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## ***Satakentia* Revisited**

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Japanese palms are not numerous, essentially confined to the southernmost archipelagos of Bonin, Volcano, and Ryukyu, but are nevertheless quite interesting and to some extent, still not well known. The most widespread of them is *Livistona chinensis*, represented by different varieties in each island group. However, apart from *Livistona chinensis* var. *boninensis* which is widespread and very abundant in the Bonin Islands and distinctive in the large, obpyriform, glossy green fruits, the other varieties are undescribed (a putative one in the Volcano Islands) or of doubtful if not unknown origin (Moore and Fosberg 1956). Since *Livistona chinensis* is one of the most widely cultivated palms, it should deserve further investigation. Another distinctive and elegant palm from this region is *Clinostigma savoryanum*, endemic to the humid uplands of the Bonin Islands. *Clinostigma*, one of the most widespread Pacific palm genera, reaches its northern limit there, well north of the Tropic of Cancer. The most striking Japanese palm, however, remains undoubtedly *Satakentia liukuensis*. This massive palm, described as a distinct and monotypic genus by Moore in 1969, is confined to two nearby islands, Ishigaki and Iri-

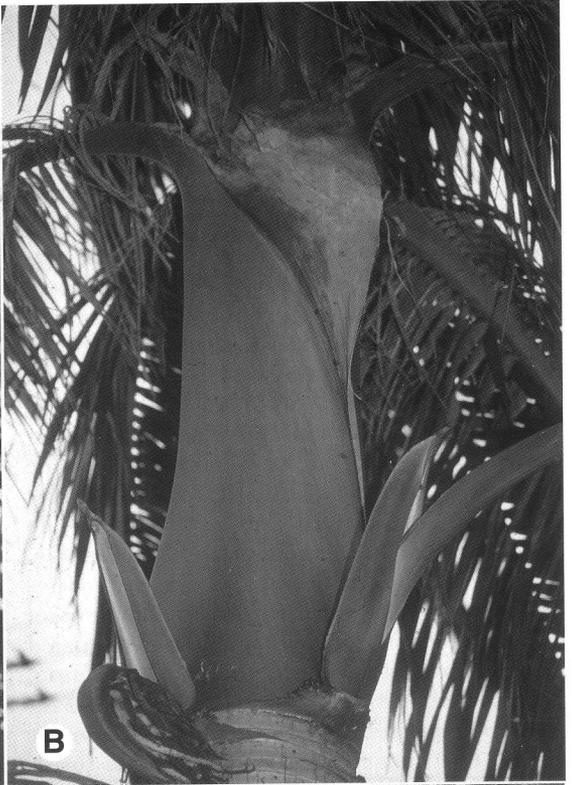
omote, in the southern Ryukyu Islands, close to Taiwan. Three decades later, a bronze plate honors the work of H. E. Moore, Jr., at the entrance of a paved trail leading to the largest stand of *Satakentia* at Yonehara on Ishigaki island. The site is declared as a National Treasure and is the island's major tourist attraction. Each day, hundreds of Japanese tourists, brought by big buses, come to admire the famous palm and learn from the preserve's guides, the story of *Satakentia*. The palm is also increasingly planted along streets, roads, and in gardens all around the island, of which it has become the emblematic tree.

*Satakentia* is typically a Pacific element, curiously endemic to these small islands that otherwise bear an essentially Asian flora, including *Arenga engleri*, as far as palms are concerned. Since the study of Moore, *Satakentia* was believed to be closely related to and scarcely distinct from *Clinostigma* (Moore 1969, Uhl and Dransfield 1987). However, during the course of field studies on both genera in February, 1997, it appeared to us that this was highly questionable, and that, on the contrary, these two genera were probably quite distant within the large and diverse subtribe Iguanurinae, to which they belong. The palm that we collected on Ishigaki island (Pintaud & Setoguchi 447, K) had an inflorescence enclosed in its bracts, showed a flattened and bicarinate prophyll much shorter than the protruding first peduncular bract (Fig. 1 A,B), this one complete, rostrate and including

