

# *Pachystegia rufa* and allied rock daisies: rarity and threats

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## CONTENTS

Abstract	5
1. Introduction	6
2. <i>Pachystegia rufa</i> Molloy	6
3. <i>Pachystegia minor</i> (Cheeseman) Molloy	9
4. <i>Pachystegia insignis</i> (Hook. f.) Cheeseman	10
5. <i>Pachystegia</i> A	11
6. <i>Pachystegia</i> B	11
7. Acknowledgements	12
8. References	12

# *Pachystegia rufa* and allied rock daisies: rarity and threats

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## ABSTRACT

This report provides additional information on *Pachystegia rufa* and allied rock daisies, with particular emphasis on rarity and threats. *Pachystegia rufa*, currently listed as a 'Declining' species, is reassessed on the basis of new information available and is now regarded as 'Range Restricted' and not under threat. *P. minor* s.s. and *P. aff. minor* require more information ('Data Deficient') to enable their true status and trend to be properly assessed. Of the two, *P. aff. minor* is certainly more restricted and threatened. *Pachystegia insignis* consists of two major disjunct populations; one essentially north of the Kaikoura ranges and not considered to be threatened overall; the other south of the Kaikoura ranges and especially vulnerable, although more information ('Data Deficient') is required to assess this southern population objectively. *Pachystegia* A and B, the former essentially coastal, the latter an inland entity, are unnamed taxa which are relatively widespread and abundant and are not considered to be threatened overall.

Further effort is needed to determine the status of *P. minor* and southern populations of *P. insignis*, and outlying populations of all taxa should be monitored from time to time and their protection and management advocated.

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# 1. Introduction

This report attempts to build on the information provided in my preliminary report on *Pachystegia rufa* (Asteraceae) and allied rock daisies (Molloy 2001). In that report, aspects covered in broad outline included current knowledge of the taxonomy and distribution of the constituent taxa, and their habitats, ecology, breeding system, recruitment, rarity and threats. Additional information on some of these aspects is provided in a taxonomic revision of the group now in preparation.

The present report focuses on *rarity* and *threats*, with particular emphasis on *P. rufa*, the only species at present listed among the threatened and uncommon plants of New Zealand (de Lange et al. 1999). However, further fieldwork since my preliminary report was prepared has revealed that another species, *P. minor*, may be more uncommon than *P. rufa* and worthy of attention in conservation management. Recent fieldwork also reveals that other rock daisies, and their regular native plant associates, are under increasing threat from competing plants, notably introduced grasses and broom (*Cytisus scoparius*). With this in mind, it is opportune to review the relative abundance of all the named and unnamed taxa of *Pachystegia*, and to assess the threats each is exposed to in their respective habitats throughout their known natural range.

## 2. *Pachystegia rufa* Molloy

This species, illustrated in colour by Eagle (1982, Plate 246, as *Pachystegia* D), was described by Molloy (1987), and is perhaps the most colourful member of the genus, with its reddish petioles and inflorescences, especially on new season's growth. It is also the best known in terms of its distribution, relative abundance and habitat. This is due partly to its recent recognition and its attractiveness, and partly to the threat of large-scale quarrying of a section of its natural habitat, proposed by Tranz Rail New Zealand Limited in the mid 1990s.

This proposal led to two developments: a joint field survey of *P. rufa* and associated plants by Ruth Bartlett (Kingett Mitchell & Associates for Tranz Rail) and Cathy Jones and Jan Clayton-Greene (Department of Conservation), carried out in 1996; and the formal protection of about 138 ha of *P. rufa* habitat by an open space covenant agreement between a landholder, Charles Waddy, and the Queen Elizabeth The Second National Trust. This covenant, initiated in 1997, now protects a substantial part, about 75%, of the known habitat of *P. rufa*, principally on rock bluffs and outcrops in the Blind (Otuwhero) River and Stace ('Waterfalls') Stream which drain the 'Little Haldon Hills', about 10 km south of the Marlborough township of Seddon.

