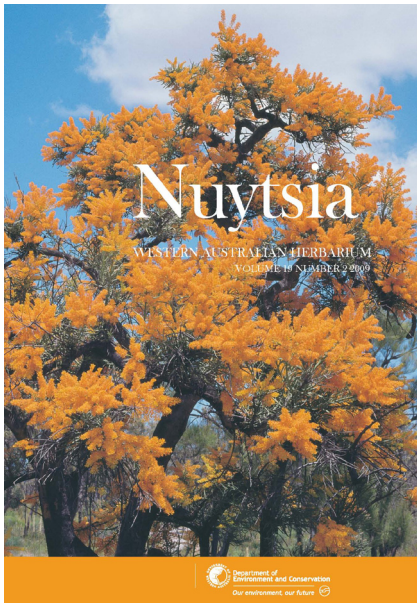


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A new, rare *Marianthus* (Pittosporaceae) from the Bremer Range in Western Australia

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Abstract

Wege, J.A. & Gibson, N. A new, rare *Marianthus* (Pittosporaceae) from the Bremer Range in Western Australia. *Nuytsia* 19(2): 295–302 (2009). *Marianthus aquilonaris* N.Gibson & Wege, a new species allied to *M. mollis* (E.M.Benn.) L.Cayzer & Crisp, is described. Morphometric analysis shows that it is most readily differentiated from *M. mollis* by its higher leaf L:W ratio, higher petal L:W ratio and longer petioles. Other distinguishing features include a more erect habit, smooth and more or less glabrous leaves with attenuate rather than rounded bases, fewer pilose hairs on the stems, peduncles and fruit, and paler petals. Descriptions of both taxa are provided and include the first record of glandular trichomes for the genus. *Marianthus aquilonaris* is endemic to the Bremer Range and potentially threatened by mining-related activities. It is gazetted as Declared Rare Flora in Western Australia under the name *M. sp. Bremer* (N. Gibson & M. Lyons 1776).

Introduction

Marianthus mollis (E.M.Benn.) L.Cayzer & Crisp (Pittosporaceae) is a rare species distinctive in the genus for its shrubby habit, indumentum of pilose and glandular hairs on the stems, leaves, peduncles, calyces and fruit, and blue to purple flowers on \pm nodding peduncles. Originally named under the genus *Billardiera* Sm. from a population in the Ravensthorpe Range (Bennett 1983), it was transferred to *Marianthus* Hueg. ex Endl. by Cayzer and Crisp (2004) who reinstated this genus on the basis of both morphological and molecular data. In addition to populations from the Ravensthorpe Range, Cayzer and Crisp (2004) included a specimen from the Bremer Range (N. Gibson & M. Lyons 1776) under their concept of *M. mollis*. This collection had previously been considered to represent a distinct, new taxon on account of its glabrous leaves (Western Australian Herbarium 1998–, as *M. sp. Bremer* (N. Gibson & M. Lyons 1776); Gibson & Lyons 1998, as *Billardiera* sp. nov.). We reinvestigate the taxonomic distinctness of the Bremer Range population in view of the rarity of *M. mollis* and the ongoing mining and mineral exploration in both the Ravensthorpe and Bremer Ranges.

Methods

The morphometric analyses are based on 21 individuals: five from each of two subpopulations in each Range (*J.A. Wege, R. Butcher & N. Gibson* JAW 1408, 1409, 1411 and 1412), and an additional, unusually robust individual that was growing in a disturbed area beside a drainage channel (JAW 1412). The following quantitative characters were scored: leaf length (not including petiole), leaf width (at widest point), leaf length:width ratio, petiole length, peduncle length, petal length, petal width (at widest point), petal length:width ratio and pistil length. Leaf features were scored from pressed specimens whereas floral characters were measured from flowers preserved in 70% ethanol. Five leaves and five flowers were measured for each individual, with the individual petal measurements averaged for each flower.

