

Exploring for Palms in Japan

Part I. Ryukyu Islands to Kyushu, Kyoto, and Tokyo, 2013

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Photographs by Donald R. Hodel

When one thinks of Japan the first thoughts that come to mind are likely Mt. Fuji, cherry blossoms, the bullet train, and in a more somber note, Hiroshima and Nagasaki. Palms typically do not figure prominently in our first impressions of the island nation. However, southern Japan, especially the Ryukyu and Ogasawara Islands, has a small but intriguing if not compelling assemblage of palms. This intrigue is due in part to the island nature of these palms, spread over a rather vast expanse of the western Pacific, from southern Japan nearly to Taiwan, an area that is steeped in world history.

Six species of palms occur naturally in Japan. The Ryukyu Islands are home to the endemic *Arenga ryukyuensis* and *Satakentia liukiensis* and the indigenous *Livistona chinensis* and *Nypa fruticans*. The Ogasawara Islands (Bonin Islands) have the endemics *Clinostigma savoryanum* and *Livistona boninensis*. In addition to these naturally occurring palms, three other species, *Rhapis excelsa*, *R. humilis*, and *Trachycarpus fortunei*, have been cultivated for so long that they have at times been considered, although erroneously so, as Japanese native palms. One, *T. fortunei*, is even naturalized in moist

forests from southern Kyushu to at least as far north as Kyoto in south central Japan.

As part of senior author Hodel's long-term project to catalog and illustrate the palms of Pacific Islands, two trips were made in 2013 and 2014 to study and document Japanese palms. We cover these two trips in two parts. Part I includes our trip from the Ryukyu Islands to Kyushu, Kyoto, and Tokyo in October, 2013 while Part II covers our trip to the Ogasawara Islands in May, 2014.

We had intended to visit Japan in only one trip in 2013 but, because of a powerful typhoon in one of the most active typhoon seasons in history, our boat service to the Ogasawara Islands was cancelled in October. Because of inflexible return flights to the United States, we had to end our Japanese sojourn prematurely and reschedule our trip to the Ogasawara Islands for 2014. Indeed, during our October 2013 trip, we always seemed to be leaving an island just before an oncoming typhoon or arriving at an island after a typhoon had been in the area. The senior author's son, Robert, was present on both trips but, unfortunately, co-author Adam was unable to participate on the 2014 trip to the Ogasawara Islands.



Figure 1. At the Yonchara Reserve, a wide, paved, hard-surfaced, well maintained pathway takes you into a forest of towering *Satakentia liukuensis*.

Part I. Ryukyu Islands to Kyushu, Kyoto, and Tokyo, 2013

Ryukyu Islands

Our trip actually began in Taipei, Taiwan on October 16 when we three boarded a morning flight to Ishigaki in the Ryukyu Islands. We had just spent 10 days exploring and cataloging the palms of Taiwan. See Hodel et al. (2014) for a report of our findings. The Ryukyu Islands are actually much closer to Taiwan than to the main islands of Japan and we were eager to compare and contrast their respective palm floras.

The Ryukyu Islands, known in Japanese

as *Nansei-shoto*, stretch in a long southwest curving arc for over 1,200 km, about 30° N to 24° N, from the most southerly main Japanese island of Kyushu nearly to Taiwan. They are mostly high islands, some with extensive areas of limestone substrate, but smaller ones are coral reefs. The climate ranges from humid subtropical in the north to tropical rain forest in the south. Winters are mild and dry to moist while summers are hot, humid, and wet with frequent typhoons.

The most famous of the Ryukyu Islands is Okinawa but our objective was Ishigaki and its sister island of Iriomote, way in the southern end of the archipelago, only about 225 km from Taiwan. Here we hoped to find *Arenga ryukyuensis*, *Livistona chinensis*, *Satakentia liukiuensis*, and the elusive *Nypa*



Figure 2. Co-author Adam Chi-Tung Hsu provides scale for *Arenga ryukyuensis*, which is abundant in the understory of the *Satakentia liukiuensis* forest at the Yonehara Reserve.

fruticans. Upon our late-morning arrival in Ishigaki, we made haste and immediately hired a car and driver at the airport to take us straight to the north coast of the island to the famous Yonehara Reserve, which encompasses and protects the main population of *Satakentia liukuensis*, estimated at well over 1,000 individuals (Moore 1969).

