A welfare approach for captive wild birds

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Working with captive wild birds presents researchers with a multitude of challenges. Not least of these is appropriate cage size. Previous studies have highlighted some AEC concerns in this area. Our AEC has worked with a research group to ensure improved outcomes for captive wild birds in a specific study as well as for future studies. This involved the redesign of an outdoor aviary for the latest cohort of birds (n=8). The re-design includes 8 individual aviaries with sufficient space to allow flight for small birds (<150 g). The birds have been taught to feed in smaller cages within the aviaries so that they are easily re-caught and can be handled for the research. The capacity to reduce the aviary size for trial participation has also been incorporated, allowing researchers to conduct experiments with minimal handling of the birds. Current occupants (Silvereyes, ~10 g) appear to have adapted well. The AEC has also endeavoured to set some guidelines for the time space between the various components of the research so that the birds are provided with time frames free from research interaction in the aviaries. The student researcher has been proactive in including remote monitoring through cameras as well as through nearby windows, and has recently implemented a remote design to close the smaller cages. This session will discuss the process and evaluate its outcomes to date.

Introduction

Research with captive wild animals presents a range of particular challenges both for researchers as well as for an AEC. There are studies which necessitate wild caught animals, and which would be impossible to conduct in the wild. Such studies may have

many kinds of outcomes, including improvements in animal welfare and potential for human health advances. Utilising captive wild animals for research highlights some fundamental tensions for animal welfare issues and the science; for instance, minimising impact, accommodating the needs of each particular species and at the same time enabling sound research leading to strong results, all need to be carefully balanced. In the wider framework, research with captive wild animals raises a number of ethical and practical questions.

Traditionally birds have been caught and acclimatised to small cages and / or laboratory settings. More recently, increasing recognition of their need for space to fly has led to the use of larger aviaries where the birds are often housed communally. However, this can create difficulties for the research and for the birds. It is important to get the space right – too little does not achieve the aims and too much may also impact negatively on the welfare of the birds (e.g. in some instances too large a cage can lead the birds to be isolated or even injure themselves such as by flying into the aviary walls).

At the same time as welfare issues are addressed, methodological issues related to appropriate housing need to be considered. A proposal for the use of wild caught birds caused Murdoch's AEC and the researchers to wrestle again with some of the issues.
In the experiments which form the focus for this paper, one important feature is the need to isolate individual birds for varying periods of time. Ensuring methodologically suitable caging while at the same time meeting the welfare requirements of the birds can be complex to achieve.

In what follows we address some of the practical solutions which the researchers developed in response to the AEC's deliberations and questions for this particular proposal to utilise wild caught birds. We will address these questions by looking at the capture and acclimation, as well as housing of the birds in this project; we will briefly describe some experimental issues and highlight current and planned welfare oriented developments.

The research in question is a physiological study of wild caught birds, examining their food intake and measuring various elements associated with this. For this project, one species was initially approved. The AEC required that suitable cages be provided, which demanded considerable design and construction effort impacting on the research design and project implementation as well as the timing of the experiments. This process delayed formal approval of the project by around 12 months. The overall result was to house the birds in individual aviaries within a larger aviary, with each individual aviary fitted with a feeding cage which can also be used to facilitate the catching and handling of the birds. This provides the project with the best compromise between communal and individual housing for the birds; it enables a number of experiments to be undertaken in the aviary without the need to remove the birds into a laboratory and it has the birds housed in a more acceptable environment. The work undertaken provides an ongoing resource for potential future projects. A rough indication of costs was around $6,000 in design and materials, to which the labour and costs of the automated equipment need to be added.

Housing

The benefits of housing birds in outdoor aviaries as opposed to indoor housing in smaller cages includes space for free flight and exposure to natural light and other ambient conditions. However, there are also wider risks involved, both from a research perspective (e.g. the lack of control over climatic variables) as well as environmental factors (e.g. exposure to the elements and visually to predators). The re-design of a large outdoor aviary at Murdoch University by the research group took these considerations into account, as well as ensuring the ability to allow several experiments to take place entirely within the outdoor aviary, minimising handling of the birds and the stress associated with repeated capture and transfer to experimental cages. This was achieved through redesigning the approach to the experiments as well as ensuring the most suitable housing.