Principal Component Analysis (PCA) was undertaken on normalised quantitative characters. Normalisation was used to remove the scale factor differences between variables. These data were also analysed using Canonical Analysis of Principal Coordinates (CAP) in order to test the level of discrimination between the two presumed taxa (Anderson & Willis 2003). This analysis was undertaken using an euclidean distance matrix based on the normalised dataset. All analyses were undertaken using PRIMER 6 software package (Clarke & Gorley 2006).

Qualitative characters and additional quantitative data were coded from the aforementioned vouchers along with the remaining collections housed at the Western Australian Herbarium (PERTH). Habit, flower colour and habitat data were compiled from field observations, herbarium label information and existing photographic records. Trichomes preserved in 70% ethanol were mounted on a glass slide in Apathy's Aqueous Mountant and viewed under a compound microscope to ascertain their structure.

Results and discussion

Trichome morphology. *Marianthus mollis* s. str. and the Bremer Range individuals share an indumentum that consists of pilose hairs to 2 mm long and shorter, glandular trichomes 0.1–0.3 mm long. The pilose hairs are uniseriate and consist of 3–5 basal cells topped by an elongated, terminal cell. The terminal cell can fall off, leaving the basal cell as a short protuberance. The glandular hairs comprise a short, uniseriate and multicellular stalk with a terminal, ellipsoid to obloid head. Some of the hairs appear to lack the terminal cell although it is unclear whether this is an earlier developmental stage or a third distinct trichome type. Glandular hairs have hitherto been unrecorded for *Marianthus*. We have also observed them on the peduncles of *M. granulatus* (Turcz.) Benth., inconspicuous beneath a dense indumentum of pilose hairs.

Data analysis. The results of the PCA of the quantitative data are consistent with the recognition of two distinct taxa, with the first three axes accounting for 84.9% of the variation (Figure 1). The collections from the Bremer Range were most easily separated from *M. mollis* s. str. by their higher leaf L:W ratio, higher petal L:W ratio, and longer petioles. The multivariate discriminant analysis (results not shown) also supported the recognition of two taxa along one discriminant axis (canonical correlation = 0.90). Diagnostic tests indicate best discrimination was derived from the first three principal coordinates representing 84.9 % variation in the distance matrix, this achieved 0% misclassification error using 'leave-one-out' procedures (Anderson & Willis 2003). An additional CAP showed no evidence of significant population level differences for the quantitative characters.

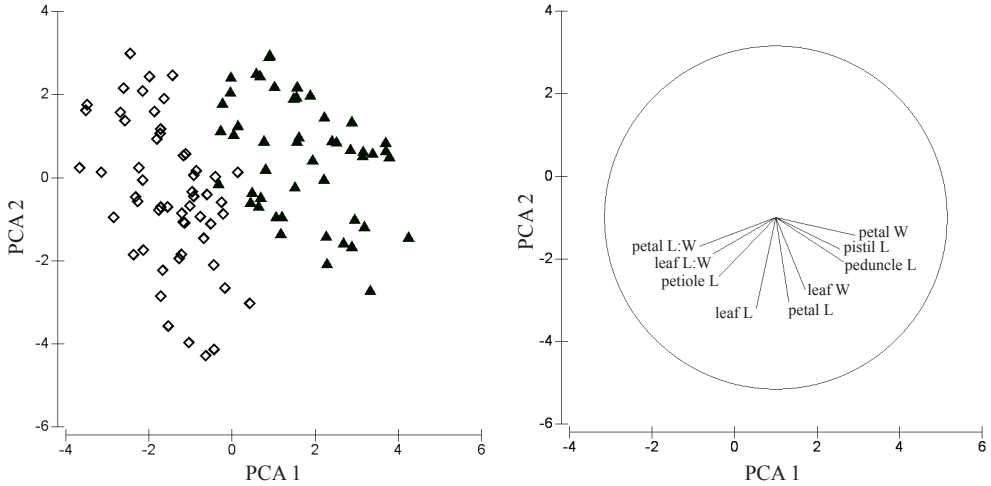


Figure 1. Plot of PCA of five replicates for each five individuals from two populations in the Ravensthorpe Range (▲) and five replicates for five and six individuals from two populations in the Bremer Range (◇). PCA 1 accounted for 36.5% and PCA 2 for 30.0% of the total variation. Eigenvectors are represented in graphical form on the right and show the direction of main contribution of each variable.

