

Translocation of Western Ground Parrots from a stable community to a new location within the historic range

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Introduction

The Interim Recovery Plan for the Western Ground Parrot (Burbidge *et al.* 1997) and the South Coast Threatened Birds Recovery Plan (Gilfillan *et al.* in prep.) propose the use of translocation as a tool to help ensure the long term survival of the Western Ground Parrot. However, translocation is a complex process (eg Griffith *et al.* 1989) and Ground Parrots have not previously been translocated. This document, therefore, is designed to outline the process necessary to carry out such a translocation.

This document is not a translocation proposal – rather, it is the prescription of what is to be done following approval for translocation to occur. All the methodologies contained in this manuscript are developed using the best practice and most recent knowledge at the time of writing. To this end, future developments in technology should be assessed by relevant experts at the time and used in an adaptive management manner. This protocol is a précis of threatened species management through translocation. In particular it refers to a process deemed essential for securing the future of a currently critically endangered bird. As such it should be supervised and carried out by people who are experts in their field. With these people will be entrusted one of the few chances we have of stemming the otherwise inevitable flow of extinction. The process should be given due consideration and remain under the watchful eye of the scientific community, via the South Coast Threatened Birds Recovery Team. Having said this, it is also important that any opportunities for training and education of interested parties, from both CALM and the wider community, be maximised during the translocation process. This can be achieved by active involvement, media coverage and a well documented report of the translocation results.

Objective

The primary objective is the safe and effective movement of Western Ground Parrot individuals from a stable/increasing population to a new environment deemed suitable for sustaining, and increasing, a translocated population.

The ultimate goal is to establish a self-sustaining satellite population of birds that can proliferate beyond the risk of a single catastrophic event. Such an event would lead to further decline of this critically endangered bird. The reintroduction of Western Ground Parrots to a habitat suitable to sustain a growing number of birds would greatly increase the sub-species chances of survival.

The Translocation Process

The translocation process can include catching birds in the source population, monitoring the source population pre- and post-capture, transporting birds, holding birds in captivity at the source population or at the translocation site, release of birds at the translocation site, and population monitoring at the release site. This document concentrates on those aspects where researchers interact most actively with individual birds, ie handling, transporting, captive maintenance and release, and radio-tracking.

Handling of Birds

It is essential that birds only be handled by personnel who are trained in handling parrots of a size similar to the Ground Parrot. Typically, such people would have an 'A' Class Banding Authority or significant experience in handling wild birds for research or active management. Personnel without such experience should not be involved in any aspect of handling unless under the direct supervision of an appropriately experienced person.

Where birds are banded, this must be by, or under supervision of, an appropriately qualified and authorised bird bander.

Capture of birds for translocation

Selection of source population.

A habitat that contains a stable or increasing population of Western Ground Parrot is to be targeted as a source population for translocation. The choice and rationale for this is documented in the peer reviewed translocation proposal. This area must be closely monitored prior to capture. The focus of this monitoring is to locate the highest concentration of birds (using morning/evening call rates) and to gain knowledge of the diurnal movement of individuals. As far as possible birds should be caught from several different regions of this target habitat, in order to minimise any disruption to local densities and population processes. On current knowledge, it would be best if birds were sourced from both Short Road and Wilderness Gate populations within the Fitzgerald River National Park. This would allow the greatest genetic diversity to be preserved and reduce genetic risks associated with founder effects and bottle necks.

Areas where birds regularly cross roads in the morning for feeding and return via the same route in the evening to roost are of high priority for capture sites. This will increase the capture team's ability to attend birds instantly and reduce the likelihood of by-catch (mostly passerines). Nets placed within bush run a higher risk of catching the smaller birds that wouldn't attempt to cross open areas such as roads. The cleared area around a road/firebreak allows quick and easy access to the nets and reduces disturbance noise. This has been noted as a limiting factor while mist netting for Eastern Ground Parrots on the sunshine coast. The high, thick vegetation in this region sufficiently slowed researchers approach to nets so that a number of birds escaped before they could be secured (Ken Chan pers. comm.).

Alternatively, areas where birds are regularly heard flying in the evening should be targeted. If a flushing and encircling technique is to be employed (explained below), then an area of suitably low vegetation with mallee dispersed at 10-15m intervals could be used if it is found to contain feeding birds.

Timing of capture

It is preferably that birds be captured approximately November-December. This is post breeding time according to evidence collected by Burbidge *et al.* (1989) and more recently by Brent Barrett in October 2004. This work found that Western Ground Parrots began nesting between late-July and early-August, with young fledging mid to late September. During this proposed capture time young are exploring the local environment and dispersing from natal sites and are more inclined to fly into nets than adults (who are more skilled). Furthermore the juveniles have been out of the nest for a few months and should possess all skills appropriate for survival. It is assumed that ground parrots need approximately three months of parental dependency in order to learn all vital survival skills. Young Ground Parrots apparently disperse from the natal area at 2-3 months of age (Higgins 1999; McFarland 1991), suggesting that they may be independent of their parents at this time. Being a generalist and opportunistic feeder the Western Ground Parrot it is likely to have a higher chance of survival in a novel environment if it is exposed at a younger (less imprinted) age. The trail of discovery that is embarked upon by dispersing juveniles will aid quick adaptation to the translocation site. Essential skills such as predator avoidance and selection of appropriate roost/nest sites must be engrained before dispersal. Thus following fledging the birds will attain all appropriate skills prior to dispersing from the parents. Some adults may be captured using the prescribed methodology and therefore be translocated also. This will ensure that birds of appropriate skill and breeding age will be among the new colonists of the translocation site. It is estimated that Western Ground Parrots are able to breed at two to three years of age (McFarland 1991). Therefore the new population would need to maintain itself in the translocation site for two and a half years before any increase in population occurred if only juveniles were translocated. However the introduction of adults at the time of translocation should accelerate this process if they pair up together. Times to be avoided when capturing individuals for translocation include the pre-breeding period when adults are pairing up, the nesting period and juvenile dependency stage. Other unsuitable capture times may include the time of post breeding moult. During this period the birds are producing the greatest volume of ground scent for predators and requiring a higher level of nutrition for the rapid growth of new plumage. Moulting time is to be avoided if possible however it may not be practical for Western Ground Parrots as this is likely to extend from early January to March (McFarland 1991).

Capture Methodology

The typical method of capturing Western Ground Parrots in the wild is through the use of mist nets. This is highly recommended following successful implementation by Burbidge *et al.* in the same habitat in 1989, and Jordan (1988) in eastern Australia. This method employed the use of multiple nets simultaneously set with appropriately skilled banders in constant attendance. While much time was spent disentangling non-target species, Western Ground Parrots were successfully captured using this method.

