A Species Action Plan for the
Key Silverside
Menidia conchorum

Final Draft
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Florida Fish and Wildlife Conservation Commission
620 South Meridian Street
Tallahassee, FL 32399-1600
Visit us at MyFWC.com

KEY SILVERSIDE ACTION PLAN TEAM

Team Leader: Martha Bademan, Division of Marine Fisheries Management

Team Members: Anthony Bresnen, Division of Marine Fisheries Management
Dr. Eddie Matheson, Fish and Wildlife Research Institute
Aaron Podey, Division of Marine Fisheries Management

Acknowledgements: Laura Barrett, Division of Habitat and Species Conservation
Brian Beneke, Fish and Wildlife Research Institute
Claire Sunquist Blunden, Office of Policy and Accountability
Brie Ochoa, Division of Habitat and Species Conservation
George Burgess, Florida Museum of Natural History
Dr. Grant Gilmore, Estuarine, Coastal, and Ocean Science, Inc.
Dr. Chuck Getter, ImpactofSeaLevelRise.org

Cover photograph by Dr. Mike Howell, Samford University

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EXECUTIVE SUMMARY

The Florida Fish and Wildlife Conservation Commission (FWC) developed this plan in response to the determination that the Key silverside should be listed as Threatened on the Florida Endangered and Threatened Species List. The goal of this plan is to maintain or improve the conservation status of the Key silverside so that the species can be removed from listing on the Florida Endangered and Threatened Species List and will not again need to be listed.

This plan has 4 objectives. The first objective is to determine the taxonomic status of the Key silverside. This objective should be completed before implementation of the other objectives in this plan. Any potential conservation efforts or actions undertaken from this plan are dependent on the genetic determination of the Key silverside. The second objective is to increase the existing measured extent of occurrence of Key silverside beyond the middle and lower Florida Keys within 10 years of plan implementation. Potential Key silverside habitat outside of the observed range should be surveyed, and Key silverside populations that are located outside of the current observed range should be identified based on habitat requirements and previous location records. The third objective is to increase the number of documented locations supporting Key silverside by 33% within 10 years of plan implementation. A protocol to sample for Key silversides within the known range (including uninhabited and remote Keys) should be developed. The fourth objective is to maintain semi-enclosed saltwater lagoon habitat for Key silverside.

This plan details the actions necessary to improve the conservation status of the Key silverside. A summary of this plan will be included in the Imperiled Species Management Plan (ISMP), in satisfaction of the management plan requirements in Chapter 68A-27, Florida Administrative Code, Rules Relating to Endangered or Threatened Species. The ISMP will address comprehensive management needs for 60 of Florida's imperiled species and will include an implementation plan; rule recommendations; permitting standards and exempt activities; anticipated economic, ecological, and social impacts; projected costs of implementation and identification of funding sources; and a revision schedule. The imperiled species management planning process relies heavily on stakeholder input and partner support. This level of involvement and support is also critical to the successful implementation of the ISMP. Any significant changes to this plan will be made with the continued involvement of stakeholders.

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GLOSSARY OF TERMS AND ACRONYMS

Area of Occupancy: The area within its extent of occurrence (See Extent of Occurrence), which is occupied by a taxon, excluding cases of vagrancy. This reflects the fact that a taxon will not usually occur throughout the area of its extent of occurrence, which may contain unsuitable or unoccupied habitats (as defined by IUCN).

BRG: Biological review group, a group of taxa experts convened to assess the biological status of taxa using criteria specified in Rule 68A-27.001, Florida Administrative Code, 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).

BSR: Biological status review report, the summary of the biological review group's findings. Includes a Florida Fish and Wildlife Conservation Commission (FWC) staff recommendation on whether or not the species status meets the listing criteria in Rule 68A-27.001, Florida Administrative Code. These criteria, based on IUCN criteria and IUCN guidelines, are used to help decide if a species should be added or removed from the Florida Endangered and Threatened Species List. In addition, FWC staff may provide within the report a biologically justified opinion that differs from the criteria-based finding.

DEP: Florida Department of Environmental Protection

DNA: Deoxyribonucleic Acid

DOACS: Florida Department of Agriculture and Consumer Services

Ecotype: A genetically distinct geographic variety or population within a species adapted to specific environmental conditions.

EPA: United States Environmental Protection Agency

Extent of Occurrence: The geographic area encompassing all observations of individuals of a species, including intervening areas of unoccupied habitat. Synonymous with range. See also Area of Occupancy. (As defined by IUCN).

