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KINGIA'S REMARKABLE ROOTS

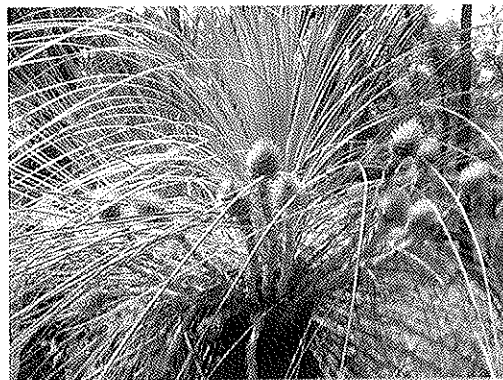
Katherine Baker

Kingia is a type of grasstree that has only one species, *Kingia australis*. It is endemic to the south-west of WA and mainly occurs in wetter shrublands, woodlands and forests between Perth and Albany, although populations also occur in the Lesueur National Park. They look slightly like another type of grasstree, *Xanthorrhoea* sp., but differ in having multiple flowering spikes with rounded heads. *Xanthorrhoeas*, in contrast, have a large single flowering spike at the end of branches. Even though these plants are all grasstrees, they are actually in different families, *xanthorrhoeas* are in the *Xanthorrhoeaceae* whereas *kingias* are in the *Dasypogonaceae*. The *Dasypogonaceae* was recently featured in *Western Wildlife* (October 2007) because it is an ancient family. *Kingias* are also interesting because they have an amazing anatomy, their roots grow from their shoot tips taking many years before they reach the soil. This is found in no other type of grasstree in Australia.

In these unique plants, up to 50 roots form in a ring at the growing



Kingia australis tree, and close-up of flowering spikes.
Photos: K. Baker.



tip of the stem and then grow downward at the rate of 2 cm a month, between the true stem and persistent leaf bases. Thus these plants have concealed aerial roots that are not visible simply by looking at the plant. Plants that are less than one metre tall form roots each winter, whereas plants taller than one metre only develop roots in response to fire. Root primordia (roots in their earliest stage of development) can remain dormant for up to 60 years in the absence of fire.

Having roots arising from the shoot apex, rather than the base of plants as is normal, allows *kingias* to grow taller and live longer than would otherwise be possible. *Kingias* are monocots and hence do not form secondary thickening (wood) in their stems. However, the roots form girders around the stem which increases its strength. Thus *kingias* can grow up to eight metres tall even though their stem is pencil thick at the base. The formation of roots from the shoot apex also enables these plants to remain alive even after the stem base starts to die. These plants have been recorded to live for more than 400 years.

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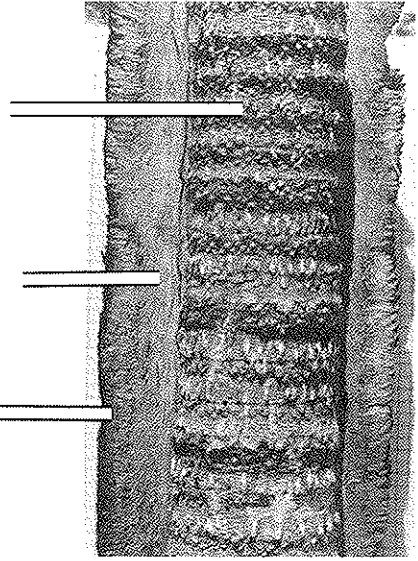
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Kingias

Primary stem with roots removed showing annual growth increments (depicted by changes in the width of the stem)

Roots descending around the primary stem (not woody)

Leaf bases



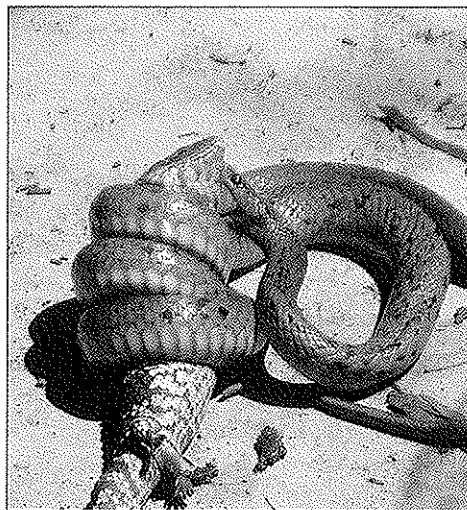
Although a number of Western Australian species have persistent leaf bases, kingia is the only one to use them as a source of nutrients. This is partly because of the unique location of the roots between the stem and leaf bases. Moisture is also derived from the kingia leaf bases. These features help this species survive in an environment with dry summers and nutrient-poor soils. Acquiring nutrients and moisture in this way is beneficial because most of the roots that reach the soil do not grow laterally, where nutrient levels are highest, but vertically. Furthermore, the amount of water and nutrients available in the leaf bases is greater than that in an adjacent equal volume of soil, especially during summer. Not only do the aerial roots help these plants survive dry conditions, it also enables these plants to grow in waterlogged soil because the plants can take in oxygen through their aerial roots.

Thus *Kingia australis* is a very unique species. Next time you see one of these plants in the bush you can marvel at the fact that beneath the leaf bases are roots that are growing from the shoot tip (sometime if you look carefully you can actually see rootlets among the leaf bases). They not only gather nutrients and moisture from the leaf bases, but also support the structure

of the plant and contribute to their great longevity.

Most of the information in this article was sourced from: Lamont, B. B. (1981). Morphometrics of the aerial roots of *Kingia australis* (Liliales). Australian Journal of Botany 29: 81-96.

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Thanks Leah for this fascinating piece of natural history!