Rice Rat *(Oryzomys cf. palustris)* Remains from Southern Indiana Caves

Ronald L. Richards
8141 Pickford Drive
Indianapolis, Indiana 46227

Living rice rats have never been recorded within Indiana. The rice rat had been on Indiana's hypothetical lists of Evermann and Butler in 1894 (6), Hahn in 1909 (11), and Lyon in 1936 (16). Lyon then noted that the rice rat should be looked for in the southern counties, and that owl pellets (as rice rats are primarily noctournal) should be examined for their remains. Indiana's first rice rat remains were recorded from the Angel Mounds archaeological site in southerly Vanderburgh County (1, 2). Mumford (1969) affirmed the Angel Mounds material to be Indiana's only record (17). Presently, rice rat populations occur no closer to Indiana than extreme southern Illinois and the lower half of Kentucky (Fig. 1).

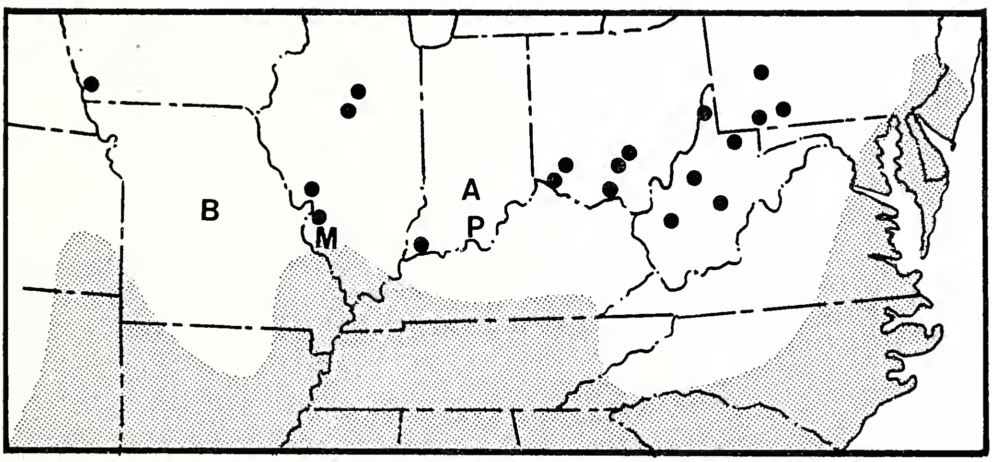

Figure 1. *Recent and past distribution of the rice rat. Modern range: stippled area (data from Hall and Kelson, 1959); Archaeological sites: dots; Cave sites: A, Anderson Pit Cave, B, Brynjulfson #2 Cave, M, Meyer Cave, P, Passenger Pigeon Cave and Raptor Roost.*

The rice rat inhabits marsh and swamp borders with dense ground cover, but may also occur in drier upland areas that have tall grasses or weeds (17, 26). Away from coastal areas an annual rainfall of at least 40-45 inches seems necessary (27); southern Indiana presently receives ca. 40-44 inches (25). The northern range of the rice rat does fluctuate (12).

Two Indiana caves and sub-recent deposits of a raptor roost have recently produced rice rat remains (Fig. 1). Recovered from Anderson Pit Cave, Monroe County, was a left dentary portion, paired maxillae, and a left premaxilla, all teeth absent. The remains occurred deep within the cave in the sediments of an ancient woodrat nesting area

(24, preliminary faunal list) in general association (upper deposit) with a more recently discerned late Pleistocene-early Recent fauna that included the extinct giant armadillo, *Dasypus bellus* (middle deposit) and 57 other vertebrate species.

From Passenger Pigeon Cave, Harrison County, a shallow "shelter-like" limestone cave and crawlway, were recovered three left and two right dentaries, three left and three right fragmented innominates, two left femora, and one right tibiofibula. One innominate had hair matted into the acetabulum, and seemed to be of more recent, perhaps owl pellet, accumulation than the other bones. Remains occurred within the loose, dusty dirt within the upper foot of sediment. Located just above the base of the Ohio River bluffs, an extensive faunal accumulation in the chamber was heavily augmented by raptor roost debris, woodrat collection, and predator-scavenger activities.

