S19
45b				28 Jul 1992	Same site
46	Kay	OK	Chikaskia R.	08 Jul 1992	Below dam at Blackwell Lake; T29N R02W S34
46b				21 Jul 1993	Same site
47	Kay	OK	Chikaskia R.	29 Jul 1993	Hwy. 177 bridge at N edge of Blackwell below low-water dam; T27N R01W S14
48	Kay	OK	Chikaskia R.	01 Jun 1992	SW of Braman; T28N R01W S18 and T28N R02W S13
48b				08 Jul 1992	Same site
49	Kay	OK	Chikaskia R.	08 Jul 1992	2 mi. N and 1 mi. W of Blackwell; T27N R01W S09
49b				28 Jul 1992	Same site
50	Kay	OK	Chikaskia R.	28 Jul 1992	Low-water dam 1.75 mi. W and 0.75 mi. S of Braman; T28N R02W S13
50b				29 Jul 1993	Same site
51	Kay	OK	Chikaskia R.	08 Jul 1992	NE of Tonkawa; T26N R01W S36
52	Kay	OK	Chikaskia R.	29 Jul 1993	SE edge of Blackwell; T27N R01W S25 and S26
53	Kay	OK	Dry Cr.	08 Jul 1992	Hwy. 177 bridge NW of Braman; T28N R01W S06
53b				21 Jul 1993	Same site
54	Kay	OK	Lost Cr.	14 Jul 1993	Hwy. 11 bridge 2 mi. E of Blackwell; T27N R01W S13 and S24
54b				21 Jul 1993	Same site
55	Kay	OK	Bluff Cr.	22 Jul 1993	Bluff Cr. near Blackwell Lake; T29N R02W S19
56	Kay	OK	Unnamed Cr.	08 Jul 1992	1 mi. S of KS/OK border on Hwy. 177 then 3 mi. W; T29N R02W S19
56b				21 Jul 1993	Same site
57	Kay	OK	Shoo Fly Cr.	19 Jul 1992	Low-water crossing; T29N R02W S36

Appendix A. Continued.

No.	County	St.	Stream	Date	Location; legal description
58	Kay	OK	Unnamed Cr.	14 Jul 1993	T29N R02W S22 and S27
Cimarron River Drainage, 58 collections at 39 sites:					
59	Meade	KS	Crooked Cr.	28 May 1993	13.75 mi. S of Meade; T34S R28W S14
60	Meade	KS	Cimarron R.	28 May 1993	Hwy. 23 bridge SW of Meade; T35S R29W S08
61	Seward	KS	Cimarron R.	28 May 1993	Hwy. 54 bridge near Arkalon (ghost town); T33S R32W S25
62	Creek	OK	Unnamed Cr.	07 Jul 1993	Hwy. 99 bridge 1.25 mi. S of Oilton; T18N R07E S08
62b				16 Jul 1993	Same site
63*	Creek	OK	Cimarron R.	07 Jul 1993	Hwy. 99 bridge 0.5 mi. N of Oilton; T19N R07E S28
64*	Creek	OK	Cimarron R.	07 Jul 1993	1 mi. S and 1 mi. W of Oilton; T18N R07E S08
65	Harper/ Woods	OK	Cimarron R.	07 Jul 1992	Hwy. 64 bridge 17 mi. E of Buffalo at Woods Co. line; T27N R20W S02
66	Kingfisher	OK	Cimarron R.	15 Jul 1992	Hwy. 81 bridge 2 mi. S of Dover; T17N R07W S14
67	Kingfisher	OK	Turkey Cr.	15 Jul 1992	0.5 mi. W of Dover; T17N R07W S02
68	Kingfisher	OK	Cimarron R.	17 Aug 1993	Hwy. 51 bridge 8.5 mi. E of Okeene; T19N R09W S16
69*	Kingfisher	OK	Cimarron R.	17 Aug 1993	2.5 mi. W of Dover at old iron-bridge; T17N R07W S05
70	Logan	OK	Skeleton Cr.	30 Jul 1992	About 1 mi. upstream from confluence with the Cimarron River; T17N R02W S04
71	Logan	OK	Cimarron R.	30 Jul 1992	Hwy. 74 bridge 5 mi. S of Crescent; T16N R04W S02 and S03
71b*				17 Aug 1993	Same site
72	Logan/ Payne	OK	Cimarron R.	21 Jul 1992	Hwy. 33 bridge 1 mi. N of Coyle; T17N R01E S08
72b				30 Jul 1992	Same site
73	Logan	OK	Cimarron R.	15 Jul 1992	Hwy. 77 bridge 2.5 mi. N of Guthrie; T17N R02W S28 and S29
73b				30 Jul 1992	Same site
73c				13 Jul 1993	Same site
73d*				17 Aug 1993	Same site
74	Major	OK	Eagle Chief Cr.	15 Jul 1992	NW of Cleo Springs; T23N R12W S35 and S36
74b				29 Jul 1992	Same site
75	Major	OK	Cimarron R.	29 Jul 1992	2.5 mi. S of Cleo Springs at mouth of Eagle Chief Creek above Hwy. 8 bridge; T22N R12W S23
75b				17 Aug 1993	Same site
76	Major	OK	Cimarron R.	15 Jul 1992	2.5 mi. S of Cleo Springs at mouth of Eagle Chief Creek below Hwy. 8 bridge; T22N R12W S23
77	Payne	OK	Wild Horse Cr.	21 Jul 1992	Hwy. 33 bridge 4.75 mi. W of Perkins; T17N R02E S05
77b				11 Jun 1993	Same site
78	Payne	OK	Wild Horse Cr.	11 Jun 1993	NW of Perkins at low-water crossing; T18N R01E S15
79	Payne	OK	Cimarron R.	21 Jul 1992	Hwy. 177 bridge 0.75 mi. S of Perkins; T17N R03E S07
79b*				13 Jul 1993	Same site
80	Payne	OK	Sand Cr.	30 Jul 1992	1 mi. S and 5 mi. E of Perkins; T17N R03E S11
81	Payne	OK	Cimarron R.	30 Jul 1992	Hwy. 33 bridge 0.75 mi. N and 6.75 mi. E of Perkins; T18N R04E S31
81b*				12 Aug 1993	Same site
82*	Payne	OK	Cimarron R.	24 Jun 1993	1 mi. S of Yale; T19N R05E S25
83*	Payne	OK	Cimarron R.	07 Jul 1993	Hwy. 18 bridge 4.75 mi. N of Cushing; T18N R05E S10
84*	Payne	OK	Cimarron R.	07 Jul 1993	Below mouth of Stillwater Creek; T18N R04E S19
84b*				12 Aug 1993	Same site
85	Payne	OK	Council Cr.	20 Mar 1993	Hwy. 51 bridge 10 mi. E of Stillwater; T19N R04E S15 and S22
85b				09 Jun 1993	Same site
85c				24 Jun 1993	Same site
86	Payne	OK	Council Cr.	20 Mar 1993	6.5 mi. S and 2.5 mi. E of Glencoe; T19N R04E S09
86b				09 Jun 1993	Same site
87	Payne	OK	Council Cr.	20 Mar 1993	6 mi. N and 2 mi. W of Cushing; T19N R05E S05 and S32
87b				09 Jun 1993	Same site
88	Payne	OK	Council Cr.	20 Mar 1993	3 mi. S and 0.75 mi. E of Glencoe; T20N R04E S31
88b				09 Jun 1993	Same site
89	Payne	OK	Dugout Cr.	13 Jul 1993	1 mi. S and 1 mi. E of Perkins; T17N R03E S07
89b				30 Jul 1993	Same site

Appendix A. Continued.

