Sanibel Island Rice Rat Biological Status Review Report

March 31, 2011

FLORIDA FISH AND WILDLIFE CONSERVATION COMMISSION
620 South Meridian Street
Tallahassee, Florida 32399-1600

Biological Status Review
for the
Sanibel Island rice rat
(*Oryzomys palustris sanibeli*)
March 31, 2011

EXECUTIVE SUMMARY

The Florida Fish and Wildlife Conservation Commission (FWC) directed staff to evaluate all species listed as Threatened or Species of Special Concern as of November 8, 2010 that had not undergone a status review in the past decade. Public information on the status of the Sanibel Island rice rat was sought from September 17 to November 1, 2010. The members of the Biological Review Group (BRG) met on November 3-4, 2010. Group members were Melissa Tucker (FWC lead), Jack Stout (University of Central Florida), and Amanda Bryant (Sanibel-Captiva Conservation Foundation) (Appendix 1). In accordance with rule 68A-27.0012, Florida Administrative Code (F.A.C.), the BRG was charged with evaluating the biological status of the Sanibel Island rice rat using criteria included in definitions in 68A-27.001, F.A.C., and following the protocols in the *Guidelines for Application of the IUCN Red List Criteria at Regional Levels (Version 3.0)* and *Guidelines for Using the IUCN Red List Categories and Criteria (Version 8.1)*. Please visit http://myfwc.com/wildlifehabitats/imperiled/listing-action-petitions/ to view the listing process rule and the criteria found in the definitions.

In late 2010, staff developed the initial draft of this report which included BRG findings and a preliminary listing recommendation from staff. The draft was sent out for peer review and the reviewers' input has been incorporated to create this final report. The draft report, peer reviews, and information received from the public are available as supplemental materials at http://myfwc.com/wildlifehabitats/imperiled/biological-status/.

The Sanibel Island rice rat BRG concluded from the biological assessment that the Sanibel Island rice rat met listing criteria. No information about the status of the Sanibel Island rice rat was received from the public. Based on the literature review and the biological review findings, staff recommends that the Sanibel Island rice rat be listed as a Threatened species.

This work was supported by a Conserve Wildlife Tag grant from the Wildlife Foundation of Florida. FWC staff gratefully acknowledges the assistance of the biological review group members and peer reviewers. Staff would also like to thank Karen Nutt who served as a data compiler on the species and drafted much of this report.

BIOLOGICAL INFORMATION

Taxonomic Classification – The Sanibel Island rice rat (*Oryzomys palustris sanibeli*) is a subspecies of the marsh rice rat found on Sanibel Island in Florida, and was originally described by Hamilton (1955). Morphological analyses suggested that the Sanibel Island rice rat (*Oryzomys palustris sanibeli*) is not a separate subspecies, but instead should be subsumed

within *O. p. natator* (Humphrey and Setzer 1989). Additional studies are needed to study gene flow between Sanibel Island rice rats and the nearby Pine Island and mainland subspecies to determine if they are distinct subspecies. However, recent molecular analyses have supported the subspecific status of *O. p. sanibeli* (Indorf 2010). Using both mitochondrial and nuclear DNA analysis, Indorf concluded that a moderate level of differentiation had occurred between the Sanibel Island rice rat and other mainland rice rats, comparable to differentiation accepted for subspecies status in other rodents.

Life History – The Sanibel Island rice rat is relatively small with a length of 263mm and an average weight of 71g. Its pelage is argus brown or amber brown.

There is virtually nothing known about the life history, behavior, and biology of the Sanibel Island rice rat so this information is summarized using information on the species, *Oryzomys palustris*, taken from Wolfe (1982). More information on these aspects of the Sanibel Island rice rat needs to be collected.

Oryzomys palustris is semi-aquatic and can be found in coastal marshes, hydric hammocks, swamps, and freshwater marshes and meadows. Rice rats also use mangrove swamps in coastal areas of Florida.

Breeding can occur throughout the year although there may be an intrinsic bimodal seasonal cycle that is affected by population and environmental variables. Gestation lasts between 21 and 28 days. Average litter size is around four or five. Neonates weigh between three and four grams. Weaning occurs sometime between day 11 and 20. Sexual maturity is reached at 50 to 60 days of age. Longevity of *Oryzomys* sp. is generally less than one year (Nowak 1999).

Rice rats have nests the size of grapefruits that are woven from grasses and sedges. They are usually located at the bases of shrubs, at the end of shallow burrows, placed on high ground under debris, or woven into thick stands of emergent grasses well above water level.

Rice rats eat a wide variety of foods including insects, crabs, snails, fishes, clams, birds, fungi, vegetation, and seeds.

