

Baron Ferdinand von Mueller, the “Princeps of Australian Botany,” and a Historical Account of his Australasian Palms

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Baron Ferdinand von Mueller was Australia's most celebrated botanist of the nineteenth century. Although a broad-based plant taxonomist, he described 19 new palm taxa, including two genera and 15 species in Australia, and one species each in New Guinea and Fiji. Significantly, Mueller's taxa represent about 25% of all the palms thus far recognized for Australia and its off-shore dependencies, and he remains the single most important taxonomist to have worked on Australian palms.

Baron Ferdinand von Mueller (1825–96) (Fig. 1) was Australia's most productive plant taxonomist of the nineteenth century (Stevens 1997), describing over 2400 taxa of which more than half remain as the currently used names (APNI 2015). Migrating from Germany to Australia in 1847, Mueller was engaged as the Victorian Government Botanist in 1853 (a position he held until his death) and established the Phytologic Museum of Melbourne (now the National Herbarium of Victoria) in the Melbourne Botanic Gardens.

His vast correspondence, estimated to be over 12000 surviving letters (Anon. 2015), and capacity to publish and disseminate widely his taxonomic work (Churchill et al. 1978), provide an extensive resource upon which to understand his botanical methods and resolve his continuing taxonomic influence. The appellation “*Princeps of Australian Botany*” was first given to him by William Thiselton-Dyer, Director of Kew Gardens, in recognition of his pre-eminence as a taxonomist and champion of the Australian flora (Mueller 1878a).



1. Baron Ferdinand von Mueller, c. 1877, *carte de visite* by J. Botterill, Melbourne.

Despite his authority over Australian plant taxonomy, Mueller received criticism because of his methodology in determining genera and species limits and changes that he made to contemporary plant classification systems (Maroske 2006). Early in his career, the prominent English taxonomist George Bentham (1853) claimed that Mueller described too many species on questionable and inconsequential differences and that some of his generic limits were too broad. Bentham bluntly told Mueller in correspondence (quoted in Moore 1997) that his:

...wholesale amalgamation of genera, without any indication of the characters to be assigned to the new compound genus, or of its relations to allied genera retained as distinct, has no other effect than the unnecessary addition of many hundred names to the already over-loaded synonymy.

An anonymous obituarist (Anon. 1896) wrote a scathing though patently unfair criticism of

Mueller with regards to his taxonomic work, writing that:

He was insatiable in his desire for titles and notoriety. This weakness caused him to publish botanical contributions in every possible organ open to him and occasionally led him to the commission of regrettable inconsistencies in botanical nomenclature... he needlessly added to the synonymy of Australian plants by simultaneously publishing many of them under two generic names, so that whichever view one might take of generic limits, his name would still stand as the authority!

It is difficult to justify such negative criticism considering Mueller's exceptional output, and it is inconceivable that he willfully created potential taxonomic and nomenclatural problems. The vastness of Mueller's taxonomic works expedited the possibility of the unintentional creation of potentially problematic synonymies. Nevertheless, and as examples, he created some nomenclatural difficulties for future taxonomists with regard to palms, as with the genera *Bacularia* and *Normanbya*. Both were first introduced by Mueller as proposed alternative genus names, actions that subsequently created taxonomic and nomenclatural challenges. However, it must be understood that during Mueller's active years there was a lack of precision and cohesion in the collective rules of plant nomenclature. Issues of nomenclatural priority ('primogeniture' in Mueller's terminology) and what is now known as 'valid publication' were imperfect concepts. There were many attempts by taxonomists to stabilize the rules of plant nomenclature but there was no mechanism to ensure conformity among taxonomists. Mueller (1892a) ostensibly supported the rules of priority, as he wrote to Adolf Engler, stating that:

...the binomial name which at first was used in the correct genus can have priority, which certainly always follows from the date.

Mueller (1893) summarized his views on priority in a later letter to Joseph Hooker writing that:

...even if we have ever so many congresses or conferences or deliberations, they will be overthrown like all other unjust legislature, unless all arbitrariness is avoided. I often wonder, what they will

think of us about the agitation now on priority of plant names, a hundred years hence. As I said, permanency and unanimity can only be secured by absolute justice. Of course no one is bound to accept decisions of Congresses which he did not attend.

Matters regarding priority and nomenclature of Mueller's palm taxa will be further discussed individually below.

Mueller's palm taxonomy

Author's note: In the following, Mueller's original nomenclature is maintained in the text and currently accepted nomenclature follows in square brackets.

During Mueller's era, Australian palms were primarily seen, at least by botanists based in southern Australian cities, as plants of unpopulated, wild places of the tropical northern outposts of the Australian colonies. Mueller (1880a) wrote to Joseph Hooker that:

...my material on palms is very scanty, but I will send you what I have. In North Queensland the palms (even there like bamboos not numerous) occur in fever-jungles beset by cannibals; indeed I rather meet a tiger or *Naja* in India or a lion in Africa, than savage bipeds in the forest-recesses of N. E. Australia.

Mueller (1880b) variously noted the difficulty in obtaining herbarium specimens of palms because of their remoteness (from his herbarium in Melbourne), their occurrence in environments which necessitated special collecting techniques, and the infrequency which his collectors entered those environments.

In addition to herbarium specimens, Mueller supplied seeds and propagation materials of palms to botanical institutions such as the Botanic Garden of the University of Florence (Mueller 1865a), Kew Gardens in Britain and Herrenhausen Gardens in Germany (Wendland & Drude 1875). Mueller (1865b) wrote in a letter to Carl von Martius that he had:

...seen to it to distribute the frost resistant species of the far southern palms *Ptychosperma*, *Seaforthia* [*Archontophoenix cunninghamiana*], *Areca sapida* [*Rhopalostylis sapida*] and *Livistona australis* in large quantities by sending of seeds around the Mediterranean.

