

FINAL REPORT
to the
KANSAS FISH AND GAME COMMISSION
on the
GRAY TREEFROGS OF KANSAS

KANSAS FISH AND GAME CONTRACT #75 - 1983-1985

by

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The University of Kansas
Lawrence
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INTRODUCTION

Until 1968, the gray treefrog, an inhabitant of the eastern third of Kansas, was assigned to a single species, Hyla versicolor, the eastern gray treefrog, an amphibian that lives in trees and low shrubs of woodland and woodland edge, and utilizes ponds in which to mate and lay eggs. Ralin (1968, 1977) demonstrated the occurrence of both Hyla versicolor and a second species, Hyla chrysoscelis, Cope's gray treefrog, in the state. This latter species was shown to occur throughout the eastern third of Kansas, whereas the eastern gray treefrog was restricted to the extreme southeastern corner of the state (probably in Cherokee County). Bogart (1980) showed Cope's gray treefrog as definitely occurring in northeastern Kansas, and tentatively restricted the range of the eastern gray treefrog in the state to the more heavily forested area along the Missouri border. James P. Bogart (pers. comm. 1974) provided specific identifications for 25 preserved Kansas specimens of gray treefrogs, some of which were shown by Collins (1982) to indicate four counties where both species were known to occur. In addition, Collins (1982) mapped gray treefrogs (specific identity unknown) from 29 other Kansas counties. To date, no other information has been available on the distribution of these treefrogs in Kansas

Previous data on length of breeding season and habitat preference was made either without the knowledge that two species were involved or without any attempt to make such a distinction. Collins (1982) summarized this data for both species as follows (in part):

Habitat. "inhabits the trees and low shrubs of woodland and woodland edge, and is more arboreal than other frogs found in Kansas....found in small holes and niches in sun-heated limestone rocks....observed on low-hanging branches in trees...."

Breeding season: "The gray treefrog may breed from April to July. This species breeds in permanent or semi-permanent woodland pools with mud bottoms and weedy vegetation."

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OBJECTIVES AND METHODS

The objectives of this study were to determine the Kansas distributions, breeding seasons, and habitat preferences of the eastern gray treefrog (Hyla versicolor Le Conte) and Cope's gray treefrog (Hyla chrysoscelis Cope). This, of course, required precise identification of the treefrogs obtained during the study.

Initially, the contract called for identification of frogs by analysis of tape recordings of mating calls of males, because these calls supposedly differ greatly under similar conditions. This technique was abandoned for two reasons: 1) mating calls vary greatly with prevailing air temperatures, making analysis complex and time-consuming, and 2) a better technique was available through microscopic examination of treefrog tissue to determine chromosome number, thus allowing a quick, precise identification of each specimen. These two species of treefrogs have virtually identical external morphologies (Figures 1 and 2), and are distinguishable only by three characteristics: mating call, blood cell size, and chromosome number. The dorsal pattern and color of both species are highly variable, and are subject to relatively rapid change from green to brown to gray, and from an intricate dark pattern to uniform green. Cope's gray treefrog is a diploid (2n) with 12 pairs of chromosomes, whereas the eastern gray treefrog is a tetraploid (4n) with 24 pairs of chromosomes.

Treefrogs obtained during this study were sacrificed and their tissues (from testes or intestines) examined for chromosome number to determine specific identity. Each specimen, after removal of tissue, was preserved and cataloged in the herpetological collection of the Museum of Natural History, The University of Kansas, Lawrence. In addition, all dates of breeding activity were recorded, and general types of habitats used by the treefrogs were documented whenever possible.

RESULTS

Species identification: From spring 1984 to summer 1985 a total of 91 gray treefrogs were collected or obtained by us. Of those, 81 were examined for chromosome number, ten having died before they could be examined. In addition, James P. Bogart (pers. comm. 1974) had previously determined chromosome number for 25 Kansas gray treefrogs in the KU collection. These are included in this study, giving us a total of 106 specimens (101 males and 5 females) from 26 counties and 53 localities, of which two (Coffey and Wabaunsee) are new county records for Kansas (Collins, 1982). Of the 106 specimens, 83 were Cope's gray treefrog (Hyla chrysoscelis) and 23 were eastern gray treefrogs (Hyla versicolor), thus substantially supporting the conclusions of previous authors that two species of gray treefrogs occur in Kansas.

