5 PACIFIC OCEAN REGION

This chapter considers the islands of the Pacific Ocean which are geographically divided into Micronesia, Melanesia and Polynesia. Micronesia delimits islands in the western Pacific and consists of the Mariana, Palau, Caroline, Marshall and Gilbert island groups. Melanesia lies to the northeast of Australia and includes New Caledonia, Vanuatu, Solomon Islands and Fiji. Polynesia designates the islands of the central Pacific, including Samoa (Western and American), French Polynesia (Marquesas, Society Islands, etc.) and Tonga. Papua New Guinea is also included within the scope of this chapter; politically the nation of Papua New Guinea consists of the eastern portion of the island of New Guinea and the Bismarck Archipelago as well as Bougainville.

The following geographic areas where palms occur are excluded from discussion in this chapter and this report: The Hawaiian Islands; New Zealand, including the Kermadec Islands; Australia and its island territories (e.g. Lord Howe, Norfolk, Christmas and Cocos); and the Bonin and Ryukyu Islands belonging to Japan.

The Pacific Ocean Region presents some very unusual patterns of native palm diversity. In the entire area of Micronesia there are only about ten species of native palms (Moore and Fosberg, 1956). The situation in Polynesia is comparable. In marked contrast Melanesia has much greater native palm diversity. For example, New Caledonia alone has 37 indigenous palm species, all endemic (Hodel and Pintaud, 1998; Moore and Uhl, 1984) and Vanuatu has 21 native palms (Dowe and Cabalion, 1996). Papua New Guinea and its islands hold a very rich diversity of palms, with about 270 native species in 31 genera (Baker and Dransfield, 2006; Essig, 1995; Hay, 1984). A recent study of the palms of the Fiji Islands describes the 25 native species (Watling, 2005). Dowe (2009), in a revision of the genus Livistona, provides utilization information, other than ornamental use, on a few of the 36 species recognized.

Coconut, considered as a cultivated tree, is the most widespread palm of the Pacific, found on virtually every island, inhabited or uninhabited, that is of sufficient size and high enough above sea level to support the growth of trees. A dozen or more palms from outside the region have been introduced to these islands and in some cases become naturalized, giving individual islands the appearance of a richer palm flora than they naturally possess. The betel nut palm (*Areca catechu*) and the African oil palm (*Elaeis guineensis*) as well as several strictly ornamental species serve as examples. Palms native to the region have also been introduced to islands where they are not native. Examples are the useful sago palms, *Metroxylon* spp., and two ornamental species, the Fiji fan palm, *Pritchardia pacifica* and the Marquesas palm, *Pelagodoxa henryana*.

Native palms of the Pacific Ocean Region, as defined above, were assessed for information on their utilization patterns and conservation status. The results of the assessment are evaluation presented below; however, they can be understood better if placed within a broader context. Two major factors stand out.

First of all, native palms of the region are not utilized to the magnitude that might be expected. This circumstance can be explained by the existence of excellent alternative sources of plant raw materials which are readily accessible. In the Pacific Islands, the chief alternative plants are coconuts and the screw pines (*Pandanus* spp.). The case study on the multiple utility of the coconut palm on the Truk Islands of Micronesia (Chapter 2) documents the very

limited exploitation of native palms. As for the other alternative plant source, screw pines are widely distributed in the Pacific and provide edible fruits as well as leaves for thatching and weaving.

The second factor is that information is lacking that would allow assigning a threatened or non-threatened status to many native palms in the region. This applies in particular to New Guinea (the country of Papua New Guinea to the east and the province of Papua, Indonesia to the west) where a larger majority of the estimated 270 palm species carries an "unknown" conservation status. This situation is being remedied by the Palms of New Guinea Project, based at Kew Gardens. About 20 articles and a field guide to the 31 palm genera found on the island have been published (Baker and Dransfield, 2006); a full palm flora is in progress.

Threatened Pacific Ocean Region Palms

A review of the technical literature on palms revealed at least 28 species of threatened palms, representing 14 genera, currently being exploited in the region (Table 5-1). It is acknowledged that this compilation probably is incomplete as regards palm utilization because it was not possible to peruse the numerous ethnographic studies of this culturally and linguistically diverse area. Coverage for Papua New Guinea is insubstantial because both conservation status and detailed ethnographic data are lacking.

Habitat destruction or degradation caused by logging and clearing of land for agriculture and urban development are the major threats to palms in the region. Palms occurring on islands are particularly at risk because they often occupy habitats that are relatively small in area. Moreover, island palms often represent distinctive species which have evolved due to isolation. New Caledonia is a remarkable example of this circumstance for it possesses 32 native described species, all endemic to the island and in certain instances individual species occur only in small areas of the island. All 32 of New Caledonia's palms are threatened, but only one, *Alloschmidia glabrata*, is reportedly exploited, for palm hearts. In New Caledonia, as elsewhere in the region, coconuts and screw pines furnish plant materials for a wide variety of uses.

