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Coccidia of the endangered South Island Takahē (*Porphyrio hochstetteri*): Investigations of pathobiology and management

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This thesis is dedicated to my Mum and Dad, as always I owe you everything, and also to absent friends.
Abstract

The South Island Takahē (Porphyrio hochstetteri) is a large flightless rail, endemic to New Zealand currently listed as endangered with a population numbering approximately 340 individuals. The intensive management programme for this species has seen a modest increase in the population and includes strategies such as captive rearing for release at protected sites and numerous translocations of birds between these sites each year to maximise genetic diversity. This interconnectedness of geographically dispersed populations and critical points of high stocking density contribute to the potential for spread of infectious disease. Coccidian oocysts have been detected in Takahē faecal samples for decades and sporadically coccidia were implicated in the death of Takahē. By early 2015 concerns were being raised about markedly elevated individual faecal oocyst counts and the apparent failures of treatment with toltrazuril. The potential for significant negative impacts of coccidia in terms of both clinical disease and sub-clinical effects on juvenile growth rates and fertility led to the investigations reported in this thesis into the coccidia affecting Takahē.

A novel Eimeria sp. is described from a Takahē host. Based on morphological characteristics this coccidian species is distinct from other Eimeria spp. described in hosts of the family Rallidae. A survey of stored historical faecal samples and contemporary routine screening samples demonstrated the presence of this Eimeria sp. across most of the fragmented conservation management network for Takahē. Modification of treatment protocols and management actions was closely associated temporally with a sustained reduction in the Eimeria sp. shedding rates at a breeding facility central to the Takahē population network. Preliminary results were supportive of the existence of a diurnal shedding pattern for the Eimeria sp. with a peak of oocyst shedding in the late afternoon after 3pm in winter, which has implications for the collection of screening samples and the interpretation of results collected at different times of day. Concurrent to these investigations into the biology of the Takahē coccidia, trials were carried out to establish the safety of the anti-coccidial medication, decoquinate, in Takahē. No clinically significant deleterious effects were found in the parameters examined.
The findings presented are initial investigations into an *Eimeria* sp. from a Takahē host, the effectiveness of control measures implemented and safety of potential management options. The crisis of regular extreme oocyst counts in Takahē, which prompted this research, was resolved, however the potential for a recurrence is ever present in a species conservation programme that relies on intensive breeding and translocation of individuals. This research is the foundation for future research into the characterisation and management of *Eimeria* spp. in Takahē.
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Permitting and Animal Ethics requirements

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The coccidiostat safety trial described in Chapter 5 was also approved by the Massey University Animal Ethics committee (Protocol 15-72). The remaining work did not involve the manipulation of live animals and therefore did not require Massey University Animal Ethics approval.
Table of Contents

Abstract..............................................................................................................................i

Acknowledgements........................................................................................................... iii

Table of Contents..............................................................................................................v

List of Tables ....................................................................................................................viii

List of Figures ................................................................................................................... ix

1. Literature Review ........................................................................................................ 13

1.1. Takahē Coccidiasis/Coccidiosis ........................................................................... 13

1.2. Takahē ..................................................................................................................... 13

1.2.1. Species description/evolution and distribution .............................................. 13

1.2.2. Takahē biology ............................................................................................... 14

1.2.3. History of Takahē conservation .................................................................. 16

1.2.4. Current situation ............................................................................................. 19

1.2.5. Known disease issues of Takahē .................................................................. 20

1.3. Coccidia .................................................................................................................. 20

1.3.1. Taxonomy of Coccidia .................................................................................. 20

1.3.2. Eimeria life cycle ............................................................................................ 22

1.3.3. Eimeria oocyst morphology .......................................................................... 24

1.4. Avian Coccidiosis ................................................................................................ 26

1.4.1. Host range and specificity ............................................................................. 26

1.4.2. Tissue Tropism ............................................................................................... 27

1.4.3. Intestinal Coccidiosis .................................................................................... 28

1.4.4. Coccidia and wildlife ..................................................................................... 34

1.5. Investigations into Takahē coccidiosis – objectives of the current research ....... 35

2. Morphological characterisation of a novel Eimeria sp. parasite in South Island Takahē (Porphyrio hochstetteri) ......................................................... 38
2.1. Introduction ........................................................................................................ 38

2.2. Materials and Methods ..................................................................................... 39
   2.2.1. Sample collection ....................................................................................... 39
   2.2.2. Faecal sample preparation and measurement .............................................. 39
   2.2.3. Revision of archived material .................................................................... 40

2.3. Results .................................................................................................................. 41
   2.3.1. Evaluation for consistency amongst oocysts .............................................. 41
   2.3.2. Morphological oocyst measurements ....................................................... 42
   2.3.3. Histological survey .................................................................................... 43
   2.3.4. Morphological description ....................................................................... 44

2.4. Discussion ............................................................................................................ 46

2.5. Conclusion ........................................................................................................... 49