There are several qualitative characters that independently support the recognition of two taxa. The Bremer Range individuals tend to have a taller, more erect growth form (Figure 2A) as compared to the lower, more spreading habit of *M. mollis* s. str. (Figure 2E) and they also possess attenuate (Figure 2B) rather than rounded leaf bases (Figure 2F). The leaves of the Bremer Range individuals are also glabrous on both surfaces, even in the juvenile state, although a sparse indumentum of both glandular and pilose hairs may be present on the margin of the young leaves. These hairs are lost with age through abrasion, although the hair bases remain as small papillate protuberances. The conspicuous hairs on the leaves of *M. mollis* s. str. are similarly lost over time and therefore mature leaves can have a papillate surface, in contrast to the smooth leaf surface found in the Bremer Range individuals. Plants from the Bremer Range also have noticeably fewer pilose hairs on their stems, peduncles and fruit. On the basis of our field observations and the notes and photographs of other collectors, there appears to be a difference in flower colour, with plants from the Bremer Range possessing pale blue to almost white petals and *M. mollis* s. str. darker blue-purple petals. We are uncertain how flower colour varies within and between populations of the same species, or with the age of the flower.

The congruence of differences in quantitative and qualitative characters between the Bremer Range and Ravensthorpe Range plants clearly supports the recognition of two taxa.

Taxonomy

***Marianthus aquilonaris* N.Gibson & Wege, sp. nov.**

A Mariantho molli habitu erecta, foliis ± glabris et longitudine:latitudine 2.1–4.1, floribus pallidis differt.

Typus: Bremer Range, Western Australia [precise locality withheld for conservation purposes], 15 September 1994, N. Gibson & M. Lyons 1776 (*holo*: PERTH 4122208; *iso*: CANB).

Marianthus sp. Bremer (N. Gibson & M. Lyons 1776), Western Australian Herbarium, in *FloraBase*, <http://florabase.dec.wa.gov.au> [accessed 12 February 2009].

Billardiera sp. nov. (NG & ML 1776), in Gibson & Lyons, *J. Roy. Soc. W.A.* 81(2): 117 (1998).

Upright, multi-stemmed *shrub*, 0.3–1.6 m high, 0.15–1 m wide; *stems* with a dense indumentum of \pm glandular hairs to 0.2 mm long and scattered pilose hairs 0.5–2 mm long, becoming glabrous with age through abrasion. *Adult leaves* alternate, elliptic to oblong, flat in T.S., 7–22(–25) mm long and 2.3–7(–9) mm wide with a L:W ratio of 2.1–4.1, apex acuminate to acute, margins entire, base attenuate with a petiole 1–2.5 mm long, yellow-green usually with a reddish border, glabrous with the exception of sparse pilose and shorter, \pm glandular hairs on the margins of young leaves, margins becoming minutely papillose with age through abrasion. *Inflorescences* axillary, flowers solitary, \pm nodding; peduncles suberect to spreading, 3–12(–19) mm long, with a dense covering of \pm glandular hairs to 0.2 mm long and very sparse pilose hairs. *Sepals* 3–7 mm long, acute, pilose and glandular. *Petals* 5, cohering at the base then recurving, spatulate, 11–19.5 mm long and 2–4.3 mm wide with a L:W ratio of 3.3–7.1, apex acuminate, margins entire, pale blue to almost white with fine purple striations at anthesis, pilose along central upper surface. *Stamens* 5; filaments 5–9.5 mm long, flared towards the base; anthers dorsifixed, white. *Pistil* 4.5–7.5 mm long; ovary bilocular, with a medium dense indumentum of pilose hairs and shorter, \pm glandular hairs; style curved or straight, hairy towards base. *Fruit* capsular, obloid to ellipsoid, 7.5–12 mm long, 6–8 mm wide, with sparse to medium pilose and glandular hairs. *Seeds* broadly elliptic to reniform, *c.* 1.5–1.6 mm long, 1.4 mm wide, dark red-brown, shiny, wrinkled, arillate. (Figure 2A–C)

