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The coastal ferns *Asplenium decurrens* and *Asplenium difforme* (Aspleniaceae) on the south coast of New South Wales.

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Abstract: The occurrence of the coastal ferns *Asplenium decurrens* and *Asplenium difforme* (family Aspleniaceae) on the south coast of New South Wales are assessed and discussed. The Illawarra coast was the zone of overlap for these two coastal fern species and they reached their geographical limits in the Kiama area, with *Asplenium decurrens* reaching its northern limit of distribution and *Asplenium difforme* reaching its southern limit. All substantiated records of these ferns are documented and assessed.

Both species require conservation consideration on the NSW south coast. For *Asplenium decurrens* the evidence suggests that New South Wales should follow Victoria and list this species as threatened under the *Biodiversity Conservation Act 2016* (NSW). For *Asplenium difforme* local conservation action is needed at its most southern limit at Kiama.

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Introduction

The coastal ferns *Asplenium decurrens* (syn. *Asplenium obtusatum* subsp. *northlandicum*) and *Asplenium difforme* (syn. *Asplenium obtusatum* var. *difforme*) are very rare on the south coast of New South Wales, both having only ever been recorded at a handful of locations. All known records of these species on the south coast are here documented and assessed. A recent discovery has confirmed the most southern known location of *Asplenium difforme* at Kiama after a gap of 48 years and where it was first collected 132 years ago. The historic northern most limit of occurrence of *Asplenium decurrens* was Shellharbour, based on a collection in the late 1880s; Bowen Island at Jervis Bay is the current known northern limit of this fern. Thus, the Illawarra coast was the zone of overlap for these two coastal fern species.

These terrestrial ferns are similar in habit and their habitat preference and are clearly closely related. Each produces a short rhizome and rather thick fronds, growing to about 30 cm tall. The majority of the plants of *Asplenium difforme* at Kiama are small individuals. Clumps may form over time, although whether these are individual or clonal plants is unknown; see Figure 1. The habitat is amongst rocks close the sea, mostly within the influence of sea spray during high seas. Shady crevices appear to be preferred, probably where there is freshwater seepage from above, at least occasionally. Both species have thick fronds, an adaptation against desiccation in the harsh coastal conditions. Jones and Clemesha (1977) also note other adaptations to the harsh conditions of the coastal habitat, namely reduced stomata and a capacity for water storage in the fronds and rhizome.

As the species are spread by wind-borne spores, it could be expected that the species would not be limited in their ability to disperse and colonise more of the south coast. Their rarity across the region may be due to the fact that both are at their limit of distribution and therefore have a tenuous existence in this region.

The species *Asplenium difforme* also occurs on Norfolk Island, where it is quite common on coastal rocks. The species does not occur far inland on this island, where presumed hybrids with the local endemic species *Asplenium dimorphum* occasionally occur (K. Mills pers. obs.). Hybridisation has also been reported between *Asplenium decurrens* (as *Asplenium obtusatum*) and *Asplenium australasicum* on Montague Island (Heyligers. & Adams 2004) and hybrids with *Asplenium flaccidum* and with *Asplenium bulbiferum* have been reported (Flora of Victoria online).

Taxonomy

There has been considerable confusion over the naming of these species in the past, with few currently available publications in agreement regarding their taxonomic status. Originally named *Asplenium decurrens* Willd. (Willdenow 1810), this taxon was later named *Asplenium obtusatum* G. Forst. subsp. *northlandicum* Brownsey (Brownsey 1977). More recently, Shepherd *et al.* (2008), including Brownsey

as a co-author, re-instated the original name *Asplenium decurrens* Willd.; Brownsey & Perrie (2016) set out the reasoning for re-instating the original name.

The Flora of New Zealand (online) summarises the situation regarding *Asplenium decurrens*: “*Asplenium obtusatum* was previously considered to include both subsp. *obtusatum* and subsp. *northlandicum* (Brownsey 1977). However, Shepherd *et al.* (2008) showed that *Asplenium decurrens* (as *A. northlandicum*) is an allopolyploid species, with either *Asplenium obtusatum* or *Asplenium oblongifolium* as the chloroplast parent and an unknown tetraploid as the other parent. Their conclusion supported the recognition of *Asplenium decurrens* as a distinct octoploid species, rather than a subspecies of the tetraploid *Asplenium obtusatum*.” The name *Asplenium decurrens* is used here as it is a validly published name (Brownsey & Perrie 2016) for the octoploid, which is accepted as distinct from the tetraploid *A. obtusatum*. *Asplenium decurrens* has recently been added to the NSW Herbarium online flora PlantNet.

