Palms

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The International Palm Society

Founder: Dent Smith

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FRONT COVER

Livistona lanuginosa near the junction of Deep Creek and Suttor River, Australia. See article by J. Dowe, page 167. Photo by J. Dowe.

Palms (formerly PRINCIPES)

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The strange, almost comical, trunks of *Coccothrinax spissa*, one of the palms to be found in the Dominican Republic. See article by L.A. Mera, p. 183. Photo by P. Craft.

BACK COVER

Pseudophoenix vinifera growing in Azua, one of the sites that will be visited by the IPS Biennial 2006. See article by L. Mera, p. 183. Photo by Paul Craft.

NEWS FROM THE WORLD OF PALMS

As this issue of PALMS goes to press, two major palm collections, the Montgomery Botanical Center and Fairchild Tropical Botanic Garden, are reeling from the effects of Hurricane Wilma that swept across Florida on 24 October 2005. FTBG was closed to the public for a week, while teams of staff and volunteers cleared debris, salvaged palms and took herbarium and DNA samples from palms that could not be saved. Some palms were simply uprooted. Others died in several different ways: trunks snapped, terminal buds blown out or, worst of all, crushed by falling limbs of large trees. Damage seemed random and unpredictable. Healthy palms stood next to others of the same species that were snapped like match sticks. The lesson learned from previous storms – keep duplicate plantings in different areas of the garden – was hammered home by Wilma. Palm nurseries in South Florida also suffered greatly during the passage of Wilma. Many nurseries were just beginning to recover from this summer's previous storms, only to receive a devastating blow from Wilma. Likewise, private collections and home gardens in South Florida were bruised and battered by the storm. We are, however, more fortunate than IPS members along the Gulf Coast and Central America, whose gardens and houses have been utterly destroyed by this season's storms.

Two web sites of interest to IPS members have come to our attention. One, the brainchild of Dr. Carl Lewis of Fairchild Tropical Botanic Garden, is the Fairchild Guide to Palms at www.fairchildgarden.org/palmguide. The site focuses on the collections of palms at FTBG, including those not normally seen by visitors, such as the DNA collection and the herbarium collection, along with conservation status. The vast image gallery and the cultural tips will be of particular interest to palm enthusiasts in South Florida. Plans are afoot to expand the Guide to include important palm collections in Hawaii and California.

A site by IPS member Julen Rojo Legarra of Spain, www.ePalmetum.com, is rich in palm history and taxonomic notes, with some text in English and some in Spanish. There is a very useful list of species and synonyms along with maps and images (although images of rare species are often missing). The site has good graphics and is easy to use. Mr. Rojo Legarra is to be congratulated for making such an attractive and content-rich site.

Many IPS members will be keen to get their copies of a new book by Rafaël Govaerts and Co-Editor John Dransfield, *World Checklist of Palms*, published by the Royal Botanic Gardens, Kew. The book is a definitive list of genera and species of palms and their synonyms and distributions [a key to the geographic abbreviations, in Access 2.0 format, can be downloaded at http://www.bgbm.fu-berlin.de/TDWG/geo/default.htm]. The list is rapidly becoming the most consulted book on our shelves – if nothing more than to check spelling of scientific names!

A beautiful new book, *The Palms of Fiji*, has just arrived, hot off the press. Author Dick Watling is resident in Fiji and has provided a detailed and highly accessible account of all the islands' palms, each illustrated with elegant images reproduced from watercolors. The book will be reviewed in a forthcoming issue of PALMS and should be available via the Bookstore. We are sure many members will wish to obtain a copy for their palm libraries. Interestingly, and perhaps slightly unfortunately, just as the book appeared, complete with its account of *Alsmithia*, a paper appeared in Novon 15: 455–457, authored by Maria Norup, sinking *Alsmithia* into synonymy with *Heterospathe*.

THE EDITORS

GROWING PALMS

Horticultural and practical advice for the enthusiast

Edited by Randy Moore

Contents

Frost Protection

Many palms are grown in the subtropical climatic zones where there are typically several mid-winter overnight frosts. Many species of cultivated palm can withstand some prolonged cold but are severely damaged by frost. Frost protection can be provided naturally, by the canopy of an overhead tree, or it can be achieved by the overhanging eves of a nearby structure. Some palm growers will also construct temporary frost protection structures by building a free-standing frame covered with burlap or plastic.

A relatively new horticultural product makes frost protection more effective, affordable and practical. Frost protection blanketing material is manufactured using durable, light-weight non-woven spun polypropylene materials (Fig. 1). Agribon+™ is made by PGI Nonwovens, Inc. (www.agribon.com), and AgriFabric is manufactured by American AgriFabrics of Alpharetta, Georgia (no web site). Frost protection cloth, also known as horticultural fleece, is sold in varying widths (generally from 10 to 30 ft [ca. 3 to 9 m]) and roll lengths (from 100 to 500 ft [30.5 to 152 m]). The wider material is usually sold on shorter rolls. Various weights (thickness) of material are sold. The weights range from 0.5 oz [14 g] to 2.0 oz [57 g] per square yard [0.84 m].

1. Close-up of the semi-transparent frost protection material.

Heavier weights provide greater frost protection and are more costly. For example, a 1.5 oz frost blanket provides about 6–8ºF [ca. 4ºC] of extra protection below the frost point. The heaviest 2.0 oz blanket can give 8ºF [4.4ºC] of protection below the frost point. Therefore, if the frost point is 34°F [1.1ºC], a 1.5 oz blanket can provide protection down to 26–28°F [ca. -2.8ºC].

The ground, especially where exposed to sun, acts as a heat sink, trapping heat during the day and releasing it at night.

Frost protection blankets trap the heat that is released overnight. If the weather has been chilly and overcast for several days, the effectiveness of the frost protection blanket will be impaired by the lack of necessary ground heat.

An advantage of the new frost protection cloth over other materials, particularly plastic sheeting, is its ability to transmit light and allow for air circulation. A 0.5 oz cover will allow for 85% light transmission; 1 oz. transmits 70% light; 1.5 oz transmits 50% and 2.0 oz transmits 30%. Thus, greater frost protection is accompanied by increased light filtration. With many other traditional cover materials, one must remove them each day to allow for air and light transmission. The new material can remain on the palm for the entire cold spell without damage. Once frost warnings have been lifted, the blanket can be removed and stored. The material is durable and reusable.

2. Installation of protective blanket over a frost-tender palm using nursery pots as the tie down device.

Because the material is very light, it can be applied as a floating cover without the need of a supporting structure. The material needs to be tied down to protect against breezes removing the easily lifted cloth. Ground staples, weighted nursery pots (Fig. 2) or mounds of soil are commonly used anchoring devices.

Most local horticultural suppliers can order a roll of frost protection blanketing material from the manufacturer. It can also be ordered through some of the catalog/online horticultural supply houses such as A.M. Leonard (www.amleo.com). For just a few dollars, you can help protect your most precious palms each winter. – *Reviewed by Donald Martin, Valley Center, California, USA*

Palm Collection Databases

A Palm Collection Database can be used by a private display garden to maintain a separate record on each individual palm in the collection. The record can include information on the acquisition, planting, maturation and disposal of every palm. The information can be stored as text and photographs. It can also extend to include maps of the garden and the location of palms in the collection, created with Microsoft Paint.

Why develop a Palm Collection Database unless you are a botanical garden or commercial nursery? When used properly, the Database will provide you with a wealth of knowledge about your palm collection and horticultural practices. Complete information can be kept in an organized and paperless manner. Information about any facet (or combination of factors) can be efficiently retrieved and sorted.

There are no standards for what constitutes a Palm Collection Database for the display garden. In general, it should provide documentation on the entire collection. Since palms are unique from other collected plants (e.g., orchids, cycads, etc.) so are the data contained within each record. This uniqueness is also what makes developing a Palm Collection Database a challenging endeavor. Some of the nomenclature, characteristics and horticultural practices, singularly or in combination, are complicated and relevant only to palms.

Botanical databases can range from simplistic to highly complex and comprehensive. For example, some collectors are satisfied maintaining a simple genus/species listing of their collection on a spreadsheet in Microsoft Excel or Word. They might see little value in having detailed documentation on each palm. Conversely, others see great use in recording and organizing this information so that it can be readily used.

The Montgomery Botanical Center (MBC) in Miami, Florida maintains one of the world's most complete botanical databases. It is used to document MBC's population-based collection of palms and cycads. It uses a database program called BG-Base and a mapping program called BG-Map. The ambitious goal of the database is to provide a detailed record of the life cycle and environmental history of each plant in its living collection. Records are maintained on 25,000 living plants representing 1,100 taxa. The complete inventory is updated each year by collecting new data on about 2,500 plants a month. The database also includes an extensive image database of plant growth and development, reproduction, horticultural and natural disasters.

Microsoft Office Access Database Management Program

There are several advantages to using Microsoft® Office Access 2003 database management application to develop the Palm Collection Database. It is commonly included with Microsoft Office (Word, Excel and PowerPoint) and operates with these other programs. The acquisition cost is about $200.00. The user interface, while complex by the standards of the other programs in Microsoft Office, is relatively easy to use by non-professional software developers. Importantly, Access has a large user base that insures its continuity, steady updating and upgrading.

The use of Access is mainly appropriate for smaller display gardens not actively involved in botanical research. The trade-off for its ease of use is its limitations in complex record-storage situations where data validation and security are an issue. It has difficulty handling very large databases (over 2 GB), many simultaneous multi-user networking environments and multiple program interfaces (including use with web-based applications). It is best when used in a straightforward single-user, stand-alone situation.

Botanic Gardens Conservation International (www.bgci.org.uk) has developed an Access template designed to provide a database for its member botanical gardens. BG-Recorder 2 is a template that can be downloaded by BGCI members at no cost. The template can then be modified (with a few restrictions) to suit individual needs.

Several other commercial database programs have been developed for managing plant collections. A large number of these programs appear to be oriented toward tracking orchid collections. For example, My Orchids 2.0 (www.orchidtalk.com) is a highly usable and comprehensive database program designed specifically for orchid collectors. While it could be used by a palm collector, much of it is oriented toward blooming, hybridization and other factors that are important to orchid growers but secondary to palms.

1. The main switchboard (menu) for the Palm Collection Database. Each item leads to a submenu for adding, maintaining or removing palms from the collection.

PALM COLLECTION DATABASE

A Palm Collection Database has been developed for the members of the International Palm Society. It is oriented towards the needs of private collectors developing display gardens. The database template is divided into three main groups that follow the normal palm collection cycle (Fig. 1):

Level 1 – Palm Acquisition (identification, sourcing and planting)

Level 2 – Palm Maintenance (fertilization, treatments, and reproduction)

Level 3 – Palm Disposition (sale, death or exchange)

Level 1 – Palm Acquisition.

