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SYSTEMATIC AND ECOGEOGRAPHIC STUDIES OF CROP GENEPOOLS: 1. *Mangifera* L.

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The International Board for Plant Genetic Resources (IBPGR) is an autonomous international scientific organization under the aegis of the Consultative Group on International Agricultural Research (CGIAR). The IBPGR was established by the CGIAR in 1974 and its Executive Secretariat is provided by the Food and Agriculture Organization of the United Nations. The basic function of the IBPGR is to promote and coordinate an international network of genetic resources centres to further the collection, conservation, documentation, evaluation and use of plant germplasm and thereby contribute to raising the standard of living and welfare of people throughout the world. The Consultative Group mobilizes financial support from its members to meet the budgetary requirements of the Board.

The designations employed, and the presentation of material in this report, and in maps which appear herein, do not imply the expression of any opinion whatsoever on the part of the International Board for Plant Genetic Resources (IBPGR) concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries.

The current study heavily relied on information in herbaria, where specimens are described using old nomenclature for area and place names. Although it is recognized that this nomenclature is occasionally out-dated, it has nevertheless been retained in this report for the benefit of further studies on the herbarium material.

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Preface

In view of widespread genetic erosion in the world's important crops, the IBPGR initiated from its creation in 1974 a vigorous genetic resources collecting programme. The major aim of this programme was to collect and conserve (ex situ) as much of the remaining landraces/primitive cultivars of the major crops as possible.

From 1980 onwards, more emphasis has been directed to the collecting of the wild relatives of crops and the possibilities for complementary in situ conservation were discussed by a number of the IBPGR's Advisory Committees and Crop Working Groups.

In order to assess the need for and prospects of in situ conservation of wild species, the IBPGR commissioned a status report from the International Union for the Conservation of Nature and Natural Resources (IUCN). This was submitted to the Board in January 1981.

The IBPGR concluded that perennial species (and especially those with recalcitrant seeds which cannot easily be conserved ex situ) merit increased attention by all organizations concerned with in situ conservation. However, wild species which have seeds with orthodox storage behaviour should preferably be collected and preserved in genebanks (ex situ). This position is reflected in IBPGR's action plans and its policy statement on in situ conservation (see FAO/IBPGR Plant Genetic Resources Newsletter No. 59).

During its meeting in February 1983, the IBPGR agreed to fund a study on the geographical distribution of species related to the cultivated mango and hence devise a plan-of-action for the collection and conservation (in situ and ex situ) of these species. The present report by Professor S.K. Mukherjee summarizes the study.

On the basis of preliminary results, in 1984 the IBPGR contracted IUCN to carry out the field component of this project with the following objectives: (i) to undertake field surveys of wild Mangifera populations in areas of highest diversity (Kalimantan, Sabah and Sarawak); (ii) to provide an assessment of genetic erosion within populations and indications of possible sites for maintaining remaining diversity in situ; and (iii) to use the ecogeographical survey of wild Mangifera as a model for the in situ conservation efforts of the wild relatives of other crops.

Prof. Mukherjee examined the Mangifera specimens in the following herbaria: (i) Rijksherbarium, Leiden, Netherlands; (ii) Herbarium of Royal Botanic Gardens, Kew, UK; (iii) Herbarium, British Museum, UK; (iv) Herbarium Museum of Paris, France; and (v) Herbarium, Jardin Botanique, Geneva, Switzerland. He also visited IUCN/WWF (World Wildlife Fund), Gland, Switzerland; IUCN's Conservation Monitoring Centre, Kew, UK and Unesco, Man and Biosphere Programme, Paris, France. During these visits detailed discussions were held on relevant conservation programmes.

Careful study of label data in addition to unpublished field notes on the herbarium specimens has provided extremely useful information, on the basis of which particular genotypes may be collected and utilized for research in mango improvement, as enumerated below. Details of each collection can be obtained from Appendix I.

(1) M. caesia, No. 21. East Borneo, Karangan reserve, coll. Kosterm. "Pulp white, sweet, fragrant, almost fibre-less". It may be a good source for direct improvement through selection.

(2) M. decandra, No. 3. Sumatra, Pakambarw, Soepadmo 50. Growing in "fresh water swamp". It may be a good rootstock for waterlogged conditions.

(3) M. gedebe, No. 6. C.E. Borneo, W. Koetai, Endert 1726. "Inundated bank of Okong river". It may be a good rootstock for waterlogged conditions.

(4) M. indica, No. 107. Indochina, Saigon, Pierre 1680. var. mekongensis flowers and mature fruits at the same time. It may fruit twice in a year, and could be a good parent for crossing.

(5) M. inocarpoides, No. 3. Papua, Morehead, Henry and Foreman NGF 49345 "Common on inner side of river Levee, at edge of seasonal swamp". It may be a rootstock for waterlogged conditions.

(6) M. pajang, (i) No. 1. Sarawak, Kapit district, M. Jacobs 5217. "The fruit is much wanted. All such trees in the forest have their owners"; (ii) No. 6. East Borneo, W. Koetai, Kosterm. 12534. "Fruit 15 cm diam.; peeled like a banana". It may lead to good varieties of M. pajang by seedling selection.

(7) M. similis, No. 5. Borneo, Loa Djanan, Kosterm. 6594. "When fruits cut into two, seeds come out". It may be a good parent for breeding freestone mangoes.

TABLE OF CONTENTS

Tables

Figures

1. SPECIES OF MANGIFERA

The monograph of Mukherji (1949) listed 41 Mangifera species. Ding Hou (1978) reduced 14 of the species listed by Mukherji to synonymy and added 4 more in the Malesian region. Tardieu (1962) added another 4 species for the Indochina region and in China, Ling (1983) added a new species. Kochummen (1983) reduced 1 more species to synonymy (M. longipes Griff. as part of M. indica L.) but since acceptance of this would extend the distribution range of M. indica with doubtful phytogeographic validity, M. longipes is listed separately below. Kochummen created 2 new species in the Malayan region. Based on the taxonomic treatments provided above, the current study recognizes 39 species. These are listed in Table 1 together with their synonyms.

Of the 39 species listed in Table 1, herbarium specimens show the following to be of very restricted and local distribution: M. andamanica (2 sheets), M. cochinchinensis (7 sheets), M. dongnaiensis (4 sheets), M. flava (6 sheets), M. gracilipes (1 sheet only of the type), M. hiemalis (?), M. inocarpoides (4 sheets), M. khasiana (1 sheet only of the type), M. magnifica (14 sheets), M. minutifolia (1 sheet only of the type), M. monandra (16 sheets), M. pentandra (10 sheets), M. reba (2 sheets), M. siamensis (6 sheets), M. superba (2 sheets), M. timorensis (13 sheets), M. whitmorei (1 sheet only of the type), M. zeylanica (15 sheets). The author considers M. gracilipes, M. khasiana, M. minutifolia and M. whitmorei to be of doubtful validity.

There has been no revision at the generic level since the monographs of Mukherji. Hence the validity of the 39 species listed below cannot at present be critically assessed. It is also pertinent to recall the words of Hooker (1876): "the genus is a difficult one and the Malayan species want careful revision with many specimens."

1.1 Diagnostic characters

The range of variation in morphological characters of the species is complicated by intergrading due to cross fertilization in nature with resultant heterozygosity (Mukherjee, 1950, 1951).

The morphological characters for delimitation of species in order of importance for taxonomic identification are:

(1) Nature of disc - swollen, lobed (Section I, 32 species) or narrow, often reduced to the form of a stalk to the ovary (Section II, 7 species)
(2) Number of floral parts - pentamerous (28 species), or tetramerous (9 species) or both tetra- and pentamerous flowers in the same inflorescence (2 species)
(3) Number of stamens and their fertility: 10-12 with 5-6 fertile (2 species), or 5 all fertile (3 species), or 5 with 3 fertile (1 species), or 5 or 4 of which only 1 fertile (33 species)
(4) Nature of ridges on petals (vide Figs. 1-26; Mukherji, 1949)
(5) Nature of inflorescence branching and pubescence
(6) Shape, size, texture and venation of leaves
(7) Fruit size and shape

It can be noted that plants with swollen disc, pentamerous flowers and 5 stamens of which 1 is fertile form the largest group (23 species to which M. indica belongs); the next largest group has tetramerous flowers and 1 fertile stamen, in which 10 species are included.

1.2 Problems in identification

Due to the intergrading morphological characters and the morphology of the flowers that provide the distinguishing characters for species identification, it is difficult to identify correctly plants in the field. Initially, spotting of plants belonging to Mangifera in the forests has to be made from tree habit, foliage, bark and fruit characters. With the help of fruits and vernacular names, some identity of the plants can be established, but realistically these should be marked for future verification.

Subsequently one must collect flowering materials as herbarium specimens and flowers in spirit for microscopic examination and correct identification. Appendices I and II provide information about flowering and fruiting time and vernacular names of each species.

Table 1. Species of Mangifera

	Mangifera species	Synonyms
1	M. altissima Blanco	M. merrillii Mukherji, M. mucronulata Bl., M. rumphii Pierre
2	M. andamanica King	
3	M. caesia Jack.	M. kemanga Bl., M. polycarpa Griff., M. verticillata C.B. Robinson
4	M. caloneura Kurz	
5	M. camptosperma Pierre	
6	M. cochinchinensis Engl.	
7	M. decandra Ding Hou	
8	M. dongnaiensis Pierre	
9	M. duperreana Pierre	
10	M. flava Evrard	
11	M. foetida Lour.	M. horsfieldii Miq., M. leschenaultii March., M. sphaeroidea Bl.
12	M. gedebe Miq.	
13	M. gracilipes Hook. f.	
14	M. griffithii Hook. f.	M. beccarii Ridl., M. microphylla Griff ex Hook. f., M. sclerophylla Hook. f.
15	M. havilandii Ridl.	
16	M. hiemalis Ling	
17	M. indica L.	
18	M. inocarpoides Marr. & Perry.	
19	M. khasiana Pierre	
20	M. lagenifera Griff.	
21	M. longipes Griff.	M. glabrescens Mukherji., M. indica var. compressa Bl., M. parish Miq., M. sumatrana Miq.,
22	M. macrocarpa Bl.	M. fragrans Maingay
23	M. magnifica Kochummen	
24	M. minor Bl.	
25	M. minutifolia Evrard	
26	M. monandra Merr.	M. philippinensis Mukherji
27	M. odorata Griff.	M. foetida var. bombom Bl., M. foetida var. kawini Bl., M. foetida var. mollis Bl., M. oblongifolia Hook. f.
28	M. pajang Kosterm.	
29	M. parvifolia Boerl. & Koord.	
30	M. pentandra Hook. f.	M. lanceolata Ridl.
31	M. quadrifida Jack.	M. langong Miq., M. longipetiolata King, M. maingayi Hook.f., M. rigida Bl., M. spathulaefolia Bl.
32	M. reba Pierre	
33	M. siamensis Warb. ex Craib	
34	M. similis Bl.	M. torquenda Kosterm.
35	M. superba Hook. f.	
36	M. sylvatica Roxb.	
37	M. timorensis Bl.	M. glauca (non Bl.) Span.
38	M whitmorei Kochummen	
39	M. zeylanica Hook. f.	

2. SURVEY OF HERBARIUM SPECIMENS AND SPECIES DISTRIBUTION

Sheets were examined for information on location, frequency of distribution, flowering and fruiting times, vernacular names and uses. A list of sheets examined are summarized in Appendix I. Of the 39 species listed above no specimens of M. hiemalis, M. magnifica or M. whitmorei were available in the herbaria visited (K, BM, G, L, P).

Appendix II summarizes the information on distribution, ecology, vernacular names, flowering and fruiting times, uses and notes providing the author's view on threat (using the categories of IUCN).

The number of species occurring in several areas within the natural range of distribution is shown in Fig. 1. It will be seen that the largest concentration of species (19) is in the Malay peninsula, followed by Sumatra and Java (17), followed by Borneo and Indochina (10 each), and Thailand (9). Figs. 2 and 3 plot the distribution of species according to sections of the genus (Section I, Mangifera and Section II, Limus).

The distribution of individual species based on data from actual specimens, is shown in Appendix III (individual species maps). This Appendix covers only 36 species, since materials of 3 species were not available in the herbaria visited.

A consolidated statement of distribution is given in Table 2.

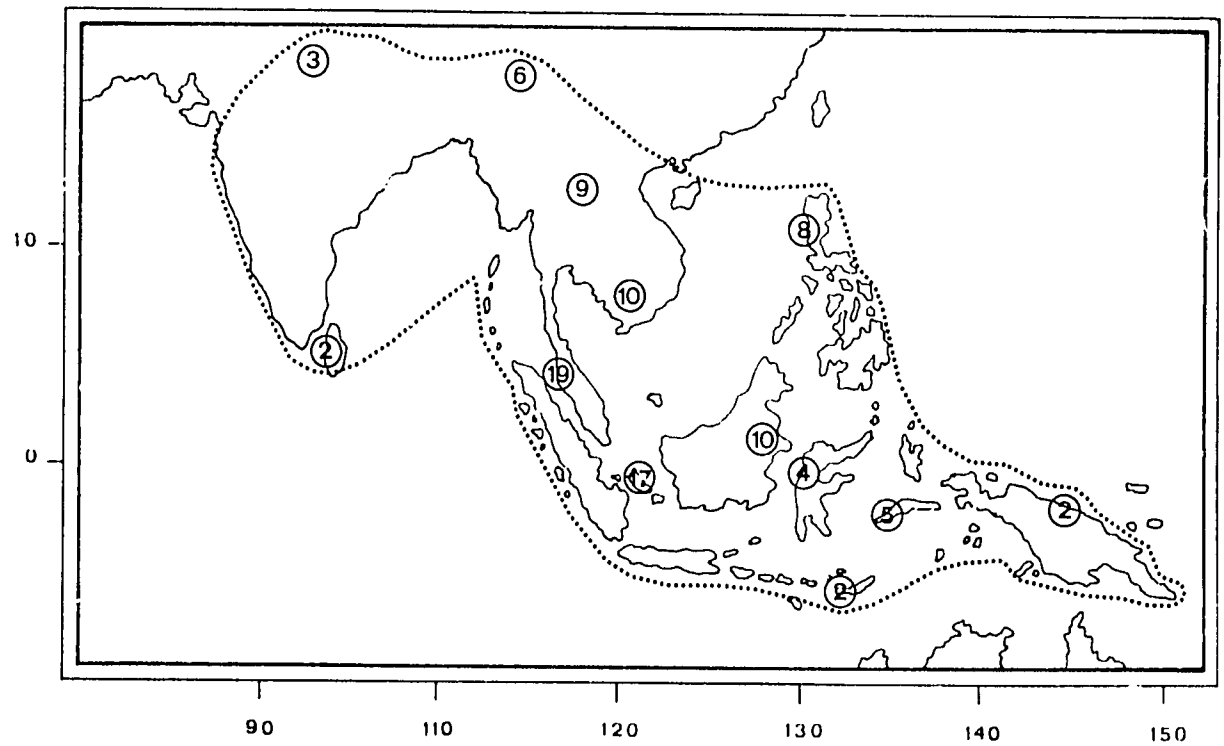

Fig. 1. Geographical distribution of the species of Mangifera (After Mukherji, 1949)

Legend: Number of species within countries/islands

India	3	Sumatra	11
Sri Lanka	2	Java	9
Andaman Islands	3	Kalimantan, Sabah, Sarawak	10
Burma	6	Bali	2
Thailand	9	Philippines	8
Indochina	10	Celebes	4
Peninsular Malaysia	19	Moluccas	5
China	1	Timor	2
		Irian Jaya, Papua New Guinea	2

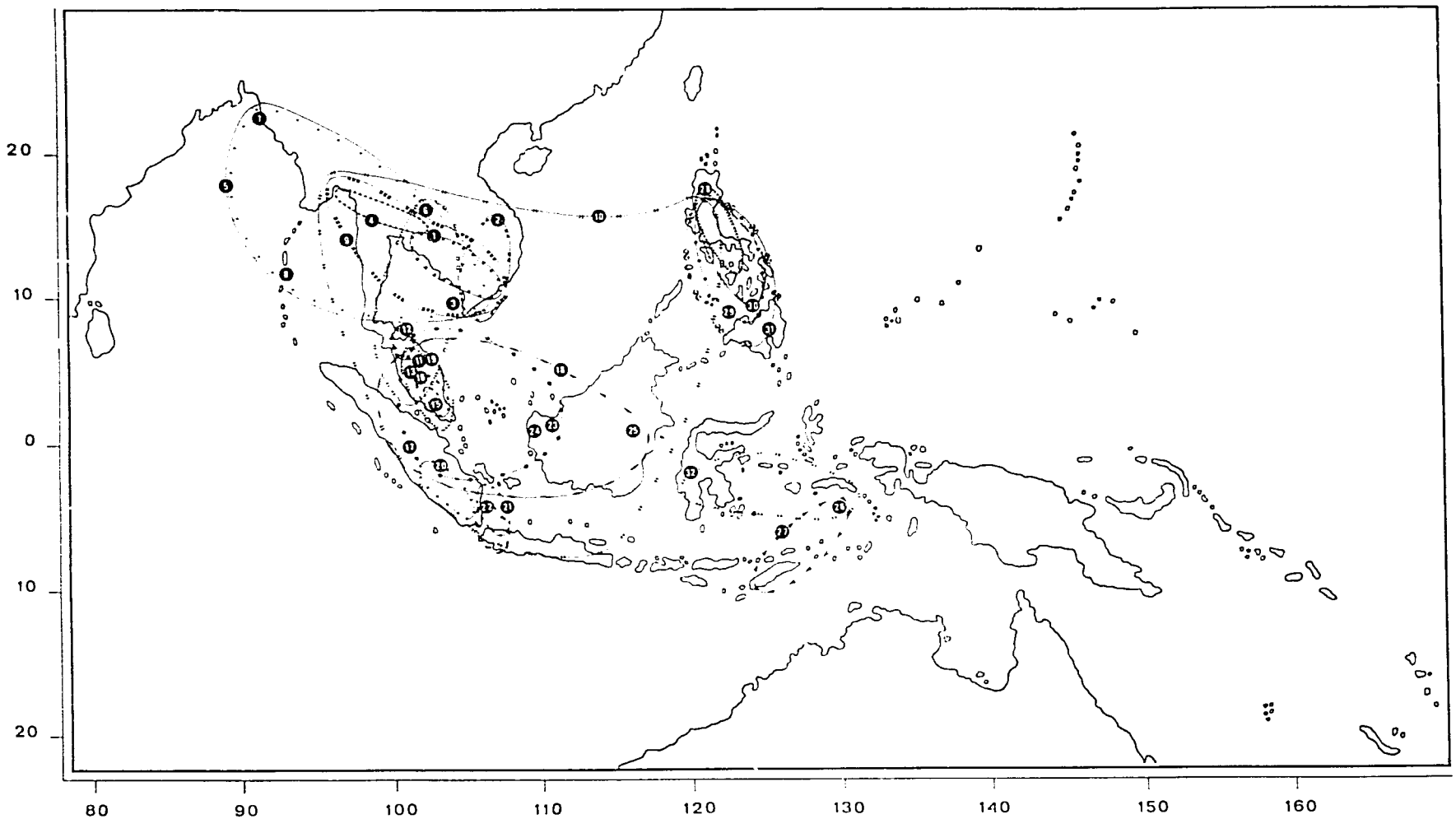

Fig. 2 Species distribution - Section . Mangifera (After Mukherji, 1949)

