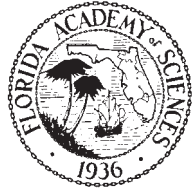


Florida Scientist



DISCOVERY OF A MODERN-DAY MIDDEN: CONTINUED EXPLOITATION OF THE SUWANNEE COOTER, *PSEUDEMYC CONCINNA SUWANNIENSIS*, AND IMPLICATIONS FOR CONSERVATION

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ABSTRACT: *We present evidence of continued take of the Suwannee cooter, Pseudemys concinna suwanniensis. Exploitation of this sexually dimorphic, state-listed species is particularly damaging to populations because it is focused on the large adult females. Our results illustrate the need for increased conservation actions for this imperiled riverine turtle. Recommendations include the development of effective education and enforcement programs.*

Key Words: Suwannee cooter, *Pseudemys concinna suwanniensis*, freshwater turtles, harvest, take, exploitation, Florida, conservation

THE Suwannee cooter, *Pseudemys concinna suwanniensis*, was originally described by Carr (1937) and is the largest emydid turtle in North America (Jackson and Walker, 1997). Initially described as part of the *Pseudemys floridana* species complex, subsequent investigations (Seidel, 1981, 1994; Ward, 1984; Jackson, 1995) have placed *suwanniensis* within various taxonomies. Currently, most authorities recognize *suwanniensis* as a subspecies of *P. concinna* (Jackson, 1995, 2002, 2006; Meylan, 2006; Seidel and Dreslik, 1996). Like other members of the subfamily Deirochelyinae, this form shows strong sexual dimorphism with adult females reaching a maximum carapace length of nearly 11 cm longer and at least 6.6 kg heavier than adult males (Jackson, 2006).

Pseudemys c. suwanniensis occurs in river systems draining into the northeastern Gulf of Mexico, from the Ochlockonee River in the Florida panhandle, southward in the peninsula to the Alafia River (Jackson, 2006). Principally riverine, this herbivorous turtle has a long history of human exploitation (Carr, 1937, 1940, 1952; Auffenberg, 1978; Jackson and Walker, 1997; Jackson, 2006). This paper reports the discovery of a large, recent

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midden that documents continued human take of the demographically most important life history stage of this turtle.

METHODS—*Site discovery*—On 26 May 2004, Heinrich and Butler discovered a rural dumpsite containing scattered remains of *Pseudemys* spp. adjacent to State Road 24 immediately north of Cedar Key, Levy County, Florida (29°10'31"N, 83°01'27"W). Skeletal material was distributed on the soil surface and partially buried throughout two sections of a wooded area totaling less than 0.5 ha. Examination of the site led us to believe that it had been used for several years, as many specimens were located under several seasons of leaf litter. Evidence that these turtles had been collected for human consumption included cleaver marks on the anterior carapace and/or skull (indicating removal of the head), plastron severed from the carapace, and absence of pectoral, pelvic, and limb bones.

Collection and inventory—Collecting trips were made on 7 June, 29 June, and 11 October 2004. Intact, as well as disarticulated, carapaces and plastra were bagged individually when possible. In addition, numerous skulls were found scattered among the remains. Intermixed bones from more than one individual were bagged as such.

All collected material was cleaned, and carapaces and plastra were reassembled where possible. No attempt was made to match carapaces with associated plastra due to the damaged conditions of bridges. Specimens were identified to species. Maximum carapace length (CL) was recorded to the nearest 1.0 mm. All but one specimen were deposited in the Chelonian Research Institute collection (PCHP 7752-7975, 8004-8139, 8171-8200). A single carapace was deposited in the University of North Florida teaching collection (no catalog number issued).

RESULTS—Four carapaces with associated plastra, 165 additional complete and partial carapaces, 163 additional complete and partial plastra, and 59 skulls were recovered. Every effort was made to match sections of partial carapaces to others from the same turtle, and likewise for plastra. A minimum number of 170 turtles was determined; these represented 164 *P. c. suwanniensis* (based on total carapaces); one peninsula cooter, *P. floridana peninsularis* (based on a single carapace); and five Florida red-bellied turtles, *P. nelsoni* (based on total plastra).

