The Flora of Egeria Rock, Northern Kermadec Island Group

Peter J. de Lange[1]

INTRODUCTION

Egeria Rock (18 m a.s.l., 1.5ha, 29°15'00.11"S, 177°53'42.27"W) (Fig. 1) lies 384 m NNE of Rayner Point, Raoul Island. I first saw it in May 2009 during a brief four day (two full days in the field) visit to Raoul Island. Although Egeria Rock is one of the larger of a number of rock stacks that dot the near-shore coastline of Raoul Island, it barely rates a mention in the Kermadec Islands flora (Sykes 1977). Because of this I was very keen to investigate its flora and vegetation. While I was unable to do this during my May 2009 visit, the opportunity to visit the Rock came for me two years later when, as one of the the May 2011 Kermadec Biodiscovery expedition research team, I was able to visit Egeria Rock on the afternoon of 13 May 2011 for three hours (de Lange 2011).

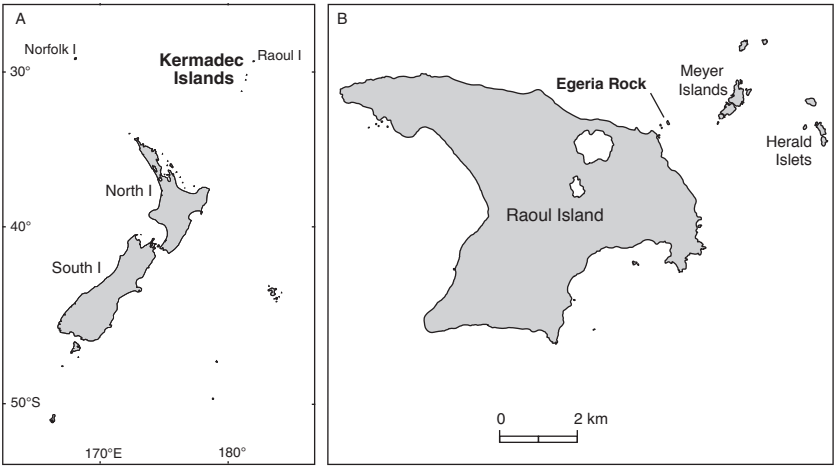

Figure 1. Location of Egeria Rock, Kermadec Islands. A, position of the Kermadec Islands in relation to New Zealand and Norfolk Island. B, Egeria Rock in relation to Raoul Island.

1. Terrestrial Ecosystems Unit, Science & Capability, Department of Conservation, Private Bag 68908, Newton, Auckland. pdelange@doc.govt.nz

Egeria Rock is a steep-sided roughly tabular block of yellowish-coloured volcanic breccia (Fig. 2). This is possibly the same as the palagonitic tuff and associated 'massive' tuff breccia that was described by Lloyd & Nathan (1981, p. 58–60) as making up much of the nearby Meyer Islands. On Egeria Rock, the breccia was usually strewn with a heterogeneous jumble of xenolith clasts up to 1.5 m across (Fig. 3) suggesting a very violent eruptive process had torn through the sea bed during the breccia's formation.

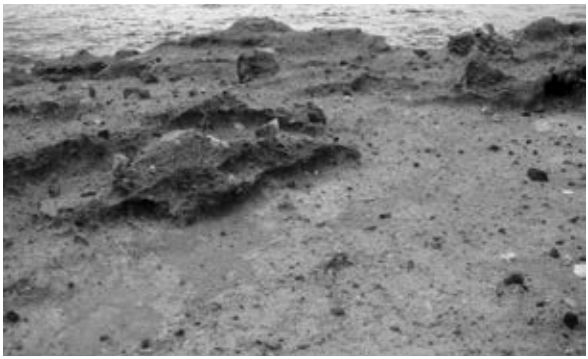

Figure 2. Summit saddle area of Egeria Rock showing the coarse palagonised tuff and massive breccia that forms the Rock.

On the landward, Raoul Island side of the Rock a narrow wave-cut platform lies at about 2–3 m above the surge line (Fig. 4). Above this platform at c.10 m or so is another smaller wave-cut platform, above which one reaches a broad saddle (Fig. 5) between which rise two, narrow 'horn-like' ridges, the southern most of which is the highest. These rock platforms suggest that, like the nearby Meyers and Herald Islets, Egeria Rock has also been and is probably still being uplifted.

I was able to make a landing on the southern end of Egeria Rock (Fig. 4), where a small channel runs between a smaller, steep-sided splinter-like rock stack and the main Rock itself. Although the surge was high, the coarse breccia gave excellent purchase, so landing proved no more difficult than any of the other landings I did within the nearby Meyers and Herald Islets.

This short note documents what I saw during my visit to Egeria Rock.

FLORA

As with all of the islands, islets and rock stacks that I visited in May 2011, the vegetation of Egeria Rock had been severely damaged by Cyclone Bune which had passed through the Kermadec Islands on 28 March 2011 (de Lange 2011). Indeed, based on the presence of lumps of coral and coral-encrusted rock strewn over the top of Egeria Rock, it seems likely that the cyclone generated surges of sufficient size to sweep over it. If so they must have been close to 18 m in height.

