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All illustrations
X 1/12
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Platycerium bifurcatum
in the Wild and in Cultivation
by Ralph H. Hughes

Platycerium bifurcatum (Cav.) C. Chr. is highly variable in growth habit both in nature and in cultivation, and a medley of garden forms are offered by the horticultural trade. Many are easy to propagate and grow from plantlets or "pups" that emerge from the roots of existing plants. This allows for interesting diversity in plant presentation in cultivation as well as an added dimension in the horticultural trade.

This article continues the review of natural habitats and of outdoor culture as reported for P. superbum (Hughes 1982b) with additional observations to aid in growing suitable cultivats indoors. Discussions, as before, are based on harvests from the wild and on plants grown from divisions or spores taken from these plants and from various cultivars growing in the author's garden.

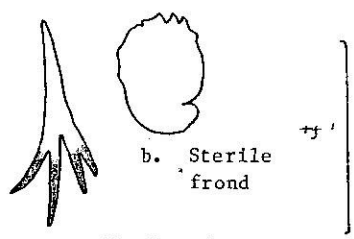
Description

Shield fronds in the wild or on recently imported plants upright, six inches to one foot in height as measured from the rhizome or bud, base pressed close to the substratum, growth late in the season and then turning brown, the upper margin wavy, fringed, and obtusely or deeply lobed. Fertile fronds ascending, semi-erect or nodding, mostly 12 to 15 inches long; stipes (petioles) slender and narrowly lance-shaped, the upper half of the frond typically forked two to three times, with strap-shaped ultimate segments two to eight per frond, to one foot long and one inch wide. Spore patches on the tips, occasionally covering most of the segments and sometimes extending from one segment to another (Fig. 1).

Fig. 1

Platycerium bifurcatum

ssp. bifurcatum var. bifurcatum



a. Fertile frond

b. Sterile frond

Distinguishing characteristics in Australia for the three closely related species as observed by Jones and Clemesha (1978) follow. Synonyms in parentheses denote the recent revision of the genus by Hennipman and Roos (1982).

P. hillii (P. bifurcatum ssp. bifurcatum var. hillii): normal fronds branching in the upper third, the ultimate segments up to 8 inches long and to 2 1/2 inches wide; base of the fertile fronds broadly wedge-shaped; nest leaves shallowly lobed.

P. bifurcatum (P. bifurcatum ssp. bifurcatum var. bifurcatum): normal or fertile fronds branching in the upper half, the ultimate segments up to 12 inches long and up to one inch wide; base of fertile fronds wedge-shaped; nest leaves deeply lobed.

P. veitchii (P. bifurcatum ssp. veitchii): the plant silvery in appearance, fronds thick and lacking protruding veins; spore patches hidden by short, fine hairs until the spores are shed.

Growth is seasonal. Base or shield fronds in southwest Florida emerge mostly from June through November, continue to grow rapidly September through October to a maximum height by mid-winter, turn quickly to chestnut brown, persist intact through the following spring and summer, then gradually become an integral part in support of the plant's root system. Inception and growth of fertile fronds are continuous. Spores are shed anytime, the fronds developing and shedding any season of the year - mostly within two years, but occasionally within three years, from inception.

P. bifurcatum is often difficult to identify because of intergradation (passing into another form through a series of intermediate grades) with other species, particularly with P. hilii in North Queensland, and with cultivated forms of P. hillii, P. veitchii, and P. willinckii in the United States. Identification is complicated by variations in cultivation not known in the wild and vice versa. Such is the case with acclimated individuals and recent introductions observed growing side by side outdoors year long over a period of five to ten years.

As expected, taxa propagated as pups or divisions of cultivars are similar in form and vigor. As a general rule, however, sporelings of cultivars are more variable and less vigorous than the cultivars themselves. Further, offspring of spores from recently collected plants, while of similar form, tend to be weak growers and somewhat dwarfed in cultivation. So many variables are introduced that the exact impact of each cannot be determined. Observations on taxonomy are preliminary and await further study.

In the United States, cultivars for the most part have replaced the species as it is known in nature. Hence it may be conjectured that the staghorn labels here are non-descripts of the trade and that P. bifurcatum in cultivation is an enigma. Nevertheless, continuing observations strengthen the thesis that imports do not persist in the wild form, but rather that they gradually adapt to the local climate and to specific nursery practices.

