Attempted eradication of house sparrows *Passer domesticus* from Round Island (Mauritius), Indian Ocean

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SUMMARY

In 1982, house sparrows *Passer domesticus* were confirmed as having established a naturalized population on Round Island (Mauritius). A planned pending translocation of an endangered Mauritian endemic bird, Mauritius fody *Foudia rubra* to Round Island suggested eradication of sparrows to be pertinent as they were potentially a resource competitor and vector of parasites and pathogens. An attempted eradication using a combination of techniques was undertaken from 19 August 2008 to 25 February 2009. Following food preference trials, microwave-sterilized millet seed was used as bait for trapping and for narcotisation with alphachloralose. House sparrows were also shot, caught in mist nets and on glue sticks, and some nests and chicks were removed. In total, 320 house sparrows were killed, with trapping accounting for 87% (277) of birds removed. However, the population was not eradicated. The assumption that the Round Island house sparrow population was derived from one storm-driven event and is closed to further immigrants needs to be investigated in order to determine whether long-term eradication is in fact feasible. Suggestions for improving the prospects for eradication or ongoing management of the population are presented.

BACKGROUND

On oceanic islands with a high degree of endemism, exotic species can be responsible, directly or indirectly, for species' extinctions although their effects are not always clear-cut (Strubbe & Matthysen 2007, Blackburn *et al*. 2009). While there are some established methods to eradicate alien mammal populations from islands which have proven successful (Veitch & Clout 2002), development of techniques for the eradication of non-native birds is less advanced.

Round Island (19°50' S, 57°47' E; 219 ha; 267 m a.s.l.; Fig. 1) lies about 22 km north of Mauritius (Indian Ocean). Unlike Mauritius main island, it has never experienced permanent human settlement and has not been colonized by rats *Rattus* spp. or cats *Felis catus*, the introduction of which has been attributed with many oceanic island extinctions. As a result it has retained many elements of native biodiversity that have been lost on Mauritius and other more accessible surrounding islands (Cheke & Hume 2008). To conserve this diversity, including unique reptile and seabird faunas (Merton & Bell 2003, Cheke & Hume 2008), introduced European rabbits *Oryctolagus cuniculus* and goats *Capra aegagrus hircus* were successfully eradicated in the 1980s (Merton 1987, Bell & Bell 2002). Subsequent recovery of endemic and indigenous vegetation is contributing to restoration of some of the island's former habitats, especially palm forest, now rendering the island suitable for introduction of some of Mauritius's endangered endemic birds whose relict mainland populations experience numerous ongoing threats. The extent of vegetation recovery on Round Island was considered sufficiently advanced to be suitable for the introduction of the endangered Mauritius fody *Foudia rubra*.

However in 1982, house sparrows *Passer domesticus* were seen on the island for the first time following a cyclone and have now become naturalized (Bullock *et al.* 1983). House sparrows are a common introduced bird on Mauritius and have colonised many small islands located between Mauritius and Round Island. Seeds of exotic weeds, which proliferated following the eradication of rabbits and goats, provide an important food source for them (Bednarczuk *et al.* 2009).

Concerns over the possibility of transfer of parasites and pathogens from sparrows to fodies and of competition between the two species lead the Mauritian Wildlife Foundation (MWF) to attempt the eradication of house sparrows on Round Island prior to the release of Mauritius fodies. This paper describes the processes considered and approaches used during a six month eradication program that began in August 2008, and the achievements of this attempt and future recommendations.

ACTION

Assumptions and preliminary considerations: House sparrows are generally resident birds whose movements are influenced by local food availability, although they can show more extensive movements during the non-breeding season (Summer-Smith 1988, Wernham *et al.* 2002). The population on Round Island is thought to be closed and thus self-sustaining but this assumption has not been tested. To facilitate Mauritius fody introduction, eradication of the sparrow population was suggested. Reliable estimates of the house sparrow population on Round Island were lacking; the population had been variously estimated at between 100 and 1,000 individuals through *ad hoc* observations by visiting biologists. The breeding ecology of sparrows on the island (Summers-Smith 1988), was also poorly understood. Apart from observations of small flocks feeding amongst weed patches, their diet on the island was also unknown.