F.A.C. Florida Administrative Code. The Department of State's Administrative Code, Register and Laws Section is the filing point for rules promulgated by state regulatory agencies. Agency rulemaking is governed by Chapter 120, Florida Statutes, the Administrative Procedures Act. Rules are published in the Florida Administrative Code.

FKNMS: Florida Keys National Marine Sanctuary

FWC: The Florida Fish and Wildlife Conservation Commission, the state agency constitutionally mandated to protect and manage Florida's native fish and wildlife species.

GIS: Geographic Information System

Habitat: The area used for any part of the life cycle of a species (including foraging, breeding, and sheltering)

ISMP: Imperiled Species Management Plan

IUCN: International Union for Conservation of Nature, a professional global conservation network

IUCN Red List of Threatened Species: An objective global approach for evaluating the conservation status of plant and animal species, the goals of which are to: Identify and document those species most in need of conservation attention if global extinction rates are to be reduced; and provide a global index of the state of change of biodiversity.

NOAA: National Oceanic and Atmospheric Administration

NMFS: National Marine Fisheries Service

SSC: Species of Special Concern. Protected under 68A-27.005, F.A.C., which declares that "no person shall take, possess, transport, or sell any species of special concern included in this subsection or parts thereof or their nests or eggs except as authorized by permit from the executive director, permits being issued upon reasonable conclusion that the permitted activity will not be detrimental to the survival potential of the species. For purposes of this section, the definition of the word take in Rule 68A-1.004, F.A.C., applies."

Take: As defined in 68A-1.004, F.A.C. (General Prohibitions), "Taking, attempting to take, pursuing, hunting, molesting, capturing, or killing any wildlife or freshwater fish, or their nests or eggs by any means whether or not such actions result in obtaining possession of such wildlife or freshwater fish or their nests or eggs."

USACE: United States Army Corps of Engineers

USFWS: United States Fish and Wildlife Service, the federal agency mandated to protect and manage the nation's native freshwater fish and wildlife resources.

INTRODUCTION

Biological Background

The Key silverside (*Menidia conchorum*) was originally described by Hildebrand and Ginsburg (1927) as being "not uncommon in the shallow water around Key West." This small silverside is generally found in protected, saline lagoons and ponds with restricted tidal exchange (Getter 1981, Conover et al. 2000). However, the Key silverside is known to be tolerant of a wide range of salinities, from 0 to 115 parts per thousand (Getter 1981). Gut content analysis by Getter (1981) showed that *M. conchorum* are mostly carnivorous, consuming small, planktonic crustaceans and insects.

Geographic Range and Distribution

The Key silverside is endemic to the lower and middle Florida Keys. Key silversides have been documented in lagoons on Long Key, Grassy Key, Big Pine Key, No Name Key, Little Torch Key, Cudjoe Key, Sugarloaf Key, Saddle Bunch Key, Rockland Key, Boca Chica, and Key West. However, the presence of Key silverside in available habitats is sporadic (Getter 1981, Conover et al. 2000). Conover et al. (2000) collected silversides on Key Largo and mainland Florida north of Key Largo that were identified as either Key silverside or tidewater silverside (see Fig. 2). Duggins et al. (1986) and Conover et al. (2000) hypothesized that the Key silverside also occurs at other sites in the Keys that are not accessible by road or easily sampled.

Population Status and Trend

The total number of Key silversides in Florida is unknown. Conover et al. (2000) found little evidence of a Key silverside population decline during a 1999 survey in which 2,680 specimens were collected. The Key silverside seems to be abundant in the limited area where it occurs; however, local population numbers fluctuate (Gilbert 1978, Getter 1981, Conover et al. 2000). Key silversides are believed to live up to 1 year (Getter 1981).

Taxonomic Classification

The taxonomic status of the Key silverside is unclear. The Key silverside may be distinguished from other *Menidia* silversides by internal or external physical characteristics; however, these measures are not always reliable because of intra- and inter-specific morphological variations (Duggins et al. 1986, Conover et al. 2000). Allozyme and mitochondrial deoxyribonucleic acid (DNA) analyses suggest that the Key silverside is not a distinct species, but an ecotype or subspecies of *M. peninsulae*, the tidewater silverside (Duggins et al. 1986).

Conservation History

The Key silverside was first listed by the state as Endangered in Florida in 1977. The listing status was modified to Threatened in 1985. Harvest of listed species is prohibited in Florida, so harvest of Key silverside has been prohibited since 1977. The Key silverside occurs within the Florida Keys National Marine Sanctuary (FKNMS) and Florida Keys Complex of National Wildlife Refuges, so it is likely that water quality and habitat conservation actions taken in these areas have indirectly affected Key silverside populations.

