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Notes on the economic plants of Batanes : Citrus species and Phoenix loureiroi var. loureiroi

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Notes on the economic plants of Batanes: *Citrus* species and *Phoenix loureiroi* var. *loureiroi*

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バタン諸島の有用植物についての覚え書き——柑橘類とナツメヤシ属植物
(*Phoenix loureiroi* var. *loureiroi*)

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The Batanes Islands represent a distinct biogeographic region in the Philippines. It shares numerous indigenous plants with Lanyu-Lutao Islands of Taiwan and the Ryukyu Islands of Japan as well as the Babuyan Islands north of Luzon. The flora of Batanes, estimated at more than 700 species of flowering plants, includes an exceptionally high proportion of endemic species. Among the distinct and interesting floristic elements in the islands are the rutaceous plants, which include a high number of *Citrus* species and *Phoenix loureiroi* var. *loureiroi*, a rare date palm.

The citrus family (Fam. Rutaceae) is group of native plants of particular interest for ethnobotany, and the family is represented by many genera in the Batanes. The genus *Citrus* is exceptionally diverse: seven (64%) of the 11 species present in the Philippines are present in Batanes. A native citrus called *dukban*, is a local delicacy and is planted in house gardens and in farms of the Ivatan people. It is not known to be cultivated outside the island group.

The indigenous plant *voyavoy* is a dwarf palm belonging to the genus *Phoenix*. It has a minor use, locally, as an ornamental plant, and its leaves are culturally important for making men's vests and women's headgear. The survival of this palm is now threatened by habitat destruction (land conversion), excessive burning of the landscape, and animal grazing.

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Key Words : Batanes Islands, Philippines, ethnobotany, conservation, *Citrus*, *Phoenix*
キーワード : バタン諸島, フィリピン, 民族植物学, 保全, ミカン属, ナツメヤシ属

バタン諸島はフィリピンの中でも生物地理学的に特異的な地域である。多くの自生植物が台湾の蘭嶼一緑島、日本の琉球諸島と共通し、またルソン島の北のバブヤン諸島とも共通する。バタン諸島の植生には、推定700種以上の顕花植物があり、並はずれて高い割合で固有種が含まれている。この島々の独特で興味深い植物群として、多くの柑橘類の種を含むミカン科の植物と希少なナツメヤシ属植物の*Phoenix loureiroi* var. *loureiroi*がある。

ミカン科 (*Rutaceae*) は、民族植物学から見てとくに興味深い自生植物のグループであり、バタン諸島にはミカン科の多くの属が存在する。ミカン属 (*Citrus*) はとりわけ種類が多く、フィリピンに存在する11種のうちの7種 (64%) が、バタン諸島にある。Dukbanと呼ばれる自生の柑橘はこの地の名産でイヴァタンの人々の庭や畑に植えられている。これは、この諸島以外では栽培が知られていない。

固有種 *voyavoy* は、ナツメヤシ属に属する矯性のヤシである。この植物は、現在では観賞用植物としての用途もあるが、その葉は男性用のバストと女性用の頭飾りの材料として文化的に重要である。このヤシは、現在、土地の転用による生息地の破壊、過剰な火入れ、動物による食害などのために、生存の危機に瀕している。

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1 Natural and cultural setting

The Batanes group of islands, with a total land area of 20,928 hectares, comprise the smallest province in the Philippines. The group is located at the northernmost tip of the archipelago with a latitude and longitude of approximately 20°30' north and 121°50' east (Fig. 1). It is bounded by the Bashi Channel on the north, the Pacific Ocean on the east, the Balintang Channel on the south, and by the China Sea on the west.

The group is composed of ten small islands and 13 islets. The biggest and inhabited islands are Batan, Itbayat, and Sabtang. Mt. Iraya, an extinct volcano with a height of 1,009 m, and Mt. Matarem, with a height of 459 m, dominate the hilly landscape of Batan Island. Mt. Riposet dominates the island of Itabayat. The main soil of the islands is volcanic loam, but other soils appear on island fringes formed by uplifted coral limestone.