Some cultivars, particularly wide-leaved forms and those grown in certain regions, as noted by Harry Edie (1977) in Hong Kong, are seldom, if ever, fertile and it is not possible to identify the species with any certainty. Also, juvenile sporelings (these commonly with simple, strap-like leaves) look alike and are not possible to distinguish from one another.

"Staghorn" for the genus Platycerium and "common staghorn" for the species P. bifurcatum are well established usages in the United States (Hughes 1981). Even so, the name "common staghorn" may be ambiguous because the most popular entities are cultivars, locally P. bifurcatum 'Florida' and in the world-wide trade P. bifurcatum 'Netherlands'. Furthermore, the common name applied in the United States is a misnomer in Australia where P. bifurcatum is known as "elkhorn" and P. superbum as "staghorn."

Unnamed specimens under observation collected from the Mt. Fraser-Mt. Lewis-Mt. Spurgeon complex within the somewhat isolated Atherton province of North Queensland appear distinct from P. bifurcatum, P. willinckii, and P. hillii, but with intermediate characteristics, at least until such time as the importations in 1982 became acclimated. Floristically, the region is imperfectly explored and many taxa remain undescribed (Groves 1981).

Habitat

The range of P. bifurcatum is widespread, extending in forested regions from North Queensland to southern New South Wales and Lord Howe Island. Range to the south in Australia is limiteed by increasingly colder temperatures, to the west by scant rainfall and low humidity, and to the north by blending with other species. Many factors control natural distribution, but the significance of the following data is apparent. To the south, P. bifurcatum is found within Plant Hardiness Zone 10 with its annual minimum temperatures of 30° to 40° F, with the occurrence ending within Zone 9 (20° to 30°) below Sydney. To the west its range into interior Queensland and New South Wales lies within areas of more than 30 inches annual rainfall, i.e. to the 30-inch isohyet. In north Queensland, the previously mentioned intergradation of species occurs with P. hillii in the wet lowlands, occasionally with P. veitchii in the moderately dry bush country, and possibly with P. willinckii (P. bifurcatum ssp. willinckii) (not recognized as an indigenous species in Australia) in mountain rainforest. The species per se gradually becomes unrecognizable.

P. bifurcatum that has been reported in New Caledonia awaits confirmation. Those reported earlier in New Guinea were probably cultivated or escaped plants. In habitations bordering on the south Pacific Ocean, including Sun Coast and Gold Coast regions of Queensland and New South Wales, human activity very often prevents the existence of native habitats. Harvested plants are a common feature of home gardens, however, throughout its natural range.

This staghorn is found to have the greatest altitudinal and substrate diversity of any Australian species, as epiphytes in single plants to large masses atop closed canopies of rainforests, in mangroves only a few feet above salt water, on tree trunks in depauperate forests (bush country), and as lithophytes on rough boulders and rock faces near streams when trees or other substrates are absent.

Further, with the possible exception of P. veitchii, the most obvious feature of its ecology is greater endurance to withstand prolonged dry seasons. These features in combination with the species' tolerance to a long temperature range, as judged by its altitudinal and geographical range, allow it to occur in habitats too harsh for the other species.

All epiphytes lack permanent roots in the ground and so have to tolerate small and irregular supplies of water and mineral nutrients. A dry period of several weeks in winter is characteristic of climates throughout the natural range of the species in Australia, particularly in North Queensland. Most distinctive of wet-dry seasons are remote areas of tropical rainforest on easterly slopes of the Great Dividing Range. Investigations in India have shown that a drought of one month has minimal effect on vegetation (Walter 1965). Further, to maintain the tropical rainforest in a seasonal climate, an annual ~~precipitation of at least 90 inches is required with two~~ months drought, and the drought periods must coincide with the cool season of the year.

Drought-induced temporary dormancy in cultivation, made apparent by limp foliage and dull coloring, is mitigated by the simple expedient of hand watering, this assuring new growth and display of good horticultural practice. Growth is resumed whenever rainfalls begin.

In southern Queensland above Brisbane, P. bifurcatum is a prominent feature of forest canopies of the McPherson Range at 3,000 feet elevations, and nearby in the cluster of national parks within the resort area of Mt. Tamborine (inadvertently termed Tambourine Mountains in the literature) at 1.600 feet. The form that is typical of the species and thrives in isolation apart from the mainland on Lord Howe Island occurs from sea level to an elevation of 1,000 feet.