There are three main activities associated with adding a new palm to the collection. First, the palm is identified by assigning it a unique code number and scientific name. Second, the sourcing information for the palm is recorded. Third, the palm's physical location is given within the display garden.

Palm Identification:

Accession Number: The accession number is automatically assigned as a sequential whole number. This number acts as the primary key that uniquely identifies the specific palm within the collection.

Family: Of course, for purposes of developing a Palm Collection Database, the family Palmae is used. However, the PCD is not restrictive, and other plant families can be entered.

Genera: A standardized list of palm genera can be created and stored within the template. Intergeneric hybrid names can also be entered.

2. The acquisition of the new palm into the collection is entered into the database. The new palm is identified, then the acquisition and location data are recorded.

Species Name: The species name is indicated. This can include complications arising from species hybrids, subspecies, variants and cultivars.

Other Names: The vernacular (common) name and any synonymous names can also be entered.

Acquisition Information:

Source: The source of the palm (usually a commercial nursery or fellow collector). A list of usual sources can be developed in a table that is linked to this field.

Date: The date that the palm was acquired.

Cost: The acquisition cost of the palm.

Size: The initial size of the palm from a standard list: seedling, 4 inch liner, 1 gallon, 2/3 gallon, 5 gallon, 15 gallon, 24 inch box, 36 inch box or specimen.

Condition: The general condition of the palm.

Planting Location (Fig. 2):

Location: The specific garden location is based upon a standardized list developed specifically for your particular display garden. In addition to being field planted in the garden, this record could also include the greenhouse, shadehouse, full sun nursery, conservatory, etc.

Date: The date the palm was planted.

Size: The planted size of the palm from a standard list: seedling, 4 inch liner, 1 gallon, 2/3 gallon, 5 gallon, 15 gallon, 24 inch box, 36 inch box or specimen.

Notes: Any horticultural notes related to the planting of this palm.

Level 2 – Palm Maintenance

Once the palm has been placed into the collection, the database can then be used to record the horticultural practices necessary to its maintenance. The horticultural activities that are covered are: fertilization, growth, treatments and reproduction (Fig. 3).

Fertilization Regimen:

Type: Granular, soluble, foliar, and time release period.

Brand: The fertilizer brand name and manufacturer.

Date: The date of the last application.

Interval: The date (or number of days) to repeat application.

Supplements: Any additives to the regular fertilizer regimen. For example, sea kelp, growth stimulants, fish emulsion, etc.

Notes: Specific notes on the application rate, palm reaction such as burning, etc.

Growth Record:

Measurement Date: This recording may be done periodically – possibly annually at the end of the growing season.

Growth Recording: Palms are commonly measured in centimeters from the ground to the growing point or meristem.

Notes: This field could include notes regarding climatic conditions (e.g., precipitation, wind, frosts) which impede/promote growth, damage caused by natural disasters (e.g., blow-over, fallen limbs, flooding) or errors in horticultural practices (e.g., over-pruning, irrigation problems, etc.)

Pest/Disease Treatments:

Pest/Disease: Separately records the most common pests and diseases encountered by this palm.

Treatment: Separately records the insecticide, miticide or fungicide used for treating the pests and diseases.

Interval: The recommended interval for repeat preventative treatment.

Adjuvant: Any spray stickers, markers or PH adjustment which was used in conjunction with the pesticide or fungicide.

Notes: The success of knockdown with the indicated treatment and subsequent reoccurrence.

Pruning Notes: Leaf removal for appearance, disease, damage, reduction of transpiration during transplanting, etc.

Reproductive Information:

Sex: Male, female, hermaphrodite.

First Flower: The date the palm reached maturity with its first flower.

Flowering Frequency: How often does the palm produce flowers?

Time to Maturity: The time from flowering until the harvesting of ripe fruit.

Germination Percentage: What is the likelihood of germination based upon past experience? This record provides an indication of seed viability.

Germination Time: The time from sowing to sprouting.

Level 3 – Palm Disposition

The removal of the palm from the living collection can occur in several different ways. The methods of disposition of a palm covered are: fertilization, growth, treatments and reproduction (Fig. 4).

Disposition from Collection:

Date: When the palm was removed from the living collection.

3. Information on the maintenance of an existing palm in the collection is recorded. The fertilization record for a palm is shown.

Size: The final size of the palm from a standard list: seedling, 4 inch liner, 1 gallon, 2/3 gallon, 5 gallon, 15 gallon, 24 inch box, 36 inch box or specimen.

Cause: Removal of the palm may be due to sale, death or exchange.

Sale or Exchange: Buyer's Name: The name of the person acquiring the palm.

Sale: Price: The sale price.

Death: Reason: The cause of death, if known.

Exchange: Plants: The palm(s) or other items received in exchange.

4. A palm is removed from the living collection due to its sale, death or exchange. In this example, a palm has died due to gopher damage.

Customized Reporting

The Microsoft Access program allows the user to organize and format reports by extracting the stored data (Fig. 5). A report "wizard" in Access automates the process of selecting the data fields, sorting the data and formatting the reports. Queries are used to retrieve data based on specific criteria. For example, the collector can quickly create a customized report that only includes palms acquired from a particular nursery during the past year, and sorted in order genus (primary sort) and species (secondary sort), with the acquisition size and cost and garden location.

5. A sample customized report generated in Access from data stored in the Palm Collection Database. In this case, the tropical palm collection located in the Conservatory is listed by Genus and Species.

Most hobbyists will not have a need to record all of this information for every palm in the collection. With the exception of the Accession Number, which serves as the unique identifying key for each palm in the database, all of the other fields are optional.

Members of the International Palm Society can receive a free copy of the Palm Collection Database by e-mail. The database requires 1.32 MB of disk space and a recent version of Microsoft Office Access. Send your request to Randal.Moore@cox.net. – *Randal J. Moore, Poway, California USA*

Submit an article!

Members are encouraged to submit articles for the "Growing Palms" section to Randal J. Moore, Growing Palms Editor, at Randal.Moore@cox.net.

Observations of Palms Made by the Botanist and Explorer Ludwig Leichhardt, During the Australian Overland Expedition of 1844–1845

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Ludwig Leichhardt's journal of the Overland Expedition from Darling Downs to Port Essington, Australia, of 1844–1845 contains some of the first botanical records of a number of Australian palms, as well as many other plants. Leichhardt's account offers insights into species distribution, the condition of the Australian environment at the time of European colonization, and the risks, difficulties and successes of scientific exploration and discovery.

The explorations of Ludwig Leichhardt (b.1813, d. 1848?) place him as one of Australia's most controversial figures of the colonial era (Jack 1921, Chisholm 1955, Dalton 1986, Roderick 1988, Jackes 1990, Maclaren & Cooper 1993, Pearn 2001). Leichhardt had a scientific education at Göttingen and Berlin Universities in Germany. He migrated to Australia in 1842 to pursue his scientific interests and apparently to satisfy a passion for adventure and exploration (Neumayer 1944). After spending two years conducting botanical collecting in southeastern Australia, Leichhardt's ambitions led him to embark on some of Australia's more interesting scientific expeditions (Maiden 1908, Hall 1978, Blake 1955, Barker & Barker 1990, Orchard 1999, Short 2003). His first expedition was the Overland Expedition from the Darling Downs in eastern Australia to Port Essington on the far northern coast, a direct distance of about 2700 km (Leichhardt 1847a, 1847b, Webster 1980). Planned as a six-month trip, the Expedition lasted for 14.5 months, and traversed over 4800 km in a somewhat circuitous route. The exploration party was given up for lost, and their eventual arrival back in Sydney generated controversy and notoriety for Leichhardt. Encouraged by the success of the Overland Expedition, Leichhardt mounted a second expedition within seven months of his return, this time attempting to cross Australia from east to west (Sprod 1989). However, this was abandoned after eight months because of illness, slow progress and the loss of stock, and Leichhardt returned to Sydney (Bunce 1859, Mann 1888, Turnbull 1983). Not to be daunted, Leichhardt commenced a second attempt at an east-west crossing some six months later. The last contact with this expedition was on 3 March 1848, after which the party was to disappear without a trace, thus adding to Leichhardt's 'mythical' status in Australian folklore (Connell 1980, Simpson 1997).

The Journal of the Overland Expedition

The publication of Leichhardt's diary of the Overland Expedition in the form of a journal was one of the major literary events in Australia at that time (Leichhardt 1847a). Leichhardt's focus was botanical exploration and he was an energetic and observant plant collector, and in the two years between his arrival in Australia in 1842 and his departure on the Overland Expedition in 1844 he had

1. Route of Ludwig Leichhardt's Overland Expedition 1844–1845. Numbers in circles indicate the locations where Leichhardt's first record of palm species occurred. 1. *Livistona nitida*; 2. *Livistona decora*; 3. *Livistona lanuginosa*; 4. *Corypha utan*; 5. *Livistona rigida*; 6. *Livistona inermis*; 7. *Hydriastele wendlandiana*; 8. *Carpentaria acuminata*; 9. *Livistona humilis*; 10. *Livistona benthamii*; 11. *Hydriastele ramsayi*. Map by M. Alewijnse.

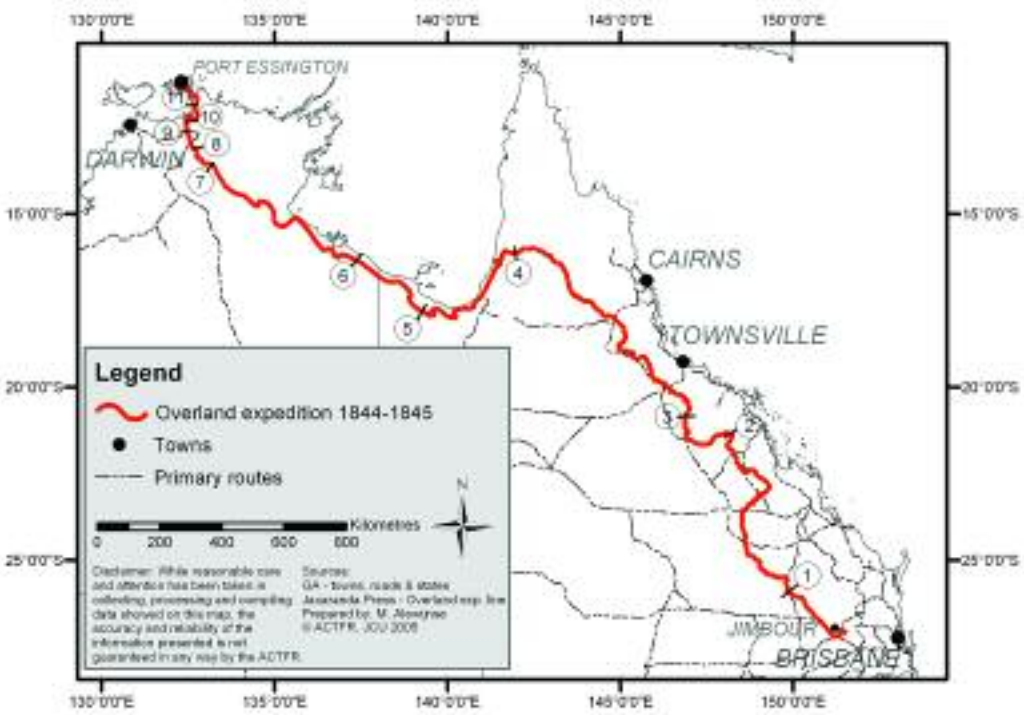

Table 1. Current species name and the name or descriptive terms used by Ludwig Leichhardt to describe palms in his Journal of the Overland Expedition of 1844–1845.