No.	County	St.	Stream	Date	Location; legal description
90	Payne	OK	Salt Cr.	24 Jun 1993	Hwy. 51 bridge 1.25 mi. W of Yale; T19N R05E S23
90b				16 Jul 1993	Same site
91	Payne	OK	Salt Cr.	16 Jul 1993	Hwy. 18 bridge; T19N R05E S04 and S05
92	Payne	OK	Salt Cr.	16 Jul 1993	Old Hwy. 51 bridge; T19N R05E S10 and S15
93	Payne/ Pawnee	OK	Salt Cr.	16 Jul 1993	Above and below bridge on county line; T20N R04E S25 and T20N R05E S30
94	Payne	OK	Stillwater Cr.	28 Jul 1993	3.25 mi. E and 2.5 mi. S of Stillwater on Fairgrounds Road; T19N R03E S32 and S33
95	Payne	OK	Boomer Cr.	18 Sep 1993	Couch Park in Stillwater; T19N R02E S24
96	Payne	OK	Little Stw. Cr.	21 Sep 1993	4 mi. E, 2 mi. S, and 0.25 mi. E of Stillwater; T19N R04E S36
97	Payne	OK	Stillwater Cr.	21 Sep 1993	Near confluence with Cimarron River; T18N R04E S19
Deep Fork River Drainage, seven collections at seven sites:					
98	Creek	OK	L. Deep Fork	18 Aug 1991	0.25 mi. S of Slick; T15N R10E S17
99	Lincoln	OK	Deep Fork R.	12 Sep 1993	Hwy. 177 bridge at N edge of Warwick; T14N R03E S17
100	Lincoln	OK	Deep Fork R.	18 Aug 1991	Hwy. 66 bridge at E edge of Warwick; T14N R03E S20
101	Lincoln	OK	Deep Fork R.	18 Aug 1991	Hwy. 18 bridge 3.25 mi. S of Chandler; T14N R04E S33
102	Lincoln	OK	Deep Fork R.	18 Aug 1991	Hwy. 99 bridge 3 mi. S of Stroud; T14N R06E S15 and S16
103	Okmulgee	OK	Deep Fork R.	18 Aug 1991	Hwy. 75 bridge 2 mi. S of Okmulgee; T13N R13E S29
104	Okmulgee	OK	Deep Fork R.	18 Aug 1991	Hwy. 56 bridge 3 mi. W of Okmulgee; T13N R12E S10
Medicine Lodge River, 10 collections at six sites:					
105	Barber	KS	Medicine Lodge	06 Jul 1992	NW of Medicine Lodge; T32S R12W S04
105b				16 Jun 1993	Same site
106	Barber	KS	Medicine Lodge	07 Jul 1992	ESE of Medicine Lodge; T33S R11W S21
106b				16 Jun 1993	Same site
107	Barber	KS	Medicine Lodge	07 Jul 1992	1 mi. S of Lake City; T31S R14W S14 and S15
107b				19 May 1993	Same site
108	Barber	KS	Medicine Lodge	07 Jul 1992	0.75 mi. S of Sun City; T31S R15W S02
108b				19 May 1993	Same site
109	Barber	KS	Medicine Lodge	16 Jun 1993	Hwy. 2 bridge 1 mi. NE of Kiowa; T34S R11W S36
110	Alfalfa	OK	Medicine Lodge	12 Jul 1992	Hwy. 58 bridge 2.5 mi. W of Byron; T28N R11W S24
Ninnescah River Drainage, 13 collections at nine sites:					
111*	Kingman	KS	S. F. Ninnescah	23 Jul 1992	Kingman City Park; T28S R07W S05
111b				21 May 1993	Same site
111c*				15 Jun 1993	Same site
112	Kingman	KS	S. F. Ninnescah	23 Jul 1992	Hwy. 54 bridge 3 mi. E of Cunningham; above and below bridge; T27S R10W S36 and T28S R10W S01
112b				15 Jun 1993	Same site
113	Pratt	KS	S. F. Ninnescah	23 Jul 1992	S edge of Pratt; T28S R13W S02 and S03
114	Pratt	KS	S. F. Ninnescah	15 Jun 1993	Hwy. 54 bridge 4 mi. E of Pratt; T27S R12W S33
115	Reno	KS	N. F. Ninnescah	21 May 1993	Hwy. 17 bridge 13.5 mi. S of Hutchinson; T25S R06W S26
116	Sedgwick	KS	Ninnescah R.	22 Jul 1992	SW of Clearwater; T29S R02W S26 and S27
117	Sedgwick	KS	S. F. Ninnescah	22 Jul 1992	1.25 mi. S of Cheney; T28S R04W S20 and S21
117b				15 Jun 1993	Same site
118	Sedgwick	KS	N. F. Ninnescah	22 Jul 1992	3 mi. E and 2.25 mi. S of Cheney; T28S R04W S25 and S26
119	Sumner	KS	Ninnescah R.	22 Jul 1992	2 mi. S of Belle Plaine; T31S R01E S11 and S12
North Canadian River Drainage, 14 collections at 14 sites:					
120	Blaine	OK	N. Canadian R.	17 Aug 1993	Spillway of Canton Reservoir; T19N R13W S33
121	Blaine	OK	N. Canadian R.	20 Jul 1992	Hwy. 270 bridge 2 mi. W of Watonga; T16N R12W S22 and S27
122	Canadian	OK	N. Canadian R.	20 Jul 1992	Hwy. 81 bridge 1 mi. N of El Reno; T13N R07W S33
123	Harper	OK	Beaver R.	29 Jul 1992	Hwy. 283 bridge 2.75 mi. N of Laverne; T26N R25W S09 and S10

Appendix A. Continued.