<u>Aviary design:</u>

An existing large outdoor aviary (580 x 450 x 210 cm) was divided into eight individual aviaries (116 x 160 x 210 cm) joined by a central service corridor (see Appendix 1). Individual housing averts risks associated with communally housing birds captured from different populations, dominant individuals restricting feeder access to other birds, and other confounding factors. Physiological studies (e.g. intake of different feed types) require examination of individuals for appropriate statistical analyses. Furthermore, individuals are able to be closely monitored for normal behaviour and food intake. With this housing design, the requirements of the researchers are met, and at the same time, the birds have visual and auditory contact with one another through the mesh of the aviaries.

Each aviary is equipped with two natural perches, one fixed and one hanging from chains, two native plants (a potted *Calothamnus* and a hanging basket containing a *Grevillea*) and one shallow water bath.

Each individual aviary and the service corridor were skinned with 0.6 cm rodent proof galvanised wire mesh. This fine mesh served two purposes: first allowing the housing of very small birds (weighing < 12 g), and second removing the risk of predators (e.g. rats and snakes). The mesh was buried 30 cm into the ground to prevent entry by predators tunnelling underneath. The roof of each aviary was half covered (80 cm wide) by colorbond roofing material to allow protection from sun, wind and rain, and visual protection from aerial predators. The sides of the aviary were also covered by sheets of colorbond (80 cm wide) to provide a corner in each aviary for birds to shelter from inclement weather and to provide additional shade. The presence of large trees surrounding the aviary provides natural shade over the area. To increase the filtration of natural light to the aviaries and ensure continued shielding from rain, the other half of the aviaries was covered by transparent Perspex sheets (110 cm wide).

Smaller feeding cages (47 x 54 x 41 cm) were mounted to the front wall of each aviary, 140 cm above the ground. These feeding cages allow for ease of capture and experimental participation. Feeders (stoppered 30 ml syringes) are placed on the outside of the feeding cage by way of the service corridor, with the opening facing towards the

aviary, thus feed can be supplied without the need for entry into each individual aviary. The door of the feeding cage facing the aviary is left open so that the bird is freely able to enter and exit. This design also enables researchers to capture the birds with minimal handling - the door to the feeding cage can simply be lowered, confining the bird to the feeding cage. Birds can then quickly and easily be caught by hand if they need to be weighed or moved to a different experimental cage. This enables short-term trials to be carried out while the bird is retained in its familiar feeding cage. While this method of capture is feasible, it is often not optimal for the long term.

Capture and experimental design

Eight silvereyes (*Zosterops lateralis*, average ± SD body mass 9.93 ± 0.49 g) were captured on the grounds of Murdoch University, Perth, Western Australia, by mist netting on 12 May 2009. The birds were confined to smaller feeding cages within the aviary for the first 48 hours to ensure acclimation to the feeders and maintenance diet. A towel was placed over the cages to minimise visual disturbance for the first two days. All birds adapted to the maintenance diet of Wombaroo® nectarivore mix (Wombaroo Food Products, South Australia) very quickly. Birds were released from the feeding cages into the aviary after 48 hours, with all birds successfully locating the feeders (in the smaller feeding cages) within 3 hours. Feed intake was closely monitored for two weeks, with all birds feeding well from the maintenance diet and various fruits (grapes, rockmelon, re-hydrated currants and apricots). Birds were free from research interaction for this time. To minimise impact on the birds, monitoring was conducted via video cameras mounted on aviary walls, visual observation from outside the aviary by researchers, and by marking feeders (to monitor intake). The current cohort of eight silvereyes have adapted extremely well through the acclimation and intial experimental phase.

Experiment protocols were designed to give the birds rest days where they are able to fly freely in the aviary after interaction each experimental protocol. Several of the experiments require the use of experimental cages in laboratories (i.e. controlled environmental conditions), while other trials could be conducted in the aviary feeding

cages. The experimental timetable has been designed so that the trials within the aviary are conducted in the first 2.5 months, and the laboratory trials will be conducted later in the period of captivity when the birds are more habituated to human presence and handling. Trials where birds are transferred to the laboratory are followed by multiple rest days in the aviary, free from research interaction.

