Conservation of the critically endangered Mangrove Finch *(Camarhynchus heliobates)*

Summary

Historically, the mangrove finch could be found in a number of sites on Isabela and Fernandina, in the Western Galapagos Islands. Since 2011 it has been confirmed that their remaining habitat consists of only two small mangrove patches on Isabela. Combined with their very small numbers and low reproduction rates, this means that the mangrove finch is highly susceptible to changes in their environment and its extinction risk is classified as Critically Endangered on the IUCN Red List of Endangered Species.

Figure 1: Mangrove finch *Camarhynchus heliobates* ©Michael Dvorak

Need statement

Figure 2: The green areas are Playa Tortuga Negra and Caleta Black on Isabela, the only remaining habitats of the Mangrove finch. © Francesca Cunninghame, CDF

The Mangrove Finch, *Camarhynchus heliobates*, is one of fifteen species of Darwin's Finches and one of the rarest birds in the world. The species is endemic to Galapagos and once occupied a number of mangrove sites on Isabela and Fernandina. The finch's area of occupancy, however, has declined severely throughout the last 100 years and the world population is now restricted to only two sites on Isabela. Until 2011, it was thought that three small remnant populations survived within two widely separated areas of coastal mangrove on the northwest and southeast coasts of Isabela. Following field surveys in 2011 and 2012, it became clear that the southeast population had disappeared and the two remaining northwest populations held a combined total of only around 100 birds. The Mangrove Finch is classified by IUCN as Critically Endangered.

The principal threats are believed to come from predation of eggs and nestlings by introduced black rats *Rattus rattus* and the loss of nestlings through parasitism by the larvae of the introduced parasitic fly *Philornis downsi*. Further sources of extinction risk are loss of genetic diversity due to the historical population decline and potential inbreeding, contact with new diseases, climate change

effects and any sudden freak event such as land uplifts or tsunamis which have the potential to wipe out the entire current remaining habitat. In order to increase local awareness of mangrove finches and the importance of protecting mangrove habitat outreach activities with the local community in Puerto Villamil on Isabela Island have been conducted since 2010.

Initial research into the wild population showed extremely poor nesting success due to predation from rats, and consequently rat control was initiated in conjunction with the Galapagos National Park (GNPD). Ongoing control and monitoring show this to be successful and mangrove finch nesting success has increased. However this effort is not sufficient to ensure the survival of the species due to threats from *Philornis downsi* and other pressures causing low reproductive output. During recent years, other conservation management techniques have been trialed in an attempt to reduce the extinction risk to mangrove finches. Captive holding of the closely related woodpecker finch (*Camarhynchus pallida*) took place in 2007 – 2008 to evaluate the viability of setting up a captive assurance population of mangrove finches. Logistical challenges and disease risk meant that this was not considered a viable option in the near future and that management should focus on the wild population.

Assurance population: a species population held in captivity to ensure that in the event of catastrophic decline, the species can be maintained.

Distribution and current population estimate

Currently, mangrove finches only exist in the coastal mangroves (<1km²) at Playa Tortuga Negra (18ha) and Caleta Black (CB, 10ha) on the northwest coast of Isabela.

A remnant population of at least three individuals remained at Bahía Cartago (Cartago) on the southeast coast at a distance of approximately 65km from the main population on the northwest coast until 2009. Surveys conducted in 2011 and 2012 failed to find these birds and it is assumed that the birds are no longer present.

In 2009, the world population of the Mangrove Finch was estimated to be around 100 birds (Fessl *et al.* 2010). Additional sampling from 2012-13 using the same methods puts current population estimates at a minimum of approximately 60 birds. (Minimum numbers are suggested here because it is challenging to identify unbanded non-breeding birds).

IUCN Conservation Status

In the 1994 list of globally threatened bird species which used for the first time the new IUCN criteria, the Mangrove Finch was classified as Endangered (Collar *et al*. 1994). It was up-listed to Critically Endangered in 2000 (Stattersfield and Capper 2000), under nine IUCN Red List criteria: B1 ab (i, ii, iv), 2 ab (i, ii, iv), and D, owing to:

- Extremely small (30ha), severely fragmented range (potentially suitable habitat estimated to be only about 500ha).
- Potentially as few as two viable subpopulations.
- Population size estimated to number fewer than 50 mature individuals

- Recent surveys suggest that the number of locations and mature individuals are both declining.

Causes of decline, risks and potential threats

The exact causes for the reduction of the Mangrove Finch's range are unknown, but a variety of causes, particularly introduced animal species, are known or suspected to negatively impact the Mangrove Finch.