current name	*Leichhardt's manuscript names*
Carpentaria acuminata Becc.	*Seaforthia* palm [South and East Alligator Rivers, Cobourg Peninsula]
Corypha utan Lam.	*Corypha* with a thick trunk swelling in the middle [Mitchell River]
Hydriastele ramsayi (Becc.) W.J. Baker & Loo	*Seaforthia* palm [East Alligator River], small *Seaforthia* palm [Cobourg Peninsual]
Hydriastele wendlandiana (F. Muell.) H. Wendl. & Drude	small *Seaforthia* palm [Jim Jim Creek; Arnhemland Escarpment]
Livistona decora (W. Bull) Dowe	*Corypha* palm is frequent under the range (Isaac River and Suttor Creek headwaters)
Livistona benthamii F.M. Bailey	stately *Corypha* palm [South and East Alligator Rivers]
Livistona humilis R. Br.	*Livistona inermis* R. Br.; *Livistona* palm [South and East Alligator Rivers; Cobourg Peninsula]
Livistona inermis R. Br.	small fan leaved palm (*Livistona humilis* R. Br.); small *Livistona* palm; *Livistona* palm [western Gulf of Carpentaria; Katherine River headwaters; west Arnhemland Escarpment]
Livistona lanuginosa A.N. Rodd	small *Corypha* palm [Suttor River]
Livistona nitida A.N. Rodd	*Corypha* palm [Dawson River catchment]
Livistona rigida Becc.	stream-edge *Corypha* [Albert and Gregory River catchments

collected extensively throughout southeastern Australia (Leichhardt 1845, 1846, Orchard 1999). However, many plants in these areas had been previously collected, and Leichhardt's ambitions were ignited with the opportunity to collect in unexplored areas (Politzer 1944, Priessnitz 1991).

During the Overland Expedition, Leichhardt maintained a diary with daily entries, with detailed descriptions of the vegetation and plant species that he encountered (Leichhardt 1847a). With the taxonomic resources available to him, such as those of Brown (1810, 1830) and volumes 1–7 of Candolle and Candolle (1823–1839), Leichhardt was able to recognize undescribed species and make collections of them. However, a number of incidents beset the Expedition, which resulted in the unfortunate loss of all but a few of the thousands of specimens collected during the Expedition. Firstly, the pack-horses carrying his specimens were drowned during an attempt to cross the Roper River on 21 October 1845. Leichhardt's journal described the event: "*….Charley came and brought the dismal tidings that three of the most vigorous of them* [horses] *were drowned, at the junction of the creek with the river…This disastrous event staggered me, and for a moment I turned almost giddy; but there was no help. Unable to increase the load of my bullocks, I was obliged to leave part of my botanical collection which had been carried by one of the horses. The fruit of many a day's work was consigned to the fire…My collection had the advantage of being almost complete in blossoms, fruit, and seed….*" (Leichhardt 1847a, p. 445).

In a letter to G. Duranto of the Paris herbarium [20 May 1846] Leichhardt wrote "…. *As my collection increased, I surrounded the different packages with green hide, which when dry, formed a fine box round them, and protected them from hard usage to which they were exposed….the time came when I had to open all my fine green hide boxes, to make a poor choice of the dried plants, and to throw the greatest number of them away unable to carry them any farther, as four of my pack horses drowned, and the means of carrying my collections of plants and geological specimens were consequently destroyed. I fully lost 4–5000 specimens. There are however still some very interesting remnants…*" (Politzer 1944, Aurousseau 1968). Furthermore, on 4

2. *Livistona nitida* near the Palm Tree Creek/ Robinson Creek junction.

November 1845, additional losses were incurred when a bullock "*which carried the remainder of my botanical specimens, watched his opportunity, and plunged into a deep pond, where he was quietly swimming about and enjoying himself, whilst I was almost crying with vexation at seeing all my plants thoroughly soaked*" (Leichhardt 1847a, p. 469).

Some 2800 specimens collected by Leichhardt during his six years of collecting in Australia have been located. About 90 of these are type specimens of various designations (Dowe 2005). In the absence of specimens from the Overland Expedition, the journal itself is the primary botanical reference for that period in Leichhardt's career. Joseph Hooker (1860, p. cxxi) noted that the journal was at the time of its publication "*....by far the fullest published detailed account of the tropical vegetation of the interior of Australia that we possess.*"

The aim of this paper is to annotate all references to palms in the Journal of the

3. *Livistona decora* at Sandy Creek, tributary of Suttor Creek, Denham Range.

Overland Expedition. The author subsequently visited many of the locations where Leichhardt mentioned palms. Herbarium collections were made at some locations and photos taken. The manuscript names used by Leichhardt and their current names are listed in Table 1.

Extracts from Journal of an Overland Expedition

The Overland Expedition departed Jimbour on the Darling Downs, northwest of Brisbane, on 1 October 1844 (Fig. 1). Heading northwest, Leichhardt followed the Condamine River until 9 October, and then to the north entered the Dawson River catchment on 5 November. Following a creek that enlarged into a stream that Leichhardt named the Dawson River, the expedition passed beside it for some distance until it was joined by a stream lined with *Livistona nitida*, which would be the first palm species to be encountered on the Expedition. Because of the abundance of palms, Leichhardt

named it Palm Tree Creek (Fig. 2). The species is a riparian element on the Dawson River system, where it forms groves in gorges and at the bases of sandstone cliffs as well as on the edges of streams that flow through forests and scrubs on undulating topography.

> 14 Nov. 1844: "*A dense scrub, which had driven us back to the river, obliged me to reconnoiter to the north-west, in which I was very successful; for, after having crossed the scrub, I came into an open country, furnished with some fine sheets of water, and a creek with Corypha palms, growing to the height of 25 to 30 ft....*
>
> *...Several rocky gullies were passed, that were full of palm trees. The valley of Palm-tree Creek extends about nineteen miles from west to east. The ranges which bound it to the south, I called "Lynd's Range", after my friend R. Lynd Esq.*"

After camping on Palm Tree Creek on 16 November, the Expedition took a westerly course to follow Robinson Creek. Here *Livistona nitida* was similarly abundant, and Leichhardt set up camp on the night of 17 November beneath a grove of palms. *Livistona nitida* is here a conspicuous riparian species, and forms extensive groves on the lower plains of Robinson Creek, as well as the gorges and cliff-bases of upper Robinson Creek in Expedition National Park. The party consumed palm hearts as a welcome dietary addition, apparently causing no ill effects.

> 17 Nov. 1844, near S25°30'11": "*We went about nine miles up the valley, on a south branch of Palm-tree Creek, which derives its water from Lynd's Range. The fine water-hole which I selected for our camp, was not only shaded by stately Coryphas and flooded gums, but the drooping Callistemon, the creek Melaleuca, and the Casuarina, gave it the character of the rivers and creeks of the Moreton Bay district....The tops of the Corypha palm eat well, either baked in hot ashes or raw, and, although very indigestible, did not prove injurious to health when eaten in small quantities*"

The Expedition followed Robinson Creek and its tributaries until 27 November. Leichhardt observed groves of *Livistona nitida* in gorges and gullies.

> 25 Nov. 1844, S25°27'12": "*The gullies were full of bush-trees, amongst which the Bottle-tree, and the Corypha-palm were frequent.*"

On 27 November, the Expedition headed away from Robinson Creek in a northwest direction, and crossed Expedition Range. *Livistona nitida* again occurred as a riparian species in headwater streams, although the suite of associated plants was *Casuarina*-dominant. At their camp, the consumption of palm heart was once again a welcome addition to their diet.

> 29 Nov. 1844, near S25°29'19": "*Instead of the cypress-pine scrub, the Corypha-palm and the Casuarina grew here, and invited us to cool shaded waters: the Corypha-palm promised a good supply of cabbage.*"

4. *Corypha utan* in the Mitchell River catchment, southern Cape York Peninsula.

5. *Livistona rigida* on Gregory River. NB. A grasshopper plague had recently descended on the Gregory River area in the days prior to the time the photo was taken, hence the chewed appearance of the leaves.

The next few days were spent negotiating deep gullies and sandstone gorges seeking a northerly route. On 1 December, the party followed Ruined Castle Creek, and to the north along Zamia Creek, so named because of the presence of the cycad *Macrozamia moorei* F.Muell. After leaving Zamia Creek on 7 December, the party headed to the northwest and skirted the eastern and northern slopes of Expedition Range. On 9 December, a series of small northeastern flowing creeks arising in Expedition Range were encountered, many of which were lined with *Livistona nitida*. Further on, the party set up camp once again in the company of palms. This creek was named Erythrina Creek and is near the northern distribution limit of *Livistona nitida*.

9 Dec. 1844, near S24°54'19": "*About six miles from our last camp, we came upon a fine creek (with Casuarinas and palm-trees), flowing from the mountains on a north-easterly course; and, about three miles further, to the W.N.W., we came to another creek, and numerous palm-trees growing near it. ...We were camped in the shade of a fine Erythrina; and the Corypha-palm, Tristania, the flooded-gum, the silver-leaved Ironbark, Tripetelus, and a species of Croton, grew around us.* "

On the 10 December, the expedition ascended Christmas Range and entered the Mackenzie River catchment. The Comet River was encountered on 28 December, the Mackenzie River on 10 January, and the Isaac River on 13

6. *Livistona inermis* in the headwaters of Katherine River, arising in the western Arnhemland Plateau.

February. In the upper reaches of the Isaac River in the vicinity of Denham Range, Leichhardt recorded "The *Corypha* palm is frequent under the range," which refers to isolated populations of *Livistona decora* associated with permanent small headwater springs of the Isaac River gorge, and Cabbage Tree and Sandy Creeks, which flow into Suttor Creek (Fig. 3). To follow, was an extensive tract of country not containing palms.