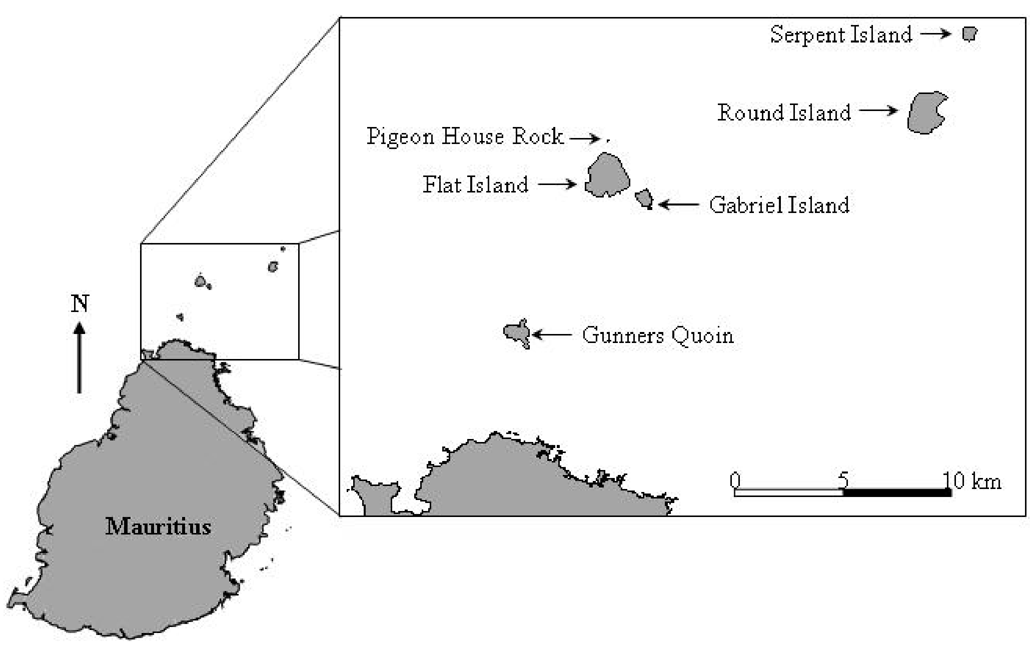

Figure 1. Map of Mauritius and the northern islets (courtesy of Nik Cole).

Round Island supports eight native reptile species including some critically endangered endemics (Cheke & Hume 2008), imposing constraints on the techniques that could be considered for use in sparrow eradication, especially with respect to avicides. Fenthion, frequently used to control red-billed quelea *Quelea quelea* in Africa (Bruggers & Elliott 1989) was excluded on the basis of its suspected toxicity to reptiles (McWilliam & Cheke 2004). Starlicide, registered in North America for controlling European starlings *Sturnus vulgaris* and blackbirds (Icteridae) (US EPA 1995) has low toxicity for house sparrows but there is no toxicity information for reptiles. Based on this knowledge and a review of other possible control methods, the techniques selected to attempt eradication were:

1) Trapping using cage traps and glue sticks (see below). Mist nets were rarely used and powered nets (e.g. clap nets) were excluded due to the persistent strong winds. In preliminary trials, broadcasting of house sparrow ‘chirrup’ calls and the presentation of stuffed house sparrow corpses failed to attract them to feeding sites and these techniques were therefore not subsequently used;

2) Shooting, mainly in the vicinity of nests, using a 12-guage shotgun. Limited availability of a licensed marksman and lack of cartridges with shot size appropriate for sparrows restricted the potential of this control method;

3) Alphachloralose, a chemical used for house sparrow control in several countries (Nelson 1994), was considered suitable as its mode of action (lowering core body temperature of homoeothermic vertebrates) posed minimal risk to reptiles.

Biology of Round Island house sparrows: Observations of sparrow distribution and behaviour were made on nine occasions from 19 August 2008 to 25 February 2009 (Table 1). The first two sessions were devoted to recording flock locations, feeding sites and habitats within which they fed, and estimating flock sizes. During subsequent observations (up to 3 h at any one feeding site), food types eaten were recorded (when food items were visible), and flight directions after feeding or on disturbance by the observer provided information on the extent to which different feeding sites were shared by the same flocks. More life history information accrued throughout the study, including stage of moult and brood patch development from trapped individuals, provided information on population sex and age composition, and breeding status. Nests were sought to establish localities of main breeding areas. Daytime and evening flight directions were recorded to assist searches for day and night communal roost sites. These data were used to decide where best to establish baiting stations and where shooting or nest destruction might be possible at nest sites.

