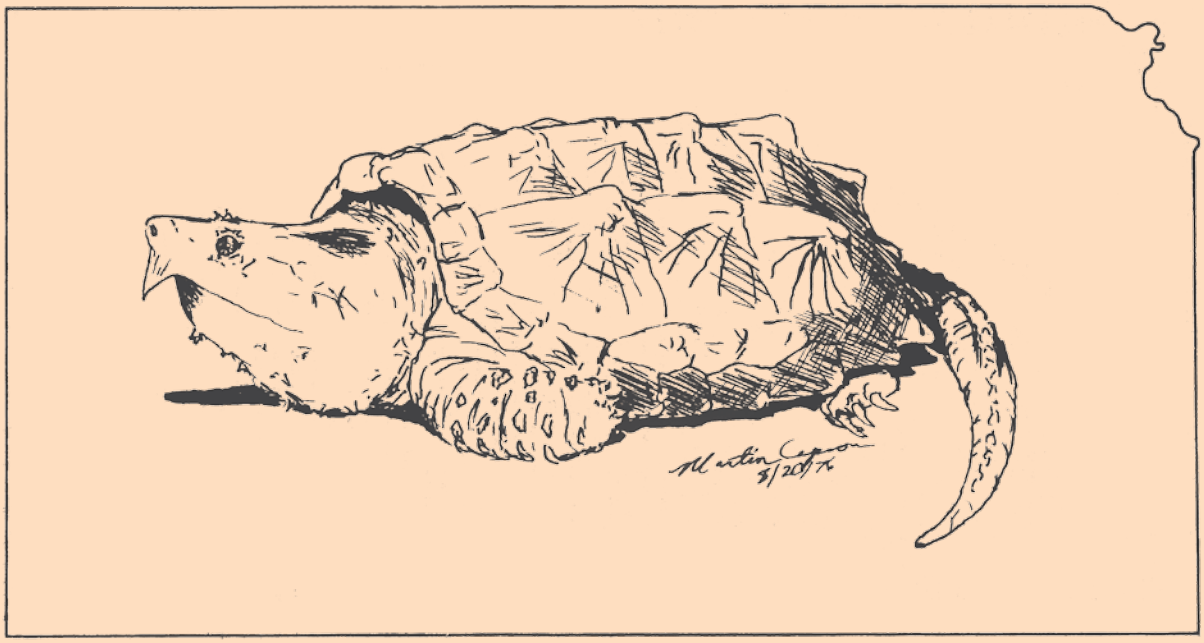
ISSN 1540-773X

Collinsorum

THE JOURNAL OF KANSAS HERPETOLOGY

Volume 4, Number 3 December 2015



1974-2015

Kansas Herpetological Society

Published by the Kansas Herpetological Society
http://www.cnah.org/khs

Front Cover: Alligator Snapping Turtle
(Macrochelys temminckii) by Marty Capron.

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ISSN 1540-773X

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Clark State Fishing Lake and Wildlife Area, near Ashland and Minneola

29 April - 1 May 2016

SPRING FIELD TRIP TO THE GREENHORN LIMESTONE OF RUSSELL COUNTY

The Kansas Herpetological Society 2015 spring field trip was held 24-26 April at various locations in Russell County, Kansas.

Scattered strong thunderstorms on Friday evening permitted the assembled participants to discover most of the amphibians found in the area. Most of the observations were made road-cruising blacktop roads in the vicinity of the campsite at LaSada (south and west of Russell; 38.800080°, -98.891252°, WGS84; http://www.lasada.com/).

Saturday morning the group caravanned to a series of south facing canyons north of the Saline River (39.012943°, -98.900038°, WGS84) and spent the morning looking under rocks and chasing down lizards resulting in the reporting of 563 individuals of 21 species. Of special interest were the 83 Western Groundsnakes observed. The Western Groundsnake population in Russell County spans approximately 10 miles of the Saline River, and because they are only active near the surface in numbers when conditions are favorable, there are few records for this area. The Russell County populations is isolated from the next closest localities in SE Kiowa County and NW Barber County (ca. 110 miles SSW).

The group broke for a quick lunch, reconvened at the campground, and then caravanned back to spend the remainder of the afternoon at another series of canyons south of the Saline River (38.947244°, -98.938231°, WGS84). Six hundred seventy-five individuals of 29 species were discovered at this site.

Sunday morning the remaining participants visited a final series of canyons just south of the Saline River (38.970301°, -98.913580°, WGS84) and recorded 380 individuals of 18 species, including the first Snapping Turtle and Eastern Hog-nosed Snake (DOR) reported during the trip.

All totaled, the 184 participants (representing nine states) discovered 1,971 individuals of 34 species of extant amphibians and reptiles (excluding birds). The final count included 541 Ring-necked Snakes, 308 Eastern Collared Lizards, 146 Great Plains Skinks, and 119 Western Groundsnakes.

The KHS thanks the families of Gary Gfeller (Stranger Valley Ranch) and Galene Steckel for permission to access their impressive properties, as well as Scott and Roxanne Young (LaSada).

Taxa:	Friday PM	Saturday AM	Saturday PM	Sunday AM	Totals
Great Plains Toad, *Anaxyrus cognatus*	12	1	--	--	13
Woodhouse's Toad, *Anaxyrus woodhousii*	63	7	6	--	76
Blanchard's Cricket Frog, *Acris blanchardi*	2	--	--	--	2
Boreal Chorus Frog, *Pseudacris maculata*	170	--	--	--	170
Western Narrow-mouthed Toad, *Gastrophryne olivacea*	11	53	14	8	86
Plains Leopard Frog, *Lithobates blairi*	18	--	--	--	18
American Bullfrog, *Lithobates catesbeianus*	1	--	--	--	1
Plains Spadefoot, *Spea bombifrons*	54	--	--	--	54
Western Tiger Salamander, *Ambystoma mavortium*	14	--	1	--	15
Snapping Turtle, *Chelydra serpentina*	--	--	--	1	1
Painted Turtle, *Chrysemys picta*	--	--	6	--	6
Ornate Box Turtle, *Terrapene ornata*	--	2	1	2	5
Pond Slider, *Trachemys scripta*	--	--	2	--	2
Spiny Softshell, *Apalone spinifera*	--	--	1	--	1
Slender Glass Lizard, *Ophisaurus attenuatus*	--	12	27	12	51
Eastern Collared Lizard, *Crotaphytus collaris*	--	137	89	82	308
Texas Horned Lizard, *Phrynosoma cornutum*	--	9	10	--	19
Prairie Lizard, *Sceloporus thayerii*	--	15	25	--	40
Great Plains Skink, *Plestiodon obsoletus*	1	67	20	58	146
Prairie Skink, *Plestiodon septentrionalis*	--	11	4	3	18
Six-lined Racerunner, *Aspidoscelis sexlineata*	2	15	9	9	35
North American Racer, *Coluber constrictor*	--	3	3	2	8
Coachwhip, *Coluber flagellum*	--	3	2	1	6
Yellow-bellied Kingsnake, *Lampropeltis calligaster*	--	--	1	--	1
Western Milksnake, *Lampropeltis gentilis*	--	22	16	10	48
Speckled Kingsnake, *Lampropeltis holbrooki*	--	6	22	7	35
Great Plains Ratsnake, *Pantherophis emoryi*	2	21	9	4	36
Gophersnake, *Pituophis catenifer*	--	1	2	--	3
Ring-necked Snake, *Diadophis punctatus*	3	47	357	134	541

	Friday Night	Saturday AM	Saturday PM	Sunday AM	Totals
Western Groundsnake, *Sonora semiannulata*	--	83	11	25	119
Western Massasauga, *Sistrurus tergeminus*	--	5	4	--	9
Eastern Hog-nosed Snake, *Heterodon platirhinos*	--	--	--	1	1
Plains Black-headed Snake, *Tantilla nigriceps*	--	43	21	19	83
Common Watersnake, *Nerodia sipedon*	--	--	--	2	2
Dekay's Brownsnake, *Storeria dekayi*	--	--	1	--	1
Western Ribbonsnake, *Thamnophis proximus*	--	--	1	--	1
Common Gartersnake, *Thamnophis sirtalis*	--	--	1	--	1
Lined Snake, *Tropidoclonion lineatum*	--	--	9	--	9
TOTALS	353	563	675	380	1971

Travis W. Taggart
KHS Field Trip Coordinator
Sternberg Museum of Natural History
3000 Sternberg Drive
Hays, Kansas 67601-2006

SUMMER FIELD TRIP IN THE HARVEY COUNTY SANDHILLS

The KHS 2015 Summer Field Trip was held the weekend of 17-19 July 2013. KHS Summer Field Trips are not as formally structured as the spring and fall trips (with previously acquired sites and set meeting times, instead they focus on taking advantage of the summer heat and a new moon to bring out amphibians and reptiles (primarily snakes) that aren't as easily found at other times of the year or through more traditional methods (turning cover). The outings typically consist of a lot of late night road-cruising and various unstructured activities during the day (seining, turtle trapping, swimming, sleeping, etc.)

The 36 participants over the three days scoured the sandhills of western Harvey, northeastern Reno, and southeastern Rice counties. The campsite and base of operations was at Harvey County Park West (38.078194°, -97.583559°, WGS84). A list of individuals (592) and species (32) reported during the trip is presented below. The *Hemidactylus turcicus* were observed at the Red Coach Inn (38.041605°, -97.324078°, WGS84) in Newton, Kansas.

Taxa:	Friday PM	Saturday AM	Saturday PM	Totals
Great Plains Toad, *Anaxyrus cognatus*	3	--	45	48
Woodhouse's Toad, *Anaxyrus woodhousii*	2	--	16	18
Blanchard's Cricket Frog, *Acris blanchardi*	100	100	100	300
Boreal Chorus Frog, *Pseudacris maculata*	3	--	--	3
Plains Leopard Frog, *Lithobates blairi*	1	24	16	41
American Bullfrog, *Lithobates catesbeianus*	2	16	3	21
Plains Spadefoot, *Spea bombifrons*	6	--	9	15
Western Tiger Salamander, *Ambystoma mavortium*	1	--	--	1
Snapping Turtle, *Chelydra serpentina*	--	1	--	1
Painted Turtle, *Chrysemys picta*	--	4	--	4
Southern Map Turtle, *Graptemys ouachitensis*	--	3	--	3
Ornate Box Turtle, *Terrapene ornata*	3	6	4	13
Pond Slider, *Trachemys scripta*	1	12	2	15
Yellow Mud Turtle, *Kinosternon flavescens*	--	1	--	1
Smooth Softshell, *Apalone mutica*	--	--	--	0
Spiny Softshell, *Apalone spinifera*	--	6	--	6
Mediterranean Gecko, *Hemidactylus turcicus*	--	--	12	12
Great Plains Skink, *Plestiodon obsoletus*	--	1	--	1
Six-lined Racerunner, *Aspidoscelis sexlineata*	2	5	4	11
North American Racer, *Coluber constrictor*	4	8	2	14
Yellow-bellied Kingsnake, *Lampropeltis calligaster*	1	2	3	6
Speckled Kingsnake, *Lampropeltis holbrooki*	--	1	--	1
Western Ratsnake, *Pantherophis obsoletus*	3	2	4	9
Gophersnake, *Pituophis catenifer*	--	2	--	2
Western Massasauga, *Sistrurus tergeminus*	1	2	--	3

	Friday PM	Saturday AM	Saturday PM	Totals
Eastern Hog-nosed Snake, *Heterodon platirhinos*	1	--	--	1
Plain-bellied Watersnake, *Nerodia erythrogaster*	4	5	2	11
Diamond-backed Watersnake, *Nerodia rhombifer*	1	8	2	11
Common Watersnake, *Nerodia sipedon*	1	2	1	4
Western Ribbonsnake, *Thamnophis proximus*	--	3	--	3
Plains Gartersnake, *Thamnophis radix*	1	2	--	3
Common Gartersnake, *Thamnophis sirtalis*	5	3	2	10
TOTALS	146	217	259	622

Travis W. Taggart
KHS Field Trip Coordinator
Sternberg Museum of Natural History
3000 Sternberg Drive
Hays, Kansas 67601-2006

FALL FIELD TRIP HELD IN WASHINGTON COUNTY

Seventy-six eager participants assembled at the campsite (Washington County State Lake [39.928502°, -97.118151°, WGS84]) Saturday (4 October) morning and visited the various sites listed below through Sunday morning. Prevailing dry conditions prevented many species and individuals from being active near the surface and thus limited our opportunities to discover them. Regardless, 514 individuals of 23 species of amphibians and reptiles (excluding birds) were reported.

