Wobbly Possum disease in the Wilkin and Young Valleys, Mount Aspiring National Park

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A B S T R A C T

Anecdotal reports suggested that brushtail possum (*Trichosurus vulpecula*) numbers had fallen sharply in the Wilkin and Young Valleys, Mount Aspiring National Park, New Zealand, in spring 2005, possibly indicating a localised disease outbreak. Attempts were made to recover sick possums from that area for post-mortem examination, to determine whether Wobbly Possum disease was prevalent. Trap-catch monitoring was also carried out to objectively assess possum abundance and to compare this assessment with that estimated about 2 years previously. Only one of six possums autopsied was confirmed to have Wobbly Possum disease. The trap-catch index was 50% lower in the Young Valley (19%) but 50% higher in the Wilkin Valley (55%) than recorded on the previous monitoring occasion. This study identified the presence of Wobbly Possum disease in this region, but failed to provide evidence of a recent outbreak that may have led to a fall in possum numbers. This does not preclude the possibility of disease outbreaks being contained within localised areas.

Keywords: possum disease, *Trichosurus vulpecula*, Wobbly Possum disease, trap-catch monitoring, Wilkin Valley, Young Valley

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1. Introduction

1.1 BACKGROUND

Historically, it has been an accepted view that there has long been a moderate- to high-density possum (*Trichosurus vulpecula*) population in the mid-regions of the Young and Wilkin Valleys, Mount Aspiring National Park, New Zealand, an area where little, if any, possum control has been undertaken. This was largely based on consistent anecdotal reports from experienced Department of Conservation (DOC) and Animal Health Board (AHB) personnel in the area. This notion was supported by recent (summer 2003/04) trap-catch monitoring in those regions.

In August 2005, a local Makarora resident and bovine TB control Locally Initiated Programme (LIP) coordinator (Gary Charteris, AHB), who had an extensive background in possum control in that locality, reported finding dead possums, including abandoned pouch young, in the mid-Wilkin Valley in circumstances that he considered to be highly unusual. The dead animals did not have a 'wasted' body condition, as would be expected of possums dying of natural attrition, and there was good access to bush/tree species that are highly palatable to possums. He also reported that there appeared to be low numbers of possums in the area, based on some subjective night monitoring (spotlighting). At the same time, there were reports from local landowners of apparently sick possums being seen out feeding during the day (which is atypical for this nocturnal species), particularly on Mount Albert Station in the lower Wilkin Valley/Makarora River flats (Joe Bayley, Southern Pest Management, Mosgiel, pers. comm.). Subsequent spotlight shooting ventures on that property appeared to confirm that there had been a sudden reduction in possum numbers (Gary Charteris, AHB, Makarora, pers. comm.). It was speculated that an unidentified fatal disease may have caused a rapid and widespread reduction in possum numbers. This scenario was widely publicised by local and national newspapers, with claims of 'an epidemic devastating possum populations over an area of tens of thousands of hectares' (Otago Daily Times, 6 August 2005), despite a complete lack of any objective evidence to support these reports.

1.2 DISEASES IN POSSUMS

There are few known fatal diseases of brushtail possums in New Zealand. They can carry leptospirosis (Hathaway et al. 1978) and bovine tuberculosis (Eckdahl et al. 1970; Livingstone 1991), and the protozoa cryptosporidium and coccidian, which can lead to severe diarrhoea.

1.2.1 Wobbly Possum disease

About 10 years ago, we identified a fatal viral disease in animals in our captive possum colony at AgResearch Invermay and named it Wobbly Possum disease (Mackintosh et al. 1995). Through transmission studies, we established that this disease was invariably fatal, with mortality rates of >95% following experimental inoculation or contact with infected possums (Thompson et al. 1999). It has been demonstrated that the causative agent is probably a virus (O'Keefe et al. 1997), although this has yet to be positively identified and characterised. It has also been shown that transmission of the disease from possum to possum requires animal-to-animal contact (exchange of body fluids or transmission of blood-sucking mites; Perrott et al. 2000). The clinical signs of Wobbly Possum disease include extensive behavioural changes, making it easily identifiable in live animals (Thompson et al. 1999). Animals are seen out feeding during the day and show progressive ataxia, with an unusual head carriage, head-bobbing and an unusual stance with legs wide apart as they struggle to maintain balance. The possums are typically in poor condition, often scouring and being wasted around the hindquarters. In the later stages of the disease, possums are 'wobbly'—unsteady on their legs, unable to judge distances and slow to react. At the tissue level, there are extensive lesions in the kidney, liver and spleen (which explains the need to feed during the day, as the animal attempts to maintain an adequate nutrition), and in the brain (which explains the ataxia). These extensive histopathological changes make it relatively easy to confirm the disease at post-mortem examination.

