Supplemental Information for the Black Creek Crayfish

Biological Status Review Report

The following pages contain peer reviews received from selected peer reviewers, comments received during the public comment period, and the draft report that was reviewed before the final report was completed

March 31, 2011

Table of Contents

Peer review #1 Dr. Keith Crandall

Evaluation of the Black Creek crayfish – *Procambarus pictus*

1) Completeness and accuracy of the biological information and data analysis

The evaluation of the Black Creek Crayfish is thorough and has consulted all the published data I am aware of on this crayfish. The conclusion is a listing of Threatened which seems justified by the data and methodology. The IUCN listing is Near Threatened which is consistent with the listing proposed here due to the restricted geographic range. There are well documented threats to this species that coupled with the restricted range justify the listing as Threatened.

2) Reasonableness and justifiability of assumptions, interpretations of data, and conclusions

The assumptions of the assessment are reasonable and the interpretations of the data appropriate and therefore the conclusion of Threatened is also a well justified conclusion. The species has a small extent of occurrence and has clear threats to the limited habitat. The "number of locations" is really not particularly helpful as this depends a lot on collecting effort and frequency of stops. More appropriate information would be gathered through genetic analysis of diversity and population substructure of the species. Nevertheless, the proposed status of Threatened is justified by the data. In the BSR Information Findings document, under data for population size reduction, there is listed "no data supporting xx% decline". Note that there is no data supporting that the population is stable either. This suggests that the conclusion is we assume populations are stable when we have no data. This is a dangerous approach to conservation biology and, I think, ill conceived. You should make conclusions based on what data you have, not on data you do not have. In this case, the data clearly indicate that the species is threatened.

Peer review # 2 from Dr. Dale Jackson

From: DaleJackson [mailto:djackson@fnai.org]
Sent: Wednesday, January 26, 2011 4:32 PM
To: Cook, David
Subject: P. pictus review plus replacement erythrops review

Dave, I noticed that I had not included my name on the erythrops comments I sent yesterday, so please substitute this one, which otherwise is unchanged.

Thanks for the other replies, which I'll dig into next week and use to update our database. I'll be back at FNAI on Monday if you need to reach me. Dale

Dale R. Jackson, Ph.D.
Senior Research Zoologist
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January 26, 2011

Procambarus pictus Final Draft BSR review
Dale R. Jackson, Ph.D.
Senior Research Zoologist, FNAI

The analysis seems proper; I believe it appropriate to err on the side of caution in this case, where development and land use changes in the region could substantially alter this species' habitat. I know of no additional data for the species. I provide a few additional comments below.

Literature Cited: I note that placement of this section is inconsistent between the BSRs for this species and *P. erythrops*. Follow the same format (before the table, I believe).

Text citations to "FNAI 2001" are confusing. There is no "FNAI" listed in Literature Cited, which lists "Florida Natural Areas Inventory," as it should. At least the first text citation needs to spell it out (and give acronym if use it subsequently, though can just spell it out for all, though I see FNAI in the table).

Table:

Area of occupancy: you could be more decisive, saying "much" < 772, or < 100 (given restriction to narrow streams).

Fluctuations: maybe better to say no "documented" fluctuations (no one really has data for this for number of adults).

Dd2: I find "AOO has not been calculated and might be < 20 km^2; ….. so criterion is not met" to be a bit inconsistent. The first part implies that it might be met, but we can't definitively say it is. So better to end with something like "so there are no conclusive data to confirm (or document) that the criterion is met."

E: the criterion itself is chopped off, not sure why FWC didn't fix this in their template, but it really should be.