Threats and Recommended Listing Status

The Key silverside is endemic to the lower and middle Florida Keys. Habitat loss and alteration are primary threats to the Key silverside. Several documented Key silverside habitat sites have been filled, destroyed, or altered by development (Gilbert 1978, Getter 1981, Duggins et al. 1986, Conover et al. 2000). Since the habitat survey by Conover et al. (2000), documented habitat sites have been destroyed, reduced, or altered by development, hurricanes, and flooding (C.D. Getter, impactofsealevelrise.org, personal communication). Because occupied lagoons and ponds are limited, development or alteration of remaining habitat could be detrimental to Key silverside subpopulations. Such alteration could include removal efforts of local invasive plant species like Brazilian pepper (*Schinus terebinthifolius*). Other nuisance species control efforts, such as the use of mosquito control chemicals, threaten Key silverside embryos and could have negative effects on local populations (Getter 1981). Conover et al. (2000) predicted that as protected lagoons are inundated and joined to open water (as a result of sea level rise), the Key silverside would be replaced by the hardhead silverside (*Atherinomorus stipes*). Getter noted that predatory fish such as snapper and grouper were more abundant at some Key silverside sites in 2010 than during surveys taken in the 1970s (C. D. Getter, personal communication). Getter (1981) also noted that a population of Key silversides disappeared from a pond on Big Pine Key following introduction of the blue gill, *Lepomis macrochirus,* and the appearance of external parasites on the Key silversides inhabiting the pond.

Figure 1. The Key silverside, *Menidia conchorum*. Photograph by Shannon O'Leary, State University of New York, Stony Brook.

In 2010, the Florida Fish and Wildlife Conservation Commission (FWC) directed staff to evaluate the status of all species listed as Threatened or Species of Special Concern that had not undergone a status review in the past decade. To address this charge, staff conducted a literature review and solicited information from the public on the status of the Key silverside. The FWC convened a biological review group (BRG) of experts on the Key silverside to assess the biological status of the species using criteria specified in Rule 68A-27.001, F.A.C. This rule includes a requirement for BRGs to follow the Guidelines for Application of the International Union for Conservation of Nature (IUCN) Red List Criteria at Regional Levels (Version 3.0) and Guidelines for Using the IUCN Red List Categories and Criteria (Version 8.1).

FWC staff developed an initial draft of a Biological Status Review report (BSR), which included the BRG's findings and a preliminary listing recommendation from staff. The draft was sent out for peer review, and the reviewers' input was incorporated in the final report.

According to IUCN guidance documents, projected population decline (Criterion A[3]) should be estimated over the next 10 years or 3 generations, whichever is longer, up to a maximum of 100 years. During the biological status review process, a reviewer suggested that information regarding the threat of sea level rise on Key silverside should be considered. Although sea level rise could reduce Key silverside habitat and populations over the next several decades, the BRG did not include sea level rise as a threat in the biological status review report because sea level rise is not expected to reduce the population size of Key silverside by 30% or greater in the next 10 years (generation length is presumed to be less than 1 year).

The BRG concluded that the Key silverside met the following listing criteria:
Criterion B, Geographic Range. Extent and area of occupancy less than 20,000 km^2 (7,720 mi^2) area of occupancy < 2,000 km^2 (772 mi^2) severely fragmented, continuing decline (observed, inferred, or projected) in area, extent, or quality of habitat.

FWC staff recommended listing the Key silverside as Threatened on the Florida Endangered and Threatened Species List.