Figure 3. Summit of Egeria Rock, showing coarse breccia dominated by a heterogeneous assemblage of xenoliths, some up to 1.5 m across. In this image clasts of andesite, dacite, basaltic andesite, tuff and calcarenite are present.

Figure 4. Looking down from summit of Egeria Rock to the landing site, and showing collecting gear and emergency equipment stowed in a yellow water proof bag (arrowed) on a ledge well above surge zone. In this image the lower wave-cut platform of the Rock is evident. Note the circular rock pool on the top left hand side. This contains a range of filamentous cyanobacteria and green alga, and also some excellent examples of *Caulerpa racemosa*.

Consequently very little vegetation of any kind was found, and most of that was either resprouting or noted as seedlings (these often at the cotyledon stage) (Fig. 5). No bryophytes were found, and even lichens were rather patchy in their distribution, suggesting that they too had been damaged by the cyclone.

Figure 5. Summit saddle of Egeria Rock. On the left hand side is the summit proper of the Rock. Patches of *Cynodon dactylon* mostly grow on remnant 'soil'; a few sparse, resprouting mats of *Disphyma australe* subsp. *stricticaule* are present along with a flush of *Cotula*, *Lachnagrostis*, *Lepidium*, and *Solanum* seedlings.

Seven vascular plants were discovered (Appendix). None of these were common, and as I have found no other, pre-Cyclone Bune account of the flora of Egeria Rock, I cannot say whether their scarcity was entirely storm induced or normal.

Of the plants seen, *Disphyma australe* subsp. *stricticaule* and *Cynodon dactylon* were the most common (Fig. 5). *Cynodon* was confined to the upper summit saddle where it grew in pockets in the pitted breccia (Fig. 5), and in one place, it covered a metre or so of gritty 'soil'. This 'soil', at best 10 mm deep, was mostly comprised of lithic fragments, sand and silty material, though there was a minor organic component. My impression based on its distribution was that it was actually the basal 'C' horizon of a soil whose upper layers had been entirely washed away. Aside from *Cynodon*, this 'soil' was also being colonized by *Disphyma*, *Cotula australis* and *Lepidium didymum* seedlings (mostly at the cotyledon stage), and small tufts of *Lachnagrostis littoralis* subsp. *littoralis* (Fig. 5).

While dead *Disphyma* mats, tangled up with coral-encrusted rocks and 'soil', were reasonably common in places where water had pooled or along the more obvious drainage channels, in a few places these *Disphyma* mats were resprouting, and in a few instances flowering.

Amongst these tangled flood strewn *Disphyma* also grew a few flowering *Solanum nigrum*. These plants appear to have been uprooted, yet they had somehow managed to survive this upheaval and continue growing. In a few places *Solanum* seedlings were frequent, and these had hairy dark green leaves and dark purple-green, smooth rather than hooked stems, so I have assumed these were also *S. nigrum*. It is of course possible that they were *S. nodiflorum* which is the more common species on the Kermadecs, or that both species are present on the Rock. As far as I know, there is no way to reliably distinguish these two species, morphologically, as seedlings, though on the Kermadecs, as in northern New Zealand, the stems of *S. nodiflorum* often bear small hooks, something I have never seen in *S. nigrum*.

The last species recorded was purslane (*Portulaca oleracea*). Purslane is very common on the nearby Meyers and Herald Islets, where it is often associated with Kermadec petrel (*Pterodroma neglectus*) nesting sites. On Egeria Rock, though common, it was mostly seen as seedlings. These were often found growing out of apparently bare rock as well the gritty 'soil' described above.

These plants occupied an estimated 2% of Egeria Rock. All were confined to the summit saddle and Rock summit proper.

Along the southern side of the Rock, on the lower platform were a few deep rock pools (Fig. 4). These appear to have formed through the erosion of xenoliths from out of the palagonised breccia matrix. While most of the rock pools were devoid of obvious life, one sported a dense growth of the creeping, green seaweed *Caulerpa racemosa*, whose vesicles look like an inverted bunch of grapes. In these rock pools I also collected some filamentous cyanobacteria (e.g., AK 327401) and green filamentous alga but my material of these proved inadequate for phycologists to identify even to family level (W.A. Nelson *pers. comm.*).

LICHENS

While lichens were not as conspicuous as they are on the nearby Meyers and Herald Islets, I was able to collect a number of taxa, eight of which have been identified either to genus or species level. The most obvious of these was the golden yellow foliose *Xanthoria ligulata*, whose colonies were mostly found on the basaltic, tuffaceous and coralline xenolith lithics found within the breccia along the northern side of the summit saddle. Growing admixed with this lichen was at least one species of *Caloplaca*, *C.* cf. *litorale*, whose dense clusters of apothecia resembled a fine gold 'dust' to the naked eye. On closer inspection most of the apothecia of this species proved to be heavily infected with a lichenicolous fungus.