The closely related taxon *Asplenium difforme* R. Br. has been known as *Asplenium marinum* L. var. *difforme* F.M. Bailey and as a variety of the above taxon, namely *Asplenium obtusatum* G. Forst. var. *difforme* (R.Br.) Hook. The name *Asplenium difforme* was reinstated by Brownsey (1998) and the name is accepted in Australian Plant Census.

Asplenium decurrens

This fern is known as Shore Spleenwort and is very rare in New South Wales. The species is common around Tasmania, the North Island of New Zealand and the Kermadec Islands. It is occasional in Victoria and Western Australia where it is listed as threatened in both states. The species is very scattered along the Victorian coast and is said to favour granite outcrops (Wakefield 1975; Duncan & Isaac 1986; Flora of Victoria online). In Tasmania, the species is common around the shores of that island and the smaller islands to the north (Garrett 1996).

There are 21 confirmed records from seven locations along the NSW south coast (date range 1884 to 2018), stretching from Shellharbour and Kiama in the north to the Victorian border in the south; see Appendix 1. Twelve of these records are from two islands, namely Bowen Island and Montague Island. Most records come from south of Montague Island, with only three substantiated locations north of Montague Island. Heyligers and Adams (2004) state that *Asplenium decurrens*, as *Asplenium obtusatum*, is “frequently found among the rocks along the east side of the island” and it is “common in crevices between, and sheltered by, taller rock outcrops around the periphery of the island.” This may be the largest population of this species in New South Wales.

The most northern record is Shellharbour (one collection in 1884), where it is almost certainly extinct; the 1884 record was probably on the sea cliffs at Barrack Point. The other northern locations are Kiama and Bowen Island. The collections from the Kiama area are historic, made in 1884, 1886 and 1894 (see Appendix 1). There are reports to the

north of Shellharbour, extending to the northern tablelands, but except for one collection (near Sydney), the records are not supported by specimens and are considered to be dubious identifications, particularly those at high inland altitudes. The collection labelled as this species in the Janet Cosh Herbarium at The University of Wollongong is not this species; the specimen is re-determined as *Deparia petersenii* subsp. *congrua* (Woodsiaceae) (K. Mills, May 2019), a species with similar linear sori; this taxon was once placed in *Asplenium*.

The presence of *Asplenium decurrens* on Bowen Island, part of the Commonwealth Jervis Bay Territory, has recently been confirmed (D. Maple, Booderee National Park, pers. comm., 2018). A photograph of the species from that island appears below (Figure 1). Bowen Island seems to be the current northern limit of the species; the author's much searching of the rocky coasts to the north over several years failed to find the species.



Fig. 1. The healthy colony of *Asplenium decurrens* on Bowen Island, Booderee National Park, Jervis Bay.

Photograph compliments of Dion Maple, Booderee National Park. (April 2018)

Asplenium difforme

The coastal *Asplenium* species north of Sydney is *Asplenium difforme*, which is said to occur as far south as the Sydney suburb of La Perouse (e.g. Benson & McDougall 1993). The southern limit of *Asplenium difforme* is however Kiama, as confirmed by specimens and recent observations by the author (see Appendix 1 and below). The species are differentiated by the thicker, fleshier fronds of *Asplenium decurrens* that are never more than pinnately divided compared to the more dissected fronds of *Asplenium difforme*; (see Figures 1, 3). This species occurs along the north coast of NSW, in the southeast corner of Queensland and on Norfolk Island.

Prior to the author's re-discovery of the species at Kiama, the most recent record from that area was a specimen collected by Clemesha and Lundie in 1971; see Appendix 1. A recent discovery of four small plants and one clump of plants in the Kiama area is therefore the first from that locality for 48 years. The plants were found in rock crevices just above the upper splash zone on a south-facing cliff directly above the sea; (see Figures 2, 3, 4). The plants are growing

with typical local coastal plants, namely *Samolus repens*, *Cyrtomium falcatum** and *Coprosma repens**. Searching of the sea cliffs from Barrack Point (Shellharbour) southwards along the Shellharbour - Kiama coast to Seven Mile Beach in 2017-2019 failed to find either *Asplenium* species. For conservation reasons, the exact location of the plants at Kiama is not specified.



