Macrozamia spiralis

by Paul Kennedy

Macrozamia spiralis (Section Parazamia) is a small cycad that is endemic to New South Wales. It has a fairly widespread distribution range and can be found growing in both coastal areas and on the inland ranges--it is thus somewhat unique as only one other cycad, *M. communis*, has a distribution range which extends from the narrow coastal plains belt over the Great Dividing Range into inland areas of New South Wales.

Macrozamia spiralis grows near Richmond, which is situated approximately 50 km to the west of Sydney, in areas of flat, poor quality, often sandy, soil.

Richmond (elevation 20 m) has an annual average rainfall of 799 mm, spread over 112 rain days, with winter minimum and summer maximum temperatures reached at least once per week during July and January of minus 1.7 and 34.4 degrees C, respectively. Frosts occur on an average of 43 days per year.

One-third of the annual average rainfall at Richmond falls during summer, with the balance of the rainfall being spread fairly evenly, on a seasonal basis, over the rest of the year. The seasonal rainfall pattern is as follows: Summer 33%; Autumn 27%; Winter 19%; and Spring 21%.

This species has been, and, to some extent, still is, the subject of some confusion, even in Australia, for several reasons:

first, prior to the 1959 revision of the nomenclature of Australian Zamiaceae by Dr. L.A.S. Johnson, the species now known as *M. communis* was known as *M. spiralis*,

second, a locally occurring "dwarf" *M. communis* plant, which grows in the same general distribution range as *M. spiralis*, has been mistakenly identified by some enthusiasts as *M. spiralis*, and

third, until very recently, one of Sydney's larger Seed Merchants listed *M. communis* seeds as "*M. spiralis (communis)*."

The principle characteristics of *M. spiralis* are as follows:

- a subterranean caudex,
- moderately spirally twisted fronds,
- entire pinnae with a more or less flat surface, but with juvenile fronds having apical tooth pinnae,
- pinnae which are angled slightly forward on the rachis and which then rise at an angle of approximately 30 degrees to form a very broad "V"-shaped profile,
- pinkish/red calluses at the base of newly emerged pinnae, and
- reddish colored seeds.

The average number of fronds per plant ranges from about six-eight, with some plants having as few as two fronds, ranging up to a maximum (which I have seen) of 17 fronds. The above ground height level of the fronds ranges from an average of approximately 0.6 m to a maximum of approximately 0.9 m.

Female cones are usually solitary, though plants with two cones are not uncommon. Male cones range from one to four per plant.