Mueller promoted the horticultural value of Australian plants and palms, not only to Australian institutions but also to European gardens and acclimatization societies, by supplying seeds and propagation materials (Naudin & Mueller 1887, Parkin 1996). He experimented with supplying live plant materials as well as seeds (Mueller 1874a). An attempt was made in 1882 to despatch a live stem of the Australian cabbage palm (*Livistona australis*) to Kew Gardens from Melbourne, but it did not survive the rigors of long-distance sea travel. Mueller (1882a) wrote in a letter to Joseph Hooker that:

...the experiment with the *Livistona* did not succeed, is not surprising, the distance of shipping is too far. Stems, quite similarly treated, have grown here in gardens quite well and made at once a magnificent show, but then it took only 2 or 3 weeks, to bring the stems from Illawarra to Port Phillip.

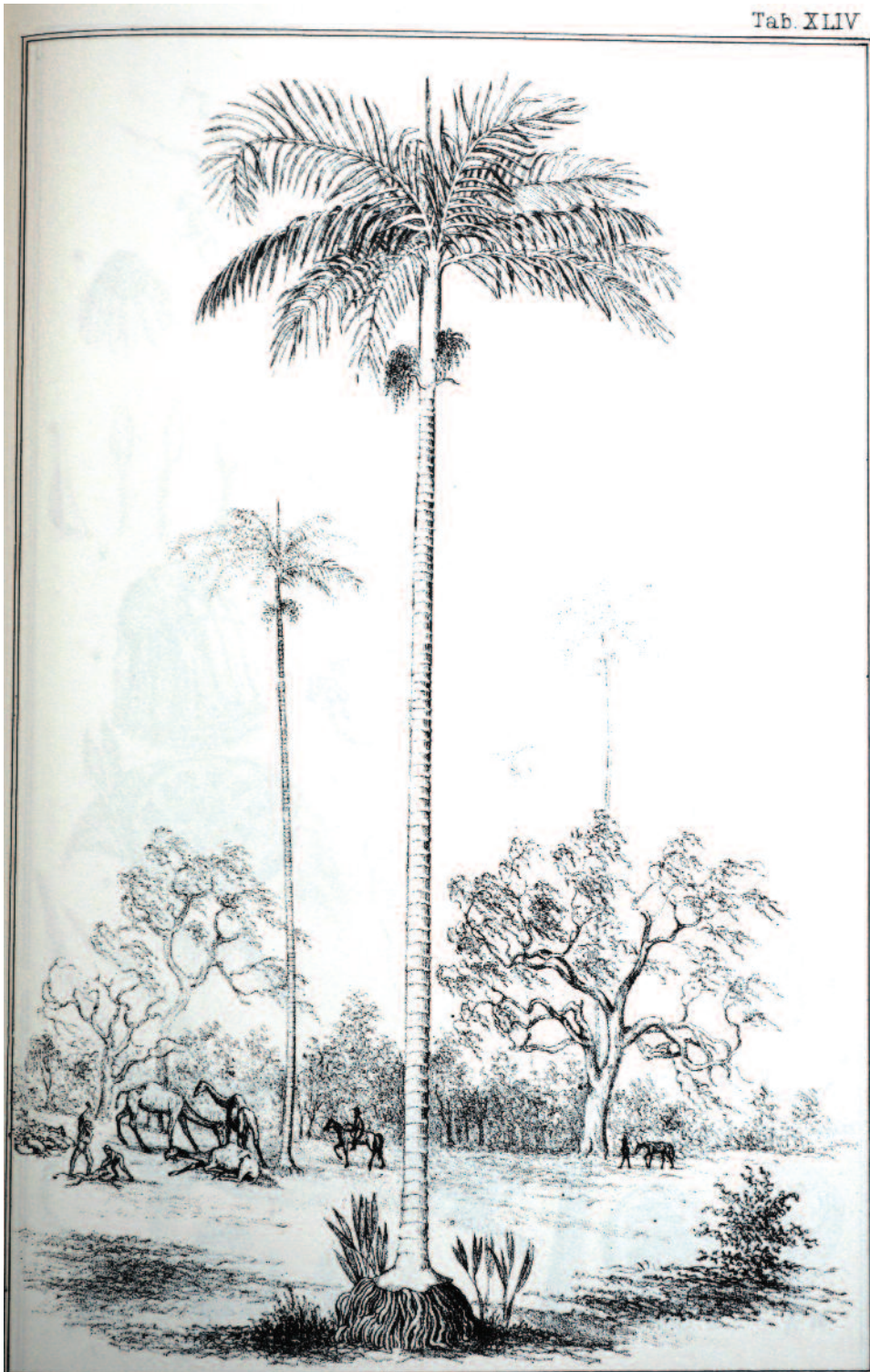
He was also a grateful recipient of palms that could be grown in Melbourne, especially if the species was readily adaptable to the temperate climate of southern Australia. On receiving seeds and plants of *Rhopalostylis sapida* (nikau palm) from New Zealand, Mueller (1865c) wrote to Governor Grey:

I have to express to your Excellency my most grateful acknowledgement for your goodness in causing my establishment to be supplied not merely with a quantity of seeds of the N. Z. *Areca* [*Rhopalostylis sapida*], but also with a number of living plants of this noble palm. As the species is so hardy I am anxious to introduce it into all the cooler latitudes, in which among tall palms only the N. Z. *Areca* and our Australian southern *Livistona* [*L. australis*] & *Seaforthia* [*Archontophoenix cunninghamiana*] will grow. The latter palms are within my reach, but I am glad to be able through Your Excellency's kindness to add now also the New Zealand palm to those others rendered already available to my correspondents.

