SHORT COMMUNICATION

How many possums make a cow?

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Abstract: The importance of possums as competitors with livestock for pasture is sometimes used as justification for possum control. Unfortunately a confusion of wet and dry weight values of pasture and daily consumption by possums appears to have resulted in a significant overestimate of the economic costs of possums as pasture pests. A correctly estimated daily dry matter intake of pasture by possums is 0.0144 kg pasture dry matter per possum per day. For a possum density of 1 ha^{-1}, this amounts to a reduction of about 1% of a stock unit ha^{-1} $year^{-1}$. At higher possum densities, which often occur on farms adjacent to forest or scrub, losses would be correspondingly higher. A more direct way to measure possum impact on pasture production would be to use exclosures.

Keywords: economic impact, pasture consumption, *Trichosurus vulpecula*

The importance of possums as competitors with livestock for pasture is an issue that is raised repeatedly in economic analyses of possum impacts, such as those supporting regional council pest management strategies (e.g. Greer 2006), and used as justification for possum control. Unfortunately a confusion of wet and dry weight values of pasture and daily consumption by possums from the original source (Harvie 1973) by later authors (e.g. Butcher 2000) appears to have resulted in a significant overestimate of the economic costs of possums as pasture pests.

Harvie (1973) wrote: 'Assuming that an opossum's mean daily intake of foods is 0.35 kg, of which 30 percent (0.11 kg) is pasture…' The 30% pasture is clearly a reflection of the data presented in fig. 1 in the paper averaged over a year, and the 0.35 kg mean daily is a stated assumption. Most authors who have used these figures subsequently have assumed that the 0.35-kg total intake and the estimated 0.11 kg of pasture eaten per night by a possum were dry weight values (e.g. Butcher 2000). Harvie (writing as Fitzgerald 1977) reinforced that assumption by stating: 'If each possum eats 0.11 kg dry matter (pasture) per day…'

Using the dry:wet weight ratio (18.2/133.1 = 0.1367) of stomach contents in Harvie (1973), 0.11 kg dry matter (pasture) converts to a total wet weight consumption of pasture about 0.8 kg day^{-1}, which is more than twice the heaviest stomach contents measured in her study (0.384 kg). This makes it highly unlikely that the 0.11 kg is a dry-matter value. Other estimates of daily dry matter consumption give values an order of magnitude less than 0.11 kg. Allometric equations for herbivorous marsupials in Nagy (1987, table 2) estimate dry matter feeding rate for a free-living 2.5-kg possum of 0.095 kg day^{-1}. Monks et al. (2005) used *n*-alkanes to estimate the daily dry matter intake of captive possums and obtained a value of 0.06 kg day^{-1} for possums averaging 3.7 kg in body weight. A similar argument indicates that Harvie's assumption for total daily intake of 0.35 kg was a wet-weight value. Using Harvie's dry:wet weight ratio for stomach contents (0.1367), 0.35 kg dry weight of stomach contents equates to a wet weight of about 2.56 kg, which is absurd given the average body weight of Harvie's possums was only 2.36 kg.

With the wet and dry weight confusion clarified, the remaining issue is whether Harvie's (1973) 0.35 kg total daily intake assumption was realistic. It is within the ranges of other recorded stomach content weights (Gilmore 1965; Clout 1977; Cowan, unpubl.), published estimates of stomach volume (Herd & Harrop 1978), and wet weights estimated from Nagy (1987) and Monks et al. (2005) (assuming vegetation dry matter of about 30% by weight).

The correctly estimated daily dry matter intake of pasture by possums based on Harvie (1973) is then (daily intake [0.35 kg] × % pasture [30] × % dry matter [13.67]) = 0.0144 kg pasture dry matter per possum per day. Assuming that in New Zealand one stock unit (SU) consumes 550 kg dry matter per year (Lincoln

University 2003 quoted by Greer 2006) then possums reduce the carrying capacity of pastoral land on average by (0.0144 kg × 365 days × D × 100)/550, where D is possum density per hectare. For a possum density of 1 ha^{-1}, this amounts to a reduction of about 1% of a stock unit per hectare per year, somewhat less than the 7.2% calculated by Greer (2006). At higher possum densities, which often occur on farms adjacent to forest or scrub, losses would be correspondingly higher.

Butcher (2000) indicated that Taranaki farmers were advised they were foregoing the production of one dairy cow for every 159 possums that grazed their land. This was based on pasture consumption per day of 0.11 kg for possums (which we now know is wet weight) and consumption per cow of 17.5 kg day^{-1}, which is most likely daily dry matter intake (Maynard et al. 1979; Eastridge et al. 1998; USDA 2003). So, again, we have a confusion of wet- and dry-weight intakes. Recalculation of Butcher's (2000) estimate of foregone production on a typical Taranaki dairy farm in 1999 changes the equivalence from 159 possums per cow to 1215 possums per cow and reduces the estimated loss from $2,800 per year to only about $370 per year or about $3.70 ha^{-1}. Redoing Greer's (2006) extrapolation from Butcher's calculation to the average Hawke's Bay dairy farm in 2003/04 reduces the estimate of foregone production from $7,700 per year to only $1,020 per year, which is about $5 ha^{-1} or about 75% of the value of milk solids from one cow.

These calculations involve many assumptions, for example that possums and livestock eat the same pasture species and in the same proportions. A more direct way to measure possum impact on pasture production would be to use exclosures, an approach used by Norbury and Norbury (1996) to address a similar question about rabbits.

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