

Status of the Bankoualé Palm, *Livistona carinensis*, in Djibouti

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1. *Livistona carinensis* grove at Didinto, Agorogouba. This site, at a spring (note the water pipe crossing the wadi), shows a range of heights of adults (and therefore age), rosettes (to the left of the site) and the associated *Phoenix caespitosa*.



The Bankoualé Palm, *Livistona carinensis* (Chiov.) J. Dransf. & N. Uhl, is the only member of the genus *Livistona* found in Africa and it is found in three areas – the Yemen in the Arabian Peninsula and in Somalia and Djibouti in the Horn of Africa.

The palm is currently classed as 'vulnerable' in the IUCN/WCMC World List of Threatened Trees (1998). It is a statuesque fan palm growing to a height of 25 m with a grey brown trunk somewhat enlarged at the base and bearing some slight leaf scars (Figs. 1, 2). The crown bears up to 40 stiff fan leaves on armed petioles over 1 m long. Inflorescences are axillary and may be 2m in length with hundreds of creamy yellow flowers. The fruits are hard and pea-like (Monod 1955). It grows in or by water. Water is not only crucial for germination, but it also seems crucial for establishment as young palms (Fig 2) are always found where the ground is wet, though the adults may live in areas now quite dry. It is restricted in its distribution to springs, oases and wadis. Both in the Yemen and in Djibouti the Bankoualé Palm is associated with a wild Date Palm, *Phoenix caespitosa* (Lebrun et al. 1989, Welch & Welch 1998).

Growth rates of adults have been measured in the field over a 13 year period (Welch & Welch 1998), and vary from between 17 and 33 cm per year, and it has been estimated that a 16.9 m palm was about 93 years old. With maximum heights of 25 m, the oldest palms would be at most 150 years old. The growth of rosettes was reported to have been more variable (Welch & Welch, 1998).

The status of the populations in the Yemen and Somalia are uncertain. It has been reported that in Somalia the population may be fewer than 38 trees (Thulin, M., in Welch & Welch 1998) and there is evidence that the population in the Yemen is under threat from cutting (in Welch & Welch 1998), where, as well as a substantial population of 1340 plants, they reported over 1800 stumps remaining as evidence of cutting. The status of the palm in its stronghold in Djibouti has been investigated several times between 1985 and 1998 (Welch & Welch 1998) and the reports show a steady decline in numbers. This study was

undertaken to determine the current status of the populations in Djibouti.

Over half of the palms are reported to be in mature, even-aged stands. This has implications for the future survival of the species. Firstly, it can be inferred that not only is establishment rare but that it occurs in singular events. The Welchs estimated that there has been little or no establishment during the last 60 years, except for a number of rosettes in Bankoualé established during the 1990s. Secondly, this portion of the population is likely to senesce and die in a short period of time, with catastrophic results for the future survival of the species, removing the majority of the reproducing adults in a short period of time with all the consequences of the reduction of the gene pool that this will entail.

The Welchs reported several threats to the survival of this palm. The creation of gardens in the palm's favored habitat has resulted in habitat loss for establishment. This creation may have resulted in the removal of adults, though there is no evidence of recent removal of living trees. However, when young, the palm retains its old leaves and forms a substantial bush and may be an obstacle to the gardeners. More insidiously, the establishments of these gardens will result in a change of hydrology both locally, particularly affecting the rosette stage, and over a wider area. These effects are not understood. Cattle and goat grazing is universal, and the young leaves are palatable and certainly seedlings will be quickly removed. The final threat is that of flash floods. It is known that these sweep away seedlings on a regular basis, and adults in more catastrophic events (Abdoulmalik, in Welch & Welch 1998).

As part of a wider study of the wildlife of Djibouti Welch and Welch (1998) produced a comprehensive report with recommendations. They suggest that the palm was everywhere in a

Table 1. Status of the Bankoualé palm (*Livistona carinensis*) worldwide in 1998 (Welch & Welch 1998)

	<i>Djibouti</i>	<i>Somalia</i>	<i>Yemen</i>	<i>Total</i>
Adults 1998	351	38	1357	1753
Extent of occurrence (km ²)	100	1600	1050	2750
Area of occupancy (km ²)	20	6	12	38
Number of Sites	9	3	3	15
Rate of Decline	23–30% in 13 yrs	51% in in 10 yrs	59% in 10–20 yrs	



2. The base of an adolescent *Livistona carinensis* showing leaf scars.

slow decline and that because of a lack of regeneration in the major sites, its status should be upgraded from vulnerable to critical. In this study we report the current status of the major sites of this palm around Bankoualé and Ditolou.

