

INFRASPECIFIC CLASSIFICATION OF NYMPHAEA GIGANTEA (NYMPHAEACEAE)

Kenneth C. Landon

Department of Botany, The University of Texas, Austin, Texas 78712

Abstract

The purpose of this report is to clarify and differentiate as accurately as possible among the various botanical varieties and forms associated with Nymphaea gigantea. The author, having at his disposal the world's largest assemblage of native Nymphaea, including a complete collection of the various described forms of gigantea, has been repeatedly approached by professional colleagues and interested laymen to make available botanical data which might help clarify much of the confusion associated with N. gigantea and its numerous varieties and forms. The present report is a modest attempt in this direction.

INTRODUCTION

It is generally accepted that the genus Nymphaea (waterlilies) constitute one of the most regal, gorgeous and universally admired group of species in the world. No class of plants can compete with the diversity in color, size, fragrance and habit of these plants. They are responsible, perhaps more than any other genus, for attracting the public to botanical gardens and public parks.

During the last 75 years great accomplishments have been realized in the production of magnificent hybrid varieties among waterlilies. Flowers of great size and richness of color and fragrance have evolved through the efforts of dedicated plant breeders. The universally admired hybrids of Dr. George H. Pring, Bory Latour-Marliac, and others have contributed vastly to the great demand and popularity of these plants. One would assume such horticultural improvements over the native species as a whole would render the latter as practically insignificant, and generally speaking this is correct. However, a proverbial exception lies with a seldom seen or known species indigenous to Australia. This species is the great Australian waterlily, Nymphaea gigantea. Despite the improving efforts of mankind, nature itself reigns supreme with regard to this species. N. gigantea with its varied and diversified forms supersede all other nymphaeas with respect to size and overall beauty. Such magnificently splendid flowers

and plants are yet to be equaled among other native or hybrid forms.

Nymphaea gigantea is found throughout New Guinea, tropical and semi-tropical Australia. It flourishes in seasonal rainpools and in many fresh water creeks which flow into several of the northern coastal rivers. In the more arid portions of Northwestern Australia it may be found in lagoons and backwater pools or billabongs.

In its native habitat Nymphaea gigantea is remarkably varied in appearance and structure. From the very beginning of collection and subsequent culture of these plants, confusion quickly arose concerning their correct nomenclature with respect to the numerous infraspecific variants. Most variants in the species were soon and are now botanically ranked as color or botanical forms. Such classifications are undoubtedly correct in some respects but it is the conclusion of the present author that much improvement in the classifications rendered is needed.

Presently there are in existence approximately 8 known primary variations of Nymphaea gigantea that are seemingly different enough from each other to be individually classified at least as botanical forms.

Through the kind and most appreciated assistance of Mr. Evan H. Williams of Alstonville, N.S.W., Australia and the much appreciated efforts of several American collectors and others the author during the summer of 1976 was fortunate in obtaining researching specimens of all the known primary forms of Nymphaea gigantea. These cultivated forms of prime concern and importance are listed as they are generally known in the following paragraphs with abbreviated taxonomical descriptions, pertinent botanical data and conclusions regarding each as to its classification. The forms 1, 2, neorosea and "Albert De Lestang" having been recently imported from Australia are generally if not totally unknown in American collections. Thusly, the author has included more detailed descriptions of these forms than has heretofore been available.

1. Nymphaea gigantea, Hooker f. var. gigantea (typical blue) Botanical Magazine 78: t. 4647. 1852.

Flowers averaging 16 cm. in diameter. Sepals 4, oval or elliptic, green without, having purplish-black lines and dots, inside of sepals sky blue. Petals longer than sepals, sky blue

shading to royal purple at apex and base without, similar but paler in color within. Stamens 500 average. Leaf (of mature plant), narrowly peltate, elliptic, averaging 45 cm. in diameter, green above, brownish-pink to purplish beneath; margin dentate having short acute teeth. Seedlings variable, often varying in floral coloring and overall plant size.

Nymphaea gigantea forma hudsonii (Anon.) Landon, Comb. nov., based upon N. gigantea var. hudsonii Anonymous, Gardening World 20: 756. 1903.