No.	County	St.	Stream	Date	Location; legal description
124	Beaver	OK	Beaver R.	29 Jul 1992	Hwy. 270 bridge N edge of Beaver; T14N R24E S07
125	Beaver	OK	Beaver R.	30 Jul 1992	Hwy. 83 bridge 7 mi. S of Turpin; T03N R21E S06
126	Harper	OK	Kiowa Cr.	29 Jul 1992	5 mi. W and 2 mi. N of Laverne; T26N R26W S14 and S15
127	McIntosh	OK	N. Canadian R.	11 Sep 1993	At Indian Nations Turnpike crossing; T10N R13E S29
128	Oklahoma	OK	N. Canadian R.	20 Jul 1992	Hwy. 62 bridge NE edge of Harrah; T12N R01E S23
129	Oklahoma	OK	N. Canadian R.	20 Jul 1992	Hwy. 62 bridge NW of Midwest City; T12N R02W S20 and S29
130	Okmulgee	OK	N. Canadian R.	27 Jul 1993	5 mi. E, 4 mi. S, and 1.5 mi. E of Henryetta; T11N R13E S36
131	Pottawa-tomie	OK	N. Canadian R.	26 Jul 1993	Hwy. 177 bridge at Shawnee; T10N R03E S25
D	Texas	OK	Beaver R.	30 Jul 1992	N edge of Guymon; T03N R15E S16 and S17
D	Texas	OK	Beaver R.	30 Jul 1992	Hwy. 64 bridge N edge of Guymon; T03N R15E S18
D	Texas	OK	Coldwater Cr.	30 Jul 1992	SSE of Guymon; T01N R16E S07
132	Texas	OK	Palo Duro Cr.	30 Jul 1992	Hwy. 3 bridge 9.25 mi. E of Hardesty; T02N R19E S21 and S28
133	Woodward	OK	N. Canadian R.	07 Jul 1992	Above and below Hwy. 34 bridge at N edge of Woodward; T23N R21W S25 and T23N R20W S30
Salt Fork of the Arkansas River (= Salt Fork River), 22 collections at 18 sites:					
134	Comanche	KS	Mule Cr.	07 Jul 1992	Hwy. 160 bridge 15.5 mi. E of Coldwater; T32S R16W S03 and S10
134b				19 May 1993	Same site
135	Alfalfa	OK	E. Br. Sand Cr.	12 Jul 1992	Hwy. 58 bridge 4.25 mi. E of Byron; T28N R09W S19
136	Alfalfa	OK	Sandy Cr.	12 Jul 1992	Hwy. 11 bridge above Great Salt Plains Reservoir; T27N R09W S19
137	Alfalfa	OK	W. Br. Salt Fork	12 Jul 1992	Hwy. 11 bridge above Great Salt Plains Reservoir; 8.5 mi. E of Ingersoll; T27N R10W S23
138	Alfalfa	OK	E. Br. Salt Fork	12 Jul 1992	Hwy. 11 bridge above Great Salt Plains Reservoir; 9.0 mi. E of Ingersoll; T27N R10W S24
139	Alfalfa	OK	Salt Fork R.	12 Jul 1992	Spillway of Great Salt Plains Reservoir; T26N R09W S11
140	Alfalfa	OK	Salt Plains Res.	12 Jul 1993	S end of Great Salt Plains Reservoir; T26N R10W S23
141	Alfalfa	OK	Salt Fork R.	29 Jul 1993	Hwy. 8 bridge 3.5 mi. N of Cherokee; T27N R11W S14
142*	Grant	OK	Salt Fork R.	27 Jul 1992	1.5 mi. S of Lamont; T25N R03W S06 and S07
143*	Grant	OK	Salt Fork R.	27 Jul 1992	3 mi. W and 0.75 mi. N of Salt Fork; T25N R04W S16 and S17
144	Grant	OK	Salt Fork R.	20 May 1992	Hwy. 74 bridge 0.5 mi. N of Salt Fork; T25N R04W S14
145	Grant	OK	Salt Fork R.	20 May 1992	Hwy. 60 bridge E edge of Pond Creek; T25N R06W S01 and T25N R05W S06
145b*				27 Jul 1992	Same site
146	Grant	OK	Salt Fork R.	27 Jul 1992	Hwy. 81 bridge 2 mi. N of Pond Creek; T26N R06W S35 and S36
147	Grant	OK	Salt Fork R.	27 Jul 1992	5 mi. E and 3.5 mi. N of Nash; T26N R07W S20 and S21
148	Kay	OK	Salt Fork R.	20 May 1992	Hwy. 77 bridge at S edge of Tonkawa; T25N R01W S04
148b*				06 Oct 1992	Same site
149	Kay	OK	Salt Fork R.	27 Jul 1992	Confluence with the Chikaskia River; T25N R01E S19
149b*				06 Oct 1992	Same site
150	Noble	OK	Salt Fork R.	06 Oct 1992	Hwy. 177 bridge 7 mi. S of Ponca City; T24N R02E S10
151	Woods	OK	Salt Fork R.	29 Jul 1993	Hwy. 281 bridge N edge of Alva; T27N R14W S18
South Canadian River, eight collections at eight sites:					
152	Caddo	OK	S. Canadian R.	09 Jul 1992	Hwy. 281 bridge 2.25 mi. E of Bridgeport; T12N R11W S01
153	Dewey	OK	S. Canadian R.	09 Jul 1992	Hwy. 183 bridge 0.75 mi. N of Taloga; T18N R17W S12
154	Hughes	OK	S. Canadian R.	26 Jul 1993	Hwy. 75 bridge N edge of Calvin; T16N R10E S22
155	McClain/ Cleveland	OK	S. Canadian R.	09 Jul 1992	Hwy. 44 bridge 3.5 mi. N of Newcastle; T10N R04W S34 and S35
156	McClain/ Cleveland	OK	S. Canadian R.	26 Jul 1993	Hwy. 77 and 39 bridge W edge of Lexington; T06N R01W S06 and S07
157	McIntosh/ Pittsburg	OK	S. Canadian R.	11 Sep 1993	At Indian Nations Turnpike crossing; T08N R13E S23

Appendix A. Concluded.

No.	County	St.	Stream	Date	Location; legal description
158	Pottawatomie/Pontotoc	OK	S. Canadian R.	12 Sep 1993	Hwy. 177 bridge 1.5 mi. S of Asher; T06N R04E S30
159	Seminole/ Pontotoc	OK	S. Canadian R.	12 Sep 1993	Hwy. 99 bridge 3.5 mi. N of Byng; T05N R06E S04

Appendix B. Museum collections of the speckled chub from the Arkansas River drainage. Collection records were compiled from the following sources: KU = University of Kansas, Museum of Natural History; OSUS = Oklahoma State University, Department of Zoology; UMMZ = University of Michigan, Museum of Zoology; MSB = University of New Mexico, Museum of Southwestern Biology; UOMZ = University of Oklahoma, Stovall Museum of Zoology; NLU = Northeast Louisiana University, Museum of Zoology; USNM = Smithsonian Institution, National Museum of Natural History. Records were sorted by drainage, grouped by state within drainage, and alphabetized by county within state. Collections of the speckled chub made during this study are designated by asterisks following the county.

County	St.	Location	da/mo/yr	No. in Coll.	Cat. No.
Arkansas River Drainage:					
?	AR	Arkansas River at Fort Smith	?	4	USNM 36374
Jefferson	AR	Arkansas River at Pine Bluff	26/11/67	?	NLU 8504
Jefferson	AR	Arkansas River at Hwy. 15; 9 mi. N of Pine Bluff	14/02/70	2	NLU 15225
Logan	AR	Arkansas River at mouth of Piney Creek	23/07/39	2	UMMZ 128401
Pope	AR	Arkansas River at Dardanelle	15/11/63	92	OSUS 7224
Pope	AR	Arkansas River at Dardanelle	15/11/63	18	OSUS 7881
Barton	KS	Arkansas River; T19S R12W S32	11/08/52	2	KU 2660
Cowley	KS	Arkansas River; T34S R03E S22	25/08/56	1	KU 3668
Finney	KS	Arkansas River drainage	11/08/52	4	USNM 194837
Finney	KS	Arkansas River S of Holcomb; T24S R33W S07 and S18	11/08/52	10	KU 2649
Finney	KS	Arkansas River at US Hwy 83 bridge SW of Garden City	25/07/50	9	UMMZ 160431
Ford	KS	Arkansas River; T24S R22W S32	13/06/58	1	KU 3938
Sedgwick	KS	Arkansas River at Wichita	1889	4	USNM 41723
Sedgwick	KS	Arkansas River 0.5 mi. above US Hwy. 54 bridge in Wichita	26/01/52	12	KU 2004
Sedgwick	KS	Arkansas River; T27S R01E S18	01/03/52	4	KU 2027
Sumner	KS	Arkansas River near Oxford; T31S R02E S36	29/07/84	1	KU 21704
Sumner	KS	Arkansas River at Oxford Diversion Dam 3 mi. N of Oxford	12/06/64	27	KU 8311
Sumner	KS	Arkansas River below Oxford; T31S R02E S36	05/08/86	1	KU 21744
Sumner	KS	Arkansas River at Oxford	29/06/26	1	UMMZ 122162
Sumner	KS	Arkansas River 2 mi. N and 0.5 mi. E of Oxford	29/06/25	1	UMMZ 67816
Sumner	KS	Arkansas River 2 mi. N and 0.5 mi. E of Oxford	29/06/25	1	UMMZ 67822
Sumner*	KS	Arkansas River 2 mi. N and 0.5 mi. E of Oxford; T31S R02E S36	22/07/92	5	OSUS 25309
Sumner*	KS	Arkansas River 2 mi. N and 0.5 mi. E of Oxford; T31S R02E S36	14/06/93	8	OSUS 26319
Kay/Osage*	OK	Arkansas River at Hwy. 60 bridge E of Ponca City; T25N R02E S02	06/10/92	4	OSUS 25521
Kay	OK	Arkansas River E of Ponca City; west side of Kaw tailwater; T26N R03E S25	11/06/80	3	OSUS 19321
Muskogee	OK	Arkansas River at Hwy. 69 bridge	15/10/78	9	UOMZ 41767
Noble	OK	Red Rock Creek 0.5 mi. W and 12 mi. N of Perry	18/02/50	1	OSUS 4017
Osage	OK	Salt Creek at Fairfax	06/03/75	1	OSUS 9053
Osage	OK	Arkansas River 0.5 mi. NE of Blackburn; T22N R07E S19	30/09/89	2	OSUS 18166
Osage	OK	Arkansas River; east side of Kaw tailwater; T26N R03E S25	11/07/93	3	OSUS 26589
Pawnee	OK	Arkansas River at Turkey Island	07/07/34	8	UOMZ 19128
Pawnee	OK	Arkansas River at Turkey Island	07/07/34	3	UMMZ 110885
Pawnee/ Osage	OK	Arkansas River near Ralston	11/07/36	21	UMMZ 113372
Pawnee	OK	Arkansas River at E edge of Ralston; T25N R05E S01	13/10/79	3	OSUS 19424
Pawnee	OK	Arkansas River at E edge of Ralston; T25N R05E S01	05/04/80	6	OSUS 19420
Pawnee	OK	Arkansas River at E edge of Ralston; T25N R05E S01	14/09/85	3	OSUS 19335
Pawnee	OK	Arkansas River at E edge of Ralston; T25N R05E S01	13/10/90	1	OSUS 19939
Pawnee*	OK	Arkansas River at E edge of Ralston; T25N R05E S01	06/10/92	1	OSUS 25830
Pawnee	OK	Arkansas River; T23N R03E S16	11/04/75	2	OSUS 9203

