FORUM ARTICLE

Are possums important dispersers of large-seeded fruit?

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Abstract: The claim by Dungan *et al*. (2002) that "in *many* areas possums may be the *only* potential dispersal vector for *large-seeded* native species" is unsubstantiated. There is little evidence possums excrete viable seed of large-seeded fruit greater than 10 mm diameter, and seeds up to this size are dispersed by a suite of bird species. Nowhere in New Zealand are there likely to be possums in the absence of this suite of bird species.

Keywords: large-seeded fruit; possums; seed dispersal.

The exotic mammalian biota introduced into New Zealand has mostly impacted upon the native biota but mutualisms also occur. After studying the diet of possums in the Orongorongo Valley near Wellington, Cowan (1990) concluded that "Seed dispersal by possums *may be* of particular importance to native species with large-seeded fruits, such as pigeonwood (*Hedycarya arborea*), hinau (*Elaeocarpus dentatus*), and matai (*Prumnopitys taxifolia*), as the extinction or marked decline in numbers of New Zealand's frugivorous birds has left those species with *few* seed dispersers" (my italics, and Latin names inserted). Possums (*Trichosurus vulpecula*) have subsequently been shown to be potential (Williams *et al*., 2000) or actual dispersers of numerous native (and naturalized) fleshy-fruited species (Dungan *et al*., 2002).

Dungan *et al*. (2002) claim that, "in *many* areas possums may be the *only* potential dispersal vector for *large-seeded* native species" (p. 126, para. 2, my italics). In a study of the diet of possums in a valley near Christchurch, they collected the seed of 10 fleshy-fruited species from possum faeces. The largest fruit, or at least one that birds would ingest whole, was ngaio (*Myoporum laetum*), and this is the example Dungan *et al*. (2002) use as a large-seeded fruit (p. 126, para. 2). Ngaio has narrow-ovoid fruit 6.0–9.0 mm long (Allen, 1961) and about 4.0–6.0 mm diameter, with seeds 6.0–7.5 mm long (Webb and Simpson, 2001). But is this a "large-seeded fruit" *sensu* the animal-bird dispersal syndrome in New Zealand, what contribution are possums likely to make to the dispersal of such fruit, and are they likely to be the only dispersers of such fruit anywhere in New Zealand?

Ngaio is a common species, but it was not among the 17 species of "large fruits", i.e. greater than 6.0 mm diameter, in a review of bird dispersal (Clout and Hay, 1989). This is probably because it is not a large-seeded fruit *sensu* the animal-bird dispersal syndrome in New Zealand even though ngaio may be "large seeded" relative to many other fleshy-fruited species. In fact, fruits of this size can be swallowed even by silvereyes (*Zosterops lateralis*), which also ingest fruits of matai (mean 9.5 mm diameter) and the exotic hawthorn (*Crataegus monogyna*) (mean 9.9 mm diameter) (Williams and Karl, 1996). Dungan *et al*. (2002) provide no evidence that possums disperse "large-seeded native species" if large-seeded fruit are defined as those too large for silvereyes, i.e. probably > 9 mm diameter.

There is evidence, however, that possums are actual or potential dispersers of some large-seeded species, in particular pigeonwood (Cowan, 1990), as summarised in (Table 1). Note there is no evidence possums excrete any species Clout and Hay (1989) listed as being dispersed only by kereru (*Hemiphaga novaeseelandiae*), with fruit diameters >14 mm, e.g. tawa (*Beilschmiedia tawa*), nor several >10 mm diameter species, e.g. maire (*Syzygium maire*), kohekohe (*Dysoxylem spectabile*), or miro (*Prumnopitys ferruginea*). When this last species was fed to captive possums, they ate the flesh and discarded the seed (Williams *et al*., 2000). This behaviour is apparently the norm for possums handling fruit of about 10 mm diameter or larger, and although occasional individual possums swallow whole seed up to the size of pigeonwood, it is unlikely they would swallow seed much larger than this. Tawa seed (*c*. 20 mm) is eaten, for example, but whole seeds have never been observed in possum gut samples (P. Sweetapple, Landcare Research, Lincoln, N.Z., *pers. comm*). Most

fruit greater than 10 mm diameter eaten by possums is therefore not dispersed.

I question whether, "in many areas possums may be the only potential dispersal vector for large-seeded native species" (Dungan *et al.*, 2002). All fruits greater than 6 mm diameter known to be excreted by possums are dispersed by a suite of birds (Clout and Hay, 1989) (Table 1). In addition, bellbirds (*Anthornis melanura*) eat a range of fruit and excrete seeds of fruit up to 9.7 mm diameter (Williams and Karl, 1996). If the concept of large-seeded fruit includes species with fruit 6.0–10.0 mm mean diameter *sensu* Clout and Hay (1989), then the ubiquitous silvereye must also be included as a disperser (Williams and Karl, 1996). Both bellbirds and silvereyes may nevertheless select only the smallest fruits of these species. Apart from bellbirds or tui, silvereyes, blackbirds and song thrushes are present over most of New Zealand (Bull *et al.*, 1978). If we consider all those areas in New Zealand where possums are present, it is unlikely any area lacks the suite of bird species capable of dispersing the same fruits possibly dispersed by possums. Other widespread forest-dwelling exotic species such as feral pigs (*Sus scrofa*) can also be considered, for although pigs are predominantly seed predators, they disperse some species in their faeces (LaRosa, 1992; Lynes and Campbell, 2000).

Until there is evidence of possums excreting large numbers of seeds of species with fruit > 6.0 mm diameter that are not dispersed by a suite of birds, we can say no more than — and only on scant evidence — possums "*may* be of particular importance to native species with *large-seeded* fruits", as Cowan (1990) noted previously.

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Table 1. Species with fruit > 6.0 mm diameter potentially found in wild possum faeces, and their bird dispersers.

Species	Fruit Diam.class (mm)[1]	Seeds in possums' faeces (Cowan 1990)	Dispersed by birds	
			Clout and Hay (1989)[2]	Williams and Karl (1991)
Corynocarpus laevigatus	> 14	"possums ate only the flesh from karaka fruit and it was not readily identified in the faecal samples"	K.	
Elaeocarpus dentatus	> 10	"no hinau seeds were found in possum faeces, only the remains of flesh and skin"	K.	
Prumnopitys ferruginea	> 10	n.a.	K., B.	
Ripogonum scandens	> 10	"one seed was found"	K., T., B., Th.	
Hedycarya arborea	> 6	"whole seeds were found"	K., T., B., Th.	
Prumnopitys taxifolia	> 6	"seeds were only found occasionally"	K., T., B.,Th.	T., S., B.,Th.
Rhopalostylis sapida	> 6	"no nikau seeds were found in possum droppings"	K., B.,Th.	

[1]From Clout and Hay (1989)
[2]B.= blackbird, K.= kereru, S.= silvereye, T.= tui, Th.= thrush.

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