Supplemental Information for the Crystal 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*

Crystal darter - *Crystallaria asprella*

Crystallaria asprella requires clean areas of gravel and sand, fast flows, and is relatively cryptic (burying itself in the sand). The biggest threats to populations in Florida include siltation and stream flow modification. These are characteristics that make this species at high risk.

The BSR for this species does not contain much information about depth or flow of habitat or behavior (sand burrowing). A description of the condition and specific threats to the existing habitat needs to be included. Because it is so cryptic and likely occurs in deeper areas, we do not have an accurate population estimate for this species.
There is a significant gap in genetic knowledge for the FL population. This probably needs to be mentioned in the BSR. The limited genetic studies conducted on other populations show that they are highly distinct populations with multiple lineages. Genetics using both nuclear (msats) and mitochondrial DNA (cyt b) need to be examined to determine the extent of divergence of the FL populations (important with any species that has a more widespread distribution).

Based on most of the information provided in the BSR, and my review of the literature, I support the state listing of this species.

Peer review #2 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 Crystal 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, in particular noting that the description by Welsh and Wood (2008) of *Crystallaria* (*C. cincotta*) based on populations in the Cumberland, Elk, Green, and Muskingum river drainages of the Ohio River basin that were formerly referred to as *C. asprella*, greatly reduces the range of the Crystal Darter.

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
Crystal Darter
(*Crystallaria asprella)*

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 crystal 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 crystal 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://myfwc.com/WILDLIFEHABITATS/imperiledSpp_listingprocess.htm to view the listing process rule and the criteria found in the definitions.

The Crystal Darter BRG found that the crystal darter met two of the criteria for listing as a threatened species. Staff recommends listing the crystal darter as a threatened species.

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 crystal darter, *Crystallaria asprella* (Jordan 1878), in Florida. The species was formerly placed within the genus *Ammocrypta* until Simons (1991) determined it to be distinct from other darters and assigned this species to its own monotypic genus. Welsh and Wood (2008) described a second species of *Crystallaria*, *C. cincotta*, from the Cumberland, Elk, Green, and Muskingum river drainages of the Ohio River basin.

Life History References – Roberts et al. 2007**,** Evans and Page 2003, Grandmaison et al. 2003**,** Hatch 1998**,** George et al. 1996**,** Hubbs 1985**,** Kuehne and Barbour 1983, Page 1983, Williams 1975

Geographic Range and Distribution – Crystal darters were historically distributed within the Mississippi River basin from Wisconsin and Minnesota east to Ohio, west to Oklahoma, and south to Louisiana and Florida (Boschung and Mayden 2004, Page 1983). The species occurs also in Gulf slope drainages such as the Escambia/Conecuh, Pearl, and Mobile River drainages (Page and Burr 1991). In Alabama, crystal darter distribution is primarily

limited to larger rivers within the Mobile and the Conecuh (Escambia) River drainages (Grandmaison et al. 2003). Crystal darter records are sparse from the Conecuh River (Escambia) in Alabama to south of the Point A reservoir (Andalusia, Alabama). Crystal darters were collected in 1981 (2.7 miles south of Brewton, Alabama) and in 1985 (0.4 miles above the Florida state line). Popp (2005) reported only one collection record of the species during a 20-year study (1982-2002) from the Conecuh River (Escambia County, Alabama).

In Florida, crystal darters are only known to occur from the Escambia River. The species was first collected in Florida in 1972 (Gilbert 1992). Additional specimens were collected by Yerger and Beecher (1975) and Beecher et al (1977). FWC staff collected five individuals from the same location during 2003 and 2004 (Bass et al. 2004). Crystal darters were most recently collected (a single individual) from the Escambia River in 2009 (Knight et al. 2010).

Population Status and Trend – No population status or trend data are currently available for crystal darters. The species was once believed to be widespread, although the crystal darter is most likely rare throughout its historical range (George et al. 1996, Page and Burr 1991). Crystal darters were last collected from Indiana and Ohio in 1899, Kentucky in 1929, Tennessee in 1939, and Mississippi in 1981 (Grandmaison et al. 2003, Hatch 1998). ~~). The West Virginia population (Elk and Ohio drainages) is now recognized as Crystallaria cincotta (Welsh and Wood 2008).~~ Wood and Raley (2001) concluded that ~~the species~~ *C. asprella* was in serious decline throughout its range, and that the species may be approaching extinction. The upper Ohio River population (in the Cumberland, Elk, Green, and Muskingum river drainages, West Virginia, Ohio, Kentucky and Tennessee)) is now recognized as *Crystallaria cincotta* (Welsh and Wood 2008). With recognition of some populations as a separate species, the crystal darter has a smaller range and smaller population than previously thought.