Fig. 2. *Asplenium difforme* growing at Kiama; whether these are individual or clonal plants is unknown. (January 2019)



Fig. 3. Underside of a fertile frond of *Asplenium difforme* found at Kiama. (January 2019)



Fig. 4. Habitat of *Asplenium difforme* at Kiama. (March 2019)
A clump of ferns can be seen at the back of the crevice.

Conservation

The coastal fern *Asplenium decurrens* is very rare in New South Wales and indeed on the Australian mainland, as it is also rare in Victoria. In NSW the species is restricted to the south coast, where it has only ever been found at seven locations; there have only been six records from three locations since 1985. The evidence suggests that New South Wales should follow Victoria and list this species as threatened under the *Biodiversity Conservation Act 2016* (NSW).

While not threatened in NSW, *Asplenium difforme* requires conservation action at its most southern limit at Kiama where weeds threaten its existence at this site. Kiama Municipal Council manages the public land where the species occurs, and would be the most appropriate authority to take the necessary actions to protect the plants.

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Appendix 1

Records of *Asplenium decurrens* and *Asplenium difforme* in southern NSW

Location ¹	Date	Record
<i>Asplenium decurrens</i>		
NC (no specimens)		
SW Solitary Island ²	28/04/1974	'default sighting'
NT (no specimens)		
Mt Boonangai area ³	01/03/2000	vegetation survey
	02/03/2000	vegetation survey
	21/03/2000	vegetation survey
CC (no specimens)		
Fern Tree Creek, Metropolitan Special Areas	2003-2009	vegetation surveys
Water Catchment west of Wollongong ³		
SC		
Shellharbour	01/02/1884	specimen MEL114924, S.W.Cocks
Kiama	01/02/1884	specimen MEL114940, S.W.Cocks
Kiama	08/1886	specimen NSW195441, WB (Bauerlen)
Kiama	1894	specimen MEL114870, S.W..Cocks
Bowen Island	01/10/1922	specimen NSW195443, F.A.Rodway
Unknown (likely Bowen Island)	19/10/1933	specimen NSW, F.A.Rodway
Bowen Island	18/09/1996	specimen NSW500598, N.M.Taws
Bowen Island	18/09/1996	specimen MEL2276753, N.M.Taws
Bowen Island	18/09/1996	specimen CBG9914365, N.M.Taws
Bowen Island	04/04/2018	photographs, D. Maple
Montague Island	01/06/1921	specimen NSW195444, W.H.Williams
Montague Island	01/02/1933	specimen NSW738847, L.R.Fraser
Montague Island	26/02/1935	specimen NSW195440, A.Melvaine
Montague Island	07/08/1964	specimen NSW195445, J.Cassell
Montague Island	30/03/1994	specimen, CBG465918.1, P.C.Heyligers
Montague Island	30/03/2000	specimen NSW623427, P.C.Heyligers
Eden	1880	specimen, MEL114941, E.Reader
Green Cape	01/12/1920	specimen NSW195446, F. A. Rodway
Green Cape	10/10/1954	specimen NSW481133, F. Constable
Nadgee NR	22/11/1982	specimen, CBG8403506.1, P.Gilmore
Nadgee NR	21/01/1985	specimen, MEL675838, D.E.Albrecht
<i>Asplenium difforme</i>		
CC		
Shellharbour	01/02/1884	specimen MEL0114924A, W.Cocks
Kiama	1894	specimen MEL114605A, W.Cocks
Kiama	1970	specimen CBG8408180.0, B.Whitehead
Kiama	01/05/1971	specimen MEL294719, S.Clemesha
Kiama	04/06/2018	specimen, photographs, K.Mills,
Kiama	20/01/2019	specimen, photographs, K.Mills,

1. Botanical subdivisions: NC - north coast; NT - northern tablelands; CC - central coast; SC - south coast.

2. This observation is almost certainly *Asplenium difforme*.

3. These sites are well inland and mostly at high altitude and very unlikely to contain this coastal species. The records are not substantiated by specimen.