In a survey carried out shortly after the discovery of the disease in 1995, tissues from animals collected from various locations throughout New Zealand were examined by veterinary pathologists. Wobbly Possum disease was positively identified from the pathology of histological tissue sections from animals recovered from Roxburgh, Queenstown, Tuatapere, Gore, Mosgiel and Dunedin, as well as from several North Island locations (C.G. Mackintosh, AgResearch, pers. comm.). We have also identified Wobbly Possum disease in possums captured from several locations in coastal Otago (Thompson et al. 1999). More recently, between January and June 2006, a total of 19 possums captured in the Mosgiel/Dunedin locality and housed in the Invermay possum facility have been positively identified as having Wobbly Possum disease. The disease is believed to occur in brushtail possums in Australia (John Hartley, Taronga Zoo, Sydney, Australia, pers. comm.). The extent or persistence of the virus in the environment is unknown.

Collectively, information to date suggests that the Wobbly Possum virus is widespread in possums throughout New Zealand. It is possible that severe outbreaks of the disease may occur in localised areas where there are high-density populations with close possum-to-possum contact and den-sharing leading to a rapid spread of the disease. This could explain the apparent decrease in possum numbers in the Makarora area. The objectives of the present study were to determine whether Wobbly Possum virus is present in possums in this region and to objectively establish whether there has indeed been a significant drop in possum numbers since the previous trap-catch monitoring.

2. Methods

2.1 WOBBLY POSSUM DISEASE

Some weeks after the initial reports of ailing possums in the Wilkin Valley, an attempt was made to recover sick possums from the area for histopathological examination. Gary Charteris and two other AHB staff recovered three possums from Kerrin Forks (upper Wilkin Valley), two of which were clearly unhealthy. All were sent for post-mortem examination, although one animal had died several hours earlier and tissue autolysis would probably have occurred.

In late August 2005, DOC organised a further expedition to recover affected possums in the Makarora area (Paul Hondelink, Wanaka Area Office, DOC, pers. comm., 22 August 2005; Chris Sydney, Wanaka Area Office, DOC, pers. comm., 30 August 2005). Teams of two to four people, each with one to three dogs that were experienced in possum retrieval, searched the Wilkin Valley (one team working downstream from Kerrin Forks, one team working upstream from the Wilkin River mouth), the Young Valley (Young Forks) and the Siberia Valley (Fig. 1). In total, five possums were recovered, three of which were considered to be affected by disease at the time of capture. However, two of these possums died at the time of capture and had undergone autolysis by the time they were returned to Makarora, so were unsuitable for pathological examination. It was considered surprising that so few possums were recovered, given that five experienced teams with a total of ten dogs covered such a large area that was believed to have a high-density possum population.

In total, six possums that had been recovered from the Wilkin and Young Valleys were autopsied for histopathological examination by the veterinary pathologist who originally described Wobbly Possum disease (Dr John Gill, Gribbles Veterinary Pathology, Invermay).

2.2 POSSUM ABUNDANCE

Trap-catch monitoring exercises had previously been undertaken in the mid-Wilkin Valley (Kerrin Forks) in November 2003 and in the mid-Young Valley (Young Forks) in January 2004 (trap-catch summary data, Bruce Kyle, Otago Conservancy, DOC, pers. comm.). Trap-catch indices from these dates were used as baseline measures of possum densities for comparison with the trap-catch monitoring outlined in this report, which was carried out in early December 2005.