Distribution: The 83 Cope's gray treefrogs were from 24 counties and 34 localities (see Appendix A). The 23 eastern gray treefrogs were from 9 counties and 19 localities (see Appendix B). The Kansas counties from which we had samples (both our data and Bogart's) are shown on Map 1. The distribution of both species of treefrogs in Kansas is shown on Map 2.

Length of breeding season: Eighty-one treefrogs collected or obtained by us during 1984 and 1985 were collected from breeding choruses, and precise dates of collection exist for the 71 specimens taken during the 1985 season. The species, number of specimens, and span of the collecting dates is as follows:

<u>Hyla versicolor</u> (n=15)	11 April to 22 June 1985
<u>Hyla chrysoscelis</u> (n=56)	11 April to 26 June 1985

Habitat preferences: General habitat data was recorded for both species of tree frogs, at 4 localities where only Hyla versicolor was found (see Appendix C), at 17 localities where only Hyla chrysoscelis was found (see Appendix D), and at all 3 localities where both species were found (see Appendix E). In summary, there appears to be no difference in the breeding habitat used by both species, a conclusion substantiated by our discovery that both species used the same breeding pond on the same date at three widely separate localities in Douglas, Elk and Franklin counties. Aquatic situations chosen by treefrogs ranged in depth from 8 feet to a few inches and from temporary, flooded ditches to rain pools in cultivated fields to permanent ponds. Only a few of these aquatic situations contained fish predators, and none was further than 500 feet from forest. Figures 3 and 4 show habitats utilized by Hyla chrysoscelis; Figure 5 shows habitat where we found Hyla versicolor.

CONCLUSIONS

1. Based on determination of chromosome number, Kansas has two species of gray treefrogs, the eastern gray treefrog (Hyla versicolor), a tetraploid (4n), and Cope's gray treefrog (Hyla chrysoscelis), a diploid (2n)—see Appendices A and B.

2. Cope's gray treefrog occurs throughout the eastern third of Kansas, from the Missouri border west to Riley County in the north and probably to Cowley County in the south. The eastern gray treefrog has a more restricted range, being found only along the forested eastern border counties from Cherokee in the south to Atchison in the north, and extending west along the wooded Kansas and Marais des Cygnes river valleys to Douglas, Franklin and Jefferson counties. In addition, populations of the eastern gray treefrog occur in the forested Chautauqua Hills region in Elk and extreme southeastern Greenwood counties (see Map 2).

3. There is no apparent difference in length of breeding season between Hyla chrysoscelis and Hyla versicolor in Kansas. During this study, calling males of both species were found from early April to late June 1985. Collins (1982) gave a breeding range of April to July for both species, and one of us (JTC) heard gray treefrogs (species not determined) calling in Douglas County during August 1985. Although males of these two species are reported to have distinctive breeding calls, it should be noted that one of us (JTC) listened to calling Hyla versicolor (KU 203746) and Hyla chrysoscelis (KU 103720-721) in Cherokee County on 22 June 1985, and could not distinguish between them.

4. In terms of habitat preference, Cope's gray treefrog utilizes the same type of aquatic situations as the eastern gray treefrog, but the latter is restricted to heavily forested areas, whereas the former uses breeding habitat throughout eastern Kansas, whether heavily wooded or not.

RECOMMENDATIONS

Although we had a sample in this study of 106 gray treefrogs from 26 counties and 53 localities, we feel that much additional collecting will be needed to refine the known range of Hyla chrysoscelis and Hyla versicolor in Kansas. Once such additional data is available, it will be possible to begin an intense search for subtle differences in activity cycles and microhabitat preferences among these two species of frogs. We recommend that future work require examination of chromosome number to confirm species identification, since this has proven more reliable and workable than mating call analysis.