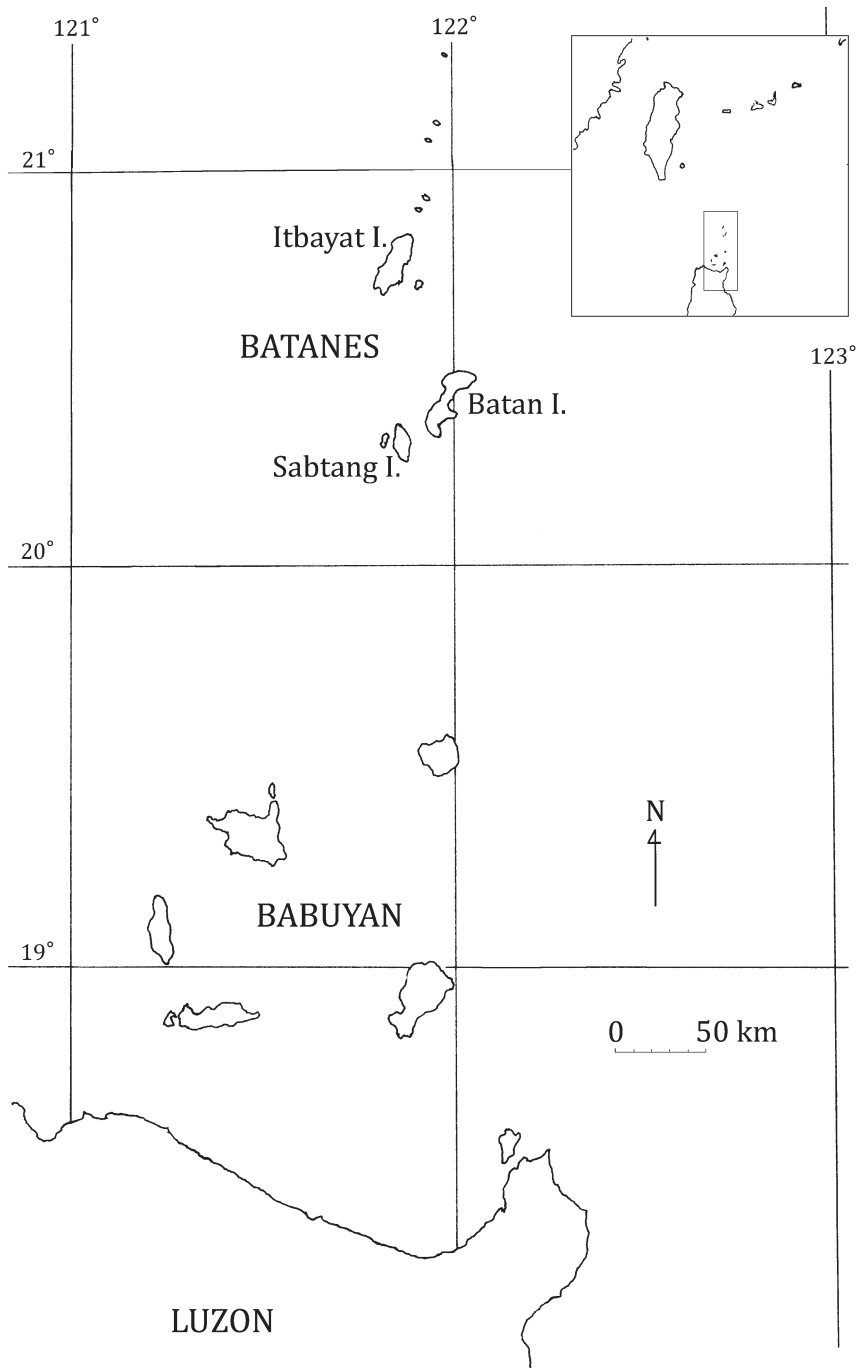


Figure 1

The province has a strongly monsoonal climate. Strong typhoons frequent islands from June to November; the coolest months are from December to March, and rain falls throughout the year with an average annual rainfall of 93 inches (2370 mm), much higher than the Philippines average. The average annual daytime temperature is about 26°C.

