

GLOBAL RE-INTRODUCTION PERSPECTIVES

Re-introduction case-studies from around the globe



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Conservation introductions of the Seychelles white-eye on predator-free rehabilitated islands of the Seychelles archipelago, Indian Ocean

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Introduction

The Seychelles white-eye (*Zosterops modestus*) is one of the most threatened endemic birds in Seychelles. Originally known only from Mahé, it was classified as Critically Endangered due to its tiny and declining population and range. Intensive surveys and public appeals in 1996 - 1997 lead to the discovery of an unknown healthy population on Conception Island (69 ha). Research on population size, biology and ecology was mainly conducted under Phase 1 of the Seychelles White-eye Recovery Program (SWERP), started by the Seychelles Ministry of Environment in 1998. This elucidated the species' requirements and the main problems responsible for the species decline (mainly nest predation and habitat degradation due to introduced invasive species). A Species Action Plan was adopted and a transferred population established on Frégate Island (221 ha) between 2001 and 2003. The species was consequently downlisted to Endangered in 2005, and in 2007 there were about 400 birds on three different islands (245 on Conception, 60 on Mahé, and 100 on Frégate). The Island Conservation Society, now leading SWERP conservation activities under the FFEM funded project 'Rehabilitation of Island Ecosystems', was responsible for undertaking in July 2007 additional transfers to North Island (201 ha), and to Cousine Island (26 ha) where post-release monitoring results are being analyzed and will be reported after all planned transfers are completed.

Goals

Goal 1: Ensure the survival of the Seychelles white-eye on at least three islands in viable, self-maintaining populations, and bring the species conservation status from Critically endangered to Vulnerable (as a first step to remove this bird from the Globally



Seychelles white-eye (*Zosterops modestus*)

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Conception Island source site
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Threatened Species list). This corresponds to the overall aim of the SWERP, and of the Species Action Plan.

Sub-goal 1: Establish a new viable population on another island in order to ensure the long-term survival of the species.

Sub-goal 2: Establish a second new viable island population of, mixing individuals from both Conception and Mahé origins, to restore the species genetic diversity and ensure the long-term survival of the species.

Success Indicators

- Indicators for sub-goal 1 (Frégate Island introduction):
 - ⇒ 1.1: First breeding attempt of transferred birds by October/November 2001.
 - ⇒ 1.2: First successful nest of transferred birds by November/December 2001.
 - ⇒ 1.3: Number of transferred birds that bred successfully; number of breeding territorial groups formed; number of successful nests, and number of fledglings produced during the first breeding season (April 2002).
 - ⇒ 1.4: Establishment of a breeding population of minimum 100 individuals by 2004.
 - ⇒ 1.5: Presence of a viable/self-sustaining population of minimum 225 birds by 2006.
- Indicators for sub-goal 2 (North Island introduction):
 - ⇒ 2.1: First breeding attempt of transferred birds by September/October 2007.
 - ⇒ 2.2: First successful nest of transferred birds by October/November 2007.
 - ⇒ 2.3: Number of transferred birds that bred successfully; number of breeding territorial groups formed; number of successful nests, and number of fledglings produced during the first breeding season (April 2008).
 - ⇒ 2.4: Presence of a breeding population of more than 60 individuals by 2009.
 - ⇒ 2.5: Presence of a breeding population of more than 100 individuals by 2012.
 - ⇒ 2.6: Presence of a viable/self-sustaining population of minimum 250 birds by 2016.

Project Summary

Feasibility: The conservation introduction proposals to Frégate and North Island strictly followed the IUCN guidelines, providing information on each required section. In both cases, a detailed assessment to ascertain availability and quality of suitable habitat (through measurements of vegetation composition and structure, and abundance of invertebrates and fruits) was produced and included a carrying capacity estimate for each island using a model built with Conception parameters. Basic parasite screening for internal parasites and general body condition was conducted for the source populations (Conception, and later, Mahé) and for other bird species present on destination islands, and existing information, compiled and assessed. The white-eye is a species that inhabits mixed woodland dominated by broad-leaved trees (both introduced and native). On Mahé (and Frégate), it is found in residential areas with orchards and gardens adjacent to mixed forest. The species principally eats insects, but also berries. Flowers and nectar are occasionally taken. Large preys are mainly caterpillars, crickets and grasshoppers, spiders, smaller ones including aphids, mosquitoes, flies, etc. captured from leaves, branches and trunks. Vegetal items for source populations comprise mainly berries from native plants such as 'Bois siro' (*Premna serratifolia*), 'Bois cuillère' (*Tabernaemontana coffeoides*), 'Bois dur' (*Canthium bibracteatum*), and introduced species like Cinnamon (*Cinnamomum verum*) or 'Vieille fille' (*Lantana camara*). Hence, abundance in the above mentioned features was considered as an indicator of habitat suitability. Absence of the introduced ship rat (*Rattus rattus*), a nest-predator identified as the main cause of decline for the species, and feral cat (*Felis catus*) was the first basic requirement. Rats had been eradicated in 2000 on Frégate (under a DTF program run by the Ministry of Environment), and in 2005 on North (under the same FFEM project), whilst Cousine has always been rat free. Candidate islands also needed to have a proven record for the necessary abatement protocols in place to prevent re-infestation (rat fence, rat proof room, bait stations, etc).