STATISTICAL DATA ON FIELD WORK

Mileage: 1984 =	895	Days in field: 1984 =	7
Mileage: 1985 =	<u>1235</u>	Days in field: 1985 =	<u>12</u>
Totals	<u>2130</u>		<u>19</u>

ACKNOWLEDGEMENTS

This study would not have been possible without the generosity of John S. Frost of the University of Kansas. He most graciously allowed us the use of his fine laboratory at the KU Center for Biomedical Research in which to prepare, examine and store our specimens, and his assistance was deeply appreciated.

Larry Miller (Caldwell) and Kelly J. Irwin (Wakarusa) accompanied us on many field trips, took many trips on their own to collect frogs for us, and were immensely helpful in seeing the project to completion.

Further, many individuals assisted us in the field or responded to our request for tree frogs, as follow: James Arnwine (Independence Community College), C. Camblin (KSU), David Cannatella (KU), Suzanne Collins (KU), Linda Dryden (KU), Henry Fitch (KU), Linda Ford (KU), John Fraser (Fredonia), Mark Heinrich (KSU), Errol Hooper, Jr. (KU), Kris Irwin (Topeka), Harold Klaassen (KSU), Marc Linton (Logan Jr. High School, Topeka), John Parmerlee and Robert Powell (Avila College, KCMO), Johnny Ray (KFG, Emporia), Martin Simon and B. Tremmel (Benedictine College, Atchison), M. Whiles (KSU) and Jeff Whipple (KU).

