



# The acquisition and maintenance of dogs' aversion responses to kiwi (*Apteryx* spp.) training stimuli across time and locations



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## ABSTRACT

Dogs (*Canis familiaris*) pose a significant threat to kiwi (*Apteryx* spp.) through predation. In an attempt to balance kiwi conservation and the need for dogs to be used for hunting purposes in kiwi habitat, the New Zealand Department of Conservation (DOC) developed the Kiwi Aversion Training (KAT) programme. KAT involves a training session in which a dog is presented with KAT stimuli (stuffed kiwi, frozen kiwi, and kiwi feathers) and a brief period (0.5–1.5 s) of aversive electrical stimulation from an electric shock collar is applied when the dog makes contact with the training stimuli. This paper reports three experiments: (1) investigating whether dogs can learn to avoid the KAT stimuli through aversion training; (2) investigating maintenance of aversion to the KAT stimuli 1 month after initial training; and (3) investigating maintenance of aversion to the KAT stimuli 1 year after initial training. All dogs showed aversion responses to the KAT stimuli during the initial KAT training and also when exposed to the KAT stimuli 1 month after training without an electric collar being worn. 1 year after initial training, 87% (48/55) of dogs avoided the KAT stimuli. This research indicates that KAT effectively produces aversion towards the KAT stimuli that generalizes to another location, is independent of the electric collar being worn, and that lasts at least 1 year after training.

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## 1. Introduction

Kiwi (*Apteryx* spp.) populations have been in decline since the arrival of humans to New Zealand more than 700 years ago, resulting in all species currently being at risk, and some precariously close to extinction (Holzapfel et al., 2008). The kiwi is *taonga* (treasure) to Māori (indigenous people of New Zealand), is equally treasured by all cultures

in New Zealand, and is a significant national icon (Holzapfel et al., 2008). The North Island brown kiwi is classified as “Nationally Vulnerable” (Miskelly et al., 2008) and kiwi abundance in most North Island forests has declined by at least 90% over the last century (McLennan et al., 1996). Habitat destruction is an important factor in this, but most of the decline is due to predation by introduced pests such as ferrets (*Mustela putorius*), possums (*Trichosurus vulpecula*), stoats (*Mustela erminea*), cats (*Felis catus*) and dogs (*Canis familiaris*) (e.g. McLennan et al., 1996; Pierce and Sporle, 1997). Dogs are the primary killer of adult kiwi (Holzapfel et al., 2008) and this predation can cause catastrophic declines in local populations (Pierce and Sporle, 1997; Taborsky, 1988) and can strongly influence

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population trends by significantly reducing the life expectancy of adults in some areas (e.g. Northland) (Holzapfel et al., 2008).

Given the threat that dogs pose to kiwi, banning dogs from areas where kiwi live would appear to be the simplest solution but this is impractical for many reasons. Some kiwi habitats are either privately owned or adjacent to private land, or are publicly owned land where dogs are allowed. Dogs also provide benefits in reducing introduced predators and grazing species that damage kiwi habitat, with dogs being commonly used and necessary for hunting feral pigs (*Sus scrofa*), deer (*Cervus* spp.) and goats (*Capra hircus*), often in remote areas. This is considered an essential method of pest control by the Department of Conservation (DOC). In addition to this, prohibition of dogs from kiwi habitat may impact negatively on kiwi conservation if DOC's dog-control approach is perceived by dog owners as too rigid or inconsistent, even though kiwi conservation is an issue that is well supported by the New Zealand public (James, 2000).

Given that there are approximately 700,000 dogs in New Zealand (Mackay, 2011), a solution was therefore sought that would allow dogs to be used for recreational and professional hunting in conservation areas containing kiwi populations while minimizing the risk to kiwi. Accordingly, the Kiwi Aversion Dog Training Programme (KAT) was developed, funded by the Bank of New Zealand Recovery Trust in association with DOC. The KAT procedure involves a training session in which a dog is presented with one or more kiwi stimuli (frozen dead kiwi and stuffed kiwi) and a brief period (0.5–1.5 s) of electrical stimulation from an electric shock collar is applied when the dog makes contact with the KAT training stimuli. The dog passes the training if the dog displays aversive behaviours to the KAT stimuli after being shocked, i.e. not looking at or going near the training stimuli. Information regarding the dangers of dogs to kiwi is also provided to owners along with a KAT certificate. The purpose of KAT is to train dogs to associate the sight and/or odour of kiwi training stimuli with the shock so that they will avoid kiwi if encountered in the future.

