Crystal Darter

Crystallaria asprella

Photograph by Florida Fish and Wildlife Conservation Commission.

Species Overview

Status: Listed as state Threatened on Florida's Endangered and Threatened Species List.

Current Protections

- 68A-27.003(2)(a), F.A.C. No person shall take, possess, or sell any of the endangered or threatened species included in this subsection, or parts thereof or their nests or eggs except as allowed by specific federal or state permit or authorization.
- 68A-27.001(4), F.A.C. Take – to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in such conduct. The term "harm" in the definition of take means an act which actually kills or injures fish or wildlife. Such an act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering. The term "harass" in the definition of take means an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding or sheltering.

Biological Background

This section describes the biological background for this species and provides context for the following sections. It focuses on the habitats that support essential behaviors for the crystal darter, threats faced by the species, and what constitutes significant disruption of essential behaviors.

Crystal darters are relatively large, slender fish with a maximum length of 13 cm (5.1 in). They are differentiated from similar species by the presence of 4 brown saddles and a forked caudal fin (Boschung and Mayden 2004). Overall, the crystal darter is mostly translucent with mottling between the saddles and midlateral dark brown, oblong blotches (Page 1983). During breeding season, males develop tubercles on their anal fins, and their anal and soft dorsal fins become enlarged (George et al. 1996).

Spawning occurs late winter to early spring for crystal darters throughout their range. George et al. (1996) found crystal darters spawning from January to mid-April in the Saline River in Arkansas. They also found that the young grow quickly and are sexually mature before age 1, suggesting that crystal darters are able to spawn in the season after their hatch (George et al. 1996). In the Tallapoosa River in Alabama, crystal darters move to shallower water for spawning when water temperatures reach 12°C (54°F). Males fertilize eggs while the female is partially buried in gravel substrate, and the straw-colored, adhesive eggs attach to small substrate particles (Simon et al. 1992). In the Tombigbee River, Alabama, crystal darters were found in spawning condition from mid-March to mid-April when the water temperature was 15°C (59°F) (Boschung and Mayden 2004). The crystal darter diet consists mostly of microcrustaceans, including larval midges and mayflies (Forbes 1880, Hatch 1997). Crystal darters have been observed buried in sandy substrate with only their eyes exposed, presumably in wait for prey (Miller and Robinson 1973).

In Florida, crystal darters are only known to occur in the Escambia River. 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 (Page 1983, Boschung and Mayden 2004). The species also occurs in Gulf slope drainages such as the Escambia and 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 Conecuh (Escambia) river drainages (Grandmaison et al. 2003). Crystal darter records are sparse from the Conecuh (Escambia) River in Alabama to south of the Point A Reservoir (Andalusia, Alabama).

Habitat Features that Support Essential Behavioral Patterns

Crystal darter habitat is best described as deep raceways with clean sand and gravel substratum and strong current velocities in large creeks and rivers (Page 1983, Boschung and Mayden 2004). They are typically found at depths greater than 100 cm (3.3 ft) and up to depths of 180 cm (6 ft). They are commonly collected in areas where current velocity exceeds 46 cm/sec (1.5 ft/sec) up to velocities as great as 90 cm/sec (35 in/sec) (George et al. 1996, Hatch 1997). Crystal darters are associated with clean gravel, and cobble and sand are often present as well (George et al. 1996). Presence of aquatic vegetation, detritus, silt, and mud is uncommon in habitats used by crystal darters (Boschung and Mayden 2004). Within Florida, crystal darters are found within the upper 25 km of the Escambia River, extending south from the Alabama state line, closely associated with the gravels bars found here (J. Knight, unpublished data).