Appendix B. Continued.

County	St.	Location	da/mo/yr	No. in Coll.	Cat. No.
Pawnee	OK	Arkansas River; T23N R03E S16	15/02/75	2	OSUS 7957
Pawnee	OK	Arkansas River at Red Rock Creek; T23N R03E S09	04/10/75	29	OSUS 9632
Pawnee	OK	Arkansas River at Greasy Creek; T23N R03E S24	06/12/75	72	OSUS 9716
Pawnee	OK	Arkansas River 5 mi. below Blackburn; T22N R07E S11 and S12	30/12/56	1	OSUS 5275
Pawnee	OK	Red Rock Creek near mouth	18/02/50	18	OSUS 4068
Pawnee	OK	Arkansas River 6 mi. WNW of Cleveland; T22N R07E S32	27/02/76	6	OSUS 23622
Pawnee	OK	Arkansas River 6 mi. WNW of Cleveland; T22N R07E S32	07/02/70	1	OSUS 23635
Pawnee	OK	Arkansas River 6 mi. WNW of Cleveland; T22N R07E S32	07/03/70	5	OSUS 23630
Pawnee	OK	Arkansas River 6 mi. WNW of Cleveland; T22N R07E S32	07/02/70	16	OSUS 23624
Sequoyah	OK	Arkansas River Lock #14 near Muldrow; T10N R26E S28	15/11/63	93	OSUS 11738
Sequoyah	OK	Arkansas River E of Webbers Falls on Hwy. 64	01/10/89	1	OSUS 18363
Tulsa	OK	Arkansas River N of Bixby; T17N R13E S12	21/08/83	9	OSUS 19562
Tulsa	OK	Arkansas River at Jenks Bridge	26/04/86	1	OSUS 12911
Tulsa	OK	Arkansas River at Sand Springs; T19N R11E S14	05/07/83	1	OSUS 19561
Tulsa*	OK	Arkansas River Hwy. 51 and 97 bridge at Sand Springs; T19N R11E S14	11/09/93	7	OSUS 26601
Tulsa	OK	Arkansas River at Keystone	03/08/60	3	UOMZ 39032
Tulsa	OK	Arkansas River; T19N R10E S04	09/04/60	66	UOMZ 39017
Tulsa*	OK	Arkansas River Hwy. 64 bridge at Bixby; T17N R13E S13	11/09/93	2	OSUS 26609
Canadian River Drainage:					
Haskell	OK	Canadian River; T10N R18E S28	10/07/62	7	UOMZ 35019
Haskell	OK	Canadian River 0.25 mi. E of Whitefield	23/08/62	14	UOMZ 36236
Haskell/ Muskogee*	OK	Canadian River at Hwy. 2 bridge at N edge of Whitefield; T09N R20E S07	27/07/93	10	OSUS 26360
Haskell/ Muskogee	OK	Canadian River at Whitefield	18/03/74	5	OSUS 21850
McIntosh	OK	Canadian River; T10N R16E S24	01/03/59	3	UOMZ 36301
McIntosh	OK	Canadian River between Standing Rock and Broken Creek	23/08/62	38	UOMZ 36223
McIntosh	OK	Canadian River; T10N R17E S34	16/08/62	11	UOMZ 36110
Chikaskia River Drainage:					
Kay	OK	Chikaskia River	16/03/40	1	OSUS 54
Kay	OK	Chikaskia River; 3 mi. S, 3 mi. E and, 1 mi. N of Blackwell at old iron bridge; T27N R01W S36	25/05/88	4	OSUS 19085
Kay	OK	Chikaskia River; T27N R01W S36	05/07/85	15	OSUS 25543
Kay	OK	Chikaskia River; T27N R01W S36	25/08/84	4	OSUS 25544
Kay	OK	Chikaskia River; T27N R01W S36	16/07/86	2	OSUS 25545
Kay	OK	Chikaskia River; T27N R01W S36	11/07/78	1	OSUS 25546
Kay	OK	Chikaskia River 3 mi. E of US Hwy. 77 and 177 (Tonkawa)	23/08/71	12	NLU 20932
Kay	OK	Chikaskia River US Hwy. 60 Bridge 3 mi. E of Tonkawa	21/08/73	7	NLU 27069
Cimarron River Drainage:					
Meade	KS	Crooked Creek at Borchers Pasture	26/06/52	7	UMMZ 176842
Meade	KS	Crooked Creek at Borchers Pasture	01/07/52	5	UMMZ 176849
Meade	KS	Crooked Creek 8 mi. S and 2.5 mi. W of Meade	24/07/50	1	UMMZ 160418
Seward	KS	Cimarron River SE of Arkalon (ghost town) on XI Ranch; T34S R31W S25	19/08/51	6	UMMZ 161988
Creek	OK	Cimarron River; T19N R07E S27	07/02/60	19	UOMZ 38951
Creek*	OK	Cimarron River at Hwy. 99 bridge 0.5 mi. N of Oilton; T19N R07E S28	07/07/93	11	OSUS 26257
Creek*	OK	Cimarron River 1 mi. S and 1 mi. W of Oilton; T18N R07E S08	07/07/93	1	OSUS 26260
Harper	OK	Cimarron River; T29N R26W S23	23/06/63	4	UOMZ 32444
Kingfisher*	OK	Cimarron River 2.5 mi. W of Dover at old iron-bridge; T17N R07W S05	17/08/93	1	OSUS 26588
Logan	OK	Skeleton Creek N of Guthrie	24/06/39	7	OSUS 1455
Logan	OK	Cimarron River; T17N R02W S29	03/05/65	6	UOMZ 33985
Logan	OK	Cimarron River	25/07/29	?	UOMZ 15664

Appendix B. Continued.