Table 1. Round Island house sparrow observation and control sessions, August 2008 to February 2009.

Sessions	Activity	Sparrows killed
19 August - 1 September	Observation	0
20 September - 15 October	Observation and baiting	0
16 October - 20 November	Trapping, Alphachloralose baiting, mist netting, glue sticks, shooting	177
28 November - 24 December	Trapping, glue sticks, mist netting	88
30 December - 12 January	Trapping	14
29 January - 4 February*	Baiting	0
10 - 25 February	Trapping, Alphachloralose baiting	41
		Total: 320

*Island evacuated due to tropical storm ‘Gael’

Bait selection, pre-baiting and trapping: In house sparrow food preference trials on Mauritius, free-living wild birds were presented, in patches on a table in a research station garden, with three readily available food types: white millet *Panicum miliaceum*, brown rice and breadcrumbs. Food consumption was not measured but sparrows showed a clear preference for the millet, which was therefore selected as the bait to be used. Strict quarantine protocols prohibit the use of viable exotic seeds on Round Island. Therefore, millet seed sterilized by microwaving 1 kg of seed for 10 min at the maximum heat setting (1,100 W), was presented to house sparrows in the same garden situation. This confirmed that sterlisation did not impair palatability or affect preference.

Prior to swallowing, house sparrows de-husk seed by mandibular manipulation. On Round Island, in preparation for the use of alphachloralose (see below) de-husked sterilised millet was presented on bait trays to free-living house sparrows and this proved highly palatable to them.

The aim of pre-baiting was to habituate sparrows to feed on provided bait. Locations selected were those where flocks had been recorded feeding on the ground on naturally available food. Pre-baiting was done gradually, allowing sparrows to become familiar with the novel food (millet) and foreign objects (traps, feeding platforms) at each of 16 feeding locations (11 in 'mixed weed' habitat, four on the 'summit' and one in 'coastal' habitat; Fig. 2) all with abundant exotic weeds. Up to five sites were operated simultaneously supervised by one or two field staff.

Initially, handfuls of bait were scattered directly on the ground in the foraging area to encourage sparrows to sample seed not otherwise available on the island. Once sparrows were confirmed feeding on the bait, a non-functional trap was introduced nearby. Next, bait was presented in a concentrated area and the trap gradually moved closer to it over 1-2 days. When birds appeared comfortable with a trap next to their food source, bait was subsequently provided only within an open trap (all doors opened and funnel bob-wires lifted so that birds could enter and leave freely). Sparrows were observed to ensure they were regularly feeding inside the trap prior to initiating trapping.

Generally, pre-baiting lasted 2-5 days, after which trapping commenced. Bait was replenished inside traps as needed. Traps were set for 1-5 days, or until birds were no longer captured. Once a trapping site was no longer catching birds, it was temporarily closed, or it was abandoned in favour of a newly established site. Counts of birds present at foraging and trapping sites were carried out throughout the trapping program.

Seven funnel traps (large: 120 x 60 x 35 cm with 28 x 8 x 8 cm funnels; medium: 80 x 50 x 30 cm with 28 x 11 x 9 cm funnels; small: 50 x 45 x 40 x with 28 x 10 cm funnels) made out of 1.5 x 2.5 cm galvanized wire mesh were used to capture sparrows. Chardonneret and drop traps did not yield any captures during trials and were thus not used. To make funnel traps less intimidating to sparrows, the mesh floor was covered with soil and bait was scattered on top of this. Rocks were placed around the bottom perimeter of the trap to prevent birds from digging underneath the floor to access millet that had fallen through the mesh. A plastic water dish weighed down with a rock was provided inside each trap.

Two Telfair's skink Leiolopisma *telfari* (Round Island's most abundant endemic reptile) escape exits were added in the bottom corners of each funnel trap by enlarging the mesh opening to 2 x 4 cm; trapped skinks search for escape opportunities along the bottom of the trap, whilst sparrows tend to search for openings in the upper part of the trap.

During trapping, all traps were visited at least twice daily (morning and evening), or every few hours on hot days, to remove birds. During the first trapping session, several sparrows escaped during extraction from the trap. This was subsequently prevented by extracting the birds through the sleeves of old shirts placed over the trap doors.