Size distribution (CL) was as follows: *P. c. suwanniensis* (239-437 mm, mean = 351, n = 110), *P. f. peninsularis* (303 mm, n = 1), *P. nelsoni* (267–284 mm, mean = 278, n = 4). Of note is the largest *P. c. suwanniensis* carapace (437 mm) collected, which equals the length of the record-size specimen (Pritchard, 1980).

DISCUSSION—*Continued exploitation and population decline*—Carr (1937, 1940, 1952) stated that *P. c. suwanniensis* was highly esteemed for human consumption and frequently harvested during the first half of the twentieth century. Jackson (2006) reported that the discovery of several large piles of shells of this species documents that localized take of significant numbers continues in both the Florida panhandle and peninsula. Some residents of Cedar Key continue to take this species for personal consumption from three west-central Florida rivers (Smith, 2004a). One individual interviewed by Smith (2004b) reported participating in a collecting trip, along with five other people, that resulted in the take of over 50 *Pseudemys*.

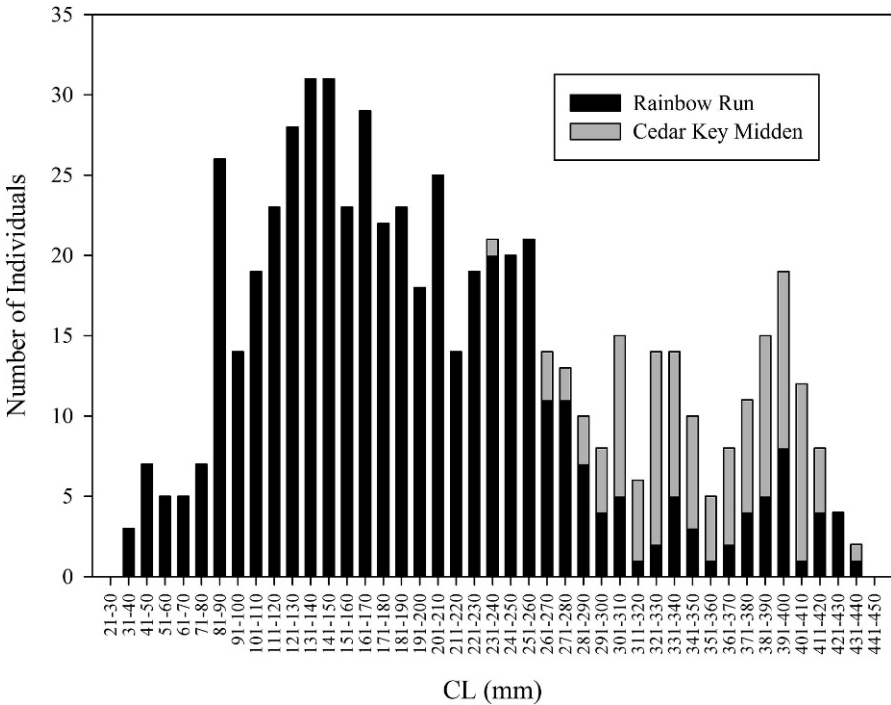


FIG. 1. Distribution of *P. c. suwanniensis* maximum carapace length (CL) captured at Rainbow Run (near Dunnellon, Florida) from 2000-2007 (n = 512) and measurable carapaces (n = 110) found at a midden near Cedar Key, Florida. All Rainbow Run data represent individuals at last capture and include a mix of males, females, and juveniles.

Historically, *P. c. suwanniensis* has been reported to occur in large numbers (Knight, 1871; Carr, 1952), and it has been the subject of population studies dating back to the late 1930s (Marchand, 1942; Giovanetto, 1992; Meylan et al., 1992; Jackson and Walker, 1997; Jackson, 2002; Huestis and Meylan, 2004). Studies conducted on Rainbow Run (Marion County, Florida) document a significant decrease in population densities since 1942 (Marchand, 1942; Giovanetto, 1992; Meylan et al., 1992; Huestis and Meylan, 2004). Meylan and co-workers (1992) reported “The fact that the three *Pseudemys* species occur in the same relative densities as they did 50 years ago suggests that the factor(s) that have reduced their numbers affect each of them equally. This would be consistent with take for human consumption if the three species were taken as encountered.” Giovanetto (1992) suggested that collection for human consumption might explain a higher proportion of immature individuals of this species at his study site on the same river.