Mueller's first synoptic assessment of Australian palms was in 1864, the year prior to his naming his first Australian species. Mueller (1864) summarized the family in a letter to Carl von Martius:

...palms, which are evidently sparsely represented in Australia, even though this noble family of plants reaches its southern limit here at the southern latitude of

Tab. XLIV



A. Thozet del. F. Schonfeld lith.

F. Mueller direxit.

De Gruchy & Lergh. imp.

Ptychosperma Alexandrae. F.M.

2. Illustration of *Ptychosperma alexandrae* (*Archontophoenix alexandrae*), Tab XLIV in *Fragmenta phytographiae Australiae* vol. 5 (1865), "A. Thozet del F. Schonfeld lith. ... F. Mueller direxit ... De Gruchy & Lergh. Imp."



3. *Archontophoenix alexandrae* (F. Muell.) H. Wendl. & Drude was named [as *Ptychosperma alexandrae*] by Baron Ferdinand von Mueller in 1865 to commemorate the wedding of Princess Alexandra of Denmark to Edward Prince of Wales, later King Edward VII of Great Britain. Photo taken at Eungella National Park, Queensland, Australia. Photo by J.L.Dowe.

Table 1. Palm taxa named by Ferdinand Mueller. The currently used names follow the treatment of the Arecaceae in *Flora of Australia* (Dowe & Jones 2011)

Original name	Currently used name
<i>Areca alicae</i> F. Muell.	<i>Areca triandra</i> Roxb. ex Buch.-Ham.
<i>Bacularia</i> F. Muell.	<i>Linospadix</i> H. Wendl.
<i>Calamus obstruens</i> F. Muell.	<i>Calamus australis</i> Mart.
<i>Caryota albertii</i> F. Muell. ex H. Wendl.	unchanged
<i>Kentia beccarii</i> F. Muell.	<i>Hydriastele montana</i> (Becc.) W.J. Baker & Loo
<i>Kentia belmoreana</i> C. Moore & F. Muell.	<i>Howea belmoreana</i> (C. Moore & F. Muell.) Becc.
<i>Kentia canterburyana</i> C. Moore & F. Muell.	<i>Hedyscepe canterburyana</i> (C. Moore & F. Muell.) H. Wendl. & Drude
<i>Kentia forsteriana</i> C. Moore & F. Muell.	<i>Howea forsteriana</i> (C. Moore & F. Muell.) Becc.
<i>Kentia mooreana</i> F. Muell.	<i>Lepidorrhachis mooreana</i> (F. Muell.) O.F. Cook
<i>Kentia wendlandiana</i> F. Muell.	<i>Hydriastele wendlandiana</i> (F. Muell.) H. Wendl. & Drude
<i>Livistona alfredii</i> F. Muell.	unchanged
<i>Livistona drudei</i> F. Muell. ex Drude	unchanged
<i>Livistona leichhardtii</i> F. Muell.	<i>Livistona humilis</i> R.Br.
<i>Livistona mariae</i> F. Muell.	unchanged
<i>Livistona ramsayi</i> F. Muell.	<i>Licuala ramsayi</i> (F. Muell.) Domin
<i>Normanbya</i> F. Muell. ex Becc.	unchanged
<i>Pritchardia thurstonii</i> F. Muell. & Drude	unchanged
<i>Ptychosperma alexandrae</i> F. Muell.	<i>Archontophoenix alexandrae</i> (F. Muell.) H. Wendl. & Drude
<i>Ptychosperma beatriceae</i> F. Muell.	<i>Archontophoenix alexandrae</i> (F. Muell.) H. Wendl. & Drude

37°30'. The particular limits of the other Australian *Livistona* species have so far not been precisely determined, and therefore the geographical limits of the individual species of this genus cannot yet be defined. They extend, however, only along the wooded east and north coasts, with the exception of one noble species, which the unhappy Leichhardt, as well as I personally met with occasionally in the open plains or on slopes of Arnhem Land. *Areca monostachya* [*Linospadix monostachyos*] is restricted to subtropical eastern Australia. *Cocos nucifera* is found on one or another of the small islands of Torres Strait, and *Caryota urens* [*Caryota albertii*] in far north-eastern Australia. *Seaforthia elegans* [*Archontophoenix cunninghamiana*] extends intermittently from Illawarra along the east coast, and perhaps belongs also to North Australia. *Calamus australis* is distributed fairly widely through tropical and extra-tropical littoral eastern Australia. There is no evidence of palms, neither on

the west nor on the south coast, nor in the distant interior of Australia.

Taxonomic progression

The first new palm species to be described by Mueller were published in 1865 in his journal *Fragmenta phytographiae Australiae*. These included three taxa, *Ptychosperma alexandrae* [*Archontophoenix alexandrae*] (Figs. 2 & 3), *Calamus obstruens* [*Calamus australis*] and *Livistona leichhardtii* [*L. humilis*] (Table 1) (Mueller 1865d). The protologue of *Ptychosperma alexandrae* included a dedication to Princess Alexandra of Denmark on her marriage to Edward Prince of Wales (later King Edward VII of Great Britain) (Mueller 1865e). When it came to naming new palm species, the eponymous dedication to royalty and nobility was to become one of Mueller's favored approaches considering the 'princely', 'noble' and 'majestic' character of palms (Dowe & Maroske 2016). *Calamus obstruens* was named for the palm's characteristics, which, with long barbed whips, obstructed the passage



4. Illustration of *Kentia belmoriana* (*Howea belmoreana*) (right) and *K. forsteriana* (*Howea forsteriana*) (left), 'From a sketch by R. Fitzgerald', in *Fragmenta phytographiae Australiae*, un-numbered plate, Vol. 7 (1870).

of persons if unfortunate enough to get caught in their grip. The last taxon of the group, *Livistona leichhardtii*, was a proposed name included in a summary of *Livistona* species that were thus far described for Australia. The name was later validated by Mueller (1874b). The species was named for the explorer and naturalist Friedrich Wilhelm Ludwig Leichhardt (1813–1848?). Leichhardt and his party attempted an east to west crossing of Australia in 1848, but they were never heard of again and the circumstances of their disappearance remain an enduring legend of Australia's outback (Lewis 2013). Mueller espoused an ongoing interest in the fate of Leichhardt, and was instrumental in promoting and organizing a number of searches for the lost explorer and his party (Mueller 1865f). Also included in this treatment of the Palmae was a brief synopsis of the twelve Australian palm species described by other botanists up to that time (Mueller 1865d).