1. M. duperreana
2. M. cochinchinensis
3. M. oblongifolia
4. M. caloneura
5. M. sylvatica
6. M. siamensis
7. M. khasiana
8. M. andamanica
9. M. camptosperma
10. M. longipes
11. M. griffithii
12. M. lanceolata
13. M. gracilipes
14. M. longipotiolata*
15. M. maingayi
16. M. microphylla
17. M. sclerophylla
18. M. quadrifida
19. M. pentandra
20. M. rigida
21. M. similis
22. M. gedebe
23. M. havilandii
24. M. beccarii
25. M. spathulaefolia
26. M. rumphii
27. M. timorensis
28. M. altissima
29. M. monandra
30. M. philippinensis
31. M. merrilli
32. M. minor
33. M. indica*
34. M. zeylanica*

* Not included in map

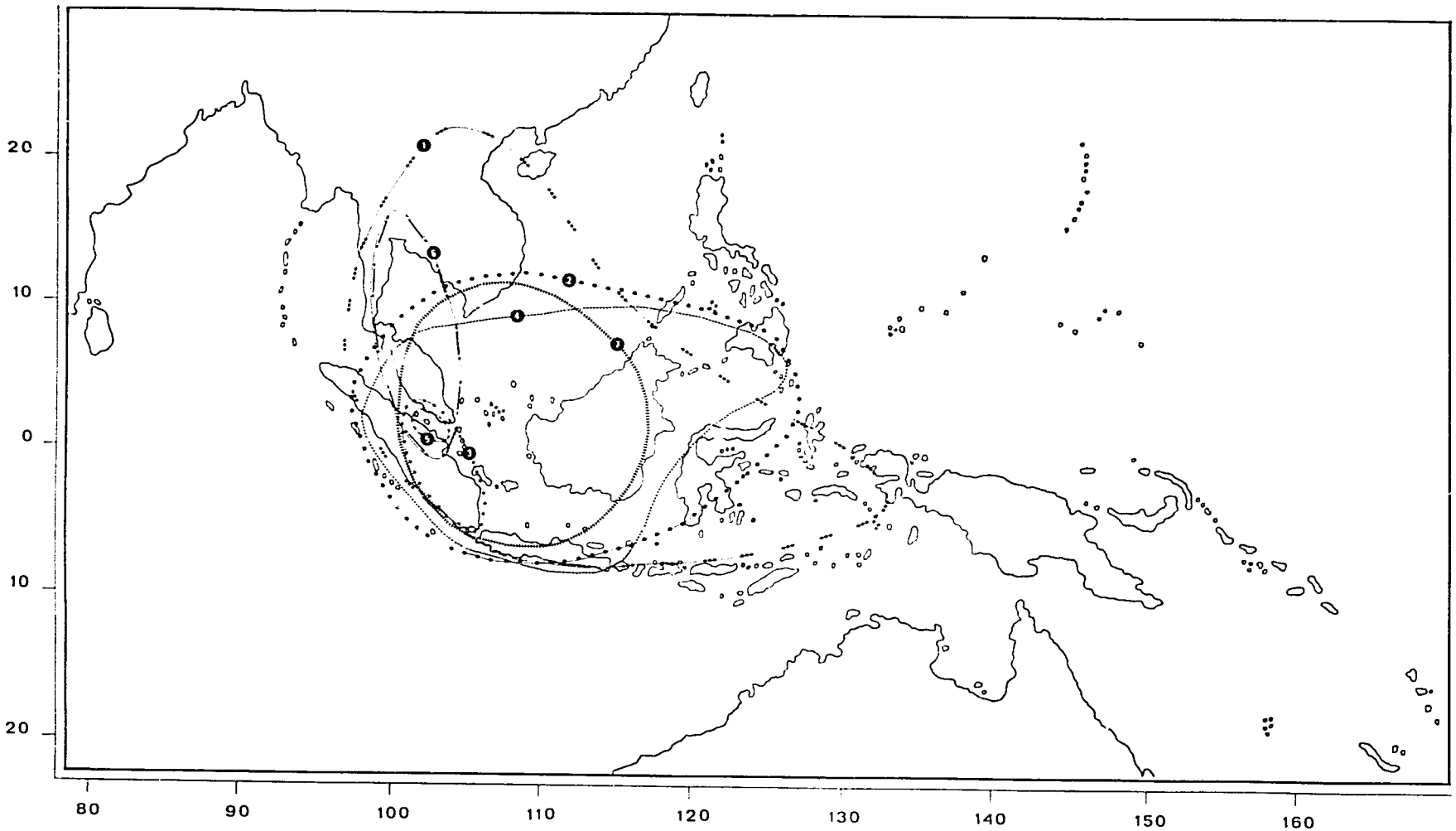

Fig. 3. Species distribution - Section II. Limus (After Mukherji, 1949)

Legend:
1. M. foetida
2. M. odorata
3. M. kemanga
4. M. caesia
5. M. superba
6. M. lagenifera
7. M. macrocarpa

Table 2. Distribution of Mangifera species

Species	India	Sri Lanka	Bangladesh	Burma	Thailand	Indochina	China	Peninsular Malaysia	Sabah Sarawak Brunei	Kalimantan	Sumatra Java Bali	Celebes	Irian Jaya Papua New Guinea Lesser Sunda Isl.	Philippines
M. altissima												+	+	+
M. andamanica	*													
M. caesia								+	+	+	+			+
M. caloneura				+	+									
M. camptosperma				+	+	+								
M. cochinchinensis						*								
M. decandra									+	+	+			
M. dongnaiensis						*								
M. duperreana					+	+								
M. flava						*								
M. foetida					+			+	+	+	+	+	+	
M. gedebe										+	+			
M. gracilipes								*						
M. griffithii								+	+		+			
M. havilandii								+	+	+				
M. hiemalis							*							
M. indica	+	+	+	+	+	+	+	+						
M. inocarpoides													*	
M. khasiana	*													
M. lagenifera								+	+		+			
M. longipes				+		+		+	+	+	+		+	+
M. macrocarpa								+	+		+			
M. magnifica								*						
M. minor												+	+	
M. minutifolia						*								
M. monandra														*
M. odorata						+		+	+		+			+
M. pajang									+	+				
M. parvifolia								+			+			
M. pentandra								*						
M. quadrifida								+	+	+	+			
M. reba						*								
M. siamensis					+								+	
M. similis									+	+	+			
M. superba								*						
M. sylvatica	+	+	+		+	+								
M. timorensis												+	*	
M. whitmorei								*						
M. zeylanica		*												
Total number of species	4	3	2	4	7	11	2	16	12	9	12	4	7	5

* indicates restricted local distribution

3. GENETIC EROSION

The wild Mangifera species occur mostly in primary tropical forests, largely as scattered individuals. Some are comparatively rare, as can be seen from the very limited collections in herbaria (Appendix I).

It is pertinent to recall a warning given 10 years ago by Frankel (1975) concerning Southeast Asia: "It has become obvious that the emergency situation extends even to many of the wild relatives of domesticated fruit species. Indeed, in some forest reserves they are singled out for destruction as unproductive weeds. Moreover, the destruction of native forests goes ahead at such speed in many parts of the region that the future existence of many of the wild species is in jeopardy".

Data from Sastrapradja (1975) showed extensive genetic erosion among the cultivated mango (M. indica) in all countries of Southeast Asia, and moderate erosion in cultivated M. caesia, M. foetida and M. odorata. There was some erosion in wild M. caesia, M. foetida, M. longipes and M. similis.

An analysis of the current state of information on individual species and their countries of occurrence has enabled the author to propose a preliminary categorization following the guidelines provided for the IUCN Red Data Book Categories (Threatened Plants Committee of IUCN) and this is summarized in Table 3. These preliminary assessments below need to be ascertained by field surveys.

Table 3. Status of threat to Mangifera species

	Category		Mangifera species
I.	Endangered (E)	*	M. cochinchinensis
		*	M. flava
			M. lagenifera
		*	M. pentandra
		*	M. reba
		*	M. superba
II.	Vulnerable (V)		M. duperreana
		*	M. inocarpoides
		*	M. monandra
		*	M. timorensis
		*	M. zeylanica
III.	Rare (R)	*	M. andamanica
			M. camptosperma
			M. gedebe
IV.	Insufficiently known (K)		M. caloneura
		*	M. dongnaiensis
		*	M. gracilipes
			M. griffithii
			M. havilandii
		*	M. khasiana
		*	M. minutifolia
			M. pajang
			M. parvifolia
		*	M. siamensis
			M. similis

* The species marked with an asterisk are of very local occurrence (endemic). The above listing does not include M. hiemalis, M. magnifica and M. whitmorei, since no data from herbaria were available. These 3 species should also be considered as endemic.

Table 3. Status of threat to Mangifera species (Continued)

	Category	Mangifera species
V.	Not threatened (nt)	M. altissima M. caesia M. decandra M. foetida M. indica M. longipes M. macrocarpa M. minor M. odorata M. quadrifida M. sylvatica

It is significant to note that the 4 important cultivated species, M. indica, M. caesia, M. foetida and M. odorata do not appear to be threatened. However, untapped parts of the mango genepool are certainly threatened.

4. THE USEFUL SPECIES OF MANGIFERA

The useful species of Mangifera fall mainly under 2 categories:

(i) Those species, the fruits of which are directly consumed by man;

(ii) Those species with close phylogenetic affinity to the main cultivated species, which can have a reasonable chance for utilization in improvement of the crop. The discovery of genotypes with resistance to mango malformation, anthracnose, powdery mildew, gall midge, etc. is becoming an urgent necessity.

4.1 Species with edible fruits

Field notes on herbarium specimens and literature references indicate 13 species as important and sometimes cultivated for their edible fruits, in addition to the common mango, M. indica (Mukherjee, 1953a); see Table 4.

Table 4. Mangifera species with edible fruits

M. altissima	M. longipes
M. caesia	M. macrocarpa
M. cochinchinensis	M. odorata
M. foetida	M. pajang
M. griffithii	M. pentandra
M. indica	M. sylvatica
M. lagenifera	M. zeylanica

Among the above species, widespread use is made of M. caesia, M. foetida and M. odorata. There are a number of variations within these species, and M. odorata is reported to have the best fruits among them. During field surveys, villages should be explored for the presence of important variants.

M. altissima has fruits 5-8 cm long with flesh almost free of fibres and used in the Philippines for pickling. M. caesia has fruits 18-19 cm long with thick flesh

traversed by coarse fibres. The flesh is juicy and acidic, but in 1 race it is sweeter than in others. It has a strong odour. M. cochinchinensis has fruits 3 cm long with thin slimy flesh having fine aroma. M. foetida has fruits 8-10 cm long with flesh 2 cm thick, and is traversed by many fibres. The fruit is much eaten by the Malays because the flesh is sweet when ripe, although the flavour is disagreeable. M. lagenifera has fruits 10-12 cm long, with cream coloured flesh 2 cm thick but it is not much liked. M. macrocarpa has big oblong globose fruits, with yellow bittersweet flesh, and is not much relished. M. odorata also has 10 cm long fruits with a distinctive flavour when ripe. The flesh is sweet but traversed by coarse fibres. After M. indica the fruits of this species are most appreciated by the people of Southeast Asia. M. pajang has 15-17 cm long fruits with thick rind, which can be peeled off like banana. The pulp is yellowish white, sweet and acid. M. pentandra has spherical fruits of good flavour. M. zeylanica has fruits 6 cm long, approximately the same size and shape as that of M. indica.

4.2 Species closely related to the major cultivated species

Attention needs to be given to those Mangifera species which are closely related to the major cultivated species and which are likely to be of use in improvement programmes through direct selection, as parents in hybridization or as rootstocks. The most important cultivated species is M. indica, and other important cultivated species can be considered part of the M. odorata - caesia complex. A list of closely related species to these major cultivated species is provided in Table 5.

Table 5. Mangifera species closely related to the major cultivated species.

M. indica complex	M. odorata - caesia complex
M. andamanica	M. caesia
M. caloneura	M. caesia var. kemanga
M. camptosperma	M. foetida
M. indica	M. lagenifera
M. longipes	M. macrocarpa
M. minor	M. odorata
M. siamensis	M. pajang
M. sylvatica	M. superba
M. zeylanica	

5. CONSERVATION OF GENETIC RESOURCES

Four groups of species should receive priority consideration for conservation:

(1) Endemic species; 18 (see Table 3)
(2) Endangered, Vulnerable and Rare species; 14 (see Table 3)
(3) Economically important species; 4 (see Table 4)
(4) Species closely related to M. indica and the M. odorata - caesia complex; 17 (see Table 5)

5.1 In situ conservation

The species of Mangifera occur mainly in the biome types of tropical humid forests, subtropical rainforests/woodlands, and tropical dry forests/woodland of the Indo-Malayan biogeographic realm (Udvardy, 1975). Hence preservation of main forest types in countries of the Indo-Malayan realm is necessary for effective in situ conservation. This is being accomplished through the establishment and maintenance of biosphere reserves, national parks and protected areas, nature conservation reserves, wildlife

sanctuaries, etc. The IUCN plans to make an inventory of plant genetic resources and from this develop guidelines for conservation, which would be carried out by the Conservation Monitoring Centre (CMC) of IUCN in collaboration with Unesco, which establishes the biosphere reserves.

Table 6 shows the numbers and types of reserves in the region of interest for Mangifera (from IUCN data, 1982). A break-down of the location of these reserves in the different regions of Indonesia, Malaysia and Singapore, where the majority of the Mangifera species are reported to occur, is shown in Tables 7 and 8.

Table 6. Number of protected areas, biosphere reserves, etc., in countries of the Indomalayan Realm

Country	Category I Scientific/ Nature Reserves	Category II National/ Provincial Parks	Category IV Nature Conservation Reserves/ Wild Life Sanctuaries	Category VI Resource Reserves	Category IX Biosphere Reserves
Bangladesh	-	-	3	-	-
Bhutan	1	-	-	-	-
Burma	-	-	-	5	-
India	1	21	184	-	-
Indonesia	43	10	27	-	6
Kampuchea	-	1	-	-	-
Malaysia	1	12	5	-	-
Papua New Guinea	-	4	1	-	-
Philippines	1	7	-	-	1
Singapore	1	1	-	-	-
Sri Lanka	4	5	24	-	2
Thailand	24	33	-	-	3

Table 7. Number of protected areas, biosphere reserves, etc., in Indonesia

	Category I	Category II	Category IV	Category IX
Irian Jaya	3	-	2	-
Java	9	5	7	1
Kalimantan	13	-	3	1
Lesser Sunda Islands	4	1	5	1
Moluccas	2	-	-	-
Sulawesi	5	3	4	1
Sumatra	7	1	6	2

Table 8. Number of protected areas, biosphere reserves, etc., in Malaysia and Singapore

	Category I	Category II	Category IV
Peninsular Malaysia	1	1	4
Sabah	-	6	-
Sarawak	-	5	1
Singapore	1	1	-

Detailed maps for each country and lists of plants in the protected areas are not yet available. The CMC (IUCN) at Kew is working on the preparation of maps, which are expected to be available shortly. For several biosphere reserves, Unesco has sollicited and received information on geographical location, altitude, area, vegetation, etc. The vegetation section of these sheets is brief and does not provide a complete inventory of species occurring in the reserves. It does not indicate the presence of Mangifera in any of them. However, a review of the data suggests the possibility of occurrence of Mangifera in the following: Tanjung Puting Nature Park, Lindu National Park, Komodo National Park, Gunung Leuser National Park, and Siberut Nature Reserve in Indonesia; Sinharaja Forest Biosphere Reserve, Sri Lanka; Sakae Rat Environmental Research Station, and Mae Sa-Kog Ma Reserve in Thailand.

In the latter half of 1984, the IBPGR Secretariat requested information on the occurrence of Mangifera species in the reserves in various countries and responses are quoted below by country.

(a) Indonesia

Response from Dr. Soedarsono Riswan, Head, Herbarium Bogoriense, Lembaga Biologi Nasional, Bogor:

Based upon our herbarium collections in Bogor, there are 10 species which are found in the Indonesian nature reserves (see Table 9). A location map of the reserves in Indonesia in which these species can be found, is provided in Fig. 4.

Six other species found outside the nature reserves are: M. decandra (Sumatra, Kalimantan), M. inocarpoides (Irian Jaya), M. lagenifera (Sumatra), M. macrocarpa (Sumatra, Java, Kalimantan), M. parvifolia (Sumatra) and M. timorensis (Nusa Tenggara Timor).

Table 9. The occurrence of Mangifera species in reserves in Indonesia

Mangifera species	Location
M. altissima	Gunung Takoko Nature Reserve, North Celebes; Manusela National Park, Ceram, Central Moluccas
M. caesia	Dungus Iwul Nature Reserve, West Java; Kersik Luwai Nature Reserve and Kutai National Park, East Kalimantan
M. foetida	Manusela National Park, Ceram, Central Moluccas
M. gedebe	Rawa Danau, Nature Reserve, West Java; Kersik Luwai Nature Reserve and Kutai National Park, East Kalimantan
M. havilandii	Kersik Luwai Nature Reserve and Kutai National Park, East Kalimantan

Table 9. The occurrence of Mangifera species in reserves in Indonesia (Continued)

Mangifera species	Location
M. longipes	Peucang Island, Ujung Kulon Nature Reserve, West Java; Pangandaran Nature Reserve, West Java Saobi Island; Nature Reserve, East Java
M. minor	Bawean Island Nature Reserve, East Java; Napobalano Nature Reserve, Buton Island, Southeast Celebes; Rumphius Nature Reserve, Ambon Island
M. pajang	Kersik Kuwai Nature Reserve and Kutai National Park, East Kalimantan
M. quadrifida	Gunung Leuser National Park, Aceh
M. similis	Kersik Luwai Nature Reserve and Kutai National Park, East Kalimantan

(b) Malaysia

Response from Dr. F.S.P. Ng, Assistant Director, Forest Research Institute, Kepong:

Based on the latest revision of the Tree Flora of Malaya, Vol. 4 (in manuscript) by K.M. Kochummen, 15 Mangifera species are described as occurring in Malaysia (see Table 10).