Within an hour of deplaning we arrived at Yonehara Reserve, a designated natural national monument, bought a few refreshments from the shops at the entrance, and, while our driver waited in the car, we set out along the wide, hard-surfaced, well maintained pathway into a forest of towering

Satakentia liukuensis (**Fig. 1**) with abundant *Arenga ryukyuensis* as the understory (**Fig. 2**).

The gregarious *Satakentia liukuensis* forms extensive stands, grows to over 20 m tall and has a solitary, grayish brown, mostly smooth, and irregularly but closely ringed trunk 20 to 30 cm in diameter. The base of the trunk typically is expanded and supported by a prominent, well developed, cone-like root boss (**Fig. 3**). About 15, ascending to drooping, long-pinnate leaves compose the canopy (**Fig. 4**). Each leaf is about four m long, has a short petiole, and holds nearly 90 pinnae per side. Pinnae are to 70 cm long, 4 cm wide, and have elevated nerves, which abaxially (underside) have numerous brown



Figure 3. The base of the trunk of *Satakentia liukuensis* is typically expanded and supported by a prominent, well developed, cone-like root boss.



Figure 4. About 15, ascending to drooping, long-pinnate leaves compose the canopy of *Satakentia liukuensis*.



Figure 5. Attractively colored leaf bases of *Satakentia liukuensis* form a conspicuous and handsome crownshaft, which ranges from reddish green to brownish green to reddish purple and even nearly black.

scales to one cm long. Tubular, attractively colored leaf bases form conspicuous and handsome crownshafts, which range from reddish green to brownish green to reddish purple and even nearly black (**Fig. 5**). The inflorescences, usually five or six in number and stiffly spreading to nearly one m long, have colorful reddish purple bases (**Fig. 6**) that strikingly contrast with the pink-purple to lilac aging to whitish rachillae (**Fig. 7**), the latter of which become greenish in fruit. The cream-colored flowers are five mm long and the staminate are faintly fragrant. The fruits, 13 mm long and 7 mm wide, are black when mature.

Satakentia liukuensis is without a doubt an appealing palm. Unfortunately, it often has canopies of abnormally few, wind-battered leaves, especially those more exposed specimens and during or near the end of the typhoon season (**Fig. 8**). Indeed, in



Figure 6. The inflorescences of *Satakentia liukuensis* have colorful reddish purple bases.

September, 1966, just after a typhoon, H. E. Moore, Jr. of the Baily Hortorium at Cornell University in New York visited the Yonehara Reserve to obtain material so he could name and describe *S. liukuensis* (Moore 1969). He noted that his party was fortunate in that the strong winds of the recent typhoon had uprooted and knocked down a tall, mature palm from which adequate collections could readily be made. He also noted that all the palms appeared to be about the same size and age and had probably grown from seedlings remaining when mature palms were cut for their edible apical meristem (palm cabbage) during World War II. Moore also visited nearby Iriomote Island where they found more, especially impressive and larger specimens of *S. liukuensis* than at Yonehara on Ishigaki because they were in undisturbed habitat well away from human activity. We felt that the population of *S. liukuensis* was



Figure 7. The rachillae of *Satakentia liukuensis* are pink-purple to lilac but age to whitish.



Figure 8. Because *Satakentia liukuensis* is in an area that typhoons frequent, it often has canopies of abnormally few, wind-battered leaves.

healthy and fully reproductive, with an understory of abundant seedlings and juveniles (Figs. 9-10).

We were also especially attentive to *Arenga ryukyuensis* because it is a new species, rather recently split off from *A.*



Figure 9. The population of *Satakentia liukuensis* was healthy and fully reproductive, with an understory of abundant seedlings and juveniles.

engleri (Henderson 2006), the latter of which we had just spent several days studying in Taiwan. Forming a major component of the understory below the *Satakentia* at Yonehara (Fig. 2), the cespitose and hapaxanthic (stems die after flowering) *A. ryukyuensis* forms clumps reaching four m tall and five m wide. Stems or trunks are slender, to 20 cm in diameter when clothed with persistent leaf bases, and short or subterranean except when flowering where they can reach more than two m tall. The ascending to spreading, pinnate leaves are six to eight in number and three to four m long, including a petiole to one m long and a leaf base to 30 cm long. Each leaf holds up to 48 pinnae per side, which are regularly arranged, spreading in more or less the same plane, to 60 cm long, 3.5 cm wide, linear, dark green and strongly nerved adaxially (upperside), strikingly



Figure 10. Seedlings of *Satakentia liukuensis* were common on the forest floor.

grayish silvery abaxially, and notched along the margins distally. Inflorescences are unisexual, with staminate to 60 cm long and 45 cm wide and pistillate to one meter long (**Fig. 11**) (when the peduncle is fully extended in fruit) and 50 cm wide, and basipetally produced (initially produced from the stem apex and then downward toward the base), the distal most ones typically subtended by much reduced leaves. Staminate flowers are to 10 mm long, orange, and fragrant while pistillate flowers are 3 mm in diameter and orange. The yellow to red fruits are nearly two cm in diameter (**Fig. 12**).