Less obvious, though probably more common than the *Xanthoria* and

Caloplaca were species of *Buellia*, of which *B. subbadioatra* seemed to be especially common. This species was previously only known from Wellington (Galloway 2007). However, despite the disjunction, the Egeria Rock specimens match the available descriptions in all characters except spore width (given as 1 µm in Galloway (2007) and 3.0–3.5 µm in Egeria Rock material). Associated with this *Buellia* was another common species which did not match any of the *Buellia* accepted for Australia or New Zealand (Galloway 2007; Elix 2011). Critical study of tropical treatments of *Buellia* (beyond the scope of this article), is probably needed to determine this lichen's identity.

In a few places the pinkish-white to pink-brown, vermiform, crustose *Roccellina exspectata* was also present, and with it grew its common associate *Haematomma fenzlianum* (see comments by Galloway 2007), evident as whitish patches sporting dark red apothecia. Occasional whitish-grey colonies of *Heterodermia tremulans* were also found, again growing on the larger breccia clasts along the northern summit slopes of the Rock.

In a few places dark green-black colonies of *Verrucaria adguttata* were also common—typically on under hanging rocks subjected to salt spray. This species was recorded by Galloway (2007) only from Rangitoto Island where it evidently grows in similar situations.

DISCUSSION

The flora and mycobiota of Egeria Rock were surprisingly depauperate. That this was in part caused by the recent passage of Cyclone Bune was without doubt. However, even without that damage the inhospitable nature of Egeria Rock, which is very exposed, suggests that it would normally support very few vascular plants.

Of the seven vascular plants recorded, three are indigenous to the islands, and all except *Cynodon* are species I found to be common in the vegetation of petrel nesting grounds in the less disturbed, and much larger 'sea bird' dominated Meyers and Herald Islets. The presence of *Cynodon dactylon* was unexpected, though it seems likely it had reached Egeria Rock from Raoul Island. The close proximity of Raoul Island to Egeria Rock provides an obvious seed source to replenish the Rock's flora. This would be interesting to study further.

The absence of mosses was unexpected. On the nearby islands, *Bryum dichotomum* was almost universally present in sites just above the spray zone (de Lange & Beever in press). Therefore I would have expected it to be present on Egeria Rock as well.

The lichens recorded from Egeria Rock are typical of those growing within the exposed, coastal zone and breccia rock forming the nearby Meyers,

and in the southern Kermadec Islands group on Cheeseman Island and L'Esperance Rock (de Lange *in press* a, *in press* b).

Because the vegetation of Egeria Rock had been so severely damaged I did not attempt to distinguish plant associations. Nevertheless I am sure that under normal conditions Egeria Rock would still be sparsely vegetated by vascular plants, and mostly dominated by expanses of bare rock and lichen field. I am also certain that once the vegetation has recovered, then the dominant plant association would probably be a *Disphyma* turf, in composition similar to that described from L'Esperance Rock (de Lange *in press* b).

As with the other islands and islets I investigated (de Lange *in press* a, *in press* b, *in press* c), the cyclone damage witnessed on Egeria Rock demonstrates the role that cyclones play in the periodic destruction and rejuvenation of the vegetation of the Kermadec Islands group, and an opportunity for new naturalised species to establish. This is a subject that I feel would merit more investigation.

ACKNOWLEDGEMENTS

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APPENDIX. ALGA, VASCULAR PLANTS AND LICHENS RECORDED FROM EGERIA ROCK

* denotes taxa naturalised to the Kermadec Islands
AK Auckland War Memorial Museum Herbarium
UNITEC Unitec Herbarium.
Vascular plant taxa are arranged according to the APG III classification (APG III 2009)

	FAMILY	VOUCHER
Chlorophyta (1)		
Caulerpa racemosa	Caulerpaceae	AK 327403
Angiosperms (7)		
Monocots II - Commelinids (2)		
**Cynodon dactylon*	Poaceae	AK 329062
Lachnagrostis littoralis subsp. *littoralis*	Poaceae	
Core Eudicots (5)		
Cotula australis	Asteraceae	
Disphyma australe subsp. *stricticaule*	Aizoaceae	AK 329064
**Lepidium didymum*	Brassicaceae	
**Portulaca oleracea*	Portulacaceae	AK 329063
**Solanum nigrum*	Solanaceae	
Lichens (8)		
Buellia subbadioatra	Physciaceae	UNITEC 5907
Buellia sp.	Physciaceae	UNITEC 5910
Caloplaca cf. *litorale*	Teloschistaceae	UNITEC 5911
Haematomma fenzlianum	Haematommataceae	
Heterodermia tremulans	Physciaceae	AK 343040
Roccellina exspectata	Roccellaceae	AK 353041
Verrucaria adguttata	Verrucariaceae	UNITEC 5909
Xanthoria ligulata	Teloschistaceae	UNITEC 5908
Total 16		