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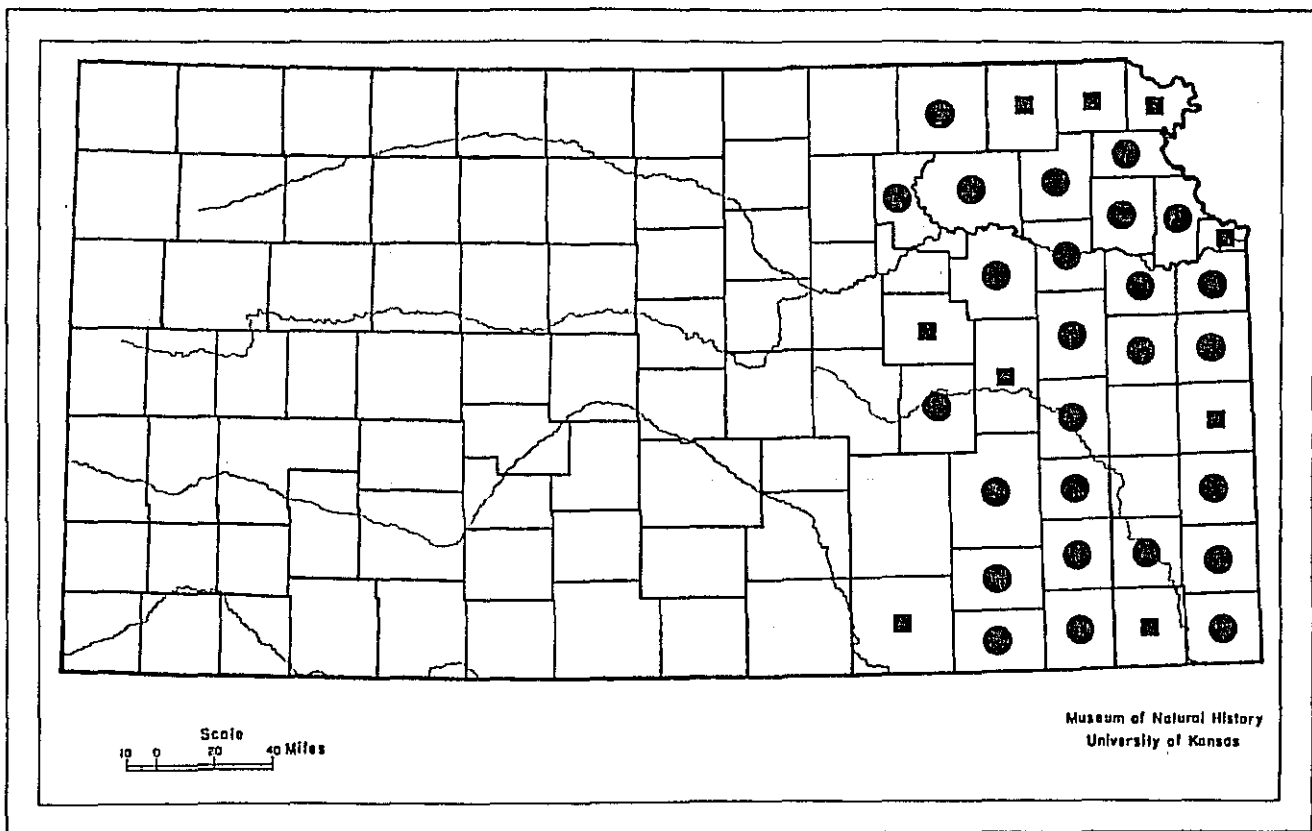
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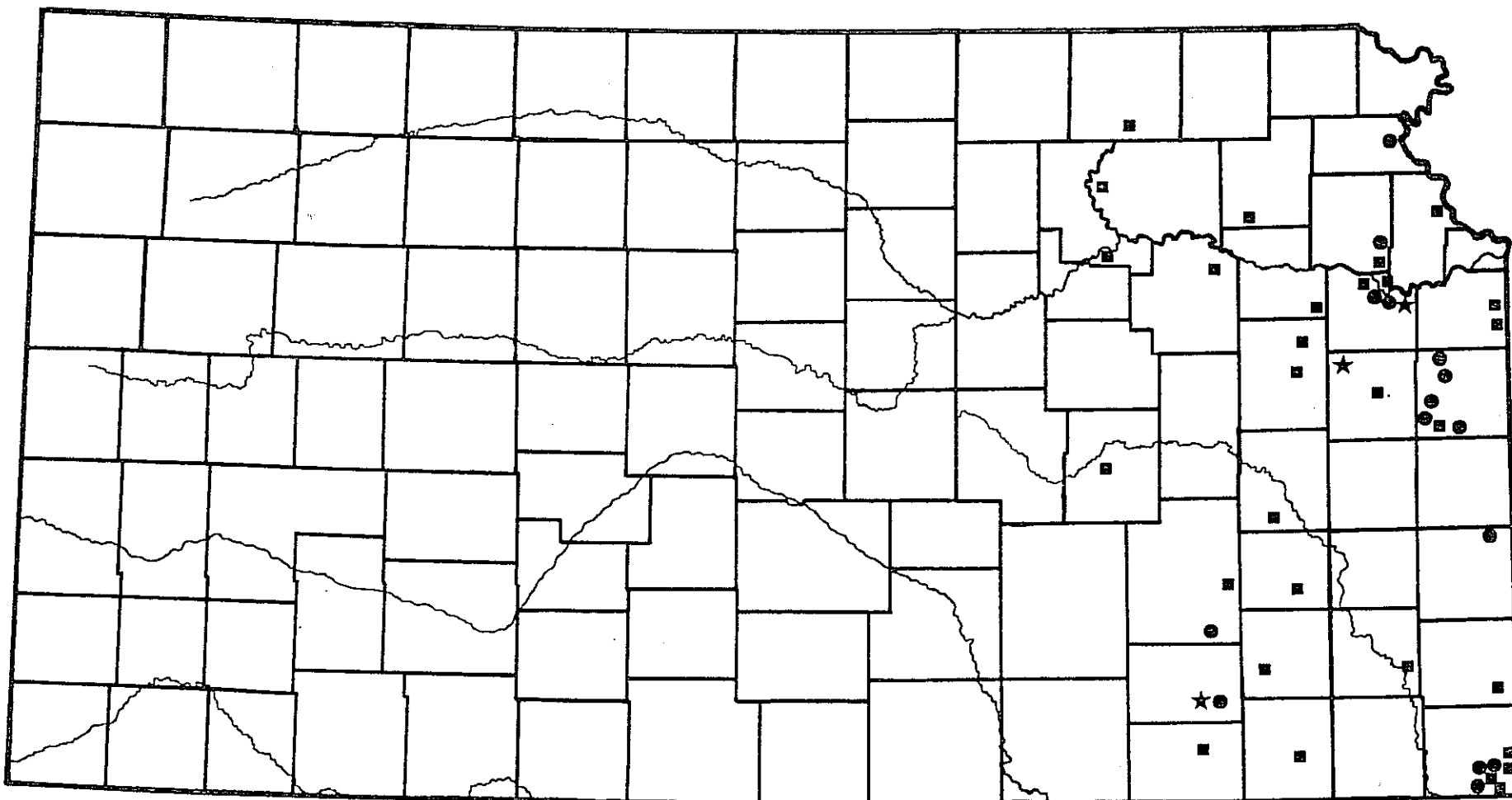
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Map 1. Kansas counties from which gray treefrogs (species not determined) have been recorded. Solid circles are counties from which we obtained treefrogs for use in this study; solid squares are counties from which we did not obtain treefrogs.