As many as 10, 60-foot, nets should be set throughout a targeted habitat. These can be set during the flight-call period in the early morning and evening. Knowledge of regular movement patterns gained from pre-capture surveys will aid the placement of these nets. In the interim period between capture times (daylight hours), when birds are feeding on the ground and not flying by choice, the nets should be 'furled', ie all the net shelves raised to make one compressed bundle at the top of the net line. These nets can then be re-opened quickly in the evening just after sunset and attended until the cessation of the

evening call-flight period (approximately 1 hour post sunset). During the day the nets must be checked to guard against the unlikely event of any bird becoming tangled in the closed net. Early morning trapping should commence one hour before sunrise with the nets closed 10-minutes prior to sunrise. Burbidge *et al.* (1989) found that by raising the base of the nets just short of 1m above the ground reduced some of the by-catch. Furthermore nets with a larger mesh that were loosely hung had a greater chance of secure capture of Western Ground Parrots, while making the release of non target species even easier. Western Ground Parrots are good strong flyers and able to escape a net that is strung too tightly. There is some evidence that the use of call playback increases the Ground Parrot catch rate in mist nets (K. Chan, pers. comm.), so this technique should also be trialled. This involves placing a playback machine on the ground in the centre of the net. Recordings obtained during recent flight-call periods should be used. Only recordings from Wilderness Gate should be played at Wilderness Gate and likewise only Short Road recordings used as Short Road. There is some anecdotal evidence that there are subtle local dialects (B. Barrett pers. obs.). Furthermore, the desire is to emulate a local bird's call in relation to roosting.

Mist nets may be re-opened during the day while researchers attempt to flush birds into them. This can be achieved by herding the bird towards the nets. This must involve in excess of eight researchers for it to be successful. Nest searching methods employed in October 2004 using only eight researchers resulted in 33 flushing events. Many of these were multiple flushings of the same individual. While this was efficient for the purposes of identifying adult/juvenile plumage, mist net capture success will increase with an increase in the number of participants. While employing this method researchers will have three opportunities to drive a bird into a net. Following the third (and sometimes fourth) flush event the Western Ground Parrot individual will typically fly a considerable distance from disturbance and therefore out of the range of flushers and nets. However if there is sufficient bird activity in the immediate vicinity of the nets this method may prove successful.

A similar method involving targeted flushing may also result in some captures, particularly of juvenile birds. This involves marking the exact landing site of a bird following the first flush event. Researchers can then take up positions around the landing site and quickly raise nets along one portion of the parameter. The principle researcher can then coordinate the advance of the flushers in order to drive the target bird out one side and directly into the nets. This was found to be a successful method of targeted flushing during 2004 nest searching. This same method succeeded in flushing a bird in a preselected direction on three out of five attempts. This was found to be most effective on juvenile birds as they tended to remain at the landing site (typically the base of a mallee). Adult birds often ran a short distance after landing. This method may be most effective in the region of the wilderness gate habitat that is north and south of the southern fire line. This habitat was burnt in 1998 and is relatively low and open. Mallees are 10-15 meters apart and were the preferred landing site of flushed birds. The more open vegetation allowed researchers to quickly encircle the landing site. This may also be conducive to carrying pre-strung nets on poles. This method can be employed with only eight researchers.

Transportation

The following is adopted from Don Merton (Kakapo Recovery Team, Department of Conservation, New Zealand). It is based on many years of experience with a range of bird species, including parrots, under a range of conditions in several different countries.

- Speed - **plan very thoroughly and carefully** to minimise time in confinement – carry out the transfer as quickly and smoothly as possible;
- **Have a contingency plan** – weather conditions, mechanical breakdowns and people tend to stuff up the best of plans;
- Keep carry crates as **cool and as dark** as possible - **better too cold than too hot**. Lower light levels are conducive to lower levels of activity (and thus energy conservation) in most animals. Never leave carry crates in direct sunlight, and dampen the moss/litter inside so that humidity is relatively high and temperature low. Dampen exterior if necessary so that latent heat will keep crate cool;
- It is vital that birds have access to **water** en-route, especially on longer trips (more than ~2 hours) and during any stops along the way. Fluids will assist in maintaining hydration and in minimising stress;
- Provision of food is important on longer trips (more than ~2 hours) and during any stops along the way. This is especially so for smaller birds and for those with a higher metabolic rate. As well as providing sustenance, eating provides excellent therapy for them – so helping to reduce stress. Juicy items such as grubs (mealworms) and fruit (apples) are better than dry foods (pellets);
- **Monitor** birds regularly during transit, and be prepared to take appropriate action (as per contingency plan) if necessary. Provision of a peep hole in the crate and a small torch is all that's needed;
- Always carry some **glucose/electrolyte** solution and a syringe with you in case you have problems – dehydration, exhaustion and stress are ever present threats, especially in hot weather and on longer trips; A few drops of weak glucose solution administered via eye-dropper may quickly revive a small passerine showing early signs of distress; an electrolyte administered subcutaneously may be appropriate for larger birds or those showing more advanced symptoms;
- **Good ventilation is crucial** - make sure carry-boxes are always **well ventilated** - plenty of holes, no vegetation blocking them on the inside; **no equipment packed on or near the carry box**. Always **personally supervise loading and stowage**;
- So far as possible **minimise noise and vibration**. Isolate/shield crates from loud noises such as from motors, mechanical devices, loud human voices, high frequency noises such as from radio transmitter/receivers, and insulate from vibration such as from the deck of a boat, or the freight compartment floor of a motor vehicle, aircraft or helicopter. Insulating carry crates on all sides (especially the bottom) with sealed foam will help reduce noise and vibration;
Make sure carry-crates are absolutely secure – tie a piece of cord or tape right around each box so that there is no way it can

come open in transit - and no unauthorised person can open it. Don't trust even the most secure type of crate fastener (we once had the bottom fall out of a kakapo transfer crate - no bird was in it at the time thank goodness!!)

Transfer Box

Following successful capture birds should be transported to the interim housing facility inside a transfer box. The box must be of sturdy wood and have three essential components. These are an access hatch, ventilation, and insulation.

The access hatch serves a dual purpose of access for introduction and removal of a bird and for addition of water and food for the journey. The access hatch must be firmly latched while the bird is inside to avoid an untimely escape. The access hatch should be designed to swing open and allow an easy exit by the bird when it is released into the interim housing and soft release aviaries. Typically a door with hinges at the top (swinging up) allows the hand to be slipped under to place food and such while reducing the avenue of escape. Alternatively a heavy rubber 'shield' can be incorporated with the door: when diagonal slits are made in the rubber it produces a flap screen that allows the hand to enter and exit the transfer box while leaving no space around the hand for a bird to escape.

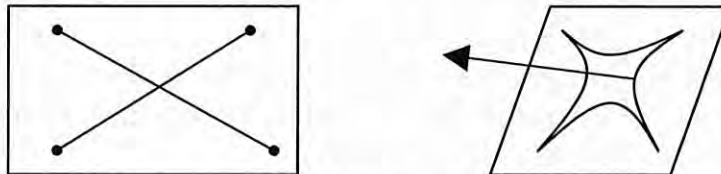


Figure 1 Left diagram shows the rubber shield when it is not being used, the diagram on the right indicated how the rubber 'opens' when something is passed through it.