Discussion

An examination of the palm products listed in Table 5-1 indicates that in most cases the threatened palms are being exploited for subsistence-level production. Thatching and stem wood for construction purposes are most prominent with some food products as well. If the destructive impact of exploiting these palms is publicized it should be possible to promote alternative raw material sources.

Commercial-level exploitation appears to be confined to the rattan palms (*Calamus* spp.), popular sources of canes for furniture making, and palm heart exploitation.

Of the five threatened rattan species, only *Calamus hollrungii* and *C. warburgii* are of sufficient importance to be even considered "minor rattans," according to Dransfield and Manokaran (1993). *Calamus hollrungii*, according to the source just cited, is a source of excellent furniture canes and has potential for cultivation. Rattans represent a potential sustainable resource, especially in New Guinea where about 60 species of *Calamus* occur, but

except for the two species mentioned above, there is as yet no published information on either conservation status or utilization.

Table 5-1 Threatened Pacific Ocean Region Palms with Reported Uses*

Scientific Names	**Selected Local Names1**	**Distribution2**	**Products/Uses**
Actinorhytis calapparia	*vekaveke (New Ireland); boluru (Sol)*	*PNG, Solomons*	*nuts as betel substitute, edible palm heart*
Areca guppyana	*bua lau*	*Solomons (endemic)*	*nuts as betel substitute*
1. Balaka longirostris; *2. B. pauciflora;* *3. B. seemannii*	*1. mbalaka, niuniu;* *2. black bamboo;* *3. mbalaka, niuniu*	*1, 2 & 3. Fiji (all endemic)*	*1. stems to make ceremonial spears; edible kernel;* *2. stems to make spears;* *3. stems for walking sticks & to make spears*
Basselinia glabrata	*?*	*New Caledonia (endemic)*	*edible palm heart*
1. Calamus hollrungii; *2. C. vanuatuensis;* *3. C. vestitus;* *4. C. vitiensis;* *5. C. warburgii*	*1. Papuan white rattan (PNG), kuanua (New Ireland);* *2. loya ken;* *3. ?;* *4.ngganuya;* *5. ?*	*1. PNG, Solomons;* *2. Vanuatu (endemic);* *3. PNG, Solomons;* *4. Fiji, Solomons;* *5. PNG, Solomons*	*1, 2,4 & 6. traditional house building & furniture making* *2. minor use for furniture making, stem sap drunk &* *used as ointment;* *3. baskets, walking sticks*
Carpoxylon macrospermum (monotypic)	*bungool*	*Vanuatu (endemic)*	*fruit eaten, brooms from leaves, carrying & storage* *vessels from first inflorescence bract and leaf* *sheath*

Scientific Names	Selected Local Names1	Distribution2	Products/Uses
1. Clinostigma harlandii; *2. C. onchorhynchum;* *3. C. samoense*	*1. ngami igh;* *2 & 3. niu vao*	*1. Vanuatu (endemic);* *2 & 3. Western Samoa (both endemic)*	*1. fruit mesocarp & palm heart eaten;* *2 & 3. stem wood split into rods for attaching thatch, leaves for thatch*
Heterospathe philipsii	*niuniu*	*Fiji (endemic)*	*immature seed & palm heart edible*
Kentiopsis spp.	*?*	*New Caledonia (endemic genus)*	*edible palm heart and stems for timber*
Licuala grandis	*tabataba*	*Vanuatu*	*leaves used for wrapping and as an umbrella, also in medicine*
1. Metroxylon amicarum; *2. M. salomonense;* *3. M. vitiense;* *4. M. warburgii*	*1.rypwyng;* *2. heavy nut, ivory nut (Sol), bia (Van);* *3. songo;* *4. tenebee (Sol), uluwar (Van), ota (Rot)*	*1. Carolines (endemic);* *2. Solomons, Vanuatu;* *3. Fiji (endemic);* *4. Solomons, Vanuatu Rotuma*	*1. leaves for thatching, seed is source of vegetable ivory;* *2. seed is source of vegetable ivory, leaves for thatching & other uses;* *3.leaves for thatching;* *4. leaves for thatching, stem starch*
Pelagodoxa henryana (monotypic)	*énu*	*Marquesas Islands (endemic)*	*young endosperm eaten*
Pritchardiopsis jenneneyi (monotypic)	*?*	*New Caledonia (endemic)*	*seedlings & young plants*

Scientific Names	Selected Local Names1	Distribution2	Products/Uses
1. Veitchia arecina; *2. V. filifera;* *3. V. joannis;* *4. V. vitiensis;*	*1. palmtri* *2. niuniu, thangithake;* *3. niusawa;* *4. kaivatu*	*1. Vanuatu (endemic);* *2,3,4. Fiji (all endemic)*	*1. palm heart harvested for tourist restaurants;* *2. stems previously (?) used as rafters; leaves for thatching, stem wood to make canoe ribs, ceremonial spears, immature fruit edible;* *3. leaves for thatching, stem for spars & construction; seed & palm heart edible;* *4. stems for house rafters, palm heart, seed & inflorescence all edible*

Notes:

* See also Table under Chapter 13.