Map 2. A map of Kansas showing the distribution of Cope's gray treefrog (*Hyla chrysoscelis*) and the eastern gray treefrog (*Hyla versicolor*). Key to map symbols: solid squares = Cope's gray treefrog only; solid circles = eastern gray treefrog only; solid stars = localities at which both species were collected on the same date at the same breeding site.



Figure 1. An adult male Cope's gray treefrog (Hyla chrysoscelis, KU 203702) from Woodson County, Kansas, collected on 8 June 1985 by Joseph T. Collins et al. Photograph by Joseph T. Collins.



Figure 2. An adult male eastern gray treefrog (Hyla versicolor, KU 203746) from Cherokee County, Kansas, collected on 22 June 1985 by Joseph T. Collins. Photograph by Joseph T. Collins.



Figure 3. A large, heavily-vegetated swamp bordered by dense forest in southeastern Shawnee County, Kansas, habitat of Hyla chrysoscelis (KU 203688). Photograph taken on 29 June 1985 by Suzanne L. Collins.



Figure 4. An artificial semi-permanent pond bordered by forest in eastern Cherokee County, Kansas, habitat of Hyla chrysoscelis (KU 203706-707). Photograph taken in spring 1982 by Joseph T. Collins.



Figure 5. A permanent, shallow silt pond adjacent to a large lake and bordered by dense forest in Jefferson County, Kansas, habitat of Hyla versicolor (KU 203732-734). Photograph taken on 29 June 1985 by Suzanne L. Collins.

APPENDIX A

Localities for 83 Cope's gray treefrogs (Hyla chrysoscelis) included in this study. All specimens are from Kansas.

CHASE CO: 8.8 km S Elmdale, Sec. 22, T20S, R7E. 8 May 1985 (KU 203673).

CHAUTAUQUA CO: along North Caney Creek, Sec. 1, T33S, R11E. 7 June 1985 (KU 203710).

CHEROKEE CO: 4.8 km E Baxter Springs. 23 April 1954 (KU 33490); N of Galena, Sec. 36, T33S, R25E. April 1984 (KU 203665-666); E of Spring River & N of Rt. 96, Sec. 11, T33S, R25E. May 1984 (KU 203667-668); 6 km N Galena, Sec. 36, T33S, R25E. 2 June 1985 (KU 203706-707); just SE Baxter Springs, Sec. 7, T35S, R25E. 22 June 1985 (KU 203720-722).

COFFEY CO: 2.8 km S & 4.8 km E Gridley, Sec. 2, T23S, R14E. 8 June 1985 (KU 203705).

CRAWFORD CO: W edge of Pittsburg, Sec. 25, T30S, R24E. 21 June 1985 (KU 203718-719).

DOUGLAS CO: 1.6 km NW Lakeview. 9 May 1932 (KU 16371, 16373-381); Lawrence Airport. April 1984 (2 specimens, both lost); KU Natural History Reservation. April 1984 (2 specimens, both lost); just NW of Lakeview. April 1984 (2 specimens, both lost); KU Natural History Reservation. 27 May 1985 (KU 203676-679); near Eudora. 10-16 June 1985 (KU 203712-714).

ELK CO: ca. 3.2 km E Elk Falls, Sec. 12, T31S, R11E. 8 June 1985 (KU 203711).

