Supplemental Information for the Harlequin Darter

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 from Dr. Catherine Phillips

From: Catherine_Phillips@fws.gov
To: Imperiled
Subject: review of BSR
Date: Thursday, January 27, 2011 10:55:59 AM
Attachments: CT Phillips Review of BSR Florida.docx

Attached is my review of the BSR for the Southern tesselated darter, the Harlequin darter, and the Crystal darter.

Please contact me if you have any questions.

Catherine T. Phillips, PhD
Deputy Project Leader - FWCO
Panama City Field Office
U.S. Fish and Wildlife Service
1601 Balboa Ave
Panama City, Florida 32405

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Panama City Field Office
1601 Balboa Avenue
Panama City, Florida 32405
850-769-0552 ext.242
Catherine_Phillips@fws.gov

27 January 2011

Mr. John Knight,

Attached is my review of the Biological Status Review of the crystal darter, the harlequin darter, and the Southern tessellated darter. Please contact me if you have any questions or need any clarification regarding my review.

Sincerely,

Catherine T. Phillips, PhD
Deputy Project Leader – Fish and Wildlife Conservation Office

Review of Biological Status Review for *Crystallaria asprella, Etheostoma olmstedi maculaticeps*, and *Etheostoma histrio*

Harlequin darter - *Etheostoma histrio*

"Bass et al (2004) collected harlequin darters from only eight locations between 2002 and 2004." This statement is deceiving because it does not list how many possible locations were surveyed. For example, eight out of a possible eight locations my mean that the population is doing well in Florida given its limited range. Based on the literature and Bass et al. (2004) report, I could not get a good feel for abundance. There are also sampling biases because they are found in areas that are difficult to sample, or not traditionally sampled.

It was also once believed that *E. histrio* migrated from larger rivers into smaller creeks and streams during spawning season. This may be important to consider in the BSR (if there is data to back this up this statement from Etnier and Starnes (2003), because this would mean that more than one habitat type would need to be preserved to conserve the species. Both habitat types would have to be evaluated to determine the species' status.

Given the limited information, I recommend that this species remain a species of concern.

Peer review #2 from Dr. Brett Albanese

From: Brett Albanese
To: Imperiled
Subject: Re: Harlequin darter Draft BSR Report
Date: Tuesday, December 21, 2010 10:45:25 AM

I concur with the decision not to list the harlequin darter as a state threatened species. As stated in the BSR, this species does not meet any of the IUCN listing criteria. However, its small geographic ranges makes this species of long-term conservation concern in Florida and it should be retained on Florida's special concern list.

Thanks,

Brett Albanese, Ph.D.
Georgia Department of Natural Resources
Nongame Conservation Section
Wildlife Resources Conservation Center
2065 U.S. Highway 278 SE
Social Circle, GA 30025-4743

Peer review #3 from Dr. Larry Page

From: Larry Page
To: Imperiled
Subject: Re: Harlequin darter Draft BSR Report
Date: Tuesday, January 25, 2011 11:37:42 AM
Attachments: Crystal darter BSR final draft - L. Page.doc
Harlequin darter BSR final draft - L. Page.doc
Letter re. Crystallaria asprella for FWC.doc
Letter re. Etheostoma histrio for FWC.doc
Letter re. Etheostoma olmstedi for FWC.doc
Readable Version of #2A976E.doc
Southern tessellated darter BSR Final draft - L. Page.doc

Dear Dr. Haubold: I have attached a letter with my brief comments on each of the three species reviews I was asked to read. All seem basically fine to me, except I do not understand what is meant by 'generation time.' On each review I have made the same comment: I don't understand what is meant by 'generation time.' If the species reaches sexual maturity at one year, isn't the generation time one year?

Also, I have made some editorial corrections and suggestions on each of the original files sent to me, and attached those as well.

Thank you for allowing me to review these reports. Please let me know if I can be of more assistance. Larry

25 January 2011

Elsa M. Haubold, Ph.D.
Section Leader, Species Conservation Planning
Florida Fish and Wildlife Conservation Commission

Dear Dr. Haubold:

The biological status review for the Tessellated Darter prepared by your office appears to be based on complete and accurate information, and I concur with your interpretations and conclusions with one exception. I don't understand your use of the term "generation time." This may be a misunderstanding on my part, but it seems to me that if a species reaches sexual maturity at one year, it has a generation time of one year.