It is around this time that Mueller began to send his palm herbarium specimens from Melbourne to specialists in Europe. He dispatched the whole palm collection to von Martius in Munich, Germany, in 1868 in anticipation of a taxonomic contribution, as described in a letter from Mueller (1868a) to von Martius:

...it gives me particular pleasure to be able to place the little material, that in this respect evidently poor flora of Australia has displayed so far, before the great expert on these princely plants. Nonetheless, there are 17 species (as far as I can judge), and that, after all, quadruples the number of palms expounded by Robert Brown. Unfortunately these plants were accessible to me only under the most unfavorable conditions, and that must excuse the inadequacies of the specimens. I fear that you, exalted friend, will not consider the poor material worth a close examination. However, should you do so nonetheless, we should gain a classic, eternally memorable contribution for the 6th volume of the Flora of Australia. I beg you, to retain any one specimen, which ever it may be, for your own palm collection, but send the rest through Dr Sonder to Bentham during 1868, as Bentham in any case wishes to compare my original material with that of Robert Brown's and Hooker's collections.

Mueller (1868b) subsequently wrote to Joseph Hooker, that:

...after several requests of the great and venerable von Martius I have sent to that excellent man the whole of my Australian palms on loan, 6 or 7 large packages, comprising 17 species.

It was unfortunate that von Martius was not able to commence any new work on the Australian palms as he died shortly after, on 13 December 1868 (Egge 1979).

Mueller's next episode of palm taxonomy involved specimens collected from Lord Howe Island in 1869 by Charles Moore, William Carron and Robert David Fitzgerald (Moore 1870), and another specimen received from northern Australia collected by Benjamin Gulliver (Mueller 1870). In addition to describing the five new species at this time, Mueller established a new genus, *Bacularia*, to accommodate a single species, *Kentia monostachya* [*Linospadix monostachyos*], that was originally described as *Areca monostachya*. The genus was suggested by name only, and therefore was nomenclaturally invalid, as there was no description or formal transfer of taxa. Although not validly published, Mueller (1878b) continued to use *Bacularia* in his own publications, and later provided a summary of his *Bacularia* species. *Bacularia* was later validated by Hooker (1882), although its identity remained obscure and is now a synonym of *Linospadix* (Dowe & Irvine 1997).

Returning to the Lord Howe Island species, Moore (1870) provided a report on their plant collecting activities on Lord Howe Island, in which he listed four unnamed palm species, two in the genus *Kentia*, one in the genus *Areca*, and another in an undescribed genus. In his report, Moore used descriptive common names that were quoted by Mueller as part of his protologues, and which are currently still in use for the respective species. Mueller described all these new species within the genus *Kentia* as *K. belmoreana* [*Howea belmoreana*], *K. forsteriana* [*Howea forsteriana*] (Fig. 4), *K. canterburyana* [*Hedyscepe canterburyana*] (Fig. 5), *K. mooreana* [*Lepidorrhachis mooreana*] and *K. wendlandiana* [*Hydriastele wendlandiana*]. The genus *Kentia* at that time was among the largest palm genera consisting of 40–50 species, functioning as an admixture of Arecoid palms from eastern Indonesia, New Guinea, New Caledonia, Fiji, New Zealand and Australia (Govaerts & Dransfield 2005). With



From a Sketch by R. Fitzgerald.

Kentia canterburiana

Dracopallum Fitz-geraldii

5. Illustration of *Kentia canterburiana* (*Hedyscepe canterburyana*), 'From a sketch by R. Fitzgerald', in *Fragmenta phytographiae Australiae*, un-numbered plate, Vol. 7 (1870).

regard to the Lord Howe Island palms, Mueller (1869) noted in a letter to Joseph Hooker that:

There are also 4 palms on the island, which seem all to belong like the 8 New Caledonians to *Kentia*, with which Miquel & Blume unite the New Zealand *Areca sapida* [*Rhopalostylis sapida*]. Possibly *Kentia* is only a section of *Areca*. I shall investigate the matter as far as my material admits.

The evident taxonomic disharmony within *Kentia* was soon to be recognized by palm taxonomists (Brongniart 1873, Wendland & Drude 1875, Beccari 1877, 1885), and the genus was partitioned into a number of small or monotypic genera, with *Kentia sensu stricto* remaining as a much diminished genus, distributed in the Moluccas, New Guinea, northern Australia and Fiji. All of Mueller's *Kentia* species were transferred to other genera through early works by other botanists. Of interest is that Bentham, though an otherwise persistent critic of Mueller's taxonomic methodologies, followed Mueller's assignment of *Kentia* species *verbatim* in his treatment of the *Palmae* in *Flora Australiensis*. Bentham (1878) wrote that:

The genus [*Kentia*] has however been variously extended or restricted by different phoenicologists. I have followed in its delimitation the views of F. Mueller, which appear most in conformity with those of Blume, although in the original species the male flowers are hexandrous. In the Australian species the number of stamens varies considerably but always more than 6, they would therefore be referable to A. Brongniart's genus *Kentiopsis* (Comptes Rendus 1873) which appears to me to be too artificially separated from *Kentia*.