Threats

Primary threats to this species include the destruction and degradation of critical habitats as a result of impoundments, channelization, dredging, and sedimentation (Grandmaison et al. 2003). The crystal darter in Florida represents a disjunctive population that is isolated from any potential source population capable of contributing to persistence of the species. The genetic structure of Florida's crystal darter population is also currently unknown. Crystal darter populations are highly divergent from one another (Wood and Raley 2000). The Conecuh River (in Alabama) population is 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 darters are fragmented from any potential source population north of Andalusia, Alabama, due to the presence of Point A Dam (Point A Reservoir). Small population sizes and inhibited gene flow between crystal darter populations (caused by habitat fragmentation) may increase the likelihood of local extinction (Grandmaison et al. 2003). Similarly, the random loss of adaptive genes through genetic drift may limit the ability of crystal darters to respond to changes in their environment (Grandmaison et al. 2003).

Non-native and invasive species may also pose a threat to crystal darters (Grandmaison et al. 2003). Non-native flathead catfish (*Pylodictis olivaris*) may also negatively impact crystal darters in the Escambia River, but the extent of that impact is unknown.

Habitat degradation is often considered the greatest threat to imperiled species (Wilcove et al. 1998). Certain land practices within the Escambia River watershed, and specifically in the northern most portion near the Florida/Alabama state line could negatively impact crystal darter populations. Specifically, land use practices that result in both increased sediment and nutrient loads in the streambed, alterations in the hydrologic regime, destruction of habitat, and changes in shoreline morphology are the primary stressors affecting imperiled aquatic taxa (Richter et al. 1997).

Potential to Significantly Impair Essential Behavioral Patterns

Due to the limited range, limited lifespan, and limited dispersal capability of this fish, there are a number of activities that could potentially prevent breeding, feeding, or sheltering of the crystal darter. Changes in land use adjacent to occupied streams could impact both water quantity and quality. Increased runoff can bring harmful pollutants as well as excess sediments that can reduce reproductive success and potential for this species. Dredging could result in significant habitat destruction and the loss of gravel bars. Additionally, impoundments could lead to further fragmentation and destruction of suitable instream habitats.

Distribution and Survey Methodology

The range map represents the principle geographic range of the crystal darter, including intervening areas of unoccupied habitat. This map is for informational purposes only and not for regulatory use.

Counties: Escambia and Santa Rosa.

Recommended Survey Methodology
This species is a gravel obligate, found only in the Escambia River. Gravel beds are a limited resource and crystal darters are likely to be found near these features. Surveys can be conducted greater than 985 ft (300 m) from gravel bar sites for reasonable assurance that both gravel and crystal darters are not present. Appropriate survey methodology is described below. Surveys should be conducted during project planning by applicants having a scientific collection permit (see below).

- Surveys for crystal darters are best accomplished using a benthic trawl, pulled in a downstream. direction for 300 m (985 ft) upstream or downstream of known gravel bars/potential impact areas.
- Surveys should be conducted at night, in depths less than 2 m (6 ft; Knight et al. 2017).
- Surveys should occur within 300 m (984 ft) upstream and downstream from potential impact area.
- Seining can also be used, with surveys being conducted at night to increase likelihood of detecting crystal darters.
- Electrofishing is not an acceptable survey method.

Recommended Conservation Practices

Recommendations are general measures that could benefit the species but are not required. No FWC permit is required to conduct these activities.

- Avoid causing changes that could degrade aquatic habitats inhabited by crystal darters. Specifically, avoid creating artificial impoundments, dredging channels in rivers and streams, and creating dredge spoils within rivers, streams, and creeks.
- Avoid the removal of sand, gravel, and pebble materials from the Escambia River, since this species is a gravel bar obligate.
- Avoid activities that would degrade or alter streamside zones adjacent to areas inhabited by crystal darters. Maintaining a minimum buffer of 50 m (164 ft) between the river or stream and upland activities would benefit the species, and a buffer of 100–200 m (328–656 ft) would likely prevent impacts to most other listed species that occur in inhabited waterways (U.S. Fish and Wildlife Service [USFWS] 2001).

- Minimize sedimentation through implementation of BMP's.
- Provide adequate buffers (75–100 m) between septic systems and riparian habitat.
- Locate stormwater management systems to provide the maximum treatment for any potential input into riparian habitat in the Escambia watershed.