Florida Resources and Environmental Analysis Center

Institute of Science and Public Affairs

Letters and emails received during the solicitation of information from the public period of September 17, 2010 through November 1, 2010

Email from Allan Hallman, FWC

To whom it may concern,

Please check your records and see if you were forwarded a copy of the 2008 survey that was conducted on Jennings State Forest and Camp Blanding Joint Training Site (National Guard base). The file is quite large so emailing it may not work (over 10MB). The document's title is:
Survey for Black Creek Crayfish at Jennings State Forest and Camp Blanding Joint Training Center, Clay and Duval Counties, Florida
FWC Final Report June 2008
Richard Franz, Heather Smith, and Allan Hallman

Please contact me at the following address if needed:

Allan Hallman
FWC - Camp Blanding Field Office
5629 SR 16 West, Bldg 4396
Starke, FL 32091

Email from Rick Cantrell

From: Rick Cantrell
To: Imperiled
Subject: Google Earth Placemark
Date: Monday, October 11, 2010 4:05:14 PM
Attachments: GoogleEarth_Placemark.kmz

While permitting the DuPont Maxville mine, DEP encountered a substantial population of Black Creek crayfish within the red polygon in part resulting in permitted mining being moved upstream from the requested locations.
Richard W. Cantrell

Email from Patrick O'Connor, DEP

From: OConnor, Patrick
To: Imperiled
Subject: Black Creek Crayfish
Date: Monday, October 18, 2010 10:37:06 AM

Information regarding the Black Creek Crayfish collected as part of our Stream Condition Index samplings should be available in the States database SBIOS.

Copy of the Black Creek crayfish BSR draft report that was sent out for peer review

Biological Status Review for the Black Creek Crayfish (*Procambarus pictus*)

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 September 1, 2010. Public information on the status of the Black Creek crayfish (*Procambarus pictus*) was sought from September 17 to November 1, 2010. The members of the biological review group (BRG) met on November 18, 2010. Group members were David Cook (FWC lead), Paul Moler (retired FWC biologist, serving as an independent consultant), and Richard Franz (retired University of Florida/Florida Museum of Natural History biologist, serving as an independent consultant). In accordance with rule 68A-27.0012 Florida Administrative Code (F.A.C.), the BRG was charged with evaluating the biological status of the Black Creek crayfish using criteria included in definitions in 68A-27.001(3) 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://www.myfwc.com/WILDLIFEHABITATS/imperiledSpp_listingprocess.htm to view the listing process rule and the criteria found in the definitions.

The BRG concluded that the Black Creek crayfish met listing Criterion B (geographic range), based on the species' small extent of occurrence and area of occupancy, its distribution among 10-12 threat-prone "locations," and observed and projected continuing decline in area of occupancy and quality of habitat. Staff recommended that the Black Creek crayfish be included on the State-designated Threatened list because it meets criteria for listing as described in 68A-27.001(3).

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

BIOLOGICAL INFORMATION

Life History References Franz and Franz 1979, Brody 1990, Franz 1994.

Taxonomic Classification The current scientific name for the Black Creek crayfish is *Procambarus* (*Ortmannicus*) *pictus* Hobbs, with no recognized subspecies. Hobbs 1942, 1958.

Population Status and Trend Franz and Franz 1979, Brody 1990, Franz and Franz 1990, Franz 1994, Franz et al. 2008.

Geographic Range and Distribution This species is endemic to Florida and is known from headwater streams in Clay, Duval, Putnam, and St. Johns counties. Burgess and Franz 1978, Franz and Franz 1979, Franz 1994, Franz et al. 2008, P. Moler pers. comm.

Quantitative Analyses We are not aware of a population viability analysis that has been done for the Black Creek crayfish.

BIOLOGICAL STATUS ASSESSMENT

Threats – This species is restricted to higher-quality headwater streams (Franz and Franz 1979). Potential threats include pollution, change in water temperature, siltation, damming, and other changes in water and habitat quality (Franz and Franz 1979, Brody 1990, Franz and Franz 1990, FNAI 2001). Populations on public lands (Camp Blanding and Jennings State Forest) may receive some protection, but those localities on private lands may be threatened with expanding urbanization, mining, and silviculture (Brody 1990, Franz and Franz 1990, FNAI 2001). Franz et al. (2008) reported specimens with a fungal disease, but the potential impact of this is unknown.

