Investigating the Physiological Impacts of Capture and Handling on Threatened Avian Species by Using Surrogate Species as Models

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Abstract

The conservation management of many threatened species requires the capture and handling of wild individuals for monitoring, translocation or research purposes. However whenever wild animals are captured and handled there is the potential for these procedures to negatively impact the animal and result in altered behaviour or physiology, injury and even death. Therefore this thesis aimed to investigate what physiological impacts routine capture and handling may be having on threatened avian species in New Zealand by using surrogate species of birds as models for threatened birds.

Layer hens (*Gallus domesticus*) were used as surrogates to model the physiological impacts of capture and handling on kiwi (*Apteryx spp*.). A treatment and control group of hens were serially blood sampled over 72 hours. Hens in the control group were placed in a box between blood samples and hens in the treatment group went through a simulation of a kiwi chase, capture and handling scenario. After 72 hours all birds were euthanized and their muscles examined histopathologically.

Wild pūkeko (*Porphyrio porphyrio melanotus*) captured using a net-gun at the Awapuni Sustainable Development Centre in Palmerston North were used as surrogates to model the physiological impacts of capture and handling on takahē (*Porphyrio hochstetteri*). Wild mallard ducks (*Anas platyrhynchos*) captured using a net-gun at Massey University's Turitea campus were used as surrogates to model the physiological impacts of capture and handling on threatened waterfowl such as pateke/brown teal (*Anas chlorotis*), or whio/blue duck (*Hymenolaimus malachorhynchos*). All mallards and pūkeko captured were serially blood sampled at capture (0 minutes), 30 and 120 minutes. Within each species there was a control group that was held in a box between samples and a treatment group which was handled according best practice protocol for takahē (for pūkeko) or pateke (for mallards). A further group of pūkeko was also shot using a rifle as comparison.

To assess the physiological impact of capture, biochemical analytes measured included plasma concentrations of the enzymes creatine kinase (CK), aspartate aminotransferase (AST), glutamate dehydrogenase (GLDH) and the stress hormone corticosterone (CORT). In mallards and pūkeko capture using the net-gun the plasma concentrations of uric acid (UA) were also measured.

Capture was found to elicit a stress response in all three of the species studied as shown by elevated plasma CORT; however there were differences between species on the effect of capture on plasma CK, AST, GLDH and UA. The handling protocol was found to have minimal impact on the physiological response of any of the species and the impact of capture either overrode the effects of handling or handling protocol was simply not a significant factor on any of the biochemical analytes measured.

Layer hens were found to have altered physiology at the commencement of the study, probably due to the high metabolic demands of egg production. There was also significant variation in their 'normal' physiology and physiological response between the two weeks they were studied. Layer hens are therefore considered to be inappropriate surrogates for kiwi or any wild bird.

Baseline levels of the biochemical analytes of pūkeko that were captured using a net-gun and those that were shot were similar. The time of day the pūkeko were captured caused significant variation in the concentration of plasma GLDH and UA. Capture did cause significant elevations in plasma CK and AST showing subclinical muscle damage was occurring in the pūkeko and this damage and the stress response was greater when the pūkeko were captured in flight. Capture also had a significant if less clearly defined impact on renal and gastro-intestinal physiology.

Seasonal variation and some time of day variation were observed in the concentration of CK in mallard ducks. While capture caused a significant stress response in captured mallards it did not have a significant effect on CK, GLDH or UA. Plasma AST concentrations decreased significantly following capture albeit by a very small amount.

The difference found between species in their physiological response to similar procedures highlights that surrogate species may not be appropriate and validation between the surrogate and threatened species is required. Small differences in the capture technique may have a significant impact on the animal's physiological response. In conclusion the handling protocol has a minimal physiological impact on these birds following capture and further research should focus on capture techniques and protocols. If surrogate species are used for further research then there should be some attempt to validate that the physiological response observed is similar in the threatened species.

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