Jurnal Natur Indonesia 13(3), Juni 2011: 226-231
ISSN 1410-9379, Keputusan Akreditasi No 65a/DIKTI/Kep./2008

The Genus Licuala Wurmb (Arecaceae) in Java

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Diterima 07-12-2010 Disetujui 07-03-2011

ABSTRACT

The comprehensive revision of the genus has been done in the Malay Peninsula, New Guinea, Sumatra and Kalimantan. In Java, the revision of *Licuala* has never been recently completed. This study was based on morphological characters of specimens which are preserved in Herbarium Bogoriense. The several living collections cultivated in Bogor Botanical Garden were studied. The aim of this study is to ascertain the correct names and improve the species delimitation of *Licuala* in Java. The result shows that there are three species of *Licuala* in Java. They are *L. gracilis, L. pumila* and *L. spinosa*. Two previously known species have been placed into synonymies; *L. flabellum* to *L. gracilis,* and *L. spectabilis* to *L. spinosa*. *Licuala gracilis* is endemic for west Java.

Keywords: Arecaceae, Java, *Licuala*

INTRODUCTION

Licuala is a genus belonging to the family *Arecaceae* (a conserved alternative name for the *Palmae*), subfamily *Coryphoideae*, tribe *Corypheae* and sub tribe *Livistoninae* (Uhl & Dransfield, 1987). It is a small to medium sized tree palm, rarely arborescent and easily recognized by the wedge-shaped fronds with segments that split to the hastula. Naturally, all species of *Licuala* are understorey palms. In general, the genus does not survive under open conditions and commonly found in the lowland forest. However, some species are also found in the other forest types, such as *L. spinosa* in open moist place and *L. glabra* in the hill stations. Traditionally, some species of this genus such as *L. acutifida*, *L. grandis, L. paludosa* and *L. spinosa,* are used as ornaments, decoration, roofing, food-wrappers, walking sticks, binding, making hats and eaten as vegetable (Burkill, 1935; Whitmore, 1973; Dransfield, 1976; Saw, 1997).

The genus consists of 141 species, occuring from Vanuatu, the Solomon Islands, New Guinea, Australia, Indonesia, the Philippines, Malaysia, Thailand, Cambodia, Laos, Vietnam, China (southern part), Myanmar, Bangladesh, and India (north-eastern part and the Andaman Islands). The centre of species diversity consider is at the two main areas, one within the Sunda Shelf in Malaya and Borneo and the other at the Sahul Shelf on the island of New Guinea (Saw, 1997; Saw *et al*., 2003).

The name *Licuala* is derived from the Makassar (Celebes) name 'leko wala' (Backer, 1936). It was first described by Rhumpius (1741), in the *Herbarium Amboinense* as *Licuala arbor*. As this name was pre-Linnean, so the name *L. spinosa* as was described by Wurmb (1780), was accepted by International Code of Botanical Nomenclature or ICBN (Greuter *et al*., 2000). Thus, *L. spinosa* is regarded as the genus type of *Licuala*.

The genus contains wide morphological variations and these cause a serious problem to the researcher in the process of revising. These morphological variations were easily observed in the field rather than through herbarium specimens. Thus, taxonomic study is based mainly on the data gained from fieldworks, such as inflorescences and flowers, which are not always found in the herbarium specimens.

The last comprehensive revision of the genus in the Malay Peninsula has been done by Saw (1997),

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in New Guinea by Barford (2000), in Sumatera by Ardan (2000) and in Kalimantan by Batoro (2001). In Java, the revision of *Licuala* has never been recently completed. According to Blume (1836), there are two species of *Licuala* in Java, *L. gracilis* Bl. and *L. pumila* Bl. Miquel (1851), reported 3 species, *L. pumila* Bl., *L. spinosa* Wurmb and *L. spectabilis* Miq. Koorders (1913), reported two species, *L. pumila* Bl. and *L. spinosa* Wurmb. Backer & Bakhuizen van den Brink Jr. (1968), recognized only two species of *Licuala* in Java, *L. spinosa* Wurmb and *L. pumila* Bl. In Bogor Botanical Garden, there are two clusters of living collection, which are believed (to be) of Ujung Kulon original and identified as *L. flabellum* (Anonymous, 1985). Interestingly, this species was previously described by Martius (1838), that was found in the wild of Celebes, however no other collections were found.

