Protocol No: 870

THE UNIVERSITY OF WAIKATO

APPLICATION TO THE ANIMAL ETHICS COMMITTEE FOR APPROVAL OF EXPERIMENTS ON ANIMALS

ANIMAL SPECIES: Hens (Use common name) **NUMBER OF ANIMALS:** 6

STARTING DATE: 25/09/2012 **COMPLETION DATE:** 31/10/2013

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1. (a) **Name of applicant:** Karmen Ngatai

   (b) **Position:** Masters of Applied Psychology (ABA) Student

   (c) **Department: /Address for Mailing)** School of Psychology
   Private Bag 3105, Hamilton, 3240

   (d) **Contact Phone number & email address:** 021 0265 0305; kln6@waikato.ac.nz

   (e) **Qualifications and Experience:** Bachelor of Social Sciences (BSocSci - Psychology); Bachelor of Laws (LLB)

   (f) Have you previously carried out related experiments? No

   Previous Protocol No(s) N/A

   Applicants should attach a short report on the results of the previous experiment(s)

   (g) **Other Personnel involved** (including titles and roles):
   Dr Lewis Bizo (Supervisor)
   Dr James McEwan (Supervisor)
   Jennifer Chandler (Animal Technician)
   Other Masters and Doctoral students that assist running the experiments (the laboratory runs as a cooperative)

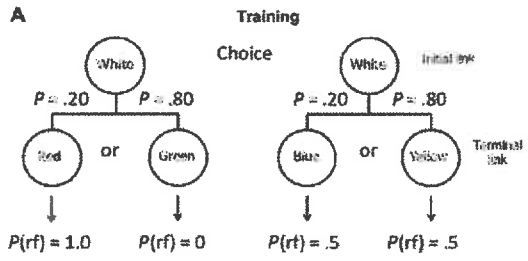
2. **Title of Project:** "An investigation of suboptimal choice behaviour by hens using an animal analogue of gambling."

3. **Aim of Project** (written in terms that people with a non-scientific background will understand):

   Contrary to human gambling behaviour in which gambling outcomes are always unclear but are often pursued by people, animals seem to be averse to situations involving uncertain outcomes. That is, animals prefer to work for information that reliably predicts reinforcement. Thus, animals tend to make sub-optimal choices by failing to maximise reinforcement and it is the signal that reliably predicts reinforcement and its absence that appears to be responsible for this suboptimal choice behaviour.

   The aim of the proposed project is to examine the degree to which hens show a preference for an alternative that reliably provides signalled reinforcement and nonreinforcement, and for an alternative that produces one of two discriminative stimuli, each correlated with a set outcome. This project will use a range of probabilities and magnitudes of reinforcement to determine whether animals specifically avoid an alternative that results in a stimulus associated with an uncertain (and unsignalled) outcome thereby leading to suboptimal choice behaviour.

   The design of Stagner and Zentall's (2010) experiments are shown in Figures 1 and 2. Initially, Phase 1 of this project will partially replicate the procedures used by Stagner and Zentall (2010) in Parts A and B of their experiment. Reinforcement across their experiments consisted of a constant 1.5-s access to food.



As shown in Figure 1, Part A of their experiment involved a choice between two alternatives that varied in constant probabilities of reinforcement. That is, choice of one alternative was followed by either a discriminative stimulus (e.g., red hue) that reliably predicted 100% reinforcement on 20% of the trials or a different stimulus (e.g., green hue) that reliably predicted nonreinforcement on the remaining 80% of the trials for that choice. Choice of the other alternative was followed by one of two stimuli (e.g., blue or yellow hues) both of which were followed by reinforcement on 50% of the trials. Spatial location and colours were also counterbalanced during their experiment.

The pattern of results obtained by using this procedure are expected to be similar to those reported by Stagner and Zentall who observed a strong preference for the 20% signalled reinforcement alternative (see Left and Middle Left panels in Figure 3 below). That is, the hens are expected to show suboptimal choice behaviour by consistently choosing the suboptimal alternative associated with 20% reinforcement rather than the optimal 50% reinforcement alternative (see Left panel in Figure 3). Similarly, when the contingencies associated with the two alternatives are reversed, the pattern of results are expected to look similar to Stagner and Zentall's (2010) findings, in that the hens will also reverse their preferences (see Middle Left panel in Figure 3).