- The introduced fly *Philornis downsi* presents a very significant threat, as its parasitic larvae cause high levels of nestling mortality. *P. downsi* was first recorded in the Galápagos in the 1960s and parasitism by *P. downsi* was identified in the islands in 1997 (Fessl *et al.* 2001) and at Mangrove Finch sites on Isabela in 2000. In previous studies, complete brood loss due to *Philornis* parasitism for the Mangrove Finch was between 10 and 15%. (Fessl *et al.* 2010). During the 2012/2013 season, *P. downsi* presented the second main reason for nest failure (17%), following abandoned eggs (29%). Furthermore, *P. downsi* accounted for the highest percentage of nestling mortality, with complete brood failure observed in 37% of nests containing nestlings. Results of partial brood loss are incomplete. Overall nesting success was just 33% with unknown causes accounting for 20% of observed failures.
- Black Rats (*Rattus rattus*) are known to significantly reduce breeding success of Mangrove Finches, largely by predating eggs (Fessl *et al.* 2010).
- Cats (*Felis catus*), Smooth-billed Anis (*Crotophaga ani*), fire ants (*Solenopsis geminata* and *Wasmannia auropunctata*) and the wasp (*Polistes versicolor*) are also potential threats (Grant and Grant 1997, Dvorak *et al.* 2004) but their effect has not yet been studied.
- The impact of introduced insect-borne avian diseases, such as avian pox or malaria, is not yet clear (Deem *et al.* 2008), but this is a priority for future research.
- Extreme climate variability, climate change and volcanic activity (e.g. geological uplifting or sinking) also represent potential threats.
- A comparative study of genetic diversity between current (specimens from PTN and CB from1998-2008) and historical (specimens from different sites and islands; 1905-1906) Mangrove Finch populations suggests reduced genetic diversity in the current populations (K. Petren, pers. comm.). This could lead to increased inbreeding depression (such as low hatch rates of eggs) and decreased ability to adapt to changes in the environment.
- Mangrove Finches have been known to hybridize with the Woodpecker Finch (*Camarhynchus pallidus*) on at least one occasion in the wild (K. Petren pers. comm.), threatening the genetic integrity of both species.

Wild management / investigation of mangrove finches in natural habitat 2006 - 2012

Since 2006 the Mangrove Finch Project has continued to conduct breeding season surveys each year, in order to determine nest success, population size and territories. This is in addition to carrying out introduced predator control and monitoring, in collaboration with the Galapagos National Park. Experimental trapping for *P. downsi* has been developed in collaboration with CDF's *Philornis* Project, also supported by Galapagos Conservation Trust, since 2012.

The UK Government's Darwin Initiative funded the Mangrove Finch project from 2006 to 2011, following which the IUCN SOS Save Our Species program provided a further two years of project funding. This enabled CDF to continue with regular Mangrove Finch monitoring and research, as well as conducting a first time *in situ* trial of head-starting with related finch species. Due to the

exceptionally low fledging success of early clutches of eggs and the fact that pairs re-nest following failure during this time, it was proposed to collect eggs and incubate and rear the chicks *in situ*, prior to releasing them into the wild, with the hope of producing twice as many chicks per pair as occurs in the wild. This component of the project was planned for early 2013; however, staff shortages meant that it was not possible for a collaborator's technical experts to come to the Galapagos. Consequently during this period breeding season monitoring and introduced predator control continued while plans for head-starting had to be delayed until 2014.

Wild management / trial translocation of mangrove finches 2010

A trial translocation of nine wild caught Mangrove Finches took place in May 2010. This was the first bird translocation to take place in the Galapagos and was conducted as an attempt to increase the geographical range of the species. The objective was to move juvenile birds, to avoid moving a significant number of reproductive adults from the population. Rat control was carried out prior to the translocation and nine mangrove finches were moved to 10ha of mangrove forest at Urbina Bay, 25km to the South of Playa Tortuga Negra (PTN).

It was the first time Mangrove Finches had been held captive for more than short periods of handling during previous mist-netting activities for marking and blood sampling. All birds arrived at the release site in good condition. All birds were fitted with radio transmitters and a unique combination of colored bands to enable post release monitoring. The translocation was successful in terms of transporting and initial establishment of the birds, however it failed to establish a new population and four individuals have since been re-sighted back at the source population while no mangrove finches have been seen at the release site since November 2010. Future translocations need to overcome site fidelity, potentially by using juvenile birds, captive-reared *in situ*.

Head-starting: One of the most frequently used techniques for improving survival rates: wild-laid eggs are harvested and reared in captivity, avoiding the hazards that cause high rates of mortality. Among mangrove finches, the first clutches of the season are rarely successful, and the adult birds have time to establish further nests during the season. In this way the population is enhanced by the survival of the first laid young.

Following the translocation in 2010, the focus of the recovery effort has evolved from translocation to actively increasing the number of birds in the population through head-starting, simply to keeping the population buoyant and viable in the short-term. This is a response to ongoing low nesting success, due to egg abandonment and parasitism by *P. downsi*. In the long-term, the aim is still to establish further populations through translocation.