Therefore, it is considered essential to proceed the study of this genus in Java to ascertain the correct names and improve the species delimitation. The study is based on the herbarium materials from Herbarium Bogoriense (BO) and fresh materials from Bogor Botanical Garden.

MATERIALS AND METHODS

Specimens of *Licuala* which were collected from Java by the previous collector, fresh materials from Bogor Botanical Garden and some other areas in Java were the major materials for examinations. Collecting method followed Dransfield (1986). Morphological species concept is adopted in this study, following Dransfield (1999). The terminologies followed Stearn (1966), Uhl and Dransfield (1987), Dransfield and Beentje (1996). The basic description follows Uhl and Dransfield (1987), Saw (1997), Barfod and Saw (2002).

RESULTS AND DISCUSSIONS

Vegetative Organs. *Licuala* is rarely treelike, small to medium sized, acaulescent to shrubby, solitary or clustered. *Licuala pumila* is solitary, whereas *L. gracilis* and *L. spinosa* are clustered. *Licuala spinosa* is the tallest within the genus and almost treelike. *Licuala pumila is* almost acaulescent.

Petioles are usually with spines. The spines are found almost at the whole length of the petiole in *L. spinosa,* about half of the petiole in *L. gracilis* and *L. pumila*. Fronds are orbicular in *L. gracilis* and *L. pumila*, but peltate-orbicular in *L. spinosa*. The base of most fronds is equal but unequal in *L. gracilis*. The leaves are always split into many segment. Central segment is usually entire, except *L. gracilis,* which has bifid central segment. The central segment is slightly larger than the rest in *L. gracilis* or about equal in size with the lateral segment in *L. spinosa* and *L. pumila*.

Generative Organs. The inflorescence pattern provide some good characters in distinguishing the species (Figure 1). The inflorescence is erect to patent, longer than petiole in *L. spinosa* or shorter than petiole in *L. gracilis* and *L. pumila*. The inflorescence varies in the number of branching orders, from one in *L. pumila*

