the available genetic data. These findings are of significance in furthering the understanding of the evolution of *Dipsochelys* and in the conservation of the surviving taxa. Further research to investigate the natural extent of genetic variation of these taxa (as represented by museum material) would be advantageous.

Acknowledgments. — We are grateful to all sponsors of this project: Air Seychelles, British Chelonia Group, Cousine Island Co., The Linnaeus Fund of Chelonian Research Foundation, Greenwich Workshop, International Market Supply, SeyBrew, and P. Treherne. We are also grateful to the owners of all the living tortoises examined and to N. Arnold, S. Chapman, R. Simmonds, J. Pickering, and R. Bour for allowing us to examine the material in the British Museum (Natural History), University Museum of Zoology, Cambridge, Oxford University Museum, and Museum National d'Histoire Naturelle, Paris, and to B. Beckett, R. Bour, S. Tolan, and R. Woodroofe for letting us examine specimens in their collections. We thank I. Das for providing information on Indian material. We are also grateful to L. Noble for undertaking the genetic study and allowing us to reproduce his preliminary unpublished results.

Literature Cited

ANONYMOUS. 1971. 3rd Report on Cousin Island National Park. Unpublished report to International Council for Bird Preservation.

ARNOLD, E.N. 1979. Indian Ocean giant tortoises: their systematics and island adaptations. Phil. Trans. Roy. Soc. Lond. (B) 286:127-145.

BOUR, R. 1982. Contribution à la connaissance des tortues terrestres des Seychelles: définition du genre endémique et description d'une espéce nouvelle probablement originaire des îles granitiques et bord de l'extinction. C. R. Acad. Sci. Paris 295:117-122.

GAYMER, R. 1968. The Indian Ocean giant tortoise *Testudo gigantea* on Aldabra. J. Zool. Lond. 154:341-363.

GERLACH, J., AND CANNING, K.L. 1995. Seychelles giant tortoise rediscovered? Oryx 29:74.

GERLACH, J., AND CANNING, K.L. 1996a. The Seychelles giant tortoise, its rediscovery and prospects for conservation. In: Devaux, B. (Ed.). Proceedings – International Congress of Chelonian Conservation. Gonfaron, France: Editions SOPTOM, pp. 133-135.

GERLACH, J., AND CANNING, K.L. 1996b. Evolution and history of the giant tortoises of the Aldabra Island group. Testudo 4(3):33-40.

GERLACH, J., AND CANNING, K.L. 1998. Taxonomy of Indian Ocean giant tortoises (*Dipsochelys*). Chelonian Conservation and Biology 3:3-19.

GÜNTHER, A.C.L.G. 1877. The Gigantic Land-Tortoises (Living and Extinct) in the Collection of the British Museum. London: Taylor and Francis, 96 pp.

HONEGGER, R.E. 1967. Beobachtungen an der Riesenschildkröten (*Testudo gigantea* Schweigger) der Inseln im Indischen Ozean. Salamandra 3:101-121.

PENNY, M. 1970. Cousin. In: ICBP 2nd Report to Subscribers. Unpublished report to International Council for Bird Preservation.

ROTHSCHILD, W. 1915. On the gigantic land tortoises of the Seychelles and Aldabra-Madagascar group with some notes on certain forms of the Mascarene group. Novitates Zool. 22:418-442.

Funded: 1995

Chelonian Conservation and Biology, 1998, 3(1):135–137

Current Status and Conservation of the River Cooter (*Pseudemys concinna*) in Southern Illinois. Linnaeus Fund Research Report

MICHAEL J. DRESLIK[1]

[1]*Illinois Natural History Survey, Center for Biodiversity, Champaign, Illinois 61820 USA*

The river cooter, *Pseudemys concinna*, is an endangered and enigmatic member of the Illinois chelonian fauna (Herkert, 1992; Dreslik et al., 1998). At its northern range limit in Illinois, *P. concinna* appears patchily distributed in small populations (Smith, 1961; Minton, 1972; Seidel and Green, 1982; Buhlmann and Vaughan, 1991; Moll and Morris, 1991; Dreslik and Moll, 1996; Dreslik, 1997b). The first record of *P. concinna* in Illinois was based on a specimen collected at Mt. Carmel in the Wabash River in the late 1800s (Garman, 1890). The species has also been recorded in Alexander, Gallatin, Hardin, Jackson, Jersey, Massac, Randolph, Union, Wabash, and White counties (Cahn, 1937; Smith, 1961; Moll and Morris, 1991).