Ventilation is essential as over heating and subsequent dehydration can be fatal in a high stress event such as transfer. The mesh used may also allow enough light through to observe the bird without opening the access hatch. This will significantly reduce stress. However the ventilation screen must not let too much light in as birds will be quieter and calmer in the dark. The ideal material for ventilation is steel fly wire. A light cloth can be draped over this when needed for further reducing light and sound. Insulation from sudden extremes of temperature is essential for the bird's condition. If the bird's metabolism was to be working over time regulating body temperature it will use up further energy reserves. This would be exasperated by the increased stress the bird is already experiencing.

Movement of birds

Birds must be transferred with only one individual per transfer box. They should be held in a cool dark place after capture until the vehicle is ready to transport them to the interim housing facility. Ideally this will be no longer than 24 hours and preferably less than 12 hours. Preferably, birds caught during the day/evening will be transported early the next morning. If it is possible birds should not be in transit during the usual time of flight-call activity (see below).

Food and water must be made available to the captive bird throughout the transport time. Water can be placed in a shallow ceramic dish and topped up using a water bottle with a

long spout. Food should be green plant matter rather than dry seed, although seed should be offered as well. Green plant matter can include silver beet, apple, pear, snow peas and grapes (Lendon 1979). One person (the '*focal bird-carer*') must have the responsibility of monitoring the birds during this entire period. This will include assessing condition every 3 hours (excluding late night). Daytime temperatures around the captive birds must be monitored. Fine mist spray should be administered frequently (every hour) during hot days ($>25^{\circ}\text{C}$).

Any birds held in this manner prior to transport during any flight call period must be monitored very closely during the flight-call hours (20min to 1 hr post sunset; 1 hour to 20 pre sunrise). This is the time when the desire to fly will be strongest in the captive birds and therefore will be the time of highest likelihood of birds injuring themselves. This behaviour may be so ingrained, especially in juveniles, that the bird could attempt to fly regardless of its captivity. Such behaviour has been observed recently by a caregiver in the Eastern States. Birds that run a **very high** risk of injury (constant flapping and movement) should be transferred to a clean catch bag to calm them down and reduce injury risk. The decision to restrain a bird must be made by the principal researcher who should be available during the entire period of bird captivity. The principal researcher may not always be the focal bird-carer but must be in constant contact with them, either by radio or by being readily located and woken up in the night.

An onsite caravan is an ideal holding area. This will be quieter and more secure than a tent. All windows can be opened for greater ventilation. Curtains can be pulled to reduce light. If a bird needs to be manipulated, or access to the interior of the transfer box is needed, then the security of being inside a caravan would further guard against the possibility of the bird's total escape. From this holding site the birds can be placed securely into a vehicle for transport. Care should be taken to ensure that the ventilation sites on the transfer box are not obscured during transport. This is achieved by not stacking the boxes too closely and not packing additional gear around the boxes. Seatbelts can be used to secure boxes in the back seat of a vehicle. Two people should accompany every transfer. One to concentrate only on driving and the other to concentrate only on the condition of the birds. While time is imperative during this transport care must be taken that the vehicle travels as smoothly as possible. This includes cautious movement on 4x4 tracks and a constant speed on open road. There are no major towns to travel through between Fitzgerald River National Park and Two Peoples Bay Research Quarters. The driver is to have a very good labelled map with clear instructions on how to get to the required location. This map should have all petrol stations, shops and toilets clearly marked so that if water or a telephone is needed in an emergency there is a quicker response time. Furthermore the bird-carer should have a transport check list that includes glucose and syringe, rain/filtered water, plenty of bird food (dry and green) and contact details for relevant veterinarians, the interim housing facility, breakdown service, principle researcher and CALM Albany office. Good, secure communications for emergency situations are required at all times. Mobile telephones are effective in almost all regions along the proposed transport route. These can be used to communicate with the field base should a breakdown or bird emergency occur. The primary contact person should have an in-depth knowledge of the events taking place and a contingency plan should a bird become ill or a vehicle incident occur. The backup contact person should likewise be briefed on the procedures being employed so that they can assist quickly. The backup communication could be via VHF radio to CALM Albany. The radio is not secure and as such should be used only during an emergency as information passed over the radio is available to anyone. There is also a higher chance of

distortion so the more that CALM Albany base knows about the process the easier they can fill in the blanks.

During transport, each bird's condition should be checked every hour, following the rationale outlined above for birds awaiting transport. Depending on the weather conditions a light spray of fine water mist should be administered to the transfer box during this check up. This will help raise the humidity and reduce dehydration. Prior to this spray a torch can be used to observe the bird's activity through the ventilation screen. Water and fresh vegetation (grapes, pear, apple) should be offered to the bird during this entire transfer process. Feeding can often have a calming effect. This will also provide more energy and be a good source of fluids to the bird. Often the water dish is spilt during transfer while fruit can be accessed during the entire period. Unless the day is considerably hot ($>30^{\circ}\text{C}$) air-conditioning should not be used while transporting the birds. This is likely to accelerate the bird's dehydration. It is better to have free movement of outside air through the car by slightly wound down windows and the cold fan on. If windows are down too far there is likely to be too much air movement and a high level of noise which may disturb the birds further. Noises should be kept to an absolute minimum. Human voices, radio, and honking are to be avoided. Because the transport process is likely to involve some stress to the bird, this is the most significant moment in the bird's life and they are already disturbed enough. Their comfort is imperative.

The movement of birds from the interim housing facility to the soft release aviaries should follow the same prescription described above. However there may be more choice in the timing of the event. A cool overcast day is desirable. However cold or wet conditions should be avoided; likewise, very hot dry days are not satisfactory. The conditions at the release site should ultimately dictate the decision concerning when to transfer. However in reality the timing of introduction of birds into the soft-release aviaries will be dictated by the duration of interim housing and the condition of the birds. The final judgment on suitability of transfer conditions lies in the hands of the principal researcher in charge of the operation. It will be a call made in the field and as such there is no exact prescription for it. All that must occur is that these factors are taken into consideration at the time.

Interim housing facility

It is suggested that birds are transported from the capture site to the release site via an interim housing facility. This is necessary due to the vast distances involved in this translocation (nearly 400 km) and the lack of current knowledge about housing translocated ground parrots. The interim housing facility can be used to buffer the asynchronous timing of capture and the intended synchronous timing of soft release. Due to the necessity of the principal researcher to be present in most stages of operation and because of the unique nature of this translocation it is profitable to have the birds under close surveillance in a facility that is easy to manage and close to professional assistance (veterinary care) should it be required. Interim housing allows monitoring of the bird's food preferences and general acceptance of captivity. Health can be closely monitored and transmitter attachment tested. The duration of this interim captivity should be from the time of first capture to the time of capture of the last translocated individual. The only foreseeable delay in this timing will result from unfavourable weather at the soft release site and any wildlife health issue. The last individual captured may need a grace time to recover from transfer. Any bird weight gain achieved during this interim housing will greatly aid the bird's likelihood of success. Furthermore if the birds get use to their captivity and feed well then there will be a higher chance that the soft release process

works. From all accounts ground parrots respond very well to captivity (Lendon 1979; Webber 1948; Mansfield 1941)