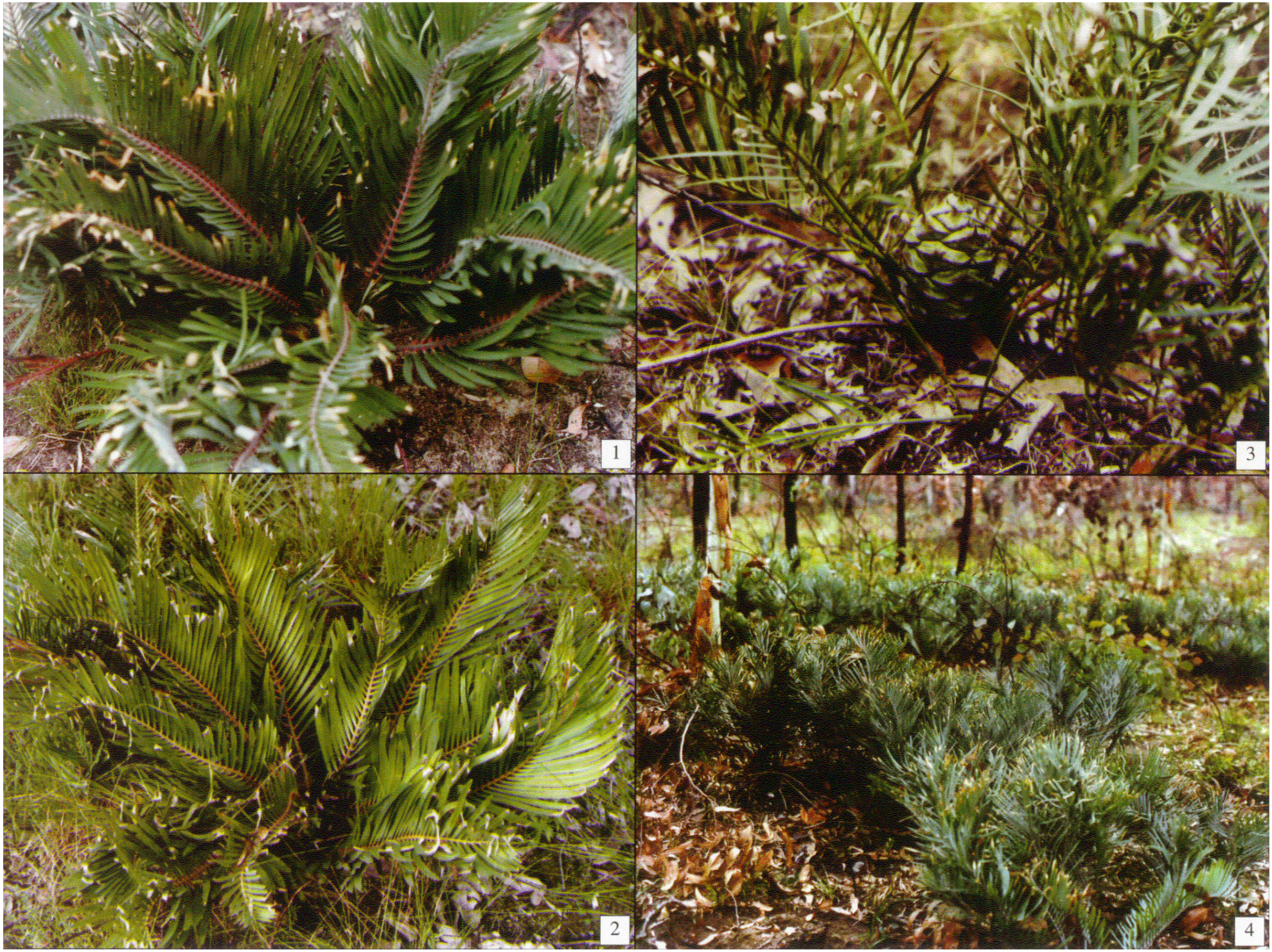
This cycad (along with most other Section Parazamia species) produces new fronds very infrequently in the wild. New fronds when produced (invariably after a fire) are an extremely attractive blue/gray color, with distinctive pinkish/red calluses where the pinnae join the rachis (see plate, photo 1). Over a period of time, however, the frond color changes from blue/gray to green, and, likewise, the calluses also undergo a color transformation and change from pinkish/red to a yellowish or creamy-white (see plate, photos 2 & 3). Occasionally, new fronds, as they emerge from the caudex, are a striking bronze/yellow.

Plants in habitat locations are extremely attractive when new fronds are produced, though they become less attractive as the frond color changes with the passage of time and a deterioration in the general condition of the fronds often occurs as a result of damage caused by leaf rolling insects.

Macrozamia spiralis normally grows under a eucalypt canopy in a pattern of scattered individual plants or, occasionally, small groups or clumps of plants. These small groups of plants contain as many as 10-12 plants growing within a 2 m radius, while the largest clump which I have sighted con-

Figure Legends: for Plate, opposite

1. Macrozamia spiralis - *plant in habitat with new fronds. Note vivid reddish calluses.*
2. Macrozamia spiralis - *same plant as in Number 1, several months later. Note color change of fronds and calluses.*
3. Macrozamia spiralis - *Old plant with female cone.*
4. Macrozamia spiralis - *Clump of plants with new fronds (after fire).*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tained about 40 plants growing in an area measuring approximately 2.5 x 5.0 m.

The reason for this clumping tendency is somewhat intriguing, though I suspect that it is simply the result of seeds germinating and growing to maturity in close proximity to parent plants, while the reason for the scattered individual plants is probably attributable to seed dispersal by marsupial animals.