Implementation: All transfer protocols (capture, transportation, captivity and release) were first tested on Conception. White-eyes were captured early in the morning by the use of mist-nets and tape-luring. Two birds maximum per territory were selected to maximize genetic diversity, taking into consideration whenever possible sex ratio and age ratio. They were then placed in individual bird bags after all morphological measurements, ringing, blood-sampling for health screening and external parasite checks had been done. During the 2007 transfers, a



'Helibird box' with cooling fans

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Translocation team with helicopter

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probably benign blood parasite *microfilaria*, was found in about 51% of the birds from Conception. A special box, called 'Hélibird box' was designed and built to safely transport the birds by Helicopter. It was equipped with pocket fans to ventilate and keep the birds cool, and 'insonorised' to a noise level of less than 60 decibels. Upon arrival, birds were placed into a release aviary for them to recover, feed and get accustomed to their new environment. The aviary was built at a suitable release site surrounded by vegetation with favorite berries, and filled with

foliage and fruit-bearing branches. Plain and sugared water was sprayed onto the foliage, and birds were regularly provided with insects captured with hand vacuum cleaners and stuck to branches with honey. In 2001 transfers, birds were kept for 3 - 4 hours in captivity before being released into the wild but during the 2007 transfers they were most often kept overnight. The 2001 transfer to Frégate Island consisted of six individual transfers of two to seven birds per trip totaling 31 white-eyes. Due to a skewed sex ratio (10 females for 21 males), an additional transfer of six females had to be undertaken in 2003. In July 2007, 25 birds (including nine females) and 20 birds (including nine females) from Conception Island were transferred to North and Cousine respectively, with an additional 3 Mahé birds transferred to Cousine in October 2007.

Post-release monitoring: Based on color-ring individual identification, initial post-release monitoring aimed at detecting all transferred birds and their initial nesting attempts, provide adequate protection to nests whenever required, and ring and blood-sample the young. Initially performed several days every 1 - 2 weeks, this was progressively reduced after six months (visits of 1 - 2 weeks several times per quarter or even per year) to determine population size, number of breeding territories, ecological measurements, plus breeding success and productivity when possible. Immediate post-release mortality was limited to 8.1% (three out of 37) and to 0% for Frégate and North transfers respectively. There were six breeding territories (3.2 birds per territory on average) established on both Frégate and North. The percentage of transferred birds participating to breeding activities on Frégate in 2001 - 2002 was 72% (21 birds including 9 females), and 80% on North in 2007 - 2008 (20 birds including eight females). Despite the limited number of females, first year productivity in fledglings was very high on Frégate and the population size increased by 60%. Similarly, nine to 12 fledglings have already been produced during the first eight months on North, bringing numbers from 25 to 34 - 37 birds. Growth rates decreased on Frégate during following years, and the population reached 70 birds by 2004, ~100 in 2007 and probably ~120 birds in 2008. A Masters study was conducted to investigate

various aspects of the Frégate population (dynamics, biology, ecology and territoriality), followed by a PhD comparing the different islands and integrating colonization patterns and species-habitat interactions. The species shows a great ecological plasticity for both its foraging and nesting habitats on the new islands, frequently using tree species for nesting (e.g. *Pterocarpus indicus* on Frégate) or vegetal food items absent (e.g. fruits from *Phyllanthus pervilleanus* & *Trema orientalis* on North) or rare (*Ficus reflexa*) from Conception. Ongoing habitat rehabilitation with native trees producing berries or rich in invertebrates has been conducted by the three private islands.