Glue sticks: Glue from Sakarat Rodent Glue Boards™ was used. At popular perching sites, dead *Scaevola taccada* shrub stems were broken off, the tips thickly coated with glue and the stem secured back into place with wire. Also, four artificial perches attached to 2 m long aluminum poles were set up among dense patches of native vegetation. Glue sticks were supervised at all times and trapped birds removed immediately upon capture.

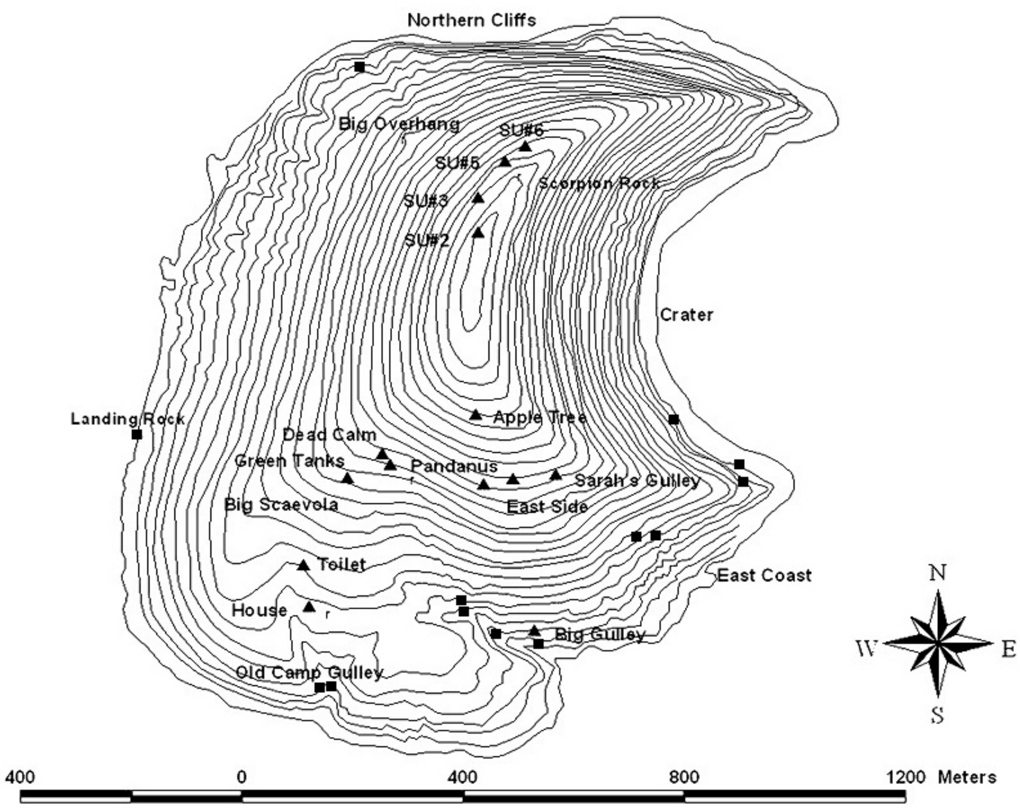

Figure 2. Position of baiting stations (triangles) and nests (squares) located during the Round Island house sparrow 2008-2009 eradication program. Contours are 10 m intervals.

Mist netting: A 10 m (3 x 3 cm mesh) mist net was set up at two sites sheltered by shrubs and young trees, which helped to mask the net and reduced movement due to wind. The net was set at dawn and opened for 4-5 hours, and continually monitored or checked every 20 minutes for captured birds.

Shooting: During 20-27 October 2008, a trained gunman used a Rizzini 12 gauge double barrel shotgun to kill sparrows at nests and daytime roosting sites (# 6 shot; smaller shot size, more appropriate for house sparrow, was not available during the eradication attempt). Windy conditions prohibited use of an air rifle.

Alphachloralose: As sparrows de-husk millet seed before swallowing, seeds were gently crushed with a pestle and mortar and winnowed (to remove the loose husks) so that alphachloralose powder could be applied directly to the kernels. De-husked seed was lightly coated with vegetable oil so that the powder attached, thoroughly mixing by shaking in a clear plastic bag until well combined. Alphachloralose was added at 0.5% or 1.0% of the bait weight. Alphachloralose-treated seed was applied at two sites: presented on a bait tray (to facilitate collection of uneaten seed) at one and placed on the soil at the other. At both sites the stupefacient was used for only two days before being removed, at the latter site complete with the soil upon which it was laying. Unused bait was taken for deep burial on Mauritius.