Occasionally, a plant will be found with multiple heads--possibly due to prior damage to the upper part of the caudex. One such plant which I have seen had seven separate heads of fronds, giving the effect of a very leafy specimen, albeit with reduced size fronds.

Coning is erratic, but seems to occur every three-four years, often with a large percentage of plants within the population taking part in the coning cycle. In intervening years few cones, either male or female, are produced.

On an affinity basis, *M. spiralis* has a degree of relationship to *M. flexuosa*--but is readily distinguishable from that species by virtue of its spirally twisted fronds and flat surfaced pinnae compared with the multi-twisted fronds and concave surfaced pinnae of *M. flexuosa*. In very rare cases, *M. spiralis* plants are found with one or two multi-twisted fronds, typical of *M. flexuosa*, but such instances are considered to be of an aberrant nature.

To a lesser extent, *M. spiralis* is also related to *M. secunda*, though it is easily distinguished from that species which has fronds with arched rachises and sharply recurved apical sections and, also, pinnae which rise from the rachis at an extremely acute angle, sometimes almost vertically.

On the lower slopes of the Blue Mountains, a variety of *M. spiralis* (or, perhaps, a new species?) can be found growing. These plants, known in Sydney botanical circles as "robust *M. spiralis*," are much larger and have more fronds than the plants which grow at Richmond, being akin in size to small to medium-sized *M. communis* plants; however, they have typical *M. spiralis* features, such as spirally-twisted fronds and reddish calluses at the base of the pinnae.

As mentioned previously, confusion has occurred (an apparently still exists--more so outside of Australia) with the identification of *M. spiralis* and *M. communis*. Distinguishing the two species is relatively easy, purely on a size basis, as *M. spiralis* is a small cycad with an average of six-eight fronds standing up to approximately 0.6 m above ground level, whereas *M. communis* is a large cycad with up to 100+ fronds which can extend up to 2.4 m above ground level.TCS

More on Cold Hardiness in *Cycas revoluta*

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There have been two recent articles in The Cycad Newsletter alluding to the cold hardiness of *Cycas revoluta*: "A New Dawn for Kew's Cycads?" (Tony King, Sept. 1997) and "Trash Pile Cycads" (Marie Standifer, March 1997). I would like to report that this species recently survived 3°F to 9°F here in southern New Mexico.

I bought an approximately three year old plant of *C. revoluta* in Florida a dozen years ago. It has grown steadily and this past year had a ten inch tall caudex and two whorls of fifteen leaves each. I have always grown it in a pot. For almost a decade, it sat in my driveway in Washington, D.C., coming indoors to the basement during only the coldest days of the year. I always found it particularly beautiful when snow covered. I would bring it indoors when the temperature got down to the mid to lower teens (Fahrenheit).

Since moving to southern New Mexico (a half hour from the Mexican border) three years ago, I have left this plant out all year long. A cold spell surprised me in early January 1977 when the temperatures plummeted to single digits. The reported low temperatures varied anywhere from 3°-9° F. I am not certain of exactly what temperature this plant experienced, as I did not have a thermometer. Helping to warm it was the fact that it did have some walls nearby. Helping to cool it was no surrounding vegetation and the fact that I lived about a hundred feet in elevation above the Rio Grande Valley. Also, keeping this plant in a pot probably exposed the roots to more cold than it would have experienced had it been planted in the ground.

After this severe (for here) freeze, all the leaves of my plant immediately turned a ghostly whitish-green. I am virtually certain that the leaves were no longer photosynthetically active. Part of the damage to the chloroplasts could have come from photoinhibition, as the plant had an eastern (morning) exposure. Does anyone know of research into whether cycads suffer from photoinhibition? The leaves finally turned the usual yellowish color of dead leaves only in late May and June. The plant remained dormant until around the first of September, with the stem/caudex remaining turgid throughout. In past years, this specimen has been leafless for at most five months, and not the nine months that it endured this year. Around the first of September, I noticed some yellowish felt starting to grow near the apical meristem. A few weeks later, a contorted and somewhat malformed whorl of ten leaves emerged. All the new leaves are very