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Capture myopathy in migratory shorebirds: An investigation of risk factors and treatment methods

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ABSTRACT

Capture myopathy is a syndrome seen as a complication of capture and handling in many species of birds and mammals. Muscular trauma and necrosis leads to ataxia, paralysis and pain, while metabolic disturbances can result in death of the animal. We investigated risk factors and a new ancillary treatment for three species of shorebirds that are reportedly susceptible to capture myopathy: bar-tailed godwits (*Limosa lapponica*), red knots (*Calidris canutus*) and great knots (*C. tenuirostris*). Serial blood samples were examined for changes in the plasma concentrations of creatine kinase (CK) and aspartate aminotransferase (AST), uric acid (UA) and potassium (K⁺). Comparisons were made for two capture methods: mist-netting and cannon-netting. Environmental factors were investigated by comparing cannon-net captures in 3 locations with differing ambient temperatures. Sex and body mass were also investigated as potential risk factors in godwits. We found marked increases in plasma concentrations of CK in godwits and great knots following capture and banding. While some muscle damage was evident by both methods of capture, cannon-net captures showed greater evidence of muscle damage in godwits and a greater occurrence of capture myopathy in godwits and red knots. Entanglement nets were especially risky, associated with the most problematic capture and a greater number of CM cases. Sex or body mass differences did not appear to influence godwit susceptibility to muscle damage. Surprisingly, hot environmental temperatures in Australia did not exacerbate muscle damage when compared with cooler New Zealand locations, but elevated plasma concentrations of AST suggested greater generalized tissue or organ damage. Plasma concentrations of uric acid showed species variability, but all species showed a significant decline in the post-capture period that may relate to interruption of digestion due to acute stress. Sixteen godwits that developed capture myopathy after a cannon-net capture in New Zealand were hospitalised and split into two groups of eight birds. Midazolam, a benzodiazepine with the effects of anxiolysis, muscle relaxation and sedation, was used as an ancillary treatment for one of the groups. Both groups were treated with subcutaneous fluid therapy, non-steroidal anti-inflammatories (meloxicam), gavage feeding, and sling therapy twice daily. Six of the 8 birds in the treatment group survived to the point of release compared to 3/8 of the control group. Birds treated with midazolam showed subjective benefits including improved tolerance of handling and sling therapy, but did not show any significant differences in any of the clinical parameters we measured. However, we found the birds' body mass, packed cell volume (PCV), plasma UA, and peak plasma CK showed potential as prognostic indicators for survival. Inability to counteract weight loss in captivity was the most significant problem encountered in the treatment of both groups of birds. Lack of

waterproofing and predation were contributing causes to death of at least two godwits subsequent to release.

Our results imply that common capture techniques have significant effects on the muscular, digestive and homeostatic physiology of shorebirds. Based on this study, we recommend the use of mist-nets or light, fine mesh nets for cannon-net capture of shorebird species known to be susceptible to capture myopathy. Entanglement (large mesh) cannon-nets should be avoided for any susceptible species. Treatment of capture myopathy remains challenging, yet midazolam shows potential as an ancillary treatment for capture myopathy in birds and is worthy of continued study and use.

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TABLE OF CONTENTS

ABSTRACT.....	ii
ACKNOWLEDGEMENTS.....	iii
TABLE OF CONTENTS.....	vi
LIST OF TABLES.....	ix
Chapter Two.....	ix
LIST OF FIGURES.....	ix
Chapter One.....	ix
Chapter Two.....	ix
Chapter Three	xi
Chapter One: <i>Introduction, Literature Review and Research Objectives</i>	14
1.1 INTRODUCTION.....	14
1.2 DEFINITION OF CAPTURE MYOPATHY	15
1.3 SCOPE OF THESIS.....	15
1.4 CAPTURE OF WILDLIFE	16
1.4.1 Purpose of Capture	16
1.4.2 Capture methods for wild birds	18
1.4.3 Capture complications	28
1.5 CAPTURE MYOPATHY.....	37
1.5.1 Overview	37
1.5.2 Species affected	38
1.5.3 Aetiology	38
1.5.4 Clinical Signs.....	40
1.5.5 Clinical syndromes	42
1.5.6 Long term effects	44
1.5.7 Pathophysiology.....	44
1.5.8 Pathology	47
1.5.9 Diagnosis	49
1.5.10 Risk factors.....	54
1.5.11 Prevention.....	61
1.5.12 Treatment	63
1.5.13 Triage and Prognosis.....	67