Specimens examined. WESTERN AUSTRALIA: [localities withheld] 18 Sep. 2002, R. Butler 299-01 (PERTH); 18 Sep. 2002, R. Butler 299-02 (PERTH); 14 Dec. 2004, J.A. Cochrane & R. Butler JAC 5266 (PERTH); 14 Dec. 2004, J.A. Cochrane & R. Butler JAC 5268 (PERTH); 14 Dec. 2004, J.A. Cochrane & R. Butler JAC 5270 (PERTH); 25 May 2004, G.F. Craig 6101 (PERTH); 11 Oct. 2003, G.F. Craig 5900 (PERTH); 7 Oct. 2008, J.A. Wege, R. Butcher & N. Gibson 1411 (CANB, MEL, PERTH); 7 Oct. 2008, J.A. Wege, R. Butcher & N. Gibson 1412 (CANB, MEL, PERTH).

Distribution and habitat. Restricted to the Bremer Range in the Coolgardie bioregion of southern Western Australia (Figure 3). Grows on weathered hill slopes and hill tops in skeletal sandy-loam over sheet laterite in open *Eucalyptus livida* woodland over low shrubs.

Flowering and fruiting period. Flowering specimens have been collected in September and October, and fruiting material in October and December.

Conservation status. Listed as Declared Rare Flora under the Western Australian *Wildlife Conservation Act 1950*, under the name *M.* sp. Bremer (N. Gibson & M. Lyons 1776). This species is locally common but highly restricted in distribution. No land in the Bremer Range is currently allocated to the conservation estate and vegetation in the region has been significantly impacted by mining and mineral exploration (Gibson & Lyons 1998).

Etymology. The species epithet is Latin for ‘northern’ and refers to the geographic location of this taxon in relation to the morphologically allied *M. mollis*. It is also an obscure reference to the failed