I have made some editorial suggestions on the original file.

Thank you for allowing me to review this report.

Sincerely,

Larry M. Page
Curator of Fishes, Florida Museum of Natural History

Biological Status Review
for the
Harlequin Darter
(*Etheostoma histrio)*

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 harlequin darter was sought from September 17 to November 1, 2010. The three member biological review group (BRG) met on November 18 and 19, 2010. Group members were John R. Knight (FWC lead), William Tate (U. S. Fish and Wildlife Service), and Howard Jelks (U. S. Geological Survey). In accordance with rule 68A-27.0012 Florida Administrative Code (F.A.C.), the BRG was charged with evaluating the biological status of the harlequin darter 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 Harlequin Darter BRG concluded from the biological assessment that the harlequin darter, *E. histrio*, did not meet any of the criteria for designation as a State-threatened species. They also, however, expressed concerns about the adequacy of the data currently available for making this evaluation. FWC staff therefore recommends that the harlequin darter be maintained as a Species of Special Concern until more data can be collected.

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

BIOLOGICAL INFORMATION

Taxonomic Classification – This status report is for the harlequin darter, *Etheostoma histrio* (Jordan and Gilbert 1887), in Florida.

Life History References – Bass et al. 2004, Boschung and Mayden 2004, Steinberg et al. 2000, Etnier and Starnes 1993, Gilbert and Yerger 1992, Page 1983, Kuhajda and Warren 1989, Kuehne and Barbour 1983, Hubbs and Pigg 1972. [shouldn't these dates be in parentheses?]

Geographic Range and Distribution – Harlequin darters are widely distributed in the lower Mississippi basin, predominantly below the fall line. Occasionally the species is distributed above the fall line (Ohio, Arkansas, Embarras, and Green ~~R~~rivers) (Kuehne and Barbour 1983). Specifically, harlequin darters range from Illinois, Indiana, and Kentucky, south to the Escambia River and west to Texas (Boschung and Mayden 2004, Etnier and Starnes 1993, Page 1983). In Florida, harlequin darters are only known from the Escambia River (Escambia/Santa Rosa counties). The species was first collected from Florida by Yerger and Suttkus (1962), and additional records are sporadic for the species (36 collection records 1962 to

2009). Harlequin darters are found in both the mainstem Escambia River and its tributaries. Collection records from the mainstem range from the Escambia River at the Florida/Alabama state line, south to the White River section of the Escambia (17.5 km ESE of Milton, Florida) (Knight unpublished data). Harlequin darters are known to occur in the following tributaries:; Big Escambia, Little Escambia, Pine Barren, Canoe, and Mitchell Ccreeks.

Population Status and Trend – No population status or trend data are currently available for harlequin darters. The species appears to be declining in some areas on the periphery of its range, specifically in Alabama, Missouri, and Kentucky (Boschung and Mayden 2004, Kuehne and Barbour 1983). Bass et al. (2004) collected harlequin darters from only eight locations in Florida between 2002 and 2004. Furthermore, only ten individuals were collected (four different locations) during sampling conducted from 2005 to 2008 (Knight and Katechis 2008). Harlequin darters are generally uncommon in museum collections, although it is not certain whether this indicates rarity or that the species' preferred habitats are difficult to sample (Boschung and Mayden 2004, Etnier and Starnes 1993).

Generation Length- Harlequin darters reach sexual maturity at age one, and the maximum age observed is four years (Boschung and Mayden 2004, Kuhajda and Warren 1989). Therefore the estimated generation time is 2.5 years. [I don't understand what is meant by 'generation time.' If the species reaches sexual maturity at one year, isn't the generation time one year?]

Quantitative Analyses – There have been no population viability analyses (PVA) or other quantitative models conducted that include in their results a probability of extinction.

BIOLOGICAL STATUS ASSESSMENT

Threats – The Florida harlequin darter population is restricted to one watershed (Escambia), which makes the species susceptible to a catastrophic event within that watershed. Although additional populations are available within the tributaries of the Escambia River, which could potentially re-populate a mainstem population if such an event were to occur. Harlequin darters occur in the Conecuh River (Escambia River in Alabama), but that population is fragmented from a source population north of Point A dam (Point A Reservoir, Andalusia, Alabama).