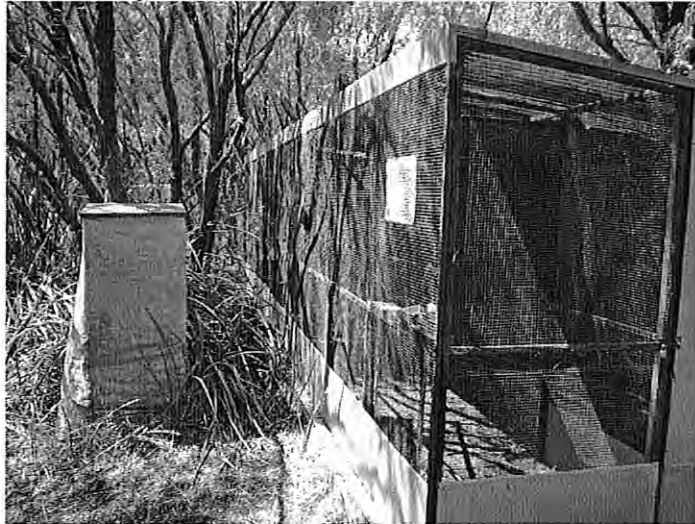


Figure 2 Two Peoples Bay Nature Reserve aviaries with hide. This facility can hold six birds, or up to 12 birds with enclosure modification.

It is proposed to house the birds at the aviaries at the research quarters in Two Peoples Bay Nature Reserve. The dimensions of the aviaries at this facility are adequate given the following slight modification. Before Ground Parrots are introduced to the aviaries a soft roof should be constructed at two metres above the aviary floor. This should be fixed to the aviary walls so that no bird can get caught above it. The reason for this lowered roof is that, should the birds attempt to fly during the dusk/dawn flight-call period, they will have a decreased risk of injury (refer to 'Release Aviaries' below). An appropriate material would be shade cloth. Shade cloth should also be used to reduce any visibility between adjacent aviary cells. This is a precaution against aggressive behaviour that may occur from close housing of free ranging wild birds.

The aviaries must be cleaned thoroughly prior to, and following, the captive housing event. This will ensure that there is a reduced chance of introducing disease into any translocated populations. Commercially available anti-viral agents (Vircon, Triagen) can be used to wash down the facility. Furthermore the sand substrate of the aviary floors should be dug out and replaced with sterile sand (commercially available for children's sandpits). The aviaries should then be filled with locally sourced brush leaving an area for viewing the feeding of the captive birds. Which, with ranger permission, can be removed from firebreaks in the park. This vegetation should contain some identified food species. Woody plants that provide off ground perching are also essential. Post transfer the aviary will be methodically searched for indicative feed-sign. This will greatly advance our understanding of Western Ground Parrot feeding behaviour.

Captive birds should be offered small parrot seed, and lots of green foods (silver beet, apple, sweet potato, pear, peas, carrot, etc). L. Webber describes seed preference in the order sunflower seed, canary and millet seed (Webber 1948). Other more recent experience has found canary seed to be suitable (Jean Barber, pers. comm.). Water must be available for bathing and consumption. This can all be offered on a large feeding tray which can be changed daily and sterilised. All food equipment must be soaked in oxygen bleach for 10 minutes then rinsed off and allowed to air dry. This should be carried out indoors away from any source of bird contamination such as the local magpie population. Food preparation, storage and feed equipment cleaning should occur well away from any areas of human food preparation and storage. An ideal location is the inside office at the

research quarters. The food should be weighed out and weighed back in with the results accurately recorded. Additional nuts can be offered and include macadamias and almonds, two favourites of the Kakapo in New Zealand. These offer a quick source of fatty acids and may help the bird to quickly gain condition. It is well established that birds lose weight during a stressful event such as translocation (B Barrett, *pers. obs.*). The heavier the bird becomes in this interim period the more reserves it has available for the next stage of transfer. The Elliot traps design used to recapture Noisy Scrub-birds in the same aviaries can be employed to assist the removal of birds from aviaries for transfer to the soft-release aviary location.

Regular observations of Western Ground Parrot feeding behaviour can be collected with the use of strategically placed feed trays and the hides currently erected at the aviary site. This and further scientific investigation is not the subject of this translocation methodology; it is enough to state here that all opportunities to gain information on the birds' biology and behaviour must be maximised.

Housing of Birds during soft release

Release Aviaries

There are a number of good records of Ground Parrots being held successfully in captivity (London, 1979; Mansfield 1941; Mattingley 1918; Webber 1948). These accounts indicate that an area suitable for running rather than flying is preferred. This supported by the fact that most Ground Parrots prefer to run on the ground after being flushed rather than take flight straight away and that the only times birds fly by choice is when the light has faded sufficiently to mask their movements (London, 1979; Mattingley, 1918). During the daylight hours Ground Parrots spend much of their time foraging on the ground (McFarland, 1991). Evidence from a care-giver who recently rehabilitated a juvenile (dispensing) Eastern Ground Parrot indicated that they have an over powering desire to take flight during their evening calling times (Jean Barber, *pers comm.*). There is no indication from the literature that this is a behaviour employed by adults, but it does have implications for the housing of dispersing juvenile Ground Parrots, which are amongst the target birds for translocation. Therefore it is strongly advised to use a soft 'roof' on the enclosure, to avoid harming the bird during repeated attempts to fly. Other aviary notes include the observation that birds would not climb the wire netting in their enclosure nor perch on high branches but would rest on branches/sticks just above the ground (London, 1979). These factors must be taken into consideration when designing and 'filling' the release aviaries.

The preposed release aviaries are designed with a solid frame, constructed front panel to include a viewing screen and allow access, light durable netting outer and a predator proof perimeter base. This consists of six cells with the dimensions of 1.5m X 2.4m laid side by side so that the entire structure is 9m long. Shade cloth is used to partition the cells and a single covering of netting is run over the entire length to form the outside barrier.