Batanes forms a distinct biogeographic region within the Philippines (Madulid 1995). Numerous indigenous species are shared with the Babuyan Islands (North of Luzon), Lanyu-Lutao Islands of Taiwan, as well as the Ryukyu Islands of Japan. A marked similarity between the flora of Lanyu-Lutao Islands and Batanes has been reported (Liu and Yang 1974). The Batanes group lies between the other island groups, and represents both the northern limit of the Malesian flora and the southern limit of the East Asian flora. The recent emergence of the Batanes islands (during the Pleistocene), their isolation by deep sea, even during periods of low sea level, and the small size of the islands are all factors that account for the uniqueness and fragility of the present flora.

The Ivatans are a distinct ethnolinguistic group of people who live on the islands of Batan, Sabtang and Itbayat. There are few early ethnographic accounts, but archaeological investigations indicate that the islands have been occupied since at least 4,000 years ago, approximately (Bellwood et al. 2003). The predominant language today is Ivatan, which belongs to the Austronesian language family and is spoken with Basco, Itbayat, and Sabtang dialects. In their culture and lifestyle, the Ivatans are very similar to the Tao people of Taiwan. They are predominantly Christian. Inter-marriage with people from Luzon has brought some changes in their general way of life. In 2000, the total population was 16,467 (National Statistics Office 2000). Ivatan plant names have been reported by Tsuchida et al. (1987), and also in Madulid (2001).

2 *Present flora*

Early accounts on the flora of the Batanes have been provided by Merrill (1908), Merrill (1923, 1925), Hatusima (1966), and Quisumbing (undated). Also in the past 20 years, the Philippine National Museum has intensively conducted floristic and ethnobotanical surveys in the islands. Through the Critical Plant Sites Project funded by the Debt-for-Nature Swap Project in 1988, a survey of the flora of the islands led to the inclusion of the islands among the Centers of Plant Diversity in the world (Madulid 1995). The Flora of the Philippines-Philippine Plant Inventory Project covered the islands through several expeditions between 1990 and 2000. Joint botanical expeditions were also conducted with the local environment agency in a bid to legally and officially establish the area as a protected area.

Batanes has been identified as a major center of plant endemism and diversity in the Philippines (Madulid 1995; Madulid and Agoo 1999). Hatusima (1966)

reported that there were 529 species of vascular plants from Batan Island and 129 of those species are also found in the Ryukyu Islands of Japan. Merrill (1908, 1923–1925) enumerated at least 671 species from Batanes, 110 of which are either endemic to the island group or to the region of the Batanes, Babuyan and Lanyu-Lutao island groups. The proportion of endemic plants in the Batanes is greater than in the comparably sized islands of Culion, and Siargao, which represent different phytogeographical regions in the southern Philippines.

The small islands of Batanes provide limited, and fragile, habitats for numerous endemic plant species (Madulid and Agoon 2001, 2005). Presumably, such species arrived in the islands earlier than humans and evolved independently from human activities. Through adaptive radiation, endemic species established themselves in a diversity of island micro-ecosystems, namely: beach forest, littoral cliff forest, lowland evergreen rainforest, forest over (coralline) limestone, lower montane forest, lowland grassland, summit grassland, and probably a forest over ultramafic soils confined to areas with mantellic deposits of heavy metals in the lava flows of Mt. Iraya. The unique island flora of Batanes is vulnerable to extirpation and extinction because of small plant populations, restricted genetic diversity, narrow ranges prior to human colonization, and lack of adaptability to change or human disturbance such as deforestation and fire, introduction of grazing animals and cultivation and introduction of weedy plants.

3 Plants of economic interest

Numerous indigenous plants are of value to the Ivatans, in various ways, and could be cultivated in other parts of the country. Such plants also have wider economic potential within the Philippines.