Flowers averaging 20 cm. in diameter. Sepals 4, green to greenish-yellow having very few purple lines and dots without, white within, being lightly tinged with blue towards base. Petals 25 average, outermost and intermediate nearly white throughout except for apex and base being slightly tinged with blue; petals when contrasted against a pure white background indicate a very slight blue pigmentation throughout which is otherwise practically indistinguishable. Stamens 600 average, anthers bright yellow, filaments filiform. Leaf (of mature plant), peltate, obicular, coriaceous, averaging 60 cm. in diameter, pure green to yellowish-green above, green suffused with purple to purplish-red beneath; margins dentate having short acute teeth spaced approximately 5 cm. apart.

This form (which is probably the same as N. gigantea var. hudsoniana R. & H., 1907) possesses many superior characteristics as compared to other forms of the species. The massive flowers are most delicate and lovely with the plant in general being probably the largest nymphaea in existence. Seedlings are noted to rarely come true to type generally producing sports reduced in overall plant size with flowers possessing fewer floral parts.

2. Nymphaea gigantea var. violacea (Lehmann) Conard
(Not N. gigantea var. violacea Backer)

Flowers averaging 13 cm. in diameter. Sepals 4, elliptic, green having very few small purple dots without, inner surface dark violet. Petals 27 average, outermost dark violet or purple, innermost paler in color. Stamens 500 average. Leaf (of mature plant), peltate, elliptic, slightly ovate, averaging 36 cm. in diameter, pure green above, deep purple beneath; margin dentate having short acute teeth.

Dr. Henry S. Conard (1905) in his monograph "The Waterlilies", concluded, gave evidence and listed this taxon as worthy of varietal rank. In a later publication of L. H. Bailey's "The Standard Cyclopaedia of Horticulture", Conrad recognized the taxon as a separate species. Comparative data from growing plants shows the species ranking to be in obvious error. However, I am in complete agreement with Dr. Conard concerning the varietal ranking of this taxon. Self-fertile seed are produced in this variety which produces plants ranging from typical var. gigantea to var. violacea with various intermediates. Flowers of this variety are probably the darkest of the blue or purplish-blue to be found in the gigantea complex. In spite of its presumably mixed heritage as judged by progeny tests, it seems reasonable, horticulturally speaking to recognize the varietal ranking.

3. Nymphaea gigantea var. alba (Benth. & Muller) K. Landon
Comb. nov., - based upon n. gigantea f. alba Benth. & Muller,
Fl. Austr. 1: 61. 1863.

Flowers averaging 9 to 10 cm. in diameter. Sepals 4, elliptic, pure green without, white within. Petals dazzling white appearing cream colored within and without. Stamens 350 to 500, filaments mostly filiform, anthers bright yellow. Flowers opening 3 to 4 days from approximately 2 hours after sunrise until 1 hour or more after sunset (dark). Leaf (of mature plant), peltate, nearly obicular, averaging 35 cm. in diameter, pure green above and below; margin dentate having short acute teeth.

Comparative evidence shows Nymphaea gigantea f. alba not to be merely a color form as generally accepted. If based on the conclusion that the slight variation such as the absence of coloring pigment in the floral leaves was the only primary taxonomical difference then classification of a color form would remain securely founded. However, there are other important and obvious taxonomic differences suggesting the higher botanical ranking of this taxon. As examples; the white flowers are quite separate in appearance and structure as compared with various Nymphaea gigantea varieties and forms. Not only is there a complete absence of coloring pigment in the flowers but the petals are shaped differently being broader, more convex and nearly acute at the apex. A variation in flowering is evidenced by the fact that flowers after opening the second day usually remain opened both night and day upon and after submerging. Leaves of mature plants tend to resemble those of the N. var. neorosea, but lack any coloring pigmentation above and below.

It should be noted that differences between the variety alba as compared to other Nymphaea gigantea varieties and forms are much more distinct and obvious than differences among Nymphaea capensis and its varieties madagascariensis and zanzibariensis, for example. Self-fertile seedlings produce plants more or less identical to the parent and do not tend to segregate in a multitude of forms such as in the var. violacea.

Nymphaea gigantea var. neorosea K. Landon, var. nov.

Var. gigantea valde affinis sed plantis minoribus, petalis roseis (hereditarie constantibus), foliis intense roseis suffusis non cyaneis vel purpureis.

Holotype (TEX): Grown from stock supplied by Mr. E. H. Williams of Alstonville, N.S.W. Australia from Undulla Creek, Queensland, Australia 23 Nov. 1976, K. C. Landon s.n.