Threats to harlequin darters include excessive snag removal (a spawning site preference) and impounding lotic water bodies (Bass et al. 2004, Boschung and Mayden 2004). Steinberg et al. (2000) indicated that high turbidity and excessive sediment loads may ~~likely~~ affect reproductive success of the species. Additional threats to harlequin darters include oil and coal exploration in areas where such activities occur (Warren and Cicerello 1982).

Statewide Population Assessment – Findings from the BRG are included in a Biological Status Review information table.

LISTING RECOMMENDATION

The Harlequin Darter BRG concluded from the biological assessment that the harlequin darter, *E. histrio*, did not meet any of the criteria for designation as a State-threatened species. They also, however, expressed concerns about the adequacy of the data currently available for making this evaluation. FWC staff therefore recommends that the harlequin darter be maintained as a Species of Special Concern until more data can be collected.

SUMMARY OF THE INDEPENDENT REVIEW – this will be completed after the peer review.

Peer review #4 from Dr. Steven Herrington

From: Steven J. Herrington
To: Imperiled
Cc: Knight, John; Tate, Bill; Howard Jelks
Subject: Peer reviews of harlequin, crystal, and southern tessellated darters proposed statuses
Date: Thursday, January 27, 2011 3:49:02 PM
Attachments: Southern tessellated darter review_herrington.pdf
Crystal darter review_herrington.pdf
Harlequin darter review_herrington.pdf
Importance: High

To Whom It May Concern,

Attached are my peer reviews of the of the biological status reviews for the harlequin darter (Etheostoma histrio), crystal darter (Crystallaria asprella), and southern tessellated darter (*Etheostoma olmstedi maculaticeps*) in Florida. I appreciate the opportunity to provide feedback on the proposed conservation status of each species. If you have any questions I can be reached via my contact information below. Thanks…

Steven J. Herrington, Ph.D.
Director of Freshwater Conservation
The Nature Conservancy
Florida Chapter -
Conservation and Science Strategies
10394 NW Longleaf Drive
Bristol, FL 32321

The Nature Conservancy
Florida Chapter Conservation Science and Strategies
10394 NW Longleaf Drive
Bristol, FL 32321

27 January 2011

Florida Fish and Wildlife Conservation Commission
Biological Status Review
imperiled@myfwc.com

Re: Biological status review for the harlequin dater (*Etheostoma histrio*) in Florida

To Whom It May Concern,

The Nature Conservancy appreciates the opportunity to provide a peer review of the biological status review of the harlequin darter (*Etheostoma histrio*) in Florida. The Conservancy is a leader in freshwater conservation throughout the world, including strategies to protect, restore, and conserve freshwater habitat and biota in Florida and the southeastern U.S. Specifically, we have actively worked with local, state, and federal partners to complete actions such as on-the-ground stream restoration, modification of water facility operations to promote migratory fish passage, and state- and basin-wide policy advocation to protect water quality and quantity in this state and region. Among our focal areas for freshwater conservation are the Gulf Coast river drainages, such as the Escambia River, identified by the Biological Review Group (BRG) as the only known drainage containing harlequin darters in Florida. We have also assisted the State of Florida and the U.S. Fish and Wildlife Service with collecting and analyzing fish collections on a river restoration project in Big Escambia Creek (Escambia River drainage); where harlequin darters were found to have recolonized the restored river reach shortly after restoration (circa 2005). Unfortunately, like many diminutive, non-game fishes, little is known of the population status and viability of this species in Florida or in most other parts of its range.

The Conservancy believes that the methods, data, analysis, and interpretation for assessing the conservation status of the harlequin darter in Florida were appropriately employed by the BRG. We also believe that the BRG used the best information available to provide a reasonable and justifiable interpretation of the data and proposed conservation status. We agree with the BRG with its conclusions on the known range of this species, population trend assessment, and threats which potential imperil its populations in Florida. We agree that its presence in both the mainstem and several medium- to large-sized tributaries of the Escambia River provide it hypothetical resistance to a cataclysmic event that might extirpate the species from Florida if it was otherwise located wholly within a continuous river reach.