Taxa:	Saturday AM	Saturday PM	Sunday AM	Totals
Woodhouse's Toad, *Anaxyrus woodhousii*	1	3	1	5
Blanchard's Cricket Frog, *Acris blanchardi*	100+	100+	15	215+
Cope's Gray Treefrog, *Hyla chrysoscelis*	1	1	--	2
Western Narrow-mouthed Toad, *Gastrophryne olivacea*	--	2	--	2
Plains Leopard Frog, *Lithobates blairi*	7	15	3	25
American Bullfrog, *Lithobates catesbeianus*	3	7	12	22
Snapping Turtle, *Chelydra serpentina*	1	2	--	3
Painted Turtle, *Chrysemys picta*	2	14	--	16
Ornate Box Turtle, *Terrapene ornata*	--	3	1	4
Eastern Collared Lizard, *Crotaphytus collaris*	--	2	--	2
Great Plains Skink, *Plestiodon obsoletus*	--	1	1	2
Six-lined Racerunner, *Aspidoscelis sexlineata*	--	7	8	15
North American Racer, *Coluber constrictor*	2	11	3	16
Ring-necked Snake, *Diadophis punctatus*	25	102	11	138
Common Watersnake, *Nerodia sipedon*	1	6	1	8
Dekay's Brownsnake, *Storeria dekayi*	5	8	1	14
Common Gartersnake, *Thamnophis sirtalis*	1	5	1	7
Yellow-bellied Kingsnake, *Lampropeltis calligaster*	--	1	--	1
Western Milksnake, *Lampropeltis gentilis*	--	2	--	2
Speckled Kingsnake, *Lampropeltis holbrooki*	--	4	--	4
Great Plains Ratsnake, *Pantherophis emoryi*	--	8	--	8
Western Ratsnake, *Pantherophis obsoletus*	--	1	1	2
Western Massasauga, *Sistrurus tergeminus*	--	1	--	1
TOTALS	149	306	59	514

Travis W. Taggart
KHS Field Trip Coordinator
Sternberg Museum of Natural History
3000 Sternberg Drive
Hays, Kansas 67601-2006

NOTES

Clutch Size of a Large Bullfrog, *Lithobates catesbeianus* (Shaw, 1802), From South-Central Pennsylvania

The Bullfrog, *Lithobates catesbeianus* (Shaw, 1802), is a large North American ranid (Conant and Collins, 1998), whose large body size, clutch size and broad diet are well known (Bury and Whelen, 1984; Casper and Hendricks, 2005; Dodd, 2013). Actual breeding occurs over only a few months throughout much of its geographic range. Large females of some populations produce second clutches a few weeks after the first clutch. The second clutches have fewer and smaller eggs than those of the first clutch (Howard, 1978). Clutch size increases with age and body mass of the female (Woodward, 1987). Estimates of individual clutch size can be as large as 43,073 (Trauth et al., 1990) and 47,480 (McAuliffe, 1978) eggs. Females from which these clutch sizes were estimated measured 176 mm snout-vent length (SVL) and 179 mm snout-urostyle length (SUL), respectively, and females as large as 184 mm SUL were noted in Dodd (2013).

In Pennsylvania, the species is widespread geographically (Meshaka and Collins, 2010), and choruses are generally heard from the latter part of May through the middle or end of July (Hulse et al., 2001). The largest Pennsylvania female examined by Hulse et al. (2001) measured 149 mm SUL (mean = 117.3 mm SUL), and clutch size was not available for Pennsylvania populations. Herein, we provide an estimate of clutch size based upon an egg count of the entire clutch from a large female from Pennsylvania, the specimen of which is stored in the section of zoology and botany of the State Museum of Pennsylvania, Harrisburg.

On 20 June 2015, a 161 mm SVL female (SMP-H 8083) was collected at night from the intersection of Rehobeth Rd and Furnace Hollow Rd in Walnut Bottom, Cumberland County, Pennsylvania. A pond from which we have heard Bullfrogs calling was nearby the roads (Figure 1). The female contained a fully-formed clutch numbering 29,281 eggs. Mean ovum diameter, measured using an ocular micrometer to 0.1 mm measured 1.58 mm (standard deviation = 0.16; range = 1.3-1.8; n = 9). The right oviduct measured 6.7 mm in diameter at mid-length. Based upon the collection date, the clutch was unlikely to have been a second clutch of the season. Compared to data of Hulse et al. (2001) this female may be considered very large, thereby conferring a reproductive advantage (Woodward, 1987). The greater fecundity of larger and older female Bullfrogs underscores the potential of one individual to increase the speed at which a new site can be colonized or that an established site can rebound after reproductive failure, such as the nearby pond (Figure 1) that occasionally dries down.

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[1]Vladimir R. Rep
[2]Eugene Wingert, and
[3]Walter E. Meshaka, Jr.

continued

[1]Department of Biology, Shippensburg University,
1871 Old Main Drive, Shippensburg, PA 17257 USA

[2]Department of Biology, Dickinson College,
P.O. Box 1773, Carlisle, PA 17013 USA

[3]Section of Zoology and Botany,
State Museum of Pennsylvania
300 North Street, Harrisburg, PA 17120 USA

Figure 1. Road in southern Cumberland County, Pennsylvania, from which a large gravid Bullfrog *(Lithobates catesbeianus)* was collected on 20 June 2015. Note nearby pond. Photograph taken by E. Wingert on 20 August 2015.

Multi-Trophic Level Feeding Interactions Among Two Native and Two Non-Native Species: Implications for the Endangered Reticulated Flatwoods Salamander *(Ambystoma bishopi)*

Eglin Air Force Base (Eglin) in Florida is one of few remaining public lands where the Reticulated Flatwoods Salamander *(Ambystoma bishopi)* occurs, and it represents the only remaining location within the entire range of this endangered species to have two populations that both occur in wetland complexes with >2 occupied wetlands (Gorman et al., 2009). The decline of the species has been rapid and few remaining breeding locations for this species remain. It was listed as federally endangered in 2009 (USFWS, 2009). Flatwoods salamanders depend on complex herbaceous vegetation for all aspects of their life history and while in wetlands they use this habitat for egg laying (Gorman et al., 2014), larval cover (Sekerak et al., 1996; Gorman et al., 2009), and metamorphs and adults are frequently observed climbing in the herbaceous vegetation (Jones et al., 2012). Feral Swine (*Sus scrofa*) damage and degrade wetlands (and other habitats) on Eglin (Engeman et al., 2007; Brown, 2014), and represent an emerging threat to Reticulated Flatwoods Salamanders and their breeding wetlands on Eglin. Thus, assessing the impacts of swine on flatwoods salamanders is a critical need.

On 27 May 2014, while evaluating the extent of damage from swine rooting in the wiregrass-dominated ecotone of one of the last remaining occupied breeding wetlands of the salamander, we observed a multi-trophic level interaction among two native and two non-native species. First, we observed the partial remains of an apparently swine-predated Eastern Glass Lizard *(Ophisaurus ventralis)*, a native species, in one of the freshly rooted patches of vegetation. While examining the carcass, we observed several Red Imported Fire Ants *(Solenopsis invicta)* visiting and apparently scavenging the glass lizard remains. Subsequently, we observed an adult Eastern Narrow-mouthed Toad *(Gastrophryne carolinensis)*, another native species, within 2 cm of one of the two small uneaten fragments of glass lizard. The Eastern Narrow-mouthed Toad was making quick movements in the direction of the glass lizard remains, which after closer inspection revealed that the toad was consuming fire ants attracted to the remains. The native anuran had found a concentrated food source in the scavenging invasive fire ants, which in turn had also found a food source in what was left from the non-native swine's foraging event on the native Eastern Glass Lizard. The consumption of *O. ventralis* by *S. scrofa* has been documented previously (Wood and Roark, 1980), as has the consumption of *S. invicta* by *G. carolinensis* (see Deyrup et al., 2013), but the multi-level predation and scavenging that involved the invasive exotics *S. Scrofa* and *S. invicta*, and the native *O. ventralis* and *G. carolinensis* demonstrates a novel multi-trophic level interaction among two native and two invasive species. Of particular concern is that this event took place in one of the few remaining breeding sites of the Reticulated Flatwoods Salamander and occurred while newly metamorphosed flatwoods salamanders were emigrating from the breeding wetland for the first time

in 4 years (we had documented almost daily movement of metamorphs in the vicinity of the hog damage from 12 April - 31 May (Gorman and Haas, unpubl. data). Furthermore, we have observed flatwoods salamanders in high densities undergoing metamorphosis under damp litter and at the bases of herbaceous vegetation near the water's edge in this same site (K. Jones, pers. obs.), which makes this a vulnerable life history stage to rooting animals such as feral swine. Thus, the native glass lizard depredated by swine could have been an endangered salamander instead. Moreover, the rooting in the breeding wetland may indirectly impact the reproductive potential of the salamander, because complex herbaceous vegetation is critical and recovers slowly following this type of negative disturbance (Brown, 2014).

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[1]Kelly C. Jones (e-mail: kcjones7@vt.edu)
[1]Brandon K. Rincon,
[1]Thomas A. Gorman,
[1]Carola A. Haas,
and [2]Richard M. Engeman

[1]Department of Fish and Wildlife Conservation, Virginia Tech, Blacksburg, Virginia 24061

[2]USDA/National Wildlife Research Center, 4101 LaPorte Ave, Fort Collins, CO 80521-2154

Fourteen County Records of Herpetofauna from Nebraska, USA, 2014-2015

In 2010, two books summarized and updated the known county records of all species of amphibians and reptiles in Nebraska (Ballinger et al. 2010, Fogell 2010). Since those efforts, smaller scientific contributions have filled in additional counties throughout the state (e.g., Geluso 2012, Hubbs 2013, Bridger et al. 2014, Davis et al. 2014). These updates not only are beneficial for better understanding state distributions of herps, but they also contribute to natural history data for species. Many county records are documented by depositing voucher specimens in accredited museums, and thus, specimens are available for examination on information such as morphological variation, diet, reproduction, etc. Additionally, tissues of specimens also may be deposited that adds to the value of such contributions, as tissues can yield important phylogenetic information such as, but not limited to, species/subspecies determinations, genetic population variation or structure, or cryptic species determinations via DNA sequencing. Herein we report on fourteen records of herpetofauna from Nebraska, representing updates on four amphibians and four reptiles from the state.

For this study, we deposited all voucher materials, including some with preserved tissues stored in 95% ethanol, in the herpetological collections at the Sternberg Museum of Natural History (FHSM), Fort Hays State University, Hays, Kansas. Specimens were verified by Curtis J. Schmidt. Coordinates of localities of occurrence were obtained via handheld GPS units using map datum North American Datum 1983 (NAD83), or if localities were acquired at a later time, we determined localities via Google Earth (World Geodetic System 1984; WGS84). Voucher specimens were collected under authorization by the Nebraska Game and Parks Commission to Keith Geluso (Scientific and Educational Master Permit No. 617) as well as approved by the Institutional Animal Care and Use Committee at the University of Nebraska at Kearney (Protocol numbers #082914 and #062409). Common and scientific names, as well as order of accounts, follow Fogell (2010).

Anura – Frogs

ANAXYRUS WOODHOUSII (Woodhouse's Toad). USA: NEBRASKA: NUCKOLLS CO.: 6.4 km N, 3.6 km E Lawrence (40.34915°N, 98.21703°W; WGS84). 13 September 2014. Chase Svoboda. FHSM 17129 with preserved tissues. First county record. Our record fills in a distributional gap in southern Nebraska with adjacent records known from Adams, Clay, Fillmore, Thayer, and Webster counties in Nebraska, and Jewell and Republic counties in Kansas (Ballinger et al. 2010, Collins et al. 2010, Fogell 2010). This specimen was captured at a rural homestead surrounded by pastures and agricultural fields.

USA: NEBRASKA: GREELEY CO.: 5.1 km N, 2.2 km E Wolbach (41.44210°N, 98.36803°W; NAD83). 31 May 2014. Keith Geluso. FHSM 17106 with preserved tissues. First county record. The species is known from all surrounding counties in east-central Nebraska (Ballinger et al. 2010, Fogell 2010). This specimen was captured on a roadway at night surrounded by grasslands. The individual had a snout-vent length of 79 mm. With the above record from Nuckolls County, only a single county remains in the state (Perkins County) that lacks a record for this species.

PSEUDACRIS MACULATA (Boreal Chorus Frog). USA: NEBRASKA: HAYES CO.: 0.8 km N, 0.9 km E Palisade, Frenchman Wildlife Management Area (40.35692°N, 101.09745°W; NAD83). 19 May 2014. Keith Geluso. FHSM 17104 with preserved tissue samples. First county record. Species known from adjacent Chase, Lincoln, and Perkins counties (Ballinger et al. 2010, Fogell 2010). Individual was captured in marshy area surrounded by deciduous trees near Frenchman Creek. Individual had a snout-vent length of 29 mm.

LITHOBATES BLAIRI (Plains Leopard Frog). USA: NEBRASKA: HAYES CO.: 0.8 km N, 0.9 km E Palisade, Frenchman Wildlife Management Area (40.35692°N, 101.09745°W; NAD83). 19 May 2014. Keith Geluso. FHSM 17105 with preserved tissues. First county record. Record fills in distributional gap in southwestern Nebraska. Species is known from bordering counties of Chase, Dundy, Frontier, Hitchcock, Lincoln, Perkins, and Red Willow (Ballinger et al. 2010, Fogell 2010). Individual was captured by hand on edge of small lake on the state wildlife management area, which is located in the floodplain of Frenchman Creek. Individual had a snout-vent length of 80 mm.

