BIOGEOGRAPHY AND ORIGIN OF GENUS DAMPIERA R. Br. (GOODENIACEAE)

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Absrtract

The genus *Dampiera* is confined to Australia and is autochthonous. It consists of seventy two taxa, which occur throughout the continent of Australia. The biogeography of genus is discussed and it is suggested that *Dampiera* originated within Australia, sometimes after the separation of New Zealand from Australia and the Western temperate area is chosen as the most likely ancestral area of distribution.

Introduction

The genus *Dampiera* is named after William Dampier (1651- 1715)circumnavigator and adventurer, in January, 1688. He arrived at north-west coast of Western Australia, in the vicinity of the Islands later known as the Buccaneer Archipelago. The history of Botany in Australia begins with the brief visit of William Dampier, who in 1688 collected plants on the north-west coast of Western Australia. Some collection of William Dampier is still preserved in the Oxford University herbarium,U.K.

The genus was first established by Robert Brown (1810) in Prodromus Florae Novae Hollandiae, using Dampier's original collection as the basis for the description of *Dampiera incana.*

The genus *Dampiera* is confind to Australia, and distributed throughout the continent in a wide variety of habitats. The genus consists of 72 taxa, including 66

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species, 2 sub-species and 4 varieties, which are attributed to the following 5 sections: Sect. Camptospora, Sect. Dicoelia, Sect. Dampiera, Sect. Linschotenia and Sect.Cephalantha. The diagnostic characters of these sections have been described earlier (Rajput & Carolin, 1988). Out of 66 species, about 50 are restricted to Western Australia, and remaining species are distributed in all other states of Australia except Tasmania, in which only one species *(D.stricta)* is found (Table 1). Rajput (1980) described *D.roycei* and *D.dentata* as two new species from Central Australia. Rajput & Carolin (1988), while discussing the systematic arrangement of *Dampiera*, described 20 new species, mostly from Western Australia.

This communication aims at systematic examination of the distribution of the genus in Australia. The pattern of distribution may also be related and helpful in studying the origin and evolutionary history of the genus which has remained unattanded so far.

Geographical distribution

An understanding of geographic pattern of distribution is basic to interpretting the origin, migration and evolution of species and floras. For the examination of geographic distribution pattern, a distribution map of *Dampiera* species has been developed (Fig. 1). A total of approximately 6000 herbarium specimens of *Dampiera,* collected from different parts of Australia have been examined for developing the map.

The herbaria from where the specimen were obtained includes AD, ADW, BM, BRI, CANB, CANTB, HAL, K, L, MEL, NSW, NT, and PERTH, (abbreviation follow Holmgren & Keuken, 1974).

The pattern of distribution emerging from this map is distinctive. The genus occupies a much larger tract in Western Australia, than in other parts. It is mostly unrepresented in Central Australia, but occurs in a wide belt margining the continent in eastern and south Australia including Tasmania. An isolated patch occurs in north western Australia.

Results and Discussion

The understanding of the origin and migration of any angiospermic taxa is related to the problem of time, as to when the breakup of the supercontinent initiated and rafting started bringing about a disjunction of once continuous floras.

The migratory abilities of land plants are highly variable from taxon to taxon. However, as the genus under discussion is autochthonous, i.e. native taxa that has originated within Australia reproducing spontaneously, its migratory abilities and time factor do not become an imposing problem.