One hundred feet east of this cave, sheltered up on a bluff cove, was an extensive deposit of raptor refuse (eg. disintegrated owl pellets). Only one element of the rice rat, a complete left dentary (Fig. 2), was recovered from the lowermost level of refuse (ca. 6 inch maximum depth) to the more than one thousand dentaries of *Microtus*. Accumulation in this cove seems to have dwindled in more recent years. Examination of modern raptor debris along the bluff base for the last several years has failed to produce extant rice rat material. While locally the older deposits contained rice rat and woodrat *(Neotoma floridana)*, recent accumulations are of the Norway Rat *(Rattus cf. norvegicus)*. Rice rat identifications were confirmed by John E. Guilday, Carnegie Museum of Natural History, Pittsburgh.

Six subspecies of *O. palustris* occur in the Eastern United States. A second species, *O. couesi*, ranges into the Southwest from Mexico. The two species can be separated by skulls or teeth (12, 13). The Angel Mounds material represents *O. palustris*. The material re-examined was: 2 skulls; 5 partial skulls; 11 dentaries; 34 femora; 16 tibiofibulae; 17 innominates; 4 humeri; 2 scapulae; 4 ulnae; a sacrum; several vertebrae, and cranial and long bone fragments (minimum number of individuals: 23). The Indiana cave and roost material was too incomplete for species determination, but was assigned to *O. cf. palustris* on geographic grounds.

An extinct form, *O. palustris fossilis*, is known from the Kansan glacial of Texas (5), late Illinoian glacial of Kansas (14), and the Sangamon interglacial of Texas (4) and Kansas (13). Dentally separable (13, 27), none of the Indiana cave material to date appears to represent this extinct form.

Recent *O. palustris* appear to be progressively larger from south to north as well as from west to east (Table 1, part A), suggesting a classical positive "Bergman's Response". The subrecent (usually archaeological) specimens follow the same trend, with some regional variation (eg. some Illinois and Iowa data), and appear slightly larger than the recent material. The Iowa data are of alveolae, which give a longer measurement than the teeth (compare parts B and C, lower toothrow). While the upper molars from the Angel site are larger than