> 5 March 1845, near S21°42': "*The Corypha palm is frequent under the range; the Ebenaceous tree, with compound pinnate leaves and unequilateral leaflets, is of a middle size, about thirty feet high, with a shady and rather spreading crown.*"

Leaving the Isaac River on 7 March, the party traveled to the northwest and on 8 March entered the southeastern catchment of the Burdekin River system. They located the headwaters of Suttor Creek, and followed it to its junction with Suttor River on 12 March. Here the Suttor River adopts a northwest to northern course, and being supplied with regular waterholes, camps were made on its banks during the next few days. At the junction of Suttor River and Deep Creek, a population of *Livistona lanuginosa* was first observed on 25 March (Front Cover). This population is near the eastern distribution limit of the species, with the main population occupying the riparian zones of rivers to the west. The Suttor River joins the much larger Burdekin River only a few kilometers north of this site, and interestingly there are no populations of *L. lanuginosa* occurring on the banks of the primary watercourse. Today, the site of the junction of Deep Creek and the Suttor River as seen by Leichhardt is inundated with the waters of Lake Dalrymple, the backflow of the Burdekin Dam constructed in 1987. *Livistona lanuginosa* is otherwise very restricted in distribution, being confined to minor rivers and their tributaries within the central Burdekin River catchment. Leichhardt suggested that Aborigines had removed the tops of many palms at this location,

supposedly to obtain the cabbage. However, this seems improbable as cabbage could be much more easily obtained from palms within reach of the ground. These may have merely been dead individuals of which the stems were still erect.

> 25 March 1845, near S21° 6': "*At the junction of the creek, a great number of small Corypha palms were growing, and my companions observed the dead stems of some very high ones, whose tops had been cut off by the natives, probably to obtain the young shoot.*"

Another tract of habitats lacking palms was to be traversed over the next three months. The Burdekin River system was explored, and eventually exited on 23 May. The Expedition was now well within the tropics and the vegetation had become largely unknown to Leichhardt. The Mitchell River system was entered on 24 May, with the Lynd River being followed until its junction with the Mitchell on June 15. For the next few days, the Mitchell River was skirted and a camp was established near the river and some of the party presented Leichhardt with the leaves of *Corypha utan*, collected from the banks of the Mitchell, where the species forms extensive groves on the banks of ox-bow lakes, secondary channels and anabranches (Fig. 4). This was the first record of this species in Australia.

> 21 June 1845, near S16° 9' 41": "*We were encamped at a small creek, scarcely a mile from the river, from which John Murphy and Brown brought the leaves of the first palm trees we had seen on the waters of the gulf. They belonged to the genus Corypha; some of them were very thick and high*"

Following the Mitchell River downstream, vegetation typically associated with the rivers that flow into the Gulf of Carpentaria was observed and recorded by Leichhardt.

7. *Hydriastele wendlandiana* in the Gimbat Creek/Jim Jim Creek area.

Populations of *Corypha utan* tend to become denser in the lower reaches of rivers where it occurs, and this is where the species attains its full potential as towering 20 m tall individuals with massive ventricose stems.

> 23 June 1845, near S16° 0′ 26″: "*I visited the bed of the river: its banks were covered with a rather open vine brush. Palm trees became numerous, and grew forty or fifty feet high, with a thick trunk swelling in the middle, and tapering upwards and downwards*"

The following day, the expedition crossed what Leichhardt recorded as one of the heads of the Nassau River, where an Aboriginal camp was observed. The watercourse is indeed Plain Creek, an upper tributary of the Nassau. The camp of 24 June was established on a lagoon near Dunbar Creek.

> 24 June 1845 near S15° 59′ 30″: "*The banks of a large lagoon, on which several palm trees grew, were covered with heaps of mussel-shells.*"

Corypha utan at this location near Dunbar Creek is close to its southwestern distribution limits on Cape York Peninsula, and populations are mainly confined to stream edges.

> 25 June, near S15° 51′ 26″: *"It was very broad where Brown saw it last, and, by his account, the brush was almost entirely composed of palm trees."*

On 26 June, the expedition turned west in an attempt to traverse the country adjoining the southern Gulf of Carpentaria. Two days later, on 28 June, the party was attacked by Aborigines and the naturalist John Gilbert was killed. Late June, July and most of August were spent negotiating the numerous streams and rivers that enter the southern Gulf of Carpentaria. Palms are absent from these systems, and none occurs again until the Albert

8. *Carpentaria acuminata* in a moist gully on the Arnhemland escarpment.

9. *Livistona humilis* near South Alligator River.

and Gregory River systems that enter the southwestern Gulf of Carpentaria. On 18 August, *Livistona rigida* was encountered for the first time, upstream of the junction of Barclay River and Albert River (Fig. 5). This palm is restricted to the riparian zone, and forms groves along many of the streams in this area.

> 18 August 1845, near S17° 57′ or 17° 52′: "*A narrow belt of brush, with drooping tea-trees, the Corypha palm, the Pandanus, and Sarcocephalus, grew along the water's edge*."

Other perennial streams were encountered in the following days. Rivers and streams here are highly braided, running parallel, then joining, and then separating, and the main channels are variously indicated on many maps. The names that Leichhardt applied to the watercourses in this area are open to different interpretations, and it is beyond the scope of this paper to unravel Leichhardt's exact route through the area. Nevertheless, the streams presently known as the Albert River, Barclay River, Beames Brook, Lawn Hill Creek and Gregory River all support significant populations of *Livistona rigida* along their banks. On 20 August, Leichhardt clearly crossed the Nicholson River, based on his description, as it is the only river in that area with the character that he described. Interestingly at this point the Nicholson River does not support any *Livistona rigida* populations along its banks, although some occur upstream.

> 19 August 1845: "*The river was joined by a running creek from south-south-west, which we had to follow up about five miles, where it formed a very narrow channel between thickets of palm trees, drooping tea-trees, Sarcocephalus, and particularly Pandanus, which crowded round the tiny stream.... Magnificent tea-trees, Casuarinas, and Terminalias, gave a refreshing shade, and Pandanus and Corypha palms added to the beauty of the spot....We again enjoyed here the young shoots of the Corypha palm*"

Leaving the Nicholson River on 22 August, the Expedition traveled across some of the most environmentally uniform country encountered during the Expedition. On 7 September, an area of sandstone was traversed north-west of Westmoreland, and *Livistona inermis* was observed and recorded for the first time by Leichhardt [though incorrectly named by him as *Livistona humilis*], in the vicinity of what he interpreted to be the van Alphen River. *Livistona inermis* most commonly occurs on sandstone, and is otherwise widely distributed, in suitable habitats, from northwest Queensland to the islands north of Darwin.

> 7 Sept. 1845, near S16° 35′: "*The rose-coloured Sterculia, and a smooth broad-leaved Terminalia, were observed on the sandy flats of the creek; and a small fan-leaved palm (Livistona humilis, R. Br.), a small insignificant trunkless plant, growing between sandstone rocks, was here first observed. A*

10. *Livistona benthamii* near South Alligator River.

taller species of this palm, as we subsequently found, formed large tracts of forest on the Cobourg Peninsula, and near the Alligator rivers."

During the remainder of September, October and early November, the Expedition traversed habitats mainly devoid of palms. It was during this sector that Leichhardt was forced to abandon 3–4000 botanical specimens because of the drowning of his packhorses, whilst crossing the Roper River on 21 October. Although a large population of *Livistona rigida* occurs on the Roper River in the area around Mataranka, the Expedition crossed the river too far downstream to encounter this species there. By early November, the Expedition reached the watershed of streams with their headwaters in the Arnhemland Plateau. On Snowdrop Creek, an upper tributary of Katherine River, *Livistona inermis* was observed growing in an area of sandstone cliffs and deep rugged gorges (Fig. 6).

9 Nov. 1845, near S13° 38′ 28″: "*Mr. Calvert saw the Livistona palm*"

At this area near Gimbat Creek in southern Arnhemland, patches of dense vegetation were becoming more common, particularly associated with sandstone escarpments and perennially moist gullies and permanent streams. Outlying populations of both *Hydriastele wendlandiana* and *Carpentaria acuminata* [respectively named as 'small *Seaforthia*' and '*Seaforthia*' palms by Leichhardt] occur here (Figs. 7 & 8). The former occurs most commonly in areas away from the Arnhemland Escarpment in the north-west of the Northern Territory, while the latter is otherwise distributed throughout the Arnhemland Escarpment and associated gullies, and in a broad arc across the north of the Northern Territory.

13 Nov. 1845: "*Very small specimens of the Seaforthia palm were here observed for the first time; and the large scarlet fruit of Eugenia was found*."

The ruggedness of the Arnhemland Escarpment sandstone was proving difficult to traverse, so Leichhardt attempted, on 20 November, an ascent to the coastal plains that now stretched ahead of them. Once on the plains in the headwaters of the South Alligator River, populations of *Livistona humilis* began to appear (Fig. 9).

11. *Hydriastele ramsayi* on Cobourg Peninsula.

25 Nov. 1845, near S13° 0′ 56″: "*The Livistona palm and Cochlospermum gossypium grew on the ridges; the tea-tree, the stringy- bark, the leguminous Ironbark and Eugenia were useful timber.*"

Descending the South Alligator River valley during late November, *Livistona humilis* [named as *Livistona inermis* by Leichhardt] became one of the dominant mid-level species in low open woodlands. As the environment changed to swampier or poorly drained formations, Leichhardt's 'stately *Corypha,' Livistona benthamii*, formed extensive populations (Fig. 10).

26 Nov. 1845, near S12° 51′ 56″: "*Livistona inermis, R. Br. formed small groves; and Pandanus covered the hollows and banks of two small creeks with rocky water-holes going to the westward....We crossed the plain to find water, but the approaches of the river were formed by tea-tree hollows, and by thick vine brush, at the outside of which noble bouquets of Bamboo and stately Corypha palms attracted our attention.*"

By the end of November, the lower areas of the South Alligator River were approached. In areas of better drainage, most often on siliceous sand, populations of *Livistona humilis* [named as *Livistona inermis* by Leichhardt] reach their greatest density.

29 Nov. 1845, near S12° 26′ 41″: "*Livistona inermis, R. Br. grew from twenty to thirty feet high, with a very slender stem and small crown, and formed large groves in the stringy-bark forest.*"

The following day, 30 November, the expedition moved through what is now northern Kakadu National Park on a route toward East Alligator River. Leichhardt recorded more *Livistona humilis* populations, and the use of its cabbage as a vegetable, which severely affected the bowels of some in the

Expedition. The further north they traveled, the more ubiquitous *Livistona humilis* became.

