Georgia Blind Salamander 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
Georgia Blind Salamander
(*Eurycea wallacei*)
March 31, 2011

EXECUTIVE SUMMARY

The Florida Fish and Wildlife Conservation Commission (FWC) directed staff to evaluate all species listed as Endangered, 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 Florida population of the Georgia blind salamander was sought from September 17 through November 1, 2010. A five-member Biological Review Group (BRG) met on November 9-10, 2010. Group members were Bill Turner (FWC lead), Ryan Means (Coastal Plains Institute), Kelly Jones (Virginia Tech), John Himes (FWC), and Paul Moler (independent consultant) (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 Georgia blind salamander using criteria included in definitions in 68A-27.001, F.A.C., and following 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 input received from the public are available as supplemental materials at http://myfwc.com/wildlifehabitats/imperiled/biological-status/.

The BRG concluded from the biological assessment that the Georgia blind salamander met listing criteria. Based on the BRG findings, literature review, and information received from independent reviewers, staff recommends listing the Georgia blind salamander as a Threatened species.

This work was supported by a Conserve Wildlife Tag grant from the Wildlife Foundation of Florida.

BIOLOGICAL INFORMATION

Taxonomy – The Georgia blind salamander was originally described as *Haideotriton wallacei*, by Carr (1939). *Haideotriton* was recently placed into synonymy with *Eurycea* in order to render the latter genus monophyletic and FWC follows this nomenclature (Frost et al. 2006).

Geographic Range and Distribution – The Georgia blind salamander has been found in subterranean waters associated with the 1) Dougherty Plain at one site in Decatur County and

two sites in Dougherty County, Georgia; 2) Chipola River system at 22 sites in Jackson County and one site in Calhoun County, Florida; and 3) Holmes Creek (Choctawhatchee River) system at five sites in Washington County, Florida (Hammerson 2004; Florida Natural Areas Inventory unpubl. data). Because it is difficult to access and sample these habitats, it is probable that this species remains undocumented from additional sites in the appropriate habitat.

Life History and Habitat Requirements – The Georgia blind salamander is confined to the clear, oligotrophic, cool waters of underground streams and pools in caves and sinkholes, where it typically lives in perpetual darkness and does not voluntarily come to the surface. Substrate is typically limestone, often covered by clay or silt (Means 1992, 2005). Smaller individuals tend to be found in shallower water than are larger individuals (Means 1992). In conjunction with its highly specialized habitat and lifestyle, this species retains its aquatic larval body form throughout life, which includes gills. As typical of aquatic cave vertebrates, eyes are vestigial, and body pigmentation is greatly reduced (Valentine 1964; Brandon 1971). Adults are 51-76 mm in total length (Petranka 1998), but are otherwise similar in appearance to juveniles (Brandon 1971).

Gravid females of the Georgia blind salamander have been found in May and November, suggesting that breeding is not seasonal, but the reproductive biology of this species is otherwise incompletely known (Means 1992). Prey consists of small aquatic invertebrates, especially crustaceans such as ostracods and amphipods (Lee 1969). Although observations are lacking, likely predators include cave crayfishes, eels, bullheads, and chubs (Means 1992). In addition, this species may be parasitized by nematodes in its digestive tract (Lee 1969). Other aspects of this species' life history and behavior are largely unknown due to the difficulty of accessing its habitat and observing wild individuals.

BIOLOGICAL STATUS ASSESSMENT

Threats – The specialized habitat and life history of the Georgia blind salamander make it vulnerable to water pollution, changes in water levels, and collection by people (in the few sites that are easily accessible). Sources of water pollution include septic tank effluent, fertilizers, pesticides, hazardous wastes, surface runoff from impervious surfaces, waste from cattle ranches and dairy farms, and siltation and erosion caused by divers and recreationalists in caves, springs, sinkholes, and in the vicinity of blind salamander sites (Brandt and Jackson 2003). Decreases in water levels occur from pumping groundwater from wells (e.g., for providing water for irrigation or drinking), whereas increases in water levels occur from stream impoundment (Means 1992). Nonetheless, sightings of salamanders in caves flooded for decades by Merritt's Mill Pond (Marianna, Jackson Co.) still occur. The potential for most known sites to be affected by one or more of these threats is relatively high, particularly given that most are on private lands that receive limited management or protection (Morris 2006).