Rice rats are preyed upon by owls, hawks, snakes, mustelids, foxes, and raccoons.

Densities of rice rats are known to range from 0.1 to 3.3 individuals per hectare in a sedge-shrub community on coastal dunes, to 50 individuals per hectare in the Florida Everglades. Whitaker and Hamilton (1998) indicate “not usually above 10/ha.” Kruchek (2004) found densities along the Texas coast were not seasonally dependent, but varied by habitat. Estimates for wetland densities were 10.5 individuals/hectare and upland densities were 3.1 individuals/hectare. Upland sites were dominated by juveniles, and may have functioned as ecological sinks. Bloch and Rose (2005) found densities to be seasonally dependent at two different salt marsh sites, with densities at site one ranging from three individuals/ha in the spring to 15 individuals/ha in the winter. At site two densities were greatest in the fall (87 individuals/ha) and lowest in the winter (8 individuals/ha).

Home range sizes of 0.25 and 0.37 ha have been calculated for males and 0.23 and 0.33 ha for females.

Geographic Range and Distribution – The Sanibel Island rice rat is endemic to Sanibel Island, Florida.

Population Status and Trend – No population estimates have been done for the Sanibel Island rice rat (SIRR). Genetic analysis by Indorf (2010) did not find evidence of recent population expansion; nucleotide and haplotype diversity was low, which may indicate a small or isolated population. The SIRR population probably declined as Sanibel Island was settled by humans. The human population now seems to have stabilized at approximately 6000 people, however, so assuming there is little additional development on the island, the Sanibel Island rice rat is unlikely to experience rapid loss of habitat in the future. A continued decline in quality of habitat is still likely as urbanization precludes maintaining burn regimes in wetland systems.

According to Florida's Comprehensive Wildlife Conservation Strategy (FWC 2005), *O. p. sanibeli* can be found in salt marsh (which is in poor condition and declining), mangrove swamp (which is in poor condition and declining), and disturbed/transitional habitat (the condition of which is unknown). Cox and Kautz (2000) characterize the habitat as "heavily fragmented" and within "heavily urbanized areas." Using data from Endries et al (2009) and Zwick and Carr (2006), a 5% decline in habitat is estimated to occur by 2020.

Quantitative Analyses – A population viability analysis carried out on the Sanibel Island rice rat found that the probability of extinction in the next 100 years was 84% if only managed habitat was taken into consideration and 70% if all potential habitat was used in analyses (Root and Barnes 2006). There was also an 86% probability of a 90% decline in abundance. The model included stable habitat conditions with no catastrophic change (hurricanes). The model, however, was quite sensitive to small changes in the demographic parameters, with changes in juvenile survival and subadult fecundity as main factors affecting survival (Root and Barnes 2006).

BIOLOGICAL STATUS ASSESSMENT

Threats – Threats to the Sanibel Island rice rat are habitat loss, habitat degradation, habitat fragmentation, predation by free-ranging cats and competition with black rats (*Rattus rattus*). Habitat loss has been reduced by wetland protection regulations, and preservation of land in conservation areas, primarily at the J.N. "Ding" Darling National Wildlife Refuge and properties owned by the Sanibel Captiva Conservation Foundation. Degradation and fragmentation are ongoing problems. Lack of fire in wetland systems because of urbanization has allowed encroachment of upland vegetation and poses a threat to some of the remaining habitat on conservation lands. No estimate is given of the threat of free-ranging cats or competition with other exotics. Sea level rise and climate change impacts will become an increasing threat.

Population Assessment – Findings from the BRG are included in the following Biological Status Review information table. The BRG found that the Sanibel Island rice rat (*Oryzomys palustris sanibeli*) meets listing criteria as described in 68A-27.001, F.A.C.

LISTING RECOMMENDATION

Staff recommends that the Sanibel Island rice rat be listed as a Threatened species.

SUMMARY OF THE INDEPENDENT REVIEW

Comments on the draft status review report were received from 4 reviewers, Dr. Beth Forys (Eckerd College), Dr. Jane Indorf (University of Miami), Dr. Bob McCleery (University of Florida) and Ms. Tara Wertz (Ding Darling National Wildlife Refuge). Appropriate editorial changes recommended by the reviewers were made to the report. All four reviewers concurred with the staff recommendation. One reviewer did not think that the PVA by Root and Barnes was well done, but agreed that the findings were justified since other criteria for listing were also met. One reviewer suggested adding an additional threat on the lack of fire in marsh habitats. Staff concurs, and this has been added in the Threats section. A reviewer suggested an additional citation, and this has been added in the Taxonomic Classification section. A reviewer also clarified the data source for information in the findings table, and the table has been edited.

