PUKA (*MERYTA SINCLAIRII*) A SOUTH ISLAND ADVENTIVE

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Introduction

On a recent trip to the West Coast a friend (Owen Dennis) reported seedlings of puka (*Meryta sinclairii*) growing under scrub near Ngakawau. Since this is well south of its natural range (off-shore islands north of Auckland) it warranted investigation and verification. The site increased my curiosity further because although the source was soon identified, seedlings appeared to be confined to parts of the stand where the canopy was dominated by taupata (*Coprosma repens*).

Site

The study area lies on the outskirts of Ngakawau, 30 km north of Westport. It is a more or less flat small strip of mahoe (*Melicytus ramiflorus*) forest approximately 240 m long and up to 100 m wide between the road and the upper strand line of the shore (Fig. 1). The substrate is well-drained beach gravels, in places overlain by a few cm of beach sand. Ditches recently cut through the area (to control road run-off?) show that the mix of gravel and sand, often with thicker bands of sand, extends to at least 1 m depth. Rainfall for the area is about 1200 mm per year, but being close to open sea the area rarely experiences frost, and is continually clouded in a fine salt spray.

The forest canopy ranges from 4-5 m tall. Mahoe comprises 50-70% of canopy cover, cherry (*Prunus* sp.) 10-15% and taupata (*Coprosma repens*) 10-20%. A subcanopy of approximately 10% cover contains pigeonwood (*Hedycarya arborea*), kawakawa (*Macropiper excelsum*), *Coprosma lucida* and four other species including saplings of puka. Much of the ground is bare, with bracken, wild onion (*Allium triquetrum)* and montbretia (*Crocosmia* x *crocosmiiflora*) in more open fringe areas, and scattered patches

of *Phymatosorus pustulatus* elsewhere. Eight other ground cover species of 10 tree or shrub species occur as scattered plants. The most common seedlings were cherry.

Puka and cherry seed sources

On the opposite side of the road, to the centre of the area, the front fence line of a property had alternate puka and pohutukawa (*Metrosideros excelsa*) as a shelter belt. A few of these puka were seed bearing but the main source (of both the wildlings and the hedge) was a 35 year-old puka tree about 3 m tall. At the rear of the house was a row of six flowering cherry trees. The solitary puka tree is a well-known local source of seedlings and seed. The owner also regularly gave away seedlings which appeared at various points around the garden, but mainly along the fence-lines under grapes (*Vitis* sp.), pohutukawa and karo (*Pittosporum crassifolium*).

Methods

The stands were traversed several times to locate all the puka seedlings and their extent, with particular care being given to examining stands at the extremes of the seedling range. At each seedling group the associated species were recorded and the number and height of puka seedlings noted. Next each mahoe and taupata within the stand was visited and under the canopy of each the presence of seedlings and saplings of puka and cherry was recorded. The stands contained 30 mahoe and 17 taupata canopy trees.

Results

Within the stand, the puka seedlings and saplings were aggregated in 10 discrete areas. Plants ranged in height from a few cm to 4 m tall (just emergent from the canopy). Table 1 (which excludes Site 3) (Fig. 1) shows that plants were scattered throughout the study area (often near forest margins) with the majority in the 1-2 m size class. Site 3 was the closest to the putative seed source and contained relatively small (young?) trees. The tallest saplings occurred at site 2 under two very large, spreading taupata.

The association of puka seedlings with taupata contrasts markedly with the situation for cherry. Of the 17 taupata and 30 mahoe canopy trees examined two taupata and four

Table 1. Numbers of seedlings and saplings at each site.

Site	To 1 m	1-2 m	Over 2m	Total
1	2	5	1	8
2	2	9	4	15
3	38	3		41
4	2	2	1	5
5	1	1		2
6		1	1	2
7	1	1		2
8			1	1
9			1	1
10	1	1		2
Totals	47	23	9	79

mahoe had no seedlings beneath them. In two cases puka saplings occurred under a joint canopy of taupata and mahoe. Tables 2 and 3 below show that the puka are exclusively associated with taupata (or a joint canopy) whereas the cherry occurs rather more indiscriminately under either taupata or mahoe.

Table 2. Association of puka seedlings with taupata and mahoe

	With puka	Without puka
Taupata	11	6
Mahoe	2	28

Table 3. Association of cherry seedlings with taupata and mahoe

	With cherry	Without cherry
Taupata	15	2
Mahoe	26	4

Adult cherry, reaching into the canopy, occurred widely, with eight occurring through mahoe and two through taupata. In spite of this there were few saplings of cherry within the study area.