1. Many other local names are given in most of the sources cited.

2. Distribution is within the region as defined; some species also occur elsewhere.

Sources: Cribb, 1992; Dowe, 1989a,b, 1996; Dowe et al., 1997; Dransfield et al., 2008; Essig, 1978, 1995; Gillett, 1971; Hay, 1984; Hodel & Pintaud, 1998; Horrocks, 1990; LeBar, 1964; Moore, 1979; Moore & Uhl, 1984; Rauwerdink, 1986; Watling, 2005; Whistler, 1992.

The native rattans of the Pacific Ocean region are in general of lower quality and have less value than the primary commercial species in Southeast Asia. As a substitute for exploiting native rattan resources, the South Pacific Forestry Development Programme introduced three commercial rattan species from Malaysia into the South Pacificwith trial plantings of *Calamus caesius, C. manau* and *C. subinermis* (Tan, 1992).

Seven palms in Table 5-1 are indicated to have edible palm hearts and *Veitchia arecina* in Vanuatu is exploited to furnish exotic salad ingredients to tou;rist restaurants. All seven of these palms are solitary species and therefore the exploitation is unsustainable and should be strongly discouraged.

The sago palms (*Metroxylon* spp.) are multipurpose species. Products currently being derived from them (Table 5-1) could all be obtained from the main cultivated species, *Metroxylon sagu*, as an alternative.

Non-threatened Pacific Ocean Region Palms

In the Region, 12 non-threatened palm species, in nine genera, have reported uses (Table 5-2). This number will certainly increase as more becomes known about the palms of New Guinea. *Arenga microcarpa, Caryota rumphiana* and *Metroxylon sagu* share the characteristics of producing suckers and are terminal flowering; palms having these growth habitats are readily managed on a sustainable basis.

Discussion

Subsistence-level uses for construction materials and food products characterize the palms in Table 5-2. Three of the palms merit further discussion. *Korthalsia zippelii* in Papua New Guinea apparently supports a cottage industry for making furniture.

Metroxylon sagu in Papua New Guinea is exploited for stem starch which is both a subsistence and commercial product. Sago is produced manually and some surplus is produced and sold in markets. Shimoda and Power (1986) and Power (1986) discuss the status of sago in Papua New Guinea. Inasmuch as *M. sagu* is native to New Guinea it represents a natural resource with substantial development potential. Over the past 20 years the sago palm has received considerable attention because it is a high producer of starch per unit area and sago starch has certain unique qualities for food and industrial uses. A new study by Schuiling (2009) provides a detailed account of starch accumulation in the sago palm trunk. Table 5-3 lists the major books on sago which have been published.

Nypa fruticans is found in pure stands in Papua New Guinea, but has been under utilized. A major drawback is the lack of local knowledge of tapping techniques to obtain nipa sap and convert it to sugar or alcohol. According to Päivöke (1983, 1984) nipa has development potential in Papua New Guinea.

Table 5-2 Non-threatened Pacific Ocean Region Palms with Reported Uses

Scientific Names	**Selected Local Names1**	**Distribution2**	**Products/Uses**
Areca macrocalyx	*Kumul, e'esu (Sol)*	*Papua New Guinea, Solomons*	*nuts as betel substitute*
Arenga microcarpa	*?*	*New Guinea*	*edible palm heart*
Caryota rumphiana	*gelep (New Ireland)*	*New Guinea, New Ireland*	*stem wood for construction planks*
Clinostigma savaiiense	*niu vao*	*Western Samoa (endemic)*	*stem wood split into rods for attaching thatch, leaves for thatch*
1.Hydriastele costata; *2. H. cylindrocarpa;* *3. H. macrospadix*	*1. ? ;* *2. niulip;* *3. niniu*	*1. New Guinea;* *2. Solomons; Vanuatu (endemic to the two island groups);* *3. Solomons*	*1. stem wood for floor boards & siding;* *2. palm heart & fruit eaten;* *3. stem wood for floor boards & siding*
Korthalsia zippelii	*? (rattan)*	*New Guinea*	*furniture making, walking sticks, etc.*