All trap-catch monitoring involved eight or nine trap lines with traps set at 20-m intervals. On each of the monitoring dates, lines were set at approximately the same randomly allocated locations and following the same predetermined compass bearings as were used for the previous trap-catch monitoring session (see Fig. 1).

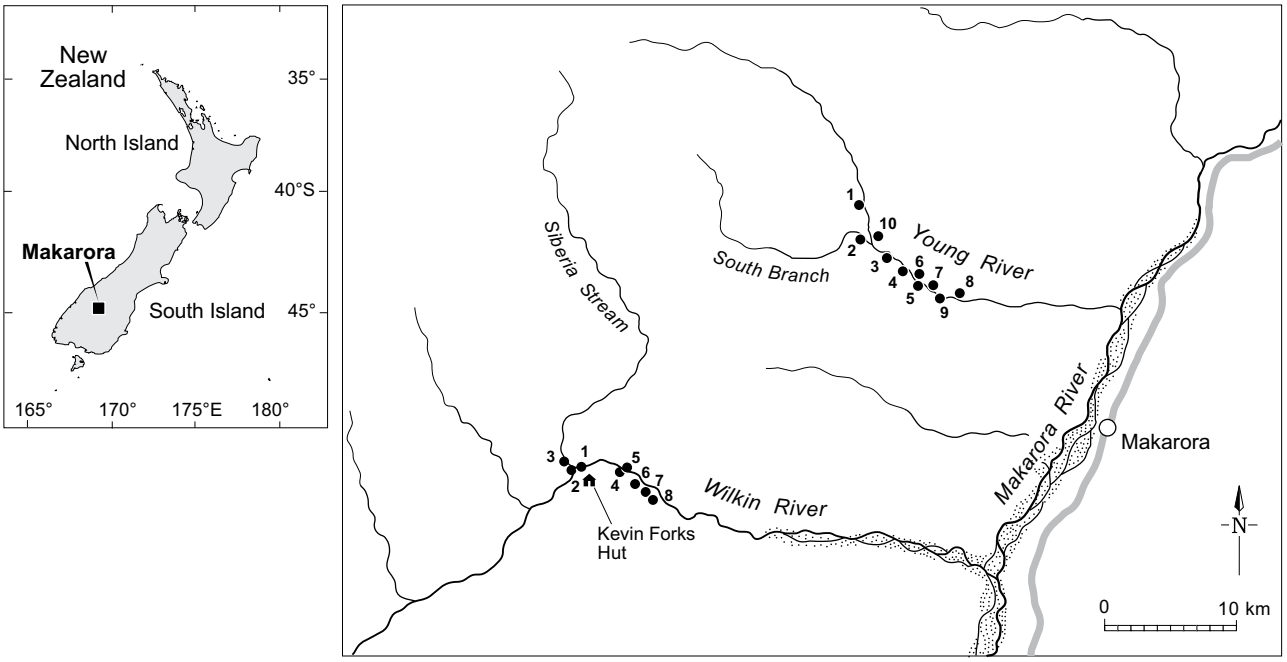

Figure 1. Location of trap catch line start points in the Young and Wilkin Valleys.

2.3 STATISTICAL ANALYSIS

To compare trap-catch indices between locations and dates, the data were analysed using a Generalised Linear Model with binomial distribution. Subsequently, the data were reanalysed by the less stringent analysis of variance method. Both methods produced identical results. Differences between the sex and ages of possums at each location were compared using Chi-squared analysis.

3. Results

3.1 WOBBLY POSSUM VIRUS

Only one of the six possums that underwent histopathological examination was diagnosed positive for Wobbly Possum disease. Three of the animals were classified as healthy, whereas the other two had some degenerative changes—these may have been very old possums.

3.2 POSSUM ABUNDANCE

Trap-catch indices for the mid-Wilkin and mid-Young Valleys are shown in Table 1. In the Young Valley, possum density was significantly lower in December 2005 than in January 2004. In contrast, there had been a small but significant increase in possum density in the Wilkin Valley between November 2003 and December 2005. The level of variation in the data indicates that the scale of trap-catch monitoring used in this study was sufficient to identify relatively large changes in trap catch (c. 17%–20%).