County	St.	Location	da/mo/yr	No. in Coll.	Cat. No.
Logan	OK	Cimarron River	25/07/29	?	UOMZ 15666
Logan*	OK	Cimarron River at Hwy. 74 bridge 5 mi. S of Crescent T16N R04W S02 and S03	17/08/93	2	OSUS 26603
Logan*	OK	Cimarron River at Hwy. 77 bridge 2.5 mi. N of Guthrie T17N R02W S28 and S29	17/08/93	29	OSUS 26604
Logan	OK	Cimarron River N of Coyle	25/07/29	21	UMMZ 109059
Logan	OK	Cimarron River near mouth of Skeleton Creek	04/08/39	57	UMMZ 127185
Major	OK	Cimarron River S of Cleo Springs	18/07/28	10	UMMZ 108888
Major	OK	Cimarron River 3 mi. S of Cleo Springs	18/07/28	33	UOMZ 15551
Major	OK	Cimarron River 3 mi. S of Cleo Springs	28/06/30	27	UMMZ 109389
Major	OK	Eagle Chief Creek 0.25 mi. NW of Cleo Springs	18/07/28	9	UMMZ 108889
Major	OK	Eagle Chief Creek near Cleo Springs	27/06/30	10	UMMZ 109388
Major	OK	Eagle Chief Creek	18/07/28	6	UOMZ 15552
Major	OK	Eagle Chief Creek	27/06/30	26	UOMZ 15663
Major	OK	Cimarron River	28/06/30	77	UOMZ 15662
Major	OK	Cimarron River	03/05/62	2	UOMZ 33800
Major	OK	Cimarron River	03/05/62	2	UOMZ 33793
Pawnee	OK	Cimarron River; T20N R10E S31	09/08/60	12	UOMZ 39025
Payne*	OK	Cimarron River at Hwy. 18 bridge 4.75 mi. N of Cushing; T18N R05E S10	07/07/93	1	OSUS 26261
Payne*	OK	Cimarron River 1 mi. S of Yale; T19N R05E S25	24/06/93	4	OSUS 26591
Payne*	OK	Cimarron River at Hwy. 33 bridge 0.75 mi. N and 6.75 mi. E of Perkins; T18N R04E S31	12/08/93	16	OSUS 26607
Payne	OK	Wild Horse Creek W of Perkins	09/04/32	2	OSUS 1419
Payne	OK	Wild Horse Creek W of Perkins	09/04/32	2	OSUS 1860
Payne	OK	Wild Horse Creek 4 mi. W of Perkins	09/04/32	8	UMMZ 108429
Payne	OK	Cimarron River 6.3 mi. S of Stillwater	10/02/39	9	OSUS 1465
Payne	OK	Cimarron River 9 mi. S and 2 mi. W of Stillwater	14/03/36	78	OSUS 1854
Payne	OK	Cimarron River at Hasting's Farm	10/05/32	6	OSUS 1857
Payne	OK	Cimarron River near Perkins	19/11/33	6	OSUS 1858
Payne	OK	Cimarron River near Perkins	28/04/34	8	OSUS 1859
Payne	OK	Cimarron River SE of Perkins	09/04/32	33	UMMZ 108313
Payne	OK	Cimarron River 1 mi. S of Perkins	11/01/61	6	OSUS 5561
Payne	OK	Cimarron River SE of Perkins	09/04/32	5	OSUS 1856
Payne	OK	Cimarron River 1 mi. W of Perkins bridge	1941	16	UMMZ 193731
Payne	OK	Cimarron River S of Stillwater	10/02/40	91	UMMZ 210636
Payne*	OK	Cimarron River at Hwy. 177 bridge 0.75 mi. S of Perkins; T17N R03E S07	13/07/93	18	OSUS 26595
Payne	OK	Cimarron River at Ripley Bridge	14/07/35	1	UMMZ 113346
Payne	OK	Cimarron River at Ripley Bridge	April 1935	54	USNM 161636
Payne	OK	Cimarron River E of Ripley	12/11/39	1	UMMZ 127165
Payne	OK	Cimarron River at mouth of Stillwater Creek	04/02/39	7	OSUS 1447
Payne*	OK	Cimarron River at mouth of Stillwater Creek; T18N R04E S19	07/07/93	1	OSUS 26251
Payne*	OK	Cimarron River at mouth of Stillwater Creek; T18N R04E S19	12/08/93	8	OSUS 26597
Payne	OK	Cimarron River at Ripley Bridge	26/04/35	54	OSUS 1855
Payne	OK	Unspecified creek 1 mi. S and 4 mi. E of Perkins	09/04/32	1	UMMZ 108410
Deep Fork River Drainage:					
McIntosh	OK	Deep Fork River 3 mi. from Richardsville	22/08/62	1	UOMZ 36211
McIntosh	OK	Deep Fork River SE of Hitchita	14/08/62	2	UOMZ 36069
Okmulgee	OK	Deep Fork River W of Hoffman	15/08/62	2	UOMZ 36072
Illinois River Drainage:					
Sequoyah	OK	Illinois River; T12N R21E S20 and S21	24/08/46	7	OSUS 2417
Medicine Lodge River Drainage:					
Barber	KS	Medcine Lodge River at Medicine Lodge; T32S R12W S12	21/07/51	4	KU 1803

Appendix B. Continued.