Major difficulties faced

- Difficulty to capture birds of known sex and (minimal) age for transfers: This applies to birds ringed in previous years expected to be adults with some breeding experience to be transferred. In 2001, only 10 known sexed adults out of 31 (32%) were transferred to Frégate. With 48% of such known sexed adults in the Conception population in 2007, these were 51% of the 45 birds transferred, but only 9 known sexed adults out of 25 (36%) could be sent to North Island (compared to 70 % for Cousine).
- Unbalanced sex ratio of transferred founder populations: This is mainly due to an already skewed sex ratio in the source population (58% of males), aggravated by the regular use of tape-luring during capture.
- Initial founder populations had 68% of males on both Frégate (31 individuals) and North (25 individuals): An additional six females were therefore transferred from Conception to Frégate in August 2003. A balanced sex-ratio was however obtained for the 20 birds that were transferred from Conception to Cousine.
- Health screening for white-eyes transferred to Frégate in 2001 had to be done abroad: Without previous experience of keeping white-eyes in captivity for more than two days, birds had to be released before the results could be obtained.
- Health screening for white-eyes transferred to Frégate in 2001 had to be done abroad: Due to custom problems, samples took three weeks to reach the New Zealand Center for Conservation Medicine (NZCCM) and their quality was affected. Lack of training in preparation of the blood and fecal smears was also a difficulty. A trained veterinarian was present on the source islands during the 2007 transfers.
- Difficulty to re-sight birds during the first few weeks after post-release: On Frégate & North Island, most of the transferred birds appeared to be prospecting the island, high in the canopy, before establishing territories and becoming more vocal. Despite intensive searches including use of tape-luring, very few birds could be spotted on Frégate immediately after the 2001 transfers. A similar pattern was observed, although less pronounced, after the North Island transfers. This was not observed on Cousine, probably due to its much smaller size (26 ha).
- Unexpected early start of the breeding season in 2001: Whereas the start of the breeding season had never been recorded earlier than September, white-eyes had already started singing by mid-August this year. Precautions had to



North island release site

© G. Rocamora / ICS

be taken to ensure that transferred birds were not involved in nesting activities, resulting in considerable extra time and energy spent during the 2001 transfers, and two dependant juveniles (one to two months old) left with only one adult in two territories. Future transfers were then planned earlier (July/ August).

- Logistical limitations in terms of transport and accommodation to the transfer islands to conduct post-release monitoring: This has been a serious limiting factor for several months on North Island during the crucial stage of the establishment

of the transferred population, when many nesting attempts could not be monitored and fledglings could not be ringed. Similar problems also occur during certain periods on Frégate. This does not apply to Cousine, which has its own team and could conduct almost daily post-release monitoring. It is important for the islands to have the necessary human and financial resources for post-release monitoring.

Major lessons learned

- Despite the problems encountered, the protocol designed and the equipment used for the first white-eye transfer worked out in general very well. In total, 31 birds were transported successfully from Conception and released in perfect condition on Frégate, making it a very successful transfer operation. Experience gained during this first island introduction was used to improve future island transfers and captive management for the same species, but also for transfer of other related passerines like bridled white-eye (*Zosterops conspicillatus saypani*) from Saipan to Sarigan (Mariana Islands).
- Improvement in captive management techniques: feeding techniques, length of captivity & release cage size. Feeding techniques tested during 2001 & 2003 transfers included water (plain and sugared) sprayed on foliage, honey smeared on sticks and sprinkled with live termites and other insects, termites provided on young coconut leaves, and seed-bearing branches or young trees in fruit placed into the aviary. During the 2007 transfers papayas and other fruits were cut in halves and placed in the aviary to attract invertebrates. On Cousine, termites were also successfully provided in small pots attached to perches; and 'Avesnectar' provided in drip feeders and sprayed onto the vegetation. The release cage was made larger (3 m x 4 m x 2.5 m instead of 2 m x 2 m x 2 m on other islands) to improve the conditions of captivity and to reduce the level of stress. Other improvements included a proper door for keeper access, a better hatch for introducing the birds and a clear plastic sheet rolled over the top to provide shelter during rains. Keeping white-eyes overnight in captivity in 2007 deemed beneficial as it allowed them with more

time to settle in and become familiar with their new environment. On both islands, some birds came back to the release site to roost after they have been released. Proper hides were also built to allow more discreet observation of the birds hence reducing their level of stress.