The distribution of male, female, adult and juvenile animals caught during the December 2005 trap-catch monitoring are listed in Table 2. There were no significant differences between locations.

TABLE 1. MEAN TRAP-CATCH INDICES (%) OF POSSUMS (*Trichosurus vulpecula*) CAPTURED IN THE MID-WILKIN AND MID-YOUNG VALLEYS.

Possums were previously trapped in November 2003 (mid-Wilkin Valley) and January 2004 (mid-Young Valley) (trap-catch summary data, Bruce Kyle, Otago Conservancy, DOC, pers. comm.). These values are compared with trap-catch indices calculated from the present study (December 2005). Within rows, percentages with different superscripts are significantly different: a versus b or c, $P < 0.001$; b versus c, $P < 0.05$.

LOCATION	MONITORING	
	PREVIOUS	CURRENT
Mid-Wilkin	38.1 ± 8.9^{b}	55.4 ± 7.6^{c}
Mid-Young	41.8 ± 5.7^{b}	19.3 ± 2.7^{a}

TABLE 2. NUMBER (AND PERCENTAGE) OF ADULT AND JUVENILE, MALE AND FEMALE POSSUMS (*Trichosurus vulpecula*) TRAPPED IN THE WILKIN AND YOUNG VALLEYS IN DECEMBER 2005.

LOCATION	ADULT		JUVENILE		TOTAL
	MALES	FEMALES	MALES	FEMALES	
Mid-Wilkin	33 (31)	37 (35)	24 (22)	13 (12)	107*
Mid-Young	17 (42)	17 (42)	5 (13)	1 (3)	40

* An additional 26 possums were captured, but their sex/age was not recorded.

4. Discussion

4.1 WOBBLY POSSUM VIRUS

This study failed to demonstrate that there had been a major outbreak of Wobbly Possum disease (or any other disease) in the Wilkin and Young Valleys in late 2005. However, to reliably identify such disease outbreaks, a much larger sample size (15–20 individuals) of obviously sick animals would be required for post-mortem examination. Sufficient numbers of sick animals could not be located in this study. Possible reasons for this include:

- The disease outbreak may have been very severe and short-lived, so that few live affected animals were present at the times when live animal recovery was attempted.
- Animals may have been difficult to locate due to possums being nocturnal. However, in the case of Wobbly Possum disease at least, it is highly likely that trained dogs would easily find sick possums as animals often feed during the day and their lack of coordination would probably limit denning to the ground or underground.
- No such disease outbreak occurred.

The positive diagnosis of Wobbly Possum disease in one of six possums demonstrates that the disease does occur in this location. It has previously been identified in possums from several other areas in Otago. The ideal time for sample collection would have been when landowners were seeing large numbers of sick possums out feeding during the day. The absence of such animals 2–3 weeks later when possum recovery expeditions were initiated supports the first suggestion listed above. It should be noted that no other diseases were apparent in the possums that underwent post-mortem examination, although, again, this should be interpreted with caution as the sample size was very small.

4.2 POSSUM DENSITIES

Prior to the December 2005 trap-catch monitoring, local DOC and AHB staff and residents of Makarora were strongly of the opinion that possum numbers in that locality had greatly decreased in the recent past, albeit based on anecdotal reports. The latest trap-catch monitoring showed a 50% reduction in trap-catch index in the mid-Young Valley from that recorded 12 months earlier. However, there was a 50% increase in trap-catch index in the mid-Wilkin Valley above the already high (c. 40%) index recorded c. 2 years earlier, which is directly opposed to the anticipated change in possum density expected from the anecdotal reports. This indicates that either this trap-catch monitoring exercise was not representative for some reason, or that the possum population had indeed increased in the Wilkin Valley, despite anecdotal reports that it had fallen drastically.

Six different methods are used for monitoring possum populations in New Zealand (Warburton 2000): spotlight counts, bait interference, bait take, faecal pellet counts, trap catch and mortality-sensing radio transmitters. These are used to obtain estimates of possum abundance or determine changes in population size. None of the methods are exempt from sampling bias and all may possibly be influenced by season, weather or habitat. To minimise this, there are basic sampling rules set in place to avoid or reduce sampling bias (National Trap Catch Protocol—National Possum Control Agency (NPCA) possum population monitoring protocol using trap catch method, www.npca.org.nz/TrapCatchE.pdf (viewed April 2004)), which were followed in the present study. Trap-catch monitoring is the method used most frequently.