> 30 Nov. 1845, near S12° 21′ 49″: "*The lower part of the creek on which we were camped was covered with a thicket of Pandanus; but its upper part was surrounded by groves of the Livistona palm. As our horses had been driven far from camp by the grey horse-fly and a large brown fly with green eyes, which annoyed us particularly before sunset, and shortly after sunrise, we had to wait a long time for them, and employed ourselves, in the meanwhile, with cutting and eating the tops of Livistona. Many were in blossom, others were in fruit; the latter is an oblong little stone fruit of very bitter taste. Only the lowest part of the young shoots is eatable, the remainder being too bitter. I think they affected the bowels even more than the shoots of the Corypha palm....We made a short Sunday stage through a fine forest, in which Livistona became more and more frequent.*"

At some locations on the flats between the South Alligator River and the East Alligator River, which the Expedition traversed during late November and early December, the low open woodlands are dominated by populations of *Livistona humilis*.

> 1 Dec. 1845: "*We traveled about eleven to twelve miles to the northward, for the greater part through forest land, large tracts of which were occupied solely by Livistona.*"

The Aborigines of the area had become familiar with European settlers, as the Port Essington settlement was established in 1839. As the Expedition passed along, they were offered refreshments including the cabbage of what Leichhardt termed *Seaforthia* palm, which could apply to either *Carpentaria acuminata* or *Hydriastele ramsayi*, as both species occur in this area (Fig. 11).

> 2 Dec. 1845: "*The natives were remarkably kind and attentive, and offered us the rind of the rose-coloured Eugenia apple, the cabbage of the Seaforthia palm, a fruit which I did not know, and the nut-like swelling of the rhizome of either a grass or sedge.*"

The area between the South Alligator River and East Alligator River was traversed in early December, and populations of *Carpentaria acuminata* (which Leichhardt named as *Seaforthia* palms) are common here.

> 4 Dec. 1845: "*The Seaforthia palm raised its elegant crown far above the patches of vine brush which we passed at the river side of the ridges.*"

Near the Murgenella area, the open forests are occupied by extensive populations of *Livistona humilis*.

> 14 Dec. 1845, near S11° 32′ 11″: "*They were all composed of a clayey ironstone, and clothed with patches of scrub, formed principally of Calythrix, and with a more open forest of Cypress pine, white-gum, tea-trees, bloodwood, Livistona palms, Pandanus, with shrubby Terminalias and Coniogetons.*"

The Expedition reached the Cobourg Peninsula in mid December, where *Hydriastele ramsayi* (named as small *Seaforthia* palms by Leichhardt) occurred in the more densely forested areas. The well-drained ridges are occupied by populations of *Livistona humilis*.

> 16 Dec. 1845, near S11°26′18″: "*We traveled about five miles over stony ironstone ridges, with extensive groves of Livistona palm covering their slopes....In the forest, we met with some few small Seaforthia palms, the young shoots of which we obtained with great difficulty, not then knowing how easily the natives strip them of the surrounding leaves and leafstalks.*"

At a stream flowing into Bremers Bay, populations of *Livistona humilis* and *Hydriastele ramsayi* [as *Seaforthia* palm] were common, although the latter was to disappear in the immediate vicinity of the harbor. Later that day, the expedition arrived at the settlement of Port Essington, where the site of coconut palms lining the entrance and neat rows of houses were noted. The expedition was to spend a month recuperating here from their 14.5-month journey before their return to Sydney on the schooner Heroine, and where they arrived on 29 March 1845, welcomed in incredulous and controversial circumstances.

> 17 Dec. 1845: "*We started, with a willing guide, for the goal of our journey, and traveled to the south-west over a hilly country, covered with groves of the Livistona palm, which, as we proceeded became mixed with Seaforthia (the real cabbage-palm).... The Seaforthia palm became very abundant, and at last the forest was formed entirely of it, with trees of every size. Our guide shewed us how we could easily obtain the young shoots, by splitting the leaves and leafstalks; and we enjoyed a fine meal of the cabbage....As we approached the harbour, the cabbage palm became rarer, and entirely disappeared at the head of it....On*

the Vollir, we came on a cart road which wound round the foot of a high hill: and, having passed the garden, with its fine Cocoa-nut palms, the white house, and a row of snug thatched cottages burst suddenly upon us."

Conclusion

Leichhardt provided a major contribution to the taxonomy of Australian plants by the collections that he made during his six years in Australia, as well as presenting the first literary accounts of many species as part of his diary and journal entries. In his Journal of the Overland Expedition, Leichhardt made 34 references to palms, accounting for a total of 11 species. In most cases he provided at least a genus name, including *Corypha*, *Livistona* or *Seaforthia*, and two by a species name, *Livistona inermis* and *Livistona humilis*. It must be noted that only a small number of palms had been described in Australia up to that time, and Leichhardt was guided by the available taxonomy. With the abandonment of 3–4000 specimens after the drowning of his pack-horses, it is not known if Leichhardt collected any of the palms that he mentioned in his journal, in particular those which were undescribed at the time. As for the collection legacy of the Overland Expedition, only about 50 specimens have survived, of which many are small herbaceous species, and unfortunately none are palms.

Leichhardt's journal entries provide an indication of the distribution of species at the time immediately prior to European settlement of northern Australia. Many of the areas where Leichhardt described palms are largely surviving as he saw them, as he traversed some of the more remote parts of Australia, which remain sparsely settled and are presently mostly used for open range cattle grazing. Although many of the populations of palms that Leichhardt described remain, research into other plant species that are more sensitive to the impact of European-style land management practices, indicate decline and possible extirpation in some locations (Benson & Redpath 1997). Indeed Leichhardt's true legacy will be his accurate and compelling first-hand description of a natural environment that is in the process of being completely altered, and fast disappearing in many locations.

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IPS Biennial 2006. Destination: Dominican Republic

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Photos by Paul Craft

1. Inside view of the Botanical Garden Dr. Rafael Ma. Moscoso.

During October 1–8, 2006, the International Palm Society (IPS) will celebrate its biennial in the Dominican Republic.

The island of Hispaniola, located in the Caribbean Sea, covers an area of 74,000 square kilometers and is shared by the Dominican Republic and Haiti. Palms are an essential element of the biology, culture and landscape of the island and are represented by 30 species, of which half are endemic.

Eighteen genera are present, occupying an amazing diversity of ecosystems and landscapes; they include *Roystonea*, *Sabal*, *Copernicia*, *Coccothrinax*, *Pseudophoenix*, *Acrocomia* and the endemic genus *Zombia*. On this occasion palm lovers will have the opportunity to see these palms in their native habitat. For a week we shall travel between Santo Domingo and Pedernales, on the border with Haiti; this is the region where the most interesting species grow.

Program

Sunday, October 1: We shall meet at the Hotel Occidental El Embajador, in Santo Domingo, and the first activity will be a welcome cocktail followed by dinner, which will formally initiate the 2006 Biennial.

Monday, October 2: We shall have our first contact with native and exotic palms grown in the splendid Botanical Garden Dr. Rafael Ma. Moscoso, in Santo Domingo (http://www.jbn-sdq.org/) (Fig. 1). In the central square we shall see impressive specimens of *Sabal domingensis*, *Roystonea borinquena*, *Coccothrinax argentea*,

2. *Coccothrinax boschiana* in habitat on the coastal Martín García Mountains.

3. *Pseudophoenix ekmanii* in Jaragua National Park.

4. *Coccothrinax ekmanii* in habitat.

Bactris plumeriana, *Calyptronoma rivalis* and *Pseudophoenix vinifera*, as well as magnificent Haitian *Attalea crassispatha*. At noon we shall leave the city toward the east to visit a golf course where hundreds of adult *Acrocomia aculeata* were transplanted (http://www.guavaberry.org/index.html). We shall eat lunch in that spectacular landscape, enjoying the

5 (top). *Coccothrinax scoparia* in Sierra de Bahoruco National Park. 6 (bottom). *Copernicia berteroana*.

native flora of the Caribbean coast, which was respected as part of the landscape by landscape architect Rosángela Bobea.

Tuesday, October 3: We shall set off for the southeast region of the country to Barrera, Azua, where we shall enjoy a population of thousands of *Coccothrinax boschiana* practically emerging from the Caribbean Sea to the mountains of Martín García (Fig. 2). After eating lunch by the sea we shall continue to the Hotel Costa Larimar, in Barahona (http://hotelcostalarimar.com/).

Wednesday, October 4: We shall have the opportunity to visit the Jaragua National Park,

7. *Coccothrinax spissa* in habitat.

where helicopters will be waiting to take us to visit populations of *Pseudophoenix ekmanii*, without a doubt the most charismatic palm of the Dominican Republic (Fig. 3). It will be a unique opportunity to view thousands of specimens of this spectacular palm from the sky as well as to be able to walk among them.

Thursday, October 5: we shall travel to Pedernales, on the Haitian border. On the way, we shall stop to see a population of *Coccothrinax ekmanii* (Fig 4), then continue to the high altitude Sierra de Bahoruco National Park (http://www.geocities.com/falco67_99/pnsb), where, at 1000 m and within pine forests grows *Coccothrinax scoparia* (Fig. 5). We shall also see this small, resilient palm in small populations on the way to Hoyo de Pelempito (http://members.aol.com/aperez11/pelempito.html), an impressive depression in the depths of which we shall contemplate as we eat lunch at the lookout constructed by the park authorities.

Friday, October 6: We shall travel back to Santo Domingo, visiting populations of *Pseudophoenix vinifera* (Back Cover) and *Copernicia berteroana* (Fig. 6) in Azua, as well as the spectacular "belly palms" of Baní, *Coccothrinax spissa* (Fig. 7).

Saturday, October 7: Back in Santo Domingo, there will be several options – tours of the historic center of the colonial city (http://www.sdq.com/colonial/), shopping at craft bazaars, or lunch at the Vivero Inmaculada. At night we shall have a farewell dinner, which will include a colorful Caribbean show.

Sunday, October 8: The biennial will conclude. Attendees will be taken to the airport to return home, or for those attendees not affected by the US embargo of Cuba, a separate trip to the neighboring island of Cuba is planned by a travel agent in the Dominican Republic. Cuba has a fascinating palm flora. This Cuba trip is not sponsored or sanctioned by the IPS.

We have chosen the month of October because it is after the hurricane season of August and September. Each evening, after dinner, we shall present lectures by specialists from various countries who will discuss the palms of the Antilles and South America, along with the latest advances in palm biology and landscape uses. In Barahona, we shall enjoy presentations of the local culture. Throughout our travels, we shall be in modern air conditioned buses. Breakfasts will be included, as well as lunches and dinners, except for the two nights in Santo Domingo. The official language will be English, and we shall have at all times guides who speak English, French and Spanish. This is the first time that the IPS has held its biennial within the Caribbean, and we shall surely take back great memories of the Caribbean sun, color and Latin flavor, as well as its palms.

We look forward to seeing you all on October 1, 2006, in Santo Domingo, Dominican Republic.