Table 10. Distribution and status of Mangifera species in Malaysia

Mangifera species	Distribution and status
M. caesia	Most parts of Malay Peninsula; wild and cultivated
M. foetida	Most parts of Malay Peninsula, Borneo; wild and cultivated
M. gracilipes	Most parts of Malay Peninsula; endemic to Malay Peninsula; wild
M. griffithii	Most parts of Malay Peninsula, Borneo; wild and cultivated
M. indica	Most parts of Malay Peninsula, Borneo, wild and cultivated
M. lagenifera	Most parts of Malay Peninsula; wild and cultivated
M. macrocarpa	Most parts of Malay Peninsula; wild
M. magnifica	Most parts of Malay Peninsula; endemic to Malay Peninsula; wild
M. odorata	Most parts of Malay Peninsula, Borneo; cultivated; origin unknown
M. pentandra	Most parts of Malay Peninsula, Borneo; cultivated
M. quadrifida	Most parts of Malay Peninsula, Borneo; wild and cultivated
M. superba	Most parts of Malay Peninsula; endemic to Malay Peninsula; wild and cultivated
M. whitmorei	Upper Perak in Malay Peninsula; endemic and rare; wild
Mangifera sp. A	Most parts Malay Peninsula; endemic to Malay Peninsula; wild
Mangifera sp. B	Mountains in Malay Peninsula; endemic to Malay Peninsula; wild

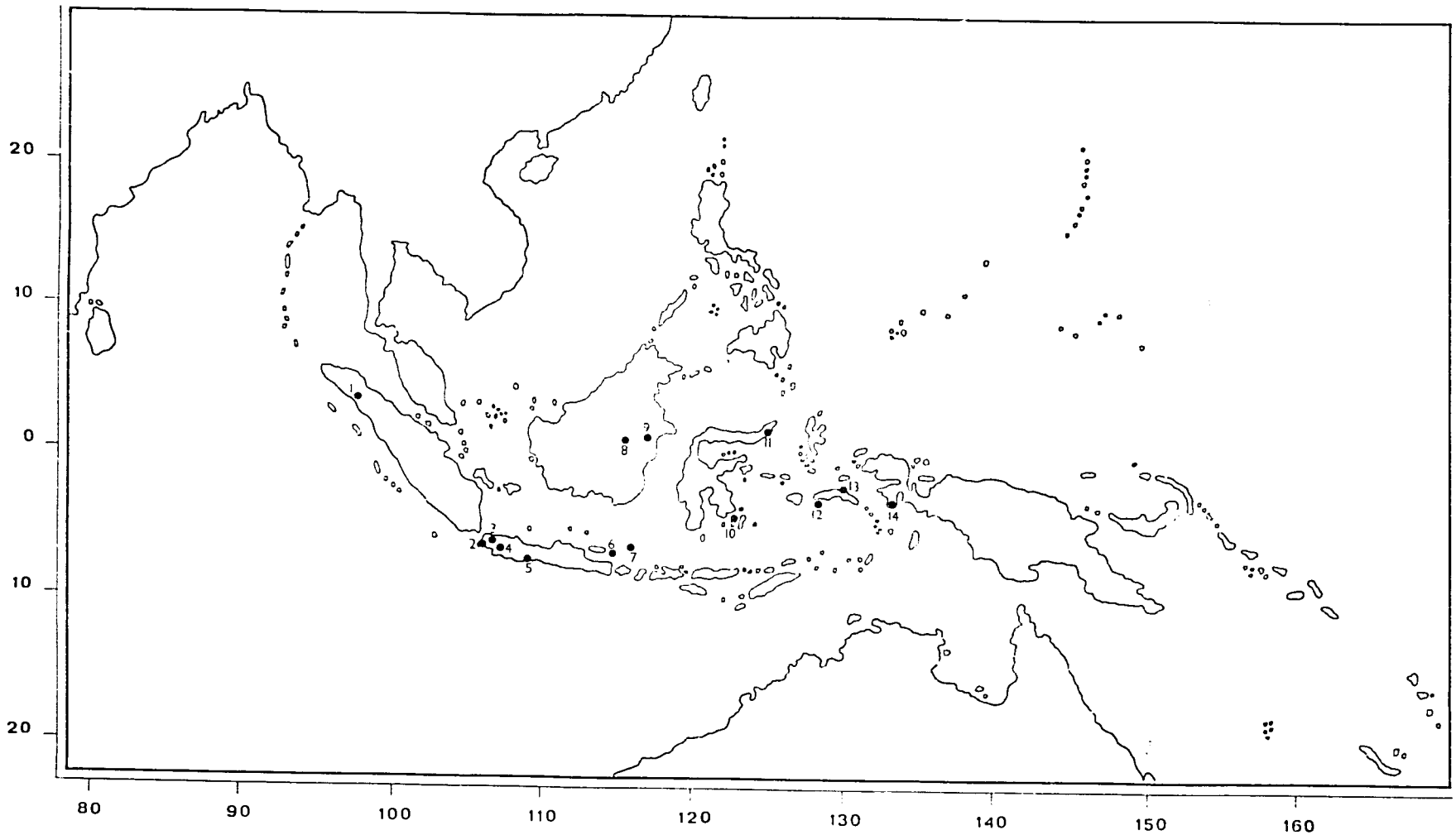

Fig. 4. Location of reserve areas in Indonesia with occurrence of Mangifera species

Legend:
1. Gunung Leuser National Park (Aceh): M. quadrifida
2. Peucang Isl., Ujung Kulon Nature Reserve (West Java): M. longipes
3. Rawa Danau Nature Reserve (West Java, Serang): M. gedebe
4. Dungus Iwul Nature Reserve (West Java): M. caesia
5. Pangandaran Nature Reserve (West Java): M. longipes
6. Bawean Isl. Nature Reserve (East Java): M. minor
7. Saobi Isl. Nature Reserve (East Java): M. longipes
8/9. Padang Luwai & Kutai Nature Reserves (East Kalimantan): M caesia, M. gedebe, M. havilandii, M. pajang, M. similis
10. Napobalano Nature Reserve (Buton Isl.): M. minor
11. G. Tangkoko Nature Reserve (Sulawesi): M. altissima
12. Rumphius Nature Reserve (Ambon Isl.): M. minor
13. Manusela National Parks (Ceram, Wahai, Pasahari): M. altissima, M. foetida
14. Kumawa Nature Reserve (Irian Jaya): M. altissima

The distribution notes are based on herbarium records, which go back about 100 years. It is impossible with present resources to carry out an inventory to determine if the species still exist where they were said to exist. We also do not have comprehensive inventories of what is in national parks and other reserves.

Response from Dr. K.M. Kochummen, Forest Biology Section, Forest Research Institute, Kepong:

We have a number of virgin jungle reserves and other nature reserves in Malaysia, but the presence of Mangifera species in these reserves has not been recorded. However, the Forest Research Institute has a research station at Pasoh Forest Reserve, Negeri, Sembilan, and in a sample plot of 10 ha the following Mangifera species are present: M. caesia (9 trees), M. foetida (4 trees), M. gracilipes (1 tree), M. griffithii (7 trees), M. indica (6 trees), M. quadrifida (15 trees) and M. superba (1 tree). The sample plots are in lowland forest at about 100 m altitude.

(c) Papua New Guinea

Response from Dr. G. Leach, Biology Department, University of Papua New Guinea (UPNG), Port Moresby:

Our UPNG herbarium records show no positive records of Mangifera spp. for the national parks or reserves that I know of. However, it would be almost certain that M. minor is in the Varirata National Park. M. inocarpoides and M. minor are also likely to be in the Tonda Wildlife Reserve. In addition to these 2 species, I believe we have only M. altissima and M. indica in Papua New Guinea.

(d) Philippines

Response from Dr. R.C. Acuña, Chief, Division Agricultural Meteorology, Philippine Atmospheric, Geophysical and Astronomical Services Administration, Quezon City:

M. monandra (vernacular name: malapaho) can be found in the Biosphere Reserve in Puerta Galera town, Mindoro province.

(e) Singapore

Response from Mrs. S.Y. Ng for Commissioner, Parks and Recreation Department, Botanic Gardens, Singapore:

The Mangifera species to be found in Singapore are listed (in Table 11), together with their location.

Table 11. Location of Mangifera species in Singapore

Mangifera species	Location
M. foetida	Bukit Timah Nature Reserve
M. griffithii	Bukit Timah Nature Reserve
M. indica	Bukit Timah Nature Reserve; Botanic Gardens, Singapore
M. macrocarpa	Bukit Timah Nature Reserve
M. odorata	MacRitchie Catchment Area
M. quadrifida	MacRitchie Catchment Area

(f) Sri Lanka

Response from Dr. B.A. Abeywickrema, Department of Botany, University of Colombo, Colombo:

We have in Sri Lanka 1 indigenous species of Mangifera, i.e. M. zeylanica. This species is present in: (i) Sinharaja Forest Biosphere Reserve, (ii) Hurulu Biosphere Reserve, as well as in several other smaller reserves maintained by the Forest Department. M. indica is found in Sri Lanka only under cultivation.

(g) Thailand

Response from Dr. T. Smitinand, The Forest Herbarium, Royal Forest Department, Bangkok:

A detailed listing is provided of those wild Mangifera species which occur in biosphere reserves and other protected areas in Thailand and this is reproduced in Table 12.

Table 12. The occurrence of Mangifera species in reserves in Thailand

Mangifera species	Location	Vegetation
M. caesia	Phatthalung, Khao Pu Ta National Park	Tropical rain forest
	Trang, Khao Chong Wildlife Sanctuary	Tropical rain forest
	Nakhon Si Thammarat, Yong Falls National Park; Khao Luang National Park	Tropical rain forest
	Ranong, Khlong Nakha Wild life Sanctuary	Tropical rain forest
M. caloneura	Nakhon Ratchasima; Sakae Rat Biosphere Reserve; Khao Yai National Park	Semi-evergreen forest
	Prachuap Khiri Khan; Huai Yang Nature Reserve	Semi-evergreen forest
	Ratchaburi, Tham Chom Phon Arboretum	Semi-evergreen forest
M. camptosperma	Saraburi, Sam Lan National Park	Semi-evergreen forest
	Rayong, Ban Phe Arboretum	Semi-evergreen forest
M. cochinchinensis	Trang, Khao Chong Wildlife Sanctuary	Tropical rain forest
M. duperreana	Chiang Mai, Doi Inthanon National Park	Semi-evergreen forest
	Chanthaburi, Khao Sabap National Park	Semi-evergreen forest
M. flava	Surat Thani, Khao Sok National Park	Tropical rain forest
	Yale, Than To Arboretum	Tropical rain forest
M. foetida	Ranong, Khlong Nakha Wildlife Sanctuary	Tropical rain forest
	Phangnga, Khao Phanom Bencha National Park	Tropical rain forest
M. gracilipes	Trang, Khao Chong Wildlife Sanctuary	Tropical rain forest
M. lagenifera	Satun, Thale Ban National Park	Tropical rain forest
M. pentandra	Nakhon Nayok, Khao Yai National Park	Semi-evergreen forest
M. quadrifida	Satun, Thale Ban National Park	Tropical rain forest
M. sylvatica	Loei, Phu Kradueng National Park	Semi-evergreen forest

Further information is required especially from Burma, Indochina, and the Philippines. 1/ It appears from the present communications that 27 Mangifera species occur in nature reserves. This information requires on-site verification by field surveys. Estimates determining the range of genetic variability within each species should also be made.

1/ Details on Mangifera species in the Philippines are provided by Bondad (1982); but his paper does not contain information on in situ conservation of these species.

At the instigation of the IBPGR the WWF/IUCN has initiated a full surveying project of Mangifera species in Kalimantan, Indonesia with modest financial assistance from the IBPGR. The project will be extended to include Sabah and Sarawak, and is likely to comprehend Peninsular Malaysia and Thailand. A comparison of the locations of occurrence of the species during these surveys with those noted from herbaria collections will enable effective planning for in situ conservation.

5.2 Ex situ conservation

Ex situ conservation by collection of variability from the wild provides materials for use in research for crop improvement. So far the improvement of mango has depended on the use of genetic variability in 1 species, M. indica. It is timely now that other species are collected, maintained and assessed for developing resistances to diseases and pests in M. indica cultivars and for improvement in quality of M. odorata, M. foetida, M. caesia and M. pajang. It is also necessary to develop wider adaptability in the superior cultivars of M. indica, possibly through use as rootstocks of different species of Mangifera.

National genetic resources programmes in the Philippines, Thailand, Malaysia and Indonesia have already initiated some work on the collection of mango germplasm with IBPGR funding, but this has largely been restricted to cultivated M. indica.

Data held by IBPGR show that, out of 39 Mangifera species 14 are presently available as plants growing in Botanical Gardens or Fruit Research Institutes. However, the range of variability within these samples is low, since they are often represented by 1 or 2 plants only.

6. FURTHER ACTION

(a) The conservation of genetic variability will best be achieved through the protection of natural habitats of the species in the forests. It can be done by preserving the habitats as biosphere reserves, nature reserves, protected areas, national parks, etc., and these should be inspected by IUCN/WWF and Unesco.

(b) A list of Mangifera species occurring in the existing protected areas needs to be prepared by IUCN/CMC so as to verify whether the species are present in these reserves. The range of variability within the species must also be determined and the information available be recorded in the data base.

(c) If some species are outside the protected areas, and such localities are not to be brought under protection, material should be collected for ex situ conservation.

(d) The real situation will have to be ascertained by actual field survey supported by periodic inspections in the future. There are several points to be considered for survey work which are suggested here:

(i) What areas to be surveyed. From the number of species occurring in different countries, as listed in this report, it appears that Peninsular Malaysia, Sumatra, Sabah, Sarawak, Kalimantan, Thailand and Indochina are important. (Dr. O. Hammann, Plants Officer, IUCN, has organized a field survey in Kalimantan, Borneo with funding from the IBPGR which will be completed in December 1985. Subsequently IUCN intends to undertake surveys in Sabah and Sarawak). When considering the concentration of species in different countries, surveys in Peninsular Malaysia and Sumatra should be given priority over Sabah and Sarawak.

(ii) During surveys, materials (as seeds and budsticks) should also be collected for ex situ conservation.

(e) A concerted sampling strategy should be devised for ex situ samples to meet urgent needs for use in research for improvement of the crop through breeding or as rootstocks. So far, only the genetic variability in M. indica has been utilized. Sources of resistance to mango malformation, anthracnose, powdery mildew, gall midge are urgently needed. The collection of the material can be made in 2 ways: (1) through collection of shoots, which have to be transported in polythene bags and grafted in the nursery (preferably within 7 days), on M. indica seedling rootstocks, or (2) through seeds from which seedlings can be raised in the nursery. The method of grafting used may be veneer grafting, cleft grafting or side grafting depending on the experience of the local horticulturists. There are 3 factors which need clarification through discussion with the scientists involved :

(i) How long scion shoots can be kept in transit before grafting;
(ii) What is the success in grafting M. indica (mango) rootstocks with other species of Mangifera; and
(iii) What is the graft compatibility between different species.

It should also be noted that mango seeds lose viability within 7-10 days if removed from the fruits. A number of local nurseries should be established ideally with the help of local forest or horticulture departments.

(f) Very close cooperation of the local forest departments will be necessary to ensure location of the plants in the forests and their collection. As most of the species have 30-40 m tall trees, collection of the shoots or seeds may require felling of trees. Hence there must be agreement with the authorities of different countries, before collection is started. The trees should be numbered and mapped during collection, so that one can go back to the plant, if required. Voucher specimens of each collection (preferably with flowers) should be preserved in a herbarium for correct identification.

7. REFERENCES

Arasu, N.T. 1975. Conservation and utilization of genetic resources in agricultural research in Malaysia. In, J.T. Williams, C.H. Lamoureux and N. Wulijarni-Soetjipto (eds.) South East Asian Plant Genetic Resources: 241-246, Bogor.

Bondad, N.D. 1982. Mango and its relatives in the Philippines. Phil. Geographical J., 26: 88-100.

Coronel, R.E. 1982. Fruit collections in the Philippines. IBPGR Southeast Asian Newsletter, 6 (2): 6-10.

Ding Hou, 1978. Anacardiaceae 4. Mangifera. In, Flora Malesiana, 8: 423-440.

Frankel, O.H. 1975. Genetic conservation - why and how. In, J.T. Williams, C.H. Lamoureux and N. Wulijarni-Soetjipto (eds). South East Asian Plant Genetic Resources: 16-32, Bogor.

Hooker, J.D. 1876. The Flora of British India, 2: 13-20.

IBPGR, 1984. IBPGR policy statement on in situ conservation of wild crop relatives. FAO/IBPGR Pl. Genet. Resources Newsl., 59: 25-26.

IUCN, 1978. The IUCN Plant Red Data Book. (Compiled by G. Lucas and H. Synge for the Threatened Plants Committee of the Survival Service Commission of IUCN). IUCN, Switzerland.

Kochummen, K.M. 1983. Notes on the Systematy of Malayan phanerograms. Anacardiaceae. Gard. Bull. Singapore, 36: 187-196.

Ling, J.Y. 1983. Mangifera hiemalis J.Y. Ling sp. nov. Guihaia, 3(3): 200-202.

Lum L.C. 1975. Fruits in Peninsular Malaysia. In, J.T. Williams, C.H. Lamoureux and N. Wulijarni-Soetjipto (eds). South East Asian Plant Genetic Resources: 47-52, Bogor.

Mukherjee, S.K. 1950. Cytological investigation of the mango and the allied Indian species. Proc. Nat. Inst. Sci., India, 16: 287-303.

Mukherjee, S.K. 1951. The origin of mango. Indian J. Genet. Pl. Breed., 11: 49-56.

Mukherjee, S.K. 1953. Origin, distribution and phylogenetic affinity of the species of Mangifera L. J. Linn. Soc., 55: 65-83.

Mukherjee, S.K. 1953a. The mango - its botany, cultivation, uses and future improvement. Econ. Bot., 7: 130-162.

Mukherji, S.K. 1949. A monograph on the genus Mangifera L. Lloydia, 12: 73-136.

Sastrapradja, S. 1975. Tropical fruit germplasm in South East Asia. In, J.T. Williams, C.H. Lamoureux and N. Wulijarni-Soetjipto (eds). South East Asian Plant Genetic Resources: 33-46, Bogor.

Tardieu, 1962. Flore du Cambodge, du Laos et du Vietnam, No. 2. Anacardiaceae: 83-99 Mus. Nat. Hist. Naturelle, Paris.

Udvardy, M.D.F. 1975. A Classification of the Biogeographical Provinces of the World. IUCN, Switzerland.

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APPENDIX I

Label data from collections of Mangifera species maintained in various herbaria

The specimens in the following herbaria: Rijksherbarium, Leiden, Netherlands; Herbarium of Royal Botanic Gardens, Kew, UK; Herbarium, British Museum, UK; Herbarium Museum of Paris, France; and Herbarium, Jardin Botanique, Geneva, Switzerland, are listed below. The collections at Leiden (L) have been fully listed, after which the additional collections at Kew (K), British Museum (BM), Paris (P) and Geneva (G) have been provided. Type specimens are prefixed by T.