A wide range of substrates in the wild is provided by forest and ornamental trees. These include Araucaria, Archontophoenix, Casuarina, Eucalyptus, Ficus, Jacaranda, Macrozamia, Pandanus, and others, most of which have persistent bark.

Worldwide changes in daylength or photoperiod in cultivation may be discounted as a growth factor. P. bifurcatum, by contrast with species confined in nature to the tropics, ranges from the humid tropics to cool temperate regions, and in clutivation it is long-lived in daylengths as widely varying as those of Malaya and northern Europe. It being cosmopolitan to this degree in distribution and cultivation, the likelihood of an adverse response to daylength would seem remote.

Temperature, Light, and Humidity

The common staghorn fern is classified as semi-hardy in warmer temperate areas, the fertile fronds remaining evergreen with short periods to 25° F. When high humidity is maintained, growth seems to come to a standstill only during cold snaps. It can also withstand occasional temperatures above 100° F as long as humidity is kept high.

In greenhouse culture, P. bifurcatum is a non-hardy fern able to co-exist with hardy ferns at 43° F (Fiddlehead Forum, May-June 1982). In the home, rooms kept cool (below 68° F) support ferns better than warmer ones do, probably because the extra heat means extra dry air.

In Florida, it thrives outdoors yearlong throughout Plant Hardiness Zone 10 and with protection during cold snaps as far north as Orlando in Zone 9b (Hughes 1982). Zone 10 includes Tampa-St. Petersburg, Florida; Brownsville, Texas; and the California coastal cities of Chula Vista, San Diego, Los Angeles, Santa Barbara, and San Francisco. In Australia, it is grown in all the major cities, including Melbourne with its temperature extremes of 28° to 104° F.

P. bifurcatum in Australia grows throughout the range of P. superbum and extends beyond it in all directions. On the approaches to the Lamington Plateau near Brisbane, the upper limit of P. superbum is about 2500 feet above sea level, whereas P. bifurcatum self-propagates atop the range at 3,000 feet in Lamington National Park.

Since it is the most widespread platycerium in Australia, from Cape York to southern New South Wales, and is the most cold hardy, it may be conjectured that the maximum resistance developed in low temperatures is a function of geographical origin, with plants from colder regions showing greater resistance to cold than those from warmer regions, even when these are growing in the same habitat. Its versatility, permitting adaptation, is demonstrated by vastly differing climatic patterns afforded by an oceanic habitat on Lord Howe Island 400 miles offshore as well as the complexities of tropical, semi-tropical, and cool-temperate regions of the mainland.

Recommendations for light vary from low to medium intensities (150 to 500 foot-candles) for sown spore, 200 to 600 foot-candles for juveniles beneath artifical light, and high light (600 foot-candles or more) for larger plants (Hoshizaki 1975). Constant vigilance is needed to assure optimum lighting for individual plants whether grown in direct sunshine, or in the shade of trees, laths, painted glass, or shade cloth, the latter of different grades that give from 30 to 80 percent shade. Growth in size, shape, and color of cultivars may be controlled to a large degree by regulating exposure to light.

Of the different grades of polypropylene shade cloth, my observations are that 30 and 40 percent shade favors narrow-leaved, upright forms. Shades of 50 and 60 percent may be consedered neutral. To maintain forms with large, dark green leaves, 70 and 80 percent shade are good. Consequently, species conversions may be accomplished in horticulture by shifts in light intensity, as for example, P. veitchii to P. hillii, through acclimation from high to low light.

Juveniles whether in the home garden or propagated commercially, benefit from gradual adaptation to increased light. Larger sporelings, divisions of adult plants, and recent imports from the wild likewise are favored by more light than is generally provided nursery stock. Sturdy, more compact plants with larger shields and fertile fronds that are more upright (less pendant) result with increased light while, as noted above, wider darker green leaves are enhanced by increased shading, In high light, the profuse growth of stellate hairs comprise a pronounced light-silvery tomentum. Choice forms also emerge in high light beneath tall trees, particularly P. bifurcatum 'Majus'. Eventual form, therefore, is determined by horticultural practice.