CLASSIFIED

The Growth of Palms under Sheltered Mediterranean Conditions

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The Palmae are one of the most important plant families, with great contributions to mankind. Their unique appearance, regular growth habit and adaptatibility to cultivation are remarkable, but their growth rates in cultivation are variable. This report examines the rate growth of palms in the Mediterranean basin in the town of Nauplio, Greece.

Palms have great potential for use in landscaping to give a tropical effect. The use of palms indeed can change the mood of a place, according to the specific mixture of plants deployed. They are suitable for symmetrical planting, in lines or rows, and as focal points at entrances, but their form and texture can also be combined with most other plants, so they can be used in mixed groupings (Sayan 2001). Most palms are low-maintainance, which is why, in most cases, they are successful in a variety of horticultural uses. Palms can easily adapt to new conditions as long as the climate is warm and the soil is moist but well drained (Brickell 1996). According to Bouchair (2004), palm trees can modify their microclimate and can shade the ground surface, thereby causing a reduction

1. Aerial view of Park of O.S.E.

in the ambent temperature, with the added advantage of cooling by evapotranspiration through the leaves.

Only two palms are native to Greece. *Phoenix theophrasti* is known from the Greek islands of Crete (Vai, Preveli), Nisiros, Karpathos, Kos and Santorini. *Chamaerops humilis var. humilis* has been reported from Pachia Ammos, Crete (Greuter 1968). According to Thymakis (2003a), in ancient times, on the plain of Argos, in Mycines and in Nauplio, there were many plants of the native *P. theophrastii*; however, today, most of the palm species that are found in Nauplio are exotics that have been introduced due to the mild climate.

Palms are ideal subjects for demographic studies, as they are easy to identify at all stages of their growth, their fruits are readily visible and easily quantified and leaf scars provide an index of age (Tomlinson 1979). The present paper analyses the rate of growth of palm trees in Nauplio, a town in southern Greece, which occupies a sheltered area with highly specific microclimate conditions. Although the first palm trees in the modern city of Nauplio were established in 1930, little is known about the growth and the successional behaviour of palm species in Nauplio, or in Greece generally. The aim of this study was to examine palm growth rates, which may apply to palms cultivated elsewhere in the Mediterranean Basin.

Methods

Nauplio is an area with gentle, mild temperatures. The mean annual temperature is 18.7ºC, with July being the warmest month and January being the coolest one. The mean annual rainfall is 510.1 mm, with low points during the summer time. Nauplio lacks strong winds, winter frosts and summer draughts, which occur in many other places throughout Greece. Thus, Nauplio has specific microclimatic conditions that make it appropriate for the cultivation of palms. The palms selected for this study (Tab. 1) are those growing in the four borders along the Old Interchange, which is called the Park of O.S.E (Fig. 1). The study site area is 10 ha.

All of the palms that were found were recorded. We measured the height of single-stemmed palms from the ground (or the top of the root mass) to the bottom of the sheathing leaf base (where the lowest live leaf was attached to the stem). In other words, only the trunk measured, and neither the crownshaft nor the crown was included in the height measurement. We used a measuring rod that was graduated in centimeters (Hastings Tools & Equipment, Hastings, Michigan), which telescoped to 750 cm, supplemented with a measuring tape where necessary. Age was determined from the year in which the plants were transplanted into the park. We also recorded the diameter at breast height (DBH). In the clustering palm trees, we measured only the central stem. The stem height (current height – height at planting) was divided by the age of the palm to give the growth rate, which was expressed in centimeters per year.

Fig. 2 (left). *Syagrus rommanzoffiana*. Fig. 3 (right). *Caryota urens*. Fig. 5 (below). *Bismarckia nobilis*.

Phoenix dactylifera, which occurs in the park, was omitted from our study, as we have no records of when or at what age it was planted in the park.

Results and Discussion

In the first column of Tab. 1, we give the botanical names of the different species that have been planted in Nauplio since 1930. In the second, the age of each plant is given. In the third, there are the heights of the trunks at the time of transplanting. In the fourth column is the present height of each trunk. In the fifth column we give the diameter at breast height (DBH) of the palm trees. In column six are the numbers of stems plants, and in column seven are the calculated growth rates for each trunk or plant.

As noted by Zona and Maidman (2001), reference books may give palm growth rates in relative terms, such as "slow" or "moderately fast," but actual growth rates are seldom reported. In interpreting the growth rates given in Table 1, the caveats of Zona and Maidman (2001) must apply. First, these growth rates are lifetime average. They do not take into account

the pre-germination period, establishment phase, during which a seedling palm may form no above-ground stem, and the variation in growth rate over the life of a palm, which may grow quickly as a juvenile but slowly as a reproductive adult. Secondly, these rates are taken from individual palms growing in Nauplio and might therefore not be typical, although they might be applicable to plants growing under similar ecological conditions in the Mediterranean Basin.

Table 1. The growth rate of palm trees in Nauplio

Species	Age (yrs.)	Initial (cm)	Height 2005 (cm)	DBH 2004 (cm)	n	Growth rate (cm/yr)
Archontophoenix cunninghamiana (*)	15	40	100	10	1	4.0
Arenga engleri	9	60	200	17	1	15.5
Bismarckia nobilis	5	10	12	8	3	0.2
Brahea armata	15	40	100	20	3	4.0
Brahea edulis	15	40	100	20	1	4.0
Butia capitata	15	10	50	25	2	2.7
Caryota urens	7	50	300	7	2	35.7
Caryota "himalayana"	5	10	50	3	3	8.0
Chamaedorea seifritzii	12	80	150	4	1	5.8
Chamaerops humilis	15	50	200	13	15	10.0
Howea belmoreana	7	100	120	8	1	2.9
Livistona australis	15	20	80	10	3	4.0
Livistona chinensis	15	20	250	12	1	15.3
Livistona decora	5	10	30	12	3	4.0
Phoenix canariensis	75	100	700	67	30	8.0
Phoenix dactylifera	-			80		
Phoenix reclinata	10	20	100	80	5	8.0
Phoenix roebelenii	15	20	200	11	11	12.0
Phoenix theophrasti	10	10	30	9	3	3.0
Pritchardia lowreyana	5	10	15	4	1	1.0
Ravenea rivularis	7	10	30	10	1	2.7
Rhapis excelsa	15	50	180	3	5	8.7
Rhopalostylis baueri	15	10	30	4	1	1.3
Sabal causiarum	15	10	70	14	3	4.0
Sabal palmetto	15	10	70	20	2	4.0
Syagrus romanzoffiana	13	50	500	14	7	50.0
Trachycarpus fortunei	13	30	300	16	15	20.8
Washingtonia filifera	75	50	1500	60	36	19.3
Washingtonia robusta	75	50	2500	45	5	32.7

(*) Pot planted

Our results indicate, not surprisingly, that considerable variation exists in the average growth rates of different species of palms. The three fastest palms are *Syagrus romanzoffiana* (Fig. 2), *Caryota urens* (Fig. 3) and *Washingtonia robusta*; the three slowest palms are *Bismarckia nobilis*, *Rhopalostylis baueri* and *Butia capitata*.

We draw several conclusions from our data. *Caryota urens* has made rapid growth and appears suitable for use in urban landscapes in Greece. *Bismarckia nobilis* (Fig. 4) is slow-growing, even when young, but this palm has become very popular in recent years (Thymakis 2003b). *Phoenix theophrasti* (Fig. 5)has shown slow growth in Nauplio, as in Crete, where it is an endangered species. *Livistona chinensis* (Fig. 6) grows more rapidly than other *Livistona* species and could replace the often-used *Washingtonia* species (Fig. 7) in urban landscapes. The success and the rapid growth of *Phoenix roebelenii* (Fig. 8)and *Rhapis excelsa*

5 (top). *Phoenix theophrasti.*

6 (middle). *Livistona chinensis.*

7 (bottom). *Washingtonia* species lines a street.

(Fig. 9) are remarkable and suggests that they could be used more often in Greece (Thymakis 2003b). Also, several unusual palm species for the Mediterranean region, such us *Archontophoenix cunninghamiana, Pritchardia lowreyana, Ravenea rivularis, Sabal causiarum,* have done suprisingly well under these specific conditions.

Growth rates are governed by the interplay of genetic factors and external factors, such as availability of light, water, nutrients, etc. (Zona & Maidman 2001). Nevertheless, we hope these data will give growers of palms some idea of the growth rates that can be expected for these species and that the data will encourage the cultivation of a greater number of palm species. Our results describe which tropical plants are the most tolerant, the most easily adaptable and fastest growing under warm Mediterranean conditions.

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Fig. 8 (left). *Phoenix roebelenii.* Fig 9 (right). *Rhapis excelsa.*

The Gulf Stream Coconut: Flotsam and Jetsam or Natural Dissemination?

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1. Balevulin Beach, Tiree, collection site of a drift seed coconut. Photo: Colin Woodcock.

In maritime law, *flotsam* applies to wreckage or cargo left floating on the sea after a shipwreck. Jetsam applies to cargo or equipment thrown overboard from a ship in distress and either sunk or washed ashore. The common phrase flotsam and jetsam is now used loosely to describe any objects found floating or washed ashore. Are seashore coconuts evidence of a natural event or just flotsam and jetsam from a shipwreck or careless cargo handling? Here's how to determine which is which if you are lucky enough to find one.

Despite its sparkling white sand and azure waters, a beach on one of Scotland's Western Isles is the last place you would expect to find a stranded coconut. Surprising though it may seem, however, coconuts appear not to be strangers to these shores, as the second author of this note can testify. Being a creature of habit, WB enjoys annual holidays at his wife's family cottage on the Isle of Tiree (Map 1), the outermost island in the Inner Hebrides group. This tiny flake of low-lying land is famed for its bird life and summer flowers, as well as for its exposure to the North Atlantic, which provides excellent conditions for windsurfing – a sort of Hawai'i of the North. The beachcombing is excellent too, but the discovery of a coconut washed up in Balephetrish Bay seemed as unlikely as it was coincidental, given that WB, the discoverer, is a palm taxonomist at the Kew Herbarium. The fruit was still partly covered in battered husk and saturated in water, and the prospect of carting the soggy mass back to Kew was unappealing and so the nut remained on the beach. On admitting this foolish course of action to his boss, John Dransfield, WB was firmly reprimanded for missing the opportunity to record a potentially exciting drift fruit, the origins of which were far from certain.

A return visit to the island in 2003 provided a chance to make amends. While visiting local artists Colin & Susan Woodcock at their studio in Balemartine, Bill spotted a rather weathered coconut, completely enclosed in its husk, sitting on the doorstep. This fruit too had been picked up on another Tiree beach at Balevulin (Fig. 1) earlier in the year. Seeing Bill's interest, both in the nut and in the good opinion of his boss, the Woodcocks kindly donated their coconut to Kew, where it is now preserved in the Herbarium for perpetuity. Bill also brought the nut to the attention of the first author, a long-time student of the coconut and its perplexing distribution.