Two reviewers commented on the genetic information and subspecies status contained in the report. One of the reviewers suggested adding additional information to clarify the distinctness of the Sanibel Island rice rat from mainland subspecies, and an additional statement has been incorporated into the Taxonomic Classification section. The second reviewer, while concurring that the listing status was justified, suggested that genetic analysis did not support subspecies status. As they were initiating the review, staff and panel members were directed to assess the Sanibel Island rice rat as it is currently listed, which is as a subspecies. Peer reviews are available at MyFWC.com.

LITERATURE CITED

Bloch, C.P. and R.K. Rose. 2005. Population dynamics of *Oryzomys palustris* and *Microtus pennsylvanicus* in Virginia tidal marshes. Northeastern Naturalist 12(3):295-306.

Bryant, Amanda. Personal communication on trapping result at Sanibel Captiva Conservation Foundation and J. N. 'Ding' Darling National Wildlife Refuge. Data on file at JNDDNWR, Sanibel.

Cox, J.A. and R.S. Kautz. 2000. Habitat conservation needs of rare and imperiled wildlife in Florida. Office of Environmental Services, Florida Fish and Wildlife Conservation Commission, Tallahassee, Florida.

Endries, M., B. Stys, G. Mohr, G. Kratimenos, S. Langley, K. Root, and R. Kautz. 2009. Wildlife Habitat Conservation Needs in Florida. Fish and Wildlife Research Institute Technical Report TR-15. x + 178 p.

Florida Fish and Wildlife Conservation Commission (FWC). 2005. Florida's Wildlife Legacy Initiative. Florida's Comprehensive Wildlife Conservation Strategy. Tallahassee, Florida, USA.

Frankham, R., J.D. Ballou, and D.A. Briscoe. 2002. Introduction to Conservation Genetics. Cambridge University Press. Cambridge UK. 617pp.

Hamilton, W.J. 1955. Two new rice rats (genus Oryzomys) from Florida. Proceedings of the Biological Society of Washington. 68:83-86.

Humphrey, S.R. and H.W. Setzer. 1989. Geographic variation and taxonomic revision of rice rats (*Oryzomys palustris* and *O. argentatus*) of the United States. Journal of Mammalogy 70(3):557-570.

Indorf, J.L. 2010. Phylogeography of the marsh rice rat (*Oryzomys palustris*) in wetlands of the southeastern United States. Unpublished Ph.D. dissertation. University of Miami. 208pp.

Kruchek, B.L. 2004. Use of tidal marsh and upland habitats by the marsh rice rat (*Oryzomys palustris*). Journal of Mammalogy 85(3):569-575.

Nowak, R. M. 1999. Walker's Mammals of the World. Sixth Edition. Volume II. The Johns Hopkins University Press. Baltimore, Maryland, USA.

Root, K.V. and J. Barnes. 2006. Risk assessment for a focal set of rare and imperiled wildlife in Florida – Final Report. FWC Contract No. 03111. Florida Fish and Wildlife Conservation Commission, Tallahassee, Florida

Whitaker, J.O. and W.J. Hamilton, Jr. 1998. Mammals of the Eastern United States. Cornell University Press. Ithaca, New York, USA. 583pp.

Wolfe, J.L. 1982. *Oryzomys palustris*. Mammalian Species 176:1-5.

Zwick, P.D. and M.H. Carr. 2006. Florida 2060: A population distribution scenario for the State of Florida. A research project prepared for 1000 Friends of Florida. Geoplan Center at the University of Florida, Gainesville, Florida, USA. 25pp.

Biological Status Review Information
Findings

Species/taxon: Sanibel Island Rice Rat
Date: 11/04/10
Assessors: Melissa Tucker, FWC; Jack Stout, UCF; Amanda Bryant SCCF
Generation length: < 1 year (use 10 yr assessment period)

