

Disease risk assessment for  
translocation of kaki (black stilt),  
*Himantopus novaezelandiae*,  
from captivity to the wild

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# Disease risk assessment for translocation of kaki (black stilt), *Himantopus novaezelandiae*, from captivity to the wild

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## ABSTRACT

A literature search was carried out to determine which diseases had been identified in captive and free-living waders in New Zealand. These were assessed to establish whether they could pose a serious risk to kaki (black stilt), *Himantopus novaezelandiae*, being translocated (the source population) and to the animals and people at the release site (the destination populations). Although no major die-offs of waders in New Zealand due to infectious disease have been reported, the following were identified as 'Diseases of Concern': Salmonellosis, Yersiniosis, Campylobacteriosis, Pasteurellosis (fowl cholera), Capillariasis, Cestodiasis, Trematodiasis, Avian malaria and Coccidiosis. A health screening process for these diseases was described. Because the majority of illnesses and deaths in captive birds relate to husbandry, methods to improve husbandry were also described. The assessment indicated that a surveillance program to establish the prevalence of significant diseases in New Zealand's free-living waders would greatly assist the development of a quarantine and health-screening protocol and provide a basis for a more quantitative risk assessment.

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# 1. Introduction

It is proposed to set up a captive breeding colony of kaki (black stilt, *Himantopus novaeseelandiae*) at the Isaac Wildlife Trust (IWT) facility in Christchurch. The purpose of this disease risk assessment is to establish which diseases could pose a serious risk to the kaki being translocated (the source population) and to the animals and people at the release site (the destination populations). A systematic review of the diseases that have been identified in New Zealand waders—with particular emphasis on the *Recurvirostridae* (stilts and avocets), *Haematopodidae* (oystercatchers) and *Charadriidae* (plovers and dotterels)—provides a rational basis for developing a cost-effective quarantine and health screening protocol. In February 2001 a preliminary report on the risks associated with release of kaki from the Isaac Wildlife Trust was produced and should be seen as an accompaniment to this document (see Appendix 1).

## 2. Methodology

A literature search was completed to identify which diseases had been identified in captive and free-living waders in New Zealand (see Section 4, Sources of information). The results were compiled into an inventory of all infectious diseases and/or disease organisms to have been identified in New Zealand captive and free-living waders. (Table 1) As the translocations will all occur within New Zealand no exotic diseases have been included in this inventory.

Veterinary literature was then consulted to establish, for each disease, the causal agent (aetiology), mode of transmission, the source (range of susceptible species that could be a reservoir of the disease), the symptoms and method(s) of diagnosis. (Table 2)

The final stage was to review the risk potential of each disease to both the source and destination populations. At present there is insufficient field data on the prevalence of diseases in free-living waders in this country to be able to make a quantitative estimate of disease risk. Instead, each disease was ranked as Low, Moderate or High against the following criteria:

**Susceptibility (S)**—an estimate of the susceptibility of any of the ‘at risk’ populations.

**Pathogenicity (P)**—an estimate of the severity of the disease in the ‘at risk’ populations.

**Transmissibility (T)**—an estimate of the likelihood that the disease will infect a significant number of individuals in the ‘at risk’ populations.

On the basis of this analysis an **overall rating (O)** was given for disease risk (Table 2). Those diseases with an overall rating of Moderate to High are ‘diseases of concern’ and should form the basis of a quarantine and health screening protocol when translocating kaki within New Zealand.

TABLE 1. INVENTORY OF INFECTIOUS ORGANISMS REPORTED FROM WADERS IN NEW ZEALAND.