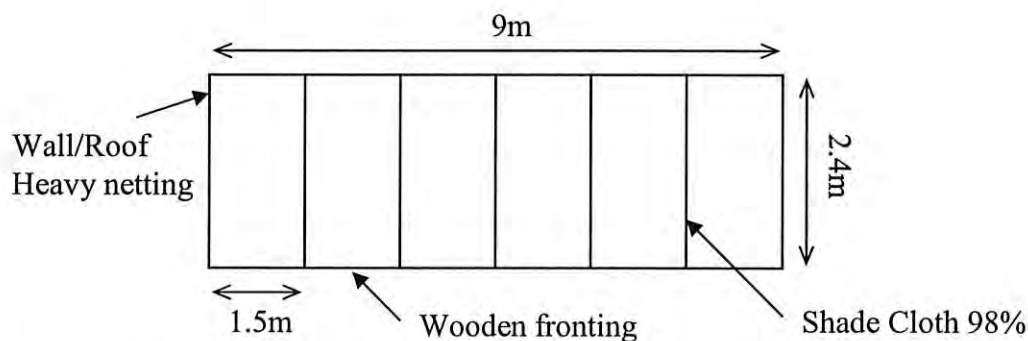


Figure 3 Aviary complex dimensions showing six cells in parallel

The construction of the aviary framing is a simple design using a heavy grade (No8) wire, star pickets and long pegs. Seven star pickets are hammered into the earth in the desired soft release site. The location of this area is subject to the translocation proposal. Within the soft release site an area is to be chosen with the greatest diversity of plant material with emphasis on plant species that are known to be in the Ground Parrot diet, together with similar or related species. This will offer the captive birds a chance to try (through necessity) local food items while still having the support of supplementary feeding while in the enclosure. These pickets are placed 1.5 metres apart. Parallel to this a second row of star pickets are placed at the same spacing, each opposing picket being 2.4 metres away from the other (Figure 3). Heavy wire is run along the entire length of the two sets of seven pickets. This is anchored in the ground using heavy pegs. Two runs of wire are used (Figure 4). One run is at the top to create the support for the heavy netting outer (and viewing screen front), while the second wire is run along the base at 0.25 metres height to create the support for the predator proof perimeter. This design is emulated on the two 2.5 metre outer walls. The interior walls (separating each cell) are created by digging in a 60 x 5 cm plank of wood (at 2.4m length). This can then have the shade cloth nailed to it to create the dividing wall. The roof support of this partition is made from metal curtain rods affixed at each end to the top of the star pickets. This allows the shade cloth to be draped over and secured at the base in order to create a double wall of shade cloth.

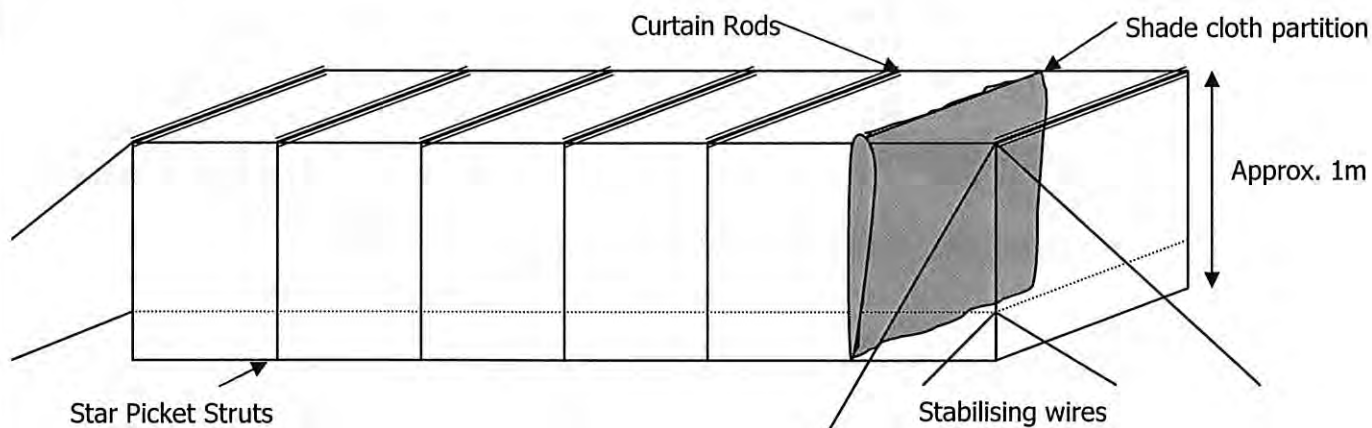


Figure 4 Individual aviary-cell construction and material

Predator proofing the enclosure

It is very important to ensure that all holding enclosures are designed to minimise the risk of predator access. This is particularly important as ground parrots are known to have a scent attractive to canines (Edwards, 1924; Gould, 1865; Mattingley, 1918). Furthermore the increased human activity, and concentration of birds that may call each evening, could make the aviary site more attractive to the local predator population. Other introduced mammals such as rats and mice and native mammals such as bush rats and possums can either affect the feeding regime or even lead to bird fatality (Lendon, 1979). In conclusion it is imperative that the aviary be designed to exclude all animals for the duration of bird captivity.

Along the base of the perimeter a predator proof edge can be constructed. This consists of heavy square 'Aviary-mesh' wire with a total width of 45cm (0.71mm galvanised wire, 12.5 x 12.5mm squares). This is sufficient to exclude mammals as small as mice and to withstand any digging or chewing attempts made by larger mammals (Lendon 1979). The length of mesh is folded so that 25 cm runs up the wall of the enclosure while the remaining 20 cm protrudes along the ground (refer to Figure 5). Research in to predator proof fences for Karori Nature Reserve in Wellington, New Zealand, found that most burrowing animals including rabbits dig holes within 20cm of an obstructing fence. Experience with foxes and cats in Australia leads to a similar conclusion.

The exterior netting can be affixed to the top edge of this perimeter base. The section of mesh protruding along the ground is affixed using long >20cm portions of heavy wire bent into a staple shape and thrust deep into the ground. This affords an additional protection below the surface should an animal commence digging further from the fence than the meshing. While this is only a measure to slow down the advance of a digging predator, the perimeter should be checked twice daily during which time digging attempts could be rectified. The front viewing screen is made of heavy steel flywire within a wooden frame. This should be inaccessible to all potential predators. The exterior netting is a heavy grade plastic that is affixed solidly but loosely fitted making it difficult to infiltrate through tearing or chewing. This loose fit also discourages birds perching on the roof, which is a potential source of disease vectoring or stress related mortality related to avian predators. The enclosure should contain plant material that offers both local food items and adequate cover such that captive birds are not visible from above.