Henderson (2006) split *Arenga*



Figure 11. Inflorescences of *Arenga ryukyuensis* are up to one meter long.



Figure 12. Fruits of *Arenga ryukyuensis* are yellow to red when ripe.



Figure 13. Although variable features, pinnae of *Arenga ryukyuensis* have a prominent rib adaxially and mid-pinna lobes or teeth on the margin.

ryukyuensis off from *A. engleri* of Taiwan, stating that the latter differed in its pinnae having a mid-pinna lobe and lacking a prominent rib adaxially. However, our examination of plants growing in Taiwan and on Ishigaki showed that these are variable, overlapping characters (**Fig. 13**), suggesting that only one, highly variable species is at hand. Nonetheless, Markey (2012), in his informative and admirable account of Japanese palms, stated that *A. engleri* has taller stems, purplish red rather than red fruits with more elongate rather than globose seeds, and infructescences that are lower on the stem and hidden among the leaves rather than at the top of the stem and exposed. These

differences need further assessment, especially the latter one that, if true, might suggest a different arrangement of pistillate and staminate inflorescences between the two taxa, which would seem significant. However, he might have misinterpreted infructescence position of these two taxa because of their basipetal nature, which means, depending on the age of the flowering/fruitlet stem, infructescences can be found distally or proximally on the stem. Fruit color can also depend on maturation state.

Like *Arenga engleri* on Taiwan, *A. ryukyuensis* appeared more luxuriant, graceful, and natural in protected, shaded forest situations (**Fig. 14**) although it also occurs in exposed, wind-swept, rocky, coastal habitats where the plants mostly looked battered, stunted, and thrifty.

After observing and studying *Arenga ryukyuensis* and *Satakentia liukiensis* in the Yonehara Reserve, we walked a short distance to the Toshihiko Satake Memorial Palm Museum, which commemorates the achievements of Dr. Toshiko Satake who brought this palm to the attention of the scientific community and for whom it is named. From the open-air viewing platform we were afforded panoramic views from the jewel-like coast to the north to extensive swaths of *S. liukiensis* sweeping up the hillsides and into the valleys towards Mt. Omoto to the south (**Figs. 15-16**). We were also able to see quite clearly numerous small groves and individuals of *Livistona chinensis* higher up on the difficult-to-access, steep slopes of Mt. Omoto. Although a great distance away, these palms, once considered as *L. chinensis* var. *subglobosa* but now included in the widespread and highly variable *L. chinensis* (Dowe 2009), are



Figure 14. Like *Arenga engleri* on Taiwan, *A. ryukyuensis* appeared more luxuriant, graceful, and natural in protected, shaded forest situations.

actually rather conspicuous because their somewhat grayish green canopies contrasted sharply with the surrounding, dark green vegetation. This encouraging sight thoroughly whetted our appetites to see and photograph *L. chinensis* up close and, as we headed to our accommodations for the evening, we made plans to visit this palm the next day.

On the morning of October 17 we again hired a car, this time to take us to Banna Park in the hills between the city of Ishigaki and Mt. Omoto, where we would be dropped off and picked up later in the afternoon. Donald's son Robert decided to forego looking at palms and spent the day scuba diving. Over dinner the previous evening we



Figure 15. Extensive swaths of *Satakentia liukuensis* sweep up the hillsides and into the valleys towards Mt. Omoto.



Figure 16. *Satakentia liukuensis* forms large groves on the hills below Mt. Omoto.

had decided on Banna Park because it encompassed areas of native forest and put us in the hills closer to the *Livistona chinensis* that we had observed the day before from the Toshihiko Memorial Palm Museum. Also, it had a small botanic garden of sorts with several cultivated palms and other plants. We thought that park staff might be able to point us in the right direction to help us find wild *L. chinensis*.