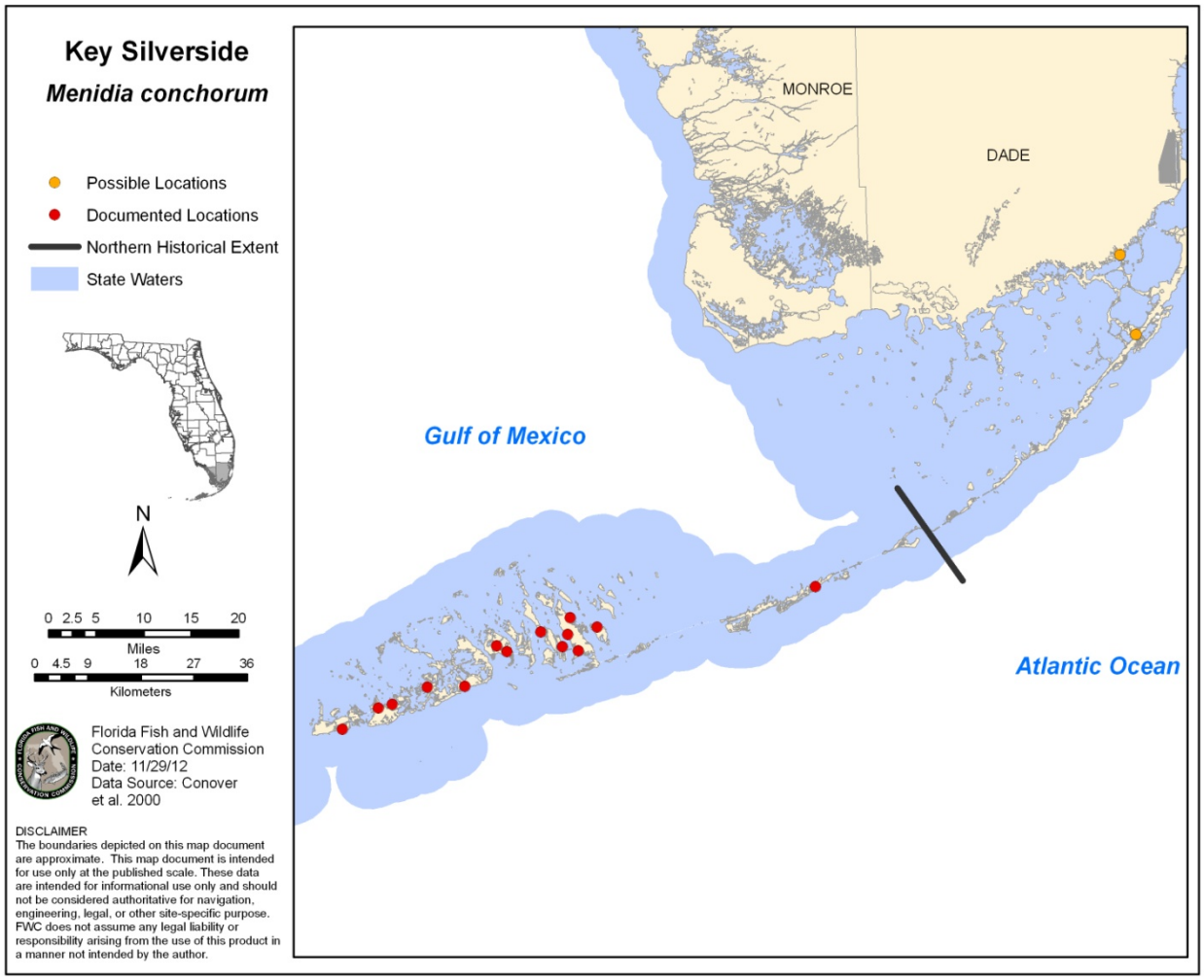

Figure 2. Historical range, documented and suspected locations of Key silverside, *Menidia conchorum*. From Conover et al. 2000.

CONSERVATION GOALS AND OBJECTIVES

Goal

Conservation status of the Key silverside is improved to a point that the Key silverside can be removed from the Florida Threatened and Endangered Species List and will not again need to be listed.

Objectives

I. Determine the taxonomic status of Key silverside before implementation of other objectives in this plan.

Rationale

The taxonomic status of Key silverside is unclear. Before implementing the actions in this plan, it is important to understand whether or not Key silverside is a unique species, a subspecies of *M. penninsulae*, or simply an ecotype that is not genetically distinct from *M. penninsulae*. If Key silverside is genetically unique, the conservation actions in this plan are likely warranted. However, if Key silverside is not distinct, delisting may be warranted because *M. penninsulae* is a common silverside species in Florida (Duggins 1980, Chernoff et al. 1981, Duggins et al. 1986).

II. Increase the existing measured extent of occurrence of Key silverside beyond the middle and lower Keys within 10 years of plan implementation.

Rationale

The Key silverside is endemic to the middle and lower Florida Keys. However, surveys for this species have been limited to areas accessible by road. It is likely that the Key silverside also occurs at other sites in the Keys (Duggins et al. 1986, Conover et al. 2000). Additionally, during the last published survey for this species, Conover et al. (2000) collected silversides on Key Largo and mainland Florida north of Key Largo that were identified as either Key silverside or tidewater silverside. Efforts should be made to continue sampling for Key silverside north of the middle Keys and positively identify collected silversides through genetic sampling.