LITHOBATES CATESBEIANUS (Bullfrog). USA: NEBRASKA: HAMILTON CO.: 0.4 km S, 4.3 km W Marquette (41.00313°N, 98.06036°W; WGS84). 9 September 2014. Anthony E. Bridger. FHSM 17130 with preserved tissues. First county record. Fills in distributional gap in east-central parts of the state with the nearest prior records from adjacent Adams, Clay, Hall Merrick, and York counties (Ballinger et al. 2010, Fogell 2010). Individual was captured on a roadway surrounded by agricultural lands dominated by center-pivot irrigation. Locality of capture was about 2 km from the Platte River. Two small farm ponds were within 0.5 km of the capture location. Snout-vent length measured 100 mm.

Squamata – Snakes

DIADOPHIS PUNCTATUS (Ringneck Snake). USA: Nebraska: VALLEY CO.: 4.8 km N, 11.9 km E Arcadia (41.46611°N, 98.98359°W; NAD83). 6 October 2014. Keith Geluso. FHSM 17109 with preserved tissues. New county record that extends distributional range in northeastern Nebraska. Known from two adjacent counties to the south (Howard and Sherman; Ballinger et al. 2010, Fogell 2010). Individual was collected on Highway 70 near small wooded areas in a grassland-dominated region with rolling hills. The individual was a male with a snout-vent length of 320 mm.

THAMNOPHIS RADIX (Plains Garter Snake). USA: NEBRASKA: ANTELOPE CO.: 0.2 km S, 0.3 km E Clearwater (42.16811°N, 98.18449°W; NAD83). 23 October 2014. Keith Geluso. FHSM 17119. New county record according to Fogell (2010) that fills in a distributional hiatus among all surrounding counties: Boone, Holt, Knox, Madison, Pierce, and Wheeler. Ballinger et al. (2010) report two old records from the county, but we selected to include such information here because details were not given in Ballinger (2010) on whether specimens existed for these records and Fogell (2010) did not locate such records. Total length of specimen was 250 mm and tail length was 60 mm. Individual was collected on the edge of a residential area in the town of Clearwater. The area consisted of a mixture of grasslands and scattered trees, and the locality of observation was about 1.2 km south

of the Elkhorn River.

THAMNOPHIS SIRTALIS (Common Garter Snake). USA: NEBRASKA: ANTELOPE CO.: 3.4 km S, 11.6 km E Clearwater (42.13866°N, 98.04779°W; NAD83). 23 October 2014. Keith Geluso. FHSM 17118. This represents a new county record that fills in a distributional gap in northeastern Nebraska (Fogell 2010). This species has been observed in the surrounding counties of Boone, Holt, Knox, Madison, Pierce, and Wheeler (Fogell 2010, this study). Individual was found dead on a road near the Elkhorn River on the edge of the town of Neligh. Total length was 620 mm and tail length was 170 mm. The area was primarily grasslands but there were patches of woodlands nearby.

USA: NEBRASKA: BOONE CO.: 0.6 km N, 9.1 km W Petersburg (41.85801°N, 98.25549°W; NAD83; FHSM 17120); 2.6 km N, 14.4 km W Petersburg (41.87667°N, 98.25235°W; NAD83; FHSM 17121 with preserved tissues); and 2.8 km N, 14.6 km W Petersburg (41.87758°N, 98.25549°W; NAD83; FHSM 17122 with preserved tissues). 23 October 2014. Keith Geluso. First county record filling in gap between Antelope, Madison, Nance, Platte, and Wheeler counties (Fogell 2010, this study). All individuals were collected alongside Beaver Creek on nearby roads. Habitat surrounding roadways consisted of rolling hills of mixed-grass prairie.

USA: NEBRASKA: VALLEY CO.: 0.5 km N, 1.0 km E Ord (41.60983°N, 98.91599°W; NAD83). 6 October 2014. Keith Geluso. FHSM 17110. First county record. Fills in distributional gap in central Nebraska and known from the surrounding counties of Custer, Garfield, Howard, Loup, Sherman, and Wheeler (Ballinger et al. 2010, Fogell 2010, this study). Individual found dead on Highway 70 in the flood plain of the North Loup River in a mixture of grasslands, riparian woodlands, and agricultural fields. The male individual had a total length of 520 mm and a tail length of 80 mm.

USA: NEBRASKA: WHEELER CO.: 11.3 km N, 6.7 km E Bartlett (41.98719°N, 98.47143°W; NAD83). 23 October 2014. Keith Geluso. FHSM 17117. First county record, filling in gap between Antelope, Boone, Garfield, Holt, and Valley counties (Ballinger et al. 2010, Fogell 2010, this study). Individual was collected on the eastern extent of the Sandhill Region of Nebraska in a low-lying area with many marshes surrounded by rolling hills of mixed-grass prairie. Beaver Creek lies about 1.7 km to the south of the locality of occurrence. Total length of the individual was 580 mm with a tail length of 150 mm.

TROPIDOCLONION LINEATUM (Lined Snake). USA: NEBRASKA: BUFFALO CO.: 4.5 km S, 4.2 km E Gibbon (40.70543°N, 98.79637°W; WGS84). 10 May 2014. Anna J. Geluso. FHSM 17108. New county record. Fills in distributional gap in south-central Nebraska along the Platte River and known from the surrounding counties of Adams, Dawson, Hall, Kearney, Phelps, and Sherman (Ballinger et al. 2010, Fogell 2010, this study). Specimen found dead in a restored tallgrass prairie in the flood plain of the Platte River on property owned by the Crane Trust.

USA: NEBRASKA: GREELEY CO.: 14.3 km S, 0.4 km W Spalding (41.55856°N, 98.36823°W; NAD83; FHSM 17126-17128) and 16.3 km S, 0.4 km W Spalding (41.54107°N, 98.36815°W; NAD83; FHSM 17127, 17128). 23 October 2014. Keith Geluso. New county record. Species is known only from one surrounding county, that is, Sherman County which is located to the southwest of Greeley County (Fogell 2010). These records represent a modest range extension for the species in the state, expanding the known distribution. Individuals were found dead on a gravel road in an area dominated by rolling grasslands away from major rivers. The Cedar River is located about 11 km to the northeast whereas the North Loup River is about 30 km to the southwest. Most previous records in Nebraska appear to be along rivers (Ballinger et al. 2010, Fogell 2010, Geluso and Harner 2013). Center-pivot irrigation practices were limited in the area, as the few field with pivots appeared to be used for hay. Such records suggest the species can occur away from rivers and might have a more extensive distribution in the region. Total lengths were 210 mm, 225 mm, and 270 mm, respectively, of individuals listed above.

USA: NEBRASKA: PHELPS CO.: 18.9 km N, 0.5 km W Funk (40.63111°N, 99.25611°W, WGS84). 15 September 2015. Brett R. Andersen. FHSM 17123 with preserved tissues. First county record. Fills in distributional gap in the distribution of species along the central Platte River, where *T. lineatum* is known from adjacent Buffalo, Dawson, and Kearney counties (Ballinger et al. 2010, Fogell 2010, this study). Individual was found along a paved road surrounded by center-pivot irrigation located about 3.7 km south of the Platte River.

We thank the Crane Trust for access to conduct research on their lands and Curtis Schmidt for museum matters associated with this research.

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[1]Brett R. Andersen,
[1]Michael G. Breight,
[1]Emily D. Plock,
[1]Joshua D. Wiese,
[1]Mikalah M. Brown,
[1]Ashley J. Forrester,
[1]Kayla E. Francis,
[1]Madeline S. Franks,
[1]Bryan J. O'Connor,
[1]Landis R. Slepicka,
[1]Andrew M. Yantzie,
[2]Anthony E. Bridger,
[1]Chase T. Svoboda,
and [1]Keith Geluso

[1]Department of Biology, University of Nebraska at Kearney, Kearney, Nebraska, 68849, USA. gelusok1@unk.edu

[2]Bureau of Land Management, 1300 N. 3rd Street, P.O. Box 2407, Rawlins, Wyoming, 82301, USA.

ARTICLES

Adult Body Sizes And Clutch Characteristics Of The Marbled Salamander, *Ambystoma opacum* (Gravenhorst, 1807) From Letterkenny Army Depot In South-Central Pennsylvania

[1]Walter E. Meshaka, Jr., [2]Eugene Wingert, [3]Stephanie I. Williams, and [3]Pablo R. Delis

[1]Section of Zoology and Botany, State Museum of Pennsylvania, 300 North Street, Harrisburg, Pennsylvania 17120 USA

[2]Department of Biology, Dickinson College, Post Office Box 1773, Carlisle, Pennsylvania 17013 USA

[3]Department of Biology, Shippensburg University, 1871 Old Main Drive, Shippensburg, Pennsylvania 17257 USA

Abstract- As part of a long-term study, body sizes of adult Marbled Salamanders *(Ambystoma opacum)* and clutch characteristics were examined from a population in south-central Pennsylvania in 2014. Mean body sizes of adult males (48.5 mm) and females (55.1 mm) were smaller significantly than those of adults measured from the same site in an earlier study in 2012. Clutch size, estimated by ovarian counts, averaged 112 eggs and co-varied with female body size. Ovum size averaged 16.2 mm and did not co-vary with either female body size or clutch size. Clutch size and relationships among characteristics of our site were partially consistent with those reported from other regions. Our report provides baseline reproductive ecology data on infrequently studied Pennsylvania populations of A. opacum.

Introduction

The Marbled Salamander, *Ambystoma opacum* (Gravenhorst, 1807), is a terrestrial salamander of the eastern United States (Conant and Collins, 1998). Although this species occurs in approximately the southern half of Pennsylvania (Conant and Collins, 1998; Hulse et al., 2001; Meshaka and Collins, 2012), very little is available concerning its natural history (Hulse et al., 2001). As part of a long-term research project characterizing the herpetofauna of south central Pennsylvania (Delis et al., 2010), we examined aspects of the reproductive ecology of the Marbled Salamander at two

adjacent vernal pools (Meshaka et al., 2013). Since most life history traits of this species remain unknown for Pennsylvania populations, herein we provide adult body sizes and clutch characteristics of Marbled Salamanders collected in 2014 at the same site as those of Meshaka et al. (2013). The primary goals of this study were to clarify clutch size for the site, as yet unreported for Pennsylvania (Hulse et al., 2001), and to compare our findings from south-central Pennsylvania with those elucidated elsewhere across its geographic range.

Materials and Methods

Salamanders were captured on the evenings of 6 and 13 September 2014, as they openly moved about in two relatively small adjacent vernal pools, Missile Pond and North Pond, in Letterkenny Army Depot (LEAD), Chambersburg, Franklin County, Pennsylvania. The herpetofauna and habitat descriptions of LEAD are provided by Delis et al. (2010), and specific descriptions of the vernal pools are provided by Meshaka et al. (2013). Salamanders were euthanized immediately, fixed in formalin, and later preserved in 70% ethyl alcohol. Snout-vent lengths (SVL) of preserved specimens were measured to the nearest 0.1 mm using hand calipers. All mature ova were counted to estimate clutch size, and 10 ova from each clutch were randomly chosen for measurement of ovum diameter. All statistical analyses were performed in Excel, and statistical significance was recognized at $p < 0.05$. Statistical differences were determined using two-tailed t-test with unequal variances (Zar, 1996). All specimens were deposited in the State Museum of Pennsylvania.

Results and Discussion

Mean body size of adult males did not differ between sites (n = 23 and 16) or between collection dates (n = 22 and 17) (t-test; $p > 0.05$). Mean body size of all adult males (48.5 +/- 3.1 mm SVL; range = 42.7–54.9; n = 39) was significantly smaller ($t = -7.400$; $df = 52$; $p < 0.001$) than that of adult females (55.1 +/- 2.3 mm SVL; range = 51.7–59.4; n = 15). The mean adult male:female body size ratio of this sample was 0.88:1.00. Mean adult body sizes of both sexes from this sample were noticeably smaller than those of males (mean = 61.6 mm SVL) and females (mean = 66.4 mm SVL) from the same sites in 2012 (Meshaka et al., 2013), and the degree of sexual dimorphism was similar to the 0.93:1.00 as measured in 2012 (Meshaka et al., 2013). Among the males, those of Meshaka et al. (2013) were more similar to males measured in Connecticut (mean = 56.6 mm) (Klemens, 1993), Indiana (mean = 59.9 mm) (Minton, 2001), and Pennsylvania (mean = 58.0 mm) (Hulse et al., 2001). Among the females, those of this study were most similar to those measured in Connecticut (mean = 54.6 mm) (Klemens, 1993). Mean body size of females from Indiana (mean = 65.8 mm) were more similar to those of Meshaka et al. (2013), whereas those from Pennsylvania (mean = 61.5 mm) (Hulse et al., 2001) were approximately mid-range between those of our sample and those of Meshaka et al. (2013).

We do not know why mean body sizes of our sample were smaller than those measured a few years earlier. That the timing of both samples was similar between this study (6 and 13 September 2014) and that of Meshaka et al. (2013) (8 and 18 September 2012) would suggest that timing within the migration was not a factor if no annual variation in migration timing and duration exist. Without knowing whether annual variation in migration timing and duration exist (which would have to be determined by following breeding season movements using individual mark-recapture techniques for ≥ 1 yr), we cannot rule out the possibility that timing of capture may bias our sampling of adult body sizes. Sample size may also explain these differences. Whereas our sample was comprised of 39 males and 15 females, the earlier study (Meshaka et al., 2013) reported samples of 203 males and 36 females, respectively. Additional surveys in subsequent years, as part of our long-term research protocol, will be helpful in clarifying these body pattern differences.