After our mid-morning arrival at Banna Park we made arrangements with the driver to pick us up later in the afternoon and immediately searched for park staff with whom we could inquire about finding *Livistona chinensis* in the wild. Unfortunately, the few staff members with whom we were able to converse were either unaware of the palms, even after pointing out nearby cultivated specimens, or said that the wild palms were simply impossible to reach. Discouraged but undeterred, even after being warned of a poisonous snake that lurked in the forest, we set out making our way carefully along an overgrown path through expansive stands of exceedingly handsome *Arenga ryukyuensis*, heading uphill toward a small group of *L. chinensis* that we earlier had seen high above us. Unfortunately, the steepness of the terrain and denseness of the vegetation proved insurmountable so we turned around and headed back to the park where we ate lunch and considered our options.

After lunch we decided to walk the road back toward Ishigaki City where, upon our arrival in Banna Park that morning, we had spotted above a steep road cut several individuals of *Livistona chinensis* that we thought we might be able to access. While it was not the picturesque grove we had hoped

to find, at least we would be seeing and photographing this species in the wild. After 15 minutes of walking up the road we found ourselves about 50 m below a palm, which we could see just poking its gray-green leaves above the short forest canopy. Donald carefully climbed up the unusually steep road cut and then picked his way through the exceedingly dense vegetation toward the palm. Adam remained on the road and, through voice communication, guided Donald to the palm, which was in such dense vegetation that Donald was unable to see it until he was nearly right next to it. Ever mindful of the warning about poisonous snakes, Donald finally arrived at the palm



Figure 17. *Livistona chinensis*, being on steep ridges and starting to emerge from the surrounding low forest canopy, had suffered greatly in the recent typhoon.

and, after briefly savoring the moment, set about taking notes and doing some minor clearing of adjacent vegetation in order to take photographs.

It was evident that this palm, being on a steep ridge and starting to emerge from the surrounding low forest canopy, had suffered greatly in the recent typhoon that had passed through the area. It had fewer leaves and those it did have were much wind battered (**Fig. 17**). Another individual was about 50 m distant in the dense vegetation (**Fig. 18**). We will provide a more extensive and detailed description and discussion of *Livistona chinensis* later in our travels when we



Figure 18. *Livistona chinensis* grows in dense forest on Ishigaki and its leaves often show damage from typhoons.

encountered many fine specimens in Kyushu. However, it should be noted here that Markey's claim (Markey 2012) that “. . . *Livistona chinensis* does not exist in the truly wild state anymore within the Ryukyu [Islands]. . .” is untrue, as the numerous populations on Mt. Omoto visible from the Toshihiko Memorial Palm Museum in the Yonehara Reserve and the individuals in Banna Park clearly show.

After photographing and taking notes, Donald descended to the road, met Adam, and the two made their way back to the more developed part of Banna Park to wait for the taxi for the return to the hotel. Once the taxi arrived, we asked the driver to take a slightly different route through Banna Park back to Ishigaki City, which allowed us to admire extensive stands of cultivated *Satakentia liukiuensis* adorning the park (**Figs. 19-20**) and some large, impressive *Arenga ryukyuensis*, the latter of which might have been remnants of once wild plants but were now in a maintained landscape.

Kyushu

The next day, October 18, we departed Ishigaki on our flight to Miyazaki on the southern part of Kyushu, Japan's most southerly main island. Unfortunately, because of the remnants of a typhoon in the area, our flight was diverted to Fukuoka on the northern part of Kyushu. After much delay and haggling with airline officials in Fukuoka, we finally had a flight to Miyazaki and arrived many hours late and in the dead of night. We took a taxi for the short ride to the small town of Aoshima, found our rental rooms in a house, and tumbled into bed after a long and trying day without palms.

The next morning, October 19, dawned



Figure 19. Cultivated *Satakentia liukuensis* adorns roadsides in some areas of Banna Park.

completely overcast; indeed, we would not see the sun at all during our one-day, one-night stay in Aoshima because of still another typhoon in the vicinity. Our goal in Aoshima was to visit Aoshima Island, just offshore from the town and covered, nearly to the exclusion of all other woody vegetation, with an extensive and spectacular grove of *Livistona chinensis* (Fig. 21), in the middle of which sits the famous Shinto Shrine Aoshima Jinja, a heavily visited tourist attraction.