Population Assessment – Data on the Georgia blind salamander were evaluated relative to each of the five listing criteria under Rule 68A-27.001, F.A.C. There were two steps in assessing the status of a regional population: (1) use FWC criteria for a preliminary categorization and (2) investigate whether conspecific populations outside the region may affect the risk of extinction within the region. This status review found that the Georgia blind salamander met criterion B (Geographic Range). The species met this criterion due to its limited area of occupancy, occurring in less than ten locations, and continuing decline due to projected decreases in water quality and increased ground water use to support a growing human population in Florida and

Georgia. Although the distribution is debatable because the extent of the salamander's use of deep karst habitat is poorly known, the BRG recommended taking a conservative approach. The BRG, considering only the known sites, determined that the range was sufficiently small to meet Criterion (B) *Geographic Range*.

LISTING RECOMMENDATION

Staff recommend that the Georgia blind salamander be listed as a Threatened species.

SUMMARY OF THE INDEPENDENT REVIEW

This report was reviewed by Richard Franz (Florida Museum of Natural History Associate Scientist), John Jensen (State Herpetologist Georgia Department of Natural Resources), David Lee (Executive Director of the Tortoise Reserve), Mark Ludlow (Biological Scientist Torreya State Park), and Bruce Means (Coastal Plains Institute and Land Conservancy). All reviewers agreed with the findings of the BRG and supported the staff recommendation to list the Georgia blind salamander as threatened. Reviewers commented that the complete distribution of the Georgia blind salamander and the isolated nature of its population is poorly known. The BRG recognized this as well and chose only to consider known sites.

A reviewer pointed out that the species may not be severely fragmented because salamanders may travel through the aquifer, so the listing recommendation should clearly state that the number of sites (less than 10) was the factor. This change was made.

A reviewer suggested a linkage between bat distribution and Georgia blind salamander distribution. This will be considered during the development of management plans for these species.

Peer reviews are available at http://www.myfwc.com.

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Biological Status Review Information
Findings

Species/taxon: Georgia Blind Salamander
Date: 11/10/2010
Assessors: John Himes, Kelly Jones, Ryan Means
Paul Moler, Bill Turner
Generation length: Unknown, used 10 years for three generations

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 declines indicated	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 declines indicated	S	N	No declines indicated
(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]	Declining water quality and an increase in the nutrients in the Floridan aquifer system as well as increased drawdown threaten blind salamander populations, but there is no quantifiable salamander decline.	I	N	R Means pers. commun.
(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]	Declining water quality and an increase in the nutrients in the Floridan aquifer system as well as increased draw down threaten blind salamander populations, but there is no quantifiable salamander decline.	I	N	R Means pers. commun.
[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	Does not exceed 2151 mi^2 (total area of 3 counties = a maximum estimate of range)	E	Y	
(b)2. Area of occupancy < 2,000 km^2 (772 mi^2)	Area of occupancy is unknown but is probably less than 772 mi^2 based on estimated cave habitat of all three areas where the salamanders occur in FL.	I	Y	Used estimated habitat from GIS. Data layer was 2003 FWC landcover data. Beth Stys pers. commun. 2010.

AND at least 2 of the following:				
a. Severely fragmented or exist in ≤ 10 locations	Known to occur in 22 caves in Jackson County, FL, but several are probably connected and would be threatened by the same events, so we estimate that there are 10 or fewer locations.	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	Projections for decline are based on water quality trends and increased need for water to support population growth (iii)	S	Y (iii)	R. Means pers. commun.
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	Not indicated in literature	I	N	
(C) Population Size and Trend				
Population size estimated to number fewer than 10,000 mature individuals AND EITHER	Impossible to estimate -no basis to make determination			
(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 declines indicated	I	N	
(c)2. A continuing decline, observed, projected, or inferred in numbers of mature individuals AND at least one of the following:	No declines indicated	I	N	
a. Population structure in the form of EITHER	No data - because of anecdotal information it seems likely that there are more than 1000 individuals at least one subpopulation.	S	N	
(i) No subpopulation estimated to contain more than 1000 mature individuals; OR				
(ii) All mature individuals are in one subpopulation		I	N	
b. Extreme fluctuations in number of mature individuals	No data	S	N	
(D) Population Very Small or Restricted, EITHER				
(d)1. Population estimated to number fewer than 1,000 mature individuals; OR	No data but unlikely	S	N	
(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	We estimated using an area of 2 mi^2 around the mouths of the caves, but due to the complexity (many have numerous branches) of the caves, total area is probably greater than 8 mi^2; Group agreed that there are < 10 locations based on connectivity, but probably not < 5 locations	I	N	using GIS data Beth Stys pers. commun. 2010
(E) Quantitative Analyses				
e1. Showing the probability of extinction in the wild is at least 10% within 100 years	No PVA available			

Initial 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 one criterion	B1+2ab(iii)
Is species/taxon endemic to Florida? (Y/N)	N
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)	Meets one criterion