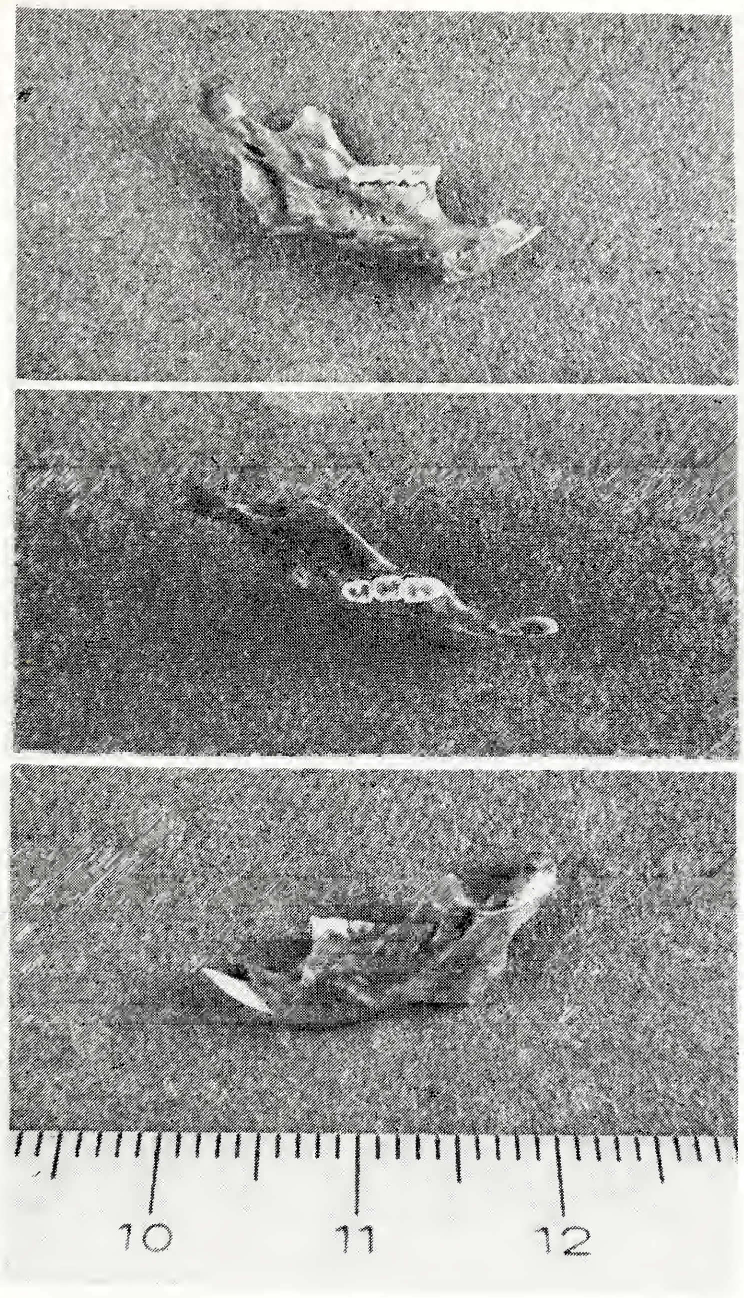

FIGURE 2. *Left dentary of a rice rat* (Oryzomys cf. palustris) *from a Harrison County raptor roost. Note the dentine "core" of the heavily worn molars. Scale: X 2; mm. grid.*

those from Iowa, the reverse is true of the lower molars, perhaps due to the small sample size from the Angel site (part B). Though the Indiana cave and roost specimens might have dentitions similar in size to those from Angel Mounds (as indicated by empty alveolar toothrow, part C), the general size of the cave and roost elements is smaller. Postcranial material is visibly smaller. The difference does not seem to be related to age class. The cave and roost specimens also have a more frequent and pronounced depression of the area between the vertical dentary ramus and the labial side of the posterior tooth-

TABLE 1. *Comparison of recent and sub-recent rice rat material from several localities.*[1, 2]

Parameter Locality	N	$\overline{X}$	O.R.
A. Cranial			
Length, upper toothrow:			
Texas, recent	14	4.4	4.0–4.7
Kentucky, Illinois, recent	11	4.80	4.5–5.0
New Jersey, Virginia, Maryland, recent	7	4.86	4.8–5.3
Arkansas, sub-recent	4	4.70	4.5–4.9
Angel Mounds, Indiana, sub-recent	3	4.81	4.70–4.98
Illinois, sub-recent	11	4.88	4.4–5.1
Iowa, sub-recent (alveoli measurements)	17	4.91	4.55–5.40
Pennsylvania, West Virginia, sub-recent	12	5.22	4.7–5.7
Length, incisive foramen:			
Texas, recent	14	6.3	4.4–7.3
Kentucky, Illinois, recent	3	6.75	6.0–7.2
New Jersey, Virginia, Maryland, recent	7	6.81	6.4–7.3
Arkansas, sub-recent	3	6.70	6.3–6.9
Angel Mounds, Indiana, sub-recent	8	6.95	6.53–7.38
Illinois, sub-recent	5	6.69	6.0–7.9
Iowa, sub-recent	6	7.12	6.20–7.85
Pennsylvania, West Virginia, sub-recent	11	6.92	6.5–7.6
Length, M1:			
Angel Mounds, Indiana, sub-recent	5	2.23	2.12–2.36
Iowa, sub-recent	26	2.15	2.00–2.25
Width, M1:			
Angel Mounds, Indiana, sub-recent	5	1.42	1.32–1.50
Iowa, sub-recent	25	1.32	.90–1.50
B. Dentary			
Length, lower toothrow:			
Indiana raptor roost (moderate wear)	1	4.67	4.67
Angel Mounds, Indiana	2	4.79	4.78–4.80
Iowa (alveolar measurement)	60	4.83	4.45–5.10
Length, m1:			
Indiana raptor roost (moderate wear)	1	1.80	1.80
Angel Mounds, Indiana	7	1.94	1.84–2.00
Iowa	51	1.95	1.75–2.20
Width, m1:			
Indiana raptor roost (moderate wear)	1	1.21	1.21
Angel Mounds, Indiana	7	1.25	1.22–1.27
Iowa	52	1.28	1.15–1.45
C. Indiana cave, roost, and Angel Mounds comparison			
m1-m3, empty alveolar length:			
Passenger Pigeon Cave	5	5.05	4.80–5.25
Angel Mounds	4	5.04	4.70–5.45
Diastema length:			
Anderson Pit Cave	1	3.10	3.10
Passenger Pigeon Cave and raptor roost	4	3.76	3.4–4.0
Angel Mounds	10	3.94	3.3–4.66
Dentary, thickness[3]:			
Passenger Pigeon Cave and roost	2	2.16	2.06–2.25
Angel Mounds	11	2.24	2.18–2.40

TABLE 1—Continued

Dentary, depth[4]:			
Passenger Pigeon Cave and roost	3	3.22	3.06–3.40
Angel Mounds	11	3.46	3.21–3.92
Dentary, length[5]:			
Passenger Pigeon Cave and roost	2	16.74	16.45–17.03
Angel Mounds	7	17.46	15.47–20.17

[1] Non-Indiana data from Johnson, 1972.