Perhaps showing some taxonomic stubbornness, Mueller continued to maintain his *Kentia* species in his own publications (Naudin & Mueller 1887; Mueller 1889), although his taxa had been assigned to different genera by other botanists as synonyms. Some botanists continued to maintain *Kentia* as a valid taxon well into the twentieth-century, though much reduced in species number (Beccari 1923; Martelli 1935; Burret & Potztl 1956). All the species that were formerly included in *Kentia* are now distributed to other genera, and it is considered an invalid and misapplied taxon (Dransfield et al. 2008).

Following on with new palm taxonomy, two more species, *Livistona ramsayi* [*Licuala ramsayi*] (Fig. 6) and *L. mariae*, were published by Mueller (1874b) in Volume 8 of *Fragmenta*. Mueller first received information about the former species in a letter from the naturalist Edward Ramsay who provided a description and a sketch of a leaf and inflorescence and suggested it was a species of *Livistona* (Barfod & Dowe 2005). Ramsay soon after dispatched to Mueller a specimen that he collected from Rockingham Bay. Ramsay's (1874) letter to Mueller included:

My No.5 is quite distinct from any *Livistonea* I know of the leaves are almost peltate and the pinnae joined for more than ½ their length it forms a flat stiff shieldlike disc – look at a short distance as if quite peltate near entire or plicate. Disc 6 to 8 feet in diameter on young tree 20 ft high they were 6 ft across. Hill [Walter Hill] found this and says he thinks he met it but has no specimens I gave him seed – it is the only one of this form I ever met with...I used a leaf for an umbrella during a very heavy storm without getting at all wet.

Perhaps as an indication of his non-specialized interest in palms, Mueller failed to recognize that it belonged to the genus *Licuala*, and not *Livistona*. What might have been an "excuse" for Mueller (1874c) for not correctly identifying the genus was provided in a reply to Ramsay:

I labor under especial disadvantage for working on palms this moment, because I lent my whole normal collection to Mr. H. Wendland, who works exclusively on palms: but although this took place several years ago, I have up to date not a single line from him on the subject of their elucidation, nor has he returned the original specimens, placing me thus at great inconvenience for further comparisons.

As to be discussed further on, Wendland was at that time preparing the first monograph on Australasian palms and Mueller had dispatched to him at Herrenhausen Gardens, Germany, most of the palm specimens then presently held in the Melbourne herbarium.

Almost at the same time that Mueller published his description of *Livistona ramsayi* [*Licuala ramsayi*], Wendland and Drude (1875) described another taxon established on the



6. *Licuala ramsayi* (F. Muell.) Domin was named by Baron Ferdinand von Mueller to honor the collector of the type specimen, Edward Pierson Ramsay [as *Livistona ramsayi* F. Muell.]. Ramsay, an ornithologist and zoologist, was Curator of the Australian Museum, Sydney 1874–94. Photo taken at Djiru National Park, Mission Beach, Queensland, Australia. Photo by J.L. Dowe.

same species, which they named *Licuala muelleri* [*Licuala ramsayi*] as a dedication to Mueller, but based on a different specimen that had been collected by John Dallachy from Dalrymple Gap, Queensland. Seemingly unaware of the association between their *Licuala muelleri* and Mueller's *Livistona ramsayi*, Wendland and Drude (1875) maintained the latter as a species within *Livistona* and proposed that it was a possible synonym of *L. inermis* (which was their interpretation of *Livistona decora*). Wendland and Drude also noted that they found it difficult to reconcile *L. ramsayi* as they had not seen adequate specimens. The publication of two names concurrently, for the same species, explains the confusion that was to eventuate in the identity of this palm. Bentham (1878) appeared to recognize the anomaly, and he chose *Licuala muelleri* as the 'legitimate' name, and placed *Livistona ramsayi* as a synonym of it. However, this action would, by current nomenclatural rules at least, be deemed "illegal" as he should have maintained Mueller's original epithet, *ramsayi*, as it antedated Wendland and Drude's *muelleri* and therefore had nomenclatural precedence (McNeil et al. 2012). Bentham (1878) wrote in *Flora Australiensis* that:

Although the flowers are unknown it is probable that Wendland and Drude are correct in transferring this palm from *Livistona* to *Licuala*, but its precise affinities must remain for the present undetermined.

The correct (and currently accepted) combination, *Licuala ramsayi* was eventually provided by Domin (1915), and the taxon that Wendland and Drude proposed to be the "true" *Livistona ramsayi* from Rockingham Bay is now attributed to *L. drudei* (Rodd 1998).

The second taxon established by Mueller (1874d) in the same issue of *Fragmenta* was *Livistona mariae* named for Grand Duchess Maria Alexandrovna on the occasion of her marriage to Prince Albert, son of Queen Victoria (Dowe & Maroske 2016). At first, Mueller only provided a name in a note, simply as "*L. mariae*," and without a description. Soon after, he provided an additional brief entry as a footnote in Ernest Giles' *Geographic Travels in Central Australia* after that explorer located a population of palms in the "Glen of Palms" (Palm Valley) and thus revoking the earlier statement by Mueller (1864) that no palms were found in

central Australia. Later in the same publication, in the list of species collected by Giles, Mueller provided the full name: "*Livistona Mariae*, F. M., *Fragm. IX., ined.*" but noted that it was *ineditus*, i.e. unpublished (Giles 1875). The validating description was eventually provided in 1878 (Mueller 1878b)