Known as “Islet of the Gods” because in Japanese mythology it was the home of the God-family, ancestors of the Emperor of Japan, Aoshima Island has been protected and conserved since the 9th century when the Aoshima Jinja was established (Yoshida et al. 2000, Ehara et al. 2002). The Shrine owns all

the land on the Island and protects it and the palms. The Japanese government has recognized its historical, cultural, and biological significance and forbids any disturbance, even maintenance on the Island (Ehara et al. 2002).

After a quick breakfast at one of the numerous eating establishments that cater to tourists, we walked, with much anticipation and excitement, under leaden skies and occasional drizzle and with a rather stiff wind past the Aoshima Subtropical Botanical Garden, which we would return to later, and crossed a low pedestrian bridge and causeway to Aoshima Island, which connects it to Aoshima town on the mainland of Kyushu (Fig. 21). The low bridge and causeway, about 350 m long, are frequently inundated



Figure 20. *Satakentia liukiuensis* is a striking, cultivated ornamental in Banna Park.



Figure 21. An extensive and spectacular grove of *Livistona chinensis* covers Aoshima Island nearly to the exclusion of all other woody vegetation. Note the pedestrian bridge and causeway that provide access to the Island.

by sea water, especially during high tides and stormy weather, a portion of which is then covered with sand and strewn with rocks.

As viewed from the bridge, even under such poor and unflattering weather conditions, one cannot help but be impressed if not awed by the immense, dense grove of *Livistona chinensis* completely covering the Island (**Fig. 22**). The English translation of the Island's name, *ao*, meaning green or blue, and *shima*, meaning island, might refer to how the Island appears in clear, bright sun: its lush, verdant, heavily forested vegetation seemingly floating in an azure sea. Unfortunately, we did not experience it under these conditions but, nonetheless, we were still struck by its singular uniqueness and

beauty.

Composed of raised, “washboard” bedrock just a few m above sea level, Aoshima Island is roughly oval shaped, about 400 m long and 150 m wide, 4.4 ha in area, and flat and table-like. The “washboard” bedrock is especially visible at low tide (**Fig. 23**). The Island's soil profile shows a shallow humus upper layer over a sublayer of sand and sea shells sitting on top of the bedrock base (Ehara et al. 2002).

At 31.5 ° N latitude, the warm Kuroshio Current, sweeping north from Taiwan, maintains Aoshima Island in a mild, humid, nearly tropical climate where temperatures have never fallen to 0 ° C (Araki and



Figure 22. One cannot help but be impressed if not awed by the immense, dense grove of *Livistona chinensis* completely covering Aoshima Island.



Figure 23. From the perimeter of the *Livistona chinensis* grove the "washboard" bedrock of Aoshima Island is visible, especially at low tide.

Kanemura 1984). Because of the Kuroshio Current and the warm, moist air it draws north, clouds and overcast are frequent and typhoons and other tropical disturbances are not uncommon in the summer and fall. The Island is frequently enveloped in a salt-laden, moist haze, the result of wind, waves, warm water, and the high humidity.

Aoshima Island is one of the two remaining places in Japan with a “. . . virgin *L. chinensis* forest . . .” (Yoshida et al. 2000). The other is Tsukishima Island about 50 km to the south. The grove on Aoshima Island is the most northerly reproducing or self-generating population of *Livistona chinensis* in the world, and has an estimated 4,000 to 5,000 trunked individuals (Yoshida et al. 2000, Ehara et al. 2002). In other places in Japan, *L. chinensis* now occurs only as mostly

isolated, small groves or scattered individuals from (south to north) Iriomote, Ishigaki, Okinawa, Yakushima, and Tanegashima Islands in the Ryukyu archipelago to Cape Sata at the extreme southern tip of Kyushu (Yoshida et al. 2000). The most northerly occurrence of *L. chinensis* is at Ashizuri Promontory, Kochi, Shikoku Island (Horikawa 1972, Suzuki 1982), at about 32.5° N, but this group is incapable of self-regeneration (Ehara et al. 2002). *Livistona chinensis* was even once known from Tsushima Island, about 100 km northwest of Kyushu and a little more than half way across the Korea Strait to South Korea (Yoshida et al. 2000); at 34° N latitude, it would have been the most northerly occurrence of *L. chinensis*.

Livistona chinensis forests like these on



Figure 24. The senior author's son Robert provides scale for the *Livistona chinensis* on the Island's perimeter.



Figure 25. Co-author Adam Chi-Tung Hsu admires the *Livistona chinensis* on the perimeter of the massive grove on Aoshima Island.