[2] Indiana measurements by ocular micrometer accurately calibrated at about 15 X, or by dial calipers.

[3] Measured from ventral surface at widest part of masseteric ridge.

[4] Measured along a line through mental foramen to lowermost swelling of symphysis.

[5] From condyle to anterior point of dentary, toothrow horizontal.

row. These differences in the Indiana material may be biased by the small number of specimens available, or might well represent local or temporal population characteristics. Guilday records an aberrant rice rat skull from an eastern archaeological site with a "broad rostrum and exceptionally large cheek teeth" (8). The association of the rice rat with man in the Indian settlements could have provided a new "optimum" habitat that locally relaxed the food or predator controls of body size, or the larger size could be typical of physiological adjustments in filling northerly and easterly "vacant" ecological niches, given present temperature and moisture gradients (eg. "Bergman's Response"). No taxonomic distinction between "wild" and "commensal" rice rat populations, however, would seem justified with the material and data at hand.

Few wild rice rats reach one year of age (26); by epiphyseal union, most of the Indiana material did represent young adults. A fractured tibiofibula from the Angel Mounds site had healed in a shorter, misaligned position.

Bones of the rice rat have been found in archaeological sites north of its present range in Iowa (15), Illinois (3, 18, 19, 21), Indiana (1, 2), Ohio (8), Pennsylvania (7, 8), and West Virginia (8, 10) (Fig. 1). Because of its close association with prehistoric maize cultivation, the rice rat is thought to have been a commensal pest of Indian settlements, rather than an indicator of past warmer temperatures (9). Rice rat bones associated with burrow systems have been recovered from refuse pits of Indian settlements (10). While most of the sites are dated ca. 1000 A.D. (15), the Scovil site in Illinois had an earlier, 450 A.D. date, where maize was not among the cultigens recovered (18). The general associations of rice rat with such mild-wintered extinct species as the giant armadillo, *Dasypus bellus*, in Brynjulfson #2 Cave, Missouri (22), and in Anderson Pit Cave, Indiana, and the abundant rice rat remains in Meyer Cave, Illinois (20), however, might predate the archaeological associations. *O. palustris* has been recovered from the Pleistocene of Ladds, Georgia (23) and from Florida (28). Parmalee and Oesch (22) do not support a maize related rice rat extension. Johnson (15), regarding archaeological and ecological evidence, believed that an amelioration of climate during the Scandic climatic episode allowed for the range expansion, where the rice rat became established as a commensal pest in the Indian settlements, perhaps allowing it to survive mild climatic change. This author, further judging by its fossil and sub-fossil cave associations, believes that the rice rat could have extended its range northerly during mild-wintered moist climatic phases (as might have *Dasypus bellus*), perhaps as early as late Pleistocene-early postglacial times, and with the development of prehistoric crop cultivation could well have maintained relict populations in the "artificial" niche when conditions became unfavorable for its northerly distribution.

Acknowledgments

I thank John E. Guilday, Carnegie Museum of Natural History, for examining the Indiana cave and roost specimens, and William R. Adams, Indiana University ethnozoological laboratory, for loan of the Angel Mounds material. Dave Rieger expertly produced Figures 1 and 2. Aid in the field was provided by especially P. David Miles and Gordon Lindamood, and also Bruce Ogle, D. Bert Haddix, John Linn, and Mike Riedlinger.