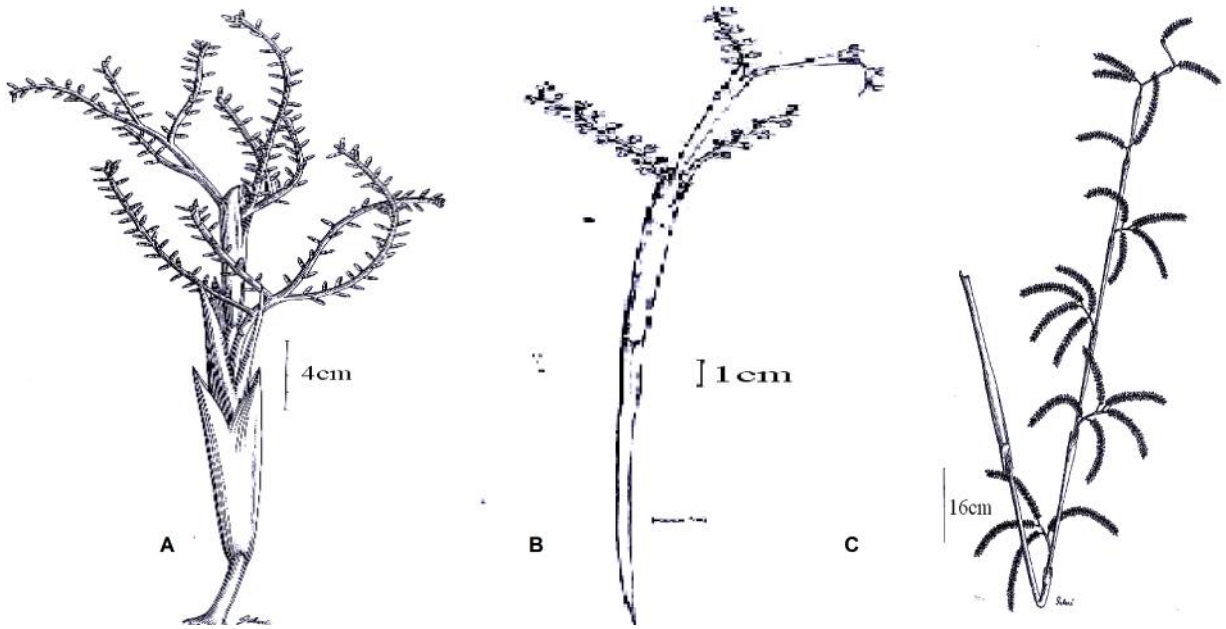

Figure 1. Inflorescence patterns of *Licuala* in Java: A. *L. gracilis* (from *Dransfield* 1498); B. *L. pumila* (from *JPM* 7723); C. *L. spinosa* (from *Koorders* 25443β, *Dransfield* 3525)

to two in *L. spinosa* and *L. gracilis.* Peduncular bract is present or sometimes absent in *L. Spinosa,* but it is completely absent in *L. gracilis* as well as in *L. pumila*.

Flowers are hairy or glabrous. The flowers of *L. spinosa* is hairy, but glabrous in *L. gracilis* and *L. pumila*. The flowers are sessile and solitary in *L. Pumila,* whereas in *L. gracilis* and *L. spinosa* are arranged in solitary or group.

The shape of calyx varies from cylindrical to cyathiform in *L. spinosa*, campanulate in *L. pumila* and tubular in *L. gracilis*. Corolla usually exceeding the calyx, tubular at the base, thick with lobe acute, except in *L. gracilis* which has blunt apex. Staminal ring is present in all species. Ovary shape are varies, from turbinate in *L. pumila* and *L. spinosa* to cone shape in *L. gracilis.* It is glabrous in all species under study.

Fruit mostly globose with smooth surface. Immatured fruits are pink or cherry red in *L. gracilis*, whereas the other species have green immature fruits. The seeds have the same shape as the fruits. The surface is always smooth.

TAXONOMY

Key To The Species Of Licuala In Java

1. Habit solitary ……..…….. 2. *L. pumila*
   Habit cluster ……..……..2
2. Inflorescence longer than petiole, outer surface of calyx and corolla hairy, young fruit green .....3. *L. spinosa*
   Inflorescence shorter than petiole, outer surface of calyx and corolla glabrous, young fruit pink or cherry red ……..1. *L. gracilis*