Criterion/Listing Measure	Data/Information	Data Type*	Sub-Criterion Met?	References
*Data Types - observed (O), estimated (E), inferred (I), suspected (S), or projected (P). Sub-Criterion met - yes (Y) or no (N).				
(A) Population Size Reduction, ANY of				
(a)1. An observed, estimated, inferred or suspected population size reduction of at least 50% over the last 10 years or 3 generations, whichever is longer, where the causes of the reduction are clearly reversible and understood and ceased[1]	No range-wide surveys for population reduction; habitat has likely improved through removal of exotic plants over the 10 yr period, although threats from fragmentation have not ceased.	S	N	
(a)2. An observed, estimated, inferred or suspected population size reduction of at least 30% over the last 10 years or 3 generations, whichever is longer, where the reduction or its causes may not have ceased or may not be understood or may not be reversible[1]	No range-wide surveys for reduction; habitat has likely improved through removal of exotic plants over the 10 yr period.	S	N	
(a)3. A population size reduction of at least 30% projected or suspected to be met within the next 10 years or 3 generations, whichever is longer (up to a maximum of 100 years) [1]	No range-wide surveys for reduction; habitat has likely improved through removal of exotic plants over the 10 yr period.	S	N	
(a)4. An observed, estimated, inferred, projected or suspected population size reduction of at least 30% over any 10 year or 3 generation period, whichever is longer (up to a maximum of 100 years in the future), where the time period must include both the past and the future, and where the reduction or its causes may not have ceased or may not be understood or may not be reversible.[1]	No range-wide surveys for reduction; habitat has likely improved through removal of exotic plants over the 10 yr period.	S	N	
[1] based on (and specifying) any of the following: (a) direct observation; (b) an index of abundance appropriate to the taxon; (c) a decline in area of occupancy, extent of occurrence and/or quality of habitat; (d) actual or potential levels of exploitation; (e) the effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites.				
(B) Geographic Range, EITHER				
(b)1. Extent of occurrence < 20,000 km^2 (7,722 mi^2) OR	Sanibel Island is approximately 33mi^2	O, E	Y	
(b)2. Area of occupancy < 2,000 km^2 (772 mi^2)	Potential habitat has been mapped by Endries et al as 0.97 mi^2 , and by Cox and Kautz as 0.26mi^2. See notes (#1) on area of occupancy.	E	Y	Endries et al. (2009); Cox and Kautz (2000)

AND at least 2 of the following:				
a. Severely fragmented or exist in ≤ 10 locations	Sanibel Island is considered one location, because a single event such as a hurricane could impact all rice rats. SIRR use "heavily fragmented" habitat that occurs within a matrix considered to be "heavily urbanized" by Cox and Kautz based on mapping data.	O,I	Y	Cox and Kautz (2000)
b. Continuing decline, observed, inferred or projected in any of the following: (i) extent of occurrence; (ii) area of occupancy; (iii) area, extent, and/or quality of habitat; (iv) number of locations or subpopulations; (v) number of mature individuals	May be a continuing decline in (ii) AOO and (iii) quality of habitat. Still some concerns that while habitat in conservation areas is managed, that management may not be maintaining habitat suitability, but don't have data to state with certainty.	I,S	N?	Inferred from trapping records on SCCF; A. Bryant (SCCF) personal communication.
c. Extreme fluctuations in any of the following: (i) extent of occurrence; (ii) area of occupancy; (iii) number of locations or subpopulations; (iv) number of mature individuals	Trapping at Ding Darling NWR and SCCF properties since 2005 have resulted in captures on DDNWR, but no captures on SCCF lands, which may indicate fluctuations in ii.) area of occupancy. Not enough data to assess with certainty. See notes (#2) for more details.		N	Inferred from trapping records on SCCF; A. Bryant (SCCF) personal communication, data on file at JNDDNWR, Sanibel.
(C) Population Size and Trend				
Population size estimate to number fewer than 10,000 mature individuals AND EITHER	No published population estimate is available. Using density estimates from published literature and area of occupancy, maximum number of individuals is less than 10,000. See notes (#3) for full explanation.	E	Y	Endries et al. (2009); Cox and Kautz (2000); inferred from trapping records on JNDDNWR and SCCF; Bloch and Rose (2005); Kruchek (2004)
(c)1. An estimated continuing decline of at least 10% in 10 years or 3 generations, whichever is longer (up to a maximum of 100 years in the future) OR	No data on population decline; projections for future decline are roughly 5%, although this is likely an overestimate based on differences in the pixel size of GIS data layers.	I	N	Endries et al (2009); Zwick and Carr (2006)
(c)2. A continuing decline, observed, projected, or inferred in numbers of mature individuals AND at least one of the following:	A continuing decline in individuals is inferred from the projected decline in habitat - see (c)1 for details.	I	Y	Endries et al (2009); Zwick and Carr (2006)