As mentioned above, the first monograph on Australasian palms was at that time being prepared by the German botanists Hermann Wendland and Oscar Drude, which resulted in the publication of *Palmae Australasiae* in the journal *Linnaea* (Wendland & Drude 1875). Hermann Wendland (1823–1903) was Director of Herrenhausen Gardens 1870–1903, and during the late 1800s was considered an authority on palms (Anon. 1903a). Wendland had described many species of palms from Africa, the Americas, Australia and the south Pacific (Wittmack 1903). He was also a renowned horticulturist, and the living collection of palms that had been assembled at Herrenhausen Gardens was to surpass that at Kew and was the largest in Europe at that time (Regel 1891, Anon 1903b). The living palm collection at Herrenhausen had developed over many decades, mainly housed in technically-advanced large heated glass-houses that were designed and constructed to allow tropical palms to be grown to maturity in an otherwise temperate climate (Wendland 1882, Auhagen 1882, Palm & Rettich 2006). Many new palm species were described on specimens that were cultivated at Herrenhausen Gardens (Hodel 1992). Over his career, Wendland described about 600 palm taxa, primarily from the Americas and Africa (IPNI 2015). Wendland's collaborator, (Carl George) Oscar Drude (1852–1933) was Assistant at the Göttingen University Herbarium during this time, later a lecturer and Professor in Botany at Dresden Polytechnikum, becoming one of the world's leading ecologists and biogeographers and Director of Dresden Botanical Gardens, 1879–1920 (Güttler 2011, Egerton 2015). Drude was an active palm taxonomist, describing about 300 taxa during his career, mostly from the Americas (IPNI 2015).

As acknowledged in their introduction to *Palmae Australasiae*, Wendland & Drude (1875) considered that Mueller had made a significant contribution to the monograph, with collaboration on some species, and the co-authorship of one taxon, *Caryota albertii*, which was named for Prince Albert, husband of Queen Victoria, and another example of

Mueller naming palms to honor royalty (Dowe & Maroske 2016). Wendland & Drude also noted Mueller's contributions to the living collection at Herrenhausen Gardens, as well as acknowledging the herbarium specimens sent by him to Wendland specifically for the study of the Australasian species. In dedication, they named two species in honor of Mueller in *Palmae Australasicae*: *Calamus muelleri* and *Licuala muelleri* [*Licuala ramsayi*]. Most of the Australasian palm specimens that Mueller housed in Melbourne, at least up to early 1875, were sent to Wendland for the monograph and were temporarily kept in Wendland's Herbarium at Herrenhausen Gardens. The Wendland herbarium, previously maintained at Herrenhausen Gardens, was incorporated into Göttingen Herbarium in 1969 (Wagenitz 1972). There is evidence that some duplicates or fragments of Mueller's Melbourne specimens are extant at Göttingen, but a full inventory of the Wendland palm collection has yet to be completed (Marc Appelhans, GOET. pers. com.).

Bentham, at this time, was preparing the *Palmae* for the seventh, and last, volume of *Flora Australiensis*, and Mueller (1872) told Bentham in a letter that the Australian palm specimens that Bentham required for descriptive purposes for *Flora Australiensis* were with Wendland at Herrenhausen. Many of the specimens that Wendland & Drude cited in *Palmae Australasicae* were also cited in Bentham's treatment of the *Palmae* in *Flora Australiensis*, so it is evident that Bentham examined the same specimens. The specimens were received by Bentham at Kew from Herrenhausen in late 1876 (Bentham 1876), and returned to Mueller in Melbourne in early 1877 (Bentham 1877). All of the specimens sent to Wendland eventually, and somewhat miraculously if the travel distances are considered, found their way back to Melbourne, where many are the type specimens for the new taxa that were described in *Palmae Australasicae* (Dowe 2010).

Mueller (1875) provided a summary in Volume 9 of *Fragmenta* of the taxonomic changes that had been adopted by Wendland & Drude in *Palmae Australasicae*. He noted that the Australian palms had been thoroughly revised, and that *Kentia* had been reduced to a single species in Australia, *Kentia acuminata* [*Carpentaria acuminata*], but otherwise Mueller gave no indication of his true thoughts, at least in published accounts, on the extensive nomenclatural changes that Wendland &

Drude had introduced in their monograph. However, it was evident that Mueller rejected many of the changes as he continued to maintain his own genus and species names in subsequent publications. In correspondence to Bentham, Mueller (1876) wrote disapprovingly that:

The limitation of the genera [in *Palmae Australasicae*] is too narrow, as you will likely observe by a mere walk through the Kew palm-house. What an unnecessary burden to the memory such superfluity of genera! How many intermediate species among such genera may still be discovered. I do not know, at what date or even year this publication of W. & D. appeared; but it must have been later than when I made my last remarks on Palms, wherein I brought myself *Kentia moorei* to *Clinostigma* [*Lepidorrhachis mooreana*], if that genus should be adopted. It seems strange, that these authors do not quote the note. As for *Livistona ramsayi* it has no resemblance to *L. inermis*; the leaves indeed are like those of *Licuala peltata* and *Corypha taliera*; but with short indentations only, not cleft. Should not *Licuala* be reduced to *Livistona*? Can you kindly tell me, when Wendland's & Drude's paper did appear?

As an indication of the slow-down in the detection of new palm species in Australia, Mueller continued to describe palms but at increasingly longer intervals. In volume 11 of *Fragmenta*, Mueller (1878b) provided one new species, *Livistona drudei*, and a new genus, *Normanbya*, as well as emended descriptions and generic alterations to already established taxa, including a summary of his otherwise illegitimate *Bacularia* species, which he had included previously as *Kentia* species. He also provided the validating description of *Livistona mariae*, the taxon for which he had previously, in 1874, only given an informal identity as a name without a description (see above). The same situation also applied to the new species *L. drudei*, in which Mueller initially only provided a proposed name as: "this distinctive species is named after Doctor Oscar Drude," but without a validating description. The name, *L. drudei*, was later included in the index of that particular issue by Mueller (1881a) with reference to the alluded name, but the citing of a name was not enough to validate the taxon. Validation was later provided when Drude (1893) monographed the Australian

species of *Livistona*, thus giving Mueller co-authorship of the taxon.