The mean clutch size of our sample (mean = 112.1 +/- 23.2 eggs; range = 73–147; n = 15) fell within the 79–150 egg range of mean clutch sizes based on egg counts of nests, with no apparent geographic trend in clutch size (Petranka, 1998). Body size of the female explained 32.8% of the variation in clutch size (Figure 1). Clutch size was found generally to increase with an increase in female body size, although exceptions occur (Scott, 2005). Among two populations of Marbled Salamanders, the relationship between log-transformed clutch size and female body size was significant in a South Carolina population but not in a New Jersey population (Kaplan and Salthe, 1979). Kaplan and Salthe (1979) interpreted a narrow range in body size possibly to have played a role in the absence of statistical significance in the New Jersey sample.

The number of nesting females estimated for the Missile Pond was calculated by Meshaka et al. (2013) by dividing the number of larvae for that pond by 80, which was the estimated clutch size of the single nest detected in their study. This value was a conservative choice within the clutch size range of 50–200 eggs found in nests (Petranka, 1989). Although mean clutch size could vary interannually, an average of 112 eggs from females smaller in body size than those of the 2012 sample (Meshaka et al., 2013) would have resulted in an estimated 85 females, or just over one half of the estimated 149 females estimated for 2012 (Meshaka et al., 2013).

Ovum size of our sample ranged 11.0–19.0 mm (mean = 16.2 +/- 1.4 mm; n = 150) the mean of which did not covary with either female body size or clutch size ($p > 0.05$). This lack of correlation is consistent with a population study to the east of ours (Kaplan and Salthe, 1979), but conflicts with data coming from another more southern population of Marbled Salamanders (Kaplan and Salthe, 1979). Thus, the relationship between log-transformed ovum volume and female body volume was not significant in the New Jersey sample, while a significant correlation was reported from South Carolina salamanders (Kaplan and Salthe, 1979). Relationships between egg size, clutch size, and female body size are expected to follow the fecundity advantage model predicted by evolutionary theory (Darwin, 1871; Crump, 1974). In contrast, the relationship between reproductive effort and female size are complex (Kuramoto, 1978, Shine 1983, 1991, 1992; Olson et al., 2002) and therefore difficult to detect, isolate, and associate with any one causal agent (Morrison and Hero, 2003).

Results of this study provided much-needed baseline data for LEAD, where the Marbled Salamander has been found in many vernal pools, has been the subject of ecologi-

cal studies, and is a component of a community identified in resource management plans by the Natural Resource Office at LEAD. More broadly, this study provided data for a species whose general ecology and reproductive bioogy has remained infrequently studied in Pennsylvania. This research is part of a comprehensive long-term study started in 2003 (Delis et al. 2010) to ascertain the population demographic trends and life history traits in populations of amphibians and reptiles in Pennsylvania. Comprehensive and integrated studies involving whole communities are indispensable to gain understanding of population dynamics and productively inform conservation and management planning.

Acknowledgements

We would like to thank Shippensburg University Undergraduate and Graduate Research Grant Programs for financial and logistical support. We also would like to thank the LEAD Base Commander, Col. Victor Hagan, and specially Natural Resources Manager, Craig Kindlin for invaluable cooperation.

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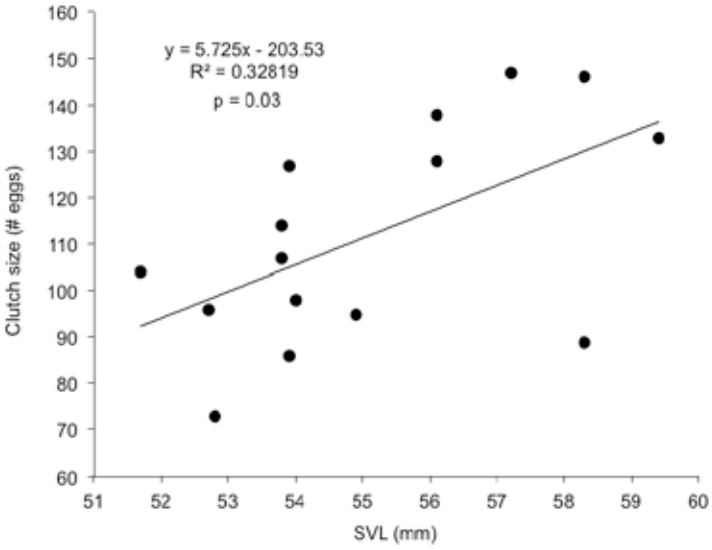

Figure 1. Relationship between clutch size and female body size in 15 Marbled Salamanders, *Ambystoma opacum*, from Letterkenny Army Depot, Franklin County, Pennsylvania, in September 2014.

Selected Life History Traits of the American Bullfrog, *Lithobates catesbeianus* (Shaw, 1802), and the Green Frog, *L. clamitans melanota* (Latreille, 1801), at a Park in South-Central Pennsylvania; Geographic and Interspecific Comparisons

[1]Walter E. Meshaka, Jr., [1,2]Vladimir R. Rep, [2]Pablo R. Delis, and [3]Eugene Wingert

[1]Section of Zoology and Botany, State Museum of Pennsylvania, 300 North Street, Harrisburg, PA 17120-0024 USA

[2]Department of Biology, Shippensburg University, 1871 Old Main Drive, Shippensburg, PA 17257 USA

[3]Department of Biology, Dickinson College, Post Office Box 1773, Carlisle, PA 17013 U.S.A.

Abstract- Aspects of breeding in the American Bullfrog *(Lithobates catesbeianus)* were examined from a single site in south-central Pennsylvania. Nocturnal calling during June 2002-May-2003 was heard in June-July. During 2008-2014, American Bullfrog testis length was largest in May, and gravid females were evident during May-July. Mean values were large for ovarian counts of eggs (15237 eggs) and ovum diameter (1.4 mm). Mean body size of male American Bullfrogs (117.4 mm) was not significantly different from that of females (122.6 mm), although gravid females were larger than non-gravid counterparts. Our findings adhered to a pattern of a sharply-curtailed American Bullfrog breeding season in northern populations and male and female adults of similar body size. As noted from other populations, calling occurred in warm and humid conditions, and females could lay large clutches of eggs. Comparisons with a syntopic population of the Northern Green Frog *(L. clamitans melanota)* revealed extensive overlap with respect to general and reproductive activity, with the latter species active in slightly warmer air temperatures and calling over more months than the American Bullfrog. Our findings corroborate a stronger adherence by the American Bullfrog to the characteristics associated with southern frogs, the consequences of which have helped explain the more northerly geographic range of the Green Frog. We suggest that these differences concomitantly place the American Bullfrog at a disadvantage relative to the Green Frog as geographic distributions of each species expand northward in response to global warming trends.

Introduction

The American Bullfrog, *Lithobates catesbeianus* (Shaw, 1802), is North America's largest native frog (Conant and Collins, 1998) and one of six species of true frogs native to Pennsylvania (Hulse et al., 2001; Meshaka and Collins, 2010). The Green Frog *L. clamitans melanota* (Latreille, 1801), is another native species and relatively common in the state. The American Bullfrog and the Green Frog share most of their natural range in North America, and in Pennsylvania they are syntopic and occupy most midsize and large permanent bodies of water throughout the state (Hulse et al., 2001; Delis et al. 2010; Meshaka and Collins, 2010). Among the ranids in Pennsylvania, the Green Frog is second in adult body size only to the American Bullfrog (Meshaka and Collins, 2010). Despite their large body sizes, ubiquity, and ease with which to find them, only some life history information on the Green Frog (Meshaka, 2013; Meshaka and Hughes, 2014) exists for the state, and scant attention is being paid to the American Bullfrog.

For this study, we examined a population of American Bullfrog, syntopic with the Northern Green Frog, in south-central Pennsylvania. We wanted to determine specifically activity patterns, morphometrics, and reproductive characteristics of American Bullfrog. We also wanted to compare our findings with the natural history information available on the Green Frog, from the same location.

Materials and Methods

The field research was conducted at Wildwood Park, a 93.5 ha County Park located in Harrisburg, Dauphin County, Pennsylvania (Figure 1). A shallow artificial lake comprises more than 60% of the park, the remainder of which is primarily mixed, secondary growth, temperate deciduous forest. During 2008–2014, American Bullfrogs (Figure 2) were captured by hand at night during opportunistic visits along a 1400 m tow path along the west edge of the lake, and also part of the Capital Area Greenbelt. The tow path is bordered on the west side by a segment of the Pennsylvania Canal. Systematic calling surveys were conducted at night along the tow path during 13 June–15 October 2002 and 17 April–15 May 2003. Green Frogs (Figure 3) were also monitored during the same dates of the 2002–2003 portion of this study and aspects of their reproductive biology were examined from collections during 2008–2009 (Meshaka, 2013), which in part overlapped those of this study.

Ambient air temperature (AT) and relative humidity (RH), with a sling psychrometer, were recorded at the beginning of each visit. Specimens were immediately euthanized, fixed in formalin, and later preserved in 70% ethyl alcohol. A small portion of the sample was preserved directly into 70% ethyl alcohol for potential genetic analysis in the future

(Pisani and Villa 1974).

Length and width at mid-body of male's left testis were measured with calipers to the nearest 0.1 mm. Presence of male enlarged thumbs associated with fertility was noted. The yellow throat color of fertile males faded to varying degrees in preserved specimens, and for that reason was not recorded. Condition of the ovaries was classified as per Meshaka (2001). In the first ovarian stage, oviducts were thin and relatively straight, and the ovaries were somewhat opaque. In the second ovarian stage, the oviducts were larger and more coiled, and the ovaries contained some pigmented oocytes. In the third ovarian stage, oviducts were thick and heavily coiled, and the ovaries were in various stages of clutch development. In the fourth ovarian stage, oviducts were thick and heavily coiled, and the ovaries were full of polarized ova with few primary oocytes, signifying a fully-ripened clutch and gravid female. Oviductal diameter was measured from a subsample of females at each ovarian stage. Clutch size was estimated by extrapolating from the mass of 200 ova. The diameters of a subset of ten ova from each clutch were measured to the nearest 0.01 mm using an ocular micrometer attached to a Leica MZ 95 microscope.

For both sexes, body size in snout-vent length (SVL) was measured to the nearest 0.1 mm using hand calipers. Fat body development was scored as absent, intermediate in volume in the body cavity, to extensive development that reached upwards in the body cavity. The latter amount was used as an estimation of monthly incidence of extensive fat relative to the sample of each month. Presence or absences of food in the digestive tract was also recorded for each individual.

In our statistical analyses, two-sample, two-tailed, with unequal variances t-tests were used to compare sample means. A simple one-way ANOVA was also used to establish some of the statistical significance parameters. A Pearson Correlation was used to determine relationships significance among variables. Data in our analyses met parametric assumptions and therefore did not require log-transformation or any other mathematical adjustment (Zar, 1996). All statistics and quantitative graphics were produced and calculated using Excel 2007 (Microsoft Inc.). Statistical significance was recognized at a p value of less than 0.05. All specimens are stored in the section of Zoology and Botany at the State Museum of Pennsylvania, Harrisburg, Pennsylvania.

Results

Body size- Adult American Bullfrogs were captured only on the first and last day of the study. Mean body size of adult males (mean = 117.4 +/- 12.2 mm SVL); range = 87.5–137.7; n = 38) was not significantly different (t = -1.620, df = 62, p = 0.11) than that of females (mean = 122.6 +/- 13.4 mm SVL; range = 100.9–144.5; n = 26).

Male reproduction from gonadal anatomy- As determined by a single factor ANOVA, American Bullfrog testis length, as a fraction of its SVL, significantly varied across months ($F = 462.327$, $p < 0.000$) (Figure 4). Mean testis length during April–October reached its peak in May, steadily decreasing in size thereafter until October (Figure 4). Extensive fat was evident in American Bullfrog males captured in April (n = 1/5), May (n = 2/11), August (n = 2/5), and September (n = 3/9). Only one of 11 American Bullfrog individuals in May and two of three males in September did not contain food.

Male reproduction based on calling surveys- American Bullfrog nocturnal calling did not take place until air temperatures ranged 15.3–22.5 ºC (mean = 19.5 +/- 2.8 ºC; n = 9) and relative humidity ranged 82–100% RH (mean = 93.7 +/- 6.9% RH; n = 9) during June–July (Figure 5). Air temperatures and relative humidity within the ranges associated with calling, and temperatures exceeding 22.5 ºC outside of June and July, did not elicit calling. Calling seasons were longer in the Green Frog (May–August), but both species shared a June–July calling peak. Mean air temperatures associated with calling were similar ($p > 0.05$) between the American Bullfrog and the Green Frog (mean = 20.1 +/- 3.0 ºC; range = 15.3–25.1; n = 14). Relative humidity was high and associated with nocturnal calling in both the Bullfrog and Green Frog (mean = 91.0 +/- 8.4 % RH; range = 74–100; n = 14); however, modal relative humidity was unimodal in the American Bullfrog (100% RH) and bimodal in the Green Frog (96 and 100% RH). Median RH differed between the American Bullfrog (96% RH) and the Green Frog (93% RH).