Coincidentally, while drafting this article, BBC television broadcast a documentary series on the natural history of the British Isles and the first program showed the celebrity presenter picking up a coconut from a beach in the Scilly Islands and claiming that coconuts float to Britain from Central America. Coconuts have in fact been reported washed ashore on European beaches from Devon to Denmark, including the Hebrides. The Gulf Stream has a significant impact on western Scotland's weather, most notably ameliorating its climate, and may well be responsible for bringing coconuts to the Hebrides quite naturally from the Caribbean, but how to tell?

The first point to make is that any nut totally without a husk is likely to be flotsam or jetsam because it is only a human action to completely remove the husk. The coconut crab (*Birgus latro*), which is reputed to be able to tear the husk from mature coconuts, is not found on Atlantic Ocean beaches and, with respect to Charles Darwin who accepted that apocryphal story, it is rats, squirrels and monkeys, not crabs, that make holes in immature coconuts, and they do it to drink the sweet water, not to eat the hard, white endosperm.

In the remainder of this article, we explain what we discovered when we examined the Tiree coconut more closely and the implications of our findings for its likely origins.

The Tiree coconut

This coconut (Figs. 2–4) is a normal fruit in every outward appearance, showing superficial damage consistent with a period of immersion in the sea before being stranded on a beach. From its size, amount of husk and generally spherical shape the coconut is more like a hybrid between domesticated forms than a wild type (but more about that later). The calyx is not present so it is impossible to say whether it had dropped naturally or had been harvested manually, but internal evidence confirmed that it must have been fully mature before entering the sea. When collected it was saturated with sea water and heavy. After the initial drying period there was no sound when the fruit was shaken, showing there was no water inside the cavity of the nut, but after a longer period a rattling noise could be heard. Upon opening, the kernel was seen to have dried into ball copra (Fig. 4). As the husk was being partially removed the track of a toredo worm (*Teredo navalis* or Shipworm) was found (Fig. 3). A shipworm is not a worm, but a greatly elongated clam, a marine bivalve mollusk specialized for boring into wood. Its two shells, enclosing only the front end of the body, function as a tool, rather than a protective covering; their ridged and roughened surfaces are used for boring. The burrow (lined with a calcareous coating produced by the clam's mantle) is begun when the animal is in its larval stage and is expanded as it grows. The common shipworm of the Atlantic Ocean, *Teredo navalis*, may grow up to

Coconut collected from Balevulin Beach. Fig. 2 (upper left). Whole coconut. Fig. 3 (upper right). Husk partially removed showing shell; note Toredo worm damage to left. Fig. 4 (lower right). Shell partially removed to reveal ball copra with Toredo worm damage. Photos: John Dransfield.

2 ft (60 cm) long, although its shells remain only 0.5 in. (12 mm) long. Shipworms do enormous damage to piers and ships but, in this instance, although it had penetrated the shell and damaged the kernel (Fig. 4), it had not caused the kernel to rot, as might have been expected if the shell had cracked open for any other reason. Possibly the high oil content of the kernel was not to the shipworm's taste!

Of course, an inspection of the fruit cannot rule out the possibility that it had been part of a ship's cargo – except for the knowledge that very few coconuts *with their husks intact* are nowadays shipped across the Atlantic.

The Gulf Stream

Off the coast of South America, the North Equatorial Current forks into a two branches: one passes into the Caribbean, the other flows north and east of the West Indies. The two branches rejoin and pour through the Straits of Florida to become the Gulf Stream, one of the strongest ocean currents in the world. It is a warm, salty current, typically 80 to 150 kilometers wide and the fastest current is near the surface with a maximum speed of about 2 m/sec. It flows northwards along the eastern coast of the United States, crossing the North Atlantic at 40–50°N and entering the Norwegian Sea around the Faeroe Islands some 402 km north of Scotland. It finally meets colder water masses from the Arctic Ocean and makes it cool down, causing the density of the water to increase, and it sinks. Between the Faeroe Islands and Scotland, the Gulf Stream has an average temperature of 8°C; this might not kill a coconut embryo, supposing that it would still be viable after floating more than 8000 km, a journey that could take 6 months. It is this distance and time scale that persuaded Henry Nicholas Ridley, the author of a standard text book on plant dispersal in 1930 to state categorically that a coconut that drifted up on the coast of Norway, and grew successfully when planted, was evidently jetsam from some ship. What Ridley did not know was that the Caribbean coconut has wild type characteristics, one of which is slow germination. Moreover, it has been suggested that floating in sea water before germination begins, may induce dormancy.

Coconuts were introduced to the Caribbean islands and coasts of America only in the early

16th century. These coconut palms had wild type characteristics and were not significant, either agriculturally or commercially, until the mid- to late-19th century so it is no coincidence that that was when the debate began about the origin of the coconut and its dissemination by floating, with or without human assistance. For a brief period in the mid-1800s entire coconuts in the husk are known to have been shipped to Europe and North America. Thereafter, primary processing for industrial use was carried out at the place of origin and cargoes consisted of the dried kernel (copra), the extracted fibers (coir) or, for domestic consumption, nuts with the husk removed. To further complicate matters, over the last half century lethal yellowing disease has virtually eliminated wild type coconuts in Florida and the Bahamas, potential places of origin for our Tiree nut. The Maypan hybrid has been the preferred planting material for 30 years and its two parents only arrived in the Caribbean in the 20th century and are both much quicker germinating domestic types.

If the coconut is a wild type, similar to the Jamaica Tall (and still to be found on other Caribbean islands) it can take more than 200 days to complete germination, may be more than enough time to float on the Gulf Stream to Europe, especially if salt water induces dormancy or lower temperatures delay development. If it is a domestic type, such as the Maypan hybrid, these can begin to germinate while still on the palm and may complete germination in 100 days which may not be enough time to float across the Atlantic and still be viable.

Flotsam and jetsam or natural dissemination?

If more coconuts are found on Tiree, or any other European shore, for that matter, then certain tests could be applied that might distinguish flotsam and jetsam from natural dispersal or even to see if the coconut is viable. Readers may wish to carry out some of these tests for themselves the next time they find a coconut on the beach!

For entire coconuts the advent of DNA technology brings the possibility of using molecular techniques to distinguish coconuts from Afro-Indian sources and those from Asian-Pacific sources, but that alone may not eliminate those from Afro-Caribbean sources and the cost (currently 70 Euros per sample) and effort make the idea unrealistic.

A more practical approach would be to remove the coconut from the beach to a warm place next to a stove or boiler for example (a minimum night temperature of 25ºC is desirable). It should be repeatedly and frequently bathed (not soaked) with warm water (up to 30ºC) to wash the excess sea-salt from between the husk fibers (warm tropical rainfall is a necessary pre-requisite to successful germination). If the treatment works and a shoot appears, it should immediately be given as much light as possible while still maintaining the minimum temperature. Otherwise, if nothing has happened after a couple of months, and no rotten smell has developed, a little careful peeling back of the husk fibers from the "eye-end" might reveal signs of life. If so, just replace the husk and leave the nut a little longer. Even a coconut responds to patience and tender loving care.

We hope that someone reading this note will find a beached coconut, make the experiment and – perhaps – re-write the textbooks!

Acknowledgments

Special thanks to Colin and Susan Woodcock for donating their drift seed coconut to Kew. John Dransfield and Colin Woodcock provided photographs.

Note added in proof

Following the submission of this article, the authors corresponded with Ulrike Rawson, a resident of Tiree living at Balephetrish. She reports finding six whole coconuts and the remains of many others washed up on Balephetrish Beach, all of which she believes to have arrived on a single tide. While it is possible that these fruit may have fallen and entered the Gulf Stream *en masse*, perhaps as a result of severe weather in their place of origin, it seems unlikely that they would float in close enough proximity to each other to arrive on a single tide. A more consistent scenario might be that a quantity of nuts in a sack has floated as flotsam or jetsam, the sack disintegrating and releasing the nuts towards the end of their journey. This additional information does not affect our interpretation of the coconut found at Balevullin, which was collected much more recently, arrived apparently unaccompanied by other coconuts and shows evidence of long-exposure to the sea in the form of Shipworm damage.

SPECIAL OFFER

THE MOST NATURAL WORLD PUPULATION OF JUBAEA

"HACIENDA LAS PALMAS DE COCALAN"

Presentation:

"Hacienda Las Palmas de Cocalan" is the second largest *Jubaea chilensis* concentration area in Chile, after the well-known Palmas de Ocoa which is located in La Ocoa National Park, owned and managed by the State. This is the most relevant palm trees area and symbolizes a unique sample where some sectors represent the closest structure to natural patterns with a broad range of ages among trees that concentrate young and medium aged individuals. The rest of living palm population is old and in a very decaying stage; most individuals range between 250-300 years old, as it can be witnessed in Cocalan Valley. It has been proven that Chile originally had about 5.000.000 individuals, but today this amount has decreased to 120.000 natural trees, approximately.

Area and geographical location:

"Hacienda Las Palmas de Cocalan" has 3.400 ha. with an estimated amount of 40.000 palm trees.The property is located in Las Cabras, VI Region, at 160 Km. (100 miles) from Santiago, Chile's capital city. (Geographical coordinates are: 32º12' South and 71º10' West).

Importance (Main characteristics):

The Chilean palm has probably been the most important forestry species in Central Chile. A very dramatic reduction of palm trees population has become evident as a consequence of the total harvest of palm fruit as well as its uncontrolled exploitation in the past decades to clear soils for agricultural practices and for urban growth purposes, particularly, in the surroundings of Valparaiso. Today, palm tree individuals appear in very few stands, most of them with old individuals. But, two of the locations are the most important: Ocoa and Cocalan.

Conservation:

This property is a unique reserve, a relict, with a significant economic value as well as with cultural and social importance. This is the main reason why Palm Tree Friends wish to preserve "Hacienda Las Palmas de Cocalan" with all the characteristics of the species cultivation, an attractive inner work of the rural culture and economic activities. The conservation of the Chilean Palm under a rational, effective and sustainable use through ecotouristic services as well as through a complementary sustainable production will make possible the conservation of this natural world patrimony.

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For more information contact: palms_of_cocalan@vtr.net

A RIVERBOAT TOUR TO SEE THE PALMS OF THE AMAZON

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The trip is planned to take advantage of the good weather of the dry season. We will live and travel aboard a brand-new, comfortable Amazonian riverboat. The boat has air-conditioning, showers, and toilets in each cabin, and a small library of books on Amazonian natural history. The owner/captain is the legendary Amazon guide Moacir Fortes, who took us on our earlier trips. Mo, as he is known to one and all, is fluent in several languages, and enjoys sharing the fascinating, and often humorous, legends of the Amazon region, where he grew up.