DESCRIPTION---FLOWER---6.5 to 13 cm. in diameter opening 3 days approximately 1 hour after sunrise and closing about sunset or 1/2 to 1 hour after sunset (dark). Faintly odorous to inodorous. BUD---Ovoid, rounded at apex. PEDUNCLE---Terete, pure green at base fading to lighter green towards receptacle; rising 12 to 37 cm. above the water. RECEPTACLE---15 mm. long average; yellow becoming green to green streaked with red with age. SEPALS---4, elliptic, breadth 3.5 cm., length 7 cm. average; persistent in fruit. Anterior (outermost) sepal pure green without, possessing numerous maroon lines and dots. Posterior (innermost) sepal with a broad green area in center of back possessing many maroon lines and dots; a wide border (5 to 7 mm.) of rich rose color around the margins narrowing in width at the apex and base of sepal. The lateral sepals in the bud possessing same color and characteristics in apical portion to the base. Lateral sepals with one margin covered being similar in coloring and characteristics to posterior sepal. Lateral sepals with one margin exposed having same characteristics as anterior sepal. Primary veins 9 to 10 with several smaller veins visible at base of each sepal. Inside of sepals rose colored being darker at margins and apex becoming slightly lighter in color at center and towards point of attachment. PETALS ---25 average; outermost elliptic, long, narrowed at the base, obtuse at apex, deeply concave, becoming longer than sepals and not entirely covered by them after first day of anthesis; deep rose colored without, being darkest at apex becoming lighter towards base, similar in color but slightly paler within; 4 outermost petals between sepals somewhat sepaloid evidenced by a narrow ridge of green with numerous maroon lines and dots in center of back;

breadth 2.3 cm., length 5.5 cm. Intermediate petals long, elliptic to oblanceolate tapering at base but being more acute at apex than outermost petals; similar in coloring to outermost petals being generally paler throughout; breadth 1.7 cm., length 6.5 cm. Innermost petals narrowly oblanceolate, acute at apex; faintly tinged with rose but practically white throughout; breadth 1 cm., length 5.5 cm. All petals thin and fragile, finely 1 to 7 nerved, satiny, crumpled in apical portion; fading in color on later days of opening. STAMENS---412 average, intorse upon first day of anthesis being incurved at the summit through an arc of 45 to 90 degrees, outermost and intermediate stamens becoming retorse upon subsequent days of opening; average length 2.7 cm.; separated from petals by approximately 15 mm. of receptacle and inserted densely on upper portion of ovary; anthers bright yellow; innermost anthers as long as filaments, outermost anthers 1/3 as long as filaments; outermost anthers first to dehisce, innermost being last; innermost filaments pale yellow becoming darker in color towards base; outermost filaments white. CARPELS---19 average; green or yellow, distinct from one another, stigmatic over all their upper surfaces; stigmatic basin deeply concave evidenced by carpellary styles curving upward and rising approximately 15 mm. above axile process; Ovules large; SEED---Large, ellipsoid, dark brown somewhat wrinkled in appearance; approximately 3200 per ovary. SUBMERGED LEAVES (from sprouting tuber)---Entire; green above with faint maroon spots, redish-green beneath. First leaf triangular sagittate, angles rounded; apex retuse, sides practically straight, sinus very broad. Second leaf triangular truncate, rounded at apex and at lobes. LEAF (first floating)---Entire, elliptic with deep open sinus, rounded at apex and lobes, green above with maroon spots, underside green suffused with maroon around the sides. LEAF (of mature plant)---Peltate, nearly obicular, slightly ovate, obtuse at apex; breadth 33 cm.; length 35 cm. average; margin dentate possessing short acute green teeth approximately 2 mm. in length and averaging 3.5 cm. apart. Leaf lying flat on the water with teeth at periphery being slightly elevated and angled upward. Upper surface dark green, shiny, slightly veiny. Underside of leaf glabrous, green slightly tinged with rose around margin; veins prominent; primary nerves 8 to 9. Margins of sinus entire, not overlapping but curving out becoming approximately 9 cm. apart at periphery; angles produced to a fine subulate tooth. PETIOLE---Smooth, terete, olive green with redish pigment visible through and beneath epidermis; average diameter 7 mm.; 2 large air canals within, with 2 smaller ones before and behind these; longest averaging 160 cm. in length. RHIZOME (tuber)---Ovoid, nearly spherical, varying in size from 15 mm. to 35 mm. in diameter, contracted above, the vegetative bud arising from central portion of the apex and surrounded by prominent dead leaf bases, basal portion of tuber smooth; larger rhizomes of rough texture being completely covered with leaf and peduncular scars throughout outer surface.