As recently as the early 1980s, *P. concinna* was believed to have been extirpated from the state; however, by 1988, extant populations were located in floodplain lakes and ponds along the Ohio River in Gallatin County (Moll and Morris, 1991). The survey by Moll and Morris (1991) became the impetus for a long-term study of *P. concinna* in a chain of floodplain lakes in southeastern Gallatin County (Dreslik et al., 1988; Dreslik, 1997b; Dreslik and Moll, 1996). In May 1994, an on-going ecological and conservation study was initiated at the most accessible lake, Round Pond.

This report discusses the results from the first phase of this research initiative in which I document new populations of *P. concinna*, report on habitat and population threats, and formulate initial conservation recommendations for the species in Illinois. Previous reports based on this work are in Dreslik and Moll (1996), Dreslik (1997a, 1997b), and Dreslik et al. (1998).

Methods. — Initial fieldwork in 1994 indicated that a chain of floodplain lakes, sloughs, and ponds located along the Ohio River in Gallatin County, Illinois, would be suitable to initiate a long-term monitoring study. To the north, the chain begins with Hulda Lake and extends southward to Fish Lake (23 ha). Other nearby lacustrine systems include: Black Lake (9 ha), Round Pond (30 ha), Fehrer Lake (15 ha), and Long Pond (6 ha). The lakes are relatively open bodies of water that connect with the Ohio River during spring floods. In White County, similar habitats were selected for survey, two of which were old channels of the Wabash River at Ribeyre and Greathouse islands. These sites were surveyed from 1994 to 1996 (Table 1).

Table 1. Sites surveyed for *Pseudemys concinna* in Illinois during the summers of 1994–96.

	Number of Specimens Collected	Observed
Gallatin County		
Long Pond	4	
Big Lake	1	
Running Slough		5
Round Pond	77	
Black Lake	1	4
White County		
Ribeyre Island		4
Greathouse Island		3
Flat Pond Slough		1
Sandy Slough		1

At Round Pond, *P. concinna* have been trapped regularly since May 1994 using one to five single-set fyke net arrays (Vogt, 1980) and all captured turtles marked by notching marginal scutes (Cagle, 1939), weighed, measured (carapace length, plastral length, carapace width, and shell height), sexed (using the presence or absence of secondary sexual characteristics) and aged (up to year six) using plastral annuli (Dreslik, 1997b). All turtles were released after being held overnight to retrieve feces for dietary studies. More details for methodologies are in Dreslik and Moll (1996) and Dreslik (1997b).

Results and Discussion. — Results from the study have not added any new counties of occurrence, however, several new populations have been located. An immature female was captured in a fyke net placed on the southern shore of Big Lake on 17 June 1994, thus confirming Moll and Morris's (1991) previous findings. In Black Lake on 17 June 1994 a male was taken in a fyke net and four others were observed basking. On several occasions in 1994 *P. concinna* were observed basking on the banks of Running Slough. In Flat Pond Slough, on 4 and 14 August 1996 a large female was spotted basking; also on 14 August specimens were seen basking in the old Wabash River channel at Greathouse and Ribeyre islands, and in Sandy Slough. However, at that location Sandy Slough was shallow; therefore, that individual may have been a migrant.

Through the course of the ongoing ecological study at Round Pond two extrinsic threats to the local persistence of *P. concinna* were noted: environmental perturbation and habitat destruction. Leaks from nearby oil tanks wash into Round Pond during rains and floods. Furthermore, shortly after the presumed nesting season and recession of the river in 1995 clear- cutting eliminated large expanses of the forest surrounding Round Pond. This increase in edge habitat may be associated with an increase in nest mortality (Temple, 1987).

Intrinsic threats to the population concern its genetic integrity and population size. Because Round Pond's population is small, estimated at ca. 157 individuals (Dreslik and Moll, 1996; Dreslik, 1997b), it is prone to genetic drift and inbreeding which may result in reduced heterozygosity and expression of deleterious alleles (Lacey, 1987). However, the Round Pond population may be a deme of a larger metapopulation; when the Ohio River floods seasonally, corridor habitat between the southeastern Gallatin County floodplain lakes is created, and individuals may migrate between lakes. Future studies plan to address rates of gene flow and dispersal patterns within this system.