In nature, the plants prefer fairly high light intensity but tolerate moderate shade. They grow in a variety of habitats from high in the exposed crowns of rainforest trees where the plants are exposed to strong light and even direct sunshine, on trunks of trees in fairly open forests on mountain slopes and on rough rock surfaces beneath banyan trees (on Lord Howe Island).

Staghorns prefer more light in the home than many house plants. They want a light, well ventilated spot when brought in, this preferable only as a respite from outdoor cold. If indoors year long, they should have full winter sunlight and curtain-filtered sunlight during the summer.

P. bifurcatum prefers a relative ;humidity of 50 percent to 75 percent, and will tolerate a day-night range of 30 to 100 percent outdoors in seasonable climates. In nature it survives habitat extremes that vary from the exposed upper branches of cloud forest canopies to the rough bark and branches of drought-stricken eucalyptus trees. In colder climates, staghorns will survive a combination of the summer outside and a well-lighted living room to spend the winter indoors. Despite lack of added humidity, they can withstand central heating in the home, where they demand less humidity than other plants.

The exact role of atmospheric humidity in horticulture is elusive and difficult to manipulate. Factors other than humidity that affect transpiration, or water loss, from plants are air movements, air temperature, substratum conditions, growth habits of the plant, an internal factors, The drier the air, the greater the water loss. Growth ceases with temporary wilting and if suppressed long enough the plant dies. All epiphytes lack normal roots in the ground so have to tolerate small and irregular supplies of water.

Cultivation

Observations on cultural needs refer specifically to the three cultivars that are readily available and commonly grown: P. bifurcatum 'Florida', developed locally; P. bifurcatum 'Majus', Florida - California; and P. bifurcatum 'Netherlands' of the trade (Fig. 2).

Established cultivars taken as pups and pot-grown juveniles are best fertilized moderately and only while they are actively growing. Feeding at three- or six-month intervals with slow release fertilizer is satisfactory. Fish emulsion at full strength is equally satisfactory when applied monthly at time of watering or after a good rain.

Where provided a suitable habitat a on bark of trees in a humid, frost-free climate, P. bifurcatum 'Florida' and other acclimated cultivars thrive as epiphytes with little or no supplementary feeding, but they do grow more rapidly if fertilized. Growth is suspended or reduced during periods of drought unless hand-watered and during cold snaps unless protected.

To avoid rot and other disease problems, staghorns should not be fed during periods of hot weather and high rainfall. Prior to application of fertilizer, dead nest fronds (other than current growth) should be cut away, accumulations of litter removed, and good drainage through the substratum assured.

To maintain the wild form subsequent to importation, particular care is needed as too much fertilizer, too high humidity, and too little light will prevent the development of the fern's best characteristics.

Although occasional dry periods of temporary wilting and retarded or no growth will not harm this staghorn, optimum growth and the best specimens are produced when watered generously. With naturally heavy rainfall or overhead irrigation, a well-drained and well-aerated substratum is required to prevent waterlogging and root rot. As a general rule, with temperatures above 50° F or so, plants that are actively growing may be watered at one- to three-day intervals.

For temperatures below 32° F over extended periods, some growers resort to a simulated drought condition of little or no watering in winter (Goudey 1982). For best cold protection in humid climates, other growers maintain atmospheric humidity at or near 100 percent during cold snaps (25° to 40° F) if plants are actively growing (Hughes 1982).

Watering needs are greater for some species than others, and P. bifurcatum and P. veitchii seem to need less frequent watering than other platyceriums.

During the winter indoors, watering an epiphyte can be a problem. A solution is to drench plants once or twice a week in a sink or tub, then to leave them to drain thoroughly before hanging them in a bright, airy place again.

Pests are seldom a serious problem to acclimated garden forms accustomed to the outdoors. Chance sporelings develop without additional care in the author's garden where adequate humidity is maintained. Colonies of ants are a nuisance on occasion in handling larger plants. Sometimes squirrel's digging and the sprouting acorns are damaging to the staghorns. Controls and repellant substances may be needed.

High humidity and limited air curculation in shade structures favor infestations by fungi, bacteria, and algae. For disease problems with any platycerium, Jerry Horne suggests drenching the substratum with Truban and spraying the foliage with Benlate, then placing the plant in front of a fan for several hours to dry excess moisture from the medium. The process should be repeated in ten days. An ounce of prevention is worth a pound of cure, so good air circulation indoors and outdoor ventilation will reduce re-infestation. The grower should examine plants regularly, particularly those in crowded areas.