FRANKLIN CO: just SE Ottawa, Sec. 12, T17S, R19E. 18 April 1985 (KU 203669-670); Sec. 32, T15S, R18E. 11 April 1985 (KU 203671).

GREENWOOD CO: just S Quincy, Sec. 20, T25S, R13E. 8 June 1985 (KU 203701).

JACKSON CO: SE of Delia, Sec. 34, T9S, R13E. 3 June 1985 (KU 203690-694).

JEFFERSON CO: 5.6 km NW Midland. 12 July 1933 (KU 17398).

JOHNSON CO: jct. Mission Road & 171st Street. 26 June 1985 (KU 203723); ca. 0.8 km N Kenneth, Sec. 3, T14S, R25E. 26 June 1985 (KU 203724).

LEAVENWORTH CO: along Missouri River at Fort Leavenworth. 24 September 1938 (KU 21145).

MARSHALL CO: 7.5 km S & 0.8 km E Irving. 15 June 1958 (KU 49182-184).

MIAMI CO: 1.6 km S & 2 km E Beagle, Sec. 13, T19S, R22E. 10 May 1985 (KU 203672).

MONTGOMERY CO: 6 km S & 3.2 km E Independence, Sec. 16, T33S, R16E. 30 May 1985 (KU 203708-709).

NEOSHO CO: Neosho Waterfowl Area, Sec. 32, T29S, R21E. 21 June 1985 (KU 203715-717).

OSAGE CO: 1.6 km SW Carbondale. 12 May 1933 (KU 17681); near Dagoon Creek, Sec. 7, T16S, R16E. 1 June 1985 (KU 203689).

POTTAWATOMIE CO: 2.7 km E Riley County line on Ks. Rt. 16. 28 April 1985 (KU 203674-675).

RILEY CO: Eureka Lake, W of Manhattan, Sec. 28, T10S, R7E. 20 May 1985 (KU 203698-700).

SHAWNEE CO: just W Richland, Sec. 28, T13S, R17E. 1 June 1985 (KU 203688).

WABAUNSEE CO: Maple Hill, Sec. 24, T11S, R12E. 3 June 1985 (KU 203695-697).
WILSON CO: 1.6 km S & 1.6 km W Fredonia near Fall River. 23 May 1985 (KU 203680-687).
WOODSON CO: 2.4 km E & 7.7 km S Yates Center, Sec. 31, T25S, R16E. 8 June 1985 (KU 203702-704).

APPENDIX B

Localities for 23 eastern gray treefrogs (Hyla versicolor) included in this study. All specimens are from Kansas.

ATCHISON CO: Benedictine College North Campus grounds. 29-30 May 1985 (KU 203740-741).
BOURBON CO: 3.2 km N Fulton. 7 May 1950 (KU 28672).
CHEROKEE CO: 4.3 km S Baxter Springs. 23 April 1950 (KU 28671); 4 km N Baxter Springs. 1 May 1953 (KU 31099); Lowell, Sec. 29, T34S, R25E (KU 203746).
DOUGLAS CO: Lawrence. Date unknown (KU 8122); 6.4 km E Lawrence. 17 April 1941 (KU 22013); near Eudora. 10-16 June 1985 (KU 203745).
ELK CO: 4 km E Longton. 7 June 1985 (KU 203742); ca. 3.2 km E Elk Falls. 8 June 1985 (KU 203743-744).
FRANKLIN CO: Sec. 32, T15S, R18E. 11 April 1985 (KU 203735).
GREENWOOD CO: Fall River. 25 May 1943 (KU 22931).
JEFFERSON CO: N edge Lake Dabinawa. 22 April 1985 (KU 203732-734).
MIAMI CO: 6.4 km SW Spring Hill. 8 June 1941 (KU 21833); Murry's Lake. 18 April 1941 (KU 22112); 4.8 km N & 8.8 km W Osawatomie, Sec. 26, T17S, R21E. 2 May 1985 (KU 203736); 6.4 km & 8 km W Osawatomie, Sec. 36, T18S, R21E. 4 May 1985 (KU 203737); 3.2 km N & 4 km W Osawatomie, Sec. 32, T18S, R22E. 6 May 1985 (KU 203738); Hillsdale Reservoir, Sec. 18, T16S, R23E. 30 May 1985 (KU 203739).