MICRO-ORGANISMS	INTERNAL PARASITES
<p><b>Viruses</b> Avian Pox*</p> <p><b>Bacteria</b> <i>Salmonella saintpaul</i>* <i>Yersinia</i> sp.* <i>Y. friedrickseni</i>* <i>Y. kristenseni</i> <i>Pasteurella multocida</i>* <i>Erysipelothrix rhusiopathiae</i>* <i>Clostridium</i> sp.* <i>Staphylococcus aureus</i>*+ <i>S. enteridis</i>* <i>S. epidermidis</i>* <i>Escherichia coli</i>*+ <i>Enterococcus faecalis</i>+ <i>Campylobacter jejuni</i> <i>C. coli</i> <i>Streptococcus viridans</i>* Non-haemolytic <i>Streptococcus</i> sp.+ <i>Klebsiella pneumoniae</i>*</p> <p><b>Fungi</b> <i>Aspergillus</i> sp.*</p> <p><b>Protozoa</b> <i>Giardia</i> sp. <i>Plasmodium elongatum</i>* <i>P. relictum</i>* <i>Sarcocystis</i> sp. <i>Cryptosporidium</i> sp.? <i>Coccidia</i> sp.*</p>	<p><b>Nematodes (Roundworms)</b> <i>Victorocara torea</i> <i>Capillaria</i> sp.*</p> <p><b>Acanthocephalans (Thorny headed worms)*</b> <i>Polymorphus</i> sp. <i>Plagiorhynchus</i> sp.</p> <p><b>Cestodes (Tapeworms)*</b> <i>Cyclophyllidian</i> spp. <i>Diplophallus polymorphus</i> <i>Hymenolepis alaskensis</i> <i>Proterogynotaenia haematopodus</i> <i>Taenia increscens</i></p> <p><b>Trematodes (Flukes)*</b> Echinostome (<i>Acanthoparyphium</i> sp.) Notocotylineae (<i>Catatropis</i> or <i>Notocotylus</i> sp.) Microphallinae (unidentified spp.) <i>Orinobobilharzia kowalewskii</i> <i>Acanthoparyphium</i> sp. <i>Curtuteria australis</i> <i>Uvitellina</i> sp. <i>Wardianum</i> sp. <i>Cloacitrema</i> sp.</p> <p>EXTERNAL PARASITES</p> <p><b>Feather Mites</b> <i>Brephosceles</i> sp. <i>B. constrictus</i> <i>Bychovskiata</i> sp. <i>B. subcharadrii</i> <i>B. thinorni</i> <i>Scopusacarus</i> sp. <i>Sokoloviana</i> sp. <i>S. gracilis</i> <i>Zachvatkinia</i> sp. <i>Alloptes</i> sp. <i>Grallobia</i> sp.</p>

\* Have been associated with significant pathology

+ Commensal organisms commonly cultured from healthy stilt faeces

TABLE 2. WADER DISEASE DESCRIPTION AND THREAT POTENTIAL.

DISEASE NAME	CAUSAL AGENT	TRANSMISSION	SOURCE	SYMPTOMS	THREAT POTENTIAL	DIAGNOSIS
Avian pox	Avian pox viruses	Mosquito bites, direct contact with infected tissue, skin wounds.	Wide range of birds including banded dotterel and oystercatchers.	Wart-like growths on unfeathered skin; difficulty eating if lesions in the oral cavity.	S = Moderate P = Low T = Moderate O = Moderate Most strains are of low virulence and birds recover if able to feed normally.	Biopsy for histology of affected tissue.
Salmonellosis	<i>Salmonella</i> spp.	Faecal/sewage contamination. Carried by rodents, insects, water, wild birds.	Wide range of vertebrate hosts. Rare in free-ranging waders but common in poultry, geese, ducks, pigeons, pheasants, gulls and many wild birds. House sparrow die-offs have occurred in New Zealand. <i>S. saintpaul</i> has caused mortality in black stilt chicks.	Sudden death; trembling, gasping and staggering just before death, diarrhoea, dehydration, yolk sac infections.	S = High P = High T = High O = High Carriers may rapidly spread the organism via waterways etc.	Faecal or cloacal swabs for culture. Isolation from tissues at necropsy.
Yersiniosis	<i>Yersinia friedricksenii</i> and other spp.	Faecal contamination Disease more likely under, stressful, over-crowded and unhygienic conditions.	Wide range of birds and mammals including rodents and people. Possibly soil and waterways. Most prevalent in cooler winter months.	Loss of body condition, paralysis. Or acute death sometimes preceded by diarrhoea, lethargy and dehydration.	S = Moderate P = Moderate-High T = Moderate O = Moderate	Faecal or cloacal swab for culture or culture and histology of affected tissues at necropsy.
Fowl cholera	<i>Pasteurella multocida</i>	Via faeces and respiratory excretions. Dead birds are a major source of environmental contamination. Carrier birds common.	Wide range of birds and mammals are carriers but disease is uncommon in free-living waders.	Sudden death occurs most often. Sick birds appear drowsy, may have seizures or throw their heads back between their wings.	S = Moderate P = High T = High O = High Although no mass die-offs have been recorded in New Zealand the organism has been associated with acute mortality in captive black stilt.	Swabs for culture from cloaca or upper respiratory tract. Isolation from tissues at necropsy.

