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Source: Candollea, 72(2): 249-255

Published By: The Conservatory and Botanical Garden of the City of Geneva (CJBG)

URL: https://doi.org/10.15553/c2017v722a2

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# First record of Geosiris (Iridaceae: Geosiridoideae) from Australasia: a new record and a new species from the Wet Tropics of Queensland, Australia

Bruce Gray & Yee Wen Low

#### Abstract

GRAY, B. & Y.W. LOW (2017). First record of Geosiris (Iridaceae: Geosiridoideae) from Australasia: a new record and a new species from the Wet Tropics of Queensland, Australia. Candollea 72: 249-255. In English, English abstract. DOI: http://dx.doi.org/10.15553/c2017v722a2

Geosiris Baill. is a small genus of achlorophyllous, mycoheterotrophic herbs that until now consisted of only two species, Geosiris albiflora Goldblatt & J.C. Manning and Geosiris aphylla Baill., the latter being the type species of the genus. Prior to this study, the genus was known only from two islands off the southeast coast of Africa, Madagascar and Mayotte. A recent discovery in Australia reported here expands its geographic range to the Pacific. The Australian taxon represents a species distinct from the two African taxa based on the key morphological characters for species distinction in the genus, namely stigma characteristics. Geosiris albiflora has a somewhat club-like stigma with three coherent lobes, Geosiris aphylla with a stigma terminates in three fringed broad and flat stigmatic lobes, and the Australian Geosiris has a truncate stigma with a short fimbriate margin. Hence, the Australian taxon is formally described here as Geosiris australiensis B. Gray & Y.W. Low.

# **Keywords**

IRIDACEAE - Geosiris - Australia - Queensland - Taxonomy - Mycoheterotrophy -New generic record - New species

ISSN: 0373-2967 - Online ISSN: 2235-3658 - Candollea 72(2): 249-255 (2017)

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#### Introduction

Geosiris Baill. was established in 1894 to accommodate an achlorophyllous, mycoheterotrophic plant gathered by M. Lantz in Madagascar. A monotypic genus typified by Geosiris aphylla Baill., it was included in the Iridaceae (BAILLON, 1894). Due to its mycoheterotrophy in a family otherwise consisting of largely photosynthetic plants, Geosiris was considered to be closely related to Burmanniaceae Blume (ENGLER, 1897) but otherwise distinct, and placed in its own family, Geosiridaceae Jonker (JONKER, 1939). However, PERRIER DE LA BÂTHIE (1946) continued to treat it as a member of Iridaceae, and subsequent work eventually confirmed its familial placement in Iridaceae (GOLDBLATT, 1991a; GOLDBLATT et al., 1998) based on evidence from detailed floral anatomical and flavonoid studies (GOLDBLATT et al., 1987). In 2010 a second species, Geosiris albiflora Goldblatt & J.C. Manning was described from Mayotte Island, a French Overseas Department located northwest of Madagascar in the Mozambique Channel (GOLDBLATT & MANNING, 2010). Currently, these are the only two species enumerated for the genus, both confined to the islands off the southeast coast of Africa.

Phylogenetic studies have further reaffirmed the placement of *Geosiris* in *Iridaceae* instead of *Burmanniaceae* (REEVES et al., 2002; GOLDBLATT et al., 2006; LAM et al., 2016). In *Iridaceae*, seven subfamilies are recognised, and *Geosiris* is placed in its own subfamily *Geosiridoideae* (GOLDBLATT et al., 2008; STEVENS, 2017). It has been suggested that ancestors of *Geosiris* could have dispersed to Africa (Madagascar-Mayotte) from an Australian origin for the Iridaceae about 55 mya by long distance dispersal (LDD) across the Proto-Indian Ocean. Although the distance between Australia and Madagascar is currently about 5,400 km, substantial evidence indicates that many Asian taxa have dispersed to the Hawaiian Islands fairly recently, a distance of about 8,000 km (RAVEN, 1979).