III. Within the measured extent of occurrence from Objective II, actively increase the number of locations documented as supporting the Key silverside by 33% within 10 years of plan implementation.

Rationale

Surveys for Key silverside have been infrequent and limited to areas accessible by road. It is likely that the Key silverside also occurs at other sites in the Keys (Duggins et al. 1986, Conover et al. 2000).

IV. Maintain semi-enclosed saltwater lagoon habitat for the Key silverside.

Rationale

The Key silverside is found in protected, semi-enclosed saltwater lagoons and ponds with restricted tidal exchange. Over the past several decades, several known Key silverside habitats

have been lost or altered by development, hurricanes, and flooding. Given the fragmented and limited known distribution of this species, existing suitable habitat should be protected.

CONSERVATION ACTIONS

The following sections describe the conservation actions that will make the greatest contribution toward achieving the conservation objectives. Actions are grouped by category (e.g., Habitat Conservation and Management, Population Management). The Conservation Action Table (Table 1) provides information on action priority, urgency, potential funding sources, likely effectiveness, identified partners, and leads for implementation.

Monitoring and Research

There are many facets of Key silverside life history and ecology, such as habitat requirements, which remain poorly understood or unknown. Active research on the following topics, and others as they arise, is critical to our understanding of this species, and the results will help refine recommended management actions.

Systematics

The actions in this plan are contingent on determination of the taxonomic status of Key silverside (Objective I).

Action 1 Collect genetic samples from the 3 species of *Menidia* that occur in Florida (Key, tidewater, and inland silversides). Genetic samples of expected Key silversides will be collected from sampling outlined in Action 3 and Action 4 below. Samples of tidewater and inland silversides will be collected from known locations within Florida but outside of the expected range of the Key silverside (e.g., Tampa Bay and Indian River Lagoon).

Action 2 Use mitochondrial and nuclear DNA sequencing to isolate genetic markers that are unique to the Key silverside.

The taxonomic status of the Key silverside (*Menidia conchorum*) is unclear. The Key silverside may be distinguished from other *Menidia* silversides by morphometric characteristics; however, these measures are not always reliable because of intra- and inter-specific morphological variations (Duggins et al. 1986, Conover et al. 2000). Conover et al. (2000) noted that there are no distinct characteristics to distinguish *M. conchorum* from *M. peninsulae* in the absence of genetic testing, which is part of the reason the validity of the species is in question. Allozyme and mitochondrial DNA analyses suggest that the Key silverside is not a distinct species, but an ecotype or subspecies of *M. peninsulae*, the tidewater silverside (Duggins et al. 1986). An ex situ spawning experiment with *M. conchorum* and *M. peninsulae* could be an additional method to determine species validity if silverside species readily spawn in captivity. Should further study invalidate the distinct taxonomic status of Key silverside, conservation actions and listing designations should be reconsidered.

Geographic Extent of Occurrence

Action 3 Use Geographic Information System (GIS) to identify suitable Key silverside habitat outside of the observed range. Potential habitat will be defined based on known habitat requirements and previous location records (Gilbert 1978, Getter 1981, Duggins et al. 1986).

Action 4 Survey potential habitat areas identified by GIS analysis in Action 3 using seines, dip nets, and other appropriate gears within and outside of the known range for Key silverside.

Action 5 Form partnerships with researchers from federal, university, other state agencies, local governments, or non-governmental organizations to develop sampling programs for Key silverside within their observed range.

The Key silverside is able to tolerate a wide range of salinities in its habitat, and the species can even adapt to nearly freshwater conditions (Getter 1981). Habitat conditions can change dramatically based upon the season and environmental factors. Research conducted on habitat requirements should take into account the ability of the Key silverside to survive in a diverse range of salinities in lagoons and tidal ponds (Action 3 and Action 4). In the past, surveys for this species have been limited to areas accessible by road. It is likely that the Key silverside also occurs at other sites in the Keys (Duggins et al. 1986, Conover et al. 2000). Additionally, during the last published survey for this species, Conover et al. (2000) collected silversides on Key Largo and mainland Florida north of Key Largo that were identified as either Key silverside or tidewater silverside. Efforts by researchers should be made to continue sampling for Key silverside north of the middle Keys and positively identify collected silversides by genetic means.

Habitat Conservation and Management

Action 6 Work with local governments and other agencies (e.g., Monroe County, FKNMS, National Oceanic and Atmospheric Administration [NOAA]) to develop conservation guidelines for land management to minimize impacts to Key silverside habitat during development.