Nest destruction: Whenever possible, safely accessible nests were destroyed and chicks humanely killed.

Treatment of trapped and shot birds: Captured birds were instantaneously and humanely killed using rounded needle-nose pliers for cervical fracture. Killed birds were given a sequentially numbered label affixed to a leg. Most are stored frozen at the Gerald Durrell Endemic Wildlife Aviaries in Mauritius for future analyses. Primary moult was scored in all birds (Redfern & Clark 2001) and the extent of the incubation patch was scored in adult females. Tissue samples were taken from 10 individuals for pathogen screening, results of which will be reported elsewhere.

The eradication methodology used was approved by the Ministry of Agriculture, Government of Mauritius.

CONSEQUENCES

Biology of Round Island house sparrows: House sparrows were present throughout the island. Up to 100 birds were observed daily but no estimates of population size were obtained. Other than feeding on millet, birds were seen

Nests were only found in clefts in the walls of steep-sided gullies, but were not equally distributed along the cliffs surveyed. Repeated surveys of seven 'Palm Savannah' gullies and associated cliffs located only two possible nests, whereas over 10 nests were found in the large 'Swimming Pool' gulley in the southeast of the island. Sparrows returned to many of these sites to rear more than one brood. Additional pairs may nest on the steep northern cliffs, which are too dangerous to access without climbing equipment. Despite extensive searches, no nests were seen in blue latania *Latania loddigesii* palms (by far the most widespread trees on the island) or in other trees.

Night time roosts were never located. The Dead Calm Tree, Big Scaevola and East Side sites normally used by daytime roosting groups (20 - 70 birds) were vacated at night. Sunrise watches of these sites suggested that birds flew in from all over the island. On many occasions nearing

picking seeds off the ground or perching on stems, feeding on fruits and seeds. Examination of crop contents confirmed a mainly granivorous diet including seed/fruit of scarlet spiderling *Boerhavia coccinea*, red spiderling *B. diffiusa*, false tamarind *Desmanthus virgatus*, crabgrass *Digitaria horizontalis*, passion flower *Passiflora suberosa*, black nightshade *Solanum nigrum* and millet. During the breeding season some birds were observed foraging on insects, gleaning them from foliage and hawking flying insects.

Nesting was observed from August to December 2008, and again in February 2009, at the beginning of the wet season. Primary moult scores of adults peaked in December and January (Table 2), supporting the notion of reduced breeding activity during this period. However, the presence of full brood patches in females did not show a clear pattern (Table 2) and further study of the annual reproductive cycle is needed.
dusk, sparrows (up to 20+ individuals) were seen flying towards known nest sites, and also into the Crater and toward the steep northern cliffs.

Success of control: Sparrows were not eradicated during the 5-month control effort. In total 320 birds were known to have been killed (Table 1): 60.6% (194) were adults, with immatures and juveniles making up the remainder. Lacking sound criteria for aging and sexing, to the best of our knowledge 122 females (adults), 120 males (adults and immature), and 76 juvenile sparrows of unknown sex were killed. It is possible that additional birds may have been killed as a result of ingesting alphachloralose but they were not recovered. Despite the killing of 320 birds no decline in numbers observed daily was apparent (Fig. 3). However, abundance estimates are not robust and should be interpreted with caution since search effort varied greatly in terms of duration, location and observer experience.

Table 2. Monthly proportion of adult house sparrows in active moult (scores between 1 and 44; Redfern & Clark 2001) and of females showing a full brood patch during the study.

Month	% of adults in moult (number scored)	% female with full incubation patch (number scored)
October 2008	10.9 (64)	50.0 (36)
November 2008	31.6 (19)	38.9 (18)
December 2008	72.9 (48)	56.7 (30)
January 2009	81.8 (11)	12.5 (8)
February 2009	25.0 (36)	29.4 (17)