Headstarting trails 2012 - 2015

During winter 2012, San Diego Zoo Global (SDZG) was approached by the Durrell Wildlife Conservation Trust (Mangrove Finch Project partners in the first period funded by the Darwin Initiative, and now project mentors) to see if the San Diego Zoo's Avian Propagation Centre and Institute for Conservation Research would be interested in participating in the *in situ* artificial propagation trials for Mangrove Finches: collection of eggs in the wild, artificial incubation and hand rearing of chicks followed by release of juveniles back into the wild. CDF and GNPD in partnership with SDZG now plan to start trial head-starting from January 2014. Planning for these activities is

well underway and the reconnaissance visit of leading incubation SDZG staff member has just taken place.

The main goal of the captive rearing is to develop the role of captive, artificial propagation in the Mangrove Finch recovery program. This will focus on the following key elements and objectives:

- To develop protocols for artificial incubation and hand-rearing.
- To successfully rear a small number of birds for reintroduction. (Establishment of a small captive breeding flock will almost certainly not be a goal for 2013-2014).
- Continue to develop basic veterinary protocols for the treatment of prevalent disease, particularly introduced pathogens and parasites, in collaboration with partners.
- To provide guidance on the future potential captive maintenance and breeding of Mangrove Finches *in situ*, including the development of husbandry protocols, using the Woodpecker Finch guidelines as a foundation for captive maintenance.
- Collaborate in a feasibility study to evaluate costs/benefits for establishing an assurance colony or *ex situ*, elsewhere in Galapagos or further afield.
- Implement "capacity building" of local expertise, by training and encouragement of intensive involvement, so that the entire captive effort can become essentially self-reliant on local personnel, with minimal input from overseas organizations in the future.

In conjunction with the captive rearing of mangrove finches in 2014 field work and research with the wild population will continue

- Monitoring of nest success among wild breeding pairs following egg collection during February
- Population estimate and territory mapping of mangrove finches
- Capture / recapture of wild individuals
- Research into control methods against *P. downsi* infestation of mangrove finch nests
- Introduced predator control in conjunction with the GNPD (rat control is vital for the protection of mangrove finches in the wild)

Objectives

1. Continue yearly monitoring of wild population in addition to long term monitoring of surviving released captive reared birds.
2. Continue introduced rat control in current habitat.
3. Develop long term strategy for control of *Philornis downsi* and continue with trials into its control in mangrove finch habitat (in conjunction with CDF Philornis Project).
4. If headstarting trials conducted in early 2014 are successful repeat them during the breeding season in early 2015
5. Evaluate possible sites for re introduction of captive reared birds if headstarting is successful.
6. Train local personal (GNPD rangers and local field assistant and volunteers) in endangered bird conservation techniques and mangrove finch field work techniques Continue to Increase awareness of Mangrove Finch in Puerto Villamil.
7. Secure necessary funding to ensure success of project.

Methodology

This project consists of two main components:

1. The ongoing conservation management of the wild population of mangrove finches in North Western Isabela (PTN and CB)
   - Monthly fortnight long field trips prior to and during the breeding season of mangrove finches (October – May) to conduct population monitoring, nest success studies and protection of breeding population via introduced predator control and research.
   - Bi monthly week long field trips outside the breeding season (July and September) to conduct introduced predator control and monitoring and monitoring of hand reared birds from 2014 headstarting.

   - The continuation of intensive conservation management to increase population size and range of the mangrove finch. Depending on results from head-starting trial in 2014 either :
     a. Continue with the head-starting program and collect wild eggs during February 2015 and repeat rearing method (artificial incubation and hand rearing of chicks followed by soft release into the wild) or conduct with minimum adaption if required. Evaluate suitable sites for possible reintroductions of captive reared juveniles for release to expand species currently restricted range. Follow up telemetry monitoring of released juveniles.
     b. Evaluation amongst all partners and stakeholders and trial of the most viable option of other management techniques in order to increase the population size of the mangrove finch e.g. Establishment of a permanent population in captivity; repeat a translocation to suitable site within historic range of the species using wild caught birds; major adaption to head-starting technique to increase its effectiveness.

Evaluation and indicators

- Wild population estimate for 2014/2015 breeding season
- Percentage nest success of wild breeding birds for 2014/2015 breeding season
- Introduced rats maintained at low densities in mangrove finch habitat
- Trails for control of *Philornis downsi* conducted in mangrove finch nests at PTN
- Evaluation of headstarting as a viable option for conservation management of mangrove finch
- Repeat of methods from 2014 during 2015 if head-starting is declared viable
- Establish new method to increase mangrove finch population size if 2014 headstarting not viable
- Local personnel trained in intensive conservation management techniques
- Increased awareness of community in Villamil about current management of mangrove finches and mangrove habitat.

Expected results and products

- Population estimate and territory maps produced
- Potential control methods for *Philornis downsi* trialled and analysed
- Head-starting protocols established and written up and presented to all stakeholders
- Technical reports and articles for peer review journals

  Education products produced and distributed throughout community in Puerto Villamil.