Gymnostachys anceps R. Br.: Australian Range and Habitat in Southeastern Queensland

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ABSTRACT

The range of *G. anceps* in Australia is depicted together with the results of two detailed surveys in southeastern Queensland and at other specific sites. Although occurring in a variety of situations, the plant was most prevalent in open (wet sclerophyll, *Eucalyptus,* hardwood) forest where flowering and fruiting were also more abundant than in closed (vineforests, rainforest) forest.

INTRODUCTION

The first description of *Gymnostachys* and its only species, *G. anceps* (Brown, 1810), was considerably enlarged by Engler (1905), and descriptions occur in various Australian texts and in aroid literature such as Shelton (1980) and Bown (1988). The position of *Gymnostachys* in the Araceae has been discussed by various investigators, including Eyde *et al.* (1967), Tillich (1985), French and Kessler (1989), and French *et al.* (1995).

Gymnostachys anceps is a grass-like plant up to 2 m high (Fig. 1) that is often difficult to see in its natural habitat. A quick first test to distinguish the vegetative plant from somewhat similar-looking plants is to try and break a leaf blade—if not easily broken the plant could well be *G. anceps* because of the strong fiber of the leaves.

AUSTRALIAN RANGE

Gymnostachys anceps is endemic in Eastern Australia (Fig. 2), occurring from about 15°S in the tropics to about 36°S latitude in the temperate zone, mainly on the coast and on coastal and near-coastal ranges in Queensland and New South Wales (N.S.W.). This long geographic strip of over 2,000 km includes summer rainfall areas in the north that gradually change to areas with a winter rainfall in the south.

HABITAT

Various descriptions of the habitat of *G. anceps* have been given in Australian texts. For example, the plant was stated to occur in rainforest and wet tall forests (Evans, 1962); in sheltered gullies and rainforest (Beadle *et al.,* 1972); mostly in rainforests and for cultivation requiring a damp shaded position in well composted

Fig. 1. Habitat of *G. anceps* in open (wet sclerophyll) forest at Carbrook; man's figure is 6 feet (183 cm) high.

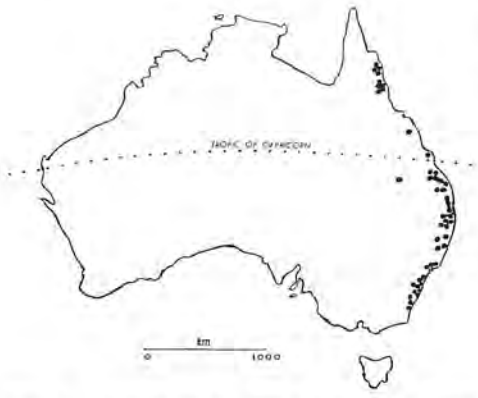

Fig. 2. Range of *G. anceps* derived from locality data of specimens in the Queensland Herbarium and in Evans (1962).

soil (Wrigley & Fagg, 1979). Williams (1979) reported *G. anceps* as an understory plant in moist hardwood forests being most numerous on cool southernly slopes where it is often very plentiful in areas of sandstone ridges where the soils are derived from weathering of sandstone and in cool moist gullies. Cribb and Cribb (1981) described it as occurring in rainforest and wet tall forests. The seeming difference in some of these reports probably owes more to differences in nomenclature for vegetation types than to actual differences in habitat.

VEGETATION TYPES IN SOUTHEASTERN QUEENSLAND

The vegetation of southeastern (SE) Queensland in the area between the coast and onto the Great Dividing Range was classified as two types by Stanley and Ross (1983) viz., 1) open forest, defined as a heterogenous assemblage of plant communities with the dominant trees usually being species of *Eucalyptus*, which may have a grassy or low shrubby understory and which is the most extensive vegetation type in the region; and 2) rainforest, comprising complex mixtures of species with a closed canopy and mostly confined to high rainfall areas on soils derived from basalt and other basic rocks and may be found as fringing forest along streams.

A broad intuitive classification of Australian rainforests based on certain diagnostic features of structure and physiognomy was proposed by Webb (1978). This defined 21 vineforests of which only five occur in SE Queensland (Forster *et al.*, 1991).

Unless quoting from other published work, the terms used here are defined as follows, sometimes qualified for greater clarity but all being simplified terms for complex forest structures:

1) open forest (including both wet and dry sclerophyll, *Eucalyptus*, hardwood);
2) marginal zone (between open and closed forests);
3) closed forest (including vineforests, rainforest).