3. A review of fresh and archived faecal samples to establish the geographic distribution of *Eimeria* sp. in South Island Takahē (*Porphyrio hochstetteri*) and variation in faecal oocysts counts over three years at a central breeding location ........................................... 53

   3.1. Chapter Introduction ....................................................................................... 53

   3.2. Materials and Methods .................................................................................. 54
      3.2.1. Source of samples ................................................................................... 54
      3.2.2. Faecal floatation technique .................................................................... 54
      3.2.3. Data analysis .......................................................................................... 55

   3.3. Results .............................................................................................................. 55
      3.3.1. Geographic variation in coccidia shedding .............................................. 55
      3.3.2. Annual variation in oocyst shedding ....................................................... 58
      3.3.3. Diurnal variation in oocyst shedding ....................................................... 60
      3.3.4. Age and sex effects on oocyst shedding ................................................. 62

   3.4. Discussion ....................................................................................................... 63

   3.5. Conclusion ....................................................................................................... 67

4. Investigation of temporal variation in *Eimeria* sp. oocyst shedding by Takahē ................................................................. 71
4.1. Chapter Introduction .................................................................................. 71

4.2. Materials and Methods ........................................................................... 72
  4.2.1. Sample collection .............................................................................. 72
  4.2.2. Faecal floatation protocol ................................................................. 73
  4.2.3. Statistical analysis ............................................................................ 73

4.3. Results ..................................................................................................... 73

4.4. Discussion ............................................................................................... 75

4.5. Conclusion ............................................................................................... 79

5. Evaluation of decoquinate safety in endangered South Island Takahē (Porphyrio hochstetteri). ................................................................. 83
  5.1. Chapter Introduction .............................................................................. 83

  5.2. Materials and Methods ......................................................................... 85
    5.2.1. Diet Preparation ................................................................................ 85
    5.2.2. Feeding protocol ............................................................................ 85
    5.2.3. Sample collection and analysis ....................................................... 86
    5.2.4. Statistical analysis ......................................................................... 87

  5.3. Results .................................................................................................. 87

  5.4. Discussion ............................................................................................. 89

  5.5. Conclusion ............................................................................................. 92

6. General discussion ..................................................................................... 95

7. References .................................................................................................. 99
List of Tables

Table 2.1 Oocyst measurements .........................................................................................42

Table 2.2 Eimeria sp. coccidia described from Rallidae hosts .............................................47

Table 5.1: Results of haematological analysis over the three collection periods for
Takahē being treated with decoquinate. .............................................................................88

Table 5.2: Results of plasma biochemical analysis over the three collection periods
for Takahē being treated with decoquinate. .....................................................................89
List of Figures

Figure 2-1: Linear regression illustrating the variation in oocyst width and length \((y=0.4795x + 6.6012, R^2=0.43)\). Data points from different sampling locations indicated, Burwood (triangles) and Cape Sanctuary (dots)..........................41

Figure 2-2: Micrograph of Takahē intestinal mucosa of caudal ileum, arrow indicating microgamont within host cell (H&E, 100x).................................................................43

Figure 2-3: Micrograph of three sporulated oocysts (x100) of a novel *Eimeria* sp. isolated from a Takahē host.................................................................45

Figure 2-4: Annotated schematic drawing of a sporulated oocyst of a novel *Eimeria* sp. isolated from Takahē.................................................................45

Figure 3-1: Coccidian oocyst counts in historical samples from Takahē over the period 2012-2013, measured in oocysts per gram of faeces at five collection locations (Mean +/- standard error).................................................................56

Figure 3-2: Coccidian presence in historical faecal samples from Takahē, with the number of individual samples from each site without (dark grey) and with (light grey) oocysts across each population location.................................................................57

Figure 3-3: Results of analysis of historical faecal samples from Takahē showing negative (dark grey) and positive (light grey) results for coccidia oocysts categorised by different cold storage periods. There was no significant difference in the presence or absence of oocysts between the cold storage periods.................................................................58

Figure 3-4: Annual variation in the faecal coccidian counts of Takahē held at Burwood, measured in mean oocysts per gram of faeces (different superscript letters indicate significant difference \(P<0.05\)) .................................................................59

Figure 3-5: Time series of Takahē faecal coccidia counts from Burwood measured in oocysts per gram. The arrow indicates August 2015 when management and treatment changes to mitigate coccidiosis were instigated.................................................................60
Figure 3-6: Burwood oocysts per gram for all samples identified by time of collection .................................................................61

Figure 3-7: Individual Burwood Takahē faecal samples found to be positive and negative for Eimeria at different time intervals across the day .............................................61

Figure 3-8: Proportion of samples positive or negative for Eimeria from juvenile or adult birds .................................................................................................................................................................62

Figure 3-9: Proportion of samples positive and negative for Eimeria separated by gender of host .................................................................................................................................................................63

Figure 4-1: Mean oocysts per gram of faeces collated at hourly time intervals........74

Figure 4-2: Number of faecal samples positive and negative for Eimeria sp. oocysts at different hourly intervals across the day .................................................................................75

Figure 5-1: Body weight over 8 week decoquinate trial........................................88