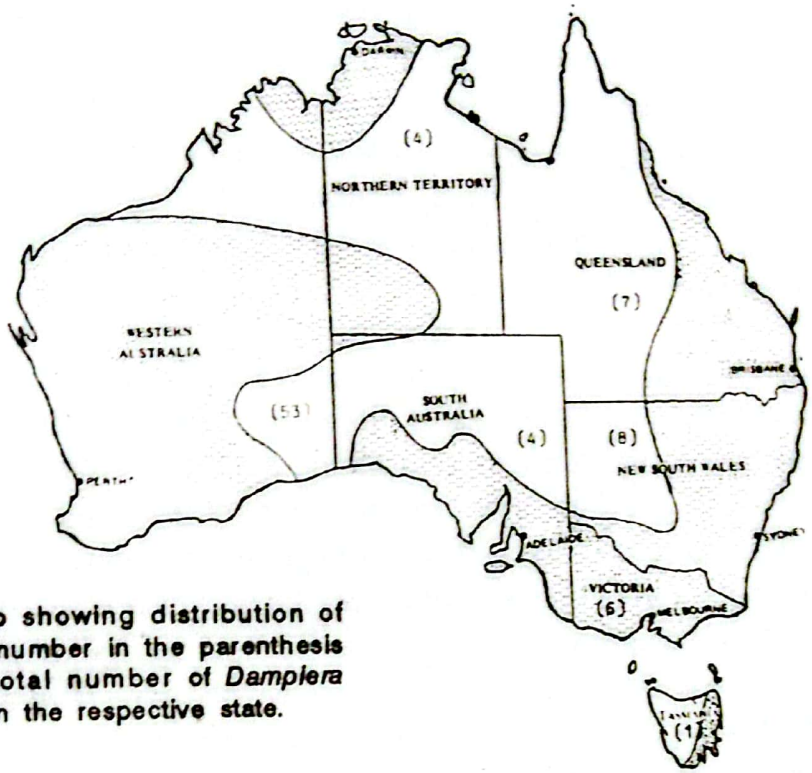


Fig 1. Map showing distribution of *Dampiera*. The number in the parenthesis indicates the total number of *Dampiera* species found in the respective state.

Rajput & Carolin (1990), while estimating phylogeny of *Dampiera* species, developed a phylogenetic tree, which was constructed by using Wagner-Tree algorithm, and on that basis, they suggested a "root area", based on the presence of primitive attributes found in *Dampiera* species. The species in the suggested root area of the phylogenetic tree diagram are mostly temperate. Therefore, it is probable that the genus arose in the temperate climates, in inland Australia, sometimes after the separation of New Zealand, since *Dampiera* is not found in New Zealand, where suitable habitats are available.

The climatic history of this continent has been a controversial issue, but recently obtained plaeobotanical and geological evidence suggests that the conditions during most of the early Tertiary were equitable and humid, and much of the inland was mainly covered by sea and probably temperate mesophytic forests (Dorman, 1966). During the Pliocene the climate of the inland Australia changed gradually from humid to arid and the great deserts of the interior were formed (Dorman, 1966). Since, in mid Eocene time Australia was 15^0 further south than now, it is likely that the north of Australia was basically temperate at that time. The

part of the phylogenetic tree, that we have previously suggested as a "root area" contains *D.dysantha, D.lavandulacea,* and *D.linearis* belonging to Sect. Dampiera, which are mostly temperate species, exhibiting primitive characters. These include terete-ribbed stem without cortical bundles and with 2/5 phyllotaxis, possibly flat leaves, foliage leaves scattered all over the stem, cymose infloresence, straight ovary, and erect basifixed ovule. Rajput & Carolin (1990) suggested the root of the phylogenetic tree is somewhere in Sect. Dampiera, which exhibits most of these primitive characters. Therefore it seems likely that *Dampiera* arose in a more or less temperate climate, somewhere in what is now called north-west Australia. Infact Beard (1979) suggests that the climates in which "root area" species occur, first appeared in the Pilbara.

The continued northward movement of Australia has caused tremendous changes in the humidity in the inland area of Australia. Therefore temperate *Dampiera* species have pushed south, and as the southern isthmus connecting east and west Australia moved into the climatic zone of *Dampiera* tolerance, some species of Sect. Dampiera and Sect. Dicoelia migrated eastwards. *D.stricta* which is a eastern species shows close resemblance with *D.fasciculata* a western species. It is likely that *D.stricta* have evolved from *D.fasciculata* by migration from west to east. Similarily *D.rosmarinifolia* and D. *dysantha* which are south-eastern species, may have evolved from a western species of *D.lavandulacea* via a connection through the sandy soils on the granite plateau of glacial times now occupied by the Bight.

The members of Sect. Linschotenia most probably developed as a direct response to the dry tropical condition prevailing in the north Australia. As *Dampiera* moved onto the sandy country of the south-west, Sect. Cephalantha and Sect. Camptospora would have developed. *D.discolor* of Sect. Linschotenia is a bit out, and has some interesting characters viz: the flowers are arranged in leafless raceme with a coflorescences at the base and highly developed hairs on the plant body; most probably these characters were developed in response to the adaptation to tropical conditions. Long-range dispersal would have been possible during less arid period, which would have allowed migration across northern Australia.