Discussion

The power poles along the road verge, spaced at about 60 m, provided a useful distance measure. Dispersal range for puka is about 120 m. Cherry seedlings were dispersed over a similar range, possibly a little greater. The differences in occurrence of the two species

within the stands is striking. Whereas cherry are dispersed throughout the stands the puka are entirely restricted to areas where taupata is present in the canopy. Both are bird dispersed with blackbirds and pigeons, both present in the area, the most likely vectors.

The concentration of puka under taupata is not easily explained. One possibility is that the seed of both are ripe at the same time with birds travelling between the species. Another possibility is that the taupata is an indicator of suitable site conditions. A third possibility is that the taupata provides those site conditions. Regeneration of the puka suggests a continuous low rate of successful colonisation whereas the lack of saplings of cherry suggests that that species has a low survival rate to sapling stage. The site is not subject to any form of ground browsing by mammals but the site is quite sandy and rocky so that it is well drained. Perhaps periodic droughts prevent establishment of cherry and limit survival of puka. Cherry, also, may be intolerant of deep shade.

Puka is not known naturally from the mainland but it is confined to the Hen and Chickens and Three Kings Islands in the far north of New Zealand. It grows readily, however, as a garden plant in areas as far south as Banks Peninsula and Dunedin, but is susceptible to frost, even as substantial adults, in places such as Nelson. The site described here shows that it is readily dispersed by birds and has the ability to establish well south of its natural habitat. Yet it does not normally do so naturally.

It would be quite possible for pigeons to disperse seed from its native island habitats to the mainland but seedlings don't establish. Puka could be quite habitat specific with suitable habitats being scarce or like *Streblus banksii*, and parapara (*Pisonia brunoniana*) seeds could be highly palatable to rats. At Ngakawau, the presence of domestic cats keeping rat and mice numbers low may be enough to allow some seed to survive. But why not elsewhere?

Taupata is a common coastal species often planted for shelter at beach-side communities. Its natural habitat has been greatly reduced by pastoral development. It is possible that Ngakawau provides a rare combination of moist coastal environment, and well drained soils and taupata. In addition, taupata may provide optimal light conditions, those which restrict competing species but not puka. It may also provide suitable soil microbial conditions.

Regeneration occurs under pohutukawa, grapes and karo (*Pittosporum crassifolium*) around the source property, in relatively undisturbed and sandy soils but not under tall *Cupressus macrocarpa* next door, where soils are undisturbed and taupata readily regenerates. Similarly it does not occur under mahoe in the roadside stands at apparently comparable light levels to those under taupata. This suggests that soil conditions are important.

The mahoe and taupata in the roadside stands are probably between 30 and 50 years old and the row of puka plants in front of the source property were sourced from the 35 year old tree and are now themselves as tall and seeding. Within the roadside stand studied two of the plants are as tall as the canopy (and taller than the parent tree) but not yet seeding. The situation at Site 3 suggests that optimal regeneration conditions occur at a particular stage of stand development. For much of the stand this was probably a few years ago.

Conclusions

The Ngakawau stands provide an interesting insight into the potential for a species restricted to off-shore islands to regenerate on the mainland. It also points to a strong association of taupata with the successful natural establishment of puka. Further studies of the requirements for natural regeneration may clarify the questions raised here.

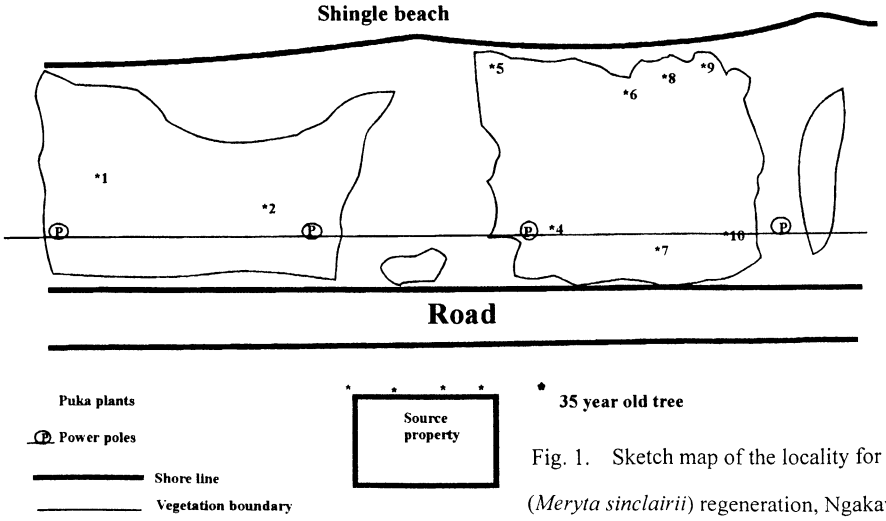

Fig. 1. Sketch map of the locality for puka (*Meryta sinclairii*) regeneration, Ngakawau.