3.1 Species with horticultural potential

Here we use the phrase ‘horticultural potential’ to indicate plants that have ornamental value or improve the human environment in some other way. Plants in this category include shade trees such as *Drypetes falcata* and *Podocarpus costalis*. *Radermachera insignis*, *Ardisia confertiflora*, *Syzygium* spp. are small trees that yield showy flowers. Local species of *Clerodendrum*, *Ixora*, *Hydrangea*, *Begonia*, *Elatostema*, *Sedum*, *Bryophyllum*, *Plectranthus*, and *Acanthus*, among others, are also potential horticultural species. Of special interest are *Begonia fenicis*, *Ophiorrhiza kuroiwae*, *Crepidiastrum lanceolatum*, and *Centella asiatica* whose chromosome numbers were studied recently (Kokubugata and Madulid 2000).

3.2 Medicinal and other economic plants.

Recio (1973) includes, in her survey of medicinal plants and medical practices of the Ivatans, 33 species of common medicinal plants. Quisumbing (undated) also

enumerated common food plants of the Ivatans. Other authors also mentioned economic plants of Batanes Island (Yamada 1995). A thorough ethnobotanical inventory of Batanes, particularly of plants from the forests, will surely yield information new to science.

3.3 Root crops and wild food sources

The Ivatans mainly cultivate a variety of rootcrops: *uvi* (*Dioscorea alata*, water yam, or greater Asiatic yam), *dukay* (*D. esculenta*, lesser Asiatic yam), *wakay* (*Ipomoea batatas*, sweet potato), *sudi* (*Colocasia esculenta*), and *vay* (*Maranta arundinacea*) There are four *uvi* varieties (*nayvisaya*, *lakun*, *talapuyu*, and *paranan*) and six *wakay* varieties. Farmers always set aside space in their farms for the cultivation of these traditional staple crops. The taxonomic and genetic diversity of rootcrops in the Batanes are still poorly known and no efforts have been made to fully investigate and document these important food sources. *Talorachit* and *mintake* are wild plants with underground tubers that can be eaten during times of crop shortage. A significant factor favouring the use of wild and cultivated roots in the Batanes is the threat of strong typhoons, which make the cultivation of cereals difficult.

Other wild and cultivated food plants in the Batanes show considerable diversity and require detailed surveys. Of particular interest are the pulses or legumes, bananas (*Musa* spp.), breadfruit (*Artocarpus altilis* and other species), oranges and lemons (*Citrus* spp.), other genera in the *Citrus* family (Rutaceae), and the Philippine date palm (*Phoenix loureiroi* var. *loureiroi*) (Madulid and Agoo 2005).

4 The Citrus family (Rutaceae)

The Batanes islands are particularly rich in genera and species belonging to the Citrus or Rutaceae plant family. Of the 25 native genera and 84 native species of Rutaceae in the Philippines, seven genera, 15 species and three hybrids are found in Batanes. Of the 11 species of *Citrus* in the Philippines, seven (64%) are found in Batanes. In Table 1, the total number of Rutaceous plants in the Philippines (including Batanes) is compared with the number in the Batanes Islands.

Table 1 A comparison of the plants of the Philippines and Batanes Group of Islands

	Genera within Rutaceae	Species, varieties, and hybrids within Rutaceae	Species, varieties and hybrids within <i>Citrus</i>
Philippines	25	84	11
Batanes	7	18	7

4.1 Conservation notes

The total number of rutaceous species—and particularly *Citrus* species—found in Batanes, indicates that the island is a center of diversity for *Rutaceae* in the country

and should be a priority area for conservation (Table 2). Of particular interest is the citrus fruit locally called ‘*dukban*’. According to the late B. C. Stone, this plant may be a hybrid formed by a *Citrus medica* (pumelo) x *C. maxima* (citron) cross, and may have originated in the Batanes from the introduced parent species. The fruit has a thick rind with consistency like that of a young papaya fruit, and the rind is eaten raw or pickled with vinegar. The pulp is extremely acidic and is used as a flavoring for food.

Two other hybrid *Citrus* fruits are cultivated in the island, and appear to be native to Batanes. These are not as common as *dukban*. One is a cross between *Citrus maxima* and an undetermined *Citrus* species, and the other is of uncertain parentage. For conservation purposes, attention must be given not only to the wild *Citrus* species, but also to the cultivated species, varieties and hybrids (Plate 1-A).