The yearly Australian monsoon typically occurs from November to March, and this provides precipitation for North Queensland (Fox, 1999; ROBERTSON et al., 2006). The monsoon that started in December 2016 after an intense El Niño episode triggered a spectacular flowering episode for many plants in the rainforests, including a flowering specimen of an unidentified mycoheterotrophic plant collected from the vicinity of Little Cooper Creek, within the Daintree National Park. An initial attempt using the Australian Tropical Rainforest Plants identification system (Hyland et al., 2017) failed to provide a positive identification of the specimen. Subsequent careful inspection of a flowering specimen revealed that it has three outer tepals, three inner tepals, three stamens opposite the outer tepals, extrorse anther dehiscence, and an inferior ovary, placing the specimen in the Iridaceae. Through literature, we managed to match the specimen to Geosiris, the only mycoheterotrophic genus of Iridaceae, and not until now recorded for Australia.

Key morphological characters useful for species distinction in *Geosiris*, as noted by GOLDBLATT & MANNING (2010), are based on stigma characteristics. *Geosiris albiflora* has a somewhat club-like stigma with three coherent lobes, while *G. aphylla* has a stigma terminated by three fringed, broad, flattened stigmatic lobes. In contrast, the Australian *Geosiris* taxon has a truncate stigma with short fimbriate margin, and thus distinct from the two African species. Hence, the Australian taxon is new and described here as *Geosiris australiensis* B. Gray & Y.W. Low. Stigma characteristics of all three *Geosiris* taxa are illustrated in Fig. 1. Apart from stigma characteristics, *Geosiris australiensis* also differs from the other two taxa in a suite of other morphological characters (see below). The discovery of *Geosiris australiensis* in Australia expands the distribution of the genus to the western Pacific rim.

#### **Materials and Methods**

A review of all known Australian mycoheterotrophic plants was conducted using the online identification key, *Australian Tropical Rainforest Plants* (HYLAND et al., 2017). Conventional methods of herbarium taxonomy were applied for this study. All measurements were taken from materials preserved in spirit collection. Field observations and photographic documentation were conducted by the first author, and also by Tim Hawkes and Tony de Groot. Botanical terms used in the study for the description of the new species largely follow GOLD-BLATT & MANNING (2010). Provisional conservation assessments were made using the methodology in IUCN (2012) following recommendation adopted for the Nature Conservation Act [NCA] 1992 and the Environment Protection and Biodiversity Conservation [EPBC] Act 1999 in Australia.

#### Key to Geosiris species



Fig. 1. – Stigmatic heads. A. Geosiris albiflora Goldblatt & J.C. Manning;
B. G. aphylla Baill. C. G. australiensis B. Gray & Y.W. Low.
[Drawings: A, B: Y.W. Low (redrawn from GOLDBLATT & MANNING, 2010);
C: B. Gray]

# Taxonomy

*Geosiris australiensis* B. Gray & Y.W. Low, spec. nova (Fig. 1C, 2-3).

**Typus : AUSTRALIA. Queensland :** N Queensland, Cook District, Little Cooper Creek, Daintree National Park, 15.I.2017, *Gray, Hawkes & de Groot BG 9763* (holo- : BRI!; iso-: CNS!)

Geosiris australiensis B. Gray & Y.W. Low is morphologically close to G. albiflora Goldblatt & J.C. Manning but differs in having stamens forming a tight ring around the style just above the throat of the corolla tube (vs diverging stamens in G. albiflora), and truncate stigma with short fimbriate margin (vs club-like stigma with three lobes cohered together in G. albiflora).

Plant perennial, achlorophyllous, mycoheterotrophe, 50-120 mm high, with slender, simple or rarely branched, purplish, stems arising from an underground rhizome c. 20-60 mm long with several tuber like thickened sections. Roots filiform arising from rhizome tubers. Leaves scale-like, 3-4.5 mm long, clasping the stem, pale creamy mauve. Inflorescence a headlike (possibly a contracted rhipidium) with 1-3 subsessile flowers opening sequentially; floral bracts membranous, maroon. Flowers erect, actinomorphic and opening widely, c. 15-16 mm diameter, very pale mauve to white, bright orange in the throat of the perianth tube. Perianth tube 2.1-2.3 mm long. Tepals lanceolateelliptic to narrowly obovate, 6-7 × 3.5-4 mm, spreading. Stamens 3, filaments included in perianth tube, filiform, free, c. 1.8 mm long. Anthers c. 1.5 mm long, basifixed, coherent and clasping style. Ovary ovoid c. 2.1-2.2 mm long. Style erect, 4.7-4.8 mm long, fusiform above the anthers and triangular in cross section but becoming only slightly triangular at the apex and finely fringed. Capsules not seen.

