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**Nestling mortality in a translocated population of hihi/stitchbirds
(*Notiomystis cincta*)**

A thesis presented in partial fulfilment of the requirements for the degree of
Master of Science in Conservation Biology
at Massey University, Palmerston North, New Zealand

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*For Dinge who was there,
For the birds, my raison d'être, and
For my Dad who shared the passion*



Photo – Raewyn Empson

*“The more sophisticated the level of our knowledge is
The more effective we will be in dealing with the natural world”*

His Holiness the Dalai Lama

Abstract Nestling mortality in a reintroduced population of the endangered and endemic hihi/stitchbird (*Notiomystis cincta*) was investigated over one breeding season (2008-09) at Zealandia – Karori Sanctuary, New Zealand, to determine whether disease impacted on nestling survival. High rates of both hatching failure (56%) and nestling mortality (39%) in the first clutch made this the least successful breeding season since translocation in 2005. Overall 34% of eggs survived to fledge, compared to 52% and 58% in 2005-06 and 2006-07 respectively. Samples collected from 34 live and 25 dead nestlings were screened for evidence of disease. Bacterial and fungal pathogens were isolated from gastrointestinal swabs but there was no evidence of coccidia or other intestinal parasites in faecal samples. There was no evidence of significant abnormalities in the blood collected from hihi prior to fledging in the haematological parameters tested, and all blood samples were negative for malarial parasites. Tropical fowl mites (*Ornithonyssus bursa*) were found on nestlings and recovered from nest material in very small numbers. Sixty percent of nestling mortality occurred during the first 7 days of life, most often caused by starvation (16%) or poor pulmonary aeration (20%), and death was associated with seasonally low minimum daily temperatures below 11°C. Two older nestlings that died suffered from aspergillosis and an unidentified haemoparasite respectively. Seven nestlings (28%) aged 6-19 days died as a consequence of ventriculitis due to traumatic penetration by insect remnants identified as bee or wasp stings (Hymenoptera). The resulting granulomatous lesions were found in the gizzard mucosa, muscle layers and ventricular or intestinal serosa, and were associated with bacterial and/or yeast secondary infection. It was concluded that hihi may lack the evolutionary adaptations to safely consume introduced bees (*Apis mellifera*) and wasps (*Vespula germanica*, *V. vulgaris*) that are attracted to the feeding stations used to support reintroduced hihi populations. Histopathological examination showed candidiasis contributed to the deaths of four nestlings and *Candida albicans* was isolated from the gastrointestinal swabs of 13 live nestlings from four nest sites, eight of which survived to fledge. The potential of all pathogens may be increased by any cause of temporary or permanent immunosuppression and, in this establishing population, the majority of nestling deaths were associated with environmental conditions (temperature) and ecological factors (introduced prey). It is suggested that ongoing monitoring should include use of temperature data-loggers in hihi nest boxes, health screening of live nestlings, necropsy examination of dead birds, and spore counts to determine environmental levels of *Aspergillus*. Nest box insulation and/or heating could reduce the incidence of hypothermia in nestlings. A review of the carbohydrate provisioning protocols may reduce bee/wasp numbers and minimise the effect of *Candida albicans* at this site.

Preface

Throughout this thesis I have used 'hihi', the Maori name, for this endemic bird, in preference to the European common name of 'stitchbird'.

This thesis is formatted as a series of distinct research papers prepared for publication. Because each chapter represents an individual paper, there is some repetition while the format and language for each paper is tailored to the specific requirements of each journal.

Papers written for publication were collaborative works involving Dr Isabel Castro and Associate Professor Maurice Alley, my supervisors for this thesis.

This thesis represents the original work of the author, except where otherwise acknowledged. It has not been submitted previously for a degree at any university.

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