Low humidity indoors encourages red spider infestations. Their control is obtained with a miticide, such as Kelthane, applied at the rate of one tablespoon per gallon of water.

Horticultural Information

Propagation from spores and by meristem or tissue cultures as noted below is a common practice of commercial nurseries, but vegetatively by offsets of improved forms is the usual method of the home gardener. In Florida pups may be taken anytime, but preferably prior to the start of the rainy season (June through September) when plants are in active growth to give the pups ample time to become well established before growth slows at the start of the winter season. The larger the division or pup the sooner the transplant will establish itself. Best are pups six inches in length or larger and with base fronds six inches in diameter. Offsets with leaves three to six inches in length will also grow when handled in two-inch or larger pots, or on a substratum of comparable size, usually with some losses. Juveniles will establish more quickly with slightly less light and higher humidity than the parent plant is receiving.

If not home grown, cultivars of special merit are best obtained from the grower. This permits scrutiny of the stock plant. Cultivars are recommended because the species P. bifurcatum, as a general rule, is neither a strong enough grower to withstand the rigors of the commercial trade nor is it available from the wild in sufficient numbers to be widely and regularly sold abroad. The species on occasion is available in a dwindling supply of harvested plants of all sizes permitted by the National Parks and Wildlife Service in Australia and sporadically as imported plants in the United States. Importation shock lingers; recovery and adptation to local conditions are possible but not probable in one to two years.

Harvested plants constitute the bulk of the market in Australia and division of stock plants is the usual mode of propagation in Florida. Meristem plants are more common in the California trade as is spore culture in Europe. The trend worldwide is in the direction of spore or meristem propagation. Juveniles of a 4-inch pot size or this equivalent on wood plaques with the staghorn label are sold in department stores or garden centers. For the most part, these are propagated in artificial light in a heated greenhouse and as a general rule become nondescripts of the trade. On occasion they proved interesting subjects for the non-discerning gardener. Grotesque and unusual forms create conversation pieces.

Regeneration through division of the parent plant assures retention of characteristics inherent to the cultivar, whereas propagation by spores as a rule displays the array of variables representative of the species. Examples of the latter are volunteer sporelings at nurseries and normal variations in the wild.

A characteristic of the most popular cultivars is that they are propagated easily through division of the clusters or by removal of offsets. On the other hand, the development of choice cultivars through spore culture at best is a slow and tedious undertaking beset by pitfalls too numerous for these plants to be of interest to other than the commercial grower or confirmed hobbyist.

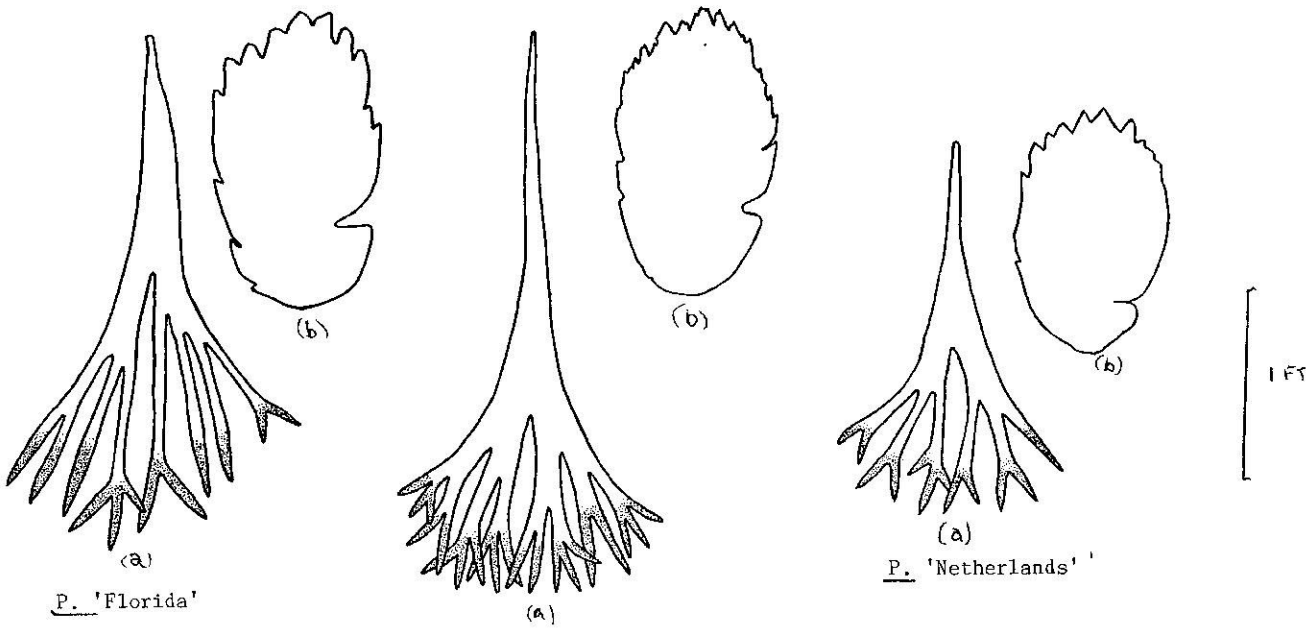
Propagation of plants from the wild is a case in point. New plants from offsets were produced in about half the time needed for sporeling of equal size. Spores sown October 1978, transplanted five times, and plaqued December 1980, on occasion had set new pups by December 1981. These pups were full size a year later (December 1982). Looking ahead, if spore-bearing fronds are produced in 1983, elapsed time to grow mature plants will be five years for sporelings to complete the life cycle and three years for offsets.