1. Mangifera altissima Blanco; Mukherji, Lloydia (1949) 12 p. 106; Ding Hou, Flora Malesiana (1978) 8 p. 430. Syns.: M. rumphii Pierre; Mukherji, Lloydia (1949) 12 p. 107; M. merrilli Mukherji; Mukherji, Lloydia (1949) 12 p. 107. Ding Hou included M. merrilli and M. rumphii in M. altissima

Collections at Leiden

T 1. M. mucronulata Bl. Type, New Guinea, Zippelius specimen
2. M. altissima, Banda (only leaves)
3. M. altissima No. bb 25944, 31.8.1939; Molucca, east Ceram, Kiandarat (40 m) (only leaves)
4. M. altissima, No. bb 28897, 17.8.1939; Molucca, Soela Island (Sanana), Kabauw (only leaves)
5. M. altissima, Boschproefel No. II/453, 12.12.1930, Celebes, Malili, Kawala (flowering)
6. M. altissima, Boschproefel No. II/455, 13.12.1930, Celebes, Malili, Thawatta (flowering)
* 7. M. altissima, H.C. Conklin 19333; Philippines, Mindoro, Mt. Yagaw (SE), S.E. Mitiyagan (330 m); 28.12.1953, flower white; fruit small mango like
* 8. M. altissima, Sandbateo No. 897,363 - 612, Dec. 8 (flowering)
9. M. altissima, H.C. Conklin 18954, 30.9.1953; Philippines, Mindoro, Mt. Yagaw (South slope), 400 m common name Pahu
10. M. altissima, C.B. Robinson 6186, 11-14.8.1908, Philippines, Limay, Bataan Prov., Luzon
11. New Guinea, Kosterm. 2700 (fl.)
* 12. New Guinea, Kosterm. 2718 (fl.), 9.10.1948 Sub. dist. Manokwari, Vogelkop, between Ransiki and Warnapi, coastal plain forest
13. New Guinea, Teporrah, Rijklof to Goensbaai Primary forest; G.g. Stefels BW 5109, 11.11.1956 (only leaves); local name "Wa Wa" (Karas-taal) (Mangifera mucronulata)
14. West New Guinea, 65 km west of Manokwari, Primary forest (5-20 m); Kosterm. BW 4464, 27.11.1957; "Scarce", local name "Waromet" (Amberbaken language), flowering
* 15 West NW New Guinea, Kebar Valley, Anisandan, Primary forest on sandy clay (470 m); FAW Schram BW 7848, 30.10.1958 (fl.), "Rather common", local name Binap (Kebar language). M. mucronulata Contact Forestry Divn., Manokwari, Neth. New Guinea for collection
16. New Guinea, Adi Island, Fak Fak Divn. Primary forest; C. Th. Wanggin BW 10149, 24.3.1961. Rather scarce. Local name Karmesan (Biak language). M. mucronulata
17. N. West New Guinea, Wariki, 50 km west of Manokwari, Primary forest, Kosterm. 6984, 7.8.1958 (leaves), scarce, Vern. Wommie (Manikiong language). M. mucronulata
18. North New Guinea, Manokwari, Sidai, F. Schram BW 1742, 10.3.1955, Vern. Mewjejetnik (Sidai). M. mucronulata

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* - Alternative areas for collection

** - Localities in which specimens are easy to collect

APPENDIX I
(Continued)

19. New Guinea, Sepik dist, Wewak-Angoram area, 4 miles N. of Timbunka mission, rain forest on level terrain, R. Pullen 1691, 9.9.1983 (leaves). About 100 ft. tall tree. "Fruit purplish white, ripe, edible"

* 20. Neth. New Guinea, Woseggi-Macoean, 30 km west of Manokware, Marshy primary forest. Rather common, Kosterm. BW 10876, 1.2.1961. Vern. Wommie (Manikiong lang.). M. mucronulata

* 21. Neth. New Guinea, Masni-plain, 25 km west of Manokwari, primary forest. Common; Kosterm. BW 11017, 20.2.1961. Vern. Oewommie (Mani-kiong lang). M. mucronulata

* 22. Neth. N. Guinea, West N.G. Divn., primary forest. Rather common on level clay soil. Kosterm. BW 7183. Vern. Binap (Kebar lang.) M. mucronulata

23. Papua, Dove village near Musa River, North dist., primary rain forest. Gillison NGF 22321, 16.8.1965. Fruits small, immature. Infl. fasciculated. M. mucronulata

24. Papua, North Dist., Wanigela, coastal regrowth, Gillison NGF 22272, 6.8.1965. Flowering and fruiting. M. mucronulata

** 25. M. altissima, cultivated in Hort. Bogor. Loc. Sub. VII.E. 22a, Kosterm. 19001, Sept. 1961 (fl.). Contact Bogor Bot. Garden for collection (L) & (K)

Collections at Kew

26. Philippines, Manila prov., Luzon, Vidal 1223, Nov. 1984

27. Philippines, Manila prov., Tangeo, A. Loher 424, 1.2.1891 (fl.)

28. Phillipines, Bataan prov., Luzon, Mt. Mariveles, Lamao River, T.E. Borden 642,830, 643 (fr.), April 1904 (K) & (P)

29. Philippines, Bataan, Mt. Mariveles, Lamao River, H.N. Whiteford 355 (fr.), April 1904 (K) & (P)

30. Philippines, Bataan, Luzon, Mt. Mariveles, Lamao River (350 ft.), R.S. Williams 591, 19.2.1904 (fl. & small fruits)

31. Philippines, Bataan, Luzon, Lamao River, P.T. Barnes 356, March 1904 (fl.)

32. Philippines, Rizal prov., Luzon, Ahern's collector 2442, Jan.-March 1905 (fl.)

33. Philippines, Rizal, Monlalban, A. Loher 5864, Feb. 1906 (fl.)

34. Philippines, Luzon east, Vidal 1075, 1076

35. Philippines, Sibuyan Isl., P. Cortes 22594, March 1912 (fl.)

36. Philippines, Sibuyan Isl., Capiz prov., Magallanes (Mt. Giting-Giting), Elmer 12334, April 1910 (fl.)

37. New Guinea, Morobe dist., Natter Bay Logging area, Croft & Lelean 68562, 1.8.1976 (fl.), rain forest

Collections at Paris (P)

38. Philippines, Luzon, Nueva Ecija Prov., R.J. Alvarez 22363, Feb. 1911 (leaf)

39. Philippines, Luzon, Zambales, Maneja & Bawan 27169, May 1918 (fl.)

2. Mangifera andamanica King

Collections at Kew

T 1. India, South Andamans, Holedaypur, Hill jungles, Dr. King, 25.11.1891 (fr.), fruits 1-1 1/2" Type

T 2. India, Andamans, Dr. King's Collector, 1884 (Type), fl. (K) & (G)

3. Mangifera caesia Jack.; Mukherji, Lloydia (1949) 12 p. 126. Syn. (By Ding Hou, Flora Malesiana (1978) 8 p. 438): 1. M. kemanga Bl.; Mukherji, Lloydia, (1949) 12 p. 124; 2. M. verticillata C.B. Robinson

Collections at Leiden

1. Sumatra North; Lorzing 17553, 12.7.1938 (fl.). Vern. (Malayan) Bindjai

APPENDIX I
(Continued)

2. Malaya, Palembang, Lematang Ilir, Semangoes, Van Steenis, bb 32192, 1.7.1939 (leaves only - big leaves)
3. Malacca, Perak, Scortechini 189 (fl.) (L), (K), & (BM)
* 4. Malaya, Selangor, South Pahang, 6 miles south of Kg. Aur. felled forest, low undulation country, T.C. Whitmore. FRI 15893, 18.2.1971 tree 120 ft. high. Fruits green, small. For collection contact Forest Research Inst. Kepong, Selangor
** 5. Malaya, Trengganu; Sinclair & Salleh 39945, 13.7.1953 (flowering). Trengganu - Besut Road, Belara F.R. Contact Singapore Bot. Garden for collection (L), (K) & (BM)
6. Solomon Isl. Flora No. 7492 (only leaves)
7. Java, Bantam, G. Karang Poetasari (100 m), Kooders 4253, 5.5.1892 (leaves only)
8. Java, Pasir Honge, Batavia, Bakhuizen and Brink 6282, 10.2.1929
T 9. Java - M. kemanga Type specimen (flowering specimen looks same as M.caesia) - Herb. Lugd.
(1) Bat. No. 897363 - 392
(2) " " " 391
(3) " " " 390
(4) " " " 387
(5) " " " 386
(6) " " " 389
10. Sumatra, Palembang, Lematang stir (75 m); (a) Boschproefstation No. I545, 6.10.1924 (FR) (b) 17.11.1917
11. Java, Batavia, Baringkok; Bakhuizen and Brink 6300, 18.2.1924, with fruit (3 cm)
* 12. Java, Batavia, Buitenzorg; C.A. Backer 32282; 1906 (250 m) fl. Contact Hort. Bog. for collection
13. Java, Buitenzorg, Tjipakoe; Ochse 17.11.1924 (fl.)
14. Java, Buitenzorg, Babakan, Kampong baroe; Loegandi-redja No. 29, 26.2.1900 (fl.)
15. Sabah, Ranau dist, opp. Kg. Sagindan, Puginatan, on ridge primary forest, San 74382; tree 110 ft. (fl.)
** 16. Sarawak, Kuching, compound of Radio Sarawak; Smythies 13299, 14.8.1963 (fl.). Vern. Binjai pulut. "There is another variety in Kuching, Binjai nasi with different coloured fruit". Collection easy
17. Brunei, Kedayen garden on low lying yellow sandy loam; Hasan Pukol 5724, 7.5.1959 (fl.), Forest Dept., Herbarium. Vern. Beluno (Kedayan)
18. East Borneo, Mahakam, Estuary of Tiram river, Sandy ridge, Schut 19, 10.12.1954 (fl.)
19. Brunei, primary mixed peat swamp forest at Labi where the swamp merges with the river, on a bank. "Fruit white fleshed red sapped, tough bitter but eaten by bans". Brun 377, 9.4.1957 (L) & (K)
* 20. Brunei, along road, Kosterm. May 63, Vern. Bindjei (collect)
21. East Borneo, Karangan reserve, North of Sangkulirang; A. Kosterm. 23.8.1957, (fl. & fruit). Vern. Wanji. "Pulp white, sweet, fragrant, almost fibreless", cultivated and wild
22. North Borneo, Sandakan, Kabili Sepilok F.R., edge of river; North Borneo For. Dept. No. 4878, 8.6.1935 (fl.). Vern. Beluno (Malay) (L) & (P)
* 23. N. Boreno, Sandakan, Tuaran dist., Tamparuli at mile 20; SAN 28525 18.5.1962 (fl.). "Cultivation near rubber garden", clay loam. Tree 150 ft.
24. N. Borneo, Sandakan, Lahad distr., Silabukan F.R., Block 61/5 (apx), 5 1/2 miles from Bakapit Log Dup. in Virgin high forest. SAN 34438, 19.4.1962 (with large fruits). Vern. Beluno
* 25. N. Borneo Sandakan, Ranau dist, near Market, planted tree (1500 ft.), W. Meijer 13.7.1963 (fl.), Vern. Beluno
* 26. Brunei, along road, cultivated; Kosterm. 1963. Tree 40 m (L) & (BM)
** 27. Herb. Bogor, Kosterm. M. caesia var. kemanga, culta. in Hort. Bogor "sub. VII E15a e Biliton" (fl.) (L) & (G)

APPENDIX I
(Continued)

* 28. Sabah, Tuaran Agric. Station, north of Jesselton, "cult. in the village", Ding Hou 313, 13.6.1966 (fl.)
29. Bali, Negara; Sarip 199, 2.9.1918 (fl.)
30. Philippines, Mindanao, Bukidnon, Wester, Sept 1918 (fl.), M. caesia (M. verticillata Rob.) (L) (K), & (P)
31. Philippines, Kahibaan, Santo 4150, 8.5.1983 (fl.); Vern. Baluno
T 32. Philippines, Mindanao, Agusan, Cabadbaran, Elmer 13.2.1958, July 1912 (fl.). Type for M. verticillata (L), (BM), (P) & (G)
33. Borneo, Brunei, cult, Koorders 4221213, 12.9.1913 (fl.)
** 34. Malaya, in the vicinity of Kuala Trengganu, cultivated in the field beside highway; Ding Hou 779, 5.9.1966. "Fruit ellipsoid oblong, light brownish, scurfy"

Collections at Kew
35. Malaya, Trengganu, Kuala Trengganu, 5.9.1966 (fr.). Tree 25 m
36. Malaya, Kedah, Gungong Jerai, F. Guard 9042 (fl.)
37. Malaya, Pulau Penang, Apr.-May 1902, No. 3744 (fl.)
38. Malaya, Singapore, Holland Road, 1892 (fl.)
39. Malaya, Malacca, Maingay No. 465, 10.5.1967 (fl.)
40. Malaya, Malacca, Griffith Cat. 1100, May 1842 (fl.), Vern. Beenjai (Malaya)
41. Malaya, Singapore, Jurong, Pulau Damar Darat, Corner 34919, 26.3.1938 (leaf), Vern. Kemang
42. Malaya, Johore, Yong Peng, Sungai Bedok, Corner SFN 34969, 8.5.1938 (fr.)
43. Philippines, Mindanao, Misamis prov., Dapitan, Obach, May 1917 (M. verticillata Rob.) (K) & (P)
44. Philippines Mindanao, Zamboanga, Foxworthy, May-June 1912, fl. (M. verticillata) (K) & (BM)

Collections at British Museum
45. Philippines, Mindanao, Misamis prov. T.N. Roque 30361, July 1926 (fl.)
46. Sumatra, Bigni Telok (500 ft.), H.O. Forbes 3198, 1881 (fl.) M. Kemanga Bl. (BM) & (G).
47. Borneo, Mt. Kinabalu, Tuaran, margin of paddy field, J. & M.S. Clemens 27743, 27.3.1932 (fl.). Edible fruits
48. Sarawak, Upper Plieran, R. Kenaban (1840 ft.), G.H. Pickles, SAR 3518, 9.10.1955 (leaf). Primary rain forest slope. Young tree 72 ft. Fruit edible. Vern. Ata; also Pickles No. 3530, 7.10.1955 Tree 117 ft. Vern. Pelam (Kayan)

Collections at Paris
49. Sabah, Elopura, Kabili - Sepilok F.R., edge of river, Enchai & Enggoh 9969, 29.6.1939 (fl.). Vern. Budoh (Dusun)
50. Philippines, Mindanao, Butuan subprov., L. Escritor 21524, Aug. 1913 (fl.) (M. verticillata)
51. Sumatra, Byni Telok (500 ft.), H.O. Forbes 3198, 1881 (fl.), very large infl. with stout branches (M. kemanga Bl.)

4. Mangifera caloneura Kurz

Collection at Leiden
1. Burma, Tavoy, Herb. Wallich Cat. No. 8487

Collections at Kew
2. Burma, Pyinmana (400 ft.), April 1913 (fl.), J.S. Gamble, Vern. Taw Thayet (small fr.)
T 3. Burma, Pegu, S. Kurz 2026, 15.8.1872, fl. (Type)
4. Burma, Pegu yomah, E. & W. slopes, S Kurz 2026 (fl.)

APPENDIX I
(Continued)

5. Thailand, Muang Prao (1300 ft.), mixed jungle, A.F.G. Kerr 2839, 23.1.1913 (fl.). Tree 50-60 ft. Vern. Mamuang (K) & (BM)
6. Thailand, N.E., Khon Kaen, Tha Phra (200 m), T. Smitinand 10358 (fr.), 20.4.1967. Tree 20 m tall, scattered in dry mixed deciduous forest. Fruits green, globose, ripened yellowish
7. Thailand, Nakhon Ratchasima, Non Tathen (200 m), T. Smitinand 10200, 22.2.1967 (fl.). Tree 25 m tall, scattered near villages. Vern. Mamuang Pa
8. Thailand, Dan Chumpon, A.F.G. Kerr 17656, 21.12.1929 (fl.). Tree 50 m in Savannah. Vern. Mamuang Kan (K) & (BM)
9. Thailand, Tahgauw, Chumpawn, Kerr 11570, 20.1.1927 (fl.). Vern. Mamuang Kan, in Savannah (K), (BM) & (P)
10. Thailand, Nong Khum, Senracha forest (80 ft.), Collins 1688, 8.11.1927 (fl.). Wild mango, none of the garden mangoes are in bud yet
11. Thailand, Bangtapan, Put 1412, 28.12.1927 (fl.). Vern. Mamuang Tun
12. Thailand, Kapir (10 m), Kerr 16844 (fr.), 25.1.1929. Tree 20 m Bamboo forest

5. Mangifera camptosperma Pierre

Collections at Leiden

1. Thailand, eastern province, Chaiyaphum dist, (16°20'N 101°45'E), evergreen forest along river on sandstone. Bensekom & Gusnok 4086, 10.12.1971 (fruiting). "Fruits green with strong turpentine smell".

T 2 Pierre - Type ? Saigon

Collections at Kew

3. Burma, South Tenasserim, Mayiunge, Tenasserim river (sea level), C.E. Parkinson 1999, 7.3.1926 (with mature fruits). Tree 80 ft. high. "Fruits 4" diam., compressed like a thick biscuit". Vern. Thayet Pya
4. Burma, Bassein dist., inside of Yomah, J.H. Lace 3016, 7.4.1906 (fr.). Vern. Sinining Thayet

T 5. Cochinchina, Pay Ninh prov., Saigon, Pierre 1683, April 1866, with large fruits. Tree 35 m very big seed and thin mesocarp, presumably non-edible Type, (K) & (P)

6. Cochinchina, Bien Hoa province, Pierre 1648, March 1877 (small fruits)

Collections at British Museum

7. Thailand, Muak Lek, Sunaburi (200 m), A.F.G. Kerr 10006, 19.4.1925 (fl.), open evergreen forest. Vern. Mak mang

Collections at Paris

8. Indochina, Saigon, Cay long, L. Pierre 161, Apr. 1866 (leaf)

T 9. Vietnam (Sud), Tay Ninh, Pierre 1683 (Type)

6. Mangifera cochinchinensis Engl.

Collections at Kew and Paris

1. Cochinchina, Thudaumot, Herb. L. Pierre. No. 1650, 1869 (leaf). Tree 20 m (K)
2. Cochinchina, Thudaumot, L. Pune 1650, Apr. - May, 1865 (fr.). Fruits 1 1/2". (K)

T 3. Cochinchina, Thorel 1287, 1862-66 (leaf). Type flowering specimen in Herb. Mus. Paris (K) & (P)

4. Vietnam, Cochinchina, Thudaumot, Saigon prov. L. Pierre 1650, Feb. 1866 (fl.). (P)

APPENDIX I
(Continued)

5. Vietnam, Cochinchina, Bienhoa prov., Thai Ngwyen, Pierre 1650, Jan. 1869 (fl.) (P)
6. Vietnam, Laos, col Paillote, Louang Prabang, Poilane 20339, 27 Aug. 1932 (fl.) (P)
7. Vietnam, Thudaumot. Pierre 1650, May 1865 (fl.). Vern. Xoay nut (P)

7. Mangifera decandra Ding Hou; Ding Hou, Flora Malesiana (1978) 8 p. 433; new species, closely related to M. lagenifera

Collections at Leiden
1. Sumatra, Palembang Res., Endel 1506, April 1920
2. Sumatra, Palembang Res., Banjoeasin, Endel 1506, 18.6.1920 (fl.)
3. Sumatra, Upper Riauw, Pakambarw, Tenajam River. Fresh water swamp, Soepadmo 50, 13.8.1960 (fruit) (L & K)
4. Borneo, Sabah, Sandakan, Kuala Belait dist, comp. 6, Andalan Forest Res., Woods, Smythies & Ashton SAN 17527, 28.4.1957 (fl.). Tree 85 ft. high
5. Borneo, Sabah, Sandakan, Kebun China, For Res. Sibuga, primary forest, tree 89 ft. Jaswir SAN 30714, 4.7.1962 (fl.) (L) & (K)
6. Brunei, Andulan For. Res., disturbed primary forest on yellow sandy soil, hillside, Ashton BUN 270, 15.7.1957 (L & K)
7. Sandakan, Tawau dist., Mile 18 1/2 Quein Hill Road, primary forest hillside. Gibot 35977, 6.6.1963 (fl.). Vern. Rengas (L) & (K)
T 8. Sandakan, Sungai Garinon, W.C.R. Labak Rd. (M. pajang), J. Sing 60874, 16.5.1967 (fl.) considered as Type by Ding Hou (L) & (K)
9. Sarawak, Segan F.R., Nanga Sapulow, Bintulu, 4th Divn., in mixed forest, Ding Hou 436, 3.7.1966 (fl.). Vern. Mawong (Iban)

Collections at Kew
10. Borneo, Bangko, near Mahakam river estuary, low ridge (20 m), Kosterm. 7101, 30.5.1952 (fr.). Tree 30 m Rather rare, Vern. Bindjai (Kutei lang.), Konjot (Benua - Dajak lang.)
11. Brunei, River Temburong at Kuala Belalong (300 ft.), 50 ft. above river. Primary forest, yellow sandy clay, Ashton BRUN 411, 2.9.1957 (leaf). Vern. Buah Assam (Iban lang.)
12. North Borneo, Ulu Trusan sapo, Beluran, dry land (sea level), Clemente 4594, 27.?.1935 (fl.). Tree 100 ft., fruit red, edible, sour. Vern. Beluno (Dusun), Binjai (Tidong)
13. Sabah, Sandakan, Lungmanis F.R., (1135 ft.). Secondary forest, black soil, lowland, J. Ahwing 29532, 31.5.1963 (fl.)