Figure 26. Even on the Island's perimeter, the grove of *Livistona chinensis* is dense. Note the understory of seedlings.



Figure 27. Although on the Island's perimeter, the grove of *Livistona chinensis* is dense and multi layered.

Aoshima and Tsukishima Islands are now found only on Guishan Island (Turtle Island) in Taiwan (Hodel et al. 2014) and Uotsurijima (Japanese) or Diaoyudao (Chinese) Island in the contested Senkaku (Pinnacle) Islands, about 160 km north of Ishigaki in the East China Sea and claimed by Japan, China, and Taiwan. Indeed, Markey (2009) estimated that the population of *L. chinensis* on Uotsurijima contains about 100,000 individuals on its 4.3 km². However, this population is still much less dense, with 232 palms/ha, than that on Aoshima, with an astounding 1,136 palms/ha!

We first circled Aoshima Island, walking and admiring the palms surviving on the fringe of the massive grove and exposed to salt spray and wind, and whose roots were likely periodically inundated by sea water (Figs. 24-25). Even here, on the Island's perimeter, the grove was dense (Figs. 26-28). These palms, showing the ravages of the



Figure 28. As viewed from the Island's perimeter, the grove of *Livistona chinensis* is dense and with numerous individuals of all age/size categories.



Figure 29. *Livistona chinensis* on the Island's perimeter, exposed to salt spray and wind, show wind-beaten and -tattered leaves, nearly always with severe, salt-induced, marginal chlorosis and burning, and curved trunks.



Figure 30. Aoshima Jinja shrine and its support buildings are in the center of the dense grove of *Livistona chinensis*.



Figure 31. The *Livistona chinensis* are so dense in the grove's interior that even on a sunny day little light reaches the forest floor.

natural elements, had wind-beaten and -tattered leaves nearly always with severe, salt-induced, marginal chlorosis and burning (**Fig. 29**) but that often, seemingly somewhat proudly, displayed twisting, curving, wind-sculpted trunks, as if daring Mother Nature to take them down.

We then entered the interior of the Island, walking down a wide path to the Aoshima Jinja and its support buildings (**Fig. 30**), where we encountered numerous tourists and others making a pilgrimage to the site and even a wedding party. Entering the Island's interior is in stark contrast to its perimeter.

The palms are so dense that even on a sunny day little light would reach the forest floor (**Fig. 31**). Here, in the self-protection of the dense grove, the palms appear healthier and more vibrant than their counterparts on the perimeter of the grove (**Fig. 32**). They are about 8 m tall, and have a solitary, tan to brown, more or less smooth but faintly ringed trunk 20 cm in diameter. The base of the trunk tends to flare outward slightly and is supported by a prominent, well developed root boss (**Fig. 33**). About 30 to 40, ascending to drooping, palmate leaves compose the canopy and about an equal quantity of old, dead, brown leaves persist



Figure 32. In the center of the dense grove, the *Livistona chinensis* appear healthier and more vibrant than their counterparts on the perimeter of the grove. Note the canopy with about 30 to 40, ascending to drooping, palmate leaves with pendulous segment tips and an equal quantity of old, dead, brown leaves below this as a “skirt.”



Figure 33. The base of the trunk of *Livistona chinensis* tends to flare outward slightly and is supported by a prominent, well developed root boss.

below this as a “skirt” (**Fig. 32**). Leaves are about 1.5 to 3 m long and have a petiole 75 to 200 cm long that is lightly to moderately armed along the margins with curved spines, especially in the proximal part. The costapalmate, nearly circular (**Fig. 34**), flat to undulating leaf blade is 1.25 to 2 m long and



Figure 34. The leaf blades of *Livistona chinensis* are nearly circular.

nearly as wide, light only slightly grayish green adaxially, slightly paler or even faintly grayish abaxially, and divided one-third to one-half its length into as many as 70, bifid segments, these conspicuously pendulous in their distal 30 to 45 cm (**Fig. 32**). The numerous, solitary, much branched, ascending to spreading inflorescences are shorter than the leaves and have at least one peduncular bract and numerous other, loosely sheathing inflorescence bracts (**Fig. 35**). Flowers are whitish to yellow, fruits ellipsoid, 25 to 30 mm long, 16 to 20 mm wide, and greenish but aging to dark brown, perhaps after falling (**Fig. 36**). We noticed that palms on the exposed periphery of the grove had much more compact canopies with shorter petioles and smaller leaf blades while those protected in the grove’s interior had more expansive canopies with longer petioles and larger leaf



Figure 35. The numerous, solitary, much branched, ascending to spreading inflorescences of *Livistona chinensis* are shorter than the leaves and have at least one peduncular bract.



