

# Genomic sequencing confirms absence of introgression despite past hybridisation between a common and a critically endangered bird

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**Manuscript Source:** <https://www.biorxiv.org/content/10.1101/2020.09.28.316299v2>

**Manuscript Authors:** Natalie J. Forsdick, Denise Martini, Liz Brown, Richard F. Maloney, Tammy E. Steeves & Michael Knapp

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### Research Paper Sections:

The sections of the research paper input text parsed in this audit.

[illegible]

Title

# Genomic sequencing confirms absence of introgression despite past hybridisation between a common and a critically endangered bird

**S1 [001]**

## Abstract

**S1 [002]**

Genetic swamping resulting from interspecific hybridisation can increase extinction risk for threatened species.

Genetic swamping resulting ...  
... from interspecific hybridisation can increase extinction risk ...  
... for threatened species.

**S1 [003]**

The development of high-throughput and reduced-representation genomic sequencing and analyses to generate large numbers of high resolution genomic markers has the potential to reveal introgression previously undetected using small numbers of genetic markers.

The development ...  
... of high-throughput ...  
... and reduced-representation genomic sequencing ...  
... and analyses ...  
... to generate large numbers ...  
... of high resolution genomic markers has the potential ...  
... to reveal introgression previously undetected ...  
... using small numbers ...  
... of genetic markers.

**S1 [004]**

However, few studies to date have implemented genomic tools to assess the extent of interspecific hybridisation in threatened species.

However, ...  
... few studies ...  
... to date have implemented genomic tools ...  
... to assess the extent ...  
... of interspecific hybridisation ...  
... in threatened species.

**S1 [005]**

Here we investigate the utility of genome-wide single nucleotide polymorphisms (SNPs) to detect introgression resulting from past interspecific hybridisation in one of the world's rarest birds.

Here we investigate the utility ...  
... of genome-wide single nucleotide polymorphisms ...  
... (SNPs) ...  
... to detect introgression resulting ...  
... from past interspecific hybridisation ...  
... in one ...  
... of the world's rarest birds.

**S1 [006]** Anthropogenic impacts have resulted in hybridisation and subsequent backcrossing of the critically endangered Aotearoa New Zealand endemic kak<sup>■</sup> (black stilts; *Himantopus novaezelandiae*) with the non-threatened self-introduced congeneric poaka (Aotearoa New Zealand population of pied stilts, *Himantopus himantopus leucocephalus*), yet genetic analyses with a limited set of microsatellite markers revealed no evidence of introgression of poaka genetic material in kak<sup>■</sup>, excluding one individual.

Anthropogenic impacts have resulted ...  
... in hybridisation ...  
... and subsequent backcrossing ...  
... of the critically endangered Aotearoa New Zealand endemic kak<sup>■</sup> ...  
... (black stilts; ...  
... *Himantopus novaezelandiae*) ...  
... with the non-threatened self-introduced congeneric poaka ...  
... (Aotearoa New Zealand population ...  
... of pied stilts, ...  
... *Himantopus himantopus leucocephalus*), ...  
... yet genetic analyses ...  
... with a limited set ...  
... of microsatellite markers revealed no evidence ...  
... of introgression ...  
... of poaka genetic material ...  
... in kak<sup>■</sup>, ...  
... excluding one individual.

**S1 [007]** We use genomic data for ~63% of the wild adult kak<sup>■</sup> population to reassess the extent of introgression resulting from hybridisation between kak<sup>■</sup> and poaka.

We use genomic data ...  
... for ~63% ...  
... of the wild adult kak<sup>■</sup> population ...  
... to reassess the extent ...  
... of introgression resulting ...  
... from hybridisation ...  
... between kak<sup>■</sup> ...  
... and poaka.

**S1 [008]** Consistent with previous genetic analyses, we detected no introgression from poaka into kak<sup>■</sup>.

Consistent ...  
... with previous genetic analyses, ...  
... we detected no introgression ...  
... from poaka ...  
... into kak<sup>■</sup>.

**S1 [009]** These collective results indicate that, for kak<sup>■</sup>, existing microsatellite markers provide a robust, cost-effective approach to detect cryptic hybrids.

These collective results indicate that, ...  
... for kak<sup>■</sup>, ...  
... existing microsatellite markers provide a robust, ...  
... cost-effective approach ...

... to detect cryptic hybrids.