This plan relies in part on the ability of state, federal, and privately managed submerged lands to support Key silverside. Submerged lands provide a high level of security for fish because of statutory provisions for long-term management funding and for guiding habitat management in those water bodies. Conservation guidelines for Key silverside should be developed by the agencies that work together to manage submerged lands where Key silversides are found (i.e., FKNMS, Florida Department of Environmental Protection [DEP], the U.S. Fish and Wildlife Service [USFWS], and the U.S. Army Corps of Engineers [USACE]) to guide conservation land management, coastal development, and habitat restoration activities. Conservation guidelines should identify sensitive habitat (through the identification of habitat requirements and the use of GIS [Action 3]), in order to facilitate:

- Avoidance of sensitive habitat by coastal development activities.
- Minimization of impacts to sensitive habitats when conducting coastal development activities where sensitive habitat impacts cannot be completely avoided.
- Compensatory mitigation in the form of habitat restoration when avoidance is not achieved. Compensatory mitigation should only be used if this species is proven able to repopulate restored habitats.

If Key silverside is a distinct taxonomic unit that remains listed as Threatened, information generated by implementation of this plan should be used by the FWC's Office of Conservation Planning Services to comment on development proposals and recommend avoidance,

minimization, and mitigation strategies. However, it is important to know the taxonomic status of Key silverside before commenting on potential effects of coastal construction and development projects on this species. Implementation of this plan will also inform acquisition of coastal properties (for conservation purposes) that contain or are adjacent to Key silverside habitat.

Conservation guidelines that benefit other wildlife may benefit Key silverside by decreasing the risk of habitat degradation. Creating specific conservation guidelines for Key silverside will fill possible gaps in the protection and proper management of their required habitats.

Action 7 Partner with local governments and private and public landowners and managers to create site-specific habitat plans using the conservation guidelines created in Action 6.

There are many federal, state, and local regulatory agencies in Florida that work together to maintain quality aquatic habitats. The National Marine Fisheries Service (NMFS), NOAA, USFWS, U.S. Environmental Protection Agency (EPA), USACE, DEP, Water Management Districts (WMDs), and local planning and environmental resource management agencies are all responsible for maintaining healthy conditions that benefit and support aquatic plants, fish, and wildlife. Using the GIS location information generated in Action 3 and documented location information, regulatory agencies could coordinate to protect Key silverside populations. During the most recent survey for this species, Conover et al. (2000) identified Key silverside at 15 sites in the middle and lower Keys. However, the presence of Key silverside in available habitats is sporadic and ephemeral (Getter 1981, Conover et al. 2000), and many of the previously documented sites have been developed or are no longer suitable habitat (Conover et al. 2000). Population surveys within the Key silverside's known and suspected range (see Objective II) are needed to identify currently occupied locations (Action 4).

Population Management
Conover et al. (2000) predicted that as the protected lagoons inhabited by Key silversides are inundated and joined to open water, the Key silverside would be replaced by the hardhead silverside (*Atherinomorus stipes*). However, it would be difficult to prevent hardhead silversides from moving into this habitat and replacing Key silverside once lagoons are joined to open water. Getter noted that predatory fish such as snapper and grouper were more abundant at some Key silverside sites in 2010 than during surveys taken in the 1970s (C.D. Getter, personal communication). Getter (1981) also noted that a population of Key silversides disappeared from a pond on Big Pine Key following introduction of the blue gill, *Lepomis macrochirus*, and the appearance of external parasites on the Key silversides. The most efficient way to protect Key silverside from competitors and predators would be to identify and protect Key silverside habitat (Actions 3 and 4), implement conservation guidelines that conserve Key silverside habitat (Actions 6 and 7), and discourage introduction of exotic species.

Rule and Permitting Intent
Maintaining existing protections for Key silverside could provide this species with adequate protection. As a State-designated Threatened species, the Key silverside is protected under 68A-27.003(2), F.A.C. Paragraph 68A-27.007(2)(f) states that collection of a marine organism as defined in Chapter 68B-8, F.A.C., and identified as a Florida Endangered or Threatened species

will be permitted pursuant to the provisions of Chapter 68B-8, F.A.C. The Key silverside meets these criteria. Provisions for licenses to harvest saltwater prohibited species, including Key silverside, are provided in Rule 68B-8.009, F.A.C. Specifically, this rule authorizes the Executive Director to issue licenses authorizing the harvest or possession of species prohibited for harvest, including Threatened species, for scientific, educational, exhibition, stock enhancement, or stock restoration purposes. The FWC utilizes the criteria established in this rule to monitor and regulate harvest levels of prohibited species harvested from Florida waters and the adjacent Exclusive Economic Zone while ensuring that such harvest activities do not adversely affect the stocks of such species. Additional harvest and collection permits may be required by the FKNMS, the National Park Service, and the Florida Park Service.