Figure 36. The ellipsoid fruits of *Livistona chinensis* are greenish but age to dark brown.

blades, especially on the younger and smaller individuals in lower light (**Figs. 37-38**).

Dowe (2009) stated that *Livistona chinensis* lacks a peduncular bract but we found this assertion not to be the case with palms on Aoshima Island or on cultivated specimens in California and Florida. The prophyll is so small and typically hidden deeply among the tightly packed leaf bases that it is often overlooked, and the peduncular bract is misinterpreted as the prophyll.

The population of *Livistona chinensis*



Figure 37. The *Livistona chinensis* on the exposed periphery of the grove had much more compact canopies with shorter petioles and smaller leaf blades.



Figure 38. The *Livistona chinensis* protected in the grove's interior had more expansive canopies with longer petioles and larger leaf blades, especially on the younger and smaller individuals.

on Aoshima Island is demographically stable (Ehara 2002). Despite the shady conditions in the forest interior, we observed abundant regeneration, with numerous plants in all size categories, including seedlings, juveniles, and adults (**Figs. 39-41**).



Figure 39. The population of *Livistona chinensis* on Aoshima Island is demographically stable, and we observed abundant regeneration.

Two theories explain how *Livistona chinensis* came to be on this small island and create this special place. One is that the palms are a relic of a once widespread population forced to retreat to island sanctuaries protected in warmer ocean currents with moister climates during a post-Tertiary dry period (Nakano 1925). The second, and perhaps more likely, is that the Kuroshio Current carried seeds or plantlets from farther south in the Ryukyus north to Aoshima, where the species was successfully established (Honda 1918). Indeed, seeds of *Livistona chinensis* from Aoshima soaked in sea water for 60 days still germinated (Ehara et al. 2002). DNA evidence, which seems to support this second theory, suggests that *Livistona chinensis* originated in the vicinity of Ishigaki and Okinawa and spread north and south from there at least 1.25 million years



Figure 40. Seedlings were common on the forest floor within the Island's dense grove of *Livistona chinensis*.



Figure 41. We observed numerous small plants within the Island's dense grove of *Livistona chinensis*.



Figure 42. At the Aoshima Subtropical Botanical Garden we admired numerous, handsome specimens of palms, including *Arenga ryukyuensis*.



Figure 43. *Phoenix dactylifera* makes an attractive specimen in the Aoshima Subtropical Botanical Garden.

ago, after the Tertiary period, and arrived on Aoshima during a Quaternary ice age, which would help to explain some of its cool and cold hardiness (Yoshida et al. 2000).

Reluctant to leave Aoshima Island and its surreal grove of *Livistona chinensis*, we strolled across the causeway and bridge to find lunch in Aoshima town. After a leisurely lunch we walked the short way back to the Aoshima Subtropical Botanical Garden, which we had passed in the morning on the way to the Island, to view its fine collections of subtropical and near tropical palms and other plants. Here we admired numerous, handsome specimens, including *Arenga ryukyuensis* (Fig. 42), *Butia odorata* (typically found as *B. capitata*), various *Phoenix* (Fig. 43) and *Sabal* spp., *Syagrus romanzoffiana*, *Syagrus weddelliana* (formerly *Lytocaryum weddellianum*), and *Washingtonia filifera*, among others. It was a



Figure 44. *Livistona chinensis* make handsome landscape subjects in Aoshima town.

fitting end to a wonderful and memorable day on the “Islet of the Gods.”

The next morning, October 20, we had a few free hours before our departure to Kyoto so after a quick breakfast we walked through Aoshima town, passing several fine cultivated specimens of *Livistona chinensis* (Fig. 44), out to the bridge to Aoshima Island, hoping that the weather had improved significantly to take better photographs. Although the heavy overcast of the day before had lightened somewhat, the cloudy conditions still persisted but we shot away, hoping for a photograph that would do justice to this most special of palm places.

Kyoto

Our mid-day flight to Kyoto was uneventful and, after checking into our hotel, we made arrangements for the next two days to see cultivated palms and some of the famous tourist sites in the city, which has to rank as one of the most beautiful and appealing in the world.

