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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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