Livistona chinensis, a Semi-Naturalized Palm of Swamp Forest in Subtropical South Africa

STEFAN J. SIEBERT A.P. Goossens Herbarium School of Environmental Sciences and Development North-West University Private Bag X6001 Potchefstroom 2520, South Africa Stefan.Siebert@nwu.ac.za

Despite numerous exotic plant species (ca. 915 taxa) becoming naturalized in South Africa, no records suggest that any of the approximately 400 palm species cultivated locally have followed suit. This paper reports on *Livistona chinensis* as the first palm species to become semi-naturalized in South Africa after 100 years of extensive cultivation along the eastern seaboard.

The first palm to be regarded as naturalized in South Africa, was *Borassus aethiopum* (Selati Palm) from Tropical Africa (Dyer 1952). However, these days its occurrence in Limpopo is accepted by most to be indigenous, and the most southern outlier population of the species in Africa (Esterhuyse et al. 2001, Glen & Archer 2006).

Only six palm species are indigenous to South Africa (Glen & Archer 2006), probably due to prevailing temperate conditions that are unfavorable for tropical taxa. It is therefore not surprising that no non-indigenous member of the Arecaceae has previously been regarded as naturalized in South Africa (Henderson 2006). Habitat conditions along the sub-tropical eastern seaboard of South Africa do, however, prove to be favorable for colonization by tropical palm species. An example of encroachment by a tropical palm in this region is that which resulted from the planting of Raphia australis (Kosi Palm) at Mtunzini in Zululand, KwaZulu-Natal, approximately 300 km south of its natural southern distribution limit at Kosi Bay in the same province. The palm was regarded as a useful stream-bank stabilizer and was subsequently planted in swamps, where large groves have successfully established in dense stands. It spreads rapidly, its seed dispersal aided by palmnut vultures and vervet monkeys, and is generally regarded as an encroacher species that excludes typical swamp forest species due to its large size (20– 15 m) (Peckham & Van Jaarsveld 1989).

This paper reports on another palm that finds the habitat conditions of swamp forest favorable, namely *Livistona chinensis*, an exotic palm species that has escaped from cultivation to become semi-naturalized in South Africa.

Species treatment

Livistona chinensis is indigenous to Japan, China and several islands in the South China Sea; its distribution is reflected in its common names, Chinese Fan Palm or Chinese Fountain Palm. In Japan, *Livistona chinensis* reaches its most northern distribution limit on Aoshima, the 'islet of the Gods', and here a rare virgin forest of this palm is regarded as sacred (Yoshida et al. 2000). The palm is well known in Chinese medicine, as the fruit and seed have a potent anti-angiogenic and anti-tumor activity (Sartippour et al. 2001).

Chinese Fan Palms are tall (4–6 m), singlestemmed and with a dense crown of divided, fan-shaped and pendulous fronds (Fig. 1). It is a hardy palm able to survive extended dry periods. Its natural habitat is open forest and it can therefore tolerate sunny conditions. Sessile flower clusters are borne during late summer on 5–7 inflorescences held within the crown. Flowers are followed by mature oval or round fruit that turn from green-blue to chinablue-gray when ripe.

Discussion

Livistona chinensis was brought to South Africa as an ornamental during the early 1900s (Esterhuyse et al. 2001). Since then it has become a common feature of coastal gardens of urban centers along the subtropical east coast of KwaZulu-Natal.

The sites where *Livistona chinensis* has now become naturalized fall within the core area of the Maputaland Centre of Endemism (Van Wyk & Smith 2001). Many aggressive alien invasive plants such as *Chromolaena odorata*, *Lantana camara* and *Melia azederach* are already problematic in this part of northern coastal KwaZulu-Natal (Henderson 2006). This palm is also recorded as naturalized in coastal areas of the USA (Oppenheimer 2003).

When the palm's non-invasive behavior for 100 years is considered, the question arises,

1. Livistona chinensis in situ: swamp forest along the uMhlatuze River near KwaDlangezwa. Photo: S.J. Siebert.



Table 1. Number of individuals recorded per size class for each naturalized population.				
Size classes	KwaDlangezwa	Ngwelezana	Thulazihleka	total
0–1000 mm	78	18	12	108
1001–2000 mm	15	7	2	24
2001–3000 mm	4	1	2	7
3001–4000 mm	1	0	1	2
>4000 mm	1	1	0	2

how did it manage to disperse its seed to more favorable shady, moist conditions in surrounding natural forest vegetation in recent years? Despite various visits to palms in fruit, no natural dispersal vectors were noted. Corlett (2005) recorded seven indigenous bird species that took fruit from non-indigenous *Livistona chinensis* in Hong Kong. However, he concluded that seed dispersal by birds and/or fruit bats is a necessary, but not sufficient, condition for the naturalization of fleshyfruited plants.