1. *Licuala gracilis* Blume.- Figure 2. ustering, gynodioecy plants (the hermaphrodite and female inflorescence appear on different individuals). *Stem* about 1-3 m tall, to c. 20 cm diameter, brown, nodes to 1.5 cm distant. *Leaves* 10-14 in crown, sheaths to 30 cm with red - brown fibres; *petioles* to 120 cm long, thornly below, 10-12 mm near base, 5-6 toward apex, green; spines along one third to more lenght of petiole, triangular to claws, patent to reflexed, largest near the base; *fronds* peltate-orbicular, unequal at the base, c. 30-45 cm long, c. 60-80 cm wide, segment c. 9-17 leaflets, the size is not same (wider toward central); lateral segment 2-5 costulate, 25-44 x 2.5-5 cm; central segment slightly larger than rest, bifid 1/5-1/3 frond lenght, c. 10-14 costulate, c. 30-45 x 7-10 cm. *Inflorescences* erect, shorter than leaves (very short), c. 15-40 cm long, extending beyond crown (axilary), branching to two order, bears either entirely female or hermaphrodite flowers at a different individual; *prophyll* tubular, c. 10-15 cm long, c. 1.5 cm wide, coriaceus and flattened at the base, closely sheathing, glabrous at the base and covered with brown hairs at the apex; peduncle c. 10-12 cm long, c. 2-3 cm wide, covered with sparsely golden brown hairs, *peduncular bract* lacking; rachis bracts only two, c. 10 cm long, c. 5 mm wide; *rachillae* 8-28, unornamented, c. 8-18 cm long, c. 2-3 mm wide, covered with sparsely golden brown hairs. *Flowers* sessile, maturing not simultaneously, bud c. 4-5 x 2 mm; *calyx* tubular, c. 2.5-3 x 2-2.5 mm, base thickened, apex trilobed, acuminate, glabrous, yellowish in colours; *corolla* tripartitus, triangular, c. 3.5-5 x 2 mm, base thickened, glabrous, apex blunt, green yellowish in colour; *pistillate flowers* solitary, spirally arranged, stays in anthesis for 8 to 10 days; *ovary* cone shaped, glabrous, to 3.5 mm long and 1.4 mm wide; *hermaphrodite flowers* arranged in group of 2-4 flowers, densely arranged, cincinni 10-15 (c. 4 clusters per cm), stay in anthesis for 3 to 4 weeks; *staminal ring* membranous, c. 1mm long, filament subulate, c. 1 mm, base thickened; *anther* c. 1 mm long; *ovary* cone shaped, glabrous, c. 2 x 0.8 mm, consist of three uniovulate carpels, all three carpels in every flower develop into independent fruits (Figure 2). *Fruit* globose c. to 9 mm in diameter, glabrous, pink or cherry red in young and dark red or dark brown when mature (the colour variations occur in the cluster, not in individual), solitary or develops an apocarpous fruit with three drupes (sometimes one flower bears three fruits); *seed* globose c. 6- mm in diameter, dark brown and smooth.

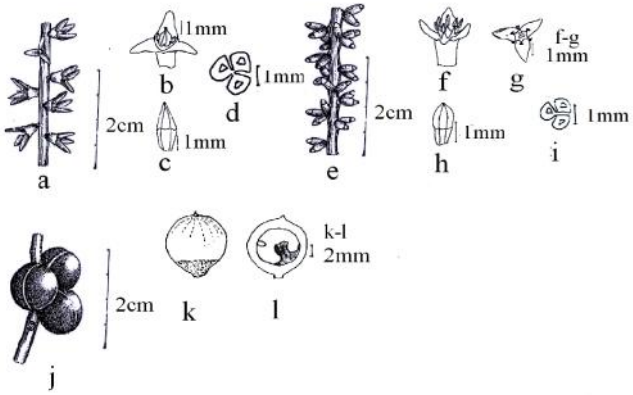

Figure 2. *L. gracilis* (from *Dransfield* 1498);a-d; female flowers; a. Rachilla with some flower buds; b.open flower bud; c.ovary; d. carpel in cross section. e-i. hermaphprodite flowers; e. rachilla with some flower buds; f-g. open flower buds showing the stamens; h. ovary; i. carpel in cross section. j. The apocarpous fruit with three drupes; k. one drupe of fruit; l. one drupe in section

Distribution: Endemic to West Java. Habitat: primary forest, common forest undergrowth component, seashore to mountain about 150-750 m altitude.

Notes: Based on the description of *L. flabellum* in Martius (1838), it has two similar characters with *L. gracilis*, which are the bifid central segment and the inflorescence pattern. This species was described by Martius based on Reinwardt collections which was said originated from Celebes. However, no collections have ever been made. So, there was a collection of this plant from Celebes. The type of *L. flabellum* is kept in Munich. According to Dransfield and Moore (1982), the entire flowers have fallen from the type and in many cases Reinwardt had written the location for his specimens incorrectly. Therefore, so they suggest that the type of *L. flabellum* has probably been collected from Ujung Kulon. Thus, it is regarded as synonym.