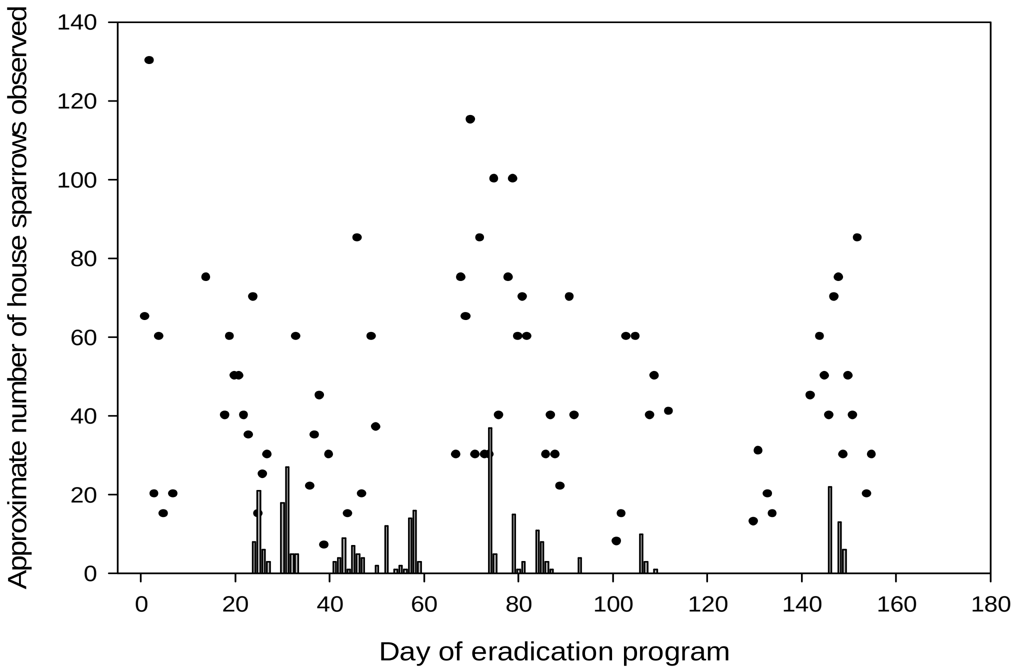

Figure 3. Estimated numbers of house sparrows observed on Round Island (points) and number caught/day (vertical bars) during the eradication attempt. Counts began on 30 August 2008; eradication efforts (trapping) began on 16 October 2008 (day 24) and ended 25 February 2009. Abundance observations during 72 out of 155 days are based on widely varying degrees of effort (variability amongst sites, time, observers etc.). Birds were not marked and individual re-sightings are probable.

Sparrow captures varied greatly between sites. Most were captured in funnel traps (277), the other techniques accounting for small numbers of birds (Table 3), although catching effort varied between techniques once it was ascertained that the larger funnel traps were the most effective. The effectiveness of all catching techniques quickly decreased with time during the first two days at each site (Fig. 4). Likewise, birds appeared to learn to avoid mist nets and glue sticks within hours of set up, and alphachloralose-treated bait was also quickly avoided (see below).

Capture rates varied greatly between sites (Table 3), the number of birds caught ranging from zero to 63 at each site. Of birds known to have been killed, 6.9% were captured on glue sticks. Some birds managed to land on the sticks, free their feet of the glue and escape, but most were immobilized long enough to be retrieved. A shrub with many glue-covered branches was more successful in capturing birds than were tall single glue sticks. Gluing was used infrequently since it required constant vigilance and sparrows quickly learned to avoid the treated perches.

Mist netting was used at two sheltered sites frequented by flocks of sparrows for day roosts; however, three netting days yielded only three sparrows, all at one site. The 3 x 3 cm mesh was likely too large for a small passerine but mist nets are of limited use on Round Island as in most situations the constant wind renders them highly visible to birds.

Table 3. Round Island house sparrow *Passer domesticus* 2008-2009 captures broken down by baiting station and eradication technique used across three habitats.

Habitat	Baiting station	Trap	Glue stick	Shot	Mist netting	Alpha-chloralose	Nest destruction	Sub-total
Mixed Weeds	House	20	18		0			38
	Toilet	7		5				12
	Big Scaevola #1	34						34
	Big Scaevola #2	12	0					12
	Green Tanks	1	1					2
	Dead Calm Rock	25						25
	Dead Calm Trees	57	3		3	0		63
	Pandanus	10						10
	Sarah's Gulley	0						0
	East Side	33						33
	Apple Tree	9						9
Summit	SU#2	23				3		26
	SU#3	28						28
	SU#5	4						4
	SU#6	14						14
Coast	Swimming Pool	0		4			0	4
	South East Coast						4	4
	Shower Gulley			1				1
	Landing Rock			1			0	1
	Sub-total	277	22	11	3	3	4	320