Table 2 continued.

DISEASE NAME	CAUSAL AGENT	TRANSMISSION	SOURCE	SYMPTOMS	THREAT POTENTIAL	DIAGNOSIS
Erysipelas	<i>Erysipelotbrix rhusiopathiae</i>	Environmental contamination; poor hygiene, often secondary to another infection.	Widely dispersed in the environment, particularly in moist soil and water of shallow lakes and ponds. Reservoirs in rodents, pigs and raw fish.	Usually sudden death due to septicaemia. May see lethargy, weakness, loss of appetite and bruising of featherless, non-pigmented skin.	S = Low P = Moderate T = Low O = Low Has been cause of a post-traumatic septicaemia in a black stilt. Not a major threat to healthy birds kept in hygienic environment.	Culture from tissues, at necropsy— especially fresh liver and spleen. If badly decomposed, culture from bone marrow.
Septicaemia	<i>Staphylococcus aureus</i> , <i>S. enteridis</i> , <i>S. epidermidis</i> , <i>E. coli</i> , <i>Streptococcus viridans</i> , <i>Klebsiella pneumoniae</i>	Usually become pathogenic secondary to environmental stressors and/or other diseases or injuries.	Common normal inhabitants of the gastro-intestinal tract, skin and respiratory tract of many birds and mammals.	Varies depending on the site infected. General signs of septicaemia are sudden death OR lethargy, weakness, loss of appetite, sometimes tremors or convulsions. May be associated with bumble foot in adults and yolk sac infections in chicks.	S = Low P = Moderate T = Low O = Low Septicaemia has been a common cause of death secondary to injuries and bumble foot in captive stilts.	Culture from affected tissues.
Campylobacteriosis	<i>Campylobacter jejuni</i>	Faecal contamination. Intestinal nematodes and coccidia predispose to clinical disease.	Common in the intestinal tracts of many birds including poultry, pheasants, gulls, waterfowl, shore birds and pigeons.	Most commonly lethargy, loss of appetite and yellowish diarrhoea due to hepatitis. Birds may recover or may die.	S = Moderate P = Moderate T = Low O = Moderate <i>C. jejuni</i> has been isolated from captive black stilt but no pathology to date. A fatality is recorded in a captive shore plover.	Cloacal swab for culture. Culture from affected tissues at necropsy.