Results and Discussion

Livistona carinensis is extremely limited in its worldwide distribution (Table 1). Welch and Welch (1998) report that the populations in Somalia and the Yemen were under threat and the population in Djibouti slowly declining. Whilst the population in the Yemen was 1357 individuals, they reported that there were over 1800 cut stumps in the main population and over 100 in the second population. They report that it seems likely that the majority of trees have been cut down within the last 20 years and that the trees were still being felled.

Table 2 illustrates the decline in some sites in Djibouti from 1985 to 1998, and Table 3 shows the population status in those sites in Djibouti

that were surveyed in February 2004. There was a 26% decline in adults between 1985 and 1998. In Bankoualé, between 1985 and 2004 there was a 37% decline in adults, and where measurable elsewhere, a 26% decline in adults in the same period.

Population Structure and Regeneration

The population structure of most of the populations appears to be heavily biased towards mature individuals with few young (Fig 4). This is typical of the age structure of populations where the population is fully stocked in the first year of recruitment resulting in an even aged stand with "doomed" juveniles (Harper 1977). However the population reduction is clearly seen in Fig 5 that illustrates the decline in adults between 1985 and 2004, without any overall compensating increase in juveniles or rosettes.

Regeneration is apparent in most populations observed, though not in all sub-populations.

Seedlings:

Welch and Welch (1998) report abundant seedlings in several sites, but though seedlings were observed on this expedition in several sites they were never seen without the presence of *Phoenix caespitosa* and therefore we were unable positively to identify these seedlings as belonging to *Livistona*. The presence of *Phoenix caespitosa* is typical of the *Livistona* sites, but in the past the *Phoenix* leaves have been cut on a regular basis for weaving and roofing. This practice is less common than in the past, and the sites are generally crowded with *Phoenix*. However, without knowledge of the ecology of the seedlings, it is not possible to say whether the *Phoenix* is out-competing the *Livistona* for resources. The *Livistona* rosettes are robust and the adults easily overtop the adult *Phoenix*.

Rosettes:

In Randa, with 41 rosettes, the total population increased by over 80% though the adults decreased

by 26%. It will be important to re-visit this site as soon as possible to establish the current status of these rosettes. Elsewhere the picture is variable; the populations at Ribta and Toha and Ditolou have no rosettes, Satabou, Agorogouba and Bankoualé have a few, though only in some sub-populations, and Wêr and Disay have reasonable numbers of rosettes.

Juveniles:

Juveniles were not apparent in many sites. In particular, the major sites at Bankoualé were without juveniles. At Agorogouba and Disay, however, the population structure appears more normal with a balance of mature adults, juveniles and rosettes.

Conclusions – The Future of the Bankoualé Palm

It is clear from the report of Welch and Welch (1998) that the Bankoualé palm is in danger of extinction worldwide.



3. Rosette of *Livistona carinensis* showing armed petioles.

Table 2. Numbers of Adults(A), Juveniles (J) , Rosettes (R) and the Total number of individuals of *Livistona carinensis* in sites around the Forêt de Dai, Djibouti, between 1985 and 1998 (Welch & Welch 1998).

		1985				1987				1998			
		A	J	R	T	A	J	R	T	A	J	R	T
Randa	1	1	0	0	1					1	0	0	1
	2	2	0	0	2					1	0	0	1
	3	2	0	0	2					0	0	0	0
	4	7	2	3	12					7	4	35	46
	5	2	0	0	2					1	0	0	1
	6	9	0	4	13					7	0	6	13
	7	3	0	0	3					2	0	0	2
Subtotal		26	2	7	35					19	4	41	64
Ribta (upper)	1	30	0	0	30					29	0	0	29
Ribta (lower)	2									7	0	0	7
Subtotal										36	0	0	36
Toha	1					14	0	20	34	12	0	0	12
	2					1	0	0	1	1	0	0	1
Wadi Eouali	1	1	0	0	1								
	2	10	0	0	10								
	3	1	0	0	1								
	4	1	0	0	1								
	5	4	0	0	4								
	6	1	0	0	1								