Natural variables such as temperature and natural light times will be treated as variables in the analysis of experimental data. Temperature and humidity are recorded by a HOBO® Onetemp placed in the aviary, and sunrise and sunset times are obtained from the Bureau of Meteorology. This ensures experimental rigour while continuing to minimise the need for unnecessary interactions with the birds.

The current experimental trials commence within an hour after sunrise; at this time the birds are active but are not able to see the researcher well in the partial light. To capture the birds, researchers have needed to position themselves in the aviary to close the feeding cage doors just before sunrise. Where experiments will be conducted well after sunrise, this approach is not ideal. Thus, a system was developed for remotely closing each feeding cage door. The remote device involves an infra red trip switch which is triggered when the bird inserts its bill into the feeder (located some distance from the door). The device can be set to close the feeding cage doors at preset timeframes so that the birds can automatically be confined for the commencement of an experimental trial. This method further reduces stress on the birds as it does not require human presence and maintains the normal environment for the bird.

Benefits and drawbacks of this housing system

The obvious benefit of using an outdoor housing system is the space and freedom afforded to the birds. The aviaries have also afforded the opportunity to measure physiology of the birds under more ‘natural’ conditions than experienced in a laboratory.

However there are also drawbacks to outdoor housing. One very obvious problem has been the need to adjust experimental schedules to the weather. Over the last month of

feeding trials, ambient temperatures have averaged (average ± SD) 15.60 ± 3.68ºC, with a minimum of 4.99ºC and maximum of 24.01ºC. In addition to cold temperatures, winter rainfall has delayed some feeding trials, since although the cages are protected overhead, wind-blown rain can interfere with the fine scale recordings required to discern feed preferences. Some trials are significantly influenced by ambient conditions and will still need to be conducted in the laboratory.

The infra-red devices used to contain the birds in their feeding cages have so far proven very successful. Video monitoring has shown that while the bird expresses a startle response and flutters for a brief time, it does not attempt to escape through the closed door and it recommences normal preening or feeding within 30 seconds. The equipment currently fitted has a drawback, namely that it cannot be used under wet conditions. In the long run this can be modified through improved equipment design.

Apart from logistical issues, there is also the very important consideration of how the birds physiology is affected by variable climatic conditions and additional flight costs, given that these variables cannot be controlled in an outdoor aviary. A recent, investigation in another study of the link between behaviour and energy intake in New Holland honeyeaters revealed significant differences in energy intake due to housing conditions in these birds[1].

For the current project a similar investigation was conducted of the maintenance costs of silvereyes held over a 24 hour period in the feeding cages compared with their energy requirements when they were free-flying within the aviary, with visual and auditory

[1] Birds housed in wire feeding cages in visual and auditory contact with conspecifics demonstrated a 40% increase in energy intake compared with a trial when the same individuals were housed in opaque cages with a one way mirror, used in studies where researchers must be able to observe the birds under controlled conditions with no visual contact (Purchase et al. unpubl. data). This may reflect the importance of both auditory and visual contact between wild caught birds whilst being housed individually in captivity.

contact in both situations. Our data indicate that housing conditions did not have a significant effect (paired samples t-test, p=0.482) on intake when feeding on a 0.63 $molL^{-1}$ sucrose solution whilst free-flying within the aviary (0.315 ± 0.011 g sucrose/g body mass ± s.e.m.) or confined to the feeding cage (0.321 ± 0.009 g sucrose/g body mass). The birds do not appear to have additional energy requirements whilst free flying in the aviary. These results pave the way for future behavioural studies to ask some interesting questions: for example, are the birds utilising the space available in the aviary, and are there significant differences in time spent flying between the two housing types?

Future welfare developments

At present, the birds are weighed weekly during experimental participation. This involves catching each bird from the feeding cage and weighing it in a cotton bird bag. While the procedure is undertaken as quickly as possible to reduce stress associated with capture, there is still the stress of capture for the bird. A remote weighing system is being investigated. The idea is that each perch will be suspended from an attached balance that will automatically record weight when a bird lands on the perch. This will enable researchers to record the weight of birds more frequently and possibly more accurately during experimental trials without the stress of physical interaction.