Collection at British Museum
14. Borneo, Tawao, Elphinstone prov., Elmer 21602, 1923

8. Mangifera dongnaiensis Pierre; Fl. Forest. Cochinch. (1897) pl. 364(?); Flore du Cambodge, du Laos et du Vietnam (1962) 2 pp. 96-7

Collections at Paris
T 1. Vietnam (Sud), Bien Hoa prov., Pho Qua, Pierre 1649, 4140, March 1877 (small fruit). (Type)
2. Vietnam, Giaray, Chevalier 36707, 3.3.1918 (fl.) Vern. Queo
3. Vietnam, Dalat et Djiring, Chevalier 31283, 21.2.1914 (leaf)
4. Indochina, locality unknown, Poilane 23414 (fl.); Muller 906 (fl.)

APPENDIX I
(Continued)

9. Mangifera duperreana Pierre

Collection at Leiden

1. Thailand, Ta Ngaw, Chumpawn, Savannah, AFG Kerr 11570, 30.1.1927 (fl.), named as M. caloneura (identified as M. duperreana by Ding Hou). Vern. Mamuang Kau

Collections at Kew

2. Thailand, Chantaburi, Makam (20 m), Kerr 9585, 19.12.1924 (fl.), edge of evergreen forest. Vern. Mamuang Pa (K) & (BM)
3. Thailand, Sangka, Surin (100 m), Kerr 8266, edge of evergreen forest, 12.1.1924 (fl.) (K & BM)
4. Cambodia, Harmand 2774, Jan. 1877 (fl.)
5. Indochina, Harmand 187
6. Thailand, Pak Kaung (450 m), Kerr 3158, 8.3.1914 (fl.). Vern. Mamuang Ki ya, (M. duperreana var. siamensis Craib.) (K) & (BM)

Collections at British Museum

7. Thailand, Kao Saming, Krat (20 m), Kerr 9439, 27.11.1924 (fl.), edge of evergreen forest

Collections at Paris

8. Indochina, Cambodia, Kampot prov., Montee de Bokor km 10, dense forest, J.E. Vidal 5067, 30.1.1966 (fl.). Use medicinal (decoction). Vern. Svay prei (P)

T 9. Indochina, Poilane 5693, 8.3.1923, (fl.). Annam, Ca Na prov., Phaurang. This is named as Phaurangia poilanei Pierre. This specimen is labelled as Type for M. duperreana which appears to be wrong. The Type specimens Pierre No. 2774 and 1651 are present in the Herbarium

10. Indochina, Cambodge, Danguk prov., Poilane 13879, 30.10.1927 (leaf). Vern. Sa Vai, fruit edible
11. Indochina, Vietnam, Annam, Ca Na, prov., Phaurong, Poilane 5714, 13.3.1923 (small fruit). Vern. Cay quao. Fruit edible

T 12. Indochina, Cambodge, Scany prov., Siem Reap, Harmand 981, Herb. Pierre No. 2774, Jan. 1877 (fl.). Vern. Queo. Type

T 13. Indochina, Saigon, Tayninh prov., Coll. Pierre. Herb Pierre. No. 1651, Feb. 1878 (fl.). Vern. Queo. Type

14. Indochina, Jardin Botanique de Saigon, Hiep 297, 17.1.1919 (fl.). Vern. Xoai liia (Annamite)

T 15. Indochina, Vietnam, Cochinchina, Thudaumot, Herb. Pierre No. 1651, Feb. 1878 (fl.). Type

16. Indochina, Isle of Phu Quoc, Herb. Pierre, Jan. 1877 (leaf). Vern. Queo
17. Indochina, Cambodge, Kg. Thom, Kg. Soai, Herb. Forestière de Cambodge No. 381, 2.5.1920 (fl.). Vern. Svai Prey (Cambodian)
18. Indochina, Vietnam, Annam, Djering prov., Hampi vill., E. Poilane 23885, 13.1.1935 (fl.)
19. Indochina, Saigon, A. Chevalier 36595, 5.2.1918 (fl.)
20. Indochina, Vietnam, Cochinchina, Thudaumot, reserve forest, F. Fleury 30013, 17.1.1914 (fl.). Vern. Xoai (Annam)
21. Indochina, Cambodge, Kompong Thom, Bejaud 381
22. Indochina, Vietnam, Saigon, Chevalier 36596

10. Mangifera flava Evrard; Bull. Soc. Bot. Fr. (1952) 99 p. 82; Flore du Cambodge, du Laos et du Vietnam (1962) 2 p. 88

Collections at Paris

1. Vietnam (Sud), Eberhardt 2583
2. Vietnam, Quang Nam prov., Mang Lum vill. (1500 m), Poilane 31983

APPENDIX I
(Continued)

3. Vietnam, Phanrang prov., Ba Ran, Poilane 9678
4. Vietnam, Col du Braian, Poilane 24307
5. Vietnam, Massif du Braian, Djining prov., Poilane 24055. 1.2.1935 (fl.)
6. Indochina, Cambodge, Pursat prov., vill. Roleat, Service Forestière 36931, 10.3.1918 (fr.). Tree 25 m

11. Mangifera foetida Lour.

Collections at Leiden

1. Malaya, Pahang, Boh Estate, Camerons Highlands (4000 ft.), Md. Noor 32605, 10.4.1937. Tree 100 ft.
2. Thailand, Nakhonsi Thammarat prov., Khao luang foothills (8°30'N/99°45'E). Evergreen forest along waterfalls (350-400 m). Fruits green with white pulp. Geesink & Santisuk 5458, 13.5.1973 (L) & (P)
3. Thailand, Peninsula: Phanguga, Hin Samkon; Nalampoon 40462, 4.3.1968 (fl.). Fruit edible, fruiting Feb.-May
4. Malaya (FRI Kepong, Selangor), Lower Perak compt. 15, changkat Jong F.R., low lying primary forest, FSP Ng, FRI 5653, 10.9.1967 (leaves only). Tree 100 ft.
5. Malaya, NW Pahang Sq. Bertam at Kuala Mensun, Bamboo Ridge (2000 ft.). T.C. Whitmore FRI 20084, 2.6.1971. Possibly planted. Vern. Machang Kampong. Fruits bright green
6. Malaya, 3 miles south Seremban to Sendayan, T. & P. 220, 28.2.1969 (fl.) (L) & (K)

** 7. Malaya, Jelutong Avenue, FRI Kepong, Selangor, Flat land. P. Selvaraj FR 11118, 8.5.1969 (fruiting). Fruits about 3" x 2", green

8. Malaya, Pahang, Sungai Teku, Riverside, Md. Shah 1339, 20.02.1968 (fl.). (L) & (K)
9. Malaya, C. Pahang, south of Kuala Lompat, Krau Game Reserve, Hillside (300 ft.). T.C. Whitmore FRI (Kepong) 3576, 16.4.1967. Fruits green, edible, sour. Vern. Machang
10. Malaya, Johore, lowlands approaching G. Bevar massif, 2 miles from Kg. Tepoh, low flat land, disturbed forest (500 ft.). Evarett FRI 14071, 17.3.1970, young fruits pale green, rounded (L) & (P)
11. Malaya, Pahang, Ulu Sepia, near Taman Negara, unstable ridge system NE of Jeram Perahap (1500 ft.). Whitmore FRI 15351, 18.7.1970 (fruiting) fruits ovoid, flesh yellow, ripen in August. Tree 120 ft.
12. Malaya, Perak, Kuala Kangsar, Piak FR, Hillsides, disturbed forest. Kochummen FRI 2445, 15.7.1967. Fruits green, globose. Vern. Machang
13. Malaya, Selangor, Ampang FR, catchment area Hillside. Whitmore FRI 15160, 6.6.1970. Tree 90 ft. (L) & (K)
14. N. Sumatra, Zerstrent (700-1000 m), Lesger 284, 19.9.1918 (fl.) Vern. Badjang (vulg.), Mtatjang (Karo)
15. Sumatra, Palembang; Korthals. Vern. Badjang
16. C. Sumatra, Si-Kabu Kabu at base of Mt. Sage near Pajakumbuh (700-800 m), Kampong Talang. W. Meijer 5955, 15.7.1957 (fl.). Vern. Ambatjang
17. Sumatra, Riow and Kolantan dist., Poelan Kedondong, van Steenis No. bb 24810, 29.6.1938
18. Sumatra, Tapanoeli, Sibolga and Ommelandu, Belimbing. van Steenis bb 28438, 2.8.1939
19. Sumatra, Riow and sub. div. Indragir/bovenlanden, Belimbing. van Steenis 28491, 1.7.1939

* 20. N. Sumatra, Gunung Lenser Nature Reserve, Afjek, Ketambe, valley of Ian Alas, near Tributary of Lan Ketambe, about 35 km NW of Kutatjane (200-400 m), primeval rain forest. Wilde & Wilde 14435, 2.9.1972. "Tree 40-50 m Fruits abundant, ovate globose, 8-10 cm dirty green or greenish yellow, pulp pale yellow"

APPENDIX I
(Continued)

21. Sumatra, East Coast, Silo Maradja, Asahan; Barlett 8734, June 1927 (fl.) (L), (K) & (G)
22. Java, Djapara, Ngarengan; Koorders 32961B, 22.5.1899 (leaves only), flowering in May
23. Java, Tjilatjap, Noesakambangan; Koorders 409B, 6.12.1891 (leaves only)
** 24. Java, Boerlage coll., Plant cultivated in Buitenzorg Bot. Garden
25. Java, Camp Baroe, Kedong halong. Boerlage 36, 27.10.1888 (fl.)
26. N. Borneo, Sandakan, Kabili For. Res. level land. N. Borneo For. Dept. No. 4872, 12.6.1935 Tree 120 ft. Fruit olive green, edible
* 27. N. Borneo, Kabili - Sepilok For. Res. Compt. 15, Hilly area (25 ft.) N. Borneo For. Dept. No. 4603, 24.11.1937 (fl.). Fruit edible
28. N. Borneo, Sandakan, Sipitang dist., Ulu Mendalong, 6 miles SE of Malamau (2000 ft.). Wood SAN 16779, 29.9.1955. Fruits 3" long
29. N. Borneo, Sabah, Sandakan, Kaningan dist., Mile 16 Keningan Nabawan Rd. Sundaling SAN 83778 at 16.7.1976 (fruits mature in August). Primary forest, hill ridge. Fruits yellow green
30. Middle Java, Japara, Soemanding (600 m), van Steenis Ja. 3823 (leaves)
31. Java, Batavia, Ragoenau near Pasar Minggoe. Cult. Ochse, 24.11.1926 (fl.). Vern. Batjang
** 32. Sarawak, Kuching, corner of Chinese cemetery near Badrudin Rd/Rock Rd junction. B.E. Smythies 13296, 12.8.1963 (fl. & small br ght lemon yellow fruits). Vern. Bachang. Contact Herb. For. Dept. Sarawak for collection (L) & (K)
33. Sabah, Sandakan For. Dist., Kretam (comp. H), Virgin forest, Top of hill (75 ft.). Tree 120 ft. (leaves only). Kadir S.H. A.1699, 9.9.1953 (Herb. For Dept., Sandakan). Vern. Asam (Malaya) (L) & (K)
34. Sarawak, R. Kenabau, Upper Plieran, Primary rain forest slope (1840 ft.), G.H. Pickles 3530, 7.10.1955 (Oxford Univ. Expedition to Borneo). Vern. Pudau (Malaya), Pelam (Kayan). (leaves only)
35. Central East Borneo, W. Koetai no. 13/14 near Marak, young secondary forest, very common. F.H. Endert 2356, 3.8.1925 (fl.)
36. Sabah, Sandakan, Ranau dist., inside K. Sabah National Park, Luhan, Primary forest on hillside, soil brown. J.K. Lajangah 44741, 18.11.1965 (big fruit). Herb. For. Dept. Sandakan (L) & (K)
37. Borneo, Mt. Kinabalu, Dallas (3000 ft). J. & M.S. clemens 27609/27572, 15.12.1931 (fruiting) (L) & (BM)
38. Sabah, Sandakan, Labuk/Ranau dist., mile 30 Telupid Rd., Roadside old cultivation, on way to Mt. Kinabalu. Cockburn SAN 73007, 22.4.1971 (fl.)
39. East Borneo, Balikpapan dist., Mentawir R. region near village Mentawir, low sandy ridge. A. Kosterm. 10.061, 24.2.1955 (fl. & fruiting). Vern. Tempajang (Mangga batjan) (L) & (BM)
40. Sabah, Sandakan, Lahad Datu dist., Silam, Primary forest hillside (300 ft.). M. Ambullah 36089, 21.9.1963 (big fruit), Herb. For. Dept. Sandakan (K) & (L)
41. Sabah, Sandakan, Ranau dist., Kilimu to Paginatan Road, Primary forest on hillside (1500 ft.). Francis Sadau 49209, 5.8.1965 (fl.) (L) & (K)
42. Sarawak, Kuching, Kampong Surabaya, village tree. P.S. Ashton S. 17274, Feb. 1963 (with 4" long fruit). "Fruit green with yellowish green flesh, sour or sweet". Vern. Machang (Sarawak)
** 43. W.Java, Bogor, cultivated in Hortus Bogorensis (260 m). J.A. Schuurman 139, 24.4.1957 (fl.) (L) & (K)
* 44. Singapore, planted by village house loc. Bajau, J. Sinclair 8912, 17.2.1957 (fl.)
** 45. Sabah, Sandakan, cult in Y.S. Long's garden. Ding Hou 146, 27.4.1966 (fl.)
46. M. foetida, cultivated along road at Brunei, Kosterm. (Herb. Bogor)
47. Molucca, Amboina, Waai, van Steenis 25986, 27.9.1938
48. Celebes, Malili, Thawata (350 m). Boschproefel No. Cel/V-65, 27.9.1932. Vern. Mangga hoetan

APPENDIX I
(Continued)

* 49. Sarawak, near the suspension bridge, Kuching 1st Divn., cultivated, tree 12 m Ding Hou 315, 17.6.1966 (fl.)

50. S. Sumatra, Lampung, Metro, Kota Gadjah dist., Purworedgo village. Cultivated. Tirtoredgo 6, (fl.), 9.8.1961 "Fruit dark green when ripe, sweet somewhat acid". Vern. Pakel

51. Thailand, Ta Ron Chang Surat, cultivated. A.F.G. Kerr 12306, 13.3.1927 (fl.). Vern. Ma Mut (L) & (P)

Collections at Kew

52. Malaya, Perak, Thaipeng, L. Wray 812 (fl.), Vern. Machang

53. Malaya, Perak, Kuala Kangsar, SFO Perak 65572, 12.1.1950 (fl.)

54. Malaya, Singapore, Penang, Walker 244 (fl.)

** 55. Malaya, Singapore Bot. Garden, Marzuki 31699, 17.8.1936 (fl.), Vern. Bachang

56. Malaya, Bentong, J.W.S. 93104, 18.1.1959 (leaf). Tree 80 ft., primary forest ridge (1750 ft.)

57. Malaya, Malacca, Maingay No. 466, 21.1.1866 (fl.)

58. Thailand, Pato, Langsuun (100 m), Kerr 12152, 27.3.1927 (small fr.), cultivated, Vern. Sommut (K) & (BM)

59. Thailand, Ta Rong Chang, Sanut, Kerr 12306, 13.1.1927 (fl.), Vern. Mamut, cultivated

T 60. Java, Type M. horsfieldii Miq.

61. Java, Koorders 388B

62. N. Borneo, Sandakan, Kretam Comp. 4, Virgin forest (75 ft.), Vern. Asam (Malaya)

63. N. Borneo, (Sabah), Beaufort dist., Lumat (50 ft.), A. Cuadra. A1313, 24,3.1948

64. N. Borneo, (Sabah), Kuala, Papar F.D., West Coast Interior dist., flat land (25 ft.), A. cuadra A. 1417, 27.4.1948 (fl.). Vern. Talang Tang (Malaya)

65. C.E. Borneo, W. Koetai, Near Marak, Secondary forest, very common, Endert 2356, 3.8.1925

66. New Guinea, Manokwari, Ransiki, Primary forest, flat stony soil (10 m), Soehanda/Ilham No. 42, 20.7.1948 (leaf). Tree 28 m. Vern. Boeeja

Collections at British Museum

67. Malaya, Penang, 1922, Herb. Wallich 8488B

68. Malaya, Singapore, Pulan Tekong, Ridley 1810, 1890 (fl.). Vern. Bachang

69. Malaya, Bukit Labaker, R. Derry 129, 1890, Vern. Bachang (fl.)

70. Malaya, Singapore, Jurong, Ridley 4776, 1893 (fl.)

71. E. Borneo, W. Kutei, Tandjung Plateau, Padang Luwai, Kosterm. 12540, 25.7.1956 (fl.). Vern. Asam Mus. Culta

Collections at Paris

72. Malaya, Johore, Mt. Austin, C.W. Franck 353, 1923 (fl.)

73 Malaya, Perak, Scortechini 2084, 1896 (fl.)

74. Br. N. Borneo, Elphinston prov., Tawao, Elmer 21602 (leaf)

75. Sunda Isl., Amboina, C.B. Robinson 126, 1913 (fl.). (Rob. Plantae Rumphianae Amb.)

T 76. Java, Leschenault (fl.). Holotype for M. leschenaulti March.