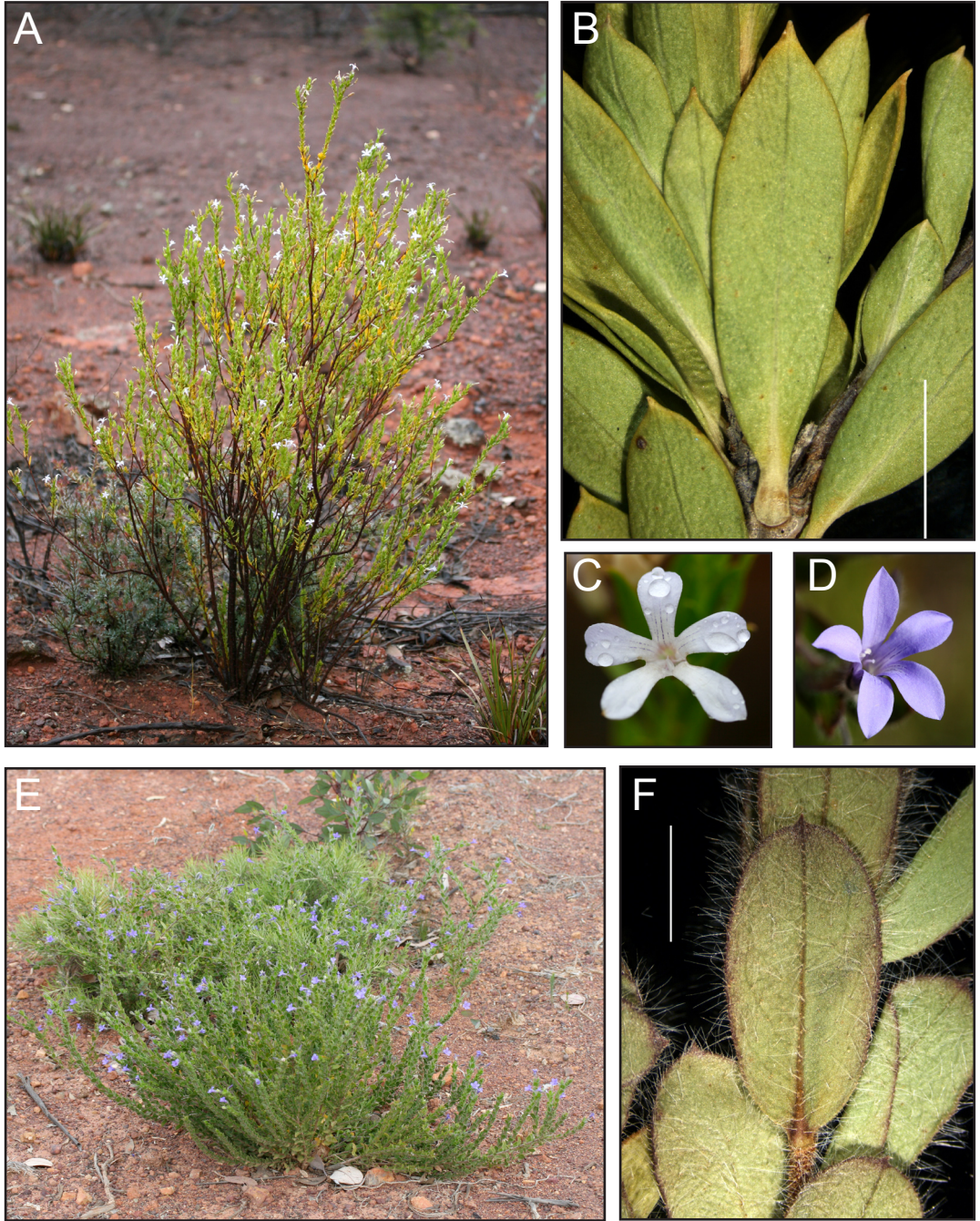


Figure 2. A–C. *Marianthus aquilonaris* (J.A. Wege, R. Butcher & N. Gibson JAW 1411) A – habit; B – young leaves, scale at 5 mm; C – flower; D–F. *M. mollis* (J.A. Wege, R. Butcher & N. Gibson JAW 1408) D – flower; E – habit; F – young leaves, scale at 5 mm.