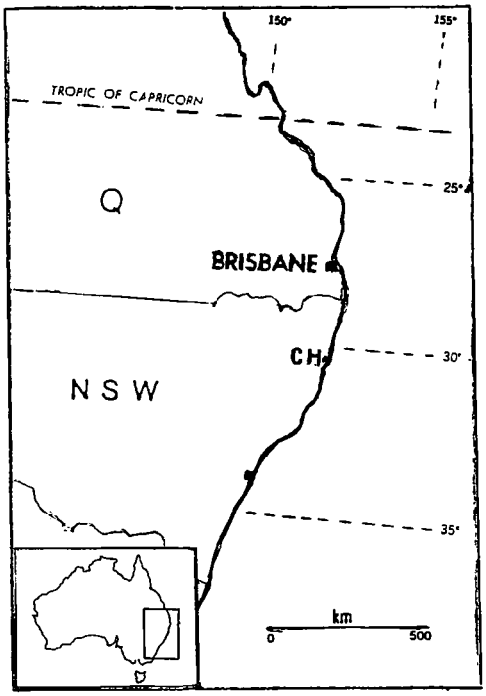

Fig. 3. *G. anceps:* Portion of Eastern Australia including area of Detailed Surveys 1 and 2 and other sites around Brisbane in SE Queensland and at Coffs Harbour (CH) in N.S.W.

SE QUEENSLAND DETAILED SURVEY 1

Detailed distribution maps of the occurrence of *G. anceps* are not available over its whole range. However, Forster *et al.* (1991) carried out a survey of plants of most taxa in closed forest in SE Queensland (Fig. 3) lying between latitudes 23°S and 28°49′S, bounded by longitude 149°45′E in the west and by the Pacific Ocean in the east. In this survey, which did not include open forest communities, *G. anceps* was recorded at 99 (42.6%) of the 232 sites examined. Of the five types of vineforest occurring in the region, *G. anceps* was recorded in four: semi-evergreen vinethicket, Araucarian microphyll vineforest, Araucarian notophyll vineforest and in complex notophyll vineforest, this last category including rainforest as generally understood. Flowering occurred in all months of the year except July with fruiting from January to October inclusive.

SE QUEENSLAND DETAILED SURVEY 2

As part of other botanical work, a survey for *G. anceps* was carried out mainly by L.H.B. in SE Queensland (Fig. 3) in an area lying between latitudes 26°11′S in the north and 27°47′S in the south, and 152°22′E longitude in the west and the Pacific Ocean in the east. This survey area was therefore smaller in extent than that of Forster *et al.* (1991) described above but contained open forest as well as closed forest communities. The survey area extends from the coast onto the Great Dividing Range and includes the Brisbane River Valley and tributaries as well as various coastal ranges. The terrain in many areas is difficult of access, steep, rugged, and difficult to traverse.

The observations were made in national parks, state forest reserves, and on private property, both partially cleared and at present uncleared, at 72 sites, 65 of which were visited by L.H.B., with 18 of these in the period May 1979 to September 1987. Two of the other observations were by G. Leeper, one by L. I. Forsberg, and four (on the south coast of N.S.W.) by A. T. Bofeldt.

The main results of the survey are shown in Table 1. Fifty percent of the sites were in open forest (four in dry and 32 in wet sclerophyll) although occasionally with a few stunted rainforest species; 19.4% of the sites were in the marginal zone, and 22.3% were in closed forest areas (12 in complex notophyll vineforest and three in semi-evergreen vinethicket). Nearly half of the sites (48.6%) were rocky (with stones, rocks, boulders, or scree slopes), and of these nearly two thirds (62.9%) were in open forest areas.

Although not shown in Table 1, 13 of the sites were on sandstone, 12 of which were in open forest and one in the marginal zone; three sites were on basalt and one on shale-derived soil. The geology of the other sites was either not apparent or unnoted. Site situations specifically men-

Table 1. Main results of survey for *G. anceps* at 72 sites.

Sites	%
N.S.W.	5.6
Queensland	94.4
Habitat	
Open forest	50.0
Marginal zone	19.4
Closed forest	22.3
N.i.*	8.3
Condition of site	
Rocky	48.6
Not rocky	22.2
N.i.*	29.2
Plants	
Many (c. 30 & over)	16.7
Some (c. 6 to c. 29)	31.9
Few (up to 5)	16.7
N.i.*	34.7
Scapes	
Present	91.7
Absent	6.9
N.i.*	1.4
Pollen visible	
Present	52.8
Absent	13.9
N.i.*	33.3
Fruit	
Present	73.6
Absent	23.6
N.i.*	2.8
Fruit matirity	
Green	22.2
Green & purplish black	19.4
Purplish black	31.9
No fruit	23.6
N.i.*	2.8

* N.i. = no information.

Table 2. Sites with habitat data with and without fruit.

Site habitat	With fruit No.	Without fruit No.	Total No.
Open forest	31	5	36
Marginal zone	11	3	14
Closed forest	7	9	16
	49	17	66

X_2^2 = 10.7, significant at 1% level.

tioned included nine at the base of cliffs, five in gullies, three on slopes, and one on a hill top.

The number of plants (Table 1) in the "few" category (up to five) were counted, but those in the "some" and "many" categories were estimated. The numbers of plants were neither counted nor estimated in the earliest observations up to 1987, hence the high figure for "N.i." (no information) for some items in Table 1.