Measures to Avoid Take

Avoidance Measures that Eliminate the Need for FWC Take Permitting

This section describes all measures that would avoid the need for an applicant to apply for a FWC take permit.

- Bridge or culvert work that follows standard road construction best management practices and does not have a major instream impact.
- Upland activities that have no connection to waterbodies and do not cause runoff, or riparian conversion.
- Activities that do not degrade riparian zones.

Examples of Activities Not Expected to Cause Take

This list is not an exhaustive list of exempt actions. Please contact the FWC if you are concerned that you could potentially cause take.

- Land management that benefits or restores the riparian zone.
- Activities that occur on impacted land not adjacent to crystal darter habitat.
- Silvicultural activities that follow the Agricultural and Silvicultural Best Management Practices (BMP's) for streamside management zones (SMZ).

Florida Forestry Wildlife BMP's and Florida Agricultural Wildlife BMP's

- Agriculture, as defined in Section 570.02, F.S., conducted in accordance with Chapter 5I-8, F.A.C., and the wildlife best management practices (BMPs) adopted in Rule 5I-8.001 and 5M-18.001, F.A.C., by the Department of Agriculture and Consumer Service pursuant to Section 570.94, F.S., is authorized and does not require a permit authorizing incidental take despite any other provision of Rule 68A-27.007 or 68A-27.005, F.A.C.
- Participation in the Florida Forestry Wildlife BMP's and Florida Agricultural Wildlife BMP's program and implementation of these BMP's provides a presumption of compliance for incidental take of crystal darters.
- Florida Department of Agriculture Consumer Services Florida Forestry Wildlife Best Management Practices apply to this species through the application of Streamside Management Zones.

Other authorizations for Take

- As described in Rule 68A-27.007(2)(c), F.A.C., land management activities (e.g., wetland restoration, prescribed fire, mechanical removal of invasive species; and herbicide application) that benefit wildlife and are not inconsistent with FWC Management Plans are authorized and do not require a permit authorizing incidental take.
- In cases where there is an immediate danger to the public's health and/or safety, including imminent or existing power outages that threaten public safety, or in direct response to an official declaration of a state of emergency by the Governor of Florida or a local governmental entity, power restoration activities and non-routine removal or trimming of vegetation within linear right of way in accordance with vegetation management plan that meets applicable federal and state standards does not require an incidental take permit from FWC.
- Emergency water management activities for human health and safety, such as flood control.

Coordination with Other State and Federal Agencies

The FWC participates in other state and federal regulatory programs as a review agency. During review, FWC identifies and recommends measures to address fish and wildlife resources to be incorporated into other agencies' regulatory processes. FWC provides recommendations for addressing potential impacts to state listed species in permits issued by other agencies. If permits issued by other agencies adequately address all the requirements for issuing a State-Threatened species take permit, the FWC will consider these regulatory processes to fulfill the requirements of Chapter 68A-27, F.A.C., with a minimal application process. This may be accomplished by issuing a concurrent take permit from the FWC, by a memorandum of understanding with the cooperating agency, or by a programmatic permit issued to another agency. These permits would be issued based on the understanding that implementation of project commitments will satisfy the requirements of Rule 68A-27.007, F.A.C.

Review of Land and Water Conversion projects with State-Listed Species Conditions for Avoidance, Minimization and Mitigation of Take