Based on our observations, the main threats to *Citrus* in the Batanes islands are habitat destruction—for example, by land conversion to agricultural fields and pasture lands. There is no obvious effort on the part of island residents to conserve and propagate the different species of *Citrus*, except for a few favorite plants such as *dukban* and *C. maxima*. National and local government agencies, NGOs, researchers, and local residents need to join hands in carrying out a conservation strategy and action plan for these important genetic resources.

Table 2 Rutaceae of the Batanes islands

Botanical name	Local name (Ivt=Ivatan, Tag=Tagalog)	Distribution within Batanes (island names)
<i>Citrus aurantium</i> L.	<i>valachinok</i> (Ivt.)	Batan
<i>Citrus madurensis</i> Lour.	—	Batan
<i>Citrus microcarpa</i> Bunge	<i>kalamansi</i> (Tag.)	Batan, Sabtang, Itbayat
<i>Citrus medica</i> x <i>C. maxima</i>	<i>dukban</i> (Ivt.)	Batan, Sabtang, Itbayat
<i>Citrus maxima</i> (Burm.) Merr.	—	Batan, Sabtang and Itbayat.
<i>Citrus</i> hybrid 1 (? <i>Citrus maxima</i> x unknown)	—	Batan
<i>Citrus</i> hybrid 2	—	Batan
<i>Clausena</i> sp.	—	Mt. Matarem. Brgy. San Vicente, Batan
<i>Evodia ternata</i> (Blco.) Merr.	<i>alis</i> (Ivt.)	Batan
<i>Melicope</i> sp.	—	Batan and Sabtang
<i>Melicope densiflora</i> Merr.	<i>idakak, idakakayo</i> (Ivt.)	Batan
<i>Melicope triphylla</i> Merr.	—	Batan
<i>Micromelum</i> sp.	—	Batan and Itbayat
<i>Micromelum compressum</i> Merr.	—	Batan
<i>Micromelum minutum</i> (Forst.f.) Seem.	—	Batan
<i>Murraya crenulata</i> (Turcz.) Oliv.	—	Batan
<i>Murraya paniculada</i> (L.) Jack var. <i>omhalocarpa</i>	<i>vanaii</i> (Ivt.)	Batan
<i>Zanthoxylum integrifolium</i> (Merr.) Merr.	<i>varok</i> (Ivt.)	Batan

5 The Philippine date palm

The date palm of Batanes (the Philippines date palm) was originally named *Phoenix hanceana* Naud. ex Hance var. *philippinensis* Becc. by the Italian botanist O. Beccari. In a recent taxonomic treatment of the genus, Barrow (1998) reduced the species name to a synonym of the more widespread Asiatic–Indochinese palm *P. loureiroi*.

P. loureiroi var. *loureiroi* extends from mainland China to Taiwan, Indo-China (Cambodia, Myanmar, Thailand, Vietnam) and the Batanes Islands (Philippines). The palm is not known to occur anywhere further south within the Philippines. A second natural variety, *P. loureiroi* var. *pedunculata*, is distributed from Bangladesh to India and Nepal.

The Philippine date palm is a solitary to clustering tree 1 to 4 m tall, 15 to 25 cm in diameter, with a trunk usually covered by old leaf bases (Plate 1-C). The leaves are pinnately compound, 1–2 m long, with numerous rigid leaflets. The fruits are small, oblong, one-seeded, bluish-black when ripe, and produce an edible pulp (Plate 1-B).

5.1 Ethnobotany

The most common use of the Philippine date palm is for making two kinds of traditional all-weather gear called *kanaye*, a vest worn by men (Plate 2-B), and *vakul* or *suot*, a hood and cape (head-gear combination) worn by women (Plate 2-C, D). These hand-woven garments are worn mostly as protection from rain.

Leaves of the palm are collected anytime of year in Sabtang and Itbayat. The younger leaves are cut off using a knife, and are then bound neatly together with a leaflet or with plastic string. Eventually the leaflets are placed on a wooden board and are shredded using a brush with sharp metal teeth. This separates the fibres, which remain attached to the rachis. The shredded leaves are hung and air-dried in shade or sun for about three days (Plate 1-D) before being woven into a vest or cape.