A comparison of the size distributions of the Rainbow Run (RR) population (P. A. Meylan, unpub. data) and that of the Cedar Key (CK) specimens further suggests size-biased take in both cases (Fig. 1). Since female *P. c. suwanniensis* reach reproductive maturity at a minimum of 325 mm CL

(Jackson and Walker, 1997), it is clear that there are relatively few mature females in the RR population. Conversely, mature males rarely exceed 284 mm CL (Jackson, 2006), so mature females represent the vast majority of the CK specimens. Applying the Mann-Whitney Rank Sum Test (U-test) to the CL data demonstrates that the RR turtles are significantly smaller than those discovered at CK ($P < 0.001$).

These data allow one to observe a life history problem from two different viewpoints. Turtles that reach the size of adult female *P. c. suwanniensis* have few predators aside from humans, thus it is very likely that the population structure in RR is caused anthropogenically. Certainly, if one is hunting these turtles for meat, it is desirable to collect the largest ones available. The CK findings support this logic. Without further knowledge of the living *P. c. suwanniensis* population(s) represented in the CK midden we cannot speculate on its structure. However, this CK midden discovery suggests size-biased (and probably unintentionally sex-biased) harvest as an explanation for the asymmetrical structure of the RR population. Small increases in mortality and reduced fecundity, a side-effect of size-biased harvesting, can lead to unsustainable populations of long-lived organisms like turtles (Congdon et al., 1993). By taking the largest individuals, humans are removing the reproductively mature or nearly mature females, which will likely lead to population collapse over time.

Legal status—The Florida Fish and Wildlife Conservation Commission (FFWCC) currently lists *P. c. suwanniensis* as a Species of Special Concern and Rule 68A-27.005 states that this subspecies “has a significant vulnerability to habitat modification, environmental alteration, human disturbance, or human exploitation which, in the foreseeable future, may result in its becoming a threatened species unless appropriate protective or management techniques are initiated or maintained” and “may already meet certain criteria for designation as a threatened species but for which conclusive data are limited or lacking.” Considering the broad range of conservation challenges facing this species (Jackson, 2005), the FFWCC should immediately address those threats that can be controlled. An inquiry from the Florida Turtle Conservation Trust to the FFWCC in April 2008 regarding regulation pertaining to the take of Suwannee cooters resulted in agency wildlife biologists and legal staff reinterpreting the existing regulation to mean that no legal take is allowed. Unfortunately, FFWCC wildlife biologists and law enforcement officers had been operating for years with the misunderstanding that the take of Suwannee cooters statewide was allowable with a possession limit of two per individual and a closed season from 15 April to 31 July.

Recommendations—Based on the documented population decline on Rainbow Run (the only site studied over a long period of time) and continued human exploitation we have shown focuses on reproductive females, we recommend that the FFWCC increase the protection of *P. c. suwanniensis* by

initiating enforcement of the illegal take regulation. We also recommend that the three *Pseudemys* species occurring in Florida be afforded the same level of protection based on the difficulty of non-specialists (particularly law enforcement officers) in accurately identifying the species. This was previously suggested by P. A. Meylan (2004) and listed as a conservation option by Jackson (2006). Development of effective education and enforcement programs would be positive actions toward conserving this imperiled riverine turtle.

ACKNOWLEDGMENTS—We thank Benjamin K. Atkinson, Robert E. Brechtel, Steven R. DeCresie, Charles H. Miller, and Virginia Smith for assistance in the field. We also acknowledge Benjamin K. Atkinson, Heather Chasez, Peter Dunkelburg, Elizabeth Eastman, Tess Falk, Donna M. Heinrich, Charles H. Miller, Michel Therrien, Linh Uong, Christine A. Venezia, and Jessica A. Waltman for their assistance with the processing and/or reassembly of skeletal material. Peter A. Meylan kindly provided access to unpublished data. Thoughtful review by Laine A. Giovanetto, Dale R. Jackson, and Peter A. Meylan greatly improved an earlier draft of the manuscript.

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Florida Scient. 73(1): 14–19. 2010

Accepted: April 29, 2009

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