Law Enforcement
The FWC's Division of Law Enforcement, in conjunction with federal, state, and local partners, is responsible for enforcing Florida's wildlife and fisheries laws.

One of the most important components of the FWC's enforcement strategy is ensuring compliance through education. FWC law enforcement officers understand the importance of explaining wildlife laws to the public to avoid unintentional violations. However, FWC law enforcement officers actively pursue and refer for prosecution those who intentionally violate wildlife laws. FWC law enforcement officers also educate the public on how to identify and report violations. The FWC's Division of Law Enforcement administers the Wildlife Alert program, which receives information via a toll-free number (1-888-404-3922) that is answered 24 hours a day, 7 days a week. Cash rewards are offered to callers who provide information about any illegal activity that result in an arrest. Callers may remain anonymous and are not required to testify in court.

FWC law enforcement officers and NOAA law enforcement partner to protect Florida's wildlife and fisheries resources through a Cooperative Enforcement Program, which authorizes the Joint Enforcement Agreement. This agreement grants FWC officers the authority to enforce federal laws. FWC officers provide most of the routine patrol of Key silverside habitat. Agents from the USFWS and FWC often jointly investigate wildlife violations to decide whether to prosecute in state or federal court.

Distinguishing Key silverside from other silverside species is a major challenge in enforcing the protections for the species. Many silverside species look alike, and it is extremely difficult to distinguish Key silverside from other commonly found *Menidia* species without using genetic analysis.

Incentives and Influencing
There are no incentive programs related to Key silverside at this time. Because this species is found in marine habitats (most of which is sovereign submerged land), the actions identified in the Habitat Conservation and Management section should be implemented to conserve this species.

Education and Outreach

Education and outreach are important components of managing imperiled marine species. Educating the public about the Key silverside can take multiple forms. Formal education programs can focus on the reliance of Key silverside on vulnerable lagoon habitat. Educating the public about the importance of diverse habitats enables many different species of wildlife, including the Key silverside, to be protected by well-informed citizens making decisions about conservation measures. Additionally, the Education and Outreach subsection of FWC's Division of Marine Fisheries Management could incorporate this unique species into event education, such as Kids Fishing Clinics and marine habitat displays. The Florida Park Service and other public land management agencies could use key silversides in informal presentations and displays of lagoons highlighting their ability to live in a wide range of salinities. This gives other groups of people the opportunity to learn and appreciate the Key silverside and its importance in the coastal lagoon ecosystem.

Coordination with Other Entities

There are several agencies that could assist with implementing the actions of this plan, including many local partners in the Florida Keys. The FWC shares management of the marine environment in the Florida Keys with the FKNMS. Areas managed by FKNMS and USFWS in the Florida Keys are currently undergoing a joint review of their management plans. These plans should incorporate potential management actions (research and monitoring: Actions 3-5; outreach and conservation guidelines: Actions 6-7) for Key silverside, if this species is found to be a distinct taxonomic unit that warrants continued protection as a Threatened species. Several of the last known locations of Key silversides are found in the Florida Keys Complex of National Wildlife Refuges. Research, monitoring, outreach, education, and development and implementation of conservation guidelines as proposed in the actions of this plan should also be coordinated with USFWS through local National Wildlife Refuges, if Key silverside remains listed. The national (Everglades National Park, Biscayne National Park) and state parks in the Florida Keys (e.g., Bahia Honda, John Pennekamp Coral Reef State Park) could also be valuable conservation partners for implementing the management goals of this plan. Finally, the U.S. Navy is a potential partner in implementation of this plan because of their substantial presence in potential key silverside habitat in the lower Florida Keys.