In Illinois, *P. concinna* may owe its endangered status to habitat degradation, swamp and oxbow drainage, river channelization, and loss of vegetation (Herkert, 1992). Being estimated as slow-growing (Dreslik, 1997b), *P. concinna* may be long-lived; furthermore, when populations of long-lived species are subject to persistent and severe environmental and habitat perturbations, they may face extirpation (Congdon et al., 1993). A population at Horseshoe Lake, Alexander County, Illinois, may have been extirpated by over-development and drought; the lake completely dried in the 1930s (Herkert, 1992). Although a specimen was recently located in a slough connected to Horseshoe Lake (Moll and Morris, 1991), the population has yet to recover. Similar incidents in Indiana populations at Little Cypress Pond, Knox County, and Foote's Pond, Gibson County, lead to local extirpation when the former was destroyed and the latter dried between 1953 and 1954 (Minton, 1972).

Similar patterns of decline have been documented elsewhere in the species' range. At Rainbow Spring Run, Marion County, Florida, a recent resurvey suggested drastic declines in the *P. concinna* population, especially adult turtles (Meylan et al., 1992). In roughly 50 years, the difference between Marchand's (1942) initial survey and Meylan et al.'s (1992) resurvey revealed a 10-fold decrease in numbers. The probable mechanisms of decline cited were human exploitation or disruption of behavioral patterns, alternate explanations were the loss of basking habitat and/or high mortality due to boat collisions (Meylan et al., 1992).

Currently, there are too few data on the ecology and life history of *P. concinna* in Illinois to provide a more concrete conservation and management plan. However, with the establishment of a marked population a long-term study examining *P. concinna*'s ecology and life history is underway. The difficulty in implementing any conservation measures is further complicated because many of the lakes and ponds are privately owned. One clear action needed is to establish a refuge, as no extant *P. concinna* populations are on protected land. Extrinsic habitat perturbations should be minimized until data on habitat utilization, population genetics, and reproductive biology are gathered. Locating new populations by continued surveying of backwater regions associated with the Mississippi, Wabash, and Ohio rivers is also important.

Acknowledgments. — This project was completed in partial fulfillment of the degree of Masters in Science at Eastern Illinois University (E.I.U.), Charleston, Illinois. Funding for this project was provided through The Linneaus Fund of Chelonian Research Foundation, Illinois Endangered Species Protection Board, the E.I.U. Council on Faculty Research, the E.I.U. Honors Program Undergraduate Research Award, and the E.I.U. Graduate Summer Research

Assistantship Award. The majority of my thanks goes to E.O. Moll for his effort as a mentor, advisor, and editor, and C.A. Phillips for his thorough review of this manuscript. I also thank E.L. Bryant amd J.R. Dreslik for their field assistance, E. Joyner and E. Bickett for allowing me to trap on Long Pond and Big Lake, respectively, and to T.L. Esker for help with White County sites.

Literature Cited

BUHLMANN, K.A., AND VAUGHAN, M.R. 1991. Ecology of the turtle *Pseudemys concinna* in the New River, West Virginia. J. Herpetol. 25:72-78.

CAGLE, F.R. 1939. A system for marking turtles for future identification. Copeia 1939:170-173.

CAHN, A.R. 1937. Turtles of Illinois. Illinois Biol. Monogr. 16:1-218.

CONGDON, J.D., DUNHAM, A.E., AND VAN LOBEN SELS, R.C. 1993. Delayed sexual maturity and demographics of Blanding's turtles (*Emydoidea blandingii*): implications for conservation and management of long-lived organisms. Conserv. Biol. 7:826-833.

DRESLIK, M.J. 1997a. Notes on the foraging behavior of *Pseudemys concinna*. Chicago Herpetological Society Bulletin 32(5):105.

DRESLIK, M.J. 1997b. Ecology of the river cooter (*Pseudemys concinna*) in a southern Illinois floodplain lake. Herp. Nat. Hist. 5:39-49.

DRESLIK, M.J., AND MOLL, E.O. 1996. Conservation, potential threats and baseline ecology of the river cooter, *Pseudemys concinna*, in a southern Illinois backwater. Unpubl. Report, Illinois Department of Natural Resources.

DRESLIK, M.J., MOLL, E.O., PHILLIPS, C.A., AND WILSON, T.P. 1998. The endangered and threatened turtles of Illinois. Illinois Audubon 263:10-15.

GARMAN, H. 1890. Notes on Illinois reptiles and amphibians, including several species not before recorded in the northern states. Illinois Laboratory Nat. Hist. Bull. 3:185-190.