APPENDIX C

Habitat observations at four localities where the eastern gray treefrog (Hyla versicolor) only was found.

ATCHISON CO: small artificial permanent pond (KU 203740-741).
CHEROKEE CO: semi-permanent one-foot deep rocky pool surrounded by dense forest (KU 203746).
ELK CO: temporary rain-filled two-foot deep roadside ditch near dense forest (KU 203742).
JEFFERSON CO: permanent shallow silt pond adjacent to large lake and bordered by dense forest and low shrubs (KU 203732-734).

APPENDIX D

Habitat observations at seventeen localities where Cope's gray treefrog (Hyla chrysoscelis) only was found.

CHAUTAUQUA CO: temporary six-inch deep rainpool along stream in dense forest (KU 203710).
CHEROKEE CO: small, weedy permanent pond bordered on north by dense forest (KU 203665-666); large weedy two-foot deep semi-permanent swamp surrounded by forest (KU 203667-668); artificial semi-

permanent pond bordered on north by forest (KU 203706-707); temporary rain-filled six-inch deep tire ruts on dirt road emerging from dense upland forest (KU 203720-722).

COFFEY CO: permanent pond surrounded by dense forest (KU 203705).

CRAWFORD CO: temporary floodpool in sparsely forested pasture (KU 203718-719).

DOUGLAS CO: large permanent pond surrounded by mature dense forest (KU 203676-679); moderate-sized roadside swamp congested with cattails and a few trees (specimens lost).

GREENWOOD CO: small pond surrounded by dense forest (KU 203701).

JACKSON CO: temporary deep rainpools in recently plowed field--trees ca. 60 feet from rainpools (KU 203690-694).

NEOSHO CO: temporary floodpool near permanent lake and surrounded by forest (KU 203715-716).

OSAGE CO: swallow three-inch deep rainpools with dead plant stalks in recently plowed field--trees ca. 150 feet from rainpools (KU 203689).

POTTAWATOMIE CO: temporary pool near forest (KU 203674-675).

SHAWNEE CO: large, heavily-vegetated swamp bordered on east by dense forest (KU 203688).

WABAUNSEE CO: grass-lined rain-filled ditch along RR tracks about 300 feet from forest (KU 203695-697).

WOODSON CO: semi-permanent flooded pond surrounded by sparse forest (KU 203702-704).

APPENDIX E

Habitat observations at the three localities where both Hyla versicolor and Hyla chrysoscelis were found.

DOUGLAS CO: permanent eight-foot deep pond with cattails--pond ca. 500 feet from forest; no fish predators (KU 203712-714 = 2n; KU 203745 = 4n).

ELK CO: Temporary eight-inch deep rainpool in cultivated field across road from dense forest (KU 203711 = 2n; KU 203743-744 = 4n).

FRANKLIN CO: small, heavily-vegetated semi-permanent pond lined with a few scattered willows--dense forest ca. 75 feet from pond (KU 203671 = 2n; KU 203735 = 4n).

FY-84


26 August 1985

Marvin Schwilling
Kansas Fish and Game
P. O. Box 1525
Emporia, Kansas 66801

Dear Marvin:

Enclosed is the original and one copy of our final report for Kansas Fish & Game Contract #75 on the gray treefrogs of Kansas. I hope you find it useful and informative.

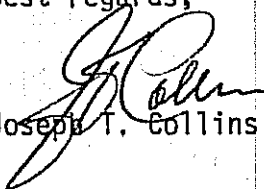
If at all possible, I would appreciate it if Kansas Fish & Game could reproduce it as a publication (complete with covers) for distribution to interested individuals and agencies.

This completes the work for KFG Contract #75. I would appreciate it if you would send a check for \$1750.  made out to me at:

Joseph T. Collins
1502 Medinah Circle
Lawrence, Kansas 66046

Much thanks for your attention to this matter. Will contact you soon re the Kansas amphibian poster.

Best regards,


Joseph T. Collins

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