a. Population structure in the form of EITHER	No known subpopulations exist.	S	N	
(i) No subpopulation estimated to contain more than 1000 mature individuals; OR				
(ii) All mature individuals are in one subpopulation	SIRR exists in a single population	E	Y	Indorf (2010) supports range and taxonomy
b. Extreme fluctuations in number of mature individuals	No data on fluctuations in mature individuals. Trapping data suggests potential fluctuations.	S	N	A. Bryant personal communication and data on file at JNDDNWR, Sanibel
(D) Population Very Small or Restricted, EITHER				
(d)1. Population estimated to number fewer than 1,000 mature individuals; OR	No published population estimate is available. Using density estimates from published literature and area of occupancy, maximum number of individuals is less than 10,000. If upper level of density estimates are used, population is greater than 1000. See notes (#3) for full explanation.	E, I	N?	Endries et al (2009); Cox and Kautz (2000); Bloch and Rose (2005); Krucheck (2004),;Whitaker and Hamilton (1998); Wolfe (1982)
(d)2. Population with a very restricted area of occupancy (typically less than 20 km^2 [8 mi^2]) or number of locations (typically 5 or fewer) such that it is prone to the effects of human activities or stochastic events within a short time period in an uncertain future	Area of occupancy estimated to be between .26 and .97 sq miles. Coastal island susceptible to hurricanes, and considered a single location.	E, I	Y	Cox and Kautz (2000); Endries et al (2009)
(E) Quantitative Analyses				
e1. Showing the probability of extinction in the wild is at least 10% within 100 years	Root and Barnes estimate a 70% chance of extinction in the next 100 years.	P	Y	Root and Barnes (2006)

Initial Finding (Meets at least one of the criteria/sub-criteria OR Does not meet any of the criteria)	Reason (which criteria/sub-criteria are met)
Meets 3 criteria	C (c)2aii, D2, E
Is species/taxon endemic to Florida? (Y/N)	Y
If Yes, your initial finding is your final finding. Copy the initial finding and reason to the final finding space below. If No, complete the regional assessment sheet and copy the final finding from that sheet to the space below.	
Final Finding (Meets at least one of the criteria/sub-criteria OR Does not meet any of the criteria/sub-criteria)	Reason (which criteria/sub-criteria are met)
Meets 3 criteria	C (c)2aii, D2, E

Additional notes

1. Area of occupancy: Endries et al 2009 estimate 250 ha (0.97 mi2) and included transitional habitats and drier upland areas in addition to wetlands. Upland sites may be sinks, and more likely occupied by juveniles (Krucheck 2004). Cox and Kautz (2000) estimated 68.29 ha (.26 mi2) and included freshwater and saltwater wetland habitats.
2. Trapping protocols are consistent across sites, and trapping sessions run concurrently. The reasons for absence of SIRR on SCCF during trapping over last 4 years is not understood, but may be tied to changes in coverage - specifically an increase by woody vegetation. Maintaining burn regimes are limited by the urban matrix and limited staffing at SCCF.
3. Population densities for rice rats in coastal habitats have been estimated from .1 to 87 rice rats per hectare (Wolfe 1982, Whitaker and Hamilton 1998, Kruchek 2004, Bloch and Rose 2005). Bloch and Rose caution against using density estimates, since methods for calculating differs between studies; however the review group used a conservative density of 3 rice rats /hectare (as reported by Wolfe 1982, Kruchek 2004, and Bloch and Rose 2005). At this density, and using the larger AOO from Endries et al 2009, populations were less than 10,000 individuals, and less than 1000 individuals. If higher reported densities are used (10/ha) with the higher Endries AOO, then the population is estimated to be greater than 1000 individuals.

Abbreviations:

SCCF – Sanibel Captiva Conservation Foundation

JNDDNWR – J.N. “Ding Darling” National Wildlife Refuge

SIRR – Sanibel Island rice rat

APPENDIX 1. Brief biographies of the Sanibel Island rice rat Biological Review Group members.

Melissa Tucker has a M. S. in Ecology from the University of Georgia. She has worked as the Mammal Taxa Coordinator in FWC's Species Conservation Planning Section since 2007. Ms. Tucker has worked over 5 years on wildlife conservation issues, including planning and implementing conservation actions for mammals statewide, with an emphasis on small mammal species.

Jack Stout has a Ph.D. from Washington State University. He is currently a Professor Emeritus at the University of Central Florida. Dr. Stout has worked over 30 years on the ecology and conservation of wildlife habitats and species in Florida, including Florida mice and beach mice.

Amanda Bryant has a B.S in Environmental & Conservation Biology from Philadelphia University. She is currently a biologist at Sanibel Captiva Conservation Foundation. Amanda's interests and work have focused mainly on threatened, endangered, and at-risk wildlife populations. She's worked predominately with small mammals including black-tailed prairie dogs, black-footed ferrets, and swift fox. Currently, she coordinates the sea turtle program, as well as assisting with other wildlife research and monitoring projects.

APPENDIX 2. Summary of letters and emails received during the solicitation of information from the public period of September 17, 2010 through November 1, 2010.

No information about this species was received during the public information request period