HERKERT, J.R. (Ed.). 1992. Endangered and Threatened Species of Illinois: Status and Distribution. Volume 2. Animals. Illinois Endangered Species Protection Board, Springfield, Illinois.

LACEY, R.C. 1987. Loss of genetic diversity from managed populations: interacting effects of drift, mutation, immigration, selection and population subdivision. Conservation Biology 1:143-158.

MARCHAND, L.J. 1942. A contribution to a knowledge of the natural history of certain freshwater turtles. M.S. Thesis, University of Florida, Gainsville.

MEYLAN, P.A., STEVENS, C.A., BARNWELL, M.E., AND DOHM, E.D. 1992. Observations on the turtle community of Rainbow Run, Marion County, Florida. Florida Sci. 55:219-228.

MINTON, S.A., JR. 1972. Amphibians and Reptiles of Indiana. Indiana Acad. Sci. Monogr. 3:1-346.

MOLL, E.O., AND MORRIS, M.A. 1991. Status of the river cooter (*Pseudemys concinna*) in Illinois. Trans. Illinois Acad. Sci. 84:77-83.

SEIDEL, M.E., AND GREEN, N.B. 1982. On the occurrence of cooter turtles (subgenus *Pseudemys*) in the upper Ohio River Valley. Herpetol. Rev. 13:132-134.

SMITH, P.W. 1961. The amphibians and reptiles of Illinois. Illinois Nat. Hist. Surv. Bull. 28:1-298.

TEMPLE, S.A. 1987. Predation on turtle nests increases near ecological edges. Copeia. 1987:250-252.

VOGT, R.C. 1980. New methods for trapping aquatic turtles. Copeia 1980:368-371.

Funded: 1996

Chelonian Conservation and Biology, 1998, 3(1):137–141

Of Deadwood and Map Turtles (*Graptemys*): An Analysis of Species Status for Five Species in Three River Drainages Using Replicated Spotting-Scope Counts of Basking Turtles. Linnaeus Fund Research Report

PETER V. LINDEMAN[1,2,3]

[1]*Center for Reservoir Research, Murray State University, Murray, Kentucky 42071 USA;* [2]*Department of Biology, University of Louisville, Louisville, Kentucky 40292 USA;* [3]*Present Address: Division of Biological Sciences and Related Technologies, Madisonville Community College, 2000 College Drive, Madisonville, Kentucky 42431 USA [Fax: 502-825-8553; E-mail: LPeter0@pop.uky.edu]*

Map turtles (*Graptemys*) are the most speciose turtle genus in North America north of the Rio Grande, with 12 species recognized (Ernst et al., 1994). Species richness stems from the restriction of these turtles to large rivers and lakes of riverine origin, resulting in drainage-basin endemism within major Gulf Coastal river drainages (including the Mississippi drainage). Many rivers are occupied by a broad-headed, molluscivorous species of *Graptemys* in sympatry with a narrow-headed species exhibiting little molluscivory. Two narrow-headed species, *G. oculifera* of the Pearl River drainage (Fig. 1) and *G. flavimaculata* of the Pascagoula River drainage (Fig. 2), are listed as Threatened under the U.S. Endangered Species Act (ESA) of 1973, and as Endangered by the International Union for the Conservation of Nature (IUCN). Reasons for decline of these two species are thought to include anthropogenic removal of deadwood from river channels, channel modification, water-quality degradation from municipal and industrial effluents, overexploitation for the pet trade, and wanton shooting (U.S. Fish and Wildlife Service, 1988, 1993).

Graptemys are among the most habitual baskers among turtles, and can be seen in great numbers on logs and branches on warm sunny days (Boyer, 1965; Lindeman, 1997b). Feeding studies and anecdotal observations suggest that narrow-headed *Graptemys* graze upon algal/invertebrate communities that occupy submerged deadwood, while broad-headed *Graptemys* are primarily molluscivorous, at least in the case of adult females (Sanderson, 1974; Moll, 1976; Shealy, 1976; Vogt, 1981; Shively and Jackson, 1985; Kofron, 1991; Seigel and Brauman, 1994; Lindeman, 1997b). *Graptemys* also cling to the underwater portions of basking sites as nocturnal resting sites (Chaney and Smith, 1950).

While abundance of deadwood may be an important habitat variable in *Graptemys* ecology, with anthropogenic removal believed to be related to declines in *G. oculifera* and