While there is anecdotal evidence from dog owners and DOC staff that suggests the KAT training results in kiwi aversion when dogs encounter live kiwi, only one study has examined the efficacy of the programme (Jones, 2006). That study had a very small sample size of 13 dogs and concluded that the KAT training is not effective. However, a number of studies have demonstrated that response-contingent electric shock can in certain conditions reduce or eliminate predatory behaviour in Canidae species (e.g. Andelt et al., 1999; Christiansen et al., 2001; Hawley et al., 2009; Linhart et al., 1976). Most of the studies investigating aversion learning in canids have been conducted while searching for non-lethal methods of controlling predation of domesticated animals by non-domestic canids such as coyotes (*Canis latrans*), foxes (*Vulpus vulpus*), wolves (*Canis lupus*), and feral dogs (*Canis familiaris*), as opposed to endangered ground-dwelling birds as is the case with the KAT programme in New Zealand.

The KAT programme started in 1997 in the DOC Hau-raki Area Office and has issued more than 1500 permits for dogs in the Coromandel region in the North Island

of New Zealand. KAT is not mandatory for all dogs but is encouraged for dogs that live in kiwi habitat and is required if hunting on DOC land as part of the requirement for a hunting permit in kiwi habitat (e.g. Waikato and East Coast/Hawke's Bay conservancies). Some forestry companies and private landowners have also made KAT a requirement for hunting in kiwi territory. There is a large community uptake and support of the importance of this training programme throughout the Coromandel region. However, the usefulness of the programme is relatively controversial due to the time, effort, and money invested in the KAT by the DOC without knowing if it is actually working in stopping or reducing the number of dogs killing kiwi. This research examines whether dogs avoid KAT stimuli during the initial KAT training, the retention of that learning in tests 1 month, and 1 year after initial training, and whether the learning generalizes to locations other than that used in training.

## 2. Methods

### 2.1. Animals

Pig and/or goat hunting dogs ( $n=120$ ) were sourced from consenting owners during DOC run KAT sessions. There were three groups of dogs: the 'Naïve' group consisted of naïve dogs undergoing their first KAT session (65 dogs); the '1 Month Retest' group consisted of dogs returning 1 month after their first KAT session (15 dogs sourced from 'Naïve' group); and the '1 Year Retest' group consisted of dogs returning 1 year after their first KAT session (55 dogs). None of the 1 Year Retest group were in the Naïve group or the 1 Month Retest group. Demographic data was not recorded.

### 2.2. Procedures

The KAT training took place at sites consisting of a walking path in native forest with KAT stimuli set up in the middle of the track. The KAT stimuli consisted of two stuffed kiwi, and one partly thawed frozen kiwi carcass. Dogs were fitted with an Agtronics Smart Aid 4 electric training collar (manufactured by Pet Training Products, New Plymouth, New Zealand) which delivered 0.0092 joules of electric shock when operated. Each dog was individually walked past the KAT stimuli with its owner/handler, either on a long lead or under voice control with the decision dependent on whether the site potentially had endangered species present and also the owner's control over the dog (Long line use: Naïve dogs,  $n=39/65$ ; 1 month Retest  $n=0/15$ ; 1 Year Retest  $n=12/55$ ). Dogs were given the opportunity to observe and approach the KAT stimuli, and when contact was made (defined as sniffing the training stimuli), an electric shock was administered via a remote control handset controlled by the DOC trainer/assessor. For dogs undergoing KAT for the first time (Naïve group), if the dog did not voluntarily sniff the KAT stimuli, the dog would be encouraged to do so by the DOC trainer/assessor and once contact was made would be shocked. The majority of the dogs were walked past the KAT stimuli for a second time to assess the behaviours

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