Female reproduction- Gravid (stage 4) American Bullfrog females were found during May–July, and nearly gravid or extensively yolking females (stage 3) were detected in all months of the study (Figure 6). However, females at earliest stages of clutch production (stage 2) were detected only in May and July, and spent females (stage 1) in months other than those with gravid females (Figure 3). Estimated clutch size for eight American Bullfrog females (mean = 133.5 +/- 5.5 mm SVL; range = 122.6-139.8) averaged 15237 eggs (+/- 10512; range = 4742–35800). American Bullfrog clutch size did not co-vary significantly ($p > 0.05$) with female body size. Ovum size averaged 1.4 mm (+/- 0.2; range = 1.0–1.7; n = 80), and mean ovum diameter did not co-vary significantly ($p > 0.05$) with either female body size or clutch size. American bullfrog gravid females were significantly larger ($t = 4.3387$; $df = 24$; $p = 0.0001$) than non-gravid counterparts (mean = 117.7 +/- 13.0 mm SVL; range = 100.9–144.5; n = 18). Extensive fat was evident in only one female captured in September. Only one of two American Bullfrog females in April did not contain food.

Terrestrial activity- American Bullfrog individuals were active at night in the water as early as 17 and 18 April 2003 in air temperatures of 6.4 and 6.5 ºC, respectively, and again on 5 and 15 May 2003 when air temperature, available only for 15 May, was 13.4 ºC. However, terrestrial activity did not occur until air temperatures were at least 14.1 ºC (8 May 2003) (Figure 7), at which time Bullfrogs were still seen in the water. Summer overgrown vegetation precluded monitoring of frogs

in the water, and terrestrial movements continued in warm (mean = 18.5 +/- 3.7 ºC; range = 14.1-24.6; median = 18.1; mode = 14.9; n = 31) and humid (mean = 95.3 +/- 7.7 %RH; range = 69–100; median and mode = 100; n = 31) conditions until shortly before monitoring ended on 13 October 2003 when adults and many young-of-the-year were observed (Figure 4). Active season was similar between American Bullfrog and the Green Frog; however, mean air temperature associated with nightly activity in the American Bullfrog was significantly higher (t = -2.0203; df = 114; p = 0.05) than that in the Green Frog (mean = 20.0 +/- 3.5 ºC; range = 13.4–25.1; n = 85). Mode and median relative humidity (RH) associated with nightly activity was 100% RH for both the American Bullfrog and the Green Frog, and the mean value was similarly high in the Green Frog (mean = 92.2 +/- 11.5; range = 69-100; n = 85).

Relative abundance- Based upon individual terrestrial counts during 25 visits, relative abundance of American Bullfrogs (mean = 1.1 +/- 2.5; range = 0–12) differed significantly with respect to variance (F = 4.459, df = 24; p = 0.0003) but only nearly so with respect to mean (t = 1.960; df = 34; p = 0.0588) from that of the Green Frog (mean = 3.4 +/- 5.4; range = 0–20). A Pearson Correlation coefficient indicated a significant association between numbers of observations between the two species on a given night (r = 0.45; p = 0.02) (Figure 8).

Discussion

Life history traits of American Bullfrogs from our south-central Pennsylvania study site in general were consistent with those of other northern populations. Minimum and mean body sizes of adults were similar to those in Indiana, where respective values were similar to 95 and 121.1 mm in males and 102 and 125.2 mm in females (Minton, 2001). In Michigan minimum adult body sizes of males (95 mm) and females (108 mm) were also similar to those of our sites (Howard, 1981). In Quebec, American Bullfrogs reached sexual maturity at 95-110 mm (Bruneau and Magnin, 1980). Although minimum adult body sizes were smaller in males (85 mm) and females (82 mm) from Pennsylvania, generally, mean adult body sizes of males and females likewise did not differ statistically from one another (Hulse et al., 2001).

We do not know if the lower relative abundance of the American Bullfrog on the trail was reflective of actual differences in abundance of, or differential habitat use by, these two species. To that end, syntopic populations of these two species differentially use the habitat: The American Bullfrog is found along water margins and sometimes in water far from shore, the Green Frog is seen along water margins and more often inland than the American Bullfrog (Stewart and Sandison, 1972). The Mink Frog *(L. septentrionalis)*, also present in Stewart and Sandison's (1972) study, was the most aquatic in its habits.

Reproductive season of the American Bullfrog is subject to geographic variation with the shortest breeding seasons found in the North (Willis et al., 1956; Bury and Whelan, 1984; Casper and Hendricks, 2005; Dodd, 2013). Notwithstanding the possibility of late-May and early August calling, calling records and gonadal cycles indicate a truncated breeding season, with a clear June-July peak, like those of other northern populations. Like those of Kansas (Fitch, 1956), males at our site did not call until air temperatures exceeded 21 ºC. Actual breeding at this site was likely over a longer season in the Green Frog than in the American Bullfrog (Meshaka, 2013). This is expected in part because of body size differences between the two species, whereby the smaller-bodied species has a greater ability to reach the minimum energetic needs than larger species (Jørgensen, 1992).

The American Bullfrog and Green Frog are considered southern frogs (Moore, 1949). Ranid species of this category commence breeding later in the season, as do both ranid species at our site than do northern counterparts, such as the Wood Frog *(L. sylvaticus)* and Pickerel Frog *(L. palustris)*. Southern frogs also have lower limiting embryonic temperatures. These species show greater susceptibility to temperature effects on embryonic development rates or temperature coefficient b, and smaller egg diameters (Moore, 1949). In these aforementioned traits, breeding began later, and the latter two values were higher in the American Bullfrog (15 ºC and 2.88, respectively) than in the Green Frog (12 ºC and 2.60, respectively) (Moore, 1949). Likewise, American Bullfrogs at our site began breeding later than syntopic Green Frogs (Meshaka, 2013). Moore (1949) did not detect geographic variation in egg size in the American Bullfrog, and our data were similar to the mean ovum size of 1.3 mm for this species (Moore, 1949). Limited data were suggestive of a geographically stable egg size (mean = 1.4 mm) in the Green Frog (Moore, 1949). However, although mean ovum diameter ranged larger than reported by Moore (1949), we likewise found no geographic trend in ovum size variation in the Green Frog. For instance, Wildwood (mean = 1.6 mm) and southwestern Pennsylvania (mean = 1.8 mm) (Meshaka and Hughes, 2015) ovum diameters were larger than those in West Virginia (mean = 1.5 mm) (Meshaka et al. 2010), while the latter were smaller than those farther south in northern Louisiana (mean = 1.7 mm) (Meshaka et al., 2009). In contrast, the mean ovum size of the Northern Leopard Frog *(L. pipiens)* ranged little (1.77-1.80) mm in northern populations (Moore, 1949) and was 1.77 mm for Pennsylvania populations (Meshaka et al., 2011), which seems to be much more consistent. In any case, smaller ovum size, as a trade-off for larger clutch size, seems to be the pattern for the American Bullfrog, contrasting the strategy of larger ovum size, as a trade-off of smaller clutch size, for the smaller size congenerics such as the Mink Frog, Northern Leopard Frog, Wood Frog, Pickerel Frog, and the Green Frog (Duellman and Trueb, 1988, Meshaka et al., 2011, 2012).

Although we acknowledge the asynchronous nature of some of our data, and therefore the bases to our com-

parisons between the American Bullfrog and the Green Frog, we can infer trends and suggest consequences to our findings. Warm temperatures having been associated with activity by the American Bullfrog and the Green Frog were not surprising; however, they were higher in the American Bullfrog as were other thermal constraints identified by Moore (1949). Likewise, the American Bullfrog's smaller ovum size, than that of the Green Frog, points to a stronger adherence by the Bullfrog to life history traits associated with southern ranids (Moore, 1949). Reasonable consequences of these thermal constraints help explain the less expansive northern range of the American Bullfrog than in the Green Frog and, in turn, a presumed greater disadvantage than its congener in its northern dispersal in response to global warming trends.

Acknowledgments

Thanks are due to the staff at Wildwood Park for their ongoing support of WEM and EW for studies at the park.

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Figure 1. North-facing view of the tow path at Wildwood Park, Harrisburg, Dauphin County, Pennsylvania. Photographed by E. Wingert.

A. B.

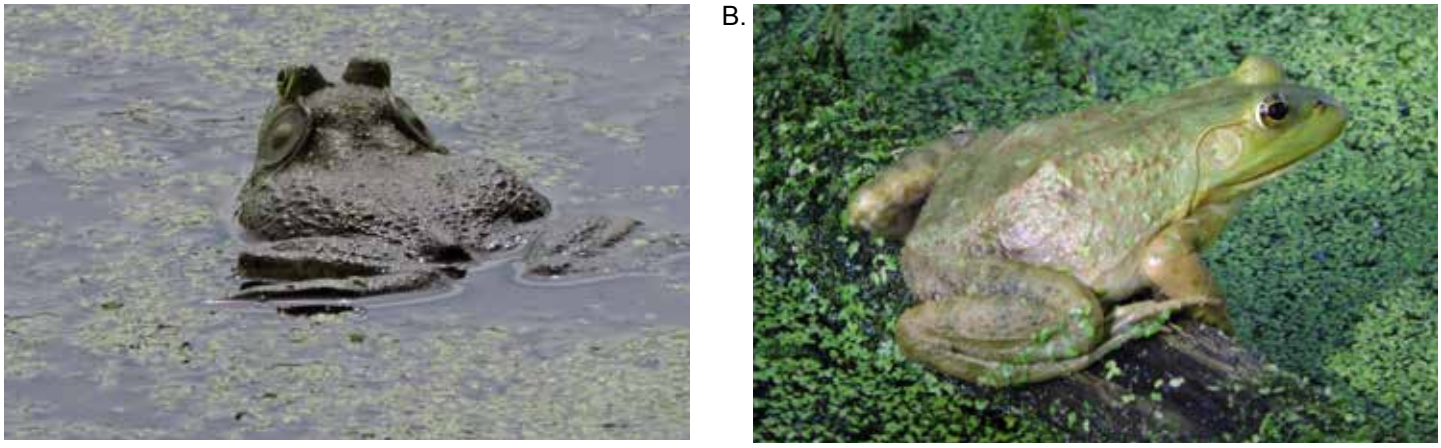

Figure 2. American Bullfrogs *(Lithobates catesbeianus)* from Wildwood Park, Harrisburg, Dauphin County, Pennsylvania, during June 2015. Photographed by E. Wingert. A = an adult male. B = an adult female.

A. B.

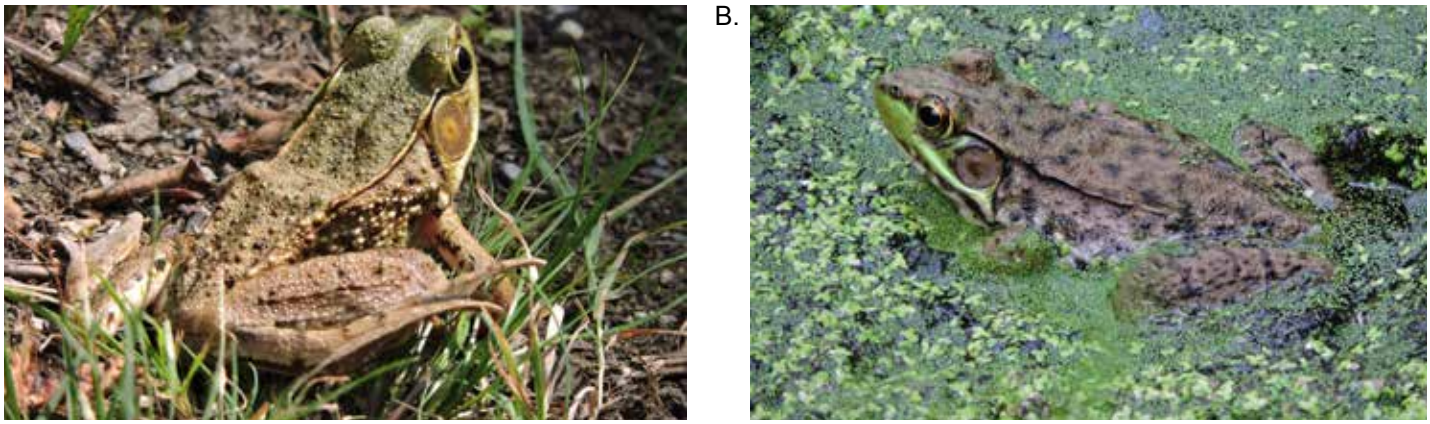

Figure 3. Green Frogs *(Lithobates clamitans melanota)* from Wildwood Park, Harrisburg, Dauphin County, Pennsylvania, in June 2015. Photographed by E. Wingert. A = a large male. B = a female suspected of being gravid.