Literature Cited

1. ADAMS, W. R. 1949. Faunal remains from the Angel site. MS thesis, Department of Anthropology, Indiana University, Bloomington. 56 p.
2. ADAMS, W. R. 1950. Food animals used by the Indians at the Angel site. Proc. Indiana Acad. Sci., 59:19-24.
3. BAKER, F. C. 1936. Remains of animal life from the Kingston Kitchen midden site near Peoria, Illinois. Trans. Illinois State Acad. Sci. 29:243-246.
4. DALQUEST, W. W. 1962. The Good Creek formation, Pleistocene of Texas, and its fauna. Jour. Paleontol. 36(3):568-582.
5. DALQUEST, W. W. 1965. New Pleistocene formation and local fauna from Hardeman County, Texas. Jour. Paleontol., 39:63-79.
6. EVERMANN, B W., and A. W. BUTLER. 1894. Preliminary list of Indiana mammals. Proc. Indiana Acad. Sci., 3:124-139.
7. GUILDAY, J. E. 1961. Prehistoric Record of *Scalopus* from Western Pennsylvania. Jour. Mammal., 42(1):117-118.
8. GUILDAY, J. E., and W. J. MAYER-OAKES. 1952. An occurrence of the Rice Rat (*Oryzomys*) in West Virginia. Jour. Mammal., 33(2):253-255.
9. GUILDAY, J. E., P. S. MARTIN, and A. D. MCCRADY. 1964. New Paris No. 4: A late Pleistocene cave deposit in Bedford County, Pennsylvania. Natl. Speleol. Soc. Bull., 26(4):121-194.
10. GUILDAY, J. E., and D. P. TANNER. 1965. Vertebrate remains from the Mount Carbon site, (46-Fa-7), Fayette County, West Virginia. The West Virginia Arch., 18:1-14.
11. HAHN, W. L. 1909. The mammals of Indiana. 33rd Ann. Rept. Indiana Dept. Geol. Natur. Res. (1908): 417-654,659-663.
12. HALL, E. R. and K. R. KELSON. 1959. The mammals of North America. 2 vols. The Ronald Press Co., New York. 1038 p.
13. HIBBARD, C. W. 1955. The Jinglebob interglacial (Sangamon?) fauna from Kansas and its climatic significance. Contr. Mus. Paleontol. Univ. Mich., 12(10):179-228.
14. HIBBARD, C. W. 1963. A late Illinoian fauna from Kansas and its climatic significance. Paps. Mich. Acad. Sci. Arts Lett., XLVIII: 187-221.

15. JOHNSON, P. C. 1972. Mammalian remains associated with Nebraska Phase earth lodges in Mills County, Iowa. MS thesis, Dept. of Geol., Grad. Coll., Univ. Iowa. 77 p.

16. LYON, M. W., JR. 1936. Mammals of Indiana. Amer. Midl. Natur., 17(1):1-384.

17. MUMFORD, R. E. 1969. Distribution of the mammals of Indiana. Indiana Acad. Sci. Monogr. 1, Indianapolis. 114 p.

18. MUNSON, P. J., P. W. PARMALEE, and R. A. YARNELL. 1971. Subsistence ecology of Scovill, a Terminal Middle Woodland village. Amer. Antiquity, 30(4):410-431.

19. PARMALEE, P. W. 1957. Vertebrate remains from the Cahokia site, Illinois. Trans. Illinois State Acad. Sci., 50:235-242.

20. PARMALEE, P. W. 1967. A recent bone deposit in southwestern Illinois. Natl. Speleol. Soc. Bull., 29(4):119-147.

21. PARMALEE, P. W. 1971. Faunal materials from the Schild Cemetery site, Greene County, Illinois, Appendix A: p. 142-143, *in* G. H. Perino, 1971, The Mississippian component at the Schild site (No. 4), Greene County, Illinois. Illinois Arch. Surv. Bull., 8:1-148.

22. PARMALEE, P. W. and R. D. OESCH. 1972. Pleistocene and Recent faunas from the Brynjulfson caves, Missouri. Illinois State Mus. Repts. Invest., No. 25. Springfield. 52 p.

23. RAY, C. E. 1967. Pleistocene mammals from Ladds, Bartow County, Georgia. Bull. Georgia Acad. Sci., 25(3):120-150.

24. RICHARDS, R. L. 1972. The Woodrat in Indiana: Recent fossils. Proc. Indiana Acad. Sci., 81:370-375.

25. SCHAAL, L. A. 1966. Climate. Pp. 156-170, *in* A. A. Lindsey (ed.), 1966, Natural Features of Indiana. Indiana Academy of Science, Indianapolis. 597 p.

26. SCHWARTZ, C. W. and E. R. SCHWARTZ. 1959. The wild mammals of Missouri. Univ. Missouri Press, Columbia. 341 p.

27. SLAUGHTER, B. and W. L. MCCLURE. 1965. The Sims Bayou local fauna: Pleistocene of Houston, Texas. Tex. Jour. Sci. 17:404-417.

28. WEBB, S. D. (ed.). 1974. Pleistocene mammals of Florida. Univ. Florida Press, Gainesville.