Statewide Population Assessment – The BRG concluded that the Black Creek crayfish met listing Criterion B (Geographic Range), based on the species' small extent of occurrence and area of occupancy, its distribution among 10-12 threat-prone "locations," and observed and projected continuing decline in area of occupancy and quality of habitat. Determining the number of locations depends on how finely one divides the Black Creek drainage, which has several tributaries that may or may not constitute separate locations. Because the number of locations is close to the "$\leq$ 10 locations" specified in this criterion, the BRG is exercising precautionary principles by considering that this criterion is met. This assessment is specifically written as B1+2a,b(ii,iii). Specific findings from the BRG, including justification and pertinent references, are included in the Biological Status Review Information Findings tables below.

LISTING RECOMMENDATION

Staff recommends that the Black Creek crayfish be listed as a Threatened species because it meets criteria for listing as described in 68A-27.001(3) F.A.C.

SUMMARY OF INDEPENDENT REVIEW This will be completed after the peer review.

LITERATURE CITED

Brody, R.W. 1990. Status of habitat and populations of *Procambarus pictus* in the North Fork of Black Creek, Clay County, Florida. St. Johns River Water Management District, Palatka, Florida.

Burgess, G.H. and R. Franz. 1978. Zoogeograpy of the aquatic fauna of the St. Johns River system with comments on adjacent peninsular faunas. The American Midland Naturalist 100: 160-170.

Florida Natural Areas Inventory. 2001. Black Creek crayfish, *Procambarus pictus*. Field guide to the rare animals of Florida. Florida Natural Areas Inventory, Tallahassee, Florida.

Franz, R. 1994. Rare: Black Creek crayfish. Pp. 211-214 in Deyrup, M. and R. Franz (eds.). Rare and endangered biota of Florida. Volume IV. Invertebrates. University Press of Florida.

Franz, R. and L.M. Franz. 1979. Distribution, habitat preference and status of populations of the Black Creek crayfish, *Procambarus* (*Ortmannicus*) *pictus* (Decapoda: Cambaridae). Florida Scientist 42: 13-17.

Franz, R. and S.E. Franz. 1990. A review of the Florida crayfish fauna, with comments on nomenclature, distribution, and conservation. Florida Scientist 53: 286-296.

Franz, R., H. Smith, and A. Hallman. 2008. Survey for Black Creek crayfish (*Procambarus pictus*) at Jennings State Forest and Camp Blanding Joint Training Center, Clay and Duval counties, Florida. Florida Fish and Wildlife Conservation Commission final report, June 2008.

FWC staff. 2010. Created from http://en.wikipedia.org/wiki/List_of_counties_in_Florida and http://dlis.dos.state.fl.us/library/flcollection/landWater.cfm

Hobbs, H.H., Jr. 1942. The crayfishes of Florida. University of Florida Biological Science Series 3: 179 pp + 24 plates.

Hobbs, H.H., Jr. 1958. The evolutionary history of the *pictus* group of the crayfish genus *Procambarus*. Quarterly Journal of the Florida Academy of Sciences 21: 71-91.

Biological Status Review Information
Findings

Species/taxon: Black Creek crayfish *Procambarus pictus*
Date: 11/18/10
Assessors: David Cook, Paul Moler, Richard Franz

Generation length: Estimated 16 months; default time frame 10 years

Criterion/Listing Measure	Data/Information	Data Type*	Criterion Met?	References
*Data Types - observed (O), estimated (E), inferred (I), suspected (S), or projected (P). 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 data for 50% decline		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 data for 30% decline		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 data for 30% decline		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 data for 30% decline		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	Maximum EOO estimated < 1700 mi^2	E	Y	Franz and Franz 1979, Franz and Franz 1990,Franz 1994, P. Moler pers comm, FWC staff 2010