We began the morning of October 21 in a most appropriate place for plant people, the Kyoto Botanical Garden. Kyoto typically experiences some snow in the winter and only cold-hardy palms can survive outside. In the Garden we admired *Butia odorata*, *Trachycarpus fortunei*, and *T. wagnerianus*



Figure 45. At the Kyoto Botanical Garden we admired several palms growing outdoors, including *Trachycarpus wagnerianus*.



Figure 46. Behind and above the famous Fushimi Inari Taisha Shrine we observed naturalized *Trachycarpus fortunei* in damp, dense woods.

(**Fig. 45**), all grown outdoors as landscape subjects. However, in the Garden's heated conservatory, we admired some tropical beauties, including *Areca catechu*, *Cyrtostachys renda*, and the rare *Ravenea musicalis*.

After lunch at the Garden, we took several trains to arrive at the famous Fushimi Inari Taisha Shrine at the base of Mt. Inari, built in 1499. Departing from the main Shrine is a system of trails ascending Mt. Inari to countless smaller shrines and *tsuka* (places for personal worship). The main path up the mountain is famous for the more than 5,000 vibrant orange, closely set *torii* gates enclosing the walkway like a tunnel. The



Figure 47. Very tall but still attractive *Trachycarpus wagnerianus* adorn the grounds of the Kyoto City Hall.

paths lead upward into damp, thickly wooded slopes where we stopped to view and photograph naturalized *Trachycarpus fortunei* (**Fig. 46**), which looked right at home, probably like one would find them in native habitat. After taking in views of Kyoto from several sites and having some refreshments, we descended Mt. Inari, passing throngs of tourists headed up or going down, and returned to our hotel for the evening.

The next day, October 22, was devoted strictly to visiting tourist sites in the historic city, including Nijo Castle, the golden Kiyomizu Temple, Imperial Palace, and Kasuga Shrine in nearby Nara. We met our bus tour at a hotel across the street from

Kyoto City Hall in the early morning and, because we were a few minutes early, we were able to admire and photograph some very tall but still attractive *Trachycarpus wagnerianus* adorning the City Hall's front entry (**Figs. 47-48**). Many references consider *T. wagnerianus* to be a synonym of *T. fortunei* but they are clearly distinct morphologically; indeed, a recent morphometric analysis, which the senior author will publish soon, showed numerous, significant vegetative differences. While we enjoyed the day, the thought of departing the next day to Tokyo to begin our ocean odyssey to the remote Ogasawara Islands was always on our mind.



Figure 48. The *Trachycarpus wagnerianus* at the Kyoto City Hall are especially handsome.

Tokyo

On the morning of October 23 we boarded the Shinkansen (bullet train), which spirited us effortlessly for a few short hours across scenic countryside to Tokyo. Upon arrival, we took several trains to our hotel at Takeshiba on Tokyo Bay, the location from which our boat would depart in two days for the Ogasawara Islands.

The next day we visited the offices of the company whose boat would take us to the Ogasawara Islands to pay for our tickets.



Figure 49. At historic Hamarikyu Gardens in Tokyo we observed some handsome specimens of *Trachycarpus fortunei*.

When we arrived at the office we were told, much to our chagrin, that, you guessed it, because of a typhoon, the once weekly boat to the Islands had been cancelled! We were devastated. To travel all this way, always carrying with us the thought of going to the Ogasawara Islands and then be told that the trip was cancelled, was heartbreaking. Oh well, life goes on.

Because of inflexible airline scheduling, commitments, and for financial reasons, we were unable to remain for a week in Tokyo and take the next scheduled boat to the Ogasawara Islands. Thus, Donald and son Robert decided to return to Los Angeles and Adam decided to return to Taiwan. However, we were unable to fly out of Tokyo for Los Angeles until October 26, so we spent October 25 touring around Tokyo. One of the

sights we took in, not far from our hotel, was Hamarikyū Gardens, which is an historic site containing some trees about 400 years of age. Although not one of these ancient and venerable trees, we did see and photograph some handsome specimens of *Trachycarpus fortunei* (Fig. 49) growing in the deep, protective shade of taller trees, which attests to the palms' cold hardiness.

On October 26 we said our goodbyes and Robert and Donald boarded the flight to Los Angeles. We left Japan with many fine palm memories but also with a firm vow to return to finish our work on the Ogasawara Islands.

See Part II of this adventure for our visit to the Ogasawara Islands seven months later in May, 2014.

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