Assessment of the effectiveness of Transonic® ESP and Yard Gard® ultrasonic devices for repelling stoats *(Mustela erminea)*

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1. Introduction

The Department of Conservation, West Coast, requested Manaaki Whenua - Landcare Research, Lincoln, to test the effectiveness of two ultrasonic devices, Transonic® ESP andYard Gard®, for repelling captive stoats *(Mustela erminea)* from a food source. If they repelled stoats, ultrasonic devices could be used to protect nesting birds such as kiwi (Apterygiformes), penguins (Sphenisciformes), and petrels (Procellariiformes) and their eggs and chicks from predation.

2. Objective

To test whether Transonic® ESP and Yard Gard® are effective at repelling captive stoats from a food source.

3. Methods

3.1 EQUIPMENT

The two types of ultrasonic devices were both manufactured by Weitech Inc., U.S.A.

The Transonic® ESP has five frequency settings. The two lower settings (2-50 and 10-50 kHz) are recommended by the manufacturer for outdoor use (against animals such as rodents and ferrets) because low frequency sounds carry further. Both settings include sonic frequencies (sound audible to humans). The 10-50 kHz setting was chosen for testing in these trials because the lower setting was too loud for neighbouring people and the manufacturer advised that it also affected some bird species.

The Yard Gard® has three frequency settings (low, medium, high). The low setting (frequency not specified) was just audible to humans (as a very high pitched sound). It was claimed by the manufacturer to be the most effective frequency setting for animals such as rats, ferrets, and weasels, and so was chosen for testing in these trials.

Both devices emitted sound continuously. The area affected by the devices is claimed by the manufacturer to be 24 x 15 m (extending at an angle of about 60° either side of the speaker).

3.2 TESTING PROCEDURE

A housing box containing one stoat was connected to the base of a stoat-proof steel-mesh T -shaped tunnel (Appendix 1). The stem of the T was approximately 1 m long and the top 10 m long, with food and water dishes at each end.The ultrasonic devices were placed 1 m away and directed at right-angles towards one (test) end of the tunnel.When the ultrasound was turned on, the stoat had a choice of feeding inside and/or outside the ultrasonic field.

Each of eight stoats (sex unknown for most, but including at least one male and one female) was placed in the test apparatus for 3 nights; 1 night for each of the two ultrasonic devices and 1 night without ultrasound. The nights that the ultrasound was turned on were randomised for each stoat (Appendix 2). One dead day-old chick (a familiar food item) was placed in each feeding dish between 1400 and 1500 hours (and, if scheduled, the ultrasound was turned on). A 24-hour time-lapse video-recorder recorded the behaviour of five of the stoats approaching the test feeding dish from 3 m away. Food consumption from test and control feeding dishes (chick removed and eaten or not removed) was noted the next day.

4. Results

All eight stoats removed the dead chicks from both test and control feeding dishes in every test. However, all five stoats recorded on video showed some hesitancy in approaching closer than about 2 m from the test feeding dish when the ultrasonic devices were turned on.This was especially noticeable when theYard Gard® was on. Stoats initially approached hesitantly to within about 2 m of the test feeding dish but then withdrew rapidly. Over a period of several minutes, they re-approached the test feeding dish several more times, coming slightly closer each time, before finally snatching the chick and running off with it. When the ultrasonic device was switched off, the stoats appeared more relaxed, generally approached the test feeding dish directly, and although they still carried the chick away they appeared to spend more time in the vicinity of the test feeding dish. However, one stoat approached the test feeding dish without hesitancy when the Transonic® ESP was switched on and spent more than 2 hours, some of the time sleeping, within about 1 m of the device.

5. Discussion

The Transonic® ESP and Yard Gard® ultrasonic devices did not completely repel any of the eight stoats tested. For a sample size of eight, the approximate 95% confidence limits are 0-21% (Rj. Barker pers. comm.). That is, it is 95% certain that, on average, the devices completely repel fewer than 21% of stoats. Given these statistics, I do not recommend the devices for stoat con-

trol. They could not be relied upon as the sole method of protection for birds such as nesting kiwi unless they repelled all stoats.