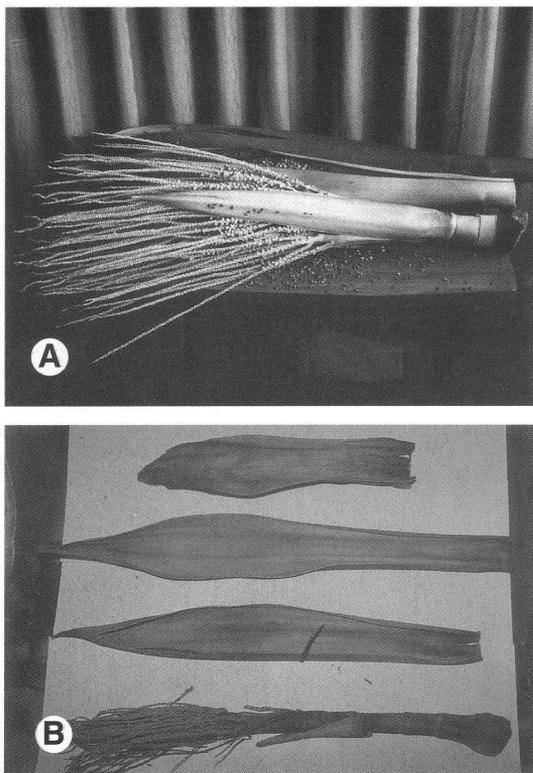
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1: Four portrait pictures 1 A, B. Well developed crownshaft of *Satakentia liukuensis* with a chartaceous ligule in the distal part of the leaf sheath and infralobar inflorescences with short prophyll and protruding first peduncular bract. (Pintaud & Setoguchi 447). 1 C. (Moore's 1969 Fig. 5). Individual with numerous infructescences and an inflorescence in bud showing first peduncular bract splitting abaxially and second one inside (Moore et al. 9382). 1 D. Gregarious population of *Satakentia* at Yonehara, Ishigaki island.



a second, also complete and similar peduncular bract, and a third and even fourth, incomplete but prominent additional ones (Fig. 2 B). This condition was different from that described by Moore (1969) who stated that the inflorescence of *Satakentia* had a complete, rostrate prophyll enclosing a similar first peduncular bract, like *Clinostigma*. He noted however, the large additional, incomplete, peduncular bracts. The reason for this discrepancy is obvious when looking at Moore's picture showing the inflorescence and its bracts (Fig. 2 A). Compared with our Figure 2 B, it is clear that the prophyll is missing in Moore's collection (Moore et al. 9382). In fact, the inflorescence bud collected by Moore was at an advanced stage of development, after the falling of the prophyll, since the first peduncular bract had already split abaxially, exposing the second one, on the tree collected by Moore (Fig. 1 C). What Moore called the prophyll corresponds evidently with the first peduncular bract of our collection and therefore Moore was misled in interpreting the inflorescence structure. Moreover, the inflorescence from Moore's collection deposited at BH shows three annular scars, the first corresponding with the overlooked prophyll and the following ones to the two complete peduncular bracts. Another collection made on the mature tree of the Tsukuba Botanical Garden's glasshouse (Pintaud & Higuchi 448, K) showed the same inflorescence structure as in our first collection on Ishigaki, proving that it is constant and diagnostic. Only the size of the incomplete additional peduncular bracts is variable, as noted by Moore (Fig. 2 A,B). This inflorescence structure is very rare in Iguanurinae, since it is found in only one other palm, *Carpoxyton macrospermum* (Dowe and Uhl 1989, Dowe et al. 1997), endemic to Vanuatu. It is also very different from that of *Clinostigma* which really has a prophyll enclosing a similar first peduncular bract, followed by 2–3 inconspicuous, ridge-like bracts. There are a number of other differences between the two genera, which are summarized in Table 1. So, with this new information, what are the affinities of *Satakentia* and *Clinostigma*? A cladistic analysis of the whole Iguanurinae based on morphological characters (Pintaud, 1999) suggests that *Satakentia* is a rather unspecialized and isolated member of the subtribe while *Clinostigma* belongs to a more derived group including *Carpoxyton* which has already been recognized as close to *Clinostigma*



2 A. Dissected inflorescence (Moore et al. 9382) showing complete first and second peduncular bracts and incomplete but very prominent third one, the prophyll is missing (Fig. 3, lower, in Moore 1969). 2 B. Dissected inflorescence (Pintaud & Higuchi 448) showing from top to bottom prophyll, first and second complete peduncular bracts and the third one, much reduced.

(Dowe and Uhl 1989). Therefore, the similarity in inflorescence structure between *Satakentia* and *Carpoxyton* should be regarded as a convergence rather than as a sign of a close affinity.

### Ecology of *Satakentia*

Moore said about the Yonehara grove in Ishigaki that "these trees appear to be essentially the same age and have probably grown from seedlings left when mature palms were cut for the cabbage or edible bud during World War II" while the trees he saw on Iriomote "were larger than those at Yonehara and very impressive, being in an undisturbed habitat away from evidence of human activity." In fact, Moore's statement about the Yonehara stand is incorrect. There is evidence that this grove is also natural and not the result of human disturbance. Moore's

Table 1. Synopsis of differences between *Satakentia* and *Clinostigma*.