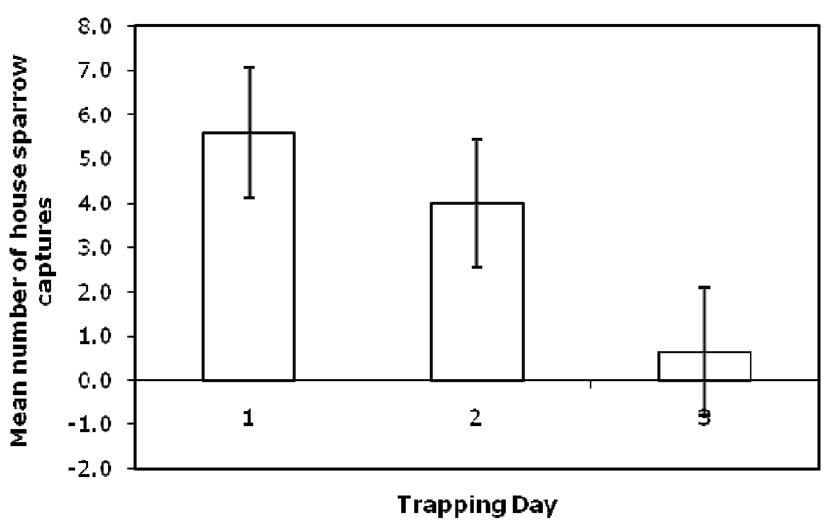

Figure 4. Mean number of house sparrow captures over the first 3 days of trapping sessions at 17 trapping stations during the attempted house sparrow eradication program on Round Island. Vertical bars are 1 standard deviation.

It is not possible to estimate the number of sparrows that died from ingesting alphachloralose as dense vegetation made it difficult to locate grounded birds, but we suspect that few succumbed. The stupefacient was used on two occasions, once at the beginning of the eradication program in October on the Summit (SU#2), and again in February at sites that were regularly visited by large flocks of sparrows. Each time the treated bait was presented for two days and then removed. Few birds consumed the bait on the first day and these birds appeared wary. On the second day they avoided the bait completely, suggesting that they were able to detect the chemical. Only three sparrows assumed to have died from ingesting the treated bait were recovered. A few apparently intoxicated sparrows and barred ground doves *Geopelia striata* (an introduced species) were seen.

During one week, nine sparrows were shot at nest sites, and two further birds out of a small flock in a bush. Further shooting was not undertaken due to the unavailability of experienced marksmen. Six nests (2 active and 4 empty) were destroyed and four chicks were killed in two of these. The nests were not rebuilt during the eradication period. Most nests were located about 10 m or higher above ground, on ledges or crevices on vertical cliff walls close to the sea, rendering them inaccessible.

Non-target mortality: Nine Telfair's skinks were unintentionally killed: two were entangled in a piece of netting placed at a baiting station to allow sparrows to acclimatize to the presence of the net, and seven died in traps, presumably from heat exhaustion. The netting was removed and skink escape exits were subsequently added to traps to prevent further incidental mortality. Two barred ground doves were killed after their feathers were glued.

Discussion – lessons learned and requirements for eradication: House sparrows on Round Island are unusual in that they show no propensity for reliance on resources provided directly by man, thereby failing to demonstrate the commensalism of most house sparrow populations worldwide (Summers-Smith 1988). Although efforts are made to limit the impacts of the small number of scientific staff present at anyone time on the island, food scraps are nevertheless available after washing crockery and culinary utensils and Telfair's skinks readily eat any such remains. House sparrows, however, show no interest in the areas of human habitation, remaining in more remote areas, albeit mainly places supporting exotic seed-bearing plants. They nest in the most isolated of places, rather than using man-made structures or in the trees now available following the eradication of grazing mammals. This choice of nest site may be influenced by Telfair's skinks, which were seen exploring some sparrow nests and may predate eggs and nestlings.

These features of their behaviour limited the control measures found effective in population reduction. Sparrows are unaccustomed to foodstuffs like rice that can be used as bait elsewhere and are wary of people, and man-made structures introduced into their environment.

Limited access to parts of the island, especially the Crater and Northern Cliffs, and the limited time available for investigation before control had to begin, precluded robust sampling to ascertain the number of house sparrows on the island. Our detection of a maximum of about 100 individuals on any day during pre-control reconnaissance was clearly an underestimate but it is impossible to say whether this resulted from our failure to locate a substantial part of the population, or whether our assumption of it being a closed population was erroneous.