Scientific Names	**Selected Local Names1**	**Distribution2**	**Products/Uses**
1. Livistona surru *2. L. tothur*	*1. surru* *2. tot-hur*	*1&2. Papua New Guinea*	*1. roofs & umbrellas from leaves, stem portions for axe handles & house frames, leaf sheath fibers for brooms and sago strainers;* *2. roofs and umbrellas from leaves, bows from split stem, salt obtained from ash of burned petioles;*
Metroxylon sagu	*ambutrum (NG)*	*New Guinea, Solomons*	*stem starch (see Table 9-22 for nutritional composition), leaves for thatching, petioles for construction, etc.*
Nypa fruticans (monotypic)	*ak-sak (Boug); towe'el (Palau)*	*New Guinea, Bougainville; Marianas*	*leaves for thatching, tapped for sap, heart & immature endosperm eaten; leaves for thatching (Mar)*

Notes: 1. See Table 5-1.

2. See Table 5-1.

Sources: References for Table 5-1 and in addition: Dowe, 2009; Essig, 1982; McClatchey & Cox 1992; Päivöke, 1983, 1984; Ruddle et al., 1978; Whistler, 1987.

Table 5-3 Books Published on the Sago Palm (Metroxylon sagu) since 1977

Abbreviated Title and Reference	Contents/Comments
First Sago Symposium, Sarawak, 1976 (Tan, 1977)	*Proceedings represent a benchmark on sago & consist of 32 papers under the general headings: prehistory & ethnobotany; agronomy & economics; technology & industry.*
Palm Sago (Ruddle, et al., 1978)	*A global study of sago starch with chapters on: traditional extraction; sago as subsistence food; sago in myth and ritual; modern commercial sago production; international trade; future outlook.*
Second Sago Symposium, Malaysia, 1979 (Stanton & Flach, 1980)	*Proceedings consist of 17 papers divided between sago palm growth & starch production, & actual & potential food & industrial uses.*
Sago West Malaysia (Tan, 1983)	*A detailed study of the sago industry in Batu Pahat District, southwestern Peninsular Malaysia.*
Sago Palm (Flach, 1983)	*A development paper prepared especially for the expert consultation meeting in January 1984, see next item. A state-of-the art summary.*
Sago Palm Products (FAO, 1986)	*A collection of 25 papers for an expert consultation meeting, January 1984, covering the general topics: management of natural stands; agronomy & farming systems; sago processing & utilization; socioeconomics.*
Third Sago Symposium, Japan, 1985 (Yamada & Kainuma, 1986)	*Proceedings consist of 28 papers covering three general areas: case studies of sago production in specific areas of Southeast Asia & Papua New Guinea; sago palm growth; technical & industrial aspects of starch production.*
Fourth Sago Symposium, Sarawak, 1990 (Ng et al., 1991)	*Proceedings consist of 33 papers given in the following seven broad areas: status & prospects; ecology, distribution & germplasm; in vitro culture; growth & nutrition; environment & production; processing & quality; utilization & product development*
Fifth Sago Symposium, Thailand, 1994 (Subhadrabandhu & Sdodee, 1995)	*Proceedings comprised of 19 papers covering three general areas: technical & industrial aspects of sago starch; sago palm cultivation; economics*

Abbreviated Title and Reference	Contents/Comments
Sixth Sago Symposium, Sumatra, 1996 (Jose & Rasyad, 1998)	*Proceedings include 30 papers with emphasis on sago as a future source of food and feed.*
Sago Round Table Meeting, Thailand (Sriroth et al., 1999)	*Proceedings of 4 SE Asian country reports focused on small scale starch extraction.*
Sago 2000 International Seminar, Java (IPB, 2000)	*Proceedings of 35 papers on topics ranging from production to food and nonfood products from sago.*
Sago 2001, International Symposium, Japan (Kainuma et al., 2002)	*Proceedings include 29 papers on various topics including production, utilization and starch processing and regional reports.*
Eighth Sago Symposium, Indonesia, 2005 (Karafir et al., 2006)	*Theme: sago palm development and utilization; proceedings volume of 266 pp. not seen.*
Ninth Sago Symposium, 2007 (Toyoda et al., 2009)	*Theme: sago potential in food & industry.* *Proceedings published but not seen.*
Growth & development of sago palm (Schuiling, 2009)	*Published PhD dissertation examining how starch is accumulated in the stem.*

Note: Two additional other international sago meetings are known to have been held:

1. A Seventh International Sago Symposium was held in Papua New Guinea in 2001. No proceeding was published.

2. The First ASEAN Sago Symposium 2009: Current Trends and Development in Sago Research, was held in Kuching, Sarawak, Malaysia, in October 2009. A proceeding is planned.