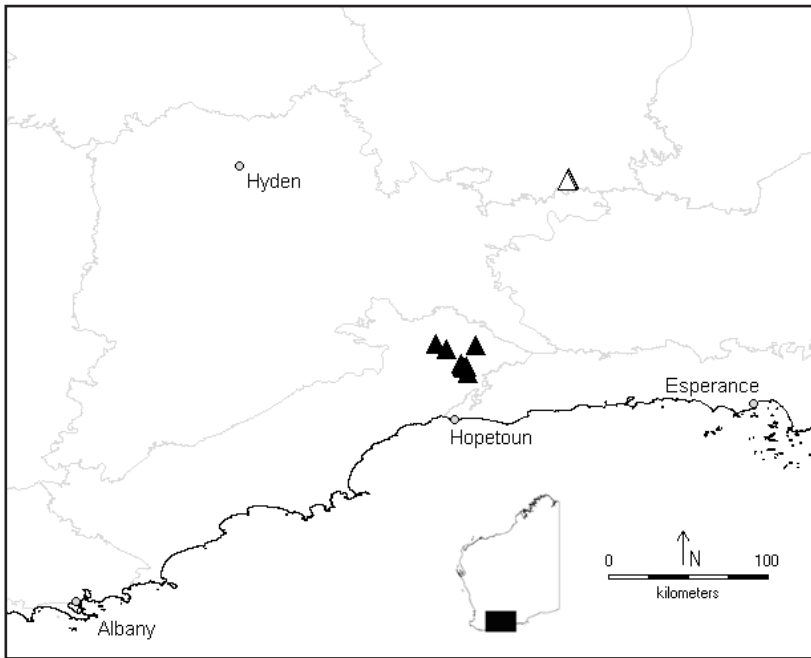


Figure 3. Distribution of *Marianthus aquilonaris* (\triangle) and *M. mollis* (\blacktriangle) in south-west Western Australia, with Version 6.1 IBRA regions (Department of Environment and Water Resources 2007) indicated in grey.

settlement attempt at Fort Dundas on Melville Island on the northern coast of Australia, led by Captain James J. Gordon Bremer on the *Tamar*. John Septimus Roe was a lieutenant on board the *Tamar* and, when he later became first surveyor-general in Western Australia, he commemorated this settlement attempt in several topographic features, including the Bremer Range, Mt Gordon and Tamar Hill.

Diagnostic features. An erect, shrubby habit; an indumentum of pilose hairs to 2 mm long and shorter, \pm glandular hairs to 0.3 mm long; smooth, elliptic to oblong leaves (L:W ratio 2.1–4.1) with attenuate bases and petioles 1–2.5 mm long; pale blue to white petals with a L:W ratio of 3.3–7.1; hairy fruiting capsules.

Marianthus mollis (E.M.Benn.) L.Cayzer & Crisp, *Aust. Syst. Bot.* 17(1): 138 (2004). *Billardiera mollis* E.M.Benn., *Nuytsia* 4(3): 275 (1983). *Type:* Ravensthorpe Range [precise locality withheld for conservation purposes], Western Australia, 16 September 1979, *E.M. Bennett* 16,979 (*holo:* PERTH 1174142!; *iso:* CANB, K, MEL).

Low, multi-stemmed, spreading *shrub* 0.2–0.6(–1) m high and 0.2–0.8 m wide; *stems* with a dense indumentum of \pm glandular hairs to 0.3 mm long and pilose hairs 0.5–2 mm long, becoming glabrous with age through abrasion. *Adult leaves* alternate, ovate to oblong, flat in T.S., 6–25 mm long and 3.2–10.5 mm wide with a L:W ratio of 0.9–2.8, apex acuminate, more rarely acute, margins entire, base rounded with a petiole 0.5–1.5 mm long, dull medium green usually with a reddish border, with pilose and inconspicuous glandular hairs on both surfaces and the margin, becoming papillose with age through abrasion. *Inflorescences* axillary, flowers solitary, \pm nodding; peduncles spreading, 8–30 mm long, with a dense covering of \pm glandular hairs to 0.3 mm long and longer pilose hairs scattered evenly throughout. *Sepals* 3–8 mm long, acute, pilose and glandular. *Petals* 5, cohering at the base then recurving, spatulate, 10.5–18 mm long and 2.4–5.5 mm wide with a L:W ratio of 2.5–5.2,

apex acuminate, margins entire, dark purple-blue, white towards base, with fine purple striations at anthesis, pilose along the central upper surface. *Stamens* 5; filaments 5.5–9.8 mm long, flared towards the base; anthers dorsifixed, white. *Pistil* 5.7–7.8 mm long; ovary bilocular, with a dense indumentum of pilose hairs obscuring shorter, \pm glandular hairs; style curved or straight, hairy towards base. *Fruit* capsular, ellipsoid to oblong, occasionally obovate, 6.5–10 mm long, 5–7 mm wide, with dense pilose and glandular hairs. *Seeds* elliptic to reniform, 1.6–2 mm long, 1.5–1.8 mm wide, dark red-brown, shiny, wrinkled, arillate. (Figure 2D–F)