However, reputable cultivars are produced in commercial quantities by means of spores. Production for the world market is centered at Aalsmeer, Netherlands. For Platyceriums the market for the most part consists of three items: (1) P. bifurcatum 'Netherlands', sometimes as P. regina wilhelmina, (2) P. vassei a dark green form, sometimes as P. alcicorne, and (3) P. superbum, also offered as P. grande. Small plants are available in sizes suitable for transplanting into 2 or 3 inch pots. Even with expertise in handling the plantlets and establishing them in their growing quarters, there is considerable loss. As an example, 25 of 100 twice transplanted (2X) P. bifurcatum 'Netherlands' imported in April 1977 had fertile fronds that averaged 30 inches in length and shields 24 inches in height in 1981; offsets began appearing in 1980. Propagations were remarkably uniform.

Observations reveal that, when grown under optimum lighting, both commercially propagated Aalsmeer sporelings and those from plants imported from the wild are relatively stable. When compared with sporelings of collected P. bifurcatum, those produced in Europe (P. alcicorne of trade and P. 'Netherlands') were twice larger, darker green, the normal fronds wider and with more ultimate segments. Vegetatively grown offspirng (from pups) closely resembled qualitiies of the parent plants.

Growth response to exposure differs from one cultivar to another. P. bifurcatum 'Majus', as an

Fig 2. Platycerium bifurcatum cultivars
a. Fertile fronds
b. Shield fronds



example, adapts easily to full exposure outdoors in southwest Florida. In three to five years, from a pup of five to seven years from spore, the exposed new growth on average consists of relatively short, stubby, nearly vertical fertile fronds 20 inches in height and shields 12 inches tall. In partial ;shade of tall oaks (Quercus laurifolia Michx.), the fertile fronds with ultimate nodding segments average 30 inches in length and shields 12 inches tall. Fronds of single speciemns, with offsets removed as they appear, are slightly larger than fronds in clusters. Form of the sun-grown cluster resembles P. veitchii, the silver staghorn of Australia, when grown side by side, whereas shade-grown P. bifurcatum 'Majus' is a dark green form.

Acclimation as a sun-grown specimen is best begun at the close of a high-sun season whereby plants are attuned to the transition in a year or so. Most large-leaved cultivars, as P. bifurcatum 'Netherlands' and P. bifurcatum 'Florida' are permanently damaged by mid-day exposure June through August (January through March in the southern hemisphere). Growth is retarded and yellowish green, and misshappen fronds may develop. The nodding fronds burn on the bend. Both cultivars are prolific, pup freely, and grow rapidly in partial shade.