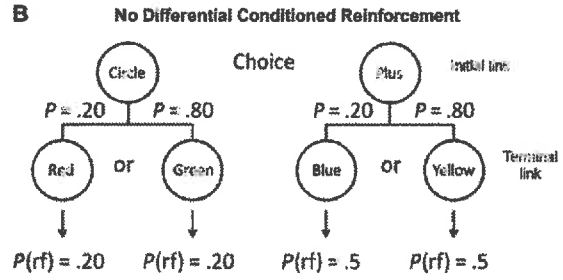


Figure 2 shows the design of Part B of Stagner and Zentall's (2010) experiment where they altered the contingencies associated with the different alternatives so that there was no differential conditioned reinforcement. Again, two choices are provided however, choice of one alternative led to one of two stimuli (e.g., red or green hues) both of which were now associated with 20% reinforcement. Choice of the other alternative led to one of two stimuli (e.g., blue or yellow hues) which were both associated with 50% reinforcement. Shapes and colours were counterbalanced across subjects.

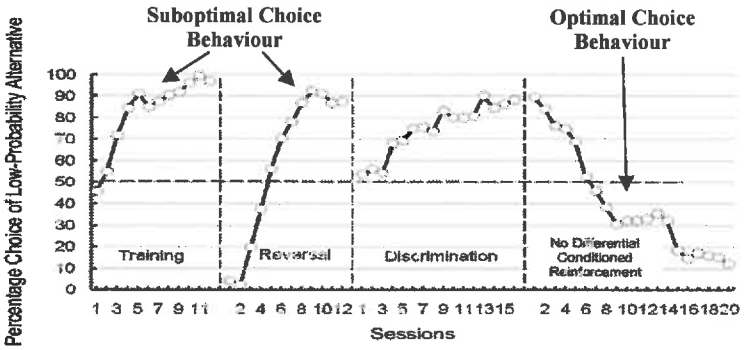


Figure 3 shows the overall results of Stagner and Zentall's (2010) study. It is expected that the pattern of results obtained by equating the probability of reinforcement across alternatives, will be similar to Part B of Stagner and Zentall's (2010) findings. For example, as the Right panel in Figure 3 shows, when reinforcement is not differentially signalled, it is expected that that the pattern of results obtained by hens in the current project will similarly show a higher preference for the alternative associated with the higher probability of reinforcement. That is, it is expected that the hens will maximise reinforcement by choosing the optimal 50% reinforcement alternative over the lower, suboptimal 20% option.

In Phase 2 of the current project, Stagner and Zentall's (2010) research will be extended by using a range of low and high probabilities and magnitudes of reinforcement with signalled reinforcement and nonreinforcement, in conjunction with an alternative associated with a constant outcome. The probabilities of reinforcement used for this project will vary between 0% up to 100% reinforcement, whereas the magnitudes of reinforcement will be manipulated in terms of using a range of durations for which reinforcement could be accessed (e.g., 1-10-s access to reinforcement). It is unlikely that the duration of access to reinforcement will go below 1-s or above 10-s. The aim of Phase 2 of this project is to assess the relative importance of reinforcer probability and magnitude in determining preference for alternatives associated with those outcomes.

4. **Significance of this Project** (written in terms that people with a non-scientific background will understand):

The prevalence of problem gamblers and the ethical issues involved in studying gambling behaviour with humans are challenging, and the results are sometimes criticised as lacking ecological validity because the stakes wagered by human subjects are either not real, or no real monetary losses are experienced. It is hoped that these problems will be partially addressed by studying the effects of unpredictable outcomes on the choice behaviour of laboratory animals, specifically hens. It is thought that an animal model may provide a useful analogue to human gambling behaviour, one that is free from the influence of human culture, language, social reinforcement, and other experiential biases that may influence human gambling behaviour.

5. **Is/Has this work already being/been carried out** (provide details)

(a) In New Zealand? No

(b) Overseas? Related research has been conducted by Zentall and Stagner (2011) who used constant as opposed to a range of magnitudes of reinforcement with signalled and unsignalled reinforcement.

6. **Have alternative methods to achieving the aims that do not involve the use of animals been explored? No**

Please provide details.

The current project aims to replicate the general procedures used by Stagner and Zentall (2010) and test the reliability of their findings in Part A of their experiment. Using this procedure, it is expected that a strong preference for the suboptimal 20% signalled reinforcement alternative, rather than the optimal 50% option will be found in a species other than pigeons (e.g., hens). This project will also partially replicate and test the findings of Part B of their experiment in which reinforcement was not differentially signalled. Under these conditions, it is expected that a higher preference for the optimal 50% reinforcement alternative rather than the suboptimal 20% option will also be found in hens.