County	St.	Location	da/mo/yr	No. in Coll.	Cat. No.
Barber	KS	Medicine Lodge River at Sun City	18/08/57	13	KU 3899
Barber	KS	Medicine Lodge River; T33S R11W S20 and S21	12/06/58	4	KU 3932
Barber	KS	Medicine Lodge River 5 mi. NW of Medicine Lodge	12/11/38	1	UMMZ 126802
Barber	KS	Medicine Lodge River 0.75 mi. S of Lake City	12/11/36	1	UMMZ 126823
Ninnescah River Drainage:					
Kingman*	KS	South Fork Ninnescah River at Kingman; T28S R07W S05	23/07/92	14	OSUS 25292
Kingman*	KS	South Fork Ninnescah River at Kingman; T28S R07W S05	15/06/93	2	OSUS 26275
Kingman	KS	S. Fork Ninnescah Riv. SW of Cheney; T28S R05W S25 and S36	22/07/64	24	KU 8534
Sedgwick	KS	N. Fork Ninnescah River at old US Hwy. 54 crossing; T27S R04W S33	22/07/64	12	OSUS 12537
Sedgwick	KS	N. Fork Ninnescah River at old US Hwy. 54 crossing; T27S R04W S33	22/07/64	119	KU 8542
Sedgwick	KS	N. Fork Ninnescah River W of Garden Plain; T27S R04W S33	30/08/63	1	KU 8168
Sumner	KS	Ninnescah River at Kansas Turnpike crossing 14.7 mi. S of Wichita	26/06/64	1	KU 8285
North Canadian River Drainage:					
?	OK	Beaver River	29/05/49	6	OSUS 4213
Harper	OK	Beaver Creek (Beaver River) N of Laverne	17/06/47	1	OSUS 1712
McIntosh	OK	North Canadian River; T09N R17E S05	13/07/62	11	UOMZ 35090
McIntosh	OK	North Canadian River; T11N R14E S28	29/06/62	2	UOMZ 34815
McIntosh	OK	North Canadian River above Deep Fork confluence	15/06/62	13	UOMZ 34533
Okmulgee	OK	North Canadian River; T11N R13E S36	25/07/62	3040	UOMZ 35250
Texas	OK	Palo Duro Creek	29/05/49	6	OSUS 4124
Texas	OK	Coldwater Creek 8 mi. SE of Guymon	July 1926	9	UOMZ 6219
Texas	OK	Coldwater Creek SE of Guymon	01/07/26	18	UMMZ 80431
Texas	OK	North Canadian River (Beaver River) N of Guymon	29/05/49	30	OSUS 4130
Texas	OK	North Canadian River (Beaver River) at Guymon	27/05/49	3	KU 2131
Woodward	OK	North Canadian River at Woodward; T23N R20W S02	14/07/82	1	OSUS 19235
Woodward	OK	North Canadian River NE of Woodward	13/07/28	50	UMMZ 108887
Woodward	OK	North Canadian River at Woodward	13/07/28	?	UOMZ 15665
Salt Fork of the Arkansas River Drainage:					
Comanche	KS	Mule Creek; T32S R16W S10	29/08/60	5	KU 6422
Comanche	KS	Mule Creek E of Coldwater	18/07/64	5	KU 8574
Alfalfa	OK	Sand Creek above Great Salt Plains Reservoir	31/03/51	3	UOMZ 36728
Alfalfa	OK	Salt Fork River below Great Salt Plains Reservoir	30/03/51	105	UOMZ 36725
Alfalfa	OK	Salt Fork River 7 mi. E and 2 mi. N of Ingersoll	11/07/26	6	UOMZ 6274
Alfalfa	OK	Salt Fork River below Great Salt Plains Reservoir	26/03/49	16	UOMZ 29157
Alfalfa	OK	Salt Fork River below Great Salt Plains Reservoir	26/03/49	11	UOMZ 36892
Alfalfa	OK	Salt Fork River	20/06/30	?	UOMZ 15554
Alfalfa	OK	Salt Fork River	21/06/30	?	UOMZ 15555
Alfalfa	OK	Salt Fork River 5 mi. N of Cherokee	21/06/30	32	UMMZ 109387
Alfalfa	OK	Pond 3.5 mi. E. of Cherokee	13/06/30	3	UMMZ 109386
Alfalfa	OK	Salt Fork River 7 mi. E and 2 mi. N of Ingersoll	11/07/26	8	UMMZ 80467
Alfalfa	OK	Salt Fork River 3 mi. E and 5 mi. N of Jet	16/08/47	2	OSUS 1869
Alfalfa	OK	Salt Fork River 3 mi. E and 5 mi. N of Jet	16/08/47	13	OSUS 1870
Grant	OK	Salt Fork River N of Nash; T26N R08W S27	20/07/89	2	OSUS 18200
Grant	OK	Salt Fork River N of Nash; T26N R08W S27	23/05/91	1	OSUS 19726
Grant	OK	Salt Fork River N of Nash; T26N R08W S27	24/07/84	52	OSUS 19586
Grant	OK	Salt Fork River E of Pond Creek; T25N R06W S01	10/08/90	3	OSUS 19152
Grant	OK	Salt Fork River E of Pond Creek; T25N R06W S01	20/07/89	19	OSUS 18061
Grant*	OK	Salt Fork River E of Pond Creek; T25N R05W S06 and T25N R06W S01	27/07/92	1	OSUS 25432
Grant	OK	Salt Fork River NE of Salt Fork; T25N R03W S06	20/07/89	1	OSUS 18112
Grant	OK	Salt Fork River S of Lamont at old Hwy. 74 crossing; T25N R03W S06	10/08/90	5	OSUS 19143
Grant*	OK	Salt Fork River S of Lamont at old Hwy. 74 crossing; T25N R03W S06 and S07	27/07/92	2	OSUS 25428

Appendix B. Concluded.

County	St.	Location	da/mo/yr	No. in Coll.	Cat. No.
Grant*	OK	Salt Fork River 3 mi. W and 0.75 mi. N of Salt Fork T25N R04W S16 and S17	27/07/92	1	OSUS 25430
Kay	OK	Salt Fork River 8 mi. E of Ponca City	June 1930	6	UMMZ 109996
Kay*	OK	Salt Fork River Hwy. 77 bridge at Tonkawa; T25N R01W S04	06/10/92	1	OSUS 25829
Kay*	OK	Salt Fork River at mouth of Chikaskia River; T25N R01E S19	06/10/92	1	OSUS 25831
Kay	OK	Salt Fork River 8 mi. S of Ponca City at Hwy. 177 crossing	26/02/61	6	OSUS 11807
Kay	OK	Salt Fork River S of Ponca City near mouth of Salt Fork	24/08/39	36	UMMZ 127199
Noble	OK	Salt Fork River S of Ponca City; T24N R02E S10	18/07/89	94	OSUS 18089
Noble	OK	Salt Fork River 7 mi. S of Ponca City on US Hwy. 177	19/08/71	?	NLU 21819
Noble	OK	Salt Fork River 5 mi. S of Ponca City on US Hwy. 177	30/12/70	6	NLU 17893
Noble	OK	Salt Fork River 5 mi. NE of Marland	24/08/39	12	UMMZ 127238
South Canadian River Drainage:					
Quay	NM	South Canadian River at Collins Ranch; T13N R35E S01	11/07/90	8	OSUS 18891
Quay	NM	South Canadian River 6 mi. E of Logan; T15N R34E S03	09/07/90	5	OSUS 18673
Quay	NM	South Canadian River at Logan	23/08/39	138	MSB 1874
Quay	NM	South Canadian River N of Logan at US Hwy. 54 Bridge	09/07/90	4	OSUS 18679
Quay	NM	Revuelto Creek 3 km W of Logan; T13N R33E S24	09/02/87	29	MSB 4668
Quay	NM	Revuelto Creek S of Logan at Hwy. 39 Bridge	10/07/90	4	OSUS 18832
Cleveland	OK	South Canadian River S of Norman	Spring 1925	1	UOMZ 6175
Cleveland /McClain	OK	South Canadian River near Newcastle	15/04/52	2	KU 2328
Dewey	OK	South Canadian River	12/07/28	?	UOMZ 15550
Dewey	OK	South Canadian River 4 mi. SW of Taloga	11/07/28	44	UMMZ 108886
Hughes	OK	South Canadian River; T07N R12E S20	27/07/62	3	UOMZ 35332
McClain	OK	South Canadian River at Purcell	28/07/32	13	UMMZ 110081
McClain	OK	South Canadian River	28/07/32	8	UOMZ 15668
McIntosh	OK	South Canadian River; T09N R16E S28	13/07/62	8	UOMZ 35103
McIntosh	OK	South Canadian River	29/06/29	?	UOMZ 15553
Oldham	TX	South Canadian River 3 mi. E of Tascosa	24/07/49	2	OSUS 3125
Oldham	TX	S. Canadian River at Hwy. 385 bridge 12 mi. S of Channing	11/07/90	114	OSUS 18837
Potter	TX	S. Canadian River at Hwy. 287 and 87 bridge 15 mi. N of Amarillo	26/05/73	4	NLU 28965
Potter	TX	S. Canadian River at Hwy. 287 and 87 bridge 15 mi. N of Amarillo	09/07/90	16	OSUS 18703

Appendix C. Fish species collected in the Arkansas River Basin, 1991 to 1993. Collection numbers correspond with Appendix A. Ranges of collection numbers (e.g., 156-159) are inclusive. Common names follow Robins et al. (1991).