Rose colored forms of Nymphaea gigantea have previously been and are presently rarely found in American collections. Even in Australia natural occurrences of such plants are extremely rare. Generally the rose forms presently cultivated in America, while being attractive, possess certain characteristics leaving much to be desired in respect to floral continuity. This is evidenced by the plant's inability to produce flowers with permanently established coloring pigment in the floral leaves. As examples: flowers of such plants may be rose-colored with previous or subsequent flowers having more purplish or blue coloring. Also, plants producing predominantly rose colored flowers one season may produce blue or purple colored flowers the next season. Vegetative offsets from the same tuber of such plants may render specimens with flowers of varying colors. Historically such floral inconsistencies are seldom encountered in native nymphaea but several of the commercial hybrids especially a few of the N. flavo-virens hybrids represent excellent examples of the phenomenon. Seedlings produced from such plants are especially unpredictable and are seldom, if indeed ever, identical to parent.

Recently, an isolated colony of Nymphaea gigantea with rose colored flowers was discovered in Western Queensland, Australia. The plants were located in Undulla creek between the towns of Condamine and Meandarra. In February of 1975 field botanist K. A. Williams was able to secure and relay specimens to Mr. Evan H. Williams who in turn relayed material to the author for immediate culture. During the summer of 1976 specimens were planted out doors to flower but due to unforeseen horticultural difficulties the plants soon went into dormancy before producing any flowers. A letter received from Mr. Evan H. Williams indicated that he also had failure in producing flowering plants with the same results experienced with plants supplied for culture to the Royal Botanic Gardens of Kew, England. The author devoting his efforts to the difficulty after much experimentation was successful in raising a plant to bud stage. The resulting plant flowered for the first time in America August 20, 1976, producing a new flower every third day. At maturity herbarium specimens were taken from this original plant and placed in the Plant Resources Center at the University of Texas, Austin.

It is not known if the original herbarium specimens of Nymphaea gigantea f. rosea described by Bentham and Muller are synonymous with the newly discovered specimens of Undulla creek. Plants with rose colored flowers collected by Bentham and Muller since 1875 have been and are presently regarded as a color form of Nymphaea gigantea. The accompanying detailed taxonomical data of

rose colored Undulla creek specimens along with actual comparative evidence clearly shows a classification as merely a color form of *Nymphaea gigantea* to be incorrect. Marked taxonomical differences clearly distinguish the Undulla creek plants from others of the species.

Distinguishing characteristics are evidenced in that Undulla creek specimens are always true to color. Floral leaves possess a rich rose pigmentation never carrying blue or purplish coloring. Flowers are always consistent in color continuity. Overall plant size is reduced as compared to others of the species with petioles noticeably smaller in relation to leaf size. Mature floating leaves are thinner in texture than in most other *gigantea* varieties and forms. Self-fertile seed produce seedlings true to type. Probably the most important characteristic of the Undulla creek plants is its mandatory requirement for higher water temperature.

Concerned horticulturists are aware that *giganteas* in general require more heat than most other tropical *nymphaea*. *Gigantea* seed or resting tubers will not commence germination until the required ambient water temperature is achieved and maintained. Young *gigantea* plants subjected to a sudden abnormal decrease in water temperature after a period of warmth are inevitably prone to cease vegetive growth to form resting perennial tubers.

The author has determined that the rose colored *giganteas* of Undulla creek are much more sensitive to cool temperatures requiring more heat than any others of the species. Studies indicate that an approximate mean temperature of 30 degrees Centigrade (87 deg. F.) is required to bring plants to flowering size. Highest daytime temperatures of 33 deg. C. (91 deg. F.) with overnight lows of 28 deg. C. (83 deg. F.) produced excellent results. Temperatures falling below 23 deg. C. (75 deg. F.) sent blooming plants into dormancy within a week. The above temperatures were taken at the axis of the plants which in this case were 20 cm. beneath the water's surface. Surface water temperatures ranged an average of 3 to 4 degrees C. or 5 to 7 degrees F. higher.

It should be noted that all *giganteas* would undoubtedly flourish in the higher water temperatures required by the rose specimens of Undulla creek. However, most if not all of these *giganteas* are easily capable of sustaining lower water temperatures that would send rose specimens into immediate dormancy. The rose specimens of Undulla creek are thusly restricted to warmer waters

while other *giganteas* exist elsewhere as is the case. This distinguishing characteristic with the accompanying taxonomical data and the isolated geographical habitat along with the fact that self fertile seedlings produce plants identical to parent, offer sufficient and conclusive evidence that the rose specimens of Undulla creek are indeed a separate and distinct variety of *Nymphaeae gigantea*.