One possible bias of trap-catch monitoring is that under particular circumstances it may relate more closely to possum activity than density. However, this is unlikely to have been the case in the present study, as the monitoring was undertaken at a time when food would have been plentiful, the most palatable food being found on the regenerating slip faces and on the river flats.

Although it is possible that the reported reduction in possum numbers was restricted to a discrete area in the Wilkin Valley (i.e. in the location of the Kerrin Forks hut, where animals may be seeking shelter), it is very unlikely that possum numbers would build up again through recolonisation of that area over the short interval between the recovery operation in August and the trap-catch monitoring in December, as several studies have shown that few adult possums in adjacent home ranges move into 'vacuum' areas created by extensive possum control (Efford 2000). Furthermore, of those that do move, juvenile male possums are the most likely to migrate (Cowan & Clout 2000); in the present study, there was no evidence of a bias towards increased numbers of juvenile males in the populations sampled. Finally, the possum recovery operation in August covered an extensive area of the Wilkin Valley—from the mouth of the Wilkin River to Kerrin Forks flat. Although the mean trap catch on trap lines in the vicinity of Kerrin Forks hut (32%; lines 1, 2 and 3) was lower than that for the remaining lines (69%; lines 4–8), trap catch increased in both of these regions (17% and 51%, respectively) between November 2003 and December 2005.

Any investigation of a possible outbreak of Wobbly Possum disease, such as was undertaken in this study, is hindered by our current lack of knowledge of the aetiology of the disease. The virus has yet to be positively identified and there is very little, if any, information available about its viability, its rate of spread, mortality rates in possums in the wild, or the time interval between natural infection and death. There is an urgent need for more research on this disease.

This project has led directly to a recent exchange of information between our laboratory and veterinary pathologists (Taronga Zoo, Sydney, Australia) regarding Wobbly Possum disease. Following the original report of the disease in New Zealand in 1995, examination of historical histological sections by a veterinary pathologist in Australia suggested that the same disease was present in Australia (John Hartley, Taronga Zoo, Sydney, Australia,

pers. comm.). However, since that date, the incidence and clinical signs of an infliction of brushtail possum have been reported in the Eastern States of Australia and Tasmania (Rose 1999), which have shown that although this condition is referred to as 'Wobbly Possum disease', both the clinical signs and the histopathology are quite distinct from 'Wobbly Possum disease' in New Zealand. The Australian condition is associated with blindness and lesions to the optic nerves, whereas the liver and spleen remain apparently healthy (Cathy Shilton, Taronga Zoo, Sydney, Australia, pers. comm.). In contrast, infected animals in New Zealand never demonstrate any indications of blindness, lesions are widespread in the liver and spleen, even in early stages of the disease (Mackintosh et al. 1995), and our own recent investigations have shown that optic nerve tissue is apparently healthy with no indication of pathological conditions (J. Gill, Gribbles Ltd, Mosgiel, pers. comm.).

5. Conclusions

This study failed to identify evidence of a recent outbreak of Wobbly Possum disease in the Wilkin and Young Valleys, although a single possum (of six) tested positive for the disease, indicating the presence of the disease in the region. A much greater sample size of sick possums would be required to identify such an outbreak. The small number of sick possums collected in this study possibly suggests that sample collection was undertaken too late after the event—perhaps after the disease had had its major impact.

In the mid-Young Valley, the trap-catch index was 50% lower in late 2005 than the previous estimate in January 2004, supporting the notion based on anecdotal reports that possum numbers had declined. However, this was not true for the mid-Wilkin Valley, where there had been a 50% increase in trap-catch index over approximately the same time period. More extensive or more frequent trap-catch monitoring is likely to improve the accuracy of possum density estimates. Nevertheless, the trap-catch method used in the present study was sufficiently robust to identify the large changes in possum numbers that occurred in both the Wilkin and Young Valleys.

6. Acknowledgements

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