Specimen examined: JAVA: Ujung Kulon - Taman Jaya, *Mc Donald & Afriastini* 3378, fr., 18-5-1992 (BO!); G. Payung, *Kosterman* 21846, fl+fr., 18-11-1960 (BO!, K, L); *UNESCO* 170, fl. ♂ + fr, s.d. (BO!); G. Kendeng, *Kosterman* 197, fl. ♀, fl. ♂ + fr, 18-11-1960 (BO!), *Dransfield* 1433, fl., 15-4-1971 (BO!, I, K, L, Sing), *Dransfield* 1498, fl. + fr., 21-4-1971 (BO!); Bogor Botanic Garden - cultivated, *Etti Siregar* 06, fl. ♀ +fr and *Etti Siregar* 07, fl. ♂ + fr., 19-6-2003 (BO!).

2. *Licuala pumila* Blume. - Figure 3. Solitary, acaulescent or with short *stem* no more than 1 m tall, about 1.5-2 cm in diameter, pale brown in colour. *Leaves* in crown 10-14; *sheaths* brownish; *petioles* up to 1.5 m long, 5-7 mm wide near base, c. 2.2 mm wide toward apex, greenish colour, with sparsely spines along less half of petiole, little and turn, claws shape, dense near base of petiole, c. 3-4 mm long and 0.5-1 mm wide. *Fronds* orbicular, apex shallow dentate, radiately parted 7-14 or more up to 18, c. 33 cm long, 41 cm wide, lateral segment 2-4 costulate, 31 x 4.5 cm, central segment entire, 4-7 costulate, 33 x 35 cm. *Inflorescences* shorter than leaves, erect to patent, 40-55 cm long with 2-3 partial inflorescences; branching to one order; one to two opposite branching in proximal part, the upper usually occupied by a single rachilla; *peduncular bract* lacking; *peduncle* tubular, flattened at the base, c. 10 cm long, c. 5 mm wide, glabrous, green in colour; rachis strongly flattened, glabrescent or sometime slightly puberulous; *rachillae* 4-5, c. 5-10 x 2 cm size, covered with sparsely golden brown hairs, bracts c. 4-7 cm. *Flowers* solitary, irregularly, sessile, bud size 6 x 2.5-3 mm; *calyx* cylindrical to cyathiform, c. 4 x 3 mm, very slightly three toothed, base thickened, apex acuminate, glabrous, striate externally, green in colour; *corolla* coriaceus, triangular, tripartitus, c. 5 x 3 mm, thick, glabrous, base thickened, apex acute, striate externally, deeply sculptured inside, whitish in colour; *staminal ring* membranous, filament subulate, anthers c. 0.5 mm long, blunt; *ovary* turbinate, glabrous, sculptured above, c. 2 mm long; *style* subulate, c. 1 mm long. *Fruit* sub globose, c. 9-10 x 8-9 mm, smooth, green in young and orange to red when mature. *Seed* dark brown, sub globose c. 6-8 mm diameter, smooth.

Distribution: Sumatera and Java. Habitat: Ridge top hill of Dipterocarp forest to lowland Dipterocarp forests, 90 - 1000 m altitude**.** Specimen examined: JAVA: *Lebak* - Sunarari River*, Backer* 6362, fl., 1-1-1913 (BO!), *Bakhuizen van den Brink* 7946, fr., 1-4-1933 (BO!); Bojong Manik- G. Liman, *Koorders* 40879â, fr., 14-7 - 1912 (BO!); Jasinga: Dungus Iwul, *Etti Siregar* 03, fr., 20-4-2003 (BO!); *Steenis* 11170, fr., 18-12-1938 (A, BO!, L, Sing), *Dransfield* 1506, fr., 15-5-1971 (BO!, I); G. Halimun, *JPM* 7723, fl., th. 2003 (BO!); Cigelung, *Beümee* A367, fl., 150, 23-11-1926 (BO!), *Backer* 10232, fr., 24-11- 1913 (BO!); Janlappa, *Meijer* 2939, st., 20-8-1954 (A, BO!, K, L, Sing), *Dransfield* 991, fr., 11-10-1970 (BO!); Leuliang, *Bakhuizen van den Brink* 7915,