As such, we agree with the BRG's conclusion that given the dearth of information on the population status and comparative trends that it does not meet the criteria for designation as a state threatened species. Because of this dearth of information, we also strongly support the BRG's recommendation to maintain its status as a Species of Special Concern in Florida. We recommend that the BRG expeditiously revisit the conservation status of the harlequin darter

should additional information on the population status, reproductive ecology, and/or threats potentially imperiling the harlequin darter in Florida become available.

Sincerely,

Steven J. Herrington, Ph.D.
Director of Freshwater Conservation
sherrington@tnc.org

Copy of the Harlequin darter BSR draft report that was sent out for peer review

Biological Status Review for the Harlequin Darter (*Etheostoma histrio)*

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 harlequin darter was sought from September 17 to November 1, 2010. The three member biological review group (BRG) met on November 18 and 19, 2010. Group members were John R. Knight (FWC lead), William Tate (U. S. Fish and Wildlife Service), and Howard Jelks (U. S. Geological Survey). In accordance with rule 68A-27.0012 Florida Administrative Code (F.A.C.), the BRG was charged with evaluating the biological status of the harlequin darter 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.

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Page 1983). In Florida, harlequin darters are only known from the Escambia River (Escambia/Santa Rosa counties). The species was first collected from Florida by Yerger and Suttkus (1962), and additional records are sporadic for the species (36 collection records 1962 to 2009). Harlequin darters are found in both the mainstem Escambia River and its tributaries. Collection records from the mainstem range from the Escambia River at the Florida/Alabama state line, south to the White River section of the Escambia (17.5 km ESE of Milton Florida) (Knight unpublished data). Harlequin darters are known to occur in the following tributaries; Big Escambia, Little Escambia, Pine Barren, Canoe, and Mitchell Creeks.

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BIOLOGICAL STATUS ASSESSMENT

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Statewide Population Assessment – Findings from the BRG are included in a Biological Status Review information table.

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SUMMARY OF THE INDEPENDENT REVIEW – this will be completed after the peer review.

LITERATURE CITED

Bass, G., T. Hoehn, J. Couch and K. McDonald. 2004. Florida Imperiled Fish Species Investigation. Final Report to the U. S. Fish and Wildlife Service. Federal Grant R-3. Florida Fish and Wildlife Conservation Commission, Holt, Florida. 59 pp.

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Etnier, D.A., and W.C. Starnes. 1993. The Fishes of Tennessee. The University of Tennessee Press. Knoxville TN. 681 pp.

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Kuehne, R.A., and R.W. Barbour. 1983. The American Darters. University Press of Kentucky, Lexington, KY. 177 pp.

Kuhajda, B.R,, and M.L. Warren, Jr. 1989. Life history aspects of the harlequin darter, *Etheostoma histrio*, in western Kentucky. ASB Bulletin. 36(2):66-67.

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Page, L.M., and B.M. Burr. 1991. A Field Guide to Freshwater Fishes, North America North of Mexico. Houghton Mifflin Company, Boston, MA.

Steinberg R., L.M. Page, and J.C. Porterfield. 2000. The spawning behavior of the harlequin darter, *Etheostoma histrio* (Osteichthyes: Percidae). Ichthyological Exploration of Freshwaters 11 (2):141-148.

Warren M.L., Jr and R.R. Cicerello. 1982. New records, distribution, and status of ten rare fishes in the Tradewater and lower Green Rivers, Kentucky. Southeastern Fishes Council Proceedings. 3(4):1-8.

Yerger, R.W. and R.D. Suttkus. 1962. Records of freshwater fishes in Florida. Tulane Studies. Zoology 9(5):322-330.

Biological Status Review Information
Findings

Species/taxon: *Etheostoma histrio*
Date: 11/19/10
Assessors: Jelks, Tate, and Knight

Generation length: 2.5 years so timeframe used for evaluation was 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 population size data available. Number of captures, size of range, and distribution has recently increased.		no	Knight and Katechis (2008), Knight et al (2010), Bass et al (2004)
(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 population size data available. Number of captures, size of range, and distribution has recently increased.		no	Knight and Katechis (2008), Knight et al (2010), Bass et al (2004)
(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 population size data available. Number of captures, size of range, and distribution has recently increased.		no	Knight and Katechis (2008), Knight et al (2010), Bass et al (2004)
(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 population size data available. Number of captures, size of range, and distribution has recently increased.		no	Knight and Katechis (2008), Knight et al (2010), Bass et al (2004)
[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				
(b)2. Area of occupancy < 2,000 km^2 (772 mi^2)	Based on 2.59 sq km grid and known recent locations (42 grids). AOO was calculated as 123.7 sq km	E	Y	Knight and Katechis (2008), Knight et al (2010), Bass et al (2004), and FWC GIS data
AND at least 2 of the following:				