	<i>Satakentia</i>	<i>Clinostigma</i>
Roots	slender, exposed to form a very prominent root-boss	thick, robust, not exposed or variously exposed, often forming stilts
Ligule of sheath	very prominent, chartaceous	inconspicuous
Ramenta on midrib on abaxial surface of pinnae	medifixed, twisted, brown	medifixed, flat, closely appressed to the lamina, membranous-translucent
Peduncle of inflorescence	slender, elongate	very short, inflated
Indument of inflorescence	very shortly but densely brown -lepidote-tomentose	inflorescence glabrous
Prophyll	much shorter than first peduncular bract	similar to and enclosing first peduncular bract
First peduncular bract	thick, woody	thin, herbaceous
Second peduncular bract	complete, rostrate, enclosing the inflorescence in bud	very small, much reduced, often to a low ridge
Third and fourth peduncular bracts	incomplete but very prominent, chartaceous	inconspicuous or lacking
Rachillae	rather stout	very slender
Triad bracts	rounded	acuminate
Second bracteole	sepal-like	not sepal-like
Third bracteole	rounded	deltate
Staminate bud	nearly symmetrical	markedly asymmetrical
Staminate sepals	rounded	lanceolate
Staminate petals	boat-shaped	deltoid, nearly flat
Pistillode	as long as stamens, swollen, capitate	very short, broadly conical, trifid
Staminodes	3	(5-) 6
Perianth residue on fruit	prominent	small

picture (Fig. 3 B), shows a part of the Yonehara grove with numerous *Satakentia* emerging above the forest canopy, just as it is today (Fig. 3 A). Palms which germinated during World War II are quite unlikely to reach such a size after 20 years and the fact that the trees present today are not taller indicates that they were already mature when the photograph was taken in 1966, and that the population is stable. Moreover, *Satakentia* presents a gregarious syndrome similar to that described by Pintaud and Hodel (1998) for *Kentia* species growing in natural conditions in New Caledonia: a dense population of mature trees of similar size (and probably age) with little juvenile establishment beneath due to continuous fall of dead leaves and synchronous phenology of all individuals with production of massive amounts of small fruits with readily germinating seeds. The gregarious behaviour of *Satakentia* is also evident in clearly undisturbed conditions on Iriomote, as illustrated by Moore (Fig. 3 C). The establishment of each stand of *Satakentia* has occurred over a very limited time span, and there are stands of different ages as Moore no-

ticed. The factors initiating these major periods of regeneration are not certain. It is possible that the establishment follows large tree fall gaps or landslides caused by the frequent typhoons which affect the island. When an open area appears, the *Satakentia* palms might be able to colonize it rapidly due to their efficient reproductive system. In normal conditions, there is insufficient regeneration to allow the future replacement of the existing trees, the numerous seedlings that germinate each year are killed by the dead leaves of the adults within the stands and are also usually unable to establish themselves in the dark understory of the adjacent rain forest.

### Conservation Status

The extent of *Satakentia* in Ishigaki is very limited. It occurs only at the Yonehara site, with a main area of gregarious patches and scattered, isolated trees not far away, in rain forest on sandstone hill slopes. Remnant small patches of forests on the flat lowlands including some *Satakentia* and isolated remnant trees indicate that



3 A. The *Satakentia* grove at Yonehara as it is today. 3 B. The same grove photographed by Moore in 1966 (Fig. 2 in Moore 1969).  
3 C. A gregarious stand of *Satakentia* on Iriomote, photographed by Moore (Fig. 9 in Moore 1969).

the species was formerly more widespread in these areas which are nowadays mostly converted to sugar cane fields or otherwise very disturbed and devoid of natural vegetation. The forests on the island are only conserved on hill slopes which are not suitable for cultivation. The remaining population at Yonehara is protected as a National Treasure but the boundary of the preserve includes only the main grove and should be extended in order to include all the forested area where *Satakentia* is likely to occur and regenerate. This is particularly important for a gregarious species showing probably the most active regeneration after unpredictable natural events which can affect any part of its actual or potential habitat.

On Iriomote, *Satakentia* occurs in isolated, mostly gregarious populations in undisturbed forest, the island biota being much less altered than in Ishigaki, and declared as a National Park. In conclusion, we can assess the conservation status of this palm as Low Risk but Conservation Dependant (LRcd) according to the new IUCN Red List categories (1994).

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