In the Yemen the population is reported to be endangered from felling, though we have no data since 1998. However, the steady decline of the Bankoulé palm described by Welch and Welch is confirmed by the current study of the majority of the populations in Djibouti. The populations at Bankoulé seem to be in particular danger as there is little regeneration. The two main sub-populations are without rosettes or seedlings and one population of 47 adults is in the middle of the wadi and is therefore in particular danger from flash floods. However, one new sub-population of six rosettes does give hope and a possible way forward for saving the palm in Djibouti.

The gardens occupy the most important sites for the regeneration of the palm and have been in existence for some 50 years. The lack of

regeneration seems to have started from this time. Though the gardens may be the cause of the recent decline of the Palm, they may also be a possible means of regeneration. Palms grow well in the soil, and the gardens are protected from the worst of the floods. The irrigation is ensured and the gardens could be used as nurseries for the palms and as sites for adults. Compensation for this will have to be provided as the palms will require time and space which would otherwise be devoted to the production of food. It is hoped that we can initiate a rescue plan to ensure the survival of the palm for the future

Acknowledgements

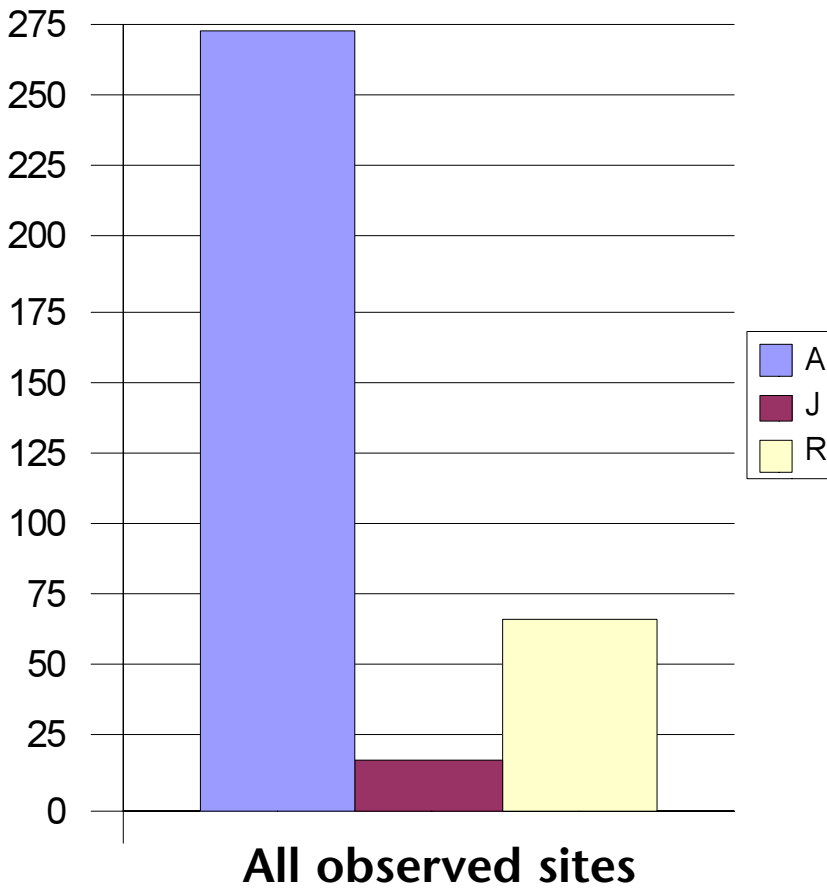
We acknowledge the help and assistance of Houssein Abdillahi Rayaleh, Ministry of Housing, Urban Affairs, Environment and Land

Table 3. Numbers of Adults(A), Juveniles (J) , Rosettes (R) and the Total number of individuals of *Livistona carinensis* in sites around the Forêt de Dai, Djibouti, between 1985 and 2004.