The aforementioned survey confirmed an earlier one of mine which found *P. rufa* was confined to the fault-bound 'Little Haldon Hills', and sandwiched between the habitat of the larger rock daisy, *P. insignis*, on the main Haldon Hills to the south, and the banks of the Blind River to the north. Where the two species are in close proximity, small populations of hybrids occur, notably on the southern edge of the 'Little Haldon Hills' and along the Blind River. The 'Little Haldon Hills' occupy an area of about 5 × 2.5 km, and rise to a maximum altitude of 537 m. The basement rock consists of massive greywacke of Jurassic age, which has somewhat higher levels of natural fertility than the older (Triassic) greywackes further to the west. Four principal streams—Stirling Brook, Beaumont Creek, Stace Stream and Blind River—dissect the area and flow to the north through relatively narrow rocky gorges, with numerous rock outcrops above on the intervening ridges.

Throughout this dissected landscape there is a noticeable increase in the amount of exposed rock—the habitat of *P. rufa*—from east to west; i.e. from the broad catchment areas of Stirling Brook in the east to Blind River in the west. This is reflected in a corresponding increase in the number of plants of *P. rufa* from east to west recorded during the joint Tranz Rail/DOC survey in 1996 which, in turn, confirms my earlier visual assessment (see Table 1).

I revisited the habitat of *P. rufa* in December 2000 with Cathy Jones and Jan Clayton-Greene (DOC), landholder Charles Waddy, and others, and confirmed the following features:

*P. rufa* is quite at home on rock faces surrounded by trees of native hardwood species; an indication of its natural habitat. Since deforestation in Polynesian times the species has expanded its area to some extent, but not all the available habitat has been taken up, especially the massive and somewhat smoother rock faces at higher altitudes and on sunny slopes. Most plants of *P. rufa* occupy the more irregular and fissured rock faces in the lower shaded gorges and on other shaded slopes. On these sites a range of plant sizes and seedling establishment is evident, and signs of animal browse are minimal. Current populations are at least stable, if not slowly expanding. Erosion of some rock faces has occurred from time to time, usually by the cleavage of large sections, and in some cases the newly-exposed surfaces have been colonised by *P. rufa*.

TABLE 1. *Pachystegia rufa*  
ABUNDANCE, LITTLE  
HALDON HILLS  
15-19 APRIL 1996.

LOCATION	NUMBER OF PLANTS
Stirling Brook	295
Beaumont Creek	282
Stace Stream	648
Blind River	1352
Total	2577

Table data taken from Kingett Mitchell report. The numbers are considered an underestimate of the populations and are biased towards the larger plants and those more readily seen on the more accessible rock faces. A total population in excess of 3000 mature, juvenile and seedling plants is highly likely.

Even on its most favourable site, the density of *P. rufa* is less than that of *P. insignis* on corresponding sites on the nearby Haldon Hills. This behaviour is difficult to explain. It may have something to do with the number of niches available to the two species, or some aspect of the plants' behaviour. Certainly, the number of florets per head on *P. rufa* is much less than on *P. insignis*. Following a pilot trial on the breeding system of *P. insignis* mentioned in my preliminary report (Molloy 2001), a similar trial with *P. rufa* cultivated at Lincoln was carried out during the last flowering season. The same trend emerged: namely, an increase in numbers of seed set in selfed flower heads, through cross-pollinated flower heads, to open-pollinated ones. This confirmed that *P. rufa*, like *P. insignis* and other rock daisies, is basically self-incompatible, but some 'leakage' occurs. Seedlots sown from selfed, crossed and open-pollinated heads of *P. rufa* yielded high germination percentages in the range 77–93%. This information is additional to that reported by Simpson & Molloy (1978), but confirms that *P. rufa*, along with other rock daisies, is not constrained by its breeding system or germination.

Another feature, unique to *P. rufa*, which may constrain its ability to spread and occupy all available niches with the same density as other rock daisies, is the collapse into the plant of flower stems before all the seed is fully ripened and ready to be shed. As a result, flower stems lose their turgor and the heads remain closed. Nonetheless, there is often an abundance of seedlings at the base of plants each autumn, as is the case with other rock daisies.

Compared with other rock daisies, *P. rufa* is exposed to very few threats. Dilution of the gene pool through hybridisation with its nearest neighbour *P. insignis* is unlikely, except in local 'hot spots' already mentioned above. Its habitat is reasonably weed free, and its bare rock substrate less prone to invasion from introduced grasses. If anything, the vigorous resurgence of native 'grey scrub' and hardwood trees will cast more shade and perhaps favour *P. rufa*. The abundance of bracken on the surrounding slopes, an indication of the relatively high level of natural fertility, while not directly affecting *P. rufa*, may do so indirectly if burnt regularly and the fires spread across the rock faces. Damage from herbicide is unlikely given current farming practice. A few wilding pines are present and need to be monitored or removed to avoid them shading-out *P. rufa*.