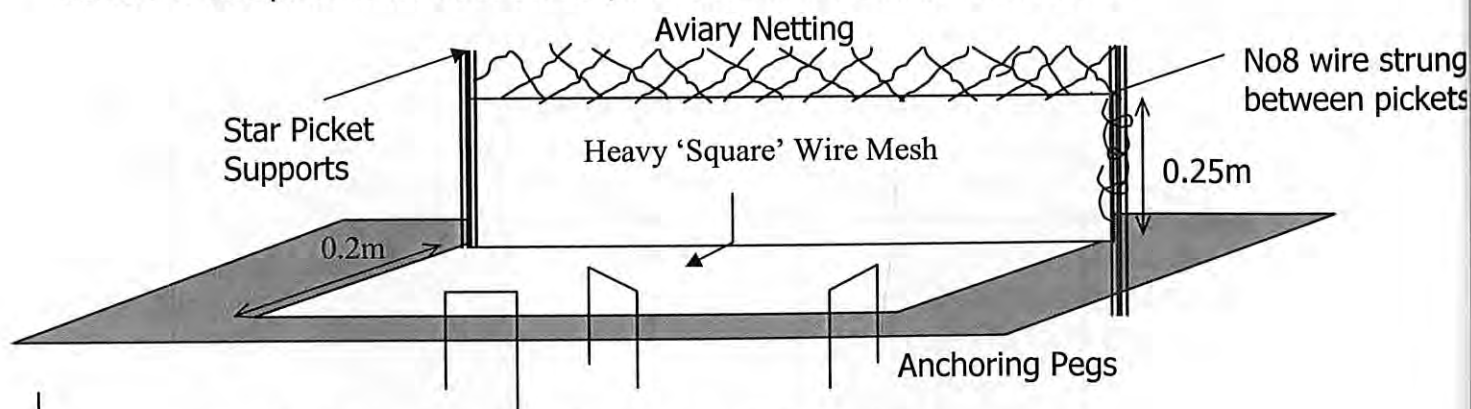


Figure 5 Design of predator proofing along base of release aviary

Viewing screen, access hatch and feed tray design

The front of all six cells contains the feeding trays, viewing screen and access hatch. This is comprised of one 0.7m X 1.0m flywire frame affixed to a wooden housing by two sturdy hinges at the top and two solid latches at the base (Figure 6). This allows unobscured viewing of the feed tray and occupant from the front of the enclosure. This also forms the door which allows the caregiver immediate access to individual aviaries should the need arise. This should be carried out with a large heavy drape placed over the researcher and enclosure front. While working below this the researcher can then gain access through the door while not presenting any avenue for escape. At the conclusion of the period of soft release captivity this panel can be removed completely allowing the bird to exit freely and still return to the feed tray for a period following release. The lower frame of the cell fronting holds the access panel for the sliding seed tray.

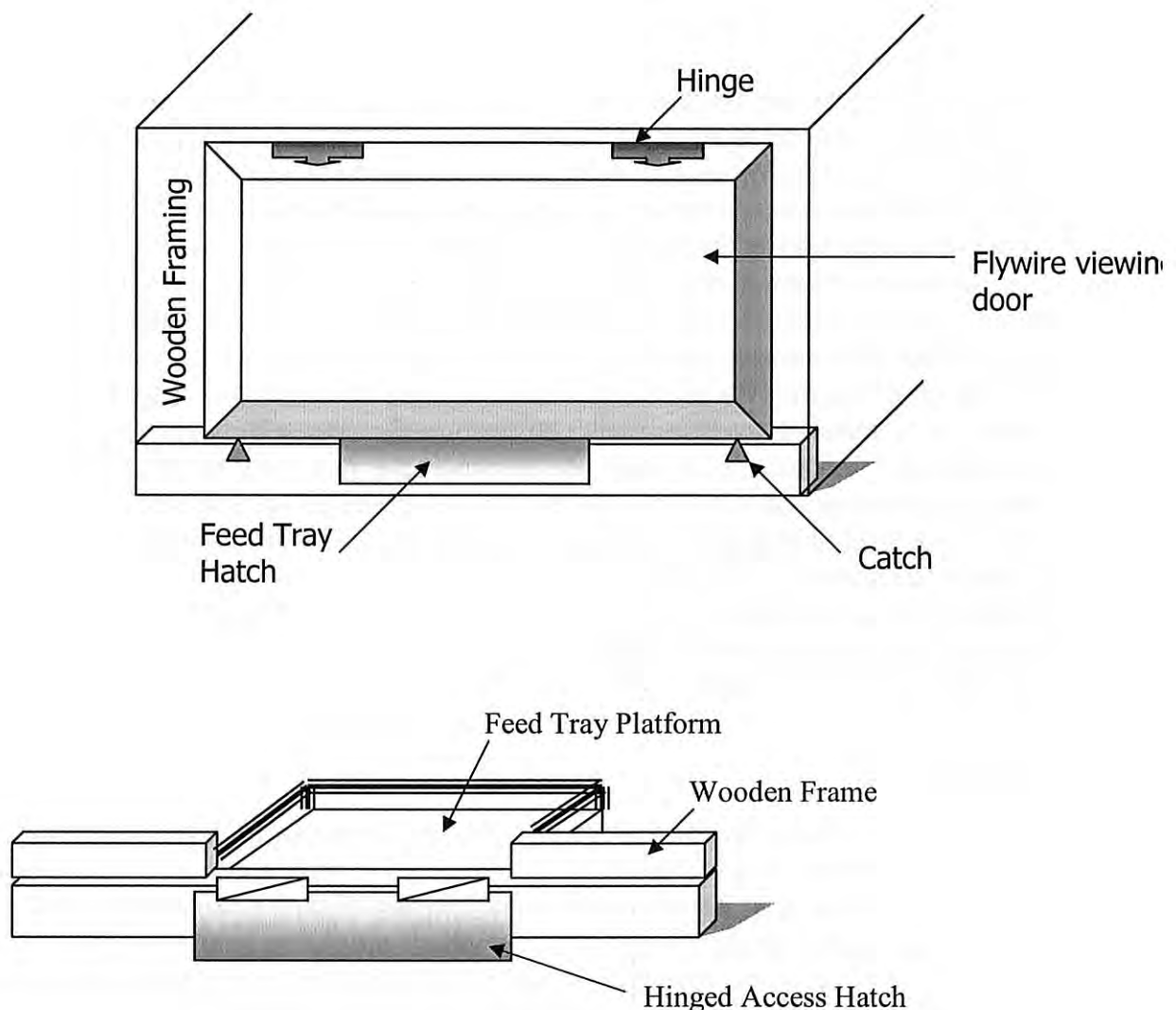


Figure 7 Layout of feed tray platform indicating open access hatch

The seed tray is designed to remove the influence of ants on the amount of food weighed out and back in during each feeding (Figure 7). This consists of a shallow, water-filled, Perspex tray within which a glazed-terracotta seed dish is placed. Birds are then able to perch on or within the large seed tray while feeding. The shallow water trays also provide the opportunity for captive birds to bath or drink during captivity in the hot summer days. It has been documented from brief periods when Eastern Ground Parrots were in captivity in zoos that bathing was a common activity (Webber 1948). Twelve Perspex trays and

terracotta seed dishes should be used. This allows the immediate replacement of both water tray and seed dish at the time of feeding.

The same diet offered to birds in the interim housing facility should be used at the soft-release site. However all seed used must be sterilised in the microwave before it enters the campsite. This will ensure that no foreign plant/seed is introduced to protected parks. The exact dietary mix should be previously calculated during the interim housing period. This will most likely follow a similar formula to what was described earlier.

Reduction in stressful events

The access hatch for the seed and water tray is designed to allow the complete removal of one tray and the placement of a second while offering no opportunity for the captive bird to escape. There is no doubt that the presence of humans will be perceived by the captive bird during the entire period. It is assumed that the bird will be at the far side of the enclosure during the manipulation of the feed trays and the small 8 cm opening is not likely to be a tempting escape route. Work with serotonin levels of captured Kiwi during human manipulation (banding, routine weighing) indicated that it was the duration of disturbance that was of most concern rather than the level of disturbance. Taking this into consideration two caregivers should work simultaneously to change feed trays, with each person starting at the opposite end of the block of cells. The duration of three tray changes (rather than all six by one person) is therefore the maximum time of disturbance. It is best to replace seed and water daily or every two days depending on seed consumption, with the ultimate goal of reducing the frequency of disturbance. Once the frequency of feeding has been established it must be conducted regimentally so that a routine is established and the birds can become familiar with the type and result of disturbance. The access hatch design removes the necessity for a caregiver to enter the enclosure, further reducing the intensity of disturbance. Perspex trays are used in preference to stainless steel as they are easier to clean in the field and because they produce considerably less noise when sliding in and out of the housing. Cover within the enclosure should provide refuge when avian predators are overhead. Further stress reducing measures include opaque shade cloth between enclosures so that movement of adjacent birds is not visible.