Ringing studies in UK have shown house sparrows to be largely sedentary, recoveries having a median distance from the ringing site of only 1 km, but with some birds moving over 20 km at all times of year apart from the breeding season (Wernham *et al*. 2002). In Europe, there is some evidence of dispersal, mainly by juveniles, but some populations of the subspecies *bactrianus* (south-central Asia) and *parkini* (Himalayas) (Howard & Moore 1984) are migratory (Wernham *et al*. 2002). The subspecies introduced to Mauritius, *indicus*, undertakes seasonal movements in its native India (Grimmett *et al*. 1998). The islands north of Mauritius that have been colonised by house sparrows, and their distances from the north coast of Mauritius, are Gunners Quoin (4 km), Gabrielle (11.5), Flat Island (11.5) and Round (22). Perhaps importantly, Round Island is only about 12 km from Gabrielle and Flat Islands. These distances are within the ranges given by Summers-Smith (1988) for known over-water colonisations, but in many cases it is difficult to exclude human transportation, deliberate or accidental, in such events. Nevertheless, these examples indicate that the assumption that the Round Island population is isolated from immigration requires substantiation.

If house sparrows do arrive from other nearby islands eradication will be impossible and the strategy employed on Round Island must be one of ongoing control to maintain a low population. To resolve this issue a marking program on Mauritius and on the other northern islands is needed, followed by regular monitoring of Round Island flocks to search for marked individuals. This study should be given priority, since the killing of 320 house sparrows during the study period, without any apparent influence on the number of birds seen daily (Fig. 3), suggests that for some reason our rate of killing was not reducing numbers. However, without more accurate census procedures, we cannot be certain that our estimates were reliable and the failure to apparently reduce numbers could have resulted from a change in the birds' social behavior in response to killing, leading to remaining birds coalescing into larger flocks that became more apparent as the control progressed.

The rapid declines in catches at each trapping site (Fig.4) could signify rapid depletion of numbers locally or be indicative of the development of trap, trap site or bait shyness. All may be involved but whatever the cause, catching efficiency might be improved by removing traps after three days or so of use and moving them elsewhere to new sites that have been pre-baited. This would ensure that traps were in more constant use than in this study. Availability of more of the larger, more successful traps might also have increased our catch rate. Increasing the diversity of bait seeds might also prolong the efficacy of traps at each site. Lefebvre and Giraldeau (1984) found that individual feral pigeons *Columba livia* preferred different components of available food mixes, and baiting with seed mixtures may attract more birds than single seed types alone (each seed species would need to be sterilised and checked for palatability).

Although sparrows learned to avoid glue sticks, this little used technique did account for about 10% of all captures. More extensive use at sites wherever house sparrows were seen perching might have increased the number of captures. Our ability to catch birds at nest sites and to destroy nests and their contents was severely constrained by the inaccessibility of these sites. Shooting was the only technique that was appropriate at such localities but a marksman was available for only one week. Whilst shooting is time consuming, there is little doubt that many more sparrows could have been shot with more intensive effort throughout the breeding season and future control effort should include this facility. In addition to having a full-time marksman on the control team, shooting efficacy would be improved by using a more appropriate shot size: no. 9 shot is preferable for small birds like house sparrows. Shooting should, however, be restricted to birds at or near their breeding sites in order to minimize the risk of instilling aversion of birds in flocks to people with guns, thereby promoting gun/gunman aversion in the wider population.

Our chances of eradication success were compromised by two further weaknesses in the program design. First, we began with inadequate information on the annual reproductive cycle of house sparrows on Round Island and of their food resources, and we therefore did not know at what stage of these cycles we were commencing our activities. Further data on breeding and moult periods when energy demands are high, along with information on food shortages, could help identify periods when birds would be more attracted to provisioned bait. The second weakness of our control effort was its cessation at the end of EB's seven month contract, during which significant numbers of house sparrows had been killed. If eradication is the desired goal of a control program, the management plan ideally must have an open-ended timescale, with adequate provision of staff, funding and other resources to ensure that eradication is achieved, and to include post-eradication monitoring to detect any failure or re-invasion and to take any further action deemed necessary.

Finally, there remains urgency to introduce the Mauritius fody in order to establish a third population of this endangered species, currently confined to southern Mauritius and Isle aux Aigrette. If this introduction takes place prior to house sparrow removal, the fodies' presence will place further constraints on the techniques that will be available to eradicate house sparrows.

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