Table 2 *continued.*

DISEASE NAME	CAUSAL AGENT	TRANSMISSION	SOURCE	SYMPTOMS	THREAT POTENTIAL	DIAGNOSIS
Aspergillosis	<i>Aspergillus fumigatus</i>	Inhalation of fungal spores when exposed to decaying organic matter during stressful periods.	Environmental spore build-up in mouldy litter or feed.	Weight loss over a prolonged period, increased breathing effort, death.	S = High P = High T = Low O = Low No bird-to-bird transmission. However, a relatively common cause of death in captive waders.	Physical exam; high white blood cell count, culture from windpipe and airsacs, x-ray. Necropsy and histology.
Capillariasis	<i>Capillaria</i> sp.	Ingestion of faecal contamination or invertebrates (particularly earthworms and fresh water crustacea) depending on parasite life cycle.	Faecal contamination; infected invertebrates.	Varies from no symptoms to lethargy, diarrhoea, anaemia, loss of appetite, weight loss, death.	S = High P = Low-Moderate T = High O = Moderate Heavy burdens can affect survival of translocated birds and increase environmental contamination.	Faecal exam Physical exam Necropsy
Cestodiasis	Refer list of tapeworms	Ingestion of infected invertebrates.	Availability of invertebrates, especially fresh water crustacea e.g. copepods or fish and possibly presence of external parasites.	Varies from no symptoms to lethargy, diarrhoea, weight loss, loss of appetite.	S = High P = Low-Moderate T = Moderate O = Moderate Heavy burdens common in stilts and can affect survival of translocated birds and increase environmental contamination.	Faecal exam Physical exam Necropsy
Trematodiasis	Refer list of flukes	Ingestion of infected intermediate hosts (mainly fresh water snails).	Availability of infected snails.	Varies from no symptoms to ill thrift, diarrhoea, weight loss and death.	S = High P = Low-High T = Moderate O = Moderate Heavy burdens can affect survival of translocated birds and increase environmental contamination.	Faecal exam Physical exam Necropsy

Table 2 *continued.*

DISEASE NAME	CAUSAL AGENT	TRANSMISSION	SOURCE	SYMPTOMS	THREAT POTENTIAL	DIAGNOSIS
Avian malaria	<i>Plasmodium</i> sp.	Mosquito bites	Exposure to infected mosquitos. Reservoir in introduced passerines (sparrows, thrushes, blackbirds) in New Zealand.	Anaemia, weight loss, death. Has caused some mortalities in captive New Zealand dotterels.	S = Moderate P = Moderate T = Moderate O = Moderate	Blood smears
Coccidiosis	<i>Eimeria</i> spp.? <i>Isospora</i> spp.?	Faecal contamination; unhygienic environment. Young birds under stressful circumstances (e.g. over-crowding) most susceptible.	Other birds. Low numbers common and harmless in most bird species.	Lethargy, loss of appetite, loss of body weight, greenish diarrhoea, sometimes with fresh blood. Severe infestations can cause anaemia and death.	S = Moderate P = Moderate T = Moderate O = Moderate One report of coccidiosis as cause of death in captive black stilt	Faecal exam by flotation.
Feather mites	Refer list of mites	Direct bird-to-bird transfer.	Close contact with other affected birds.	Generally minor feather damage and irritation.	S = High P = Low T = Moderate O = Low	Physical exam

### 3. Conclusions

1. There are no reported cases of major die-offs of waders in New Zealand due to infectious disease. However, there has also been no systematic health surveillance of waders in this country and therefore the literature probably does not reflect the true prevalence or significance of diseases in this group of birds. The majority of data comes from birds held in, or released from, captivity.
2. Analysis of the significance of infectious organisms listed in Tables 1 and 2 reveals the following 'Diseases of Concern':
  - Avian Pox
  - Salmonellosis
  - Yersiniosis
  - Campylobacteriosis
  - Pasteurellosis (fowl cholera)
  - Capillariasis
  - Cestodiasis
  - Trematodiasis
  - Avian malaria
  - Coccidiosis.