Species	Collection Numbers
Shortnose gar	127
Longnose gar	8b, 13, 16, 44, 45, 45b, 46, 46b, 47, 50b, 51, 52, 67, 72b, 73, 73b, 73d, 75b, 146-149
Gizzard shad	8, 8c, 9b, 12, 17, 18, 24, 44, 45, 45b, 47, 50-52, 55, 56b, 57, 63, 64, 66, 68, 70, 71, 71b, 73, 73b, 73d, 74b, 75, 75b, 75c, 79, 79b, 81b, 82, 84, 84b, 85b, 87b, 89, 89b, 90, 90b, 92, 94, 95, 97, 99, 101, 102, 104, 110, 112, 116, 117b, 120, 122, 130, 135, 137-142, 145, 145b, 146, 149, 151, 154, 156-159
Common carp	1, 3, 5, 8b, 8c, 22b, 23b, 26b, 27, 29b, 30, 31, 31b, 33, 37b, 39, 43b, 46b, 47, 50b, 52, 53b, 56b, 58, 66, 74, 76, 77, 77b, 80, 83, 89, 101, 106b, 107, 107b, 108b, 110, 112b, 120, 121, 124, 136-142, 155
Golden shiner	21, 21b, 23b, 27, 29, 30b, 31, 31b, 33, 33b, 41, 41b, 42, 48b, 53b, 54, 54b, 56, 56b, 57, 58, 62, 62b, 77, 84, 86, 86b, 88b, 89, 91, 93, 95, 112, 112b, 122
Silver chub	8b, 16, 19, 63, 64, 66, 68, 72, 73c, 75b, 79b, 82, 84b, 97
Speckled chub	8, 8b, 11, 14, 16, 17, 19, 63, 64, 69, 71b, 73d, 79b, 81b, 82-84, 84b, 111, 111c, 142, 143, 145b, 148b, 149b
Suckermouth minnow	2-6, 8c, 9, 13, 20b, 22, 23, 24b, 25, 25c, 26b, 27, 30, 30b, 31b, 32b, 33, 33b, 36, 36b, 37, 37b, 38, 38b, 39, 43-45, 45b, 46, 46b, 48, 48b, 49, 49b, 50, 50b, 51, 56b, 66, 67, 73d, 74, 74b, 75b, 80, 82, 85, 85c, 86, 86b, 87, 90b, 91, 92, 94, 96, 99, 100, 101, 104, 108, 116, 118, 122-130, 154
Emerald shiner	7, 8, 8b, 8c, 9, 9b, 10-12, 14-19, 45b, 47, 50b, 52, 63, 64, 66, 68-71, 71b, 72, 72b, 73, 73b, 73c, 73d, 74b, 75, 75b, 76, 79b, 80, 81, 81b, 82-84, 84b, 85, 87, 89b, 90b, 91, 92, 94-97, 103-105, 105b, 106, 106b, 107, 107b, 108, 108b, 109, 110, 115, 127, 129, 130, 134, 134b, 135-141, 144, 145, 148b, 149b, 150-159
River shiner	17, 19
Bluntface shiner	20b, 32b, 38, 38b, 39, 43, 43b, 46b, 47, 48, 48b, 49b, 50, 50b, 52, 55
Red shiner	2-8, 8b, 8c, 9, 9b, 11, 13-15, 17, 19, 20, 20b, 21, 21b, 22, 22b, 23, 23b, 24, 24b, 25, 25b, 25c, 26, 26b, 27, 27b, 28, 28b, 29, 29b, 30, 30b, 31, 31b, 32, 32b, 33, 33b, 34b, 36, 36b, 37, 37b, 38, 38b, 39, 40, 41b, 43, 43b, 44, 45, 45b, 46, 46b, 47, 48, 48b, 49, 49b, 50, 50b, 51-53, 53b, 54, 54b, 55, 56, 56b, 57-61, 63, 64, 66-70, 71b, 72, 72b, 73, 73b, 73c, 73d, 74, 74b, 75, 75b, 77, 77b, 79b, 80, 81, 81b, 82-84, 84b, 85, 85b, 85c, 86, 86b, 87, 87b, 89, 89b, 90, 90b, 91, 92, 94-105, 105b, 106, 106b, 107, 107b, 108, 108b, 109-111, 111b, 111c, 112, 112b, 113-117, 117b, 118-126, 128-134, 134b, 135-138, 140-145, 145b, 146-148, 148b, 149b, 150-159
Sand shiner	2-8, 8b, 8c, 9, 9b, 13, 14, 17, 20, 20b, 21, 21b, 22, 22b, 23, 23b, 24, 24b, 25, 25b, 25c, 26, 26b, 27, 27b, 28, 28b, 29, 29b, 30, 30b, 31b, 32, 32b, 33, 33b, 36, 36b, 37, 37b, 38, 38b, 39, 40, 40b, 43b, 44, 45, 45b, 46, 46b, 47, 48b, 51, 53, 53b, 54, 56, 57, 59-61, 66-68, 72-74, 74b, 75, 75b, 76, 77, 77b, 80, 89, 96, 99-101, 105, 105b, 106, 106b, 107, 107b, 108, 108b, 109-111, 111b, 111c, 112, 112b, 113-117, 117b, 118-126, 128, 129, 132-134, 134b, 135-139, 141-145, 145b, 146-148, 148b, 150-153, 155, 156
Arkansas River shiner	152, 153, 155-159
Red River shiner	60, 63-66, 68-71, 71b, 72, 72b, 73, 73b, 73c, 73d, 75, 75b, 76, 79b, 81, 81b, 82-84, 84b
Ghost shiner	8b, 43b, 45, 45b, 46, 46b, 47, 48, 48b, 50b, 55, 57, 70, 81b, 97