- FWC staff, in coordination with other state agencies, provide comments to federal agencies (e.g., the Army Corps of Engineers) on federal actions, such as projects initiated by a federal agency or permits being approved by a federal agency.
- FWC staff works with landowners, local jurisdictions, and state agencies such as the Department of Economic Opportunity on large-scale land use decisions, including long-term planning projects like sector plans, projects in Areas of Critical State Concern, and large-scale comprehensive plan amendments.
- FWC staff coordinates with state agencies such as the Department of Environmental Protection and the five Water Management Districts on the Environmental Resource Permitting (ERP) program, which regulates activities such as dredging and filling in wetlands, flood protection, stormwater management, site grading, building dams and reservoirs, waste facilities, power plant development, power and natural gas transmission projects, oil and natural gas drilling projects, port facility expansion projects, some navigational dredging projects, some docking facilities, and single-family developments such as for homes, boat ramps, and artificial reefs.
- Sector plans, developments of regional impacts, and county comprehensive plans are all reviewed currently and FWC provides conditions that would be beneficial to crystal darters.
- In areas with federally listed species, following the USFWS requirements is sufficient to protect crystal darter. In sector planning, a percentage of property must be set aside as conservation – focusing on riparian habitat will benefit the crystal darter.

FWC Permitting: Incidental Take

As defined in Rule 68A-27.001, F.A.C., incidental take is take that is incidental to, and not the purpose of, carrying out an otherwise lawful activity. Activities that result in impacts to crystal darters can require an Incidental Take Permit from the FWC (see above for actions that do not require a permit). Permits may be issued when there is a scientific or conservation benefit to the species and only upon showing by the applicant that that the permitted activity will not have a negative impact on the survival potential of the species. Scientific benefit, conservation benefit, and negative impacts are evaluated by considering the factors listed in Rule 68A-27.007(2)(b), F.A.C. These conditions are usually accomplished through a combination of avoiding take when practicable, minimizing take that will occur, and mitigating for the permitted take. This section describes the minimization measures and mitigation options available as part of the Incidental Take Permit process for take of this species. This list is not an exhaustive list of options.

Minimization Measure Options

The options below are intended to address the evaluation factors required for consideration when issuing an incidental take permit. These options can lessen the impact of activities, and ultimately may reduce what is needed to achieve a conservation or scientific benefit.

Seasonal, Temporal, and Buffer Measures

- Upland activities that have the potential to disturb riparian zones should follow BMPs and minimize activities within a minimum distance of 15.2 m (50 ft) from the waterways (DEP 2011, Wenger 1999).

Design Modification

- Avoid activities that would increase sediment discharge into waterways; alter hydrology; or remove rocky, gravel, or sand substrates.
- Site roads further from streams.
- Site stormwater requirements outside of the buffer zone but situated so that any potential stormwater input is treated by the stormwater management system.
- Minimize the amount of sedimentation and erosion to waterways by using turbidity and sediment screens and by following guidelines described within the Silviculture BMP Manual (Florida Department of Agriculture and Consumer Services 2008).
- Use of bridge class culverts with open bottoms.
- Avoid underground storage tanks within 15.2 m (50 ft) of the riparian buffer.

Method Modification

- Use sediment screens, bales, or other methods to limit sedimentation from upland site activity.
- Use turbidity screens instream to limit sedimentation within the river or waterbody.
- When creating waterway crossings, top down bridge construction can minimize impacts to crystal darters and other aquatic species. Specific project guidance can be obtained by contacting the Florida Department of Transportation.

Mitigation Options

Mitigation is scalable depending on the impact, with mitigation options for significant impairment or disruption of essential behavioral patterns constituting take. Potential options for mitigation are described below.

Scientific Benefit

This section describes research and monitoring activities that provide scientific benefit, per Rule 68A-27.007, F.A.C. Conducting or funding these activities can be the sole form of mitigation for a project.

- Projects to fill data gaps related to information on species discussed in the Species Action Plan for the Crystal Darter. Contact FWC for additional information on appropriate methodology or permits relating to scientific collection of these species.
- Sharing sightings data (live and dead observations) with FWC, including latitude and longitude and photographs when available.
- Following established survey methods, projects to fill data gaps related to information on species.
- Scientific studies can help address life history questions. These projects should be conducted with input from FWC.

Habitat

- Habitat acquisition may be a mitigation option.

- Acquisition efforts should target the upper Escambia River basin in areas where gravel bars are present, specifically along riparian zones.
- Targeting in-holdings would be beneficial.

Funding

- No funding option has been identified at this time. However, funding options as part of the mitigation will be considered on a case by case basis.