77. Sumatra, Indragiri, near river Kuantan, Chantier 71, 2.10.1970 (leaf)

** 78.. Java, Bogor, culta in Hortus Bogor, J.A. Schuurman 139, 24.4.1957 (fl.)

12. Mangifera gedebe Miq.; Ding Hou, Flora Malesiana (1978) 8 p. 431; cultivated in Hort. Bog. sub. n. VII - D - 5 (origin from Sumatra), Ding Hou

Collections at Leiden, Geneva and Kew

1. Sumatra, Kaju Agung, south of Palembang, along river (2 m). Kosterm. 14093, Sept. 1958 (fl.). Tree 15 m, "Fruit laterally compressed, edible, sour when unripe, when ripe pulp is little. Vern. Kedepir (L) & (K)

APPENDIX I
(Continued)

T 2. Type, Sumatra, Langong H.B. 4384, Teysman (L) & (K)
** 3. Java, culta in Hort. Bogor Sub. VI. D.5 (from Sumatra). Kosterm. 19002, Sept. 1961 (fl.). Tree 25 m (L) & (G)
* 4. Java, culta in Hort. Bogor. Kosterm. 14003, Nov. 1958 (fruiting fruits 3-4") (L)
* 5. Central East Borneo, W. Koetai; No. 2 near Moeawa Kaman, along bank of brooklet. Very common. Tree 20 m F.H. Endert 1489, 19.6.1925 (fl.) (L) & (K)
* 6. Central East Borneo, W. Koetai, No. 10, near Lahoem, inundated bank of Okong river. Very common. Endert 1726, 28.6.1925. Vern. Kepih (L)
7. W. Java, Bantam, along Lake Danau (75 m). A. Kosterm. 19009, 20.7.1961. Habitat marshy (fr.). (L) & (K)
8. W. Java, Serang/Naturmon, Danau (100 m). Boschproefst. No. E. 1196, 12.9.1931 (fl.). Vern. Kedepir (L)
9. W. Java, Serang/Naturmon, Bosch No. E1181, 12.9.1930 (fruiting fruits round, compressed, about 2" circ.). Vern. Kedepir (L)

Note - collections are limited from Palembang in Sumatra; Koetai in Central East Borneo; and along Lake Danau in Bantam and Serang

13. Mangifera gracilipes Hook. f.; Ding Hou, Flora Malesiana (1978) 8 p. 433; Mukherji, Lloydia (1949) 12 p. 98

Collection at Kew
T 1. Malaya, Maingay No. 475/2 (fl.). Type

14. Mangifera griffithii Hook. f.; Ding Hou, Flora Malesiana (1978) 8 p. 430.
Syns. (Ding Hou included the following species in M. griffithii Hook. f.):
M. microphylla Griff. ex Hook. f.; Mukherji, Lloydia (1949) 12 p. 102;
M. sclerophylla Hook. f.; Mukherji, Lloydia (1949) 12 p. 103;
M. beccarii Ridl.; Mukherji, Lloydia (1949) 12 p. 105

Collections at Leiden
1. N.E. Borneo, southern part of Nunukan Island, sandy soil, low ridges (920 m). A. Kosterm. 9220, 2.1.1954. Tree 40 m (leaves only)
2. N. Borneo, Sandakan dist., 81 1/2 miles on Lebuk Rd. (300-400 ft.). Primary forest on ridge top. J. Singh, 39172, 27.8.1963. Tree 100 ft. (leaves only)
3. Sumatra, Palembang (490 ft.), Tandjong Ning, R. Blite 1881, 1880 (fl.). Forbes 2746. Large tree (L) & (P)
* 4. Malaya, Pahang, S. slope Gunong Tahau massif, path above K. Teku (2000 ft.), T.C. Whitmore FRI 4909 (Kepong), 25.2.1968 (fl.). Leaves magenta when young. Tree 30 ft. (L) & (K)
5. Malaya, compt. 23, Ulu Gombake F.R.S gorge hillside (1200 ft.). Kochurmmen 99386, 29.3.1961 (fruiting). Tree 70 ft. Fruit green, obovate. Vern. Machang (M. microphylla) (L) & (K)
T 6. Malaya, Herb Griffith 1100/1 Type. (L), (K) & (P)

Collections at Kew
T 7. Malaya, Malacca, Maingay No. 494, 24.12.1865 (fl. and small fruits). Type for M. sclerophylla Hook. f.
8. Malaya, Kuantan Pahang, Pya-Dalam, Yeop 3635, 15.1.1920 (fl.). Vern. Rawa (M. microphylla)
T 9. Malaya, Malacca, Herb. Griffith No. 1103, 1102 (fl.). Type for M. microphylla Griff. ex Hook
T 10. Malaya, Malacca, Herb. Griffith No. 1100/1. Type for M. griffithii Hook f.

APPENDIX I
(Continued)

11. Malaya; Singapore, Sungai Pandan, Corner 34951, 25.3.1938 (fr., 1-1 1/2"), Vern. Rawa (M. microphylla) (K) & (P)
12. Malaya, Jurong, Corner SFN 26193, 5.3.1933 (fl.)
13. Malaya, Larut Perak, Dr. King's Collector 9539 (fr. 1/2"), open jungle (300-500 ft.), April 1885 (K) & (BM)
14. Malaya, Perak, L. Wray, 1888 (fl.). M. sclerophylla
15. Malaya, Johore, Ulu Kahang, R.E. Holttum 10979, 3.6.1923 (fr. 2"). M. sclerophylla
16. Malaya, Singapore, Changi, Ridley 4772, 1893 (fr. 2")
17. Anamba Isl. (Malaya), Letong, Jamaja, (sea level), M.R. Henderson, 26.4.1928 (fr.). Vern. Buah Rawa. "Probably cultivated"

T 18. Sarawak, O. Beccari No. 3079, 1865-68 (fl.). Type - M. beccarii Ridl.

Collection at British Museum

19. Malaya, Singapore, Bukit Timah, H.N. Ridley 6356, 1894 (fr.)

15. Mangifera havilandii Ridl.; Ding Hou, Flora Malesiana (1978) 8 p. 432

Collections at Leiden

1. Sarawak, Kuching, Semengoh For. Res. lowland Dipterocarp forest (Tree 35 m). Sinclair & Kadim 10217, 3.8.1960 (leaves only)

** 2. Sarawak, Kuching, Semengoh F.R. Arboretum Tree No. 501. JAR Anderson S 14616, 3.4.1962 (small fruit)

3. Sarawak, Sadong dist., Sabal F.R. (ulu sg. Sabal Tapang) - 600 ft. Anderson 13467, 30.3.1961 (fruiting), fruits about 3-4 cm, "nearly oval, green". Tree 90 ft. Vern. Asam raba

4. Sarawak, Rejang Delta, Loba Kabang P.F., sg. Tutus; mixed swamp forest, peat swamps. Paat Kam Chau S. 27805, 25.5.1971 (fruiting) ripe fruits reddish brown. Tree 40 ft.

* 5. Sabah, Sandakan, Ranau distr., open area near stream Kampung Bundu Tuhan. Aban Gibot San 56697, 76694, 24.4.1971 (fruits ripe in May, green, edible). Tree 100 ft.

* 6. Sarawak, Kuching dist, Bako National Park, primary lowland forest. Arshid S 16238, 13.4.1962. Tree 75 ft. Vern. Raba (fruits 1") (L) & (K)

7. Sarawak, Ulu Tubau, Bintulu, hillside (250 m). Mixed Dipterocarp forest. Ashton S 18197, 6.4.1963, (fruiting), fruits green (L) & (K)

** 8. Sabah, Sandakan, Lahad Datu distr., Mile 1 on Silam Road, primary forest, hillside, black soil. Ahmad Talip 47689, 5.4.1965 (fruit). Tree 80 ft.

9. Sabah, Sandakan, Tawau distr., Gemok Hill. Primary forest, hill foot (200 ft.). Meijer 39225, 14.9.1963 (ft.). Tree 80 ft.

Collections at Kew

10. Malaya, Perak, Kelidang Saiong Res., D.B. Arnot 32164, 15.2.1934 (fl.). Vern. Rengas

11. E. Borneo, W. Kutei, Belajan river near Gunungsari, sandy soil, Kosterm. 13517, 15.8.1956 (fr.). Tree 23 m Vern. Asam rawa (K) & (BM)

12. E. Borneo, Loa Haur, Samarinda, Ridge, Kosterm. 9896, 30.8.1954 (fr.). Tree 40 m Ripe fruits 3-4 cm, round, pulp pale pink, sweet. Rare. (K) & (BM)

T 13. Sarawak, Kuching, G.D. Haviland & Hose 3368 K & Z, Nov. 27-30, 1894, (fl.). Type (K) & (BM)

14. Sarawak, Lundu dist., G. Pueh, Paie 13725, 22.4.1961 (fr.). Vern. Raba

16. Mangifera indica L.

APPENDIX I
(Continued)

Collections at Leiden

1. India, Khasi Hills (2-3000 ft.), Hooker & Thom. - wild
2. Burma, Pegu, S. Kurz 2024 (Forestry Herb.), 2.5.1983, wild (L) & (C)
3. Cochin China, Saigon, Pierre, May 1865
4. Thailand, Ko Phu No. 12340
5. S. Vietnam, Saigon - Dalat (km 286) (not sure whether wild)

T 6. Type for M. indica var. cambodiana Pierre. Herb L. Pierre, Pierre No. 716, Saigon province (wild)

7. Java, Preanger reg., Koorders 390B, 1890 (wild, named as M. laurina)

T 8. Type, M. laurina; Java, Planta culta (so doubtful whether wild)

9. Sumatra - mostly cultivated
10. Malay - mostly cultivated
11. Java - a large no. of specimens mostly cultivated or naturalized
12. Borneo - Sabah, Sandakan - a no. of specimens mostly cultivated
13. Philippines - a few, mostly escape from cultivation
14. Sunda Islands - Kannangar, Lombok - a few, escape from cultivation
15. S. America - Brazil, Martinique, Mexico, Solomon Isl. - a few Surinam, Curacao, Nicaragua, escape and naturalized; a few specimens
16. Africa - Cameroon Isl., Madagascar - a few, naturalized
17. Pacific - Caroline Isl., Guam, Fiji (culta). Hawaii (culta) escape and naturalized
18. New Guinea - introduced
19. Moluccas, Obi, Ceram. Amboina, ("naturalized"),
20. Java - Soerabaya, Bogor (culta), Buitenzorg (culta)
21. Iraq (Basra)
22. Malaya, Kedah (culta)
23. S. Sumatra, Central Lampung (culta)

All from Java. (24. to 41); some are named as variety of M. laurina

T 24. Type - M. indica var. bapang Bl. from Batavia, Java - Blume's specimen

T 25. Type - M. indica var. aquosa Bl. - Blume's specimen

** 26. India, Imphal - Dimapur Rd, village hedgerow, (2500 ft.), A.A. Bullock 924, 3.2.1946 (fl.).

T 27. Type - M. indica var. kaijer Bl. - Blume's specimen from Herb. Lugd. Batav
T 28. Type - M. indica var. kalapa Bl. specimen from Herb. Lugd. Batav
T 29. Type - M. indica var. gratissima Bl. specimen from Herb. Lugd. Batav.
T 30. Type - M. indica var. globularia Bl. specimen from Herb. Lugd. Batav.
T 31. Type - M. indica var. elongata Bl. specimen from Herb. Lugd. Batav.
T 32. Type - M. indica var. domestica Bl. specimen from Herb. Lugd. Batav.
T 33. Type - M. indica var. dodol Bl. specimen from Herb. Lugd. Batav.
T 34. Type - M. indica var. derapong Bl. specimen from Herb. Lugd. Batav.
T 35. Type - M. indica var. bembem Bl. specimen from Herb. Lugd. Batav.
T 36. Type - M. indica var. teloor Bl. specimen from Herb. Lugd. Batav.
T 37. Type - M. indica var. sentok Bl. specimen from Herb. Lugd. Batav.
T 38. Type - M. indica var. sangier Bl. specimen from Herb. Lugd. Batav.
T 39. Type - M. indica var. piit Bl. specimen from Herb. Lugd. Batav.
T 40. Type - M. indica var. parrie Bl. specimen from Herb. Lugd. Batav.
T 41. Type - M. indica var. pallens Bl. specimen from Herb. Lugd. Batav.
T 42. Type - M. indica var. niela Bl. specimen from Herb. Lugd. Batav.
T 43. Type - M. indica var. microcarpa Bl. specimen from Herb. Lugd. Batav.
T 44 Type - M. indica var. marunga Bl. specimen from Herb. Lugd. Batav.
T 45. Type - M. indica var. kikulu Bl. specimen from Herb. Lugd. Batav.
T 46. Type - M. indica var. khidang Bl. specimen from Herb. Lugd. Batav.

Collections at Kew

47. Yemen, (culta), Wadi Dabab, Mitter & Long 3067, 15.3.1981
48. Iraq, (culta), Basra, Ali Rawaii 16623
49. Oman, (culta), Sharm, J. Fernandez 1954, 18.12.1925
50. Egypt (culta), Giza, N.D. Simpson 4836, 10.4.1927 (fl.)
51. Egypt (culta), Shabramant, N.D. Simpson 4929, May 1927 (small fruits), perhaps ripening in June

APPENDIX I
(Continued)

52. China, Hainan, Tam Chau dist., Sin Woh, Tsang, Wai Tak 17126, 18.5.1928. May be wild?, growing on dry ground beside a stream (small fruits) (K) & (P)
53. China, Hainan, Ching Mai distr., Ku Tung village, C.I. Lei 427, 7.3.1933 (fl.). Fairly common, moist gentle slope, sandy soil, meadow, erect. Vern. Suen To Shu or Mong Kwo (K) & (P)
54. China, Fukien, Foochow, hill slope, H.H. Chung 2486 (culta)
55. China, Yunan, mountain forests (5000 ft.), A. Henry 11643 (wild)
56. Formosa, Tamsuy, Index Flora Sinensis, Richard Oldham, 1864 (culta)
57. Formosa, Kagi, Wilson 9902, 24.2.1918 (fl.) (culta)
58. Hong Kong, Victoria Peak, Shiu Ying Hu 7202, 28.4.1969 (fl.), culta
59. Hong Kong, Hu 9632, 9.3.1970 (fl.)
60. India, Maisor (Mysore) - culta. Herb. Ind. Or. Hook. f. & Thompson
61. India, Dehra Dun, J.S. Gamble 26484, Apr. 1898 (fl.)
** 62. India, Sikkim (1-4000 ft.), "truly wild". J.D. Hooker 219, Herb. Ind. Or. Hook. f. & Thom. (unripe fruit), 1867. (shoot galls present)
63. India, Khasi Hills, Nowgong (2-3000 ft.), J.D. Hooker & T. Thomp., July 1922, wild
64. India, Central prov., Betul dist., J.F. Duthie 10344, 2.2.1891, wild
65. India, C.P., Raipur, H.H. Haines 2978, 4.3.1910 (fl.), "wild form"
** 66. India, Manipur, Imphal-Dimapur Rd., village hedge-row (2500 ft.). A.A. Bullock 924, 3.2.1946 (fl.).
** 67. Bangladesh, Chittagong Hill Tracts, Kaptai, J.S. Gamble 7753, Feb. 1888 (fl.), wild
68. Burma, Ambent, Winlon cleong forest (200 ft.). C.E. Parkinson 5096, 28.1.1927 (fl.), wild, Vern. Thayet
69. Burma, Pegu, Baingda drainage (300 ft.), J.H. Lace 6088, 11.2.1913 (fl.), wild
70. Burma, Bassein, Thityaung Chaung (100 ft.), C.W.D. Kermode 7101, 10.1.1928 (fl.). Vern. Taw-thayet. Tree 100 ft. (wild)
71. Ceylon, Road Bibile to Mahyangane, dry zone, Kosterm. 24407, 4.6.1971 (fl.). "Tree 35 m high. Wild mango, not planted" (K) & (P)
72. Malaya, Kuantan Tawn, Kuantan Pahang, Yeob. 3646. Vern. Kuini (edible fruit)
73. Malaya, Chenderiang, Batang Padang, low undulating country, Jaarib Jusoh 51563, 17.3.1952 (fl.). Vern. Mempelam padi
74. Malaya, Perak, Tronoh, Bota Rd., low undulating country (100 ft.), Talib B. Taib 65860, 10.3.1952 (very small fruit). Vern. Mempelam telor
75. Cochinchina, Saigon, Pierre 1680, June 1877, with 5-6" long obovate fruits. Vern. Xang ca
76. Cochinchina, Saigon, Pierre, May 1865 (fl.)
77. Thailand, N. Chiang Mai, Pha Mawn (1200 m), scattered by stream, Smitinand 10329, 24.3.1967 (fl.). Wild
78. Cochinchina, Saigon, Pierre 716, Feb. 1870 (fl. & small fruits). Vern. Xoai Com
79. Cochinchina, Saigon, Pierre, March 1876. Vern. Voi (fr.)
80. Cochinchina, Saigon, Pierre 1680, June 1877 (fl. & fruits 5-6" long). Vern. Xano Ca (culta)
81. Thailand, Rayong prov., Koh Samet, 4 km opp. Ban Phe, disturbed deciduous forest on granite hill, along seashore, Geesink & Hiepko 7888, 17.12.1974 (fl.). Wild

Collections at British Museum

82. Ceylon, Kunchi Mukulana, Hunduma, T.B. Worthington 2254, 21.9.1946, in forest
83. Burma, Rangoon, jungle, D.E. Barnard An UE2, 1931 (fl.)
84. Bhutan (India), Punakha (4500 ft.), R.E. Cooper 3926, 23.5.1915 (fl.)
85. Bhutan, Mirichona Timpu (3000 ft.), R.E. Cooper 3753, 21.4.1915 (fl.). Moist forest
86. Bhutan, Rydak valley (3000 ft.), R.E. Cooper 1103, 3.7.1914 (small fruit)

APPENDIX I
(Continued)

87. Nepal, Mechi zone, Ilam dist., Kankai River (350 m), D.H. Nicolson 3114, 2.4.1967 (fl.), in sal forest
88. Nepal East, Kankai Khola, Soktim (1000 ft.), J.D.A. Stainton 5750, 2.4.1967 (fl.), in mixed moist subtropical forest. Tree 60 ft.
89. Nepal, Ankhu Khola, River valley (2000 ft.). PbG 200, 9.2.1953 (small fruits). River valley isolated trees, probably planted

Collections at Paris

90. Indochina, Tonkin, Cao Bang (leaf)
91. Thailand, Doi Sutep, mixed evergreen forest on humid soil, Kai Larsen 6884, 9.2.1959 (fl.)
92. Ceylon, Trincomalee, Reynand, Feb.-March 1898 (fl.). Herb. de Jussieu
93. China, Hainan, Yaichow (200 ft.), in wood lot, Chun & Tso 44696, 23.20.1936 (fl.)
94. China, Hainan, Chang-Kiang distr., Ka Chic Shan; abundant, dry level land, Lau 3027, 31.12.1933 (fl.)
95. China, Hainan, Tau distr., Kap Shan, Lau 1115, 18.9.1937 (fl.). Fairly common dry gentle slope. Vern. Mong Kwo
96. India, Manipur, Khongal Thaunak, Top of Kaboo Valley (800 ft.), G. Watt 7237, 4.1.1882 (fl.)
97. Indochina, Herb. d'Indochine, Chevalier, 1943
98. Indochina, Cochinchina, Cantho prov., Cantho, F. Fleury 30339, 26.1.1914 (fl.), probably var. mekongensis
99. Indochina, Cochinchina, Jardin Botanique, Saigon, Chevalier 31328, 12.2.1914 (fl.), Vern. Xoai thauh ca (var. mekongensis Pierre)
100. Indochina, Jardin Botanique, Saigon, Hiep 348, 27.1.1919 (fl.) (var. cambodiana Pierre)
101. Ceylon, Thwaites 2614, 1256, 1854 (fl.)
102. Indochina, Vietnam, Tonkin, M. Balansa 4032, 4033, Jan. 1888 (fl.)
103. Indochina, Tonkin, Hanoi, Chevalier 39381, 22.12.1918 (fl.)
104. Indochina, Cochinchina, Saigon, L. Pierre 716 (fl.) Feb. 1870
105. Indochina, Cochinchina, Saigon, Pierre, June 1874 (mature fruit), var. cambodiana (culta). Vern. voi
106. Indochina, Laos, Luang Prabang, Poilane 19993, 20141, 2.2.1932 (fl.)
107. Indochina, Saigon, Pierre 1680, June 1877 (fl. & fr.), (var. mekongensis) culta. Vern. Xang Ca. Flowering and mature fruits on the same tree. It will be of great genetic significance in breeding. It may fruit twice a year.
108. Indochina, Vietnam, Annam, Hue, Truei, River Shrine, J. & M.S. Clemens 4389, May-July 1927

Collection at Geneva

T 109. Burmann's specimen is at Herb. Delessert at Geneva (flowering), which is likely to be the Type for M. indica; Ceylon 1773, No. 80

Note - outside India, Burma, Thailand and Malaysia, M. indica does not appear to be truly wild. It is most likely to be an escape which is naturalized. There are 15 collections from Indochina. It may be wild there.