Table 1. Key Silverside (*Menidia conchorum)* Conservation Action Table

Objective(s) Addressed	Team Assigned Priority Level	Action Item Number	Action Items	Conservation Action Category	Ongoing, Expanded or New Effort?	Authority	Man Power	Estimated Cost To Implement	Funding Source(s)	Lead for Implementation: FWC Program(s) and/or Section(s)	External partners	Likely Effectiveness	Feasibility	Urgent?
1	1	1	Collect genetic samples from the three species of *Menidia* in Florida (Key, tidewater, and inland silversides). Genetic samples of expected Key silversides will be collected from sampling outlined in **Action 3** and **Action 4** below. Samples of tidewater and inland silversides will be collected from known locations within Florida but outside of the expected range of the Key silverside (e.g., Tampa Bay and Indian River Lagoon).	Monitoring & Research	NEW	YES	YES	TBD	Unknown	Fish and Wildlife Research Institute	Universities	High likelihood of success.	Feasible, if funding source is identified and obtained. Specimens can be collected during normal FWRI Fisheries Independent Monitoring operations in most sites targeted.	Yes - Must be done before any other actions in order to allow for genetic testing in **Action 2**.
1	1	2	Use mitochondrial and nuclear DNA sequencing to isolate genetic markers that are unique to the Key silverside.	Monitoring & Research	NEW	YES	YES	$0-25k	Unknown	Fish and Wildlife Research Institute	Universities	High likelihood of success.	Feasible, if funding source is identified and obtained.	Yes- genetic testing to determine the genetic significance of the Key silverside is the most urgent action.
2	2	3	Use Geographic Information System (GIS) to identify suitable Key silverside habitat outside of the observed range. Potential habitat will be defined based on known habitat requirements and previous location records (Duggins et al. 1986, Getter 1981, Gilbert 1978).	Monitoring & Research, Habitat Conservation & Mgmt, Coordination with Other Entities	NEW	YES	YES	TBD	Unknown	Fish and Wildlife Research Institute	Universities, DEP	High likelihood of success.	Feasible, if funding source is identified and obtained.	Yes - Needed to fill in the data gaps.
2	2	4	Survey potential habitat areas identified by GIS analysis in **Action 3** using seines, dip nets, and other appropriate gears within and outside of the known range for Key silverside.	Monitoring & Research	NEW	YES	YES	TBD	Unknown	Fish and Wildlife Research Institute	Universities, USFWS	May or may not be effective depending on DNA analysis of silversides collected in sampling process.	Very feasible, but would probably occur after sampling sites with documented populations.	Yes - Needed to fill in the data gaps.
3	3	5	Form partnerships with researchers from federal, university, other state agencies, local governments, or non-governmental organizations to develop sampling programs for Key silverside within their observed range.	Monitoring & Research, Coordination with Other Entities	NEW	NO	YES	TBD	Unknown	Fish and Wildlife Research Institute	Federal agencies, universities, other state agencies, local governments, or non-governmental organizations	High likelihood of success.	Feasible but will be dependent on support and cooperation of outside entities.	No - Can probably be done anytime in the process after initial sampling is completed.
4	3	6	Work with local governments and other agencies (e.g., Monroe County, FKNMS, NOAA) to develop conservation guidelines for conservation land management to minimize impacts to Key silverside habitat during development.	Habitat Conservation & Mgmt, Coordination with Other Entities	NEW	NO	YES	TBD	Unknown	Aquatic Habitat Restoration/Enhancement Subsection, Division of Marine Fisheries Management, Fish and Wildlife Research Institute, Species Conservation Planning Section	Universities, DEP, FKNMS, USFWS, USACE, local governments, conservation organizations, public and private landowners	Success dependent on cooperation of agencies and local landowners.	Feasible but will be dependent on support and cooperation of outside entities and landowners.	No - Must be done after other actions are taken.
4	3	7	Partner with local governments and private and public land owners and managers to create site-specific habitat plans using the conservation guidelines created in **Action 6**.	Habitat Conservation & Mgmt, Coordination with Other Entities	NEW	NO	YES	TBD	Unknown	Aquatic Habitat Restoration/ Enhancement Subsection, Division of Marine Fisheries Management, Fish and Wildlife Research Institute, Species Conservation Planning Section	Universities, DEP, FKNMS, USFWS, USACE, local governments, conservation organizations, public and private landowners	Success dependent on the completion of previous actions.	Feasible but will be dependent on support and cooperation of outside entities, landowners, and the completion of previous actions.	No - Must be done after other actions are taken.

Acronyms used in this table:

DEP:	Florida Department of Environmental Protection
DNA:	Deoxyribonucleic acid
FKNMS:	Florida Keys National Marine Sanctuary
FWC:	Florida Fish and Wildlife Conservation Commission
GIS:	Geographic information system
NOAA:	National Oceanic and Atmospheric Administration
TBD:	To be determined
USACE:	United States Army Corps of Engineers
USFWS:	United States Fish and Wildlife Service

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