A health screen for these diseases will comprise the following:

- General physical examination by a veterinarian with special attention to signs of avian pox.
  - Cloacal swab for culture of *Salmonella*, *Yersinia* and *Campylobacter*.
  - Choanal swab for culture of *Pasteurella multocida*.
  - Faecal examination for *Capillaria*, cestodes, trematodes and coccidia.
  - Blood smear exam for avian malaria and total and differential white blood cell count.
3. The majority of illnesses and deaths in captive birds relate to husbandry. Prevention of losses could occur by changing:
    - Diet (e.g. iodine supplementation to reduce the incidence of hypothyroidism)
    - Environmental and behavioural/social management—to reduce the incidence of stress-related diseases (e.g. aspergillosis and coccidiosis), traumatic injuries to legs and bills and localised wounds leading to bumblefoot.
    - Hygiene—to reduce environmental contamination with parasites and bacterial pathogens.
    - Parasite screening—adoption of a programme of regular screening of captive birds to detect and control parasite burdens.
  4. It is clear from this assessment that a surveillance program to establish the prevalence of significant diseases in our free-living waders will greatly assist the development of a quarantine and health-screening protocol and provide a basis for a more quantitative risk assessment.

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# Appendix 1

## Evaluation of health risks associated with release of kaki from Isaac Wildlife Trust, Christchurch

### 1. BACKGROUND

It is proposed to transfer a number of kaki (black stilt, *Himantopus novaezelandiae*) from Twizel to the Isaac Wildlife Trust (IWT) in Christchurch for the purpose of establishing an additional captive breeding colony there. It is intended that kaki raised at this site will be released into the wild in the Mackenzie basin where the species' remnant population is confined.

A full review of disease risk associated with this project is in preparation. This preliminary report addresses only the suitability of the Isaac Wildlife Trust for this project on the basis of the potential risk of transferring diseases into the free-living population via wild birds bred at the Trust.

### 2. EVALUATION CRITERIA

The following criteria have been considered in evaluating this potential disease risk:

- Sources of infection at IWT.
- Bird health management at IWT.
- Disease history at IWT.
- Home range of wild kaki in relation to IWT.

### 3. EVALUATION

#### 3.1 Sources of infection at IWT

*Other captive animals*—the Isaac Wildlife Trust maintains a collection of animals comprising two mammal, 22 bird and one reptile species at its Peacock Springs property. These include three kaki and 10 New Zealand shore plovers (*Thinornis novaezealandiae*). The latter two species are housed in large aviaries over 2 km distant from the rest of the collection. There is no direct contact between the shore plovers and kaki. There is currently no aviary in which new arrivals are isolated before introduction to the resident birds. It is therefore critical that birds are quarantined and health screened prior to arrival at IWT.

*People*—the shore plovers and kaki are managed by Ann Richardson, Senior Keeper at IWT, who does not have contact with other parts of the collection from Monday to Friday. However, there is a common food preparation area for the entire collection. On weekends, one keeper services the whole collection and follows an established hygiene protocol aimed at minimising disease transfer between the rest of the collection and the kaki/shore plovers. Keepers step through a halamid disinfectant foot-bath on entry and exit to the enclosure. The disinfectant is made up at 1 teaspoon per 5 litres and replenished weekly. A more effective procedure would be to change boots before entering the kaki enclosure. Aviaries are designated as restricted to wildlife staff only or persons accompanied by wildlife staff.

*Rodents, wild birds and other vermin*—There is an on-going rodent control program involving covered traps within the aviaries and baited rodent tunnels outside. Some sparrows were found dead within the IWT property during last year's *Salmonella* outbreak and while *Salmonella* was not isolated from these birds, Ann Richardson suspects some of these deaths were due to this infection. Sparrows can get into the kaki aviary but Ann reports that they rarely do and are not very common in this area. *Salmonella* has not been a cause of death or illness in captive birds at IWT according to the records provided.

*Insects and other invertebrates*—Mosquitoes and other biting insects are reported to be uncommon or absent in this vicinity. The birds eat a certain amount of fresh water crustaceans and insect larvae but apparently prefer the artificial diet.