(b)2. Area of occupancy < 2,000 km^2 (772 mi^2)	Unknown, but restricted to streams, so estimated < 772 mi^2	E	Y	Franz and Franz 1979, Franz and Franz 1990, Franz 1994, P. Moler pers comm
AND at least 2 of the following:				
a. Severely fragmented or exist in ≤ 10 locations	Estimated 10-12 locations (4-6 in Black Creek drainages, plus Peters Creek, Governors Creek, Rice/Etoniah Creek, Durbin Creek, Julington Creek, Holly Oaks Creek); BRG is exercising precautionary principles by considering that this criterion is met	I	Y	Franz et al. 2008, P. Moler pers comm.
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	Projected continuing development of Clay County and portions of Duval County is expected to result in decline in area of occupancy (ii) and quality of habitat (iii)	O, P	Y	Brody 1990, Franz and Franz 1990, FNAI 2001
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	No fluctuations			
(C) Population Size and Trend				
Population size estimate to number fewer than 10,000 mature individuals AND EITHER	Total population estimated > 10,000	E	N	
(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				
(c)2. A continuing decline, observed, projected, or inferred in numbers of mature individuals AND at least one of the following:				
a. Population structure in the form of EITHER				
(i) No subpopulation estimated to contain more than 1000 mature individuals; OR				
(ii) All mature individuals are in one subpopulation				
b. Extreme fluctuations in number of mature individuals				
(D) Population Very Small or Restricted, EITHER				
(d)1. Population estimated to number fewer than 1,000 mature individuals; OR	Total population estimated > 10,000	E	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	AOO has not been calculated and might be < 20 km^2; however, the number of locations is estimated to be 10-12 and it is unlikely that most or all could be extirpated by proposed threats over the specified 1-2 generations (2-3 years), so criterion is not met	I	N	
(E) Quantitative Analyses				
e1. Showing the probability of extinction in the wild is at least 10% within 100 years	No extinction probability model done		N	

Initial Finding (Meets at least one of the criteria OR Does not meet any of the criteria)	Reason (which criteria are met)
Meets at least one of the criteria	B1+2a,b(ii,iii)
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 OR Does not meet any of the criteria)	Reason (which criteria are met)
Meets at least one of the criteria	B1+2a,b(ii,iii)

Appendix 1. Biological Review Group Member Biographies

David Cook received his B.S. in Biology from Brown University and his M.S. in Zoology from the University of Florida. He has worked for 24 years as a nongame biologist with GFC/FWC, with primary emphasis on reptiles, amphibians, and invertebrates. He currently serves as the Invertebrate Taxa Coordinator in the FWC's Species Conservation Planning Section, and has drafted management plans on the flatwoods salamander, Panama City crayfish, and Miami blue butterfly.

Richard Franz received his M.S. at the University of Montana. He is an Emeritus, Associate Scientist in Ecosystem Conservation with the Florida Museum of Natural History and an Emeritus, Affiliate Associate Scientist in Wildlife Ecology and Conservation at the University of Florida. He has been studying the ecology and systematics of Florida crayfish for more than forty years. He has conducted field studies and surveys on both the Black Creek and Santa Fe cave crayfish, and published scientific papers on both of these species.

Paul Moler received his B.A. in Biology from Emory University and his M.S. in Zoology from the University of Florida. He worked for 29 years as a research biologist with GFC/FWC, with primary emphasis on reptiles and amphibians. He retired in 2006. Over the last 10 years, he has increasingly focused on research and conservation of Florida's freshwater crayfish and is currently completing a Commission funded genetic assessment of the cave crayfishes of Florida.

Appendix 2. Summary of letters and e-mails received during the solicitation of information from the public.

Two items were submitted by the public. One, from Mr. Allan Hallman, FWC biologist on Camp Blanding, was the suggestion submitted on September 13, 2010 to review a Black Creek crayfish survey report from 2008 on which he was a coauthor. Mr. Hallman later submitted a copy of the report, which was included and cited (Franz et al. 2008) in the BSR assessment.

The other item was a Google Earth data point for the Black Creek crayfish submitted on October 11, 2010 by Mr. Richard Cantrell of Entrix, Inc. This information was provided to the BRG for its review.

Appendix 3. Information and comments received from independent reviewers