17. Mangifera inocarpoides Merr. & Perry.; J. Arn. Arb. (1941) 22 p. 532; Ding Hou, Flora Malesiana (1978) 8 p. 431; closely allied to M. gedebe (Ding Hou)

Collections at Leiden

** 1. Papua, W. district, balimo sub district, Aramia river (100 ft.), lowland rain forest or riverine forest, M. Kumul NGF 36296, 13.12.1971 (fl., small fruits), fruits may ripen in March, "fruits flat". Vern. Begbegere (cocodala dialect); contact Forest Dept., Lae

APPENDIX I
(Continued)

2. New Guinea, road to bir. Pomboa, along river. Anta 111, 16.7.1941 (fl.), Herb. Hort. Bot. Bog.

** 3. Papua, W. district, Morehead sub dist., Morehead river, near station (50 ft.), Henry and Foreman NGF 49345, 9.11.1972, Woodland near river - common on inner side of river - levee, at edge of seasonal swamp. Tree 50 ft. Fruit green said to be edible. Vern. Pranprh (Hamoa language). Contact - Forest Dept., Lae

* 4. Papua, W. Divn., Penzara, between Morehead and Wassi Kussa River, "Abundant in rain forest along creeks", L.J. Brass 8462, Dec. 36. Tree 12 m "Fruit much compressed, 6-8 cm diam., 3-4 cm thick"

18. Mangifera khasiana Pierre; Mukherji, Lloydia (1949) 12 p. 97

Collection at Leiden

1. India, Khasi Hills, Cherrapunji (4000 ft). Kurz 30033, 24.5.1952 (fl.)

Collection at Paris

T 2. India, Khasi Hills, Kurz's specimen in Herb. L. Pierre (with hand drawing of Pierre). The specimen justifies its separation from M. sylvatica. The comments of Mukherji (1949) justifying separate identity of the species hold good. Type

19. Mangifera lagenifera Griff.; Ding Hou, Flora Malesiana (1978) 8 p. 433

Collections at Leiden

1. Malay Peninsula, Johore, Mawai, EGH corner 34701, 34705, 8.1.1938 (fl.). Vern. Lanjut (L), (K) & (P)
2. Malay Peninsula, Malacca, A.C. Maingay 469 (fl.), Dec 13, 1865 (L) & (K)
3. Malay Peninsula, Perak, open jungle low ground near river (400-500 ft.). Dr. King's collector 10992, Sept. 1886 (fl.). Tree 50-60 ft. (L), (P) & (G)
4. Malay Peninsula, Malacca, Griffith
5. Sumatra, Riouw en ond., Karimoen (50 m). Van Steenis 17147, 3.10.1932 (leaves)

Collections at Kew

T 6. Malaya, Malacca, hilly ground. Herb. Griffith No. 1104 (fl.). Type
7. Malaya, Malacca, Cumming 2330 (fl.)
8. Malaya, Johore, Ulu Kahang (350 ft.), R.E. Holttum 10997, May 1923, (Fr). Very big fruits, about 4-5" long

** 9. Malaya, Johore, Ulu Endau Labit F.R., Compt. 277, P.F. Cockburn FRI 7872, 22.3.1968. Disturbed forest near new logging road. Tree 80 ft. "Fruits large pear shaped, green flushed pink. Vern. Lanjut"

** 10. Malaya, Singapore, Jurong, Ridley 4777, 1893, (fl.). Vern. Lanjut
11. Malaya, Perak, Scortechini 633 (fl.) (K) & (BM)
12. Sarawak, Sabal Sawmill, Sabal F.R., 70th mile, Seri [illegible] Road (600 ft.), S. Tong S. 34319, 14.5.1974 (leaf). Tree 110 ft. Fruits green, edible. Vern. Binjai (Malay)

Note - see more specimens at FRI Kepong before collection

20. Mangifera longipes Griff.; Ding Hou, Flora Malesiana (1978) 8 p. 428

Collections at Leiden

1. Malaya, Singapore, Pulau Samulan, J. Sinclair, 6.11.1949 (fl.)
2. Malaya, Ulu Kelantan, Gua musang, summit of limestone hill. FSP Ng FRI 5577, 22.6.1967 (leaves). FRI Kepong

APPENDIX I
(Continued)

* 3. Malaya, Hulu Perak, S. Perak near Fort Tapong, K. Kendrong, Ridge crest, poor bamboo forest. T.C. Whitmore FRI (kepong) 15787, 26.1.1971 (fl.). Vern. Machong

* 4. Malaya, SW Pahang, near Johore, border of Lesong F.R., low undulating country, felled forest. T.C. Whitmore FRI 15874, 17.2.1971 (young fruits). Vern. Machang (L) & (K)

5. Malaya, 8 miles south on Kepong Road, T. & P. 189, 2.10.1968 (fl.). Phytoch. survey of Malaya

6. Java, J.E. Teijsmann

T 7. Java, Type M. parih Herb. Lugd. Bat. No. 897,363 542-543

T 8. Java, Type M. negara - Wangi (3-4000 ft.), Houtsoorten

T 9. Type, M. indica var. compressa Bl. = M. longipes

10. Sumatra, Tapianoeli, Division Padang Si Dimpoean, Subdivision Padang Lawas, Si Hare-hare Djae (Topographic Sheet 41, NW quarter). Rahamat Si Toroes No. 5026, 15-20.7.1933 (fl.). Univ. of Michigan (Barlett) sheet

* 11. W. Sumatra, Mt. Sago near Pajakumbuh (1700 m). Moradjo 249, 17.7.1957 (fl.). "Tree 20 m fruits smaller than 'Pauh gudang' about 8 cm long, very palatable, ripe Oct/Nov". Contact Univ. Andalas, Herb. Agric. Fac. Pajakumbuh

12. Sumatra, Sibolangit, Lorzing 5865, 13.7.1918 (fl.)

13. Sumatra, Palembang, Kosterm. 14094

14. Sumatra, S. of Palembang, Kaju Agung, along river, Kosterm. 14097, Sept. 1958 (fl.) (L) & (K)

T 15. Type - M. sumatrana Miq. Herb. Ludg. Bat., Upper Angola No. 897,363-545, coll. Junghun

16. Java, Bawean Isl., ten van Soerabaja, Telaga Kastoba (300 m), Buwalda 3143, 25.11.1937 (leaves)

17. Java, Pasoeroean, G. Ardjoens, Koorders 38155, 7.11.1899 (fl.)

18. Java, Batavia, Buitenzorg, Pasir Honji (350 m), Bakhuizen 7299, 1.1.1978 (large fruit)

19. Java, Pentjang Isl., Udjungkulon Reserve, S.W Java, coral limestone. Kosterm. & Kuswata 29, 14.8.1960 (fl.). Tree 30 m

20. S.W. Java, Pangandaran peninsula, scattered. Kosterm. 23060, Aug. 1968 (fl.) (L) & (K)

* 21. N. Borneo, Sandakan, near Ernestina Road (400 ft.). Disturbed forest, hill side ridge top. W. Meijer SAN 20618, 4.4.1960 (fl.)

22. N. Borneo, Sandakan, Lahad Datu dist., near Sabahan river, 20 miles S.W. of Lahad Datu (200 ft.). G.H.S. Wood SAN 16107, 26.4.1955 (fl.)

23. N. Borneo, Balikpapan distr., Montawir River region, low sandy ridge, Kosterm. 9739, 14.7.1954 (fl.). Tree 35 m

** 24. Sarawak, Kuching, Kampong Surabaya, village tree (50 ft. tall). P.S. Ashton S 17275, Feb. 1963 (with big fruit). Fruit rather sour, greenish yellow skin and flesh. Vern. Emplam (Sarawak)

** 25. N. Borneo, Sandakan, Lahad Datu distr., Silam block 8, Primary forest, hillside. M. Ambullah 31477, 13.5.1963 (large fruit). Fruit green. Vern. Manga hutan

26. N. Borneo, Kudat Distr., Bak Bak (200 ft.), Primary Forest, hillside. Tree 100 ft. David Brand SAN 30942, 19.7.1962 (fl.)

** 27. N. Borneo, Tawau distr., Mile 15 Apas Road primary forest. Gibot 36968, 10.7.1963 (fl.). Tree 100 ft. Vern. Pauh Kijang

28. Java, Besoeki, Peger, Koorders 20332B, 17.10.1895 (with small fruits)

29. Java, Pekalongan, Soebah, Koorders 13550B, 13.10.1892

** 30. Sabah, Sandakan, Sandakan distr., near Labuk Road, mile 1 1/2 from Sandakan, hillside. Md. Zain 61189, 26.7.1967 (fl.). Fruits green

** 31. Sabah, Sandakan, behind forest Headqrs. Sandakan (100 ft.). Tree growing on red sandstone hillside. J. Singh, 1.10.1965 (fl.) "This is the time of the year when all the species flower

32. Sabah, Sandakan, Leila Road, Tanah Merch (250 ft.). M. Zain 60934, 26.7.1967 (fl.).

APPENDIX I
(Continued)

33. N. Borneo, Sandakan, Kudat distr., Banguey Isl. Wood & Sario SAN 15554, 11.8.1955 (fruiting). Vern. Lagawa (Dusun)
34. E. Borneo, E. Kutei, Sangkulirang Isl. Ridge. Kosterm. 4915, 26.5.1951 (fr.). Vern. Asam Kepaeng (Bassap). (L), (K) & (BM)
35. Sabah, Sandakan, Mostyn distr., Madai F.R., Mostyn. Primary forest. Mordin 47761, 25.10.1965 (fruit Nov.)
36. Sabah, Sandakan, Lahad Datu distr., Virgin jungle reserve Mt. Silam (330 ft.). Primary forest, blackish soil on hill. Ahmed Talip 52827, 23.9.1965 (fl.)
37. Sabah, Sandakan, Lahad Datu, Ulu Segama, on ridge. A. Talip SAN 71056, 20.7.1970 (fl.) "Fruit, pale yellow"
38. Malaya, Singapore, Summit of Bukit Timah. F.R., J. Sinclair, 13.6.1951 (fl.)
39. W. Sumbawa Isl., Indonesia, cult near Semomkhat (Mt. Betulante). Kosterm. 19049A, Nov. 1961 (fl.). "A better var. of the mango with knobby fruit about 3-4". Vern. Pelem poh"
40. Indonesia, W. Flores Isl., S.E. part near Dalur, Kosterm. 12.5.1965 (fl.). Tree 40 m Vern. Pau pong (Pauh = mango, pong = forest)
41. South Central Timor, North Moetis mountains, Kaslioe (4050 ft.), Walsh 333, 25.5.1929 (fl.) (L) & (BM)
42. Malaya, FRI Kepong, Selangor, Planted in lawn of FRI (240 ft.). F.S.P. Ng, FRI 5303, 31.5.1967 (fl.). Tree felled
43. Indonesia, W. Sumbawa, Mt. Batulante, cultivated near Semomkhat (200 m). Kosterm. 19049A, Nov. 1961 (fl.). "A better var. of mango with knobby fruit", also 19030, 19.10.1961 with big fruit, pulp greenish yellow, very juicy
44. Sunda Isl., W. Flores Isl., slope of Mt. Rawakon (1200 m). Kosterman & Wirawan T12, 28.4.1965 (fl.). Tree 40 m (L) & (G)
45. Sunda Isl., W. Flores, S.E. part near Dalur. Kosterm. 22143, 12.5.1965 (fl.). Tree 40 m. Vern. Pau pong (forest mango)
46. South Central Timor, Kaslioe, North Moetis mountains (4050 ft.). M.E. Walsh 333, 25.5.1929 (fl.) (L & BM)
47. Philippines, Negros Isl., Dumaguete (Cuernos Mts.), Negros Oriental prov. A.D.E. Elmer 9759, April 1908 (fl.).
48. C. Sumatra, Si-Kabu Kabu Kampong, near Pajakumbuh (700 m). W. Meijer 5966, 16.7.1957 (fl.) Cult. Tree. Vern. Pauh Sangit

Collections at Kew

49. Burma, Mergui, common tree on hills near Tenasserim river, R.N. Parker 2368, 19.12.1924 (fl.), Vern. Thayet
50. Malaya, Perak, Gunong Bubu F.R., secondary forest, hillside (3000 ft.), Y.C. Chan 17588, 18.3.1971 (fr.). Tree 55 ft. Vern. Rengas
51. Malaya, Pahang, Kuantan, Yeob 3637, 11.2.1920 (fl.). Vern. Machangapi
52. Malaya, Trengganu, Kemaman (200 ft.), A.C. Godeh 53283, 23.7.1953 (fl.). "Planted tree." Vern. Mangga
53. Malaya, Malacca, Maingay 467, Aug. 1865 (fl.)
54. Malaya, Bukit Timah, H.N. Ridley 10734, Feb. 1890 (fl.)
55. Malaya, Kelantan, base Bukit Batu Papan, S. Lebir, M.R. Henderson 29568, 6.7.1935 (leaves only). "Massive tree 80-90 ft. in forest"

T 56. Java, ex Herb. Miquel (Type for M. parih Miq.)

57. W. Sumbawa Isl., Mt. Batulante from 0-400 m Semongkat, Kosterm. 19030, 19.10.1961 (fl.). Vern. Pelem Poh. "Half-cultivated"
58. Timor, Riedel, June 1983 (fl.)
59. N. Borneo, Sandakan, For. dist., Elopura, Beshala Durat, A. Cuadra A3255, 25.4.1951 (fl.). Tree 50 ft., probably planted. Vern. Mangga teloss (Malaya)
60. Sumatra, Simaloer Isl., Achmad 922, 12.2.1919 (fl.). Vern. Ampelan dotan
61. Indonesia, Bogor (culta), Kuswata, Soepadmo & Kosterm. 14.7.1961 (fl.). Tree 25 m Fruit small, yellowish, sweet
62. Philippines, Palawan, Puerto Princesa, A.L. Cenabre 29125, Feb. 1923 (fr.)

APPENDIX I
(Continued)

Collections at Paris

63. Cambodge, Kampat prov., Cam-chay, Pierre 1652, April 1874 (fl.). Tree 20 m, cultivated

64. Vietnam (Nord), Mt. Chua Hae, Bon 2959, 17.7.1889 (fl.). Vern. Queo

Note - it is doubtful whether it is naturally distributed in the Philippines

21. Mangifera macrocarpa Bl.; Ding Hou, Flora Malesiana (1978) 8 p. 439; cultivated in Hort. Bog. Sub. VI-B-8 (Ding Hou)

Collections at Leiden

T 1. Type, Blume's specimen No. 897, 363-551 in Herb. Lugd. Bat. (leaves only). (2) 897,363-550, (3) - 552

2. Sumatra, Simaloer Isl. Achmad 1223, 9.7.1919 (fl.)

* 3. Malaya, E.W. Highway, 26 miles from Grik, Upper Perak, Hillside primary forest low alt., F.S.P. Ng. FRI 020982, 16.5.1973 (leaves). large tree.

* 4. Malaya, S.E. Kelantan, Sungai Lebir, Betong Kuala Lebir Kechil, Ridge Top. "Young leaves whitish". P.F. Cockburn FRI (Kepong) 7091. 12.9.1967 (leaves) (L) & (K)

* 5. Malaya, Pasir Panjang F.R., Bt. Kanan, Negri Sembilan, Hillside (250 ft.), P.S.P. Ng, FRI (Kepong) 7844, 26.1.1967 (leaves)

** 6. Malaya, Ulu S. Trengganu, N.W. Batu, Bidan, Trengganu, hillside, primary forest (400 ft.). Cockburn, P.F. FRI 10613 (Kepong), 11.6.1968. Vern. Machang api. "Fruits large, green, ovoid,. May be eaten" (L) & (K)

7. Java, Batavia, Pasir - Sirenngit, W.E. Leumiliang en Buitenzorg (600 m), Bakhuizen v/d Brink 6911. 9.6.1924 (leaves)

8. Java, Anambas and Natoena Eilanden, O.n. Perimpoa. Van Steenis 903, 2.4.1948 (leaves). Vern. Madjoe (Mal.)

9. Java, Loa Djanan Isl., West of Samarinda, low ridges, sandy soil. Kosterm. 6726, 24.4.1952 (leaves). Vern. Mangga or Asan

* 10. Sabah, Sandakan, Sipitang distr., Ulu Mendalong, 6 miles S.S.E. of Malamak (1250 ft.). G.H.S. Wood SAN 16792, 30.9.1955 (leaves). Tree 76 ft.

11. British North Borneo, Kabili - Sepilok F.R., top of high hill. Enggoh BNB For. Dept. 7284, 11.6.1937 (leaves). Vern. Kayu bansiku. Tree 125 ft. Fruit edible (L) & (K)

12. Borneo, Sandakan, Beaufort dist., kg. Linsok Halogilat. D.F.O./B'fort. No. 31997 (a). April 1964 (with fruit). Primary forest, hill ridge (70 ft.). "Fallen fruits collected"

Collections at Kew

13. Malaya, Pahang, Ulu Tembeling, S. sat. M.R. Henderson 21989, 20.7.1929. Tree 70-80 ft. tall. Vern. Machang lavit (leaf)

T 14. Malaya, Malacca, Maingay No. 473 (Type of M. fragrans Maingay), 18.1.1868 (fl.)

15. Malaya, Kelantan, Sungei Tekal, Henderson 19713, 28.10.1927 (fl.)

** 16. Malaya, Ulu Kelantan, Relai F.R., small valley bottom, Cockburn FRI 7241, 18.10.1967 (leaves). Tree 80 ft. Fruits large dark green, ellipsoid, with fleshy mesocarp which may be eaten

T 17. Java - Blume's specimen, Sept. 1864. Type

22. Mangifera minor Bl.; Ding Hou, Flora Malesiana (1978) 8 p. 428; sometimes also planted near village (Ding Hou)

Collections at Leiden

1. S. Celebes, Lipumangan, Elbert 2729, 22.8.1909 (fl.)

2. S. Celebes, Ban - Dan, Elbert 2638, 5.9.1909 (fl.) (L) & (K)

APPENDIX I
(Continued)

T 3. Type. Faroten specimen in Herb. Ludg. Bat. from Celebes, No. 897,363 - 557 (fl.)

4. Celebes, Sub. Div. Raha (Moena), Wapai (25 m). Van Steenis 21104, 19.7.1936 (fl.)

* 5. Celebes, Rec. Menado, Sub. div. Loewoek, between top G. Lokai and Tamboenan. Eyma 3805, 23.9.1938 (fl.). Herb. Hort. Bog.