As noted above, evidence of current animal browse on *P. rufa* plants is minimal. Most, if not all, plants of *P. rufa* are beyond the reach of domestic livestock. However, the 'Little Haldon Hills' supports a significant population of feral goats, and has done so for years. While it is difficult to assign any actual damage to *P. rufa* to these animals, like the wilding pines they should, at least, be monitored and, at best, eradicated or controlled to low numbers.

There is no firm field or historical evidence that *P. rufa* is a 'declining' species as listed by de Lange et al. (1999). Certainly, it has the smallest range of all the species in the genus, approximately 12 km<sup>2</sup>, and its total population is estimated to contain about 3000 individual plants, the majority of which are capable of reproduction. A reassessment of its classification using the step-by-step process set down in Table 3 of the draft document *Classifying species according to the threat of extinction* by Molloy et al. (2000) indicates that *P. rufa* should be classed as 'Range Restricted' and listed accordingly. Even if

quarrying was to proceed, as proposed by Tranz Rail, only a small part of the total population would be removed, and only temporarily, as restoration of the species is also part of the proposal. The formal protection of about 75% of the population by an open space covenant, with an agreed management to safeguard the species, gives cause for comfort in the long-term security of this attractive species.

### 3. *Pachystegia minor* (Cheeseman) Molloy

This species, long regarded as a variety of *P. insignis*, was elevated to species rank by Molloy (1987). Two distinct leaf forms have been recognised (Molloy & Simpson 1980); one with light green or yellowish green rhomboid leaves identical to the type specimen of Cheeseman's *Olearia insignis* var. *minor* (Cheeseman 1916); the other a somewhat smaller plant with darker green broadly obovate leaves. Both forms are illustrated in colour by Eagle (1982, Plates 244, 245, as *Pachystegia* C var(i) and var(ii), respectively). For the purposes of this report the rhomboid leaf form is referred to as *Pachystegia minor* s.s., the obovate leaf form as *Pachystegia* aff. *minor*. The taxonomic status of the latter is still unresolved.

Of the two taxa, *P. minor* s.s. is more widespread, occurring from the mid-Puhipuhi River, about 10 km from Kaikoura, north to the true left of the Clarence River, and inland along the Jordan and Wharekiri streams. It occurs predominantly on consolidated gravels and limestone, but also on greywacke rock bluffs of Cretaceous/Jurassic age. Where it occurs it is relatively plentiful, with a full range of size classes from seedlings to mature plants evident. In cultivation at Lincoln this species flowers prolifically, and open-pollinated flowers set abundant seed which germinate readily. On the north bank of the Clarence River the distribution of *P. minor* s.s. overlaps with *P. insignis* and hybrids occur on two small sites, one each on both banks, on consolidated gravels. In the Puhipuhi River valley it overlaps with a northern outlier of an unnamed taxon referred to as *Pachystegia* A, but no hybrids have been observed.

At present there is not enough information to assess the threat status of *P. minor* s.s., but it is unlikely to reach a high threat category. Although one coastal population on limestone at Waipapa Bay has been depleted by quarrying in the past, the main threat to this species is likely to come in the near future from invasion of its habitat by introduced grasses.

In contrast, *Pachystegia* aff. *minor* is apparently restricted to a short stretch of coastal greywacke of Cretaceous/Jurassic age from Ohau Point to Black Miller Stream, a distance of about 4–5 km. This particular area is well covered with coastal hardwood forest and scrub and plants of *P. aff. minor* are relatively few in number, and restricted to scattered bare rock faces.



In 1985 a significant number of plants of this taxon were destroyed in the realignment of Ohau Point alongside State Highway 1 (Molloy 1985). A few plants have recolonised the fresh rock surfaces since then, but the process is slow. Other threats to the continued well being of this taxon include the likelihood of further remedial roadworks, damage from herbicide used to kill rank grass in roadside water courses, and invasion of its habitat by introduced grasses. Again, there is insufficient information on its full distribution and abundance to assess its threat category, but it is likely to be high.