Generation Length – Crystal darters reach sexual maturity at age one and the maximum age observed is four years (Boschung and Mayden 2004, Etnier and Starnes 1993, Page 1983). 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 crystal darter in Florida represents a disjunct population, isolated from any potential source population capable of contributing to persistence of the species. Crystal darters require clean sand and gravel substrates, and ~~given~~ the sporadic occurrence of this habitat even in unaltered rivers suggests that historically these fishes were not distributed continuously throughout their range (Wood and Raley 2001). The species is only known to inhabit approximately six river miles in Florida.

Crystal darter populations are highly divergent from one another (Wood and Raley 2000), and the Conecuh River (Alabama) population is also likely limited in numbers and may not represent an adequate population size to repopulate the Escambia River, if a catastrophic event

were to eliminate the species from Florida. In addition, crystal daters are fragmented from a source population north of Florida? due to the presence of Point A dam (Point A Reservoir, Andalusia, Alabama). Additional threats include the destruction and degradation of critical habitats resulting from impounding, channelizing, dredging, and siltation of lotic environments (Grandmaison et al. 2003).

Statewide Population Assessment – Findings from the BRG are included in the Biological Status Review Information tables.

LISTING RECOMMENDATION

Based on the finding of the crystal darter BRG and in subsequent consultation with other FWC fish experts, staff recommends that the crystal darter, *Crystallaria asprella*, be listed as a threatened species.

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

Peer review #3 from Steve 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

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27 January 2011

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

Re: Biological status review for the crystal dater (*Crystallaria asprella*) 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 crystal darter (*Crystallaria asprella*) 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 crystal darters in Florida. 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. However, scientists have long recognized that the crystal darter is exceedingly rare in Florida waters, and recent studies strongly suggest that it is severely imperiled across its known geographic range.

The Conservancy believes that the methods, data, analysis, and interpretation for assessing the conservation status of the crystal 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 exceptional rarity in the Escambia River and limited connectivity to other populations increases its vulnerability to extirpation from Florida given continued habitat degradation, following a cataclysmic event, or other phenomena that affect long-term viability of such small species' populations.

As such, we agree with the BRG's conclusion that its presence but rarity in Florida, vulnerability to extirpation, and dearth of information on its population status and comparative trends warrant designation as a state threatened species. We recommend that the BRG expeditiously revisit the conservation status of the crystal darter should additional information on the population status,

reproductive ecology, and/or threats potentially imperiling the crystal darter in Florida become available.

Sincerely,

Steven J. Herrington, Ph.D.
Director of Freshwater Conservation

Peer review #4 from Dr. Brett Albanese

From: Brett Albanese
To: Imperiled
Cc: Knight, John
Subject: Re: Crystal and Southern tessellated darters Draft BSR Report
Date: Tuesday, December 21, 2010 10:26:43 AM

Please accept this email as my official review of BSR reports for crystal and southern tessellated darters.

Crystal Darter

I concur with the decision to list the crystal darter as a threatened species in Florida. However, I believe that the species only meets one of the IUCN listing critera completely, not two as stated in the BRG. The species meets critieria D (population very small or restricted), which alone is justification for listing. The species is only known from a handful of individuals collected from a 12 kilometer reach of river. The presence of only a single, isolated population makes this species very vulnerable to extirpation from Florida. Threats include random variation in population size, a catostrophic event (drought or chemical spill) or any factor that degrades habitat quality in the mainstem Escambia River.

Editorial Comment:
Threats Section
"In addition, crystal daters are fragmented from a source population
north of _____due to the presence of Point A dam (Point A Reservoir,
Andalusia, Alabama)."
-
Thanks for the opportunity to review,
Brett
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

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

Biological Status Review for the Crystal Darter (*Crystallaria asprella)*

EXECUTIVE SUMMARY

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limited to larger rivers within the Mobile and the Conecuh (Escambia) River drainages (Grandmaison et al. 2003). Crystal darter records are sparse from the Conecuh River (Escambia) in Alabama to south of the Point A reservoir (Andalusia, Alabama). Crystal darters were collected in 1981 (2.7 miles south of Brewton, Alabama) and in 1985 (0.4 miles above the Florida state line). Popp (2005) reported only one collection record of the species during a 20-year study (1982-2002) from the Conecuh River (Escambia County, Alabama).

In Florida, crystal darters are only known to occur from the Escambia River. The species was first collected in Florida in 1972 (Gilbert 1992). Additional specimens were collected by Yerger and Beecher (1975) and Beecher et al (1977). FWC staff collected five individuals from the same location during 2003 and 2004 (Bass et al. 2004). Crystal darters were most recently collected (a single individual) from the Escambia River in 2009 (Knight et al. 2010).

Population Status and Trend – No population status or trend data are currently available for crystal darters. The species was once believed to be widespread, although the crystal darter is most likely rare throughout its historical range (George et al. 1996, Page and Burr 1991). Crystal darters were last collected from Indiana and Ohio in 1899, Kentucky in 1929, Tennessee in 1939, and Mississippi in 1981 (Grandmaison et al. 2003, Hatch 1998). The West Virginia population (Elk and Ohio drainages) is now recognized as *Crystallaria cincotta* (Welsh and Wood 2008). Wood and Raley (2001) concluded that the species was in serious decline throughout its range, and that the species may be approaching extinction.