1	Biological Status Review Information Regional Assessment	Species/taxon: Georgia blind salamander
2		Date: 11/10/10
3		Assessors: John Himes, Kelly Jones, Ryan Means
4		Paul Moler, Bill Turner
5		
6		
7		
8	Initial finding	
9		
10	2a. Is the species/taxon a non-breeding visitor? (Y/N/DK). If 2a is YES, go to line 18. If 2a is NO or DO NOT KNOW, go to line 11.	N
11	2b. Does the Florida population experience any significant immigration of propagules capable of reproducing in Florida? (Y/N/DK). If 2b is YES, go to line 12. If 2b is NO or DO NOT KNOW, go to line 17.	N
12	2c. Is the immigration expected to decrease? (Y/N/DK). If 2c is YES or DO NOT KNOW, go to line 13. If 2c is NO go to line 16.	
13	2d. Is the regional population a sink? (Y/N/DK). If 2d is YES, go to line 14. If 2d is NO or DO NOT KNOW, go to line 15.	
14	If 2d is YES - Upgrade from initial finding (more imperiled)	
15	If 2d is NO or DO NOT KNOW - No change from initial finding	
16	If 2c is NO or DO NOT KNOW- Downgrade from initial finding (less imperiled)	
17	If 2b is NO or DO NOT KNOW - No change from initial finding	No Change
18	2e. Are the conditions outside Florida deteriorating? (Y/N/DK). If 2e is YES or DO NOT KNOW, go to line 24. If 2e is NO go to line 19.	
19	2f. Are the conditions within Florida deteriorating? (Y/N/DK). If 2f is YES or DO NOT KNOW, go to line 23. If 2f is NO, go to line 20.	
20	2g. Can the breeding population rescue the Florida population should it decline? (Y/N/DK). If 2g is YES, go to line 21. If 2g is NO or DO NOT KNOW, go to line 22.	
21	If 2g is YES - Downgrade from initial finding (less imperiled)	
22	If 2g is NO or DO NOT KNOW - No change from initial finding	
23	If 2f is YES or DO NOT KNOW - No change from initial finding	
24	If 2e is YES or DO NOT KNOW - No change from initial finding	
25		
26	Final finding	No Change

APPENDIX 1. Brief biographies of the Georgia blind salamander Biological Review Group members.

Dr. John H. Himes received his Ph.D. from the University of Southern Mississippi, M.S. from Louisiana State Medical Center, and B.S. from the University of Mississippi. He is currently a regional species conservation biologist for FWC. He has published many papers on southeastern herpetofauna.

Kelly Jones received his M.S. in Biology from Ball State University. He is currently the project manager for the Virginia Tech team working with red-cockaded Woodpeckers, Florida bog frogs, reticulated flatwoods salamanders, and gopher tortoises on Eglin Air Force Base. He has short notes in press on distribution and natural history of native and exotic herpetofaunal species in the Florida panhandle.

Ryan C. Means received both his M.S. in Wildlife Ecology and Conservation (2001) and his B.S. degree in Zoology (1996) from the University of Florida. He is a wildlife ecologist with the Coastal Plains Institute in Tallahassee, FL. His research interests focus on ecology and conservation of ephemeral wetlands and associated amphibian fauna in the southeastern Coastal Plain. Ryan has many other interests, including wilderness exploration, archaeology, paleontology, and anything related to being in the outdoors.

Paul E. Moler received his M.S. in Zoology from the University of Florida in 1970 and his B.A. in Biology from Emory University in 1967. He retired in 2006 after working for 29 years as a herpetologist with FWC, including serving as administrator of the Reptile and Amphibian Subsection of the Wildlife Research Section. He has conducted research on the systematics, ecology, reproduction, genetics, and conservation biology of a variety of herpetofaunal species in Florida, with primary emphasis on the biology and management of endangered and threatened species. He served as Chair for the Florida Committee on Rare and Endangered Plants and Animals in 1992–94, Chair of the Committee on Amphibians and Reptiles since 1986, and editor of the 1992 volume on amphibians and reptiles. Paul has >90 publications on amphibians and reptiles.

William M. Turner received his B.S. from Erskine College and M.S. in Biology from the University of South Alabama. From 2003 to 2007, he was the Herpetological Coordinator for the Wyoming Game and Fish Department. In Wyoming, he conducted statewide surveys for amphibians and reptiles, focusing on emerging amphibian diseases and the impacts of resources development on native reptiles. Since 2007, he has been the Herp Taxa Coordinator for FWC in the Division of Habitat and Species Conservation. He has conducted research on native amphibians and reptiles in Florida, Alabama, and Wyoming that has resulted in several published papers and reports.

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 comments were received during the public solicitation for information period.