## 4. *Pachystegia insignis* (Hook. f.) Cheeseman

This species, illustrated in colour by Eagle (1982, Plate 242) has the widest distribution of all the rock daisies. Northern populations extend from the Clarence River to the Wairau River in coastal districts, and inland to most river catchments draining the northern parts of the Inland and Seaward Kaikoura Ranges, and the Waihopai River and its tributaries further to the north. The species reaches its western limit near Mt Upcot in the Awatere Valley where it overlaps with an unnamed rock daisy referred to as *Pachystegia* B (Molloy & Simpson 1980). So far no hybrids involving these two taxa have been observed at or near to the point of overlap. A remarkably disjunct southern population of *P. insignis* occurs south of the Inland and Seaward Kaikoura ranges on the northern slopes of the Lowry Peaks and Hawkswood ranges, immediately south of the Waiau and Conway rivers respectively. The species overlaps with another unnamed taxon referred to as *Pachystegia* A (Molloy & Simpson 1980) on the Hawkswood Range and putative hybrids have been observed.

Northern populations of *P. insignis* occur on a range of substrates, including limestone, coastal sands, consolidated gravels, greywacke and volcanics. Most sites support a good range of size classes from seedlings to mature plants and the populations appear relatively stable and self-sustaining. However, riparian populations adjacent to broom-infested riverbeds are especially vulnerable to invasion by broom and introduced grasses, and to herbicides used to control broom and other weeds. Roadside pine plantings tend to shade-out *P. insignis*, but their effect on these northern populations is relatively minor.

In contrast, southern populations of *P. insignis* support considerably fewer individuals and are seriously threatened by the invasion of broom which has increased noticeably in the last 20 years or so, especially on slopes above the Waiau and Conway riverbeds, the main source areas of broom. Even more disturbing is the proposal to control these broom infestations by overplanting with exotic conifers. Added to this concern is the probability, as yet unresolved, that these southern populations of *P. insignis* may prove to belong to a different taxon. Further information on the status of *P. insignis* in this area is desirable, as these southern populations are most at risk.

## 5. *Pachystegia* A

This taxon, as yet unnamed, is illustrated in colour by Eagle (1975, Plate 200, erroneously as *P. insignis*), and has a well-defined distribution along the coastline from just south of the Conway River north to the Puhipuhi River. Its western distribution inland is, as yet, ill-defined. It overlaps with *P. minor* s.s. along the Puhipuhi River with no hybrids evident. It also overlaps with *Pachystegia* B inland, and with *P. insignis* on the Hawkswood Range where the question of hybrids is unresolved.

*Pachystegia* A is found on greywacke, limestone and consolidated gravels throughout its range, usually in well-defined openings in coastal hardwood forests, and is most conspicuous on slopes above State Highway 1 between Oaro and Kaikoura. The population just south of the Kahutara River is vulnerable to broom and introduced grasses, and a temporary loss of habitat occurred with the realignment of the highway at Punchbowl Corner in 1990 (Molloy 1989). Further temporary loss of habitat is likely with future remedial works, and the significance of this taxon and its native associates has been conveyed to the appropriate authorities accordingly (Molloy 1994).

Despite its somewhat restricted distribution, *Pachystegia* A is relatively abundant throughout its range, and most populations are highly viable and self-sustainable. Some are fully protected in Crown reserves along this coastline. I do not consider this taxon to be threatened overall.

## 6. *Pachystegia* B

This taxon, as yet unnamed, is illustrated in colour by Eagle (1982, Plate 243). It is essentially an inland entity, reaching its northern limit near Mt Upcot in the Awatere valley where it overlaps with *P. insignis*; and its southern limit in the Leamington Stream, which drains the eastern slopes of the Lowry Peaks Range, North Canterbury. Its eastern and western limits are, as yet, unknown, but it does seem to overlap with *Pachystegia* A in the southern part of its range. Hybrids between these two are not evident.

*Pachystegia* B plants are found on limestone, volcanics, greywacke and, especially, consolidated gravels. These plants are generally smaller than other rock daisies except *P. minor* with which it has often been confused in the past. Its small plant size, leaves and flower heads are retained in cultivation and appear genetically fixed. It also is difficult to grow, in contrast with the other taxa. Nevertheless, it is relatively abundant throughout its range, although still susceptible to invasion of its habitat by broom and exotic grasses, and shading from planted exotic conifers. However, I do not regard it as a threatened taxon.

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