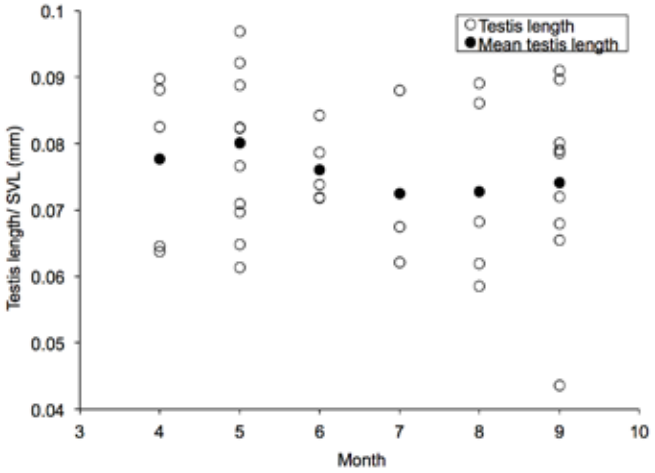

Figure 4. Testis length presented as a fraction of male body size (mm SVL) of 39 American Bullfrogs *(Lithobates catesbeianus)* from Wildwood Park, Harrisburg, Dauphin County, Pennsylvania, during 2008–2014.

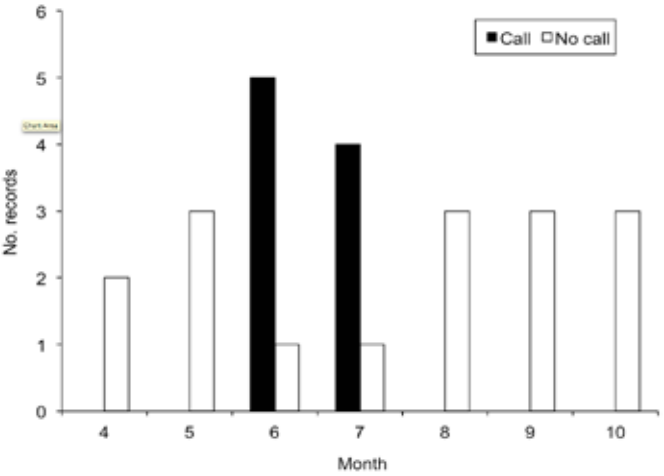

Figure 5. Number of calling records of the American Bullfrog *(Lithobates catesbeianus)* from 25 visits to Wildwood Park, Harrisburg, Dauphin County, Pennsylvania, during 13 June-15 October 2002 and 17 April–15 May 2003.

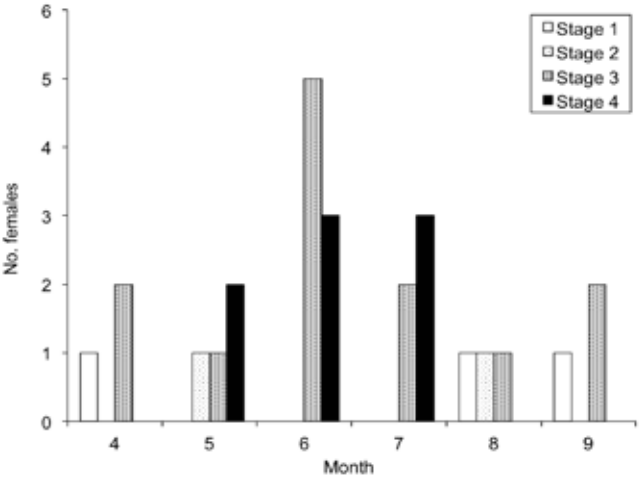

Figure 6. Ovarian stages of 26 female American Bullfrogs *(Lithobates catesbeianus)* from Wildwood Park, Harrisburg, Dauphin County, Pennsylvania, during 13 June–15 October 2002 and 17 April–15 May 2003.

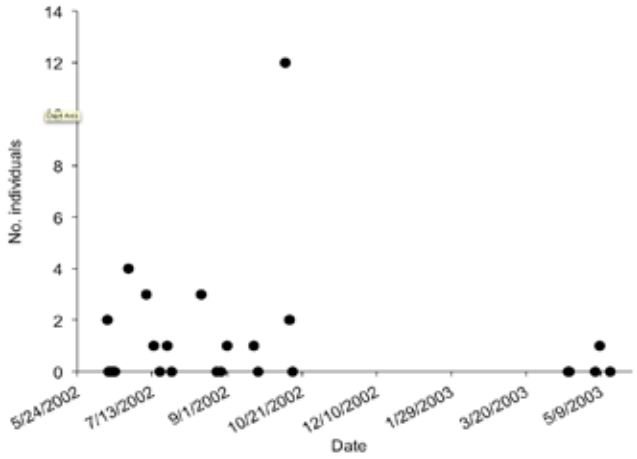

Figure 7. Monthly distributions of 31 observations of American Bullfrogs *(Lithobates catesbeianus)* from 25 visits along a trail at night at Wildwood Park, Harrisburg, Dauphin County, Pennsylvania, during June 2002–May 2003.

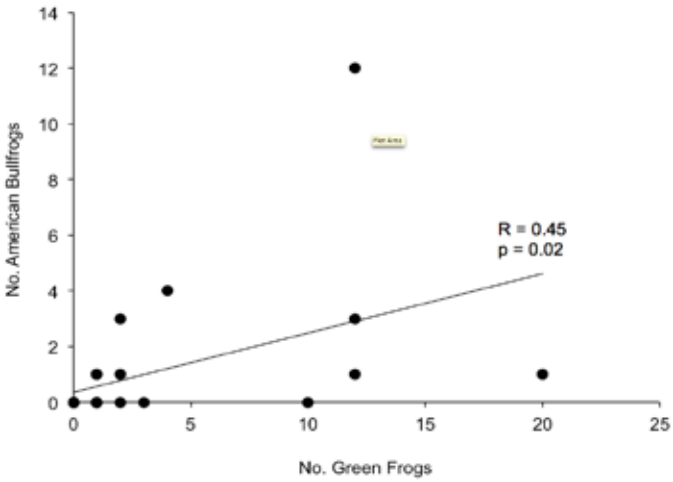

Figure 8. Relationship between numbers of 27 American Bullfrogs *(Lithobates catesbeianus)* and 85 Green Frogs *(L. clamitans melanota)* from 25 visits along a trail at night at Wildwood Park, Harrisburg, Dauphin County, Pennsylvania, during June 2002–May 2003.

Colonization History and Ecological Aspects of the Cuban Treefrog *(Osteopilus septentrionalis)* from Fakahatchee Strand Preserve State Park

[1]Walter E. Meshaka, Jr., [1,2,]Vladimir R. Rep, [3]Karen Relish, and [3]Mike Owen

[1]Section of Zoology and Botany, State Museum of Pennsylvania, 300 North Street, Harrisburg, PA 17120-0024 USA

[2]Department of Biology, Shippensburg University, 1871 Old Main Drive, Shippensburg, Pennsylvania 17257 USA

[3]Fakahatchee Strand Preserve State Park, 137 Coastline Drive, P.O. Box 548, Copeland, FL 34137 USA

Abstract- The Cuban Treefrog *(Osteopilus septentrionalis)*, an exotic species to Florida, has been present in ruderal areas (office, residences, shop) of the Fakahatchee Strand Preserve State Park since 1979, present on wetland habitats following a drought in 2000 and noted and collected in 5 December 2001 from a single site within a strand swamp. This specimen was a large female 87 mm SVL. Prior to December 2001, no Cuban Treefrogs were reported in the wild from 1989 through November 2001. Starting in 2002, coinciding with relief from a drought, numbers of individuals from surveys were indicative of a population invasion or expansion. Examination of specimens collected during 2002–2004 and calling records of 2001–2013 revealed patterns in selected life history traits that generally conform to findings in other southern mainland Florida populations. Findings of small minimum body sizes of both sexes at sexual maturity, large mean body size of adult females, associated large clutches, and an extended breeding season indicated no departure from a life history pattern that has proved successful in other systems elsewhere in southern Florida.

Introduction

The Cuban Treefrog *(Osteopilus septentrionalis)* is a large-bodied West Indian hylid treefrog whose center of distribution is Cuba (Schwartz and Henderson, 1991). This species may or may not be native to the Florida Keys but is almost certainly exotic to the mainland of Florida (Meshaka, 2001), where in a relatively short time has dispersed northward to encompass a nearly statewide distribution (Meshaka, 2011). In Florida, maximum body sizes of adults can be enormous in both males (85 mm SVL) and females (165 mm SVL) (Meshaka, 1996a), but average about 46 and 65 mm SVL, respectively, with variation greater in females (Meshaka, 2001). Sexual size dimorphism was found to be weaker in northern populations in response primarily to reduction of female body size (McGarrity and Johnson, 2009). In Florida, the breeding season is longest in extreme southern mainland (Meshaka, 2001), and females average 3961 eggs per clutch over a nearly continuous breeding season with bimodal pulses associated with wet season rainfall patterns (Meshaka, 2001).

In the Fakahatchee Strand Preserve State Park (FSPSP) in southwestern Florida, the Cuban Treefrog was detected on Janes Scenic Drive between West Main Tram and the Copeland Fire Tower after a heavy rain on 7 July 1979. The Cuban Treefrog was commonly observed around Fakahatchee Headquarters and staff housing in Copeland by 1993. During 1997–2005, Thomas Owen (pers. comm.) noted “an upward trend in the numbers of Cuban Treefrogs seen and heard starting around 2001–02 around the biologist house residence and, in the meantime, the native frog species populations seemed to decline as well.” MO, who began work at FSPSP as a biologist in 1993, noted that prior to 2003, “the Green Treefrog *(Hyla cinerea)* and Squirrel Treefrog *(Hyla squirella)* were visibly and audibly the most common of the three treefrog species.”

During 2003, PVC poles (frog refugia) were placed near water level monitoring wells and checked monthly for water level readings by KR and MO, at which time frogs of any species were identified and counted. Overwhelming dominance of the Cuban Treefrog found in those PVC poles set in wetlands prompted an interest in evaluation of this species at FSPSP. Specifically, we wanted to know how the response of this species in FSPSP compared to that of conspecifics in other southern Florida sites where breeding seasons were long, females were producing large clutches and were larger in mean body size than males (Meshaka, 2001).

Materials and Methods

Cuban Treefrogs were opportunistically collected mostly from buildings at FSPSP in 1999 and 2001, and especially during 2002–2004. Some individuals were taken from PVC pipes along water level monitoring wells. The wells are 9.7 km West to East and 0.8 km apart. The two well transects are 6.4 km apart. Habitats are based on FNAI (2010) classifications. Well 1 and PVC-Rockland Hammock and Well 1 Wet Flatwoods, Well 2-Strand Swamp, Well 3-Strand Swamp, Well 4-Strand Swamp, Well 5 and PVC- Rockland Hammock, Well 6-Strand Swamp, Well 7-Strand Swamp, Well 9-Ecotone Strand Swamp and Prairie, Well 10-Prairie Mesic Hammock, Well 11-Marl Prairie, Well 12-Rockland Hammock, Well 13-Marl Prairie, Well 14-Strand Swamp/ Marl Prairie, Well 15-Ecotone Marl Prairie/Pond Cypress,

Well 16-Strand Swamp, Well 17 and Well 18-Slough, Well 19-Strand Swamp/ Slough, Well 20-Strand Swamp/Slough, Well 21-Slough, Well 22-Ecotone Strand Swamp/Rockland Hammock, Wet Flatwoods, Well 23-Prairie Mesic Hammock/Marl Prairie, Well 24-Ecotone Hydric Flatwoods/Marl Prairie, and Well 25-Dome Swamp (Figure 1). Thirty-six consecutive monthly visits were made by MO and KR to 24 of the 25 water level monitoring wells each month during 2001-2003, which resulted in 288 water level well visits each year. Numbers of individuals detected at or in between the well readings provided data necessary to determine rate of colonization. Other sites collected were Dan House Prairie (DHP), East Main Tram (Gate 12), East Prairie, Fire Tower Pond/ Headquarters/Shop/ Park Housing, Mud Tram (Gate 16), Prairie Canal, West Main Tram (Gate 7). Weather data were recorded from Copeland, and annual call surveys were conducted annual call surveys were conducted along the Well Grade/DHP during 2001– 2003 and Janes Scenic Drive during 2003, 2007 and 2009–2013. Opportunistic records of calling were made during December 2001-March 2013. Approximately 1% of FSPSP surface area was monitored in the call surveys. Annual rainfall totals during 1998-2004 were available from the Southeast Regional Climate Center.

Shortly after capture by hand, frogs were frozen and later thawed for preservation by Ethyl alcohol. Body sizes as snout-vent length (SVL) were measured with hand calipers to 0.1 mm. among adult males, presence of nuptial pads on the thumbs was noted to provide monthly incidence of fertile males. Monthly distribution of testis length was calculated by dividing the length of the left testis by the SVL. Four ovarian stages were recognized as per Meshaka (2001), whereby 1= no evidence of yolking, 2 = first evidence of yolking, 3 = extensive yolking, and 4 = gravid. Clutch size was estimated by counting all mature ova. Ten ova from each clutch were randomly chosen for measurement of ovum diameter. All statistical analyses were performed on Mirosoft Excel, and statistical significance was recognized at p = 0.05. All specimens were deposited in the state Museum of Pennsylvania.