Scapes (flowering stems) were present at 91.7% of the sites (Table 1.) The presence of pollen (visible to the naked eye) was not checked in the earliest recordings and at a few other sites ("N.i." of 33.3% in Table 1). However, of the 48 sites where pollen was checked, it was present at 38 (52.8% in Table 1) and absent at 10 (13.9% in Table 1), indicating that some of the scapes may have been either too young for pollen exposure or so old that the pollen had already been dispersed. Of the 38 sites with visible pollen, 25 occurred in the period April to July inclusive.

Fruit was present at 73.6% of the sites (Table 1). The 66 site designations with habitat data with and without fruit are shown in Table 2. Only five (13.9%) of the 36 open forest sites were without fruit, while three (21.4%) of the 14 marginal sites and nine (56.3%) of the 16 closed forest sites were fruitless. A chi-square statistical test comparing observed and expected values on the 66 sites was significant at the 1% level, hence the hypothesis that there is no relationship between site and fruiting is rejected, and it is concluded that site and fruiting are dependent, i.e. fruiting is influenced by the site category.

Fruit maturity, as expressed by the color of the fruit coat (Shaw, 1997) is also shown in Table 1. Although not shown in

Table 3. Observations on *G. anceps* at other specific sites.

Site	Habitat	Plants	Flowering and fruiting
Coffs Harbour Mt. Cotton Woogaroo Slaughter Falls Carbrook	Open forest	Scattered groups and some individuals	Both present on some plants
Kenmore	Open forest but becoming overshaded	1 plant only	Some flowering but later no scapes; observations irregular over 8 years
Kenmore	Open forest but over-shaded	1 plant only	Some flowering but later no scapes; observations irregular over 8 years
Indooroopilly	Edge of closed forest (simulated rainforest) at first receiving some sun, later overshaded	1 plant transplanted from Carbrook; 5 plants transplanted from laboratory (Cranbrook seed)	One scape with only one fruit; later no scapes over 8 years' irregular observations.
Indooroopilly	Closed forest (simulated rainforest); heavy shade	7 plants transplanted from laboratory (Woogaroo seed)	No scapes over 8 years' irregular observations

Table 1, flowering and fruiting were present in all months of the year with most occurring in May (19 sites with flowers and 13 sites with fruit) and least in October and November, with flowering and fruiting at one site only in each month. This fruiting period is longer than that shown in the Detailed Survey 1 which was January to October inclusive. The reason is possibly because the only sites surveyed in Detailed Survey 1 were in closed forest areas, and these sites in Detailed Survey 2 (as derived from Table 2) only had 43.8% (seven out of 16) sites with fruit, whereas the open forest sites had 86.1% (31 out of 36) sites with fruit.

Although not given in Table 1, *Lantana camara* and other alien weeds were noted in 18 (25%) of the 72 sites examined.

The sites specified in the SE Queensland Surveys 1 and 2 are not included in Fig. 1 as the area is already represented on the map.

OBSERVATIONS AT OTHER SPECIFIC SITES

Some other sites, mainly in the outer suburbs of Brisbane and one at Coffs Harbour on the north coast of N.S.W. (Fig. 3), were either visited once or repeatedly but irregularly by D.E.S. and L.I.F.in the years 1986–1995. The sites are listed in Table 3 together with observations on flowering and fruiting.

The plants in open forest sites flowered and fruited whereas those in overshaded areas produced progressively less flowers and fruit or none at all, even over many years. These results support those suggested by Detailed Survey 2 (Tables 1 and 2) where fruiting in open forest (86.1% of the sites with fruit) was reduced in the marginal zone (78.6% of the sites with fruit) and further reduced to half (43.8% of the sites with fruit) in the closed forest areas.

CONCLUDING COMMENT AND THE FUTURE

In SE Queensland *G. anceps* is recorded in open forest, in marginal zones, and in closed forest. The most frequent occurrences were in wet sclerophyll forest, especially at rocky sites and those derived from sandstone. Flowering and fruiting were more abundant and of longer duration in open than in closed forest with little flowering at all under very heavy shade.

Some of the areas supporting *G. anceps* include national parks, state forest reserves, and water catchment areas, so that there is some protection of habitat. Some of the areas, however, are on private property and have been partially cleared, while others are at present uncleared but could possibly be cleared at future dates.

Forster *et al.* (1991) considered that *G. anceps* was not endangered in the area of their survey, as it was recorded in 99 out of 232 sites visited. However, this area involved closed forest communities and only in SE Queensland. Possible threats to the habitat of *G. anceps* in the future include increased suburbanization and spread of alien weeds, such as *Lantana camara,* and introduced pasture grasses and legumes proliferating along roadways and from there extending into some of the open forest communities. The exotic grasses especially may not only be replacing some Australian species but may provide a mass of vegetation to fuel fire. Some of the areas including national parks and private property are subject to occasional wildfires, and state forest reserves and some other areas may also be subject to periodic controlled burns. The question of the survival of *G. anceps* in fire is discussed elsewhere (Shaw, unpubl.), but fires can remove the above-ground parts, and even if the plant survives may prevent the next season's flowering and fruiting. The above comments, although referring specifically to SE Queensland, may apply to some extent at least to the whole range of *G. anceps* as shown in Fig. 1.

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