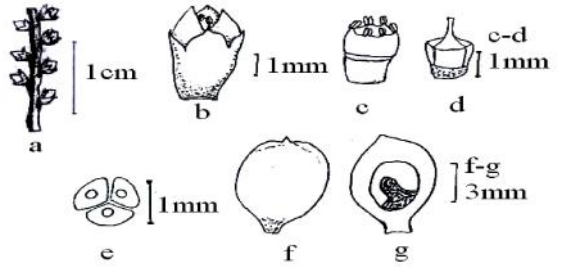

Figure 3. *L. pumila* (from *JPM* 7723, *Etti Siregar* 03); a. Rachilla with some flower buds; b.flower bud; c. calyx and corolla removed revealing the androecium; d. ovary; e. carpel in cross section. f. young fruit; g. young fruit in section

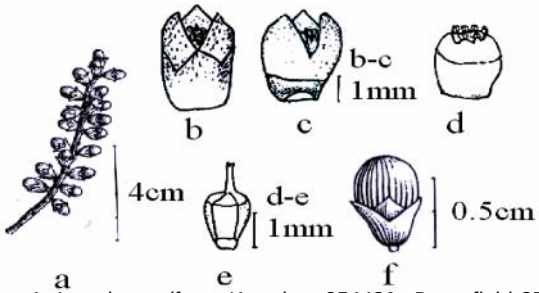

Figure 4. *L. spinosa* (from *Koorders* 25443β, *Dransfield* 3525); a. Rachilla with some fruits; b.flower bud; c.flower with calyx removed; d. calyx and corolla removed revealing the androecium; e. ovary; f. young fruit

st., 30-11-1932 (BO!); Sukabumi: Lengkong, *Dransfield* 1062, fr., 25-11-1970 (BO!, I, K, L); Cianjur, *Backer* 23905, fr., 1-4-1918 (BO!).

3. *Licuala spinosa* Wurmb. -Figure 4. Clustering. *Stem* to 5 m or more tall, to c. 23 cm across. *Leaves* c. 15 to 17 in crown; *sheaths* disintegrating into coarse reticulate fibers with dark brown colours; *petioles* to 2 m long, edge with black thorn, 10-20 mm near base, 5-10 mm toward apex, green to yellow brownish; spines along whole length of petiole, triangular, patent to reflexed, largest near base; *fronds* peltate-orbicular, dark green, c. 50-65 cm long, c. 80-150 cm wide, segment c. 14-19, all rather the same size; lateral segment 2-5 costulate, 41-51 x 4-9 cm; central segment slightly larger than rest, bipartitus (half to 5-7 cm toward leaf base), sometimes petiolulate, c. 8-14 costulate, c. 52-65 x 20-23 cm. *Inflorescences* erect to patent, longer than leaves, extend above the crown, with 7-9 partial inflorescences, c. 1.5-3 m long, branching to two orders; *prophyll* tubular, c. 20 cm long or more, c. 1.5-2 cm wide, coriaceus, flattened, closely sheathing, apex with two keels, densely covered with stellate caducous ferruginous hairs; peduncle c. 40-90 cm long, c. 4.5-8 across basally; *peduncular bract* present, sometimes lacking; rachis rigid, not sinuous; rachis bracts similar to prophyll, c. 20-22 x 0.7-1.5 cm, rachis bracts mouth splitting neatly in a few lobed; *rachillae* 4-11 at one partial inflorescence, unornamented, slightly close to or away from mouth of rachis bract, 10-25 cm long, c. 1.5-3 mm wide, covered with scattered simple brown hairs. *Flowers* solitary to in group of 2-4, sessile, densely arranged, cincinni 5-10 per cm, maturing not simultaneously; bud c. 4-5 x 2.5-3 mm; *calyx* cylindrical to cyathiform, c. 3 x 2.5–3 mm, base thickened, apex trilobed, acuminate, lobed to about half of calyx length, covered with translucent scattered patent hairs; *corolla* c. 3.5-4 x 3 mm, thick, densely covered in upper two third with simple translucent hairs, glabrescent toward base, lobes acute c. 1.5 x 2 mm; *staminal ring* truncate c. 0.6-0.8 mm high, filament subulate, c.0.3 mm long, anthers c. 0.3 mm long; *ovary* glabrous, turbinate, apex truncate, 1.5 x 1 mm, style filiform, 1 mm long. *Fruit* globose c. 6.5-8.5 x 6-8 mm, glabrous, smooth, immature fruit green and orange to red when mature. *Seed* globose, smooth, c. 4-6 mm across.