Where eventual size is a potential problem, as in the case of house plants, the native species (Fig. 1) and cultivars of comparable size, particularly the latter, are recommended because of their adaptability to adverse conditions and substratum limitations. Juveniles growing back-to-back on a hand-sized piece of treefern fiber persist several years to form a ball less than a foot in diameter, with occasional pruning of emergent leaves. A gregarious species, clusters of ten to 100 plants with fronds 12 to 15 inches in length are common in the wild. Accordingly, in cultivation, pups frequently double in number annually. A single mounting on a 1-foot board in three or four years accommodates a cluster of eight to 12 plants.

Acknowledgements

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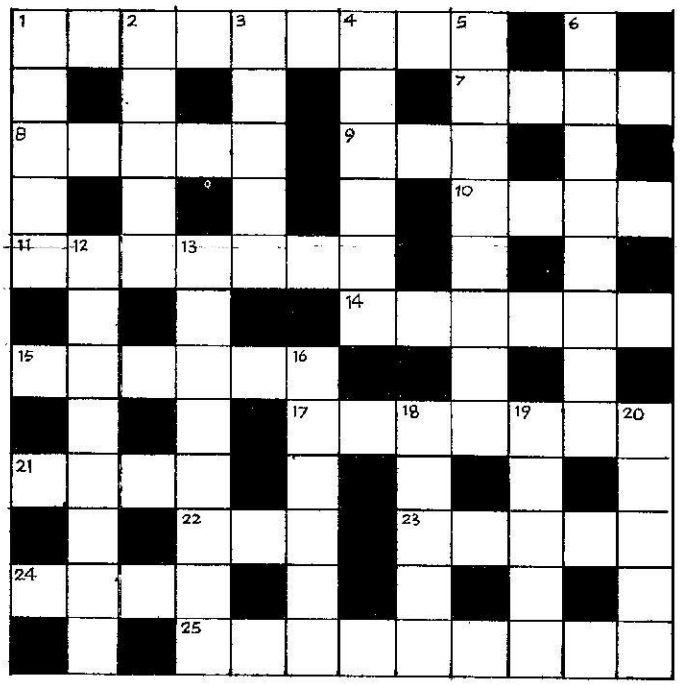
Fern Fun

Our Potpourri of Pteridological Ptrivia

You have double meanings here to insure that you have the right word - or else an anagram here and there to certify it - so count the letters in word combinations for a clue.



ACROSS

1. Hey! Export it - it's a resurrection fern? (9)
7. When raindrops do this you're drenched to the - skin (4)
8. 16th Century Flemish Botanist of genus fame (5)
9. Mixed-up first German person is a Greek character (3)
10. It's a deal! With 'com' and 'im' a solid blow (4)
11. Fern genus named for an American pteridologist (7)
14. Look out! It's a dangerous game (6)
16. Mama mia Sam - it's disgusting (6)
17. The flow masters a Marsilea habitat (7)
21. It needs Al to make it an annual affair (4)
22. A French king (3)
23. In spite of everything a piece of fern (5)
24. She's something special but don't tell her (4)
25. More pages won't clarify its reproductive function (9)

DOWN

1. Conducting tissue (5)
2. Package it again or be cross (5)
3. Only P marks the post (5)
4. State flowers of New Mexico (6)
5. One of those airy ferns? They pipe down (8)
6. No elm bunch looks like this fern (8)
12. Am I a nut? D-- it! Of course it's a fern (8)
13. Sounds as though someone wants to wipe out these Clubmosses (8)
15. From the standpoint of royalty it's questionable (6)
18. Call them what you like they still smell sweet (5)
19. I'm a no good acid (5)
20. Vascular bundles (5)

Knife blade Solution

Across

1. Xerophyte (Hey! Export); 7. Pelt: 8. Lobel: 9. Chi (Ich) 10. Pact (Impact\Compact); 11. Maxonia: 14. Spying; 15. 16. Miasma (Mia, Sam); 17. Streams (masters) 19. Annua -Al; 22. Roi; 23. Stipe; 24. Lulu; 25. Megaspore (More pages)

Down

1. Xylem; 2. Re-box (or be X); 3. Pylon (Only P); 4. Yuccas; 5. Epiphyte (They pipe); 6. Blechnum (elm bunch); 12. Adiantum (Am I a nut D-); 13. Obscurum; 15. Asking (as king); 18. Roses; 19. Amino (I' a no); 20. Stele.

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