The research conducted by Stagner and Zentall (2010) will then be extended by the current project by examining a range of both probabilities (e.g., varying the percentages of reinforcement gained) and magnitudes of reinforcement (e.g., varying the durations of access to reinforcement) with, and without signalled reinforcement. It is hoped that the current project will inform further research on animal models of suboptimal choice behaviour by assessing the relative importance of reinforcer probability and magnitude in determining preference for alternatives associated with those outcomes.

7. **How will the results of this work be disseminated?**

This project will be conducted as part of a Masters Thesis and will be submitted to the University of Waikato's Library, and it will be presented at the *New Zealand Analysis of Behaviour Conference* in 2013. Additionally, if the data obtained from this project is suitable, it will be put forward for publication in a peer reviewed journal.

8. **Description of Experiments**

All experiments should take into account the statutory responsibility to adhere to the three important principles governing the use of animals in research, testing and teaching:

a) Refinement (refinement of procedures applied to decrease to the minimum practicable extent the negative impacts they have on the animals):
b) Reduction (reduction in the numbers of those sentient animals to the minimum necessary to achieve the scientific objective):
c) Replacement (replacement of animals with non-sentient animals or non-animal alternatives):

(a) Full details of procedures

Animals: Six hens will serve as subjects and will be exposed to all of the conditions of this project.

The hens will be individually housed in cages for the duration of this project in order to facilitate the management of the hen's weight. Individual housing is important to control food intake given that

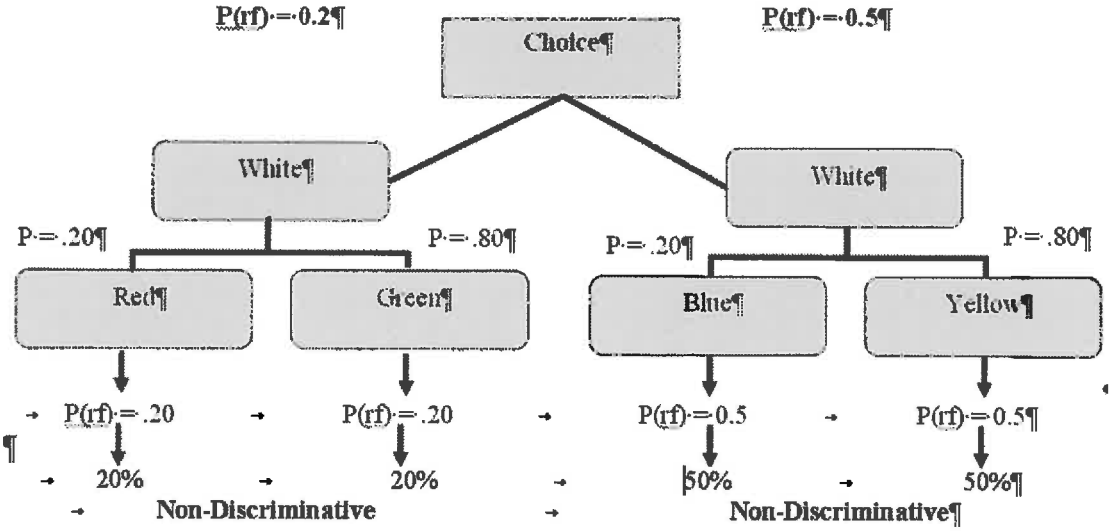
deprivation level is a critical component of the experimental design in this proposed experiment. The hens will earn the majority of their food during experimental sessions and will be given supplementary food as required to maintain their body weight within the desired range. Hens will also be given supplementary feedings of vitamins and health grit on a regular basis. While caged, the hens be exposed to a 12-hour light, 12-hour dark cycle.

The hens' ad-libitum body weight will be established after periods of free food access (2-3 weeks) immediately prior to the first experimental condition. The hen's body weight will be maintained at 85% +/- 5% of their ad-libitum body weight and will only run in an experimental session if their weight immediately prior to an experimental session falls within the prescribed weight range. Hens that are too light will not be used for any experimental condition, and will be given supplementary feed to increase their body weight. Whereas, hens that are too heavy will not be used for any experimental condition until their body weight falls within the desired weight range, however, they will still be given a small amount of food.

Experimental sessions will be planned for 7 days a week, and will run at approximately the same time each day. At the end of an experimental session, the hens will be returned to their home cages. At the conclusion of the project, the hens will be removed from their home cages and moved to group aviaries, where they will be housed with other hens that are not currently involved in experiments.