Results

Colonization history.- During the 12 monthly visits of the 24 wells for a total of 288 annual visits during 2001-2003, no Cuban Treefrogs were detected in 2001, six Cuban Treefrogs were detected in 2002 and eleven individuals were detected in 2003. The annual rate of detection during 2001-2003 was 0% (2001), 2.1% (2002), and 3.8% (2003).

Explosive calling at the DHP frog call monitoring sites in the southwest region of FSPSP (summer 2001–2003) revealed a similar colonization pattern, whereby no Cuban Treefrogs were detected in a 30.5 m radius at any of the five sites in Aug 2001, two sites with index 1 call detections in Aug 2002, and all five sites with index 1 call detections in Aug 2003. The annual rate of detection for the DHP surveys during 2001-2003 was 0.0% (2001), 40.0% (2002), and 100.0% (2003). The initial two sites were ruderal and the last three were located in marl prairie. The first site was along Union Road with Strand Swamp adjacent to the east side of the road and a maintained field in a residential area to the west; Site 2 to the east Strand Swamp, to the west Canal Bank; Site 3, on Well Grade Road, to the north Strand Swamp/ Marl Prairie and to the south Ditch and Marl Prairie; Site 4 to the north and south Marl Prairie; and Site 5 to the north Dome Swamp and to the south Marl Prairie/Ditch. It appears that our 288 annual well visits with opportunistic documentations along with the summer frog call surveys captured the expansion of the Cuban Treefrog into the natural wetlands of FSPSP. Annual rainfall volumes for Everglades Station were indicative of a drought during 1999-2000, Subsequent high annual rainfall during 2001-2003 overlapped the population explosion of the Cuban Treefrog in 2002: 1998 (157.8 cm),1999 (75.6 cm), 2000 (67.1 cm), 2001 (149.7 cm), 2002 (135.7 cm), 2003 (161.4 cm), 2004 (29.6 cm).

Body size- During 1999–2004, 164 Cuban Treefrogs were collected while they were in retreats and when they were actively moving about. Adult males (mean = 49.5 +/- 4.5 mm SVL; range = 39.8–59.0; n = 66) were significantly smaller (t= -12.886; df = 120; p < 0.000) than adult females (65.3 +/- 11.0 mm SVL; range 45.0–91.0; n = 87). Among females, gravid individuals (mean = 71.5 +/- 9.0 mm SVL; range = 59.0–91.0; n = 19) were significantly larger in body size (t = 2.8634; df = 85; p = 0.005) than non-gravid counterparts (mean = 63.6 +/- 11.3 mm SVL; range = 45.0–87.1; n = 60). Body sizes of 11 juveniles ranged 29.8–44.4 mm SVL.

Reproduction- Testis length peaked during May-June (Figure 2). A portion of adult males did not have developed nuptial pads during January-April, after which time nuptial pads were present on all adult males through November when the last males were taken for the year (Figure 3). Over a 12-year period calling was heard during March-October and especially so in May and during July-September (Figure 4).

Nearly-gravid (stage 3) and gravid (stage 4) females were present during March-September 2003 with a bimodal May–June (63.6 and 31.6%) and August-September (33.3 and 30.0%) peak in numbers of gravid females (Figure 5). Among 12 females (mean = 74.7 +/- 9.1 mm SVL; range = 60.4–91.0) clutch size averaged 3298.5 eggs (+/- 1235.5; range = 1814–5141), and egg size averaged 1.28 mm (+/- 0.137; range = 1.0 –1.6; n = 120). Clutch size co-varied with female body size (Figure 6). No significant relationships (p > 0.05) were detected between ovum size (maximum and mean) and either clutch size or female body size.

Discussion

Since 1979, at FSPSP, the Cuban Treefrog was only rarely encountered and nearly exclusively so on buildings until 2001 when noted both audibly and visually into the wild. Observations of individuals around the buildings became strikingly

more numerous audibly in 2002 and individuals were abundant enough by sightings that the species was considered a pest around buildings around 2002–2004 before making the leap in Fakahatchee via Janes Scenic Drive. Following the 1999–2000 drought, the Cuban Treefrog was detected in none of the five stations during the August 2001 anuran call survey in DHP. In 2002, the Cuban Treefrog was detected in two of the five stations, and by 2003 Level 1 index calls of this species were recorded from all five stations. It appears that anecdotal contributions, summer frog call surveys, and opportunistic documentations during monthly water level well readings have captured the expansion of the Cuban Treefrog into the wilderness of FSPSP, concomitant with favorable annual rainfall volumes following a drought. This species is associated with sites having pronounced rainy seasons, its activity is closely associated with rainfall, and post-metamorphic individuals are refuge-limited (Meshaka, 2001). Moreover, the Cuban Treefrog is highly vagile in the agency of humans (Meshaka, 1996b). Not surprisingly then, release from a drought would have been key to its population explosion at FSPSP with individuals having been steadily and incidentally transported nearby by humans, plausible from the Hog Farm's activities during 1994-1999.

Life history traits examined in this study closely match those of populations elsewhere in southern Florida (Meshaka, 2001). As in other southern Florida locations, minimum, maximum, and mean adult body size were smaller in males than females in FSPSP, and for both sexes body size measurements were similar to those generally in southern Florida (Meshaka, 2001). Exceptionally, populations comprised of large females were typical of sites not yet saturated with individuals (Meshaka, 2001).

Male Cuban Treefrogs of the southern Everglades were fertile year-round, with both the monthly distribution of testis dimensions and males with nuptial pads having been associated with day length (Meshaka, 2001). Likewise, in FSPSP, testis sizes were largest during the months immediately surrounding June, and nuptial pads were most frequently developed during May-November. In the southern Everglades, calling occurred year-round; however, nocturnal calling was heard only during March-October and especially during June–October (Meshaka, 2001). In FSPSP, nocturnal calling was heard during March–October with most calling having been heard during May–September.

Proportion of gravid females each month varied between two years (November 1990-November 1992) in the southern Everglades (Meshaka, 2001). With the region coming out of a drought and small sample sizes, gravid females were not apparent until April 1991, followed by high monthly proportions of gravid individuals through September, then few gravid females during October–November (Meshaka, 2001). A wetter year in 1992 and larger samples in the winter yielded gravid females beginning in January. Hurricane Andrew in August 1992 increased the proportions of gravid females during September-November (Meshaka, 2001). Common to both years was absence of gravid females in December. In FSPSP, notwithstanding a small sample size (n = 79), gravid females were found during March-September. Bimodal peaks in monthly frequencies of gravid females in the southern Everglades (Meshaka, 2001), were likewise evident in FSPSP. Mean clutch size co-varied with the female body size. Mean ovum size of FSPSP (mean = 1.3 mm) was comparable to that of the southern Everglades and Okeechobee; however, only eggs from the southern Everglades significantly co-varied, even if weakly, with female body size (Meshaka, 2001).

Our study documented the successful colonization of the CTF in FSPSP in southwestern Florida. Its perhaps inevitable colonization appeared to have been brought about by the timing of its suspected human-mediated dispersal to FSPSP. Within the wetlands of FSPSP, the Cuban Treefrog was not heard until 9 October 2002 at Well 2 located 12.6 km northwest of Fakahatchee headquarters in Copeland. On multiple occasions during 1994-1999, MO observed trailer transport of small hogs by out of county trucks passing Well 1 to private property known as the Hog Farm located immediately adjacent to the western boundary of FSPSP. The Hog Farm was located 0.4 km south of Well 1. Dispersal coincided with subsequent favorable rainfall patterns ending a drought from which this species could gain advantage. Life history traits examined in this population were similar to those of other populations elsewhere in southern Florida and indicative of a well-established population.

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A.

B.

C.

Figure 1. Three wells associated with captures and monitoring of the Cuban Treefrog *(Osteopilus septentrionalis)* from the Fakahatchee Strand Preserve State Park, Copeland, Florida.

A = Rockland Hammock of Well 1.
B = Rockland Hammock of Well 5.
C = Dome Swamp of Well 25.

Photographed by Dick Brewer on 14 February 2015.

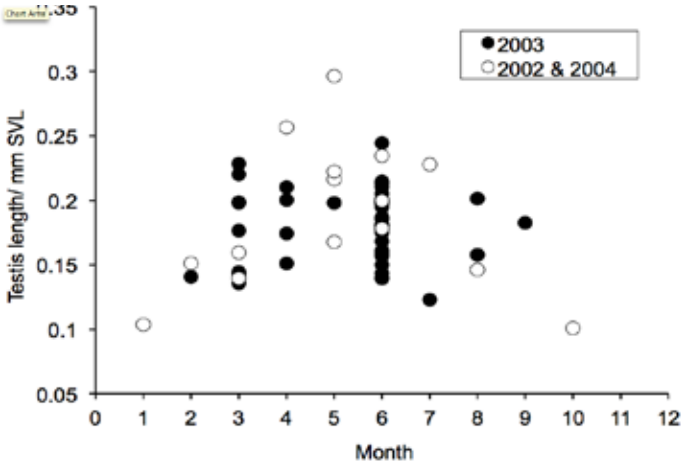

Figure 2. Monthly distribution of testis length presented as a fraction of male body size of Cuban Treefrogs *(Osteopilus septentrionalis)* from the Fakahatchee Strand Preserve State Park, Copeland, Florida, during 2003 (n = 44) and combined 2002 and 2004 (n = 15).

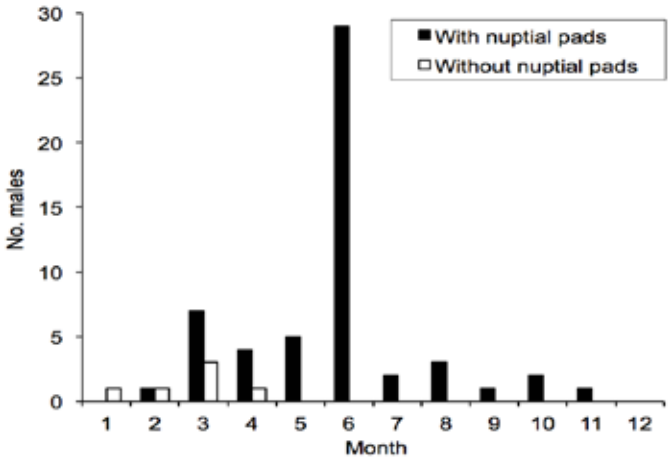

Figure 3. Monthly distribution of 61 male Cuban Treefrogs *(Osteopilus septentrionalis)* with and without nuptial pads from the Fakahatchee Strand Preserve State Park, Copeland, Florida, during 2002–2004.

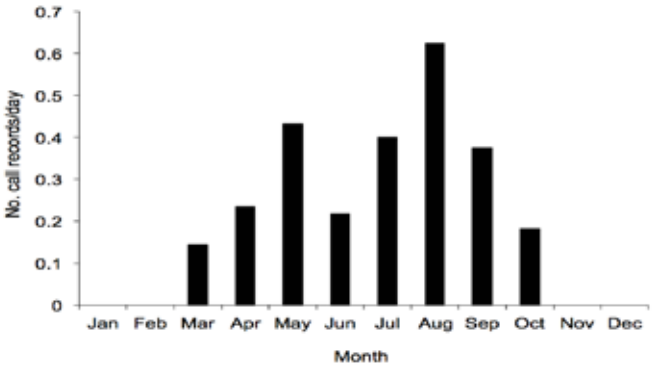

Figure 4. Monthly distribution of 58 call records by the Cuban Treefrog *(Osteopilus septentrionalis)* presented per day for each month from the Fakahatchee Strand Preserve State Park, Copeland, Florida, during December 2001–March 2013

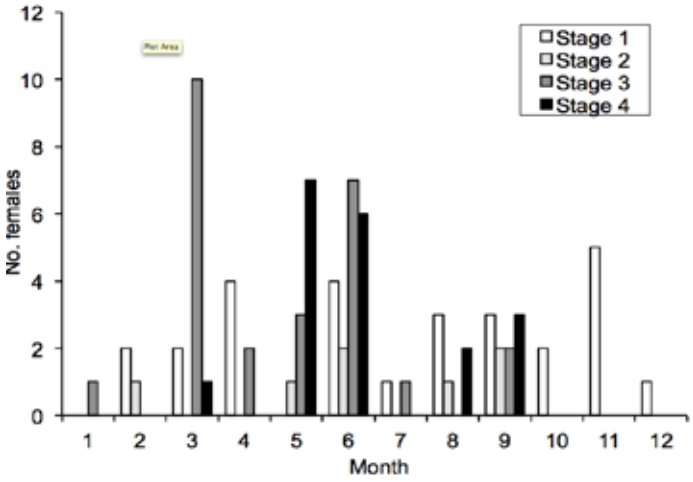

Figure 5. Monthly distribution of ovarian stages of 79 female Cuban Treefrogs *(Osteopilus septentrionalis)* from the Fakahatchee Strand Preserve State Park, Copeland, Florida, during 2002–2004.