In our motorized canoes we can travel among the rain forest trees, enjoying close up views of palms and other plant and animal life (on previous trips we have seen the giant Amazon water lily and an anaconda!). We will often get off our boat for short hikes in the forest, and to visit the friendly caboclos who live along the riverbanks. These people use an amazing variety of palms in their daily lives and always know of some interesting palm that grows not far away ! Frequent swims, fishing opportunities, and occasional cookouts add to the enjoyment of our trip. In Manaus, our port of departure in Brazil, we will visit the famous Opera House and be able to buy such artifacts as hammocks made from palm fiber and also sample ice cream made from the fruits of *Euterpe* and *Astrocaryum*!

The tour will be led by Dr. Andrew Henderson of the New York Botanical Garden. Henderson is author of *Palms of the Amazon* and *Field Guide to the Palms of the Americas*. Participants will receive complementary copies of the *Field Guide*. The 10-day trip is planned for 9—19th October 2006, immediately following the IPS biennial. For additional information see http://www.nybg.org/botany/amazonpalmtour/ or contact Andrew Henderson at ahenderson@nybg.org, or by phone at 718 817 8973, or by mail at The New York Botanical Garden, Bronx, NY 10458.

Fee: estimated $3400 including round trip airfare from Miami, accommodation, meals, and field trips.

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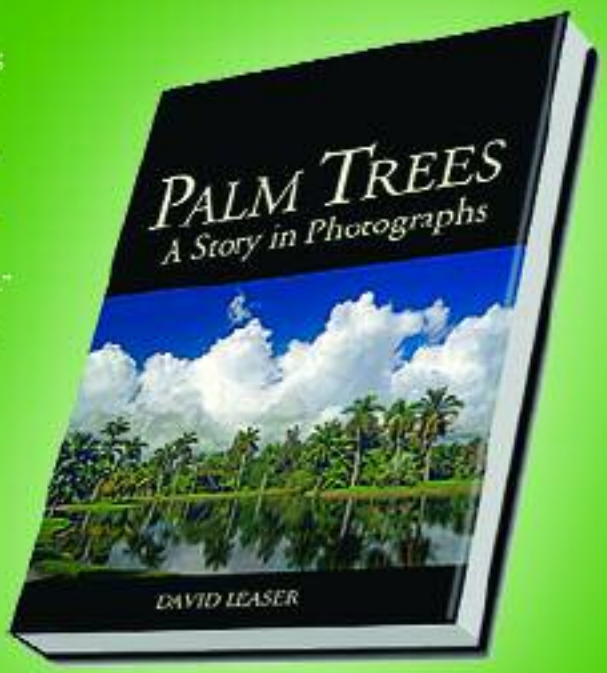

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PALM LITERATURE

FEAST OF DATES. Daniel Potts. Trident Press, London, UK. 2003 ("2002"). ISBN 1-900724-69-6. £40.00. Hardcover, color dust jacket. Pp. 320.

FEAST OF DATES: THE DATE PALM IN THE UNITED ARAB EMIRATES. Trident Press, London, UK. ISBN 1900724-67-7. £20.00. High definition DVD.

Those of us living where the date palm (*Phoenix dactylifera*) is grown as an ornamental tend to forget that in some parts of the world, the palm is so much more. Daniel Potts' *Feast of Dates* is a sumptuous reminder of the pre-eminate role of the date palm in the culture, economy and history of the Arab world, especially in the United Arab Emirates. This large format (330 mm × 260 mm) book tells the story of the date palm with a reverence usually reserved for national heroes, and in a way, the date palm is just that, for without it, life in the harsh desert would be impossible. The date palm provides shade for crops, fodder for animals, fiber and timber for construction, food, medicine and enumerable products that make up the fabric of the lives of Emiratis, both ancient and modern.

The book is divided into three parts. The first part is the illustrated English text (pages 5–46), the middle part is an illustrated section (comprising 135 pages) with bilingual captions or short texts and the final part is the text repeated in Arabic. The text is well written and concise in its treatment of date palm botany, early archeological and cuneiform evidence and the date in the late pre-Islamic, Islamic, Medieval, pre-Modern and Modern eras. Potts, an archeologist, has drawn on wide range of sources, from agricultural treatises to the Koran, to tell his story. Of particular interest are the many translations of ancient writings and legends about the date. The sources document the fact that ancient date growers knew that date palms exist as either male or female and the pollen from the male is necessary in order for the female tree to bear fruit. Long before Greek scholars unraveled the details of gender expression in the plant kingdom, ancient growers devised a way to assist the natural pollination process by tying bundles of male flowers to the female inflorescence, a practice that persists to this day.

The illustrated section is especially browse-worthy. It includes both artistic renderings and photographs, the latter some of the best representations of date palms ever captured on film. It includes photo essays on the biology of the date palm, fertilization and cultivation, harvesting, processing, and the date palm in art and poetry, traditional life and history. There are a few missteps among the photographs. At least one photograph is desperately out of focus, and two photos (among many) purporting to show the ornamental use of the date palm show, in fact, coconut palms. One 17th century illustration is surely that of *Areca catechu*. Despite these mistakes, the collection of over 300 photos is the great strength of this book and will give this book broad appeal.

The DVD, *Feast of Dates: The Date Palm in the United Arab Emirates*, is a 26-minute, award-winning documentary with narration in English or Arabic. I was able to play the DVD on both a Mac and pc computers, but my home DVD player was unable to read the disk, which is probably coded for the UK. The documentary is a paean to the date palm, covering virtually everything in the illustrated section of the book, with stirring pictures and computer graphics and an evocative sound track. Footage from rural UAE provides a fascinating glimpse into a world that is likely unfamiliar to most IPS members. I especially enjoyed seeing the segment on the traditional uses of date palm leaves for boat-building. That these traditions still exist in a country as thoroughly modern as the UAE is both gratifying and astonishing. I was also fascinated by the many creatures that feed on and live among the palms. The documentary shows that date palms support all manner of reptile, bird and mammal life. Even the DVD packaging is interesting, providing at-a-glance facts on the date palm and the UAE. I learned, for example, that 40 million date palms grow in the UAE, outnumbering humans ten to one. The cinematography and sound are excellent and the English narration clear and strong. A screening of this documentary would make an excellent short program for meetings of IPS chapters and affiliates.

For persons interested in one of the world's most important palms, a palm rocked in the cradle of civilization, a palm that has inspired ancient poets and modern scholars, this book and DVD are well worth having. They are a treat every bit as tasty and satisfying as the sweetest Medjool.

SCOTT ZONA
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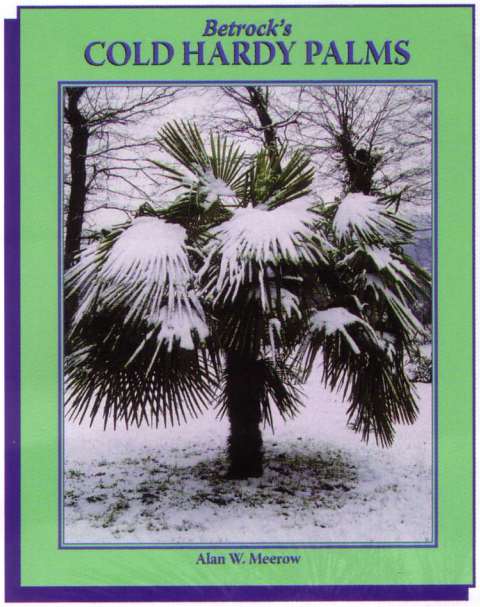

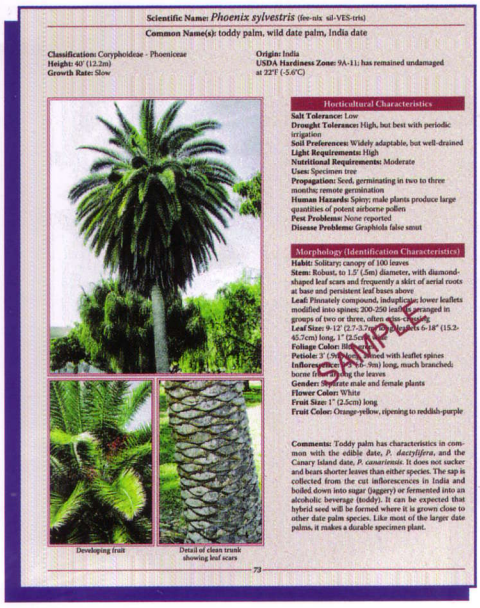
Scientific Name: *Phoenix sylvestris* (fee-nix sil-YES-tris)
Common Name(s): toddy palm, wild date palm, India date
Classification: Coryphoideae - Phoeniceae
Height: 40' (12.2m)
Growth Rate: Slow
Origin: India
USDA Hardiness Zone: 9A-11; has remained undamaged at 22°F (-5.6°C)
Horticultural Characteristics
Salt Tolerance: Low
Drought Tolerance: High, but best with periodic irrigation
Soil Preferences: Widely adaptable, but well-drained
Light Requirements: High
Nutritional Requirements: Moderate
Uses: Specimen tree
Propagation: Seed, germinating in two to three months; remote germination
Human Hazards: Spiny; male plants produce large quantities of potent airborne pollen
Pest Problems: None reported
Disease Problems: Graphiola false smut
Morphology (Identification Characteristics)
Habit: Solitary; canopy of 100 leaves
Stem: Robust, to 1.5' (.5m) diameter, with diamond-shaped leaf scars and frequently a skirt of aerial roots at base and persistent leaf bases above
Leaf: Pinnately compound, indupliciate; lower leaflets modified into spines; 200-250 leaflets arranged in groups of two or three, often at 90-120°
Leaf Size: 9-12' (2.7-3.7m); petiole 6-18" (15.2-45.7cm) long, 1" (2.5cm) wide
Foliage Color: Blue-green
Petiole: 3' (.9m) long, armed with leaflet spines
Inflorescence: 5-6' (1.5-1.8m) long, much branched; borne (when young) among the leaves
Gender: Separate male and female plants
Flower Color: White
Fruit Size: 1" (2.5cm) long
Fruit Color: Orange-yellow, ripening to reddish-purple
Comments: Toddy palm has characteristics in common with the edible date, *P. dactylifera*, and the Canary Island date, *P. canariensis*. It does not sucker and bears shorter leaves than either species. The sap is collected from the cut inflorescences in India and boiled down into sugar (jaggery) or fermented into an alcoholic beverage (toddy). It can be expected that hybrid seed will be formed where it is grown close to other date palm species. Like most of the larger date palms, it makes a durable specimen plant.
Developing fruit
Detail of clean trunk showing leaf scars
73

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