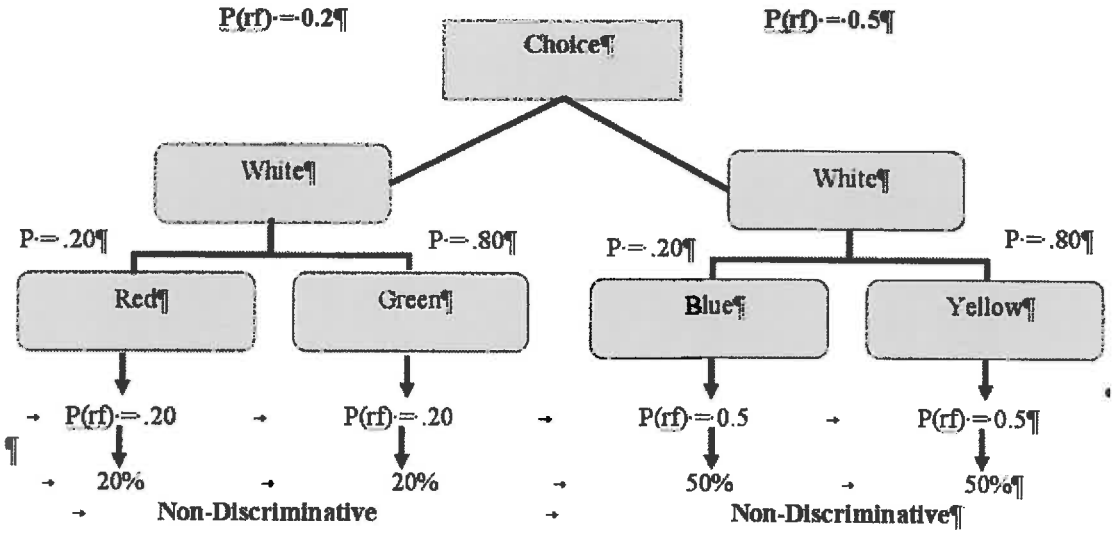
Apparatus:
One experimental operant chamber will be used for the duration of the proposed experiment. The dimensions of this operant chamber will be approximately 800mm wide, 500mm high and 500mm deep. Inside the chamber on one of the internal walls will be three response keys mounted on a central intelligence panel that can be illuminated, and that the hens will be trained to peck at. The pecks will be reinforced with timed access to wheat (duration of access will be varied across a range as in variable probability of approximately 0.5s – 10s). Access to the food reward will be via a central food hopper in the chamber that is positioned below the response keys. The food hopper will have an infra-red beam that will ensure the scheduled number of seconds of timed access to food, from the time a hen puts their head in the food hopper.

Procedure:
Initially, Phase 1 of the proposed project will partially follow the methodologies used by Stagner and Zentall (2010) in Parts A and B of their experiment. As shown in Figure 4 below, all hens will be exposed to a choice between two alternatives. Choice of one alternative will be followed by either a discriminative stimulus (e.g., red hue) that reliably predicts 100% reinforcement on 20% of the trials or a different stimulus (e.g., green hue) that reliably predicts nonreinforcement on the remaining 80% of trials for that choice. Choice of the other alternative will be followed by one of two stimuli (e.g., blue or yellow hues) both of which will be followed by reinforcement for 50% of the trials when that alternative is chosen. Following this condition, the sides and colours will be counterbalanced across hens.