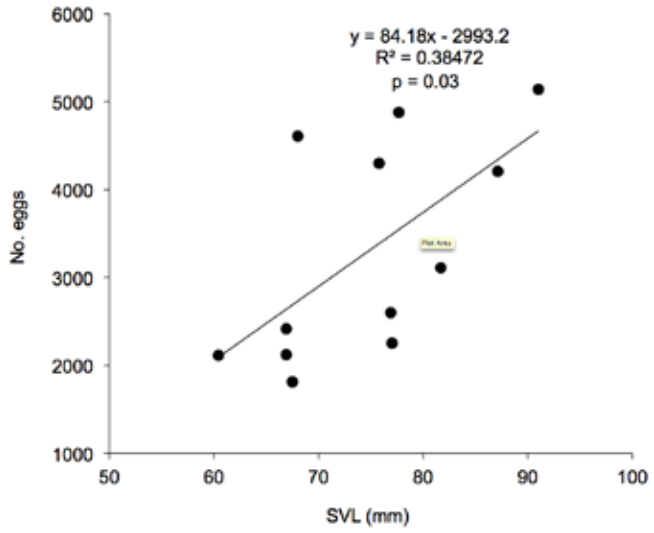

Figure 6. Relationship of clutch size and female body size of 12 Cuban Treefrogs *(Osteopilus septentrionalis)* Fakahatchee Strand Preserve State Park, Copeland, Florida, during 2002–2003.

KHS 42nd Annual Meeting, Hays, Kansas, 7-8 November 2015

Fort Hays State University and the Sternberg Museum of Natural History once again were great hosts of a successful 42nd annual KHS meeting. Our meeting committee was chaired by Curtis J. Schmidt, Collections Manager Extraordinaire. The rest of us (Walter E. Meshaka, Jr., Jeff Seim, Kasandra Brown, Bill Stark, and Travis Taggart) pressed on in our designated tasks. The friendly faces of David Oldham and Eva A Horne were there to greet for registration of 113 attendants, five of whom were from high school, and again at the auction.

The icebreaker Friday night was almost as fun as the after-party at Dexter Mardis' room. A rollicking good

Dexter Mardis, Sarah Parker and Steph Kelley of the Sedgwick County Zoo, enjoying a bit of merriment.

time repeated Saturday night after the auction. KHS's longtime member, John Lokke, kindly designed the logo for the 2015 shirt, an Emory's or Great Plains Rat Snake. The idea began at the end of the 2014 meeting. I had asked John to work this species so emblematic of the Great Plains into the logo. In no time, John had the image of an individual near post rock at night. A fantastic memory of John's transposed into a great image. By coincidence, The Sternberg was displaying an exhibit on post rock at the time of our meeting, and we shared the image with them. More work, though. Dan Fogell performed magic on colorizing it and seeing to its production in shirts. Suzanne Collins suggested that the image be on the back of the shirt, and Travis Taggart reminded us of noting the information of the meeting on the shirt. The original image went to Curtis- most deserving. Signed and numbered copies were made available for purchase. I'm proud to have the first one, it's framed, and I treasure it. We were on a roll.

Sarah Bartle, Shippensburg University, discusses behaviors of Female Eastern Box Turtles

Our Keynote Speaker was Dr. Eli Greenbaum of University of Texas-El Paso. His Address was Mambas, Malaria, and Militias: 21st Century Herpetology in the Jungles of the Democratic Republic of Congo. The room was packed. We were proud to have him. This meeting marked a first in activities. Mike Lannoo, keynote speaker in 2014, liked our meeting and camaraderie so much that he brought his posse in 2015. The Crawfish Frog Working Group met the day before the KHS meeting at the Sternberg, and Mike shared an abstract of their discussions in a talk at our meeting. Participants were Dan Saenz, Cory Adams, Laura Springer, Chelsea Kross, Curtis Schmidt, Mike Lannoo, Jonathan Swan, Rochelle Stiles, Toby Hibbitts, Chuck Battaglia, Jeff Briggler, and Steve Kimble.

Daniel Hughes, University of Texas-El Paso, with booty he scored at the Saturday night auction.

The paper sessions were full. Interest was keen in the talks. Of course, the geographic and taxonomic range of talks was phenomenal. Texas, Kansas, Nebraska, Missouri, Pennsylvania, Virginia, Australia, India, and Africa were sources of studies. Presentations were both Saturday and Sunday. It was nice to see so many people there to present and to listen to talks. The KHS group photograph, never an easy task, was taken by Greg Sievert in lieu of Larry Miller who was unable to make it to the meeting.

Best poster award went to Chelsea Kross, University of Arkasas for her poster documenting her work with Crawfish Frogs.

A KHS tradition - The Kansas Herpetological Society Annual Meeting Group photo 2015
Annual Meeting photos by Greg Sievert and Suzanne L. Collins.

Justine Becker from Emporia State University won this year's Gloyd-Taylor award.

Saturday evening was an occasion of much activity and merriment. Discounted tickets were made available to visit the Sternberg's wonderful exhibits, and Curtis and his graduate curatorial assistants provided tours of the herp collections. A poster session, another first for the KHS meeting, made its debut that evening at the Sternberg. With this new session came a new Award, The Walter E. Meshaka, Jr. Award for Best Poster on North American Herpetology. Wonderful posters were presented by students and established professionals. Topics ranged widely, with presenters on hand to discuss their work.

The KHS Awards Ceremony commenced at 6:30 pm at the Sternberg. Winner were as follows: The inaugural Walter E. Meshaka, Jr. Award for Best Poster on North American Herpetology was won by Chelsea Kross, University of Arkansas, for her work on Crawfish Frogs. Chelsea won a certificate and a check for $100.

The Henry S. Fitch-Dwight R. Platt Award for Field Herpetology was not awarded this year, as there were no applicants.

The Howard Kay Gloyd-Edward Harrison Taylor Scholarship was won by Justine Becker, Emporia State University. Justine was awarded a certificate and a check for $300.

The Alan H. Kamb Grant for Research on Kansas Snakes was won by David Penning, University of Louisiana, Lafayette. David was awarded a certificate and a check for $300.

Winner of the 2015 Toland award for best student presentation: Jeff Seim, Fort Hays State University.

The Suzanne L. and Joseph T. Collins Award for Excellence in Kansas Herpetology was won by Josh Mead, Fort Hays State University, for his outstanding photograph of a Prairie Rattlesnake. Josh was given a certificate and a check for $1,000. We are proud of the awards and the winners. Really nice going.

The KHS annual Auction followed

the awards ceremony at almost exactly 7:00 pm. The crowd, restless with auction bid cards in one hand and ice cold orange juice in the other gathered to begin bidding. Taking the

Members Daren Riedle, Chad Whitney and Michal Bernasconi pose to create another KHS Annual Meeting moment.

Reese Barrick and Elmer Finck, Ft. Hays State University, trade bidding strategies at the auction Saturday night.

stage were the Three Amigos- Dan Fogell, Eric Thiss, and Walter Meshaka- willing and able to make a deal for the highest bidders. The auction moved along with the able assistance of Eric's son, Evan, and by Grace Anne Johnson. On-the-spot artwork by the Lokke's, Eva Horne's amazing stitch work, among other contributions, were sources of energetic bidding, such that over $2,300 was made in approximately two hours- all for the production of future fun, productive, and inexpensive KHS meetings.

Following the last talk on Sunday remained one last welcomed award presentation. The fifth annual George Toland Award was given to Jeff Seim, Fort Hays State University, for the best presentation by a KHS student member on the ecology of North American amphibians and reptiles. Jeff spoke on turtle assemblages at Quivira National Wildlife Refuge and was awarded a certificate and a check for $200. Congratulations on a job well done!

Vlad Rep, Shippensburg University, during his presentation Sunday morning.

With that, I can say times are changing, smooth, even if bittersweet. David Oldham and Eva Horne, stalwart in their respective posts of treasurer and secretary, served through 2015, ready to pass along the torches and enjoy the meetings. Robin Oldham, longtime publicist for the KHS, too, is passing on the torch, and Grace Anne sung her swan song as auction assistant this year as she begins new adventures as a newlywed in Hawaii. Always a home in KHS! New officers for 2016? Eric Kessler is president, and Dexter Mardis is president-elect. Daren Riedle, back in Kansas, is treasurer, and Kelley Tuel is secretary. Three cheers to them for taking on these responsibilities.

— Walter E. Meshaka, Jr.

Pablo Delis, Shippenburg University, pays for his aquisitions won during the Saturday night auction. Running the card is treasurer, David Oldham and keeping the records, Eva Horne, secretary.

About the Kansas Herpetological Society

The KHS is a non-profit organization established in 1974 and designed to encourage education and dissemination of scientific information through the facilities of the Society; to encourage conservation of wildlife in general and of the herpetofauna of Kansas in particular; and to achieve closer cooperation and understanding between herpetologists, so that they may work together in common cause. All interested persons are invited to become members of the Society. Membership dues per calendar year are $15.00 (U.S., Regular), $20.00 (outside North America, Regular), and $20.00 (Contributing) payable to the KHS. Send all dues to: KHS Secretary, (address inside the front cover)

KHS Meetings

The KHS holds an annual meeting in the fall of each year. The meeting is, minimally, a two day event with lectures and presentations by herpetologists. All interested individuals are invited to make presentations. The annual meeting is also the time of the Saturday night social and fund-raising auction.

Field Trips

The KHS hosts three field trips each year, one each in the spring, summer, and fall. Field trips are an enjoyable educational experience for everyone, and also serve to broaden our collective understanding of the distribution and abundance of the amphibians, reptiles, and turtles in Kansas. All interested persons are invited to attend.

Editorial Policy

Collinsorum, currently issued quarterly (March, June, September, and December), publishes all society business.

Submission of Manuscripts

As space allows, *Collinsorum* publishes all manner of news, notes, and articles. Priority of publishing is given to submissions of Kansas herpetological subjects and by KHS members; however all submissions are welcome. The ultimate decision concerning the publication of a manuscript is at the discretion of the Editor. Manuscripts should be submitted to the Editor in an electronic format whenever possible. Those manuscripts submitted in hard copy may be delayed in date of publication. Manuscripts should be submitted to the Editor no later than the 1st of the month prior to the month of issuance. All manuscripts become the sole possession of the Society, and will not be returned unless arrangements are made with the Editor.

Reprints & Artwork

Collinsorum publishes original peer-reviewed submissions under the Articles and Notes sections. Upon review, acceptance, and publication, Portable Document File (PDF) copies are provided gratis to the author on request. Figures and photographs submitted with manuscripts are welcome, but must be sized appropriately by authors for this journal's column sizes (i.e., 19.5 or 39 picas wide). Particular attention should be paid to reduction of text on the figures.

Societal Awards, Grants, and Recognitions

Distinguished Life Members

Individuals selected as Distinguished Life Members are chosen by the KHS Executive Council based on their distinguished published research papers on Kansas herpetology.

Bronze Salamander Award

Established in 1987, this Award is presented to those individuals whose efforts and dedication to the Kansas Herpetological Society go far beyond the normal bounds. The recipients of this Award have given exemplary service to the KHS, and are presented with an elegant bronze sculpture of a Barred Tiger Salamander.

The Howard K. Gloyd - Edward H. Taylor Scholarship

Established in 1993, The Gloyd-Taylor Scholarship is presented annually by the Kansas Herpetological Society to an outstanding herpetology student. The scholarship is a minimum of $300.00 and is awarded on the basis of potential for contributing to the science of herpetology. Students from grade school through university are eligible.

The Alan H. Kamb Grant for Research on Kansas Snakes

KHS members only are eligible to apply for The Alan H. Kamb Grant for Research on Kansas Snakes, which was established in 2001. The recipient of the grant will be selected by the KHS Awards Committee. A minimum award of $300 is given annually.

The Henry S. Fitch - Dwight R. Platt Award for Excellence in Field Herpetology

KHS members only are eligible to apply for The Henry S. Fitch - Dwight R. Platt Award for Excellence in Field Herpetology, which was established in 2010. The recipient of the grant will be selected by the KHS Awards Committee. The award will be given annually when sufficient funds have been raised to establish a trust.

The George Toland Award for Ecological Research on North American Herpetofauna

This CNAH Award was established in 2008 in recognition of the scientific career of George Fredrick Toland, whose lifelong interest in herpetology was passed on to so many of his students. The recipient of this award will be selected by the KHS Awards Committee. A minimum award of $200 is given annually at the end of the KHS meeting.

The Suzanne L. & Joseph T. Collins Award for Excellence in Kansas Herpetology

This CNAH Award was established by Westar Energy in 1998 in recognition of the achievements of Suzanne L. Collins and Joseph T. Collins. In even years, the Award is bestowed upon an individual who, in the preceding two calendar years, had published a paper of academic excellence on native species of Kansas amphibians, reptiles, and/or turtles, and in odd years, the Award is given to an individual who, in a juried competition, took the best photograph of a Kansas amphibian, reptile, or turtle. The Collins Award is minimally $1,000.00, and is neither a grant nor a scholarship. No nominations or applications can be made for it.

Kansas Herpetological Society
Attn: Kelly Tuel, Secretary
15669 S. Rene St
Olathe, KS 66062

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