6. S. Central Timor, Kaskoe, north Noetis mountains (4050 ft.). Walsh 2126, 25.5.1929 (fl.). (M. timorensis)

7. Sunda Isl., Flores West, Kenari - Nunang (20-650 m). P.E. Schmutz 1622. 13.7.1967 (fl.). Vern. Pao Kode

8. Molucca, Forster collection in Herb. Ludg. Batav. No. 896,363 - 558 (fl.)

9. Molucca, Soela Isl., (Eil. Mangoli), Mangoli, Van Steenis 29849, 21.9.1939 (fl.).

** 10. New Guinea, Divn. West New Guin., Warsamson river, 25 km east of Sorong, Primary forest, sandy clay soil (60 m). Iwanggin 5715, 13.11.1957 (fl.). Vern. 'A woek' also "Kaoe" (Mooi language)

* 11. New Guinea, sub distr., Manokwari, Momi Primary forest, on rocky and sandy soil. Rather common, few specimens growing together. A. Kosterm. 338, 27.8.1948. Vern. Sieka haks

12. New Guinea, New Britain, Gazelle Penin, Boava, Waterhouse 871. Sept. 1934 (fl.). Vern. 'Koai'. "An apparently indigenous mango - fruit poor"

13. New Guinea, Kaiser Wilhelmsland, M. Hollrung No. 540/545, Herb. Lugd. Bat. sp. No. 897,363-556 (1887) fl. (L), (K) & (P)

14. New Guinea, Meranke, Th. Val, 1906 (fl. & small fruit)

15. New Guinea, Manokwari, Ransiki, Primary forest (25 m), Kosterm. 119, 2.8.1948 (leaves only)

16. New Guinea, Madang distr. Madang sub. dist., Northern facing of Bagabag Isl., edge of coconut plant. (10 ft.), Vandenberg and Mann. NGF 42273, 17.6.1969 Fruits immature, light green

17. New Guinea, Morobe dist., Clemens 887, 9.11.1935 (fl. & small fruits)

** 18. New Guinea, N.E. Morobe dist., Boana mission ground (3100 ft.), Mary S. Clemens 8607, 8.8.1938 (fl.)

* 19. Papua, Milne Bay dist., Goodenough Isl., Bolu Bolu (5-20 m). "A very common large tree in rain forest, of coastal plain and lower mountain, fruits up to 10.5 cm long". L.J. Bran 24454. 1.10.1953 (large fruits)

20. W. New Guinea, Sorong, Sausapor, Primary forest (25 m), Versleegh BW 3968, 16.10.1956 (leaves). Vern. Koesi (Manikiong language), Wai (Karoon lang.,), Awoe (Mooi lang.,)

* 21. W. NW New Guinea, Andai near Manokwari, Primary forest (80 m). Rather common, Brand BW 7272, 9.11.1958. Vern. Koesi (Manikiong)

22. New Guinea, Lae, Morobe dist., Labu - Midi (sea level), Inner zone of beach forest, Havel & Kairo NGF 15467, 25.10.1962 (fl.). Vern. Yuwi (Labu dialect) (L) & (K)

** 23. New Guinea, Morobe dist., Bulolo, station logging area (2500 ft.), T.N.G. Havel & Kairo NGF 15432, 10.9.1962 (fl.) (L) & (K)

24. New Guinea, Morobe dist., Wantoat or Wantot (3500 ft.), Mary Strong Clemens 11122, 10.2.1940 (fl.)

** 25. New Guinea, Morobe, vicinity of Kajabit Mission (800-2000 ft.). Clemens 10801, 31.10.1939 (fl.)

26. New Guinea, W. New Guinea, Valley of lower Pami river, 5 km north of Manokwari, Primary forest clay soil (40 m). Kosterm. BW 4385, 26.8.1957 (leaf). Scarce. Vern. Koeti (Manikiong lang.)

* 27. New Guinea, West NG, South Manokwari, Mt. Krabo, Primary forest, clay (200 m), Kosterm. BW 10804, 5.11.1960 (fl.). Vern. Bie (Kebar lang.). Common. Fruits green

28. New Guinea, Lae, Madang distr., Ramu sub. distr., 7 miles south of Dumpu, ridge forest (900 m). Foreman LAE 52205, 2.8.1972. Fruit pale green

APPENDIX I
(Continued)

29. New Guinea, Lae, Morobe distr., Wau Sub dist., 5 miles west of Bulolo (2800 ft.). Lower mountain forest on flats. Streimann NGF 47919, 14.7.1970 (with young fruits, green) (L) & (K)

30. New Guinea, Lae, East New Britain dist., Rabaul sub. dist., Powell harbour, lowland rain forest (30 m). Foreman LAE 52108, 18.6.1972 (fl.)

** 31. New Guinea, Lae, Morobe dist., Middle logging area, Bulolo (3000 ft.), Lower mountain rain forest along gentle slope. Streimann NGF 231159, 6.10.1965 (with 3" long fruit, dark green). Vern. Bagidza (Garaina)

32. Papua, Milne Bay distr., Cape Vogel Penin, in the hills behind Tapio (50 m), In the abandoned native garden; common in limestone hills. Hoogland 4348, 21.7.1954 (fl.). Vern. Abudar (Onjob lang.), Mogari (Tapio lang.)

33. Papua, Misima Isl., Narian, occasionally on old garden lands, planted (?). L.G. Brass 27568, 3.8.1956 (fl.)

34. New Guinea, Lae, Milne Bay distr., Kiriwina sub. distr., Beach forest near Boli point (8°30'S/151°05'E). Gillison NGF 25269, 30.9.1966 (fl.). "Fruit typical mango"

35. Solomon Isl., East Malaita, Faumamanu Ridge top (100 ft.). Well drained secondary forest. Runikera & collectors BSIP 10632, 21.8.1968 (fl.). Vern. Asai (Kwara'ae)

36. Solomon Isl., Faragia Bay, East Sta. Ysabel, Hillside, secondary forest. Beer's collectors BSIP 7739, 2.2.1967, (fruiting, fruits light green). Vern. Asai (Kwara'ae)

37. Solomon Isl., Bougainville Isl., Konigura, Buin rain forest (600 m). Common. Kajewski 2157, 28.7.1950 (fl.) "Natives eat fruit which has strong astringent taste" - also collected from Diwai

38. Solomon Isl., East Guadal Canal, Makina river area, Flat plain (90 ft.), well drained secondary forest. Boraule & collectors BSIP 9402, 13.5.1968 (fl.). Vern. Asai (Kwara'ae name) also Sususi. Fruits 3 1/2" long, 4 3/4" circum.

Collections at Kew

39. S. Celebes, Ban Ban, Elbert 2638, 5.9.1909 (fl.)

40. New Guinea, Morobe dist., Bulolo, Wau, Station Logging area (2300 ft.), J.J. Havel and A. Kairo, NGF 17189, 19.8.1963 (fr., fruits 2-3" long). Fruit ovoid, flattened and slightly pointed, edible. Vern. Bagitza (Garaina)

41. Papua, Central distr., Laloki river below Rouna falls (1000 ft.), on steep rocky forest slope, T.G. Harthy 10659, 7.9.1962 (Fr. 2-3")

42. New Guinea, Morobe, Finschhafen, track from Tigadu to Sambiang E. of Mongi river, Croft & Katik 68596, 17.9.1976 (fl.) (BM)

23. Mangifera minutifolia Evrard; Bull. Bot. Soc. Fr. (1952) 99 p. 83; Flore du Cambodge, du Laos et du Vietnam (1962) 2 p. 99

Collection at Paris

T 1. Vietnam (Sud), Nhatrang prov., Nui Han Heo (600 m), Poilane 4803, (small fruit about 1 1/2" long, apex protruded but shorter than M. sylvatica). Vern. Xoai rung. Type

Note - It is known only from type specimen (collection from one locality). As the specimen has no flowers, and these have not been decribed so far, it is a doubtful species

APPENDIX I
(Continued)

24. Mangifera monandra Merr.; Ding Hou, Flora Malesiana (1978) 8 p. 432; Syn.: M. philippinensis Mukherji; Mukherji, Lloydia (1949) 12 p. 108

Collections at Leiden
1. Philippines, Samar, M. Ramos 1618, April, 1914 (fl.) (L), (BM) & (P)
2. Philippines, Samar, Mt. Mahagua, Oquendo, M.D. Sulit 14333, March-April 1951 (fl.) (L) & (BM)
3. Philippines, Guimaras Isl., Buenavista - Bo. Pamirta, alongside of rocky limestone hill (100 m), M.D. Sulit 11827, 6 March 1950 (fl.). Vern. Pangi (Bis Dongo dialect)

Collections at Kew
4. Philippines, Luzon Central, Antipolo (Morong), A. Loher 420, 20.1.1892 (fl.)
T 5. Philippines, Luzon, Rizal prov., Antipolo, Ahern's collector 414, Feb. 1904 (fl.). Type (K) & (BM)
6. Philippines, Zambales, Masinloc, E.D. Merril 2946, May 1903 (leaves)
7. Philippines, Rizal, Montalbau, A. Loher 5863, Feb. 1906 (fl.)
8. Philippines, Luzon, Zambales prov., R. Medina 23540, Jan.-Feb. 1915 (fl.) (K) & (P)
9. Philippines, Samar, Catubig river, M. Sablaya 85, Feb.-March 1916 (fl.) (K) & (P)
10. Philippines, Luzon, Rizal prov., Bosoboso, Ramos 2102, Feb. 1907 (fl.)

Collections at British Museum
11. Philippines, Luzon, Rizal prov., A. Loher 14189, Feb. 1913 (fl.)
12. Philippines, Leyte, Wenzel 604, 25.2.2924 (fl.)

Collections at Paris
13. Philippines, Luzon, Laguna prov., Mt. Maquiling, C. Mabesa 25731, June 1916 (fr.)
14. Philippines, Luzon, Rizal prov., A. Loher 14189, Feb. 1913 (fl.)
15. Philippines, Luzon, Rizal prov., Montalbau, A. Loher 12810, March 1909 (fl.)
16. Philippines, Luzon, Rizal prov., Bosoboso, Ahern's collector 263, Dec. 1904 (fl.)

Collections at Geneva
17. Philippines, Samar, M. Ramos 1618, April 1914 (fl.)
18. Philippines, Luzon, Rizal prov., Ramos 993, Feb. 1911 (fl.)

25. Mangifera odorata Griff.; Ding Hou, Flora Malesiana (1978) 8 p. 437; Syn.: M. oblongifolia Hook. f.; Mukherji, Lloydia (1949) 12 p. 95

Collections at Leiden
1. S. Sumatra, Lampang, Metro Kota Gadjah Distr., Sukoredjo Vill. Tirtoredjo 7, 9.8.1961 (fl.). Tree 7 m
2. N. Sumatra, Sibolangit, Lorzing 12851, 20.12.1927 (fl.)
3. S. Sumatra, Palembang distr., along river, Kosterm. 14005
4. Malaya, Perak, Parit Buntar, Borwich 36576, 13.11.1939. Vern. Kwini Boli
T 5. Type - M. oblongifolia Hook. f., Herb. Griffith 1101 from Burma and Malay Peninsula (named as Mangifera foetida ? Lour.) (K) & (L)
* 6. Java, Batavia, Buitenzorg, Ochse 6.4.1925 (fl.). Perhaps from tree in Bot. Garden. Vern. Bombem
T 7. Type for M. foetida var. mollis Bl. Herb. Lugd. Bat. No. 897,363-417
T 8. Type for M. foetida var. kawini Bl. Herb. Lugd. Bat. No. 897,363-412/411/413/416
T 9. Type (Lecto) for M. foetida var. bombom Bl. Herb. Lugd. Bat. No. 897,363-409/410

APPENDIX I
(Continued)

* 10. S. Sumatra, C. Lampung, Metro, Sukadana distr., Purwosari vill. Tirtoredjo 10,13, 10.8.1961 (fl.). "Fruit, rounded, yellowish green, sweet". Vern. Kwini (L) & (K)

11. Java, Batavia. W.A. Visser. Oct. 1928 (fl.)

12. Java, Kedin, Gadoengau: Koorders 22741B (2), 4.6.1896 (leaves); 22781, 27.5.1896 (fl.)

13. Java, Pekalongan, Soebah: Kooders 136819, 22.5.1899 (leaves)

14. Java, Pekalongan, Houtvesterij Margasari: Tohkinga 4074, 11.9.1923 (fl.)

** 15. W. Java, Bantam, village near Lake Danau. Kosterm. 19004, 19.7.1961. (fl.) "Semicult". Tree 35 m Vern. Gendarassa (L) & (K)

* 16. Java, Batavia, Buitenzorg culta: Ochse 18.10.1926 (with large fruit). Perhaps in garden, Vern. Kebembem

** 17. Sabah, Sandakan, cultivated in the garden of Y.S. Long. Ding Hou 147, 27.4.1966 (fl.)

** 18. Sabah, Sandakan, Mile 1 1/2 North Road near PWD Qrs. Div. III. Ampon & Watis 48272, 26.4.1965 (fl.)

19. Sabah, Sandakan, Mile 1 1/2 North Road, in Orchid Road, near Govt. Qrs. Ampon & Watis 48270, 26.4.1965 (fl.). Vern. Wani (Malay)

20. Sabah, Sandakan, West Ward Co., Meijer & Husin 32839, 24.4.1963 (fl.)

21. N. Borneo, Sabah For. Dist., Kg, Buit Penampang, cultivated area. Sikajat 7783, 2.5.1939 (fl.). Vern. Manga wani (Malay), Wanih (Dusun). Fruit round, edible

22. Sabah, Sandakan, Sipitang distr., Lamaku F.R., Medalong, Saikeh SAN 72390, 20.10.1972 (with large fruit), on flat land, secondary forest. Fruits yellow

Collections at Kew

23. Malaya, Malacca, Herb. Griffith 1098, June 1842 (fl.)

24. Malaya, Malacca, Maingay No. 470, 1.11.1865 (fl.)

25. Malaya, Pahang, Gated road to Gap, Roadside (3400 ft.), T.C. Whitmore FRI 8627, 26.4.1968. "Fruits yellow green, sweet, resinous smell"

26. Malaya, Perak, Parit Buntar, 13.11.1939 (leaf). Berwick SFN 36575. Vern. Mangga, Kwini Bali

27. Malaya, Singapore, MacRitchie Reservoir, Corner 30800, 26.6.1936 (fl.)

28. Malaya, Irwell Bank Rd., Singapore, Corner 30799, 26.6.1936 (fl.), Vern. Kwini

29. Java, Zollinger 430

30 Sabah, For. Dist., Kg. Buit Penampang, cultivated area, Sikajat 7783, 2.5.1939 (fl.). Fruit round edible. Vern. Manga Wani (Malay), Wanik (Dusun)

31. Sumatra, Palembang, along Musi River, Kostermans 14091, Sept. 1958 (fl.). Vern. Pelem

32. Sarawak, Seriam, Bt. Gaharu (400 ft.), Primary forest, Smythies 15207, 17.10.1961 Vern. Binjai

33. Philippines, Mindanao, Zamboanga dist., R.J. Alvarez, 15427, April 1910 (fl.)

34. Philippines, Balabao Isl., L. Mangabat 502, March-April 1906 (fl.). Wild and cultivated. Fruits eaten only when green

Collection at Paris

35. Indochina, North Annam, Nghe-an (Vinh) prov., reserve forest Co-Ba, F. Fleury 30181, 13.5.1914 (fr.)

APPENDIX I
(Continued)

26. Mangifera pajang Kosterm.; Ding Hou, Flora Malesiana (1978) 8 p. 436. Not included by Mukherji in Lloydia

Collections at Leiden

1. Sarawak, 3rd. Divn., Kapit distr., Belaga sub. dist., left bank of Rajang river, about 10 km below Belaga, Segaham range, near Belaga airfield. Primary forest on sandstone hills. M. Jacobs 5217, Aug. 1921 (with big fruits about 4"). "The fruit is much wanted. All such trees in the forest have their owners". Vern. Embang (Kayan). Perhaps this is the most liked fruit of Mangifera after M. indica. This species has the biggest leaf (L) & (G)

* 2. Sabah, Sandakan, Sipitang distr., Ulu Medalong, 6 miles S.S.E. of Malamau (1750 ft.). G.H.S. Wood SAN 16783, 30.9.1955 (with small fruit). Tree 100 ft.

3. Sabah, Sandakan, Sipitang distr., Mile 60, Labuk Rd. (100 ft.) Primary forest. Meijer 38109, 24.8.1963, "Big fruit, 7" long. Vern. Bembang

* 4. Brunei, Kedayan garden, Jalan Berakas. Ashton BRUN 5172, 6.2.1959 (fl.). Tree 100 ft. Vern. Bombangan (Kedayan). (L) & (K)

5. East Borneo, Sangkulirang distr., Sq. Mandu Region, N. of Sangkulirang, Sandstone, A. Kosterm. 13502, 14.8.1957. "Fruit green with yellow tinge. Skin thick (peeled like banana); pulp yellow, fibrous, acid". (L) & (K)

T 6. E. Borneo, West Kutei, Tandjung Plateau, Padang Luwai, white acid sands, culta, near feet of Maranga Mt. A. Kosterm. 12534, 27.7.1956 (fl.). "Tree 30 m Fruit 15 cm diam. rough, brown; rind very thick (peeled like a banana). Pulp yellowish white, sweet acid. Stone flattened". Vern. Asem pajang. Type duplicate (L) & (K)

** 7. N. Borneo, Sandakan, along the rail road, near Govt. Hospital, Forest Dist. Beaufort. A. Cuadra A3046, 24.5.1951 (fruiting). "Edible fruit". Vern. Bambangan. Contact Forest Herb. Sandakan

* 8. Sarawak, Long Silat, Ulu Dapoi, wet sandy clay soil in valley, mixed Dipterocarp forest (500 m). Murthy and Ashlok S22616, 3.4.1965 (leaf). Vern. Mawang (Iban lang.), Embang (Sarawak lang.)

Note - The author has seen this species in Sarawak

27. Mangifera parvifolia Boerl. & Koord.; Ding Hou, Flora Malesiana (1978) 8 p. 431; (1) Kept as a sp. dubia by Mukherji; (2) M. parvifolia Merr. = M. merrilii Mukherji has been reduced to M. altissima Blanco by Ding Hou

Collections at Leiden

1. Sumatra West, Sihir (90 m) Van Steenis 18727, 21.8.1934
2. Sumatra, Bengkalis, Panglong, Soengei missigit, Beguin 588, 17.1.1920 (leaves)
3. Sumatra, Riouw, sub. div. Indragiri/Bovenlanden, Kwala Belilas, Neth Ind. For. Serv. No. 27585, 21.4.1939 (leaf)

* 4. Sumatra, Bengkalis, + 3 m Panglong 232, Poeloe Rangsang. Beguin 510, 39.11.1919 (with small fruit). Vern. Mempelem hera

5. Singapore, Jurong: EGH Corner SFN 26193, 5.3.1933 (fl.)

28. Mangifera pentandra Hook. f.; Ding Hou, Flora Malesiana (1978) 8 p. 426; Syn.: M. lanceolata Ridl.; Mukherji, Lloydia (1949) 12 p. 83

Collections at Leiden

* 1. Malaya, Ulu Kelantan, Relai F. Res. small valley bottom. Cockburn FRI (Kepong) 7241, 18.10.1967 (leaves). "Fruits large dark green, ellipsoid with fleshy mesocarp which may be eaten". Contact for collection FRI, Kepong, Selangor

APPENDIX I
(Continued)

* 2. Malaya, S. Perak near Kuala Rekam, Hulu Perak, Alluvial bank over shale (500 ft.). Tree 100 ft. Whitmore FRI (Kepong) 15820, 28.1.1971 (fl.). Vern. machang

Collections at Kew

3. Singapore, Changi by the bungalow, H.N. Ridley, 25.12.1914. "Two big trees". Fruiting, fruits 2-3", green
4. Malaya, Hulu Perak, S. Perak near Kuala Rekam, alluvial bank over shale (500 ft.). 28.1.1971 (fl.). Tree 100 ft. T.C. Whitmore FRI 15820
5. Malaya, Kelantan, Gimlette, March 1914 (fl.). Vern. Pauh Puteh

** 6. Malaya, 1 mile south from kota Tinggi towards Jamerluang, Mersing, T. & P. 595, 26.2.1976 (fl.). Vern. Pelum (Mempelam)

T 7. Malaya, Kedah, Alor sta, H.N. Ridley 15233, 15235, Feb. 1890 (fl. & fr.). Type? (K) & (BM)

8. Malaya, Malacca, Herb. Griffith
9. Malaya, Malacca, Herb. A.C. Maingay No. 1540, 20.1.1868 (fl.)

T 10. Malaya, Malacca, Herb. Maingay No. 1538, 21.1.1866 (fl.) - Lectotype

29. Mangifera quadrifida Jack.; Ding Hou, Flora Malesiana (1978) 8 p. 429; Syn.: (1) M. spathulaefolia Bl.; Mukherji, Lloydia (1949) 12 p. 113; (2) M. maingayi Hook. f.; Mukherji, Lloydia (1949) 12 p. 111.; (3) M. longipetiolata King; Mukherji, Lloydia (1949) 12 p. 112; (4) M. rigida Bl.; Mukherji, Lloydia (1949) 12 p. 110; Ding Hou reduced above 4 species to M. quadrifida Jack.