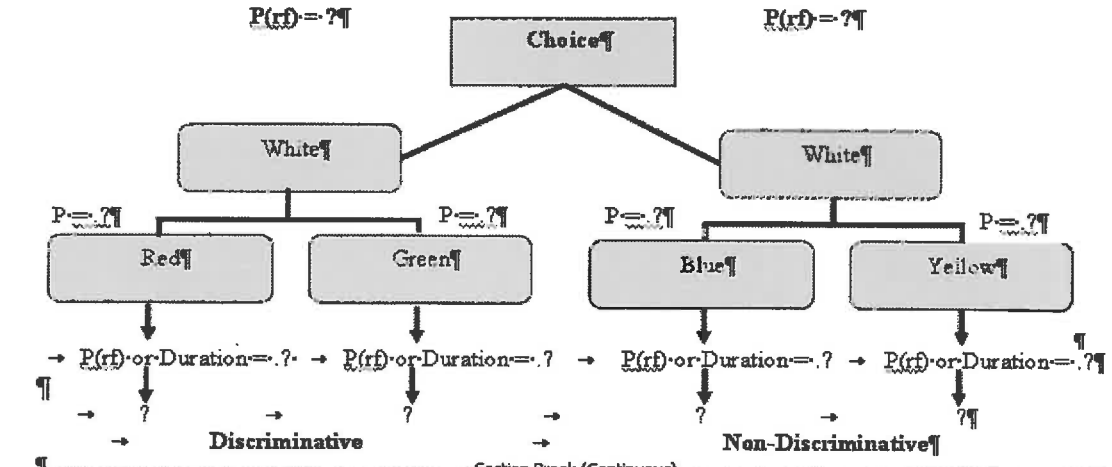


The next stage of the proposed project involves the partial replication of Part B of Stagner and Zentall's (2010) experiment. As shown in Figure 5 below, all hens will be exposed to a choice between two alternatives however; the contingencies associated with the different alternatives will be altered so that there is no differential conditioned reinforcement. Choice of one alternative will be followed by one of two stimuli (e.g., red or green hues) both of which will be associated with 20% reinforcement. Choice of the other alternative will be followed by one of two stimuli (e.g., blue or

yellow hues), both of which will be associated with 50% reinforcement. Following this condition, the sides and colours will be counterbalanced across hens.



As shown in Figure 6 below, Phase 2 of the proposed project attempts to extend the research conducted by Stagner and Zentall (2010) by exposing all hens to a range of low and high probabilities (e.g., varying the percentages of reinforcement gained) and magnitudes of reinforcement (e.g., varying the durations of access to reinforcement) with, and without signalled reinforcement. In conjunction with those varying ranges, an alternative that produces one of two stimuli, each correlated with a set outcome that does not provide discriminative stimuli will also be used (e.g., 50% probability of reinforcement, or half of the overall magnitude used in the proposed experiment, equated to half the duration of access to reinforcement). The probabilities of reinforcement for this project will vary between 0% up to 100% reinforcement whereas the magnitudes of reinforcement will be manipulated in terms of using a range of durations for which reinforcement could be accessed (e.g., 1-10-s access to reinforcement).



Section Break (Continuous)

Probabilities Table				
Exp	Left Key		Right Key	
1				
2				
3				
4				
5				
6				

Magnitudes Table				
Exp	Left Key		Right Key	
1				
2				
3				
4				
5				
6				

(b) The statistical design of the experiments

The subject's performance will be compared across subjects using parametric statistics including t-tests and ANNOVA, as well as nonparametric analysis. The principle dependant variables for this project will be the proportion of choices made by the subjects across the different conditions, and their latency to respond.

9. **List the relevant SOP's (number and full title) to be used:** **N/A**

10. (a) **Where experiments will be conducted:** Psychology Animal Behavioural Laboratory, No.3 Dairy, Ruakura.

(b) **Where the animals will be housed:** Hens will be individually caged at the Psychology Animal Behavioural Laboratory, No.3 Dairy, Ruakura, for the duration of the proposed project.

(c) **Person in immediate charge of laboratory and housing:** Jennifer Chandler

(d) **Veterinary advisor to the laboratory:** Ali Cullum

11. **Is there an operational procedure required for the use of a product (drug/chemical) in these experiments? No**

If 'Yes' this will require an Institutional Drug Administration Order, this should be arranged with the Institutional Operating Plan Validator.

See Appendix 1: ***Is an Institutional Drug Administration Order Required?*** **No**

Name the product: N/A

12. (a) **Anaesthetic:** N/A

Local: **N/A**

General: N/A

(b) **Method of Restraint:** **N/A**

(c) **Will the animal have to recover from anaesthetic?** **N/A**

(d) **How will you deal with post-operative pain and/or discomfort?** N/A

13. **What is the fate of the animals at termination of experiment?** Retained in experimental colony, and the hens will be rehoused to barnyard flocks. If they become ill during the experiment, they will be humanely euthanized at the recommendation of the Veterinarian.