1.5.14	Post-treatment survival	67
1.6	RESEARCH NEEDS CITED IN LITERATURE	68
1.7	SHOREBIRD SPECIES IN THIS STUDY	69
1.7.1	Bar-tailed Godwits (<i>Limosa lapponica</i>)	69
1.7.2	Red Knots (<i>Calidris canutus</i>)	71
1.7.3	Great Knots (<i>Calidris tenuirostris</i>)	73
1.8	RESEARCH OBJECTIVES	75
	LITERATURE CITED	77
Chapter Two: <i>Risk Factors for Capture Myopathy in Shorebirds</i>		88
	ABSTRACT:.....	88
2.1	INTRODUCTION	89
2.2	MATERIALS AND METHODS	92
	Statistical methods.....	93
2.3	RESULTS.....	95
2.3.1	Bar-tailed godwits	95
2.3.2	Red Knots	100
2.3.3	Great Knots	102
2.3.4	Species comparisons	102
2.4	DISCUSSION.....	105
	ACKNOWLEDGEMENTS	110
	LITERATURE CITED	111
Chapter Three: <i>Midazolam as an adjunctive therapy for capture myopathy in bar-tailed godwits, with prognostic indicators</i>		116
	ABSTRACT:.....	116
3.1	INTRODUCTION	117
3.2	MATERIALS AND METHODS	118
	Statistical methods.....	121
3.3	RESULTS.....	122
3.3.1	Survival	122
3.3.2	Effect of Midazolam	122
3.3.3	Body mass	123
3.3.4	Clinical Pathology	124
3.4	DISCUSSION.....	126
3.4.1	Effects of Midazolam	126

3.4.2	Nutrition.....	126
3.4.3	Clinical parameters as prognostic indicators	127
3.4.4	Survival.....	129
	ACKNOWLEDGEMENTS.....	130
	LITERATURE CITED	131
	Chapter Four: <i>General Discussion</i>	133
4.1	INVESTIGATION OF RISK FACTORS.....	134
4.2	TREATMENT SUMMARY.....	136
4.3	PLASMA BIOCHEMISTRIES	137
4.4	LIMITATIONS	139
4.5	ETHICS OF CANNON-NETTING	140
4.6	REPORTING	142
4.7	COLLABORATIVE RESEARCH.....	143
4.8	SUGGESTIONS FOR FUTURE STUDIES	144
4.9	CONCLUSIONS & RECOMMENDATIONS	145
	LITERATURE CITED	147

LIST OF TABLES

Chapter Two

Table 1:	Location, capture method, dates and temperatures associated with the capture of bar-tailed godwits (<i>Limosa lapponica</i>), great knots (<i>Calidris tenuirostris</i>) and red knots (<i>Calidris canutus</i>) in New Zealand and Australia 2008-2009.....	94
-----------------	--	----

LIST OF FIGURES

Chapter One

Figure 1.	A mist net has been strung between two bamboo poles via shelf-strings (trammels). Pockets are formed by the net folds, which the bird falls into after encountering the net	19
Figure 2.	A cannot-net is prepared for firing. This involves camouflaging a mesh net behind where the birds are expected to roost. Cannons, like the one shown here, are partially buried in the sand. Projectiles are tied to the leading edge of the net. A gunpowder firing mechanism fires the leading edge of the net over the group of birds, trapping them beneath	21
Figure 3.	A bar-tailed godwit (<i>Limosa lapponica</i>). Photo Phil Battley.....	70
Figure 4.	Red knots (<i>Calidris canutus</i>). Photo Phil Battley.....	72
Figure 5.	A great knot (<i>Calidris tenuirostris</i>). Photo Phil Battley.....	74
Figure 6.	Map of Australia and New Zealand showing the proposed catching locations: Miranda and Foxtton Beach, New Zealand; and Roebuck Bay, near Broome, Western Australia.).....	76

Chapter Two

Figure 1.	Scatter plots of the plasma concentration of creatine kinase (CK) against the time from capture in bar-tailed godwits (<i>Limosa lapponica</i>) (1A, B), red knots (<i>Calidris canutus</i>) (1C, D) and great knots (<i>Calidris tenuirostris</i>) (1E, F) caught by cannon and mist-nets in New Zealand and Australia 2008-	
------------------	--	--

2009. The first blood samples (Interval 1) are shown in graphs **1A, C, E** and the second blood samples (Interval 2) are shown in graphs **1B, D, F**.