a. Severely fragmented or exist in ≤ 10 locations	9 known locations, based on tributary and mainstem collections	O and E	Y	Knight and Katechis (2008), Knight et al (2010), Bass et al (2004), and FWC GIS data
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	number of captures, size of range, and distribution has increased, recently	O and E	no	Knight and Katechis (2008), Knight et al (2010), Bass et al (2004), and FWC GIS data
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	when present, only collected in low numbers (typically <10 individuals)	O and E	No	Knight and Katechis (2008), Knight et al (2010), Bass et al (2004), and FWC GIS data
(C) Population Size and Trend				
Population size estimate to number fewer than 10,000 mature individuals AND EITHER	No data available		No	
(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	No data available		No	
(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	Based on 2.59 sq km grid and known recent locations (42 grids). AOO was calculated as 123.7 sq km (9 known locations)	E	no	Knight and Katechis (2008), Knight et al (2010), Bass et al (2004), and FWC GIS data
(E) Quantitative Analyses				
e1. Showing the probability of extinction in the wild is at least 10% within 100 years	no data available		N	

Initial Finding (Meets at least one of the criteria OR Does not meet any of the criteria)	Reason (which criteria are met)
No	
Is species/taxon endemic to Florida? (Y/N)	no

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)
No	

1	Species/taxon:	Etheostoma histrio
2	Biological Status Review Information Regional Assessment Date:	11/19/10
3	Assessors:	Jelks, Tate, and Knight
4		
5		
6		
7		
8	Initial finding	Supporting Information
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 Florida 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: Biological Review Group Members' Biographies

Bill Tate (U.S. Fish and Wildlife Service)
Bill Tate is the US Fish and Wildlife Service biologist responsible for assisting Eglin Air Force Base's Jackson Guard unit in protecting the endangered Okaloosa darter . Through their efforts and his guidance this darter species has been managed successfully enough for the last decade that it qualified for down-listing from federally endangered to threatened this year. His expertise extends to all North Florida darters and many other benthic (therefore cryptic) freshwater species.

Howard Jelks (U.S. Geological Survey)
Howard received his undergraduate education at FSU, then went to UF for his master's degree. Howard has diverse experience from wetland plants, aquatic invertebrates, fish, and wading birds. He has studied these organisms from the estuaries of Apalachicola Bay, freshwater marshes of the Everglades, and streams of the Piedmont and Coastal Plain. Although he specializes in fishes, he classifies himself as a general naturalist/ecologist. How the dynamic environment structures biotic communities is his broad interest. Imperiled freshwater fishes are his speciality, but nonindigenous and marine taxa are also studied. For the past 16 years, he has been a leader of Okaloosa darter monitoring and recovery planning at Eglin Air Force Base in northwest Florida. He has developed skills in sampling design, database development, geographical information system and statistical analyses. He is an active member of the American Fisheries Society Endangered Species Committee and directs their website at http://fl.biology.usgs.gov/afs/index.html

John R. Knight (FFWCC/FWRI)
John R. Knight II received his B.S. in Fisheries from the University of Georgia in 2000. After graduation, he accepted a position with the University of Georgia, Institute of Ecology and Georgia Museum of Natural History, where he primarily worked on research of Federally Endangered and Threatened fish species. He accepted a graduate research assistantship at Auburn University and completed his master's research in 2005. Later that year he accepted a position with FWCC's Fish and Wildlife Research Institute (FWRI). For the past five and a half years, he has worked primary on developing monitoring strategies/techniques to effectively characterize fish communities from streams and rivers in Florida. Additional duties while working for FWRI include; biological comments on the effects of development on state and federally listed species, provided consultation for scientific permit applications, assisted USFWS with sampling for federally listed fish and mussel species, and worked on numerous interagency technical committees and partnerships within the state of Florida.

Appendix 2. Summary of letters and emails received during the solicitation of information from the public.

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

APPENDIX 3. **Information and comments received from independent reviewers.**

To be added after peer review.