Hygiene

It is highly recommended that all seed dishes and Perspex water trays are washed thoroughly with hot water (boiled for 10 min). All equipment used in the preparation or dispensing of food is to be soaked in either oxygen-bleach or *trigene* or similar commercially available (or veterinarian provided) sterilizing solution. Following this treatment the equipment should be rinsed and placed in an enclosed airing cupboard to dry. Only glass, metal, plastic or glazed ceramic utensil/dishes are to be used in feeding of captive animals (no wood, terracotta or other porous material). Preferably no-one other than approved/trained caregivers will come within the vicinity of the aviary or feeding equipment. Anybody wishing to come into contact with the captivity site or caregivers must not to have been in the presence of aviaries, used aviary equipment, or domestic avian stock within 48 hours. Total exclusion of disease risks is the ultimate goal during the entire process of translocation, housing and release. Equipment should be purchased new and cleaned thoroughly. Any equipment previously used with the transport or containment of wild or domestic birds must be similarly cleaned thoroughly (including Elliot traps and banding gear). While it is preferable to exclude anyone who

has been in recent or prolonged contact with aviary birds they could become involved only if they use new clothing or clothing washed in *Vercon* and have showered between contact with their aviary and coming to the translocation site. Likewise any attending veterinarian is required to thoroughly sterilise all of their equipment. There must be no cross over of human consumption equipment and feed-out equipment. A special "Quarantine" tent should be erected and used for the feeding and manipulation process. This area will provide a clean and secure location for food preparation, weighing and subsequent clean up.

The aviary design discourages the perching of wild birds, thus reducing the chance of disease transmission into the enclosure. During stressful events such as containment birds are more susceptible to diseases that would otherwise not be expressed or not become threatening in the wild (Kate McKinnis pers. comm.)

Sick or injured birds

A secure tent or caravan is to be made ready for use as a site to remove any injured or sick bird from the aviaries and for use by an attending veterinarian should there be a need to examine any individual outside of the aviary. A **local** veterinarian should be contacted and thoroughly briefed on the project and its objectives prior to the translocation process. They can then be asked to stay contactable should any situation arise that requires their expertise. It may be necessary to have a veterinarian briefed in each region of the translocation process — capture, interim housing and release site. This will accelerate the rate-of-care for the rare event of an injured bird. Furthermore a basic bird first aid kit (including splint, Betadine, saline solution, glucose and eye dropper) should always be available at each site for quick response by appropriately skilled team members.

A bird may become ill and exhibit symptoms of disease either transmitted from outside the population or resulting from a background disease that has become expressed due to a stressful event. Should this happen it is highly advised that the individual is not allowed to be released either back into the source population or into the translocation site. In the very rare event that this should happen an aviculturist should be available to take this bird and assist it towards recovery for the eventual use as a captive bird for research, display or education. Every possible measure must be taken to ensure that such an event does not occur. However, as with all translocations, there must be a contingency plan for everything.

Harness Attachment techniques

Transmitter attachment has historically employed one of two methods. **Gluing** (eg Raim 1978) uses a combination of glue, gauze and clipped feathers. **Harness** attachment (eg Powlesland *et al.* 1992) involves the use of cord or elastic to tie the transmitter to the bird's back. Gluing methods have typically been more difficult and less reliable than harness attachment. The glue doesn't adequately address the risk of a bird getting caught up by the transmitter. The use of a harness attachment may lead to longer and more reliable use of transmitters for Western Ground Parrot radio tracking (Woolnough *et al.* 2004). In the past there has been difficulty in keeping the transmitters on birds for any duration of time (Burbidge *et al.* 1989). A harness designed in New Zealand (Flux 1994) should be employed to secure transmitters to Western Ground Parrots. This method places the transmitter in the interscapular region with cord running around both wings and secured on the chest of the bird (at the keel bone). This has two essential

elements to it: the Rot-link and the Weak-link (refer to Figure 9 and Figure 10). These are necessary to ensure that the transmitter will fall off after the effective life of the transmitter and that should the bird become strung up it can exert enough force to break the harness and free itself. A similar harness design has been employed for transmitter attachment on Kakapo in New Zealand. It was found that the bird could escape this harness if it became strung up in the wild (Daryl Eason pers. comm.). The advantage of a harness design is that it rests more snugly on the bird's back while still allowing unrestricted movement of the wings. Elastic attachments run the risk of abasing the skin along the ridge of the wing joint, unless they are soft elastic. The free movement that is afforded by a cord harness should ensure that the bird is not restricted in any way from the harness and can continue to effectively forage and escape predation. The weight of the transmitter, and the hindrance of its external aerial, will therefore be the only limiting factors.

The main components of the transmitter attachment are:

Cord – non abrasive and resistant to chewing or preening

Link – joins the harness to the transmitter via the thread-holes.

Release mechanism – combined or separate components of:

- Weak Link – Releases entire/partial harness under a prescribed pressure/force. (e.g. exerted by similar sized parrot)
- Rot Link – Deteriorates over a predetermined time period – releasing entire/partial harness. (Approximately 2-6 months)



Figure 8 Transmitter with modified harness

The transmitter selected for use is a SIRTRACK 150 Mhz *single pulse* non-mortality unit. This unit includes electronic components emitting an individual frequency (channel) and a battery (E389) with an effective life of 3.5 months. These components are encased in resin with thread-holes for a harness at the posterior and anterior ends and an external 172 mm aerial terminated with a small knob of plastic (Figure 9). This weighs a total of 2.4 grams (excluding harness) which is less than 3% of the adult body weight and as such fits within current guidelines for transmitter use. The harness cord is 2mm diameter polyester braid and together with the weak link weighs only 1 gram. The material inside the tube, i.e. the true weak link, is made of a single loop of sewing cotton tied to all four lengths of harness cord so that when it breaks all four are released simultaneously (Figure 10). This material is housed inside the plastic tubing to guard against premature breakage from the parrot's beak.