The video recordings showed that stoats detected the signals emitted from the ultrasonic devices. That none were completely repelled may mean that the range of sound frequencies emitted by the devices was inappropriate for stoats. The manufacturer of the devices claims that different animal species respond to different ranges of sound frequencies. Alternatively, the stoats may not have been repelled by the devices because, being in captivity, they were accustomed to hearing human-induced noises.The devices may initially be more effective in the wild where stoats do not encounter such interference, but wild stoats may also become accustomed (habituate) to ultrasonic signals. Habituation to ultrasound has been demonstrated in other animals (Bomford & O'Brien 1990).

The results of this study are consistent with the findings of Bomford & O'Brien (1990), who reviewed 23 studies on the effectiveness of ultrasonic devices for vertebrate pest control.They found no evidence of any persistent effect of ultrasound on animal movements or food intake. At best, the devices tested produced short-term effects. The best results were obtained when a range of sound frequencies was used, the sound was presented at random intervals, and the sound source was moved frequently. Some makes of ultrasonic devices incorporate some of these features, and these devices may be more repellent to stoats than the two devices tested.

6. Recommendations

- The Transonic® ESP and Yard Gard® ultrasonic devices tested cannot be considered useful for protecting nesting birds such as kiwi from stoat predation.

- Any tests of other ultrasonic devices for stoat control should include a quantitative description of the sound waves produced, measurement of what sound frequencies stoats can hear, and an assessment of whether some sound frequencies attract stoats.

7. Acknowledgements

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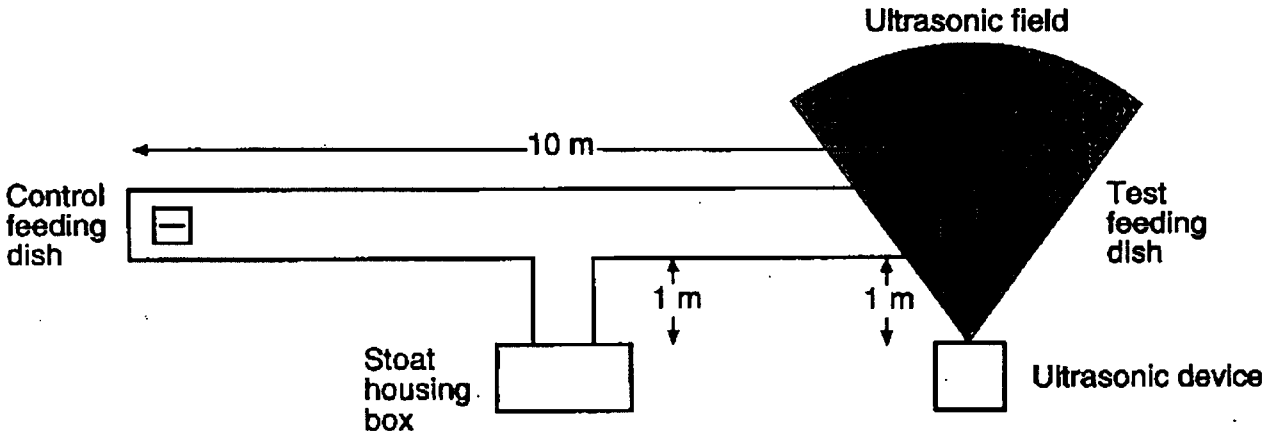
8. References

Bomford, M., and O'Brien, PH. 1990. Sonic deterrents in animal damage control: a review of device tests and effectiveness. *Wildlife Society Bulletin 18:* 411-422.

Appendix 1

Experimental set up for testing the effectiveness of ultrasonic devices (Transonic® ESP and Yard Gard®) for repelling stoats from a food source.



Appendix 2

Nights on which ultrasonic devices (Transonic® ESP and Yard Gard®) were turned on.

	Ultrasonic device		
Stoat no.	**Night 1**	**Night 2**	**Night 3**
1	None	Yard Gard	Transonic
2	None	Yard Gard	Transonic
3	Yard Gard	Transonic	None
4	Transonic	Yard Gard	None
5	None	Yard Gard	Transonic
6	Transonic	Yard Gard	None
7	Yard Gard	None	Transonic
8	Transonic	None	Yard Gard