- In spite of the practical difficulty to conduct transfers after the breeding season had began in 2001, the timing of the transfers (October - November) allowed a successful introduction in 2001 with a quick establishment of several territorial groups, the first successful breeding within two months (December), and a high productivity (14 fledglings) during the first eight months after the release.
- Due to the early start of the breeding season in certain years (late July in 2007) future transfers should be planned early July, as done for the 2007 transfers. By early July, the chicks fledged at the end of the breeding season (late April/early May) are no longer dependant. Compared to Frégate transfers, birds transferred in July 2007 to North Island (and Cousine) had to wait longer for favorable breeding conditions, with first breeding attempts in October and first successful nesting in December, although still within three and six months respectively after the transfers.
- To maximize the number of adult birds (with supposed previous breeding experience) of known sex, it is necessary to capture and ring the largest possible number of birds in the source population one year before the transfer.
- However additional transfers of females may prove necessary to re-equilibrate sex-ratios and maximize the number of breeding groups the following year, as done on Frégate in 2003.
- Health screening needs to be organized locally so that results can be immediately available (within 1 - 2 days) and the birds released afterwards
- ICS Veterinarian was especially sent to New Zealand for training at NZCCM in June 2007, and consequently performed all required analysis in July during the transfers and also trained other participating staff in sample collection and preparation.
- Close monitoring of established territorial groups and nesting attempts allows surveillance and protection measures that can be crucial for an early breeding success. Surveillance and protection against disturbance, predators or adverse weather conditions maximizes chances of success for the very first nests, hence helping the population to kick off rapidly.
- The white-eye is a species with major adaptability and ecological plasticity. Close monitoring of the transferred birds have provided (and are still providing) very valuable and novel information regarding the extreme adaptability of these birds to plants, habitats or conditions that are new to them.
- Post release breeding success and productivity immediately after the transfers were exceptionally high on Frégate, and to a lesser extent on North Island. On Frégate, 66% of breeding attempts were successful with 0.71 fledglings / breeding adult after eight months. A prolonged breeding season was observed on Frégate compared to Conception and Mahé (as it happened on Aride with the transferred Seychelles warbler compared to Cousin). Nesting attempts could not be properly monitored on North, however nest failures appear more frequent than on Frégate and productivity was still high with 0.45 to 0.60 fledglings/ breeding adult after eight months. Initial productivity in fledglings

appears much lower on Cousine and reasons are being currently investigated (e.g. the Seychelles magpie robin has been seen attacking and killing young fledglings which occupy the same territory).

- The dynamic of a transferred population cannot be extrapolated from previous transfers with other species in different islands. The same applies to source populations. Very high population growth did not last for several years with the white-eye introduction on Frégate, contrarily to what had been observed with introduced Seychelles warblers on Aride (1988) or Cousine (1992). Replacement of transferred adults by island-born juveniles appear as a delicate phase, as this coincided with a slight decrease in the Frégate white-eye population in 2005. More Seychelles white-eyes island introductions are required before we can make reasonable predictions based on modeling. Similarly, rapid recovery of the Conception source population after the 2001 transfers could not be established, unlike with the Seychelles Warbler source population on Cousin island.
- The white-eye appears like a powerful propagator for seeds of several native plants and trees. Some trees producing berries preferentially eaten by the species have shown a spectacular spread on Frégate. This was particularly the case for *Tabernaemontana coffeoides* (introduced to Frégate during the preparatory stages) or *Premna serratifolia* seedlings. Similar observations are now being done on Cousine Island

Success of project

Highly Successful	Successful	Partially Successful	Failure
	√		

Reasons for success/failure:

- Our main initial goal to create two new viable populations (in addition to the existing mother population of Conception) has been partially achieved but has not yet been reached.
- Following the establishment of a new breeding population of almost 100 birds on Frégate Island, the species has been downlisted in the IUCN Red Data List from Critically endangered to Endangered.
- This is one step to having the species further downlisted to Vulnerable category, when two of the new populations are considered viable, alike Conception (~250 birds).
- Six years after the first transfers, one new middle size population (>100 birds) has been successfully established on Frégate Island. Indicators 1.1 to 1.4 have been met, although 1.4 was only achieved by 2008.
- Despite absence of introduced predators, and suitable habitat not being a limiting factor, this population has grown slower than originally envisaged. Indicators of population growth were derived from previous transfers of Seychelles warbler, and it now clearly appears that these cannot be transposed to the white-eyes case. Based on the Frégate experience, more realistic indicators were set up for the North Island introduction.

- With regards to the North Island transfers, conducted in 2007, indicators 2.1 to 2.3 have already been met satisfactorily. In addition, successful breeding has also been recorded on Cousine Island.

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