**S1 [010]** Further, for well-differentiated species, the use of genomic markers may not be required to detect admixed individuals.

Further, ...  
... for well-differentiated species, ...  
... the use ...  
... of genomic markers ...  
... may not be required ...  
... to detect admixed individuals.

## **S2 [011] 1 Introduction**

**S2 [012]** Growing evidence from genetic and genomic data indicates that interspecific hybridisation (hereafter, hybridisation) has been integral in the evolutionary history of many species (Mallet, 2008), challenging existing perceptions of the intrinsic value of hybrids and hybrid species, and further highlighting the complexity of conservation policy relating to them (Haig & Allendorf, 2006; Jackiw et al., 2015; Wayne & Shaffer, 2016).

Growing evidence ...  
... from genetic ...  
... and genomic data indicates ...  
... that interspecific hybridisation ...  
... (hereafter, ...  
... hybridisation) ...  
... has been integral ...  
... in the evolutionary history ...  
... of many species ...  
... (Mallet, 2008), ...  
... challenging existing perceptions ...  
... of the intrinsic value ...  
... of hybrids ...  
... and hybrid species, ...  
... and further highlighting the complexity ...  
... of conservation policy relating ...  
... to them ...  
... (Haig & Allendorf, 2006; ...  
... Jackiw et al., 2015; ...  
... Wayne & Shaffer, 2016).

**S2 [013]** Hybridisation may improve individual fitness, population resilience and adaptive potential (Arnold, 1997; Dowling & Secor, 1997; Mallet, 2007; Seehausen, 2004), and as such hybridisation between closely related species or subspecies has been proposed as a conservation management tool to assist genetically depauperate threatened species by introducing novel genetic variation to increase genetic diversity and improve fitness (Arnold, 2016; Harrisson et al., 2016; Ingvarsson, 2001; 65 Mallet, 2005).

Hybridisation ...  
... may improve individual fitness, ...

... population resilience ...  
 ... and adaptive potential ...  
 ... (Arnold, 1997; ...  
 ... Dowling & Secor, 1997; ...  
 ... Mallet, 2007; ...  
 ... Seehausen, 2004), ...  
 ... and as ...  
 ... such hybridisation ...  
 ... between closely related species ...  
 ... or subspecies has been proposed ...  
 ... as a conservation management tool ...  
 ... to assist genetically depauperate threatened species ...  
 ... by introducing novel genetic variation ...  
 ... to increase genetic diversity ...  
 ... and improve fitness ...  
 ... (Arnold, 2016; ...  
 ... Harrisson et al., 2016; ...  
 ... Ingvarsson, 2001; ...  
 ... 65 Mallet, 2005).

**S2 [014]** Nevertheless, potential tradeoffs resulting from conservation management of hybrids and hybridisation – especially recent human-induced hybridisation between threatened endemic and non-threatened non-endemic congeners – warrants careful ethical and practical consideration, balancing conservation priorities alongside the ecological, social, and economic costs-benefits of hybrids (e.g., Hamilton & Miller, 2016; Estévez et al., 2015; Schlaepfer et al., 2011).

Nevertheless, ...  
 ... potential tradeoffs resulting ...  
 ... from conservation management ...  
 ... of hybrids ...  
 ... and hybridisation – especially recent human-induced hybridisation ...  
 ... between threatened endemic ...  
 ... and non-threatened non-endemic congeners – warrants careful ethical ...  
 ... and practical consideration, ...  
 ... balancing conservation priorities alongside the ecological, ...  
 ... social, ...  
 ... and economic costs-benefits ...  
 ... of hybrids ...  
 ... (e.g., Hamilton & Miller, 2016; ...  
 ... Estévez et al., 2015; ...  
 ... Schlaepfer et al., 2011).

**S2 [015]** From a conservation perspective, threatened endemic species are valued over non-threatened non-endemic species due to their rarity and their known (or perceived) ecological importance, which generally leads to ethical and moral obligations to conserve them, especially if they are also culturally significant species (Booth et al., 2011; Courchamp et al., 2006; Maguire & Justus, 2008; Richardson & Loomis, 2009).

From a conservation perspective, ...  
 ... threatened endemic species are valued ...  
 ... over non-threatened non-endemic species ...  
 ... due to their rarity ...  
 ... and their known ...

## **End of Sample Audit**

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