Only one species *D.stricta* along with its distribution in other state, is also found in Tasmania. It is possible that long- distance dispersal may have occurred in recent times or it may have migrated by land when Tasmania was connected to the mainland during the glacial period. Other species of *Dampiera* are not found in Tasmania mainly because Tasmania is further south than rest of Australia, and generally out of climatic tolerance zone of most *Dampiera* species.

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Table 1: Distribution of Dampiera species in various states of Australian continent.

Name of the species.	WA.	NT.	SA.	QL.	NSW.	VIC.	TAS.
Sect. Camptospora							
D.alata	+	–	–	–	–	–	–
D.carinata	+	–	–	–	–	–	–
D.deltoidea	+	–	–	–	–	–	–
D.coronata	+	–	–	–	–	–	–
D.angulata	+	–	–	–	–	–	–
D.heteropetera	+	–	–	–	–	–	–
D.lindleyi	+	–	–	–	–	–	–
D.sacculata	+	–	–	–	–	–	–
Sect. Dicoelia							
D.latealata	+	–	–	–	–	–	–
D.decurrens	+	–	–	–	–	–	–
D.obliqua	+	–	–	–	–	–	–
D.sericantha	+	–	–	–	–	–	–
D.fusca	–	–	–	–	+	–	–
D.glabrescens	+	–	–	–	–	–	–
D.stricta	–	–	–	+	+	+	+
D.tribola	+	–	–	–	–	–	–
D.trigona	+	–	–	–	–	–	–
D.fasciculata	+	–	–	–	–	–	–
D.leptoclada	+	–	–	–	–	–	–
D.galbraithiana	–	–	–	–	–	+	–
D.parvifolia	+	–	–	–	–	–	–
D.loranthifolia	+	–	–	–	–	–	–
D.sylvestris	–	–	–	+	+	–	–
Sect. Dampiera							
D.diversifolia	+	–	–	–	–	–	–
D.incana	+	–	–	–	–	–	–
D.lutiflora	+	–	–	–	–	–	–
D.tomentosa	+	–	–	–	–	–	–
D.pedunculata	+	–	–	–	–	–	–
D.linearis	+	–	–	–	–	–	–
D.rosmarinifolia	–	–	+	–	+	–	–
D.eriantha	+	–	–	–	–	–	–
D.lanceolata	–	–	+	+	+	+	–
D.lavandulacea	+	–	–	–	–	–	–

Contd.

Name of the species.	WA.	NT.	SA.	QL.	NSW.	VIC.	TAS.
D.dysantha	–	–	+	–	–	+	–
D.stenophylla	+	–	–	–	–	–	–
D.rodwayana	–	–	–	–	+	–	–
D.orchardii	+	–	–	–	–	–	–
D.scaevolina	+	–	–	–	–	–	–
D.fitzgeraldiana	+	–	–	–	–	–	–
D.tephera	+	–	–	–	–	–	–
D.hederacea	–	–	+	–	–	+	–
D.marifolia	–	–	–	+	–	–	–
D.ferruginea	+	–	–	–	–	–	–
D.altissima	+	–	–	–	–	–	–
D.salehae	–	–	–	+	+	+	–
D.purpurea	+	–	–	–	–	–	–
D.haematotricha	+	–	–	–	–	–	–
D.oligophylla	+	–	–	–	–	–	–
D.pritzelii	–	–	–	+	+	–	–
D.adpressa	+	–	–	–	–	–	–
D.tenuicaulis	+	–	–	–	–	–	–
D.roycei							
Sect. Linschotenia							
D.ramosa	+	–	–	–	–	–	–
D.teres	+	–	–	–	–	–	–
D.atriplicina	+	–	–	–	–	–	–
D.stenostachya	+	–	–	–	–	–	–
D.cinerea	+	+	–	–	–	–	–
D.conospermoides	+	+	–	–	–	–	–
D.krausiana	+	–	–	–	–	–	–
D.discolor	–	–	–	–	–	–	–
D.candicans	+	+	–	–	–	–	–
D.spicigera	+	–	–	–	–	–	–
Sect. Cephalantha.							
D.plumosa	+	–	–	–	–	–	–
D.eriocephala	+	–	–	–	–	–	–
D.wellsiana	+	–	–	–	–	–	–
D.dentata	+	+	–	–	–	–	–

Abbrivations used: Western Australia (WA); Northern Territory (NT); South Australia (SA); Queensland (QL); New South Wales (NSW); Victoria (VIC); Tasmania (TAS); Distributed (+); Not distributed (–).

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