Generation Length – Crystal darters reach sexual maturity at age one and the maximum age observed is four years (Boschung and Mayden 2004, Etnier and Starnes 1993, Page 1983). Therefore the estimated generation time is 2.5 years.

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 crystal darter in Florida represents a disjunct population, isolated from any potential source population capable of contributing to persistence of the species. Crystal darters require clean sand and gravel substrates, and given the sporadic occurrence of this habitat even in unaltered rivers, suggest that historically these fishes were not distributed continuously throughout their range (Wood and Raley 2001). The species is only known to inhabit approximately six river miles in Florida.

Crystal darter populations are highly divergent from one another (Wood and Raley 2000), and the Conecuh River (Alabama) population is also likely limited in numbers and may not represent an adequate population size to repopulate the Escambia River, if a catastrophic event were to eliminate the species from Florida. In addition, crystal daters are fragmented from a source population north of due to the presence of Point A dam (Point A Reservoir, Andalusia, Alabama). Additional threats include the destruction and degradation of critical habitats resulting from impounding, channelizing, dredging, and siltation of lotic environments (Grandmaison et al. 2003).

Statewide Population Assessment – Findings from the BRG are included in the Biological Status Review Information tables.

LISTING RECOMMENDATION

Based on the finding of the crystal darter BRG and in subsequent consultation with other FWC fish experts, staff recommends that the crystal darter, *Crystallaria asprella*, be listed as a threatened species.

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

LITERATURE CITED

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Williams, J.D. 1975. Systematics of the percid fishes of the subgenus *Ammocrypta*, genus *Ammocrypta*, with descriptions of two new species. Bulletin of the Alabama Museum of Natural History 1:1-56.

Welsh, S.A. and R.M. Wood. 2008. *Crystallaria cincotta*, a new species of darter (Teleostei: Percidae) from the Elk River of the Ohio River drainage, West Virginia. Zootaxa 1680: 62–68.

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Yerger, R.W. and H.A. Beecher. 1975. First records of two percid fishes in Florida freshwaters. Florida Scientist 38:142-143.

Biological Status Review Information
Findings

Species/taxon: *Crystallaria asprella*
Date: 11/19/10
Assessors: Tate, Jelks, and Knight

Generation length: 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]	Data not available		No	
(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]	Data not available		No	
(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]	Data not available		No	
(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]	Data not available		No	
[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	Based on 2.59 sq km grid and known recent locations (8 grids). AOO was calculated as 23.5 sq km	E	Y	Bass et al. 2004, FWC GIS data, Knight et al 2010.
(b)2. Area of occupancy < 2,000 km^2 (772 mi^2)	Based on 2.59 sq km grid and known recent locations (8 grids). AOO was calculated as 23.5 sq km	E	Y	Bass et al. 2004, FWC GIS data, Knight et al 2010.
AND at least 2 of the following:				
a. Severely fragmented or exist in ≤ 10 locations	Total occupied river length ~12km. Considered one location	E	Y	Bass et al. 2004, FWC GIS data, Knight et al 2010.

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	Data does not support criteria, never found at high population numbers and/or difficult to collect	I	No	
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	Data does not support criteria, never found at high population numbers and/or difficult to collect	I	No	
(C) Population Size and Trend				
Population size estimate to number fewer than 10,000 mature individuals AND EITHER	six individuals collected in previous 10 years	S	Y	Bass et al. 2004, FWC GIS data, Knight et al 2010. Walsh and Tate 2003 (NG00-103)
(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	Data does not support criteria, never found at high population numbers and/or difficult to collect	I	No	
(c)2. A continuing decline, observed, projected, or inferred in numbers of mature individuals AND at least one of the following:	Data does not support criteria, never found at high population numbers and/or difficult to collect	I	No	
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	six individuals collected in previous 10 years	S	Y	Bass et al. 2004, FWC GIS data, Knight et al 2009. Walsh and Tate 2003 (NG00-103)
(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	Total occupied river length ~12km. Considered one location	E	Y	Bass et al. 2004, FWC GIS data, Knight et al 2009.
(E) Quantitative Analyses				
e1. Showing the probability of extinction in the wild is at least 10% within 100 years			N	

Initial Finding (Meets at least one of the criteria OR Does not meet any of the criteria)	Reason (which criteria are met)
Y	D1+2

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)
Y	D1+2

1	Species/taxon:	Crystallaria asprella
2	Biological Status Review Information Regional Assessment Date:	11/19/10
3	Assessors:	Tate, Jelks, 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.	DK
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 Public Comment

No public comments were received on this species.

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

To be added later.