The following is a copy of Mr. K. A. Williams' field report concerning the var. neorosea of Undulla creek.

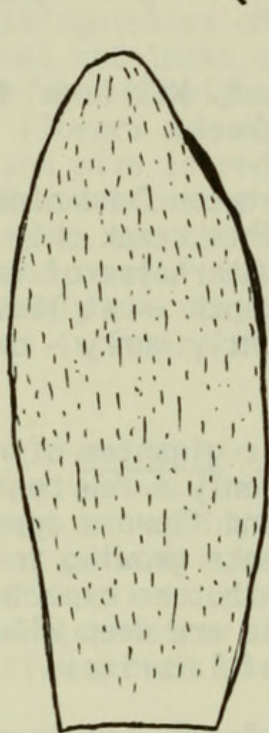
Undulla creek crosses the road between Condamine and Meandarra in South Western Queensland. This creek only flows after rain and then becomes a series of waterholes of varying sizes. Most of the holes appear to have a fair depth -- at least more than two metres. The water is pellucid - slightly murky - owing to suspension of colloidal clay.

The plants form a population of n. gigantea of normal blue colour and the plants grow in water from only a few centimetres to about two metres in depth. Both plants and flowers appear to be influenced by water depth with larger plants growing in the deeper water. This is only personal observation but no experiment has been performed to confirm this. The soils are deep alluvial muds with the surrounding area being largely of laterites.

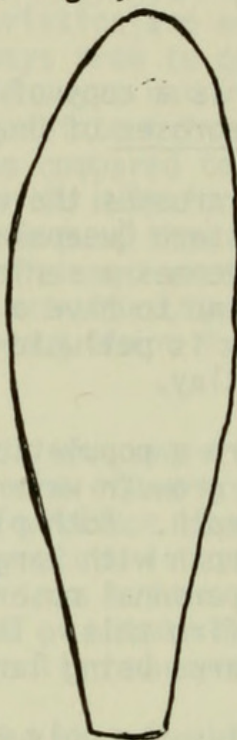
This creek holds the only known plants - at least within the district -- where this pink flowering form occurs naturally. One person, Mr. David Gordon of Myall Park, Glenmorgan, maintains a large garden of native plants and has collected from many parts throughout Australia. He has confirmed that he knows of no other occurrence of a pink form of this water lily. He has collected seed from plants in Undulla creek and has introduced them into an artificial dam on his property which is isolated by many kilometres from the nearest influence of other natural plants. The seedlings have come true to form, with nothing but pink flowering plants being obtained. I have seen these plants which over a period of many years have naturally colonised the perimeter of the dam in which the deepest water is nearly 5 metres in depth. The progeny from the original planting have continued to remain true in the pink flowers.

There have also been similar transplants made on other properties by similarly interested people and these plants have also remained true pink. This information has been communicated to me but the plants have not been sighted.

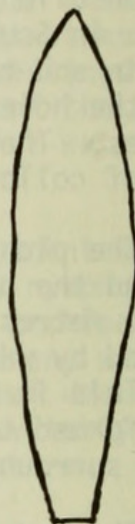
Line tracings of N. gigantea Neurosea
(actual size)



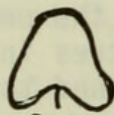
anterior
sepal



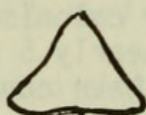
outermost
petal



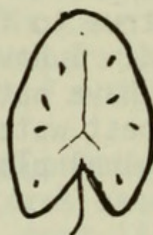
innermost
petal



1st



2nd



1st
floating
leaf

submerged leaves
from sprouting
tuber

Nymphaea gigantea var. gigantea cultivar Albert De Lestang,
Taxonomy:

DESCRIPTION---FLOWER---15 cm. in diameter average, opening 3 days approximately 1 hour after sunrise and closing about sunset. Faintly odorous to inodorous. BUD---Ovoid, elliptic, rounded at apex. PEDUNCLE---Terete, light green rising approximately 40 cm. above the water. RECEPTACLE---10mm. long average, deep red in color becoming redish-green to pure green after submerging. SEPALS---4, elliptic, breadth 4.5 cm., length 8.5 cm. average; persistent in fruit. Anterior (outermost) sepal pure green without, possessing very few purple lines and dots; outer margins tinged with purplish-blue color being lightest at apex becoming darker towards the base. Posterior (innermost) sepal with a broad green area in center of back having very few purple lines and dots; a wide border 1.5 to 2 cm. of purplish-blue being darker at apex and base becoming lighter around the sides and narrowing in width at the apex and base. The lateral sepals in the bud possessing same color in apical portion to the base. Lateral sepals with one margin covered being similar in coloring and characteristics to posterior sepal. Lateral sepals with one margin exposed possessing same coloring and characteristics as anterior sepal. Primary veins 15 average, not easily detected from smaller veins visible at base of each sepal. Inside of sepals white tinged with purplish-blue being slightly darkest at apex and gradually fading in color around margins to the base. PETALS---33 average, outermost petals elliptic tapering towards base, concave; breadth 4.9 cm., length 10 cm.; becoming longer than sepals in length and not entirely covered by them from two days prior to opening; no petals sepaloid; predominantly white in color streaked with purplish-blue without, becoming dark purple at point of attachment; practically white within, tinged with streaks of purplish-blue being darker in color around sides, apex and base; 7 primary veins visible throughout length. Intermediate petals elliptic, more acute at apex than outermost petals; pure white within and without except for purple coloring at point of attachment; breadth 3.8 cm., length 8.5 cm. Innermost petals narrowly oblanceolate; colored as intermediate petals; breadth 1.9 cm., length 7.2 cm. All petals thin and fragile, finely 1 to 7 nerved, satiny, vertically crumpled, wavy or weakly crimped along margins; purplish-blue coloring fading on later days of opening becoming deep rose in color upon submerging. STAMENS---500 average, intorse upon first day of anthesis being incurved at the summit through an arc of 45 to 90 degrees, outermost and intermediate stamens becoming retorse upon subsequent days of

opening; separated from petals by approximately 5 mm. of receptacle and inserted densely on upper portion of ovary; longest averaging 4 cm.; anthers bright yellow, outermost averaging 1.5 cm. in length, innermost averaging 7 mm., outermost anthers first to dehisce, innermost being last; filaments slightly paler yellow than anthers. CARPELS---14 average, yellow, distinct from one another, stigmatic over all their upper surfaces. LEAF (of mature plant) ---Coriaceous; narrowly peltate, obicular ovate or elliptic; retuse at apex; large, average diameter 48 cm., breadth 47 cm., length 49 cm., margin wavy irregularly elevated; dentate possessing short acute yellow (brown tipped) teeth approximately 2 to 3 mm. in length and an average of 3 cm. apart; upper surface yellowish-green, slightly veiny; underside of leaf glabrous, green slightly tinged with brownish-violet, veins prominently reticulate, primary nerves 10 to 11; margins of sinus entire, overlapping within then curving out becoming approximately 10.5 cm. apart at periphery; angles produced to a fine subulate tooth. PETIOLE---Smooth, terete, dark olive green with dark purplish pigment visible beneath epidermis; 12 mm. in diameter, 1 to 1 1/2 meters long average; 2 large air canals within, with 2 smaller ones before and behind these.

This form, like the form *hudsonii*, possesses superior characteristics as compared to other forms of *n. gigantea*. Flowers as a rule are larger possessing more petals being fairly rich in color. Seedlings of this form are seldom identical to the parent, generally producing sports regressive in plant size and richness of floral color.



Landon, K C. 1978. "INFRA-SPECIFIC CLASSIFICATION OF NYMPHAEA-GIGANTEA NYMPHAEACEAE." *Phytologia* 40, 437-448.

View This Item Online: <https://www.biodiversitylibrary.org/item/46706>

Permalink: <https://www.biodiversitylibrary.org/partpdf/176349>

Holding Institution

New York Botanical Garden, LuEsther T. Mertz Library

Sponsored by

The LuEsther T Mertz Library, the New York Botanical Garden

Copyright & Reuse

Copyright Status: In copyright. Digitized with the permission of the rights holder.

Rights Holder: Phytologia

License: <http://creativecommons.org/licenses/by-nc-sa/3.0/>

Rights: <https://biodiversitylibrary.org/permissions>

This document was created from content at the **Biodiversity Heritage Library**, the world's largest open access digital library for biodiversity literature and archives. Visit BHL at <https://www.biodiversitylibrary.org>.