Conclusion

It is too early to draw any conclusions from the research. It can, however, be said that the welfare improvements are pointing to new possibilities where technology combined with well designed aviaries will enable continuing research to be undertaken with captive wild birds while at the same time meeting high welfare standards. The point is that strong animal welfare need not undermine good science, but at the same time it can place limitations on science and often, as in this case, may require considerable re-thinking of the experimental protocol and its implementation.

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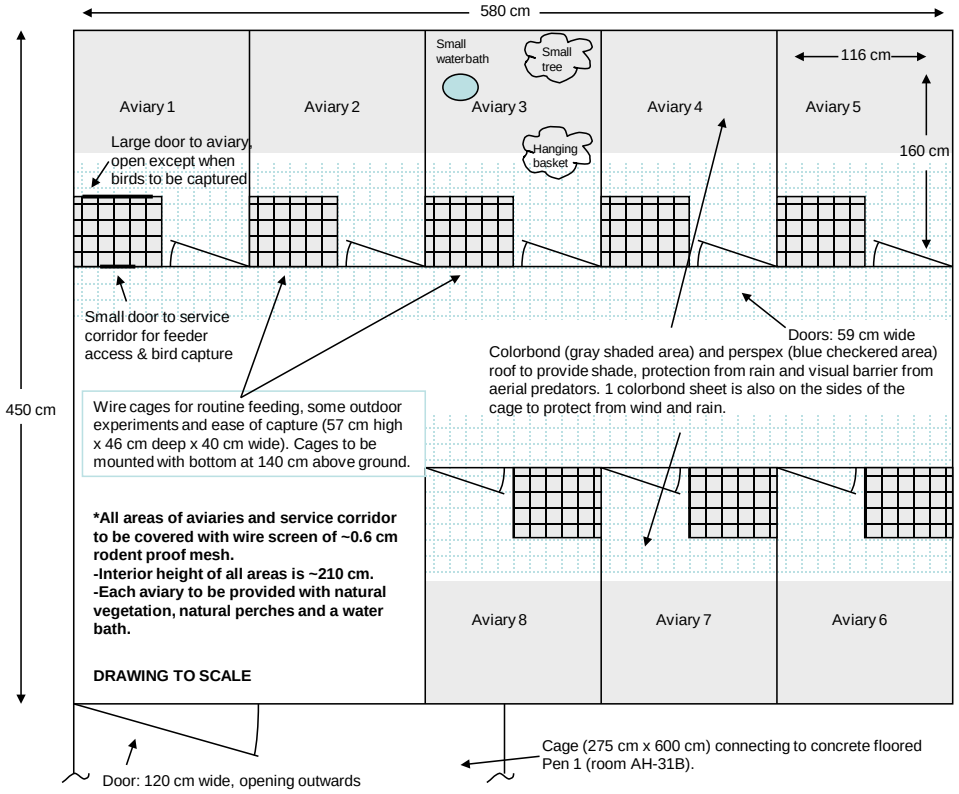
Appendix 1


580 cm
116 cm
160 cm
450 cm
Small waterbath
Small tree
Hanging basket
Aviary 1
Aviary 2
Aviary 3
Aviary 4
Aviary 5
Aviary 8
Aviary 7
Aviary 6
Large door to aviary, open except when birds to be captured
Small door to service corridor for feeder access & bird capture
Doors: 59 cm wide
Colorbond (gray shaded area) and perspex (blue checkered area) roof to provide shade, protection from rain and visual barrier from aerial predators. 1 colorbond sheet is also on the sides of the cage to protect from wind and rain.
Wire cages for routine feeding, some outdoor experiments and ease of capture (57 cm high x 46 cm deep x 40 cm wide). Cages to be mounted with bottom at 140 cm above ground.
*All areas of aviaries and service corridor to be covered with wire screen of ~0.6 cm rodent proof mesh.
-Interior height of all areas is ~210 cm.
-Each aviary to be provided with natural vegetation, natural perches and a water bath.
DRAWING TO SCALE
Door: 120 cm wide, opening outwards
Cage (275 cm x 600 cm) connecting to concrete floored Pen 1 (room AH-31B).