	1985				1990				1998				2004			
	A	J	R	T	A	J	R	T	A	J	R	T	A	J	R	T
Bankouale																
1	32	1	0	33					19	0	12	32	17	0	10	27
2	16	4	0	20					11	2	41	54	11	1	2	14
3	6	1	0	7					0	0	0	0	0	0	0	0
4	0	3	0	3					0	1	0	1	1	0	0	1
5	1	0	0	1					0	0	0	0	0	0	0	0
6	13	0	0	13					10	0	0	10	8	0	0	8
7	15	0	0	15					9	0	0	9	7	0	0	7
8	65	0	0	65					48	0	0	48	42	0	0	42
9	19	0	0	19					14	0	0	14	13	0	0	13
10	5	0	0	5					4	0	0	4	4	0	0	4
11	34	0	76	110					29	0	50	79	28	0	0	28
12	1	0	0	1					0	0	0	0	0	0	0	0
13	1	0	0	1					1	0	0	1	0	0	0	0
15	3	0	0	3					0	0	0	0	0	0	0	0
16													0	6	0	6
Satabou, Bankoualé																
1,14	12	0	19	31									8	2	6	16
Subtotal	223	9	95	327					145	3	103	252	139	9	18	166
Satabou																
1	12	0	19	31					9	2	2	13	8	2	6	16
* 2									6	0	4	10	13	0	3	16
* 3									9	0	23	32	8	0	0	8
* 4									2	0	0	2	2	0	0	2
Subtotal									26		57		31	2	9	42
Disay																
	39	0	2	41					27	6	26	59	25	4	18	47
*alternative nos!													23	20	25	68
Wêr																
	51	2	15	68					48	7	22	77	42	2	6	50
Ditilou																
													11	0	0	11
													1	0	0	1
Agorogouba																
1					12	3	16	31	12	3	18	33	12	0	12	25
2					13	0	0	13	10	0	0	10	11	1	1	13
3					2	0	0	2	2	0	1	3	1	0	0	1
4					1	0	0	1	1	0	0	1	0	0	0	0

Note: * : Satabou sites 2, 3 and 4 were first visited in 1999.

2004



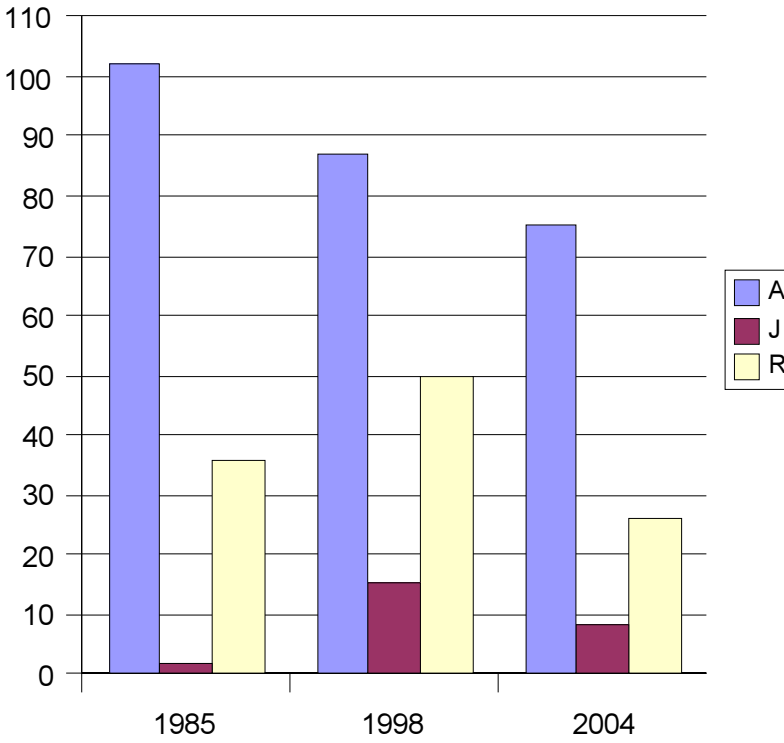
4. Life history class structure of all populations visited in 2004.

Management in Djibouti, without whose field knowledge and organizational skills the project would not have been a success, and Houmed Ali, Bankoualé whose knowledge and abilities in the field crucial to our success. The project was funded in part by a grant from the World Pheasant Organisation, Fordingbridge, Hampshire, UK

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Other sites



5. Life history class structures of populations visited in 1985, 1998 and 2005.

Bankoualé