Further visits to collecting localities revealed evidence of garden refuse dumping at all sites. Therefore, human behavior seems to be the main dispersal agent. When masses of seeds are swept from pavements and dumped in favorable, moist conditions, there exists a chance for at least some seedlings to reach maturity. Seeds germinate readily within two to three months. Further self dispersal of seed is localiszd in proximity to the mature individuals, forming dense monocultures of seedlings on the forest floor (Table 1). An individual plant can produce on average 3000 seeds per annum (n=10). If the natural germination viability is modestly estimated at 1%, 30 seedlings will germinate from the seeds of a single palm annually.

Naturalized populations of Chinese Fan Palm occur at an altitudinal range of ca. 15–120 m above sea level. In situ it is regularly associated with an indigenous palm, *Phoenix reclinata* (Wild Date Palm), and tends to prefer forested areas along seepages characterized by large individuals of the tree species *Bridelia micrantha, Ficus sur, Trema orientalis, Trichilia dregeana* and *Syzygium cordatum*. Here in the

2. A dense stand of *Livistona chinensis* seedlings within a 10 m radius of the adult plant at Ngwelezana. Photo: S.J. Siebert.



subcanopy it occurs with other problematic alien or invader species such as *Canna indica*, *Nephrolepis exaltata*, *Odontonema strictum*, *Passiflora edulis*, *Pereskia aculeata* and *Psidium guajava*. A size class analysis of the palm populations suggest that the subcanopy surrounding a mature individual is dominated by palm seedlings of less than 1 m (Fig. 2). Could this be the slumbering cohort of a potential invasive alien?

There is also an urgent need to assess the invasive status and potential of other cultivated palms in South Africa. For instance, Butterfly- or Golden Cane Palm, Dypsis lutescens, holds a major threat to the subtropical coastal region of South Africa. This species is native to Madagascar and widely cultivated due to its artistic clumping nature, yellowish crownshafts, arching, pinnate fronds with drooping leaflets, and light-green bamboo-like stem with yellowish node scars. This palm is hardy and once established, can tolerate dry conditions. It flowers in December, is pollinated by bees and then produces masses of yellow fruit with fertile seed. Seed germinates readily and en-masse after eight weeks. In a clump, each stem can produce two to four inflorescences, which can carry approximately 1400 seeds (n=10). In gardens these palms usually have on average ten stems (n=10) resulting in a total fruit set per plant of approximately 14,000 per year. If germination viability is modestly estimated at 1%, 140 seedlings will germinate from the seeds of each palm every year. Although no birds have been noted taking seed from observation sites, the semi-sweet smelling fruit that fall to the ground are consumed whole by domestic dogs and vervet monkeys.

VOUCHER SPECIMENS

SOUTH AFRICA: KwaZulu-Natal: Empangeni, KwaDlangezwa, swamp forest along the uMhlatuze River, *Siebert 2456* (ZULU, NH, PRE); Empangeni, Ngwelezana, swamp forest along the uMhlatuze River, *Siebert 3188* (ZULU); Richards Bay, swamp forest along Thulazihleka Pan, *Siebert 3499* (ZULU).

LITERATURE CITED

- CORLETT, R.T. 2005. Interactions between birds, fruit bats and exotic plants in urban Hong Kong, South China. Urban Ecosystems 8: 275–283.
- DYER, R.A. 1952. A note on the distribution of the palms of South Africa with special reference to *Borassus* in the Transvaal. South African J. Sci. 48: 215–220.
- ESTERHUYSE, N., J. VON BREITENBACH AND H. SOHNGE. 2001. Remarkable Trees of South Africa. Briza, Pretoria.
- GLEN, H.F. AND C. ARCHER. 2006. Arecaceae. In G. GERMISHUIZEN, N.L. MEYER, Y. STEENKAMP AND M. KEITH (eds), A checklist of South African plants. Southern African Botanical Diversity Network Report No. 41: 873–874. SABONET, Pretoria.
- HENDERSON, L. 2006. Comparisons of invasive plants in southern Africa originating from southern temperate, northern temperate and tropical regions. Bothalia 36: 201–222.
- OPPENHEIMER, H.L. 2003. New plant records from Maui and Hawaii Counties. Bishop Museum Occasional Papers 73: 3–30.
- PECKHAM, G.D. AND F.A. VAN JAARSVELD. 1989. New botanical perspectives of the origin of the *Raphia* palms at Mtunzini. Bothalia 19: 213.
- SARTIPPOUR, M.R., C.H. LIU, Z.M. SHAO, V.L. GO, D. HERBER AND M. NGUYEN. 2001. *Livistona* extract inhibits angiogenesis and cancer growth. Oncology Reports 8: 1355–1357.
- VAN WYK, A.E. AND G.F. SMITH. 2001. Regions of Floristic Endemism in Southern Africa. Umdaus Press, Hatfield.
- Yoshida, N., R. Nobe, K. Ogawa and Y. Murooka. 2000. Origin of *Livistona chinensis* var. *subglobosa* (Arecaceae) on the "Islet of the Gods": Aoshima, Japan. Am. J. Bot. 87: 1066–1067.