Information

- All data (negative and positive) from surveys should be provided by contacting FWC as specified in an incidental or intentional take permit and can provide a benefit in addition to minimization options.

Programmatic Options

- No programmatic options are available for this species

Multispecies Options

- Other species with overlap include federally listed mussels, Gulf sturgeon, alligator snapping turtles, and bluenose shiner. Activities that benefit these species are likely to also benefit the crystal darter.

FWC Permitting: Intentional Take

Intentional take is not incidental to otherwise lawful activities. Per Rule 68A-27, F.A.C., intentional take is prohibited and requires a permit. For state-Threatened species, intentional take permits may only be considered for scientific or conservation purposes (defined as activities that further the conservation or survival of the species taken). Permits are issued for state-Threatened species following guidance in Rule 68A-27.007(2)(a), F.A.C.

Risks to Property or People

Intentional take for Human Safety

- There are no circumstances for which crystal darter may be taken for human safety.
- Permits will be issued only under limited and specific circumstances, in cases where there is an immediate danger to the public's health and/or safety, including imminent or existing power outages that threaten public safety, or in direct response to an official declaration of a state of emergency by the Governor of Florida or a local governmental entity. Applications submitted for this permit must include all information that is required from any other applicant seeking a permit, along with a copy of the official declaration of a state of emergency, if any. An intentional take permit may be issued for such purposes.

Aversive Conditioning

- Not applicable for the crystal darter.

Permits Issued for Harassment

- Not applicable for the crystal darter.

Scientific Collecting and Conservation Permits

Scientific collecting permits may be issued for the crystal darter using guidance found in Rule 68A-27.007(2)(a), F.A.C. Activities requiring a permit include any research that involves capturing, handling, or marking wildlife; conducting biological sampling; or other research that may cause take. A scientific collecting permit is needed to use crystal darter for education and outreach.

Considerations for Issuing a Scientific Collecting Permit

1) Is the purpose adequate to justify removing the species (if the project requires this)?
   - Permits will be issued if the identified project is consistent with the goal of the Species Action Plan for the Crystal Darter (i.e., improvement in status that leads to removal from Florida's Endangered and Threatened Species List), or addresses an identified data gap important for the conservation of the species.
2) Is there a direct or indirect effect of issuing the permit on the wild population?
3) Will the permit conflict with program intended to enhance survival of species?
4) Will purpose of permit reduce likelihood of extinction?
   - Projects consistent with the goal of the Species Action Plan for the Crystal Darter or that fill identified data gaps in species life history or management may reduce the likelihood of extinction. Applications should clearly explain how the proposed research will provide a scientific or conservation purpose for the species.
5) Have the opinions or views of other scientists or other persons or organizations having expertise concerning the species been sought?
6) Is applicant expertise sufficient?
   - Applicants must have prior documented experience with this or similar species, have met all conditions of previously issued permits, and have a letter of reference that supports their ability to handle the species.

Relevant to all Scientific Collecting for Crystal Darters

- No more than 5 whole specimens must be provided to FWC's Fish and Wildlife Research Institute, 3 for genetic analysis and the remainder to be provided to the Florida Museum of Natural History.
- Format of data needed to be provided to FWC should include at a minimum, GPS coordinates (DD), habitat, date, time of day, substrate type, number collected, and disposition of specimens. Spreadsheet and electronic submission is allowed.
- Any mortality should be reported immediately to the FWC at the contact information below. The FWC will provide guidance on proper disposition of specimens.
- Geographical or visual data gathered must be provided to FWC in the specified format.
- A final report should be provided to the FWC in the format specified in the permit conditions.

Additional information

Information on Economic Assessment of these Guidelines can be found at http://myfwc.com/wildlifehabitats/imperiled/management-plans/

Contact

For more species-specific information or related permitting questions, contact the FWC at (850) 921-5990 or WildlifePermits@myfwc.com. For more regional information visit http://myfwc.com/contact/fwc-staff/regional-offices.

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