*Etymology.* – The species epithet refers to Australia, as it is the first generic record for the continent.

Distribution and habitat. – Geosiris australiensis is only known from the tropical rainforests of north-east Queensland, Australia (Fig. 4). The only known specimens were growing on a moist forest floor covered with thick organic litter under shaded conditions in the Daintree National Park, a UNESCO World Heritage site.

*Phenology.* – The only known flowering specimens of *Geosiris australiensis* were collected in early January, during the annual monsoon that occurs from November to March. Fruiting period unknown.

*Conservation status. – Geosiris australiensis* is known only from a single location, protected within Daintree National Park. We assign a preliminary conservation status under the Nature Conservation Act (NCA) 1992, and the Environment Protection and Biodiversity Conservation (EPBC) Act 1999 of "Vulnerable" [VU D2] (IUCN, 2012). This preliminary conservation status will require reassessment as more efforts to locate the species for conservation purposes are initiated by local authorities.

Notes. - The first discovery of G. australiensis was an immature inflorescence about 50 mm long bearing a single flower bud, found amongst leaf litter in mid-December 2016 during a survey for mycoheterotrophic plants in the Daintree rainforests. Subsequently, numerous trips were made to the same site, until a flowering specimen was finally collected. Numerous and extensive surveys around the type locality have located only 15 individuals to date, all located in a restricted area which is extremely wet (average annual rainfall about 4700 mm), within a tall and dense lowland rainforest. Geosiris australiensis is a perennial, as are G. aphylla and G. albiflora. It produces flowers soon after the onset of the wet season, each flower withering soon after anthesis. No fruiting plants have been observed. The discovery of this genus in Australia, perhaps further supports the hypothesis of the southern origin of the family (GOLD-BLATT, 1991b; GOLDBLATT et al., 2008).

# Acknowledgements

We are grateful to the Director of the Australian Tropical Herbarium, Prof. Darren Crayn for continuous support and permission to access the herbarium. Frank Zich (CNS) provided much-needed curatorial support and assistance; Dr Ashley Field (CNS) kindly assisted with the documentation of conservation status and listing for *Geosiris australiensis*. Tim Hawkes and Tony de Groot are credited here as the discoverer of *Geosiris australiensis* in the wild, and provided valuable assistance in the field with observations, collections and photographs. Research opportunity for YWL is provided by the National Parks Board, Singapore through



Fig. 2. – Geosiris australiensis B. Gray & Y.W. Low. A. Habit showing underground rhizome; B. Close-up of stigma with a truncate apex; C. Side view of a flowering head with an unopened flower bud; D. Cross section of an open flower showing stamens in a tight ring around the style just above the corolla throat. [Drawing: B. Gray]

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Fig. 3. – Geosiris australiensis B. Gray & Y.W. Low. A. Habit; B. Close-up of a flower bud with bracts; C. Close-up of extrorse stamens showing anthers with a longitudinal slit and forming a tight ring around the style; D. Top view of stigma showing truncate apex with short fimbriate margin. [Photos: A-B, D: B. Gray; C: T. Hawkes]



Fig. 4. - Distribution of the three Geosiris Baill. species.

the Singapore Botanic Gardens. YWL is especially grateful to Prof. David Burslem (University of Aberdeen), Dr David Middleton (SING) and Dr Eve Lucas (K) for encouragement to participate in this paper on *Iridaceae*. Dr Bruce Maslin AM (PERTH, SING) provided valuable nomenclatural comments and suggestions at the initial stage of this research. Serena Lee (SING) kindly helped with composition of plates used for the manuscript. Finally, we would like to express our appreciation to the anonymous reviewer and Dr Kevin Thiele (PERTH) for their constructive comments in improving this manuscript.

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