14. **Has this application in whole or in part previously been declined approval by another Animal Ethics Committee?** **No**

15. **For experiments to be undertaken at Ruakura or at other facilities under the control of another Animal Ethics Committee, has an application also been made to that Committee:** **No**
If 'YES' state which Committee N/A

16. **Is any of this work being used in a thesis to be submitted for a degree at The University of Waikato?** **Yes**

17. **Are any permits (e.g. DOC) or approvals (e.g. Iwi) required?** **No**

If 'YES':
Have the permits or approvals been obtained? **N/A**

List details of permits/approvals required **N/A**

18. **I have read and understand the conditions outlined in the Code of Ethical Conduct for the Use of Animals for Teaching and Research.** **Yes**
http://www.waikato.ac.nz/research/unilink/uow_only/Approved%20Code%202010%20-%202014.pdf

19. **I have read the Good Practice Guide for the Use of Animals in Research, Testing and Teaching**
http://www.biosecurity.govt.nz/files/regs/animal-welfare/pubs/naeac/guide-for-animals-use.pdf **Yes**

20. **Further conditions:**
If this application is approved, I will inform the Committee of any changes in the project or unexpected outcomes affecting animal welfare, and any event (beyond any approved manipulation) impacting adversely on animal welfare.

Signed by the applicant: Kngatii **Date:** 13/9/2012

I accept responsibility for this project's compliance with the University's Code of Ethical Conduct for the Use of Animals for Teaching and Research.

Signed by the Supervisor: **Date:** 13/9/2012

I accept responsibility for this project's compliance with the University's Code of Ethical Conduct for the Use of Animals for Teaching and Research.

Approved/NOT approved

Signed on behalf of the Committee: ..... **(Chairperson)**

Date: 21/09/'12

ANIMAL USE STATISTICS
APPLICATION/FINAL RETURN FORM

Protocol ID
870

If more than one animal type is required then fill in one form for each type

Application: When applying to the AEC for approval of a manipulation the applicant should complete Box 1 and **enter in Questions 2 - 9, in the *'Planned'* column (P)**, the appropriate figures for the number of animals required.

Final return: When the manipulation is completed the approved original application form will be returned. Boxes 2 to 10 should then be completed in the *'Used'* column (U) by entering appropriate figures for the number of animals which were actually used.

NAME/INSTITUTION: **Karmen Ngatai**
0226118
University of Waikato (Faculty of Social Sciences)

1. Animal type Chickens Code: 1P
(see Appendix A page 3 of this form)

2. Source of animals (number)

		P	U
Breeding unit	a		
Commercial	b		
Farm	c	6	
Born during project	d		
Captured	e		
Imported	f		
Public sources	g		
TOTAL = A		6	

3. Status of animals (number)

		P	U
Normal/conventional	a	6	
*SPF/germ free	b		
Diseased	c		
Transgenic/chimaera	d		
Protected species	e		
Unborn/prehatched	f		
Other	g		
TOTAL		6	

**Specific pathogen free*

4. Main category of manipulation/use (enter the total from 2 above in one box only)

		P	U			P	U			P	U
Teaching	a			Animal husbandry	d			Veterinary research	g		
Species conservation	b			Basic biological research	e	6		Testing Development of alternatives	h i		
Environmental management	c			Medical research	f			Other	j	6	

5. Any re-use of animals (number to be inserted)

		P	U			P	U	
No prior use	a	0		Previously used	b	6		Total a + b = **6**

6. Grading of manipulations/use (number in each grade to be inserted). For examples of grades of manipulation see these in "Grades of manipulation" Appendix B on page 3 of this form.	Grade	P	U
Manipulations that are expected to cause no impact or virtually no impact. **No impact**	A	6	
Manipulations of minor impact and short duration. **Little impact**	B	6	
Manipulations of minor impact and long duration or moderate impact and short duration. **Moderate impact**	C	0	
Manipulations of moderate impact and long duration or high impact and short duration. **High impact**	D	0	
Manipulations of high impact and long duration. **Very high inpact**	E	0	

7. Expected date of completion: 31 October 2013

ANIMAL DISPOSITION/FATE AT CONCLUSION OF EXPERIMENT/TEACHING EXERCISE ETC OUTLINED IN THIS PROTOCOL

8. ALIVE		P	U	**9. DEAD**		P	U
Retained by your institution's	a	6		Killed for dissection, sampling, taking organs	a		
Returned to commercial farmers	b			Died/destroyed in the course of the manipulation/use	b		
Released to the wild	c			Euthanased after manipulation or use	c		
Disposed of to others	d			Died/destroyed for reason not associated with manipulation/use	d		
TOTAL ALIVE	=B=	6		TOTAL DEAD	=C=	0	

To be completed at conclusion of protocol

10. GRAND TOTAL MANIPULATED/USED = B + C

Check on the final return that B + C = A in the "Used" column of Box 2.