It is around this time that Bentham & Hooker were completing their *Genera Plantarum*, in which they were to introduce a substantial rearrangement of palm genera. Mueller (1881b), having received advance notification of taxonomic changes, voiced his opposition at their proposed actions, and wrote to Joseph Hooker saying that:

...you must not be angry with me, when I express my regret at the impending multiplication of the genera of palms. As still more spec. will be discovered, more generic limits will break down. We can as a rule attain much better by sections in a large genus, what by severance of them is accomplished under generic names.

Mueller (1885a) attempted to clarify some of the confusion regarding the identity of a number of Australian species, and wrote to Joseph Hooker that:

...you wrote to me about Australian palms inquiringly before, I would like to add, that the lamented Bentham rightly united *Livistona ramsayi* and *Licuala muelleri* [*Licuala ramsayi*]. That is a Palm restricted to the East-Coast of Queensland, while *Livistona inermis* [their interpretation of *L. decora*] under which *L. ramsayi* is placed in the Kew Catalogue (or Report) belongs to the North-Coast exclusively. As Bentham thought *L. humilis* seems merely the young state of *L. inermis*; the latter is neither unarmed; so both names are misleading and these two palms might well be united under the name *Livistona leichhardtii* [*L. humilis*]. At last I have some hope of getting flowers of the Australian *Licuala*, so that its generic position may become definitely settled.

The generic name *Normanbya* was first proposed by Mueller derived from the specific epithet used in Walter Hill's (1874) protologue for the species *Cocos normanbyi* [*Normanbya normanbyi*]. In a letter to Edward Ramsay, Mueller (1874e) claimed that he had 'saved' Hill's name from taxonomic obscurity, in that:

...when Mr Hill's palm fruits arrived, that his supposed *Cocos*! is an *Areca*, near the common Indian Betel nut (*A. catechu*), and his supposed *Areca* is a true *Kentia*. It is singular, that he should venture to send descriptions almost of no diagnostic value and on such ill digested data, as he

obtained, into an official report. To protect him to some extent, I have placed his name along with mine as authority of the Normanby palm, so that his dedication may not be destroyed; and that is more than likely anyone else would have done for him! Pray do not mention this to any one, until you get the new number of the *fragmenta*, which is printed, but not yet issued.

Regarding the suggestion that *Normanbya* be established as a new genus, Mueller (1878b) referred to the possibility that with more collections the relevant species, by then renamed *Ptychosperma normanbyi* [*Normanbya normanbyi*] may be deemed sufficiently distinct to warrant placement in a new genus. However, that was only a proposed (and nomenclaturally illegitimate) use of the name *Normanbya* by Mueller, as there was no formal transfer of species or genus description. Validation of the name was eventually provided by Beccari (1885), with whom Mueller (1885b) by that time was exchanging his concepts about Australian and Papuan palm genera and species, as well as sending Beccari herbarium specimens of Australian palms (Mueller 1887a).

The last five palm species to be described by Mueller were published in various publications other than *Fragmenta*, between 1879 and 1892. As with most of Mueller's previous palm taxonomy, he promptly described these species as he received specimens of them.

The name *Areca alicae* [*Areca triandra*], named for Princess Alice, the third child and second daughter of Queen Victoria and Prince Albert, was first used by Mueller (1879a) in a brief pre-publication note in the *Gardeners' Chronicle* giving notification that a description of the species was to appear in the forthcoming December issue of *Gartenflora*. In the latter publication, Mueller (1879b) noted, somewhat resignedly, that 'it seemed unlikely that many new discoveries could be expected in this group of plants [the palms]' and he was 'particularly happy to be able to add another palm to those already described from Australia'. It was apparent that Mueller considered that most Australian palms had been located and described by this time. Unfortunately, Mueller was incorrect in his identification of his *Areca alicae*, as the palm was an already described Asian species, *Areca triandra*, that had been introduced into cultivation in north Queensland and the

Brisbane Botanic Gardens (Dowe 2010).

The name *Kentia beccarii* was introduced by Mueller (1880c) in the Indian edition of his *Select extra-tropical plants readily eligible for industrial culture or naturalisation*, and named after the Italian botanist and explorer Odoardo Beccari (1843–1920), who by this time had become the world authority on the palms as well as a confidant and regular correspondent of Mueller. Based at the University of Florence, Beccari had travelled extensively throughout south-east Asia and New Guinea (Cuccuini & Nepi 2006). Mueller (1880c) associated this species with *Nengella montana*. The identity of *K. beccarii* remains unresolved as there are no known specimens or diagnostic description related to that name. Notwithstanding, the name has been placed as a synonym of *Hydriastele montana* (Baker & Loo 2004). However, in the absence of specimens directly related to the name *K. beccarii*, and lacking an identifying description, this allocation is questionable, and the name perhaps should be relegated to a *nomen superfluum*. Beccari was to produce some of the most extensive and influential monographs on the palm family and eventually amassed the world's largest palm herbarium in Florence. He named about 1200 palm taxa during his career, mainly from New Guinea, Borneo and Sumatra (Cuccuini & Nepi 2006).