A modification of the standard design provided by Sirtrack (New Zealand) is suggested. This is the addition of a link in the attachment mechanism. This serves the role of a rot-link (Figure 9). A commercially available cotton coated sewing elastic has proven properties in a recent trial (N Mulholland, unpub. report, 2003). This holds its structural integrity for a maximum of four months. The cotton coating serves as a buffer to the degradation of the rubber within it. As the rubber degrades over time the material loses its elasticity and thus stretches permanently under load. Tests indicate that this stretch results in a 135% increase in the length of material. This would result in the loosening of the harness sufficient for the bird to struggle free of its transmitter. This material can be employed to tie the cord to the transmitters attachment tube. Thus it is only on the back of the bird and therefore under the greatest exposure to the elements and furthermore out of the reach of the birds beak which has the potential to chew through this material. It is calculated that 133 mm of cotton coated elastic is required to create the configuration in the diagram below (Figure 9). The stretch resulting from 3-4 months exposure in the field is expected to result in a 313 cm total length of degraded elastic. This is hypothesised to be more than enough stretch to allow the bird to pass one wing through the harness cord. The configuration proposed in the diagram represents one continuous loop around the entire transmitter. This affords the greatest total stretch. This independently links all four cord ends to the transmitter. As a result the calculated stretch can result at any one of these attachment points, or at a combination of points. Thus the release of material will occur at the penultimate point of stress. As such this design is 'self adjusting'.

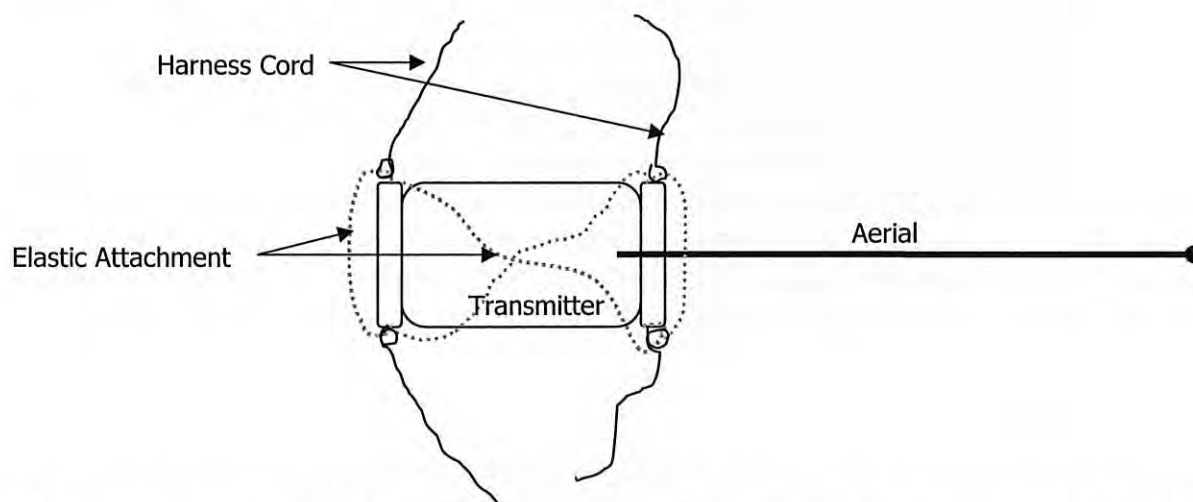


Figure 9 Diagram of modification of transmitter harness showing the use of elastic attachment designed as a rot link

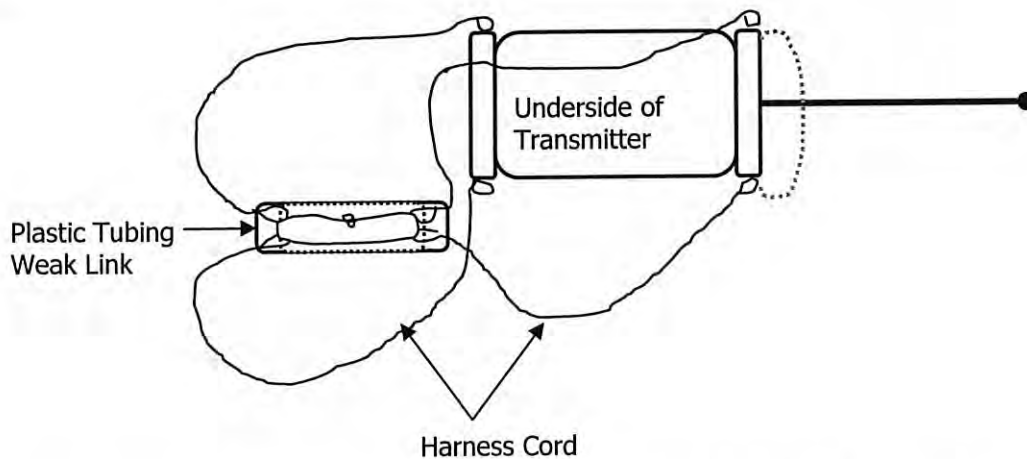


Figure 10 Diagram of standard Sirtrack weak-link harness design. The plastic tube sits on the breast muscle of the bird and the transmitter is positioned in the inter-scapular region of the back with the aerial running down the tail.

Monitoring Post-release

The translocated population should be monitored for the entire duration of the transmitters' life. This may be 2-3 months. However we do anticipate that some transmitters will remain operational for longer and that there may be some that fail before this time. While all transmitters are attached to birds and emitting signals then radio-tracking should be conducted as the minimum monitoring technique. Investigation of bird biology and habitat use through scientific investigation (relying on transmitters) will take whichever course is necessary and is independent of this translocation methodology. However as the effective life of the transmitters approach the end, then listening surveys can be conducted to gain a measure of call rates relative to the population size and individual location. When transmitters cease operating, listening surveys will be the only measure available for assessing the health and stability of the translocated population. This should be conducted as frequently as possible with the aim being an absolute minimum of one survey per week until six-months post-translocation. If birds disperse widely this will be considerably harder than if they occupy a limited area of habitat.

Radio Tracking.

Telemetry equipment can be used to get accurate positional fixes on translocated birds that retain working transmitters. There are two schools of thought in this area. One is to gain location information by tracking the bird to its current location (or the bird's location prior to your disturbance). This methodology is more invasive and often less accurate than the alternative. This results from the observer influencing the daily activity of the target bird. Low heath/sedge habitat is nearly impossible to move through without making a tremendous racket. This will alert the bird to the presence of the observer and may force it to change its current behaviour (from roosting to activity or from feeding to movement) or force the bird to displace and give an inaccurate indication of habitat use and suitability. The preferred method that should be employed in this translocation is to take simultaneous recordings of the direction of the bird in relation to two or three observers. These 'fixes' are taken from standard locations of known latitude and longitude. If a bird's 'fix' is taken by two researchers at the exact same time (with pre-determined or via radio communication) then it is possible to bi-angulate the bird's location. Thus the intersection of the line drawn from the two observer locations will give an approximate

location of the target bird. If an additional researcher (third fix) is assisting then the three intersecting lines produce a tri-angulation which is the basic premise for remote positional fixes. This can be calculated at the end of a research day rather than at the time of the fix as the data set is 'stand-alone'. In other words researchers can move on to another location or take a fix on a second and subsequent bird from the same location. After a predetermined period of time the same location can be revisited to get a second fix on the original bird. Thus the movement patterns of various radio tagged birds can be recorded simultaneously within the same day.

Sites for observers to take fixes from can be located and tagged prior to the translocation process.

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