Specimens examined. WESTERNAUSTRALIA: [localities withheld] 16 Oct. 2007, *E.D. Adams* 30/1007 (PERTH); 9 Sep. 1999, *S. Barrett* 793 (PERTH); 19 Dec. 2005, *B.L. Bayliss* BLB 33 (PERTH); 20 Dec. 2005, *B.L. Bayliss* BLB 39 (PERTH); 16 Nov. 1979, *E.M. Bennett s.n.* (CANB, PERTH); Sep. 1980, *E.M. Bennett s.n.* (PERTH); 7 Dec. 1995, *J.A. Cochrane* JAC 1801 (PERTH); 13 Dec. 2004, *J.A. Cochrane & K. Bennett* JAC 5245 (PERTH); 7 Dec. 2003, *G.F. Craig* 6000 (PERTH); 6 Feb. 2004, *G.F. Craig* 6044 (PERTH); 8 May 2007, *G.F. Craig* 8231 (PERTH); 2 Dec. 1998, *J. Hill* 2 (PERTH); 4 Sep. 2007, *S. Kern, R. Jasper & H. Hughes* LCH 17302 (PERTH); 25 Sep. 2007, *S. Kern, R. Jasper & H. Hughes* LCH 17611 (PERTH); 25 Sep. 2007, *S. Kern, R. Jasper & H. Hughes* LCH 17613 (PERTH); 27 Sep. 2007, *S. Kern, R. Jasper & H. Hughes* LCH 17780 (PERTH); 25 Oct. 1987, *K.R. Newbey* 11803 (PERTH); 6 Oct. 2008, *J.A. Wege, R. Butcher & N. Gibson* JAW 1408 (CANB, MEL, PERTH); 6 Oct. 2008, *J.A. Wege, R. Butcher & N. Gibson* JAW 1409 (CANB, MEL, PERTH).

Distribution and habitat. Largely restricted to the Ravensthorpe Range in the Esperance bioregion of southern Western Australia, with a single record from *c.* 20 km north-east of Ravensthorpe (Figure 3). Found on ridge crests and upper hill slopes in sandy loam, clay loam or light clay over laterite, with surface fragments of laterite, schist and silcrete, shale or siltstone. Grows in tall mallee shrubland and open mallee shrubland over dense heath, often in association with *Banksia lemmaniana*. Also recorded in tall shrubland of *Acacia pinguiculosa* subsp. *pinguiculosa* and *Kunzea affinis* over *Lepidosperma*.

Flowering and fruiting period. Flowering from early September to December, with a single record from February (*G.F. Craig* 6044). Mature fruit has been collected in November, December and February.

Conservation status. Gazetted as Declared Rare Flora under the Western Australian *Wildlife Conservation Act 1950*.

Diagnostic features. A low, spreading habit; a dense indumentum of pilose hairs to 2 mm long and shorter \pm glandular hairs to 0.3 mm long; pilose or minutely papillate, ovate to oblong leaves (L:W ratio 0.9–2.8) with rounded bases and petioles to 1.5 mm long; dark blue-purple petals with a L:W ratio of 2.5–5.2; hairy fruiting capsules.

An amendment to the *Key to Marianthus* (Cayzer & Crisp 2004: 129)

3. Erect to spreading shrubs, not scandent; petals purple, blue or almost white
4. Branching shrubs 0.2–1.6 m high; new shoots with both pilose and glandular hairs; leaves alternate, 7–25 \times 2.3–10.5, ovate, elliptic or oblong; flowers in leaf axils, \pm nodding on slender peduncles 3–30 mm long; petals dark purple-blue or pale blue to almost white
 - 4a. Leaves ovate, elliptic or oblong (L:W 0.9–2.8), rounded at base with petioles to 1.5 mm, bearing pilose and glandular hairs on both surfaces (becoming papillate through abrasion); petals dark purple-blue..... (10) *M. mollis*
 - 4b. Leaves elliptic to oblong (L:W ratio 2.1–4.1), attenuate at base with petioles 1–2.5 mm long, glabrous on both surfaces; petals pale blue to almost white *M. aquilonaris*

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