The third species to be described by Mueller (1882b) in this period was *Ptychosperma beatrixae* [*Archontophoenix alexandrae*] for a collection made by Eugene Fitzalan in 1881 from Mount Elliot in northeastern Queensland. The species was described in the Australasian supplement of the trade journal *Chemist and Druggist* and named for Princess Beatrice third daughter of Queen Victoria. Although the generic name of *Ptychosperma* for some Australian species had been superseded by *Archontophoenix* by Wendland & Drude in 1875, Mueller persisted with the generic name of *Ptychosperma* without explanation (Dowe & Hodel 1996). Mueller characterized his new species on the structure of immature flowers and fruit. This is a good example of Mueller describing a new species on questionable and unreliable characters, which was a common criticism from some of his contemporary botanists, as well as publishing taxonomic items in obscure periodicals.

The fourth species to be described was a Fijian species, *Pritchardia thurstonii*, in collaboration

with Drude (1887), and was published in the German-language gardening periodical *Gartenflora*. In 1886, Fijian Governor John Thurston visited the eastern islands of Fiji where he took photos of a palm. The photos were sent to Mueller who determined that it was a new species. Drude evidently received specimens as he provided a detailed description and prepared diagnostic illustrations of flowers and fruit (Anon. 1887). It appears that the specimens were sent directly to Drude as there are no labels recording that the specimen went through Mueller's herbarium in Melbourne. The type specimen is now conserved at Kew Herbarium, and with only a fragmentary duplicate at Melbourne herbarium. Thurston was a correspondent of Mueller (Home *et al.* 2002), and the botanical gardens in Suva, Fiji, now named Thurston Gardens, were founded by him in 1879 (Watling 2005).

In early 1892, Mueller (1892b) provided a summary of the Australian fan palms in the genus *Livistona* in the *Gardeners' Chronicle* writing that:

In the Census of Australian plants, I admitted only three species of *Livistona*, inasmuch as dubious or very imperfectly-known species are omitted in that work, and retained for further consideration till another census can be instituted. Thus, I have recorded there besides *Livistona australis*, only *L. leichhardtii* [*L. humilis*] and *L. mariae*.

In a second instalment of that article, Mueller (1892c) explained his reasons for rejecting the two species named by Robert Brown, i.e. *L. inermis* and *L. humilis*, and noted that:

...*L. humilis* is a youthful *L. inermis*, I kept up the name *L. leichhardtii* for the united species, their original names having become inapplicable now.

This was an illegitimate nomenclatural proposal, and the correct action would have been to use the original name *L. inermis* for the species, as it had precedence over all other names according to Mueller's interpretation. Both *L. humilis* and *L. inermis* are now considered valid species, and *L. leichhardtii* as a synonym of the former (Dowe & Jones 2011).

Although Mueller had seemed to resolve the complexities of the genus *Livistona* for Australia, he was soon to name another species which was to be the last palm to be formally

described by him. In a second article in the *Gardeners' Chronicle* on Australian fan-palms, Mueller (1892c) alluded to a new species in his summary of *Livistona*, as a palm in which:

The fruitlets are globular, and particularly large, from the Western Australian locality in contrast with those of *L. australis* from which species *L. mariae* is also distinguished by the paler leaves, with elongated rachis, which forms a solid axis sometimes nearly 1 foot long beyond the petiole, whereby the leaf gets a somewhat cuneate form: on this account it seems likely that the unnamed *Livistona*, referred to in the *Gardeners' Chronicle* may be *L. mariae*.

Seemingly to contradict his appraisal of the 'Western Australian' species that he named as *L. mariae* in his *Gardeners' Chronicle* summary, Mueller (1892d) soon after described it as a new species, *L. alfredii*, named for Prince Alfred Ernest Albert, husband of Grand Duchess Marie Alexandrovna, and based on the Western Australian collections of what he had previously identified as *L. mariae* (Mueller 1878b). Although the description was more of an informal note than a diagnostic account, the article in the *Victorian Naturalist* provided some manner of distinguishing it from *L. mariae*, and discussed leaf colour and fruit size. The article did not mention any specific specimens, although specimens collected from the Fortescue River, Western Australia, by Forrest were cited by Mueller (1878c) in a previous account of the distribution of what he thought was the occurrence of *L. mariae* in Western Australia. The specimens related to that earlier interpretation were therefore concomitant as types for *L. alfredii*.

Taxonomy summary

Mueller's last comprehensive summary of the Australian palms was presented in his *Second Systematic Census of Australian Plants* (Mueller 1889). In that he listed 25 species under the *Palmae*, and one species in the *Nipaceae*. He later published one more species in 1892 (Mueller 1892d), whilst other botanists described five additional Australian species between that time and Mueller's death in 1896, thus bringing the total number of Australian palms to 32 species by the end of the "Muellerian Era."

Mueller played no particular attention to the palms with regards to monographic treatments, and most of his palm taxonomy involved single or small groups of species

promptly treated as he received specimens of them. Over time, he increasingly assigned Australasian palm taxonomy to specialists such as Hermann Wendland, Oscar Drude and Odoardo Beccari (Mueller undated pre-1875, 1885c, 1887a, 1887b).

Mueller's palm taxonomy can be characterized as intermittent and non-specialized. Periodically, Mueller provided synopses of the palm taxa described for Australia, but these were mainly annotated lists without critical consideration of generic placement or synonymy in the broad sense, and sometimes tending to either ignore or openly contradict the synonymizing work of specialist palm taxonomists. Mueller remained conservative in his palm taxonomy and preferred to use his own nomenclature, despite its contemporary invalidity, even into his later years. Mueller was often accused of describing too many taxa and thus producing confusing synonyms for later botanists. However, this situation does not strictly apply to his palm taxonomy. Of the 19 palm taxa established by Mueller, six retain his original binomial or generic name, seven are now homotypic synonyms that retain Mueller's specific epithet, five are now heterotypic synonyms, and one is a generic synonym. In regard to nomenclatural and taxonomic longevity, much of Mueller's palm taxonomy is relevant today and he remains the single most important taxonomist to have worked on the Australian palms.

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