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Species	Collection Numbers
Plains minnow	7, 10, 45, 45b, 47, 56, 63, 64, 66, 68-71, 71b, 72, 72b, 73, 73b, 73c, 73d, 75, 75b, 76, 79, 79b, 81, 81b, 82-84, 84b, 90b, 92, 105b, 106, 106b, 107, 107b, 108, 108b, 109-111, 117b, 123-126, 134, 134b, 136-141, 145, 145b, 146, 147, 151-159
Fathead minnow	2-6, 9, 13, 20b, 21, 21b, 22, 22b, 23, 23b, 24, 24b, 25, 26b, 27, 28, 28b, 29, 29b, 30, 30b, 31, 31b, 32, 32b, 33, 33b, 34, 34b, 35, 36, 36b, 37, 37b, 38, 38b, 40, 42, 43, 43b, 44, 45b, 46, 46b, 47, 48, 48b, 49, 50b, 51, 53, 53b, 54, 54b, 55, 56, 56b, 57-59, 61, 62, 62b, 65-67, 69, 73c, 74, 74b, 75b, 91, 100, 101, 107, 107b, 108, 108b, 111c, 112b, 116, 117, 119, 120-126, 128, 129, 131-133, 135-142, 144, 146, 147, 148b, 155, 156
Bullhead minnow	7, 8, 8b, 8c, 9b, 12, 15, 17-19, 22, 22b, 23b, 24, 24b, 25, 25c, 30, 33b, 36, 36b, 37, 37b, 38, 38b, 39, 43, 43b, 44, 45, 45b, 46b, 47-49, 49b, 50, 50b, 51, 52, 55, 56b, 57, 64, 66, 67, 70, 72, 73, 73c, 73d, 77, 77b, 79b, 80, 81b, 84, 84b, 85b, 86b, 87b, 90, 90b, 91, 92, 96-104, 111, 111b, 111c, 112b, 113, 115-117, 117b, 118-120, 122, 127-130, 148, 148b, 150, 152-155, 157, 159
Slim minnow	38, 38b, 39, 43, 43b
Bluntnose minnow	20b, 32b, 33b, 38, 38b, 39, 43, 43b, 45, 46, 48, 48b, 49, 50b, 55, 56, 56b, 111b, 111c, 112b, 116, 117b
Central stoneroller	2, 3, 5, 6, 9, 20-22, 22b, 23b, 24, 24b, 25, 26, 26b, 27, 28, 28b, 29, 29b, 30, 30b, 31, 31b, 32, 32b, 33, 33b, 34b, 36, 36b, 37, 37b, 40, 40b, 43, 43b, 46b, 48, 50b, 54, 56, 56b, 57, 59, 60, 107, 107b, 108, 112b, 113, 114, 118, 134, 134b
Black buffalo	44, 46b, 47, 50, 81b, 111c, 116
Smallmouth buffalo	10, 15, 87b, 102, 104
Quillback	3, 117b
River carpsucker	7, 8c, 12, 25, 37b, 38b, 39, 45b, 46, 46b, 48, 48b, 56b, 68, 69, 71, 72, 73c, 77, 79b, 81b, 82, 85b, 87b, 99, 100, 107b, 127, 129, 147, 152, 154-157, 159
Golden redhorse	21b, 32, 32b, 35, 43, 56b, 57, 107
White sucker	2, 5
Black bullhead	21, 23b, 24b, 25b, 27b, 28b, 30, 31b, 32b, 34b, 41, 42, 54, 54b, 56b, 58, 61, 86b, 93, 107
Yellow bullhead	21, 25, 28, 31, 32b, 54, 56b, 77, 86b, 118
Channel catfish	2, 5-8, 8c, 9, 10, 13, 16, 17, 19, 20b, 22, 22b, 23, 24b, 25, 25c, 26, 26b, 30, 31, 31b, 32, 32b, 36, 36b, 37, 37b, 38b, 39, 43, 43b, 44, 45, 45b, 46b, 50, 50b, 55, 56, 56b, 63, 64, 66, 67, 69, 72, 72b, 73b, 73c, 73d, 74, 74b, 75, 75b, 76, 77, 77b, 79b, 81b, 82-84, 84b, 87b, 89, 94, 97, 99-102, 104, 105b, 106b, 108, 108b, 109-111, 111b, 111c, 115, 116, 117b, 119, 121, 122, 127-130, 135-143, 145b, 146, 147, 148b, 149b, 152, 154-159
Blue catfish	19, 45, 45b, 72, 79b, 81b, 84b, 102, 127, 143, 145b, 146, 148b, 149b, 154, 157
Flathead catfish	22b, 57, 72, 127
Freckled madtom	57, 74, 104
Red River pupfish	152, 153, 155
Plains killifish	2, 4-6, 8, 9, 14, 20, 20b, 22, 22b, 23, 23b, 24, 24b, 25, 25b, 25c, 27, 27b, 28b, 29, 29b, 32, 32b, 33, 33b, 36, 38b, 40, 40b, 43b, 47, 48b, 53, 59, 60, 65, 66, 68, 69, 71, 75, 75b, 76, 105, 105b, 106, 106b, 107, 107b, 108, 108b, 109-111, 111b, 111c, 112, 112b, 114-117, 117b, 118-120, 121-126, 132-134, 134b, 137, 138, 140,

Appendix C. Concluded.

Species	Collection Numbers
Plains killifish (cont.)	141, 151, 152, 155, 158
Western mosquitofish	3, 7, 8, 8b, 8c, 9, 13, 15, 16, 20, 21, 21b, 22, 22b, 23, 23b, 24, 24b, 25, 25b, 26b, 27, 28, 28b, 29, 29b, 30, 30b, 31, 31b, 32, 32, 33, 33b, 34, 34b, 35-37, 38b, 40b, 42, 43, 43b, 45, 45b, 46, 46b, 47, 48, 48b, 50b, 51-53, 53b, 54, 54b, 55, 56, 56b, 57-59, 61, 62, 62b, 64-72, 72b, 73, 73b, 73c, 74, 74b, 75, 75b, 76, 77, 81-83, 90b, 92, 94-98, 100-104, 106, 106b, 107, 107b, 108, 108b, 111b, 112, 112b, 113-129, 132, 133, 135-141, 145b, 146, 148b, 149, 149b, 150, 152, 153, 155-159
Inland silverside	10, 11, 15-19, 45b, 72, 73, 103, 110, 120-122, 128-131, 135-140, 146, 147, 157
Brook silverside	90b, 91, 92, 112
Striped bass	10, 11
Hybrid striped bass	147, 149b
White bass	8b, 8c, 19, 64, 72b, 73, 75b, 79b, 81b, 82, 84b, 120, 130, 131, 154, 157-159
Largemouth bass	3, 21, 23b, 24b, 29b, 30, 31, 33, 33b, 34b, 37, 46, 50b, 53, 56, 56b, 57, 64, 67, 77, 77b, 78, 80, 85b, 86b, 87b, 88b, 89, 89b, 90b, 91, 92, 94, 95, 98, 107, 107b, 112, 113, 115, 116, 124, 141, 152
Green sunfish	2, 3, 13, 21, 21b, 23, 23b, 24, 24b, 25b, 27, 27b, 28, 28b, 29, 29b, 30b, 31, 31b, 32b, 33, 33b, 34, 34b, 36, 36b, 37b, 38b, 40, 40b, 41, 41b, 42, 43b, 50b, 53, 53b, 54, 54b, 56, 56b, 57, 58, 62, 62b, 66, 75b, 77, 78, 80, 85b, 86, 86b, 87b, 88, 88b, 89, 89b, 90, 91, 93-96, 107, 107b, 113-116, 121, 124, 141, 152
Redear sunfish	88b, 95
Bluegill	3, 18, 21b, 23b, 24b, 25b, 31, 31b, 32b, 45, 46, 56, 56b, 64, 70, 77, 78, 85b, 86b, 87b, 88b, 90b, 92, 93, 95-97, 106b, 107b, 109, 112, 112b, 113, 115, 120, 121, 141
Orangespotted sunfish	2, 13, 21, 21b, 22, 22b, 23b, 24b, 25b, 28b, 29b, 30, 31b, 36, 36b, 37, 37b, 38, 38b, 43b, 46, 48b, 49, 50b, 51-53, 53b, 54, 54b, 56, 56b, 57, 58, 75b, 86b, 88b, 89, 90, 95-97, 101, 116, 121, 128, 140, 144, 152, 155, 158
Longear sunfish	3, 10, 13, 15, 21, 22b, 23b, 24, 24b, 25b, 28, 28b, 30, 30b, 31, 31b, 32b, 34, 34b, 37, 37b, 38, 38b, 39, 42, 43, 43b, 46, 48, 48b, 49, 50b, 53, 53b, 55, 56, 56b, 57, 67, 77, 78, 80, 85b, 85c, 86b, 87b, 88b, 90, 90b, 91, 93-98, 100, 101, 104, 107b, 121, 123, 124, 127, 157
White crappie	8, 8c, 23b, 25b, 37, 39, 45b, 48, 57, 77, 86b, 95, 97, 107b, 111b, 112, 115, 116, 119, 121, 157
Black crappie	3, 39, 45, 57, 111c, 112
Walleye	8b, 120
Slenderhead darter	13, 36, 43b, 44, 45, 45b, 46b, 47, 49, 49b, 50, 50b, 51, 52, 55, 57
Logperch	15, 64, 85, 85b, 85c, 90b, 92, 154
Arkansas darter	40, 59, 60, 111b, 112b, 114, 118
Orangethroat darter	22b, 23b, 24, 25, 26b, 27, 28, 31, 34b, 36b, 37, 40, 40b, 112b, 114, 118
Freshwater drum	8, 8c, 19, 45b, 46b, 63, 72, 79b, 82, 97, 127, 150, 157

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