To create strips for weaving, each leaf is divided longitudinally into two along the rachis (the main rib of the leaf). In more refined garments, the rough rachis is wrapped in a strip of thin dry tissue from the leaf base of *Musa textilis* (*abaca*) (Plate 2-A). This provides padding and a smoother finish for contact between the woven surface and the wearer.

To make a hood and cape, around fifty strips are laid out in horizontal, overlapping rows and are fastened together by plastic or *abaca* string running vertically at equally spaced positions along each strip. Construction begins at the top, where a strip is bent into a tight circle, to form the top or cap of the hood (Plate 2-A); the shredded leaflets are neatly trimmed on one side, just above the wearer's eye level.



Plate 1 A: Fruit from a range of *Citrus* species found in Batanes
B: The edible fruit of *Phoenix loureiroi* var. *loureiroi* (Philippines date palm, *voyavoy*)
C: Wild example of the palm on Itbayat Island, Batanes
D: The leaves drying after shredding of the leaflets



Plate 2 A: Weaving a cape, starting with the hood: here we can see strips of tissue from *Musa textilis* (*abaca*) being used to wrap the split rachis of *voyavoy*.
B: A completed vest (*kanaye*)
C: A completed hood and cape (*vakul* or *suot*)
D: The hood and cape provide all-weather protection for head and shoulders

The outside central point is covered by a circular piece of abaca stem tissue, which thus waterproofs the top of the hood. Two strips of *abaca* fibre radiate out from the hood, defining the vertical edges of the cape. The horizontal strips of palm-leaf loop back and forth between these edges, and are firmly tied to the edge at each turn. The end of one horizontal strip is firmly tied to the beginning of the next strip, and the strips are laid close together, side-by-side, so that coverage is complete. Similar techniques are used to make the vest.

The cape and the vest are then hung and air-dried for about three days to cure the natural green color of the leaves or fibers.

Weaving the all-weather gear is a craft still practiced as a home industry of the local women¹⁾. The rachis of the leaves is also used to make brooms. These products are not currently produced for commercial purposes. The fruits of the date palm are also eaten when ripe, and the tender pith of young trunks can be extracted and eaten raw or boiled as a salad. The tree is also planted as an ornamental in some gardens.

5.2 Traditional habitat management

The Philippine date palm grows in open grasslands or along the edges of low forest thickets. The grasslands are dominated by *Imperata cylindrica* (*cogon*) which grows up to 1.5 metres within a year, after cutting and burning. Other grassland species found in the palm habitat are *Ampelopsis heterophylla* (*nitinit*), *Centella asiatica*, *Chrysopogon aciculatus* (*amorseco*), *Cleome rutidosperma*, *Commelina benghalensis* (*kuhasi*), *Crinum asiaticum* (*vakong*), *Deeringia polysperma* (*didit*), *Geniostoma rupestre* (*gagadang*), *Imperata cylindrica* (*vuchid*), *Oldenlandia biflora* (*peseke*), *Paederia foetida* (*rayi*), *Saccharum spontaneum* (*tadayeb*), *Tabernaemontana pandacaqui* (*adibotbot*), *Tetrastigma harmandii* (*havok*), and *Wedelia biflora* (*anoyoy*) (Madulid 2003).

Cows, goats, and water buffalo (*carabao*) graze on cogon grass and the seedlings of the date palm. To keep the grasses palatable, the grasslands are burned at least once a year, particularly during the dry season. This is also done after the people harvest the above-ground parts of cogon grass. These are tied, stacked, dried, and used as thatching for traditional houses.

If the grasslands are left unburned, the cogon grass grows tall, depriving the palm seedlings of space, sunlight, and nutrients. By burning, succession is retarded, the diversity of the grassland is maintained, and the date palm population is maintained. After grasslands have burned, we have observed that date palm seedlings grow new shoots, seeds germinate, and inflorescence buds shoot from the trunks of mature trees within a week after the fire. Burning is thus a cultural practice that helps to maintain palm groves. However, frequent burning (more than once a year) can be detrimental to the palm by not giving the seedlings enough time to recover from the effects of previous fires. We recommend that areas with palm groves should be burned only once a year. If a property is bigger, then partial and rotational

burning of grassland patches can be undertaken to allow growth and recovery of the fragile seedlings and older individuals that have been weakened (Madulid 2003).