.....96

Figure 2. The change in plasma concentration of creatine kinase (2A,B), aspartate aminotransferase (2C,D), uric acid (2E,F) and potassium (2G,H) for serial blood samples of bar-tailed godwits (*Limosa lapponica*) captured in New Zealand and Australia 2008-2009. Graphs 2A,C,E and G show comparisons of godwits captured by cannon-net in three locations. Graphs 2B,D,F and H show comparisons of godwits caught by mist-nets vs. cannon-nets. Asterisk denote significantly different results.....99

Figure 3. The change in concentration of plasma creatine kinase (**3A,B**), aspartate aminotransferase (**3C,D**), uric acid (**3E,F**) and potassium (**3G,H**) for serial blood samples of red knots (*Calidris canutus*), caught in two locations in New Zealand 2008-2009. Graphs **3A,C,E and G** show comparisons of red knots captured by cannon-net in two locations in New Zealand. Graphs **3B,D,F and H** show comparisons of red knots caught by mist-nets vs. cannon-nets. Asterisks denote significantly different results101

Figure 4. Species comparisons of the change in concentration of plasma creatine kinase (**4A,B**), aspartate aminotransferase, (**4C,D**), uric acid (**4E,F**) and potassium (**4G,H**) for serial blood samples of great knots (*Calidris tenuirostris*)(**4A,C,E,G**) or red knots (*Calidris canutus*) (**4B,D,F,H**) compared with bar-tailed godwits (*Limosa lapponica*) caught by cannon-nets 2008-2009. Asterisks denote significantly different results.....103

Figure 5. Species comparisons of the change in concentration of plasma creatine kinase (**5A**), aspartate aminotransferase, (**5B**), uric acid (**5C**) and potassium (**5D**) for serial blood samples of red knots (*Calidris canutus*) compared with bar-tailed godwits (*Limosa lapponica*) caught by mist-net in Miranda, New Zealand 2008-2009. Asterisks denote significantly different results.....104

Chapter Three

- Figure 1.** Bar-tailed godwits (*Limosa lapponica baueri*) undergoing sling therapy as part of a treatment regimen for capture myopathy (October-November 2008). Sling therapy allows the bird to have its weight supported while attempting to stand and relieves pressure on the limbs.120
- Figure 2:** Mean +/- standard error of body mass (grams) over the period of hospitalisation for bar-tailed godwits (*Limosa lapponica baueri*) treated for capture myopathy October-November 2008. Birds in the Control group (C) were treated with fluid therapy (10mls 0.9%NaCl subcutaneously twice daily), non-steroidal anti-inflammatories (meloxicam 0.1mg/kg per os once daily), twice daily sling therapy and supplemental nutrition (10 mls insectivore slurry per os twice daily). Birds in the Treatment (T) group were additionally treated with intramuscular midazolam at 1.5mg/kg twice daily.....123
- Figure 3.** Mean +/- standard error of (A) packed cell volume (%), (B) plasma uric acid (uMol/L), (C) plasma creatine kinase (IU/L), and (D) plasma aspartate aminotransferase (IU/L) over 7 days of hospitalisation for bar-tailed godwits (*Limosa lapponica baueri*) treated for capture myopathy October-November 2008. Birds in the Control group (grey lines and bars) were treated with fluid therapy (10mls 0.9%NaCl subcutaneously twice daily), non-steroidal anti-inflammatories (meloxicam 0.1mg/kg per os once daily), twice daily sling therapy and supplemental nutrition (10 mls insectivore slurry per os twice daily). Birds in the Treatment group (black lines and bars) were additionally treated with intramuscular midazolam at 1.5mg/kg twice daily.....125