*Food and feeding practices*—The kaki are fed the same diet as used at Twizel. Meat is sourced from a local butcher and other components of the diet are proprietary brands (Go Cat, calcium, iodised salt, kiwi premix). A hygienic food preparation protocol which includes hand washing and antiseptic bench-top spraying has been established. Separate 'black stilt only' dishes and utensils are used for the kaki and their dishes are washed separately in hot water.

*Water and soil*—All water for the aviaries is from natural fresh-water springs and there is no water passing from one aviary to another. Due to the presence of a Salmon Farm on the property water is regularly tested for coliforms by MAF and must maintain a high quality. The aviary substrate is river-bed shingle. Some screened top-soil is bought and stored on site for addition to ponds to give the birds something to probe through.

### **3.2 Bird health management at IWT**

It is not possible to evaluate the standards of health management at IWT without a site visit. It is recommended that a DOC staff member familiar with Black Stilt management at Twizel conduct an audit of health management at IWT against the 'Standards for the Health Care of Native Vertebrate Species in Captivity' (Jakob-Hoff 1999). Of critical importance to the current evaluation are the sections on Quarantine; Hygiene Practices, Health Monitoring, Health Records and Animal Deaths.

### **3.3 Disease history at IWT**

A review of health screening and necropsy reports for animals at IWT over the past eight years was provided by Ann Richardson.

The only significant infectious disease organisms isolated during this period were *Yersinia pseudotuberculosis* (from necropsies of two yellowheads and one New Zealand pigeon, and from a live, clinically normal, black stilt) and *Campylobacter jejuni* (from necropsy of a New Zealand shore plover).

There is currently work being done by people involved with kiwi and takahe on the prevalence of *Campylobacter* as this organism has been isolated from both these species and is known to have caused fatalities in takahe as well as weka and, possibly, pukeko. Domestic animals, including poultry, are probably the most common source so it is important to ensure these animals and/or their manure do not get anywhere near the aviaries.

*Yersinia* bacteria are widespread in New Zealand soil and some birds and rodents can act as carriers. A good rodent control program is an important part of prevention.

Aspergillosis has also been a common cause of death in several species at IWT (yellowhead, black stilt, shore plover, emu). This is generally associated with stress and exposure to an environment containing moist, rotting organic matter. It is therefore a husbandry matter, but not a disease of concern in terms of translocation of birds to the wild.

### **3.4 Home range of wild kaki relative to IWT**

Although wild kaki are restricted in range to the Mackenzie Basin, I understand pied stilt, with whom they associate and to which they are closely related, are known to migrate between the Christchurch area of Canterbury and the Mackenzie Basin. There is, therefore, undoubtedly some indirect exposure of free-living kaki to the diseases endemic in the Charadriiformes of the Canterbury area. Assuming this is the case, the wild kaki will also have developed an immune response to combat these diseases.



## 4. Recommendations

1. That kaki be isolated and health-screened prior to transfer to the IWT.
2. That foot baths at the IWT kaki aviary be replaced by a boot change. These boots only to be worn inside the kaki aviary.
3. That a DOC staff member familiar with kaki management conduct an audit of health care at IWT against the attached 'Standards for the Health Care of Native Vertebrate Species in Captivity'.
4. That an on-going surveillance program for *Yersinia* and *Campylobacter* be established for kaki and shore plover at IWT (this could be an annual cloacal swab taken during routine handling). It would be useful to establish the prevalence of these organisms in the wild stilt populations of the Mackenzie basin.
5. That a stringent rodent control program be maintained at IWT.
6. That all domestic animals, including poultry be excluded from the area immediately around the kaki/shore plover aviaries.
7. That kaki to be released from IWT be isolated and subjected to an appropriate health screen prior to release.
8. That every effort be made to minimise stress on the captive birds and their exposure to decaying vegetation (which is likely to harbour *Aspergillus* spores).

## 5. Conclusion

Subject to the implementation of the above recommendations I see no reason why kaki bred and raised at the IWT should pose a disease threat to the wild population.