Distribution: Andaman and Nicobar Islands, Thailand, Vietnam, Malaysia, the Philippines, Sumatra, Java, Borneo. Habitat: Open, slightly swampy ground, lowland alluvial forest, peat and mangrove swamp forest, beach forest, primary forest.

Notes: *L. spectabilis* is a synonym of *L. spinosa* due to several characters such as: segments of frond, the number of inflorescence branching order % inflorescence is branching to two orders, flowers hairy and sessile. Miquel (1851), based his *Licuala spectabilis* on specimen collected by Junghuhn from Wijnkoops Bay (close to Pelabuhan Ratu) in Banten, West Java % where *L. spinosa* is also found. Miquel did not mention where the specimens kept. I have tried to look for the specimen in BO, but I did not find it. However, it was likely that Miquel used the specimen kept in BO when he described this species. Unfortunately, the specimen is now believed to be lost.

Specimen examined: WEST JAVA: P. Panaitan, *Waalkes* 470, st., 10-9-1951 (BO!); Ujung Kulon, P. Peucang, *Dransfield* 1478, fl., 18-4-1971 (BO!); Serpong, *Backer* 17594, fr., s.d. (BO!); Kemayoran, *Backer* 427, fl.+ fr., s.d. (BO!); Pelabuhan Ratu, *Etti Siregar* 01, fr., 24-8-2002 (BO!), *Dransfield* 1098 (BO!, Ithaca); Preanger, *Koorders* 34586β, fl., 14-5-1899 (BO!), *Koorders* 34589β, fl., 1-4-1899 (BO!); Cibunar, *Dransfield* 1472, fl. 17-4-1971 (BO!); *Dransfield* 1407, fl., 13-4-1971(BO!); Tanjung Suka, *Van Steenis* 994, fl., 3-4-1928 (BO!). CENTRAL JAVA: Karimun Jawa, Tg. Gelam, *Karta* 207, fr., 23-11-1930(BO!), *Karta* 304, fr., 26-11-1930 (BO!); Jepara, Ngarengan, *Koorders* 33618β, fl. 26-5-1899 (BO!), *Koorders* 36846β, fl., s.d., (BO!), *Beümee* 3598, fl., Dec. 1918 (BO!); Kedung Jati, Tempuran, *Koorders* 25443β, fr., 30-10-1896 (BO!); EAST JAVA: Sukamade, Meru Betiri, *Dransfield* 3525, fl., 20-5-1973 (BO!, L).

CONCLUSION

Three species of *Licuala* in Java are recognized. They are *L. gracilis, L. pumila* and *L. spinosa*. Two previously known species have been placed into synonymies; *L. flabellum* to *L. gracilis,* and *L. spectabilis* to *L. spinosa*.

ACKNOWLEDGEMENTS

This paper forms part of the thesis for master degree at the Bogor Institute of Agriculture in 2004, with financial supports from DIKTI. I would like to thank my supervisors Dr. Sri Sudarmiyati Tjitrosoedirdjo,

M.Sc. (IPB) and Dr. Johanis P. Mogea (LIPI) for their advice and guidance throughout the thesis. I also would like to thank to the Herbarium Bogoriense for the loans material.

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