5.3 Conservation status

In a research funded by the Chicago Zoological Society, the conservation status of the Philippine date palm was assessed and an action plan was prepared together with local people. The plan was aimed towards adoption of the palm as an iconic species for the Batanes. The conservation status of the palm was assessed in the islands of Sabtang, Itbayat, and Ivuhos. The distribution record for Ivuhos was new. This island is uninhabited, lacks water, and is used mainly for grazing cattle and goats. In Sabtang Island, the palm population is relatively dense, with an average of 30 mature individuals per 100 square metres. In Itbayat Island, the palm grows taller, and the population is very sparse with an average of four individuals per 100 square metres. The smallest and the most threatened population was in Ivuhos island, which has only about a 100 individuals (Madulid 2003).

Although these areas of palm are within the jurisdiction of the Batanes Protected Landscapes and Seascapes, coordination among stakeholders is needed to promote conservation of the species. If the cultural and agricultural practices of the people continue to change, there may be less dependence on the grasslands for roofing materials and for stock grazing. This change may promote ecological succession in the area and jeopardize managed populations of the Philippine date palm. It is recommended that the species be listed as *Vulnerable* in the IUCN Red List of Threatened Plants. At the national level, it is recommended that the species be listed as *Endangered*, according to the published criteria for categorization of conservation status at the national level.

Areas recommended for declaration as special date palm reserves are Chavayan in Sabtang Island, Vula in Ivuhos Island, and the entire island of Itbayat.

6 Protecting plants of natural and cultural significance

The Batanes Islands have been declared a Protected Landscape and Seascape under the laws of the National Integrated Protection Area System (NIPAS). Under these laws, the flora and fauna of the islands are regulated. Customary uses are allowed, but collecting plants for commercial and non-commercial purposes requires a permit from the Department of Environment and Natural Resources (DENR).

Other national laws also protect the biodiversity of the island, and the entire country for that matter, the foremost being the Philippine Wildlife Act. Several provincial and municipal ordinances in Batanes have been enacted for the purpose of protecting biodiversity. Mt. Iraya, being the main source of water for Batan Island, is a critical watershed area and protection of the forest there is strictly enforced. The mountain provides habitats for many endemic and useful plant species of Batanes,



Plate 3 The 2003 workshop on the conservation and preservation of the Philippines date palm (*voyavoy*), held in Batan town.

including several native *Citrus* species and other Rutaceous plants.

After conducting an assessment of the conservation status of the Philippine date palm in 2003, the present authors, with the help of officials of the Batanes islands, organized a workshop in the provincial capital to develop a strategy and action plan for the protection of *Phoenix loureiroi*. In attendance were provincial officials of Batanes, municipal officials of Batan, Sabtang and Itbayat Islands, representatives of the provincial offices of DENR and other government departments (DOST, DepEd, DA, etc.), conservation NGOs, and teachers from the high school and college of Batan Island (Plate 3).

The one-day workshop consisted of a slide presentation on the flora of Batanes, the economic and useful plants, and current information about the biology, uses and conservation status of endemic plants. An afternoon session was scheduled to allow representatives of the Ivatan people to make an action plan for the preservation and sustainable utilization of the palm. Finally, a resolution was prepared by the participants endorsing the draft of “An Action Plan for the Conservation and Preservation of the Voyavoy (*Phoenix loureiroi*)”. This was subsequently presented to the provincial government of Batanes, for eventual endorsement. It is our hope that this plan will be adopted by officials of the province and by the people of Batanes.

This and other workshops were conducted by the concerned agencies to raise awareness of the rich biodiversity of the islands and to promote their establishment as a UNESCO World Heritage Site.

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Note

- 1) In November 2008, the first author was able to examine ethnographic examples held in the Batanes collections of the National Museum of Ethnology, Osaka, Japan. These were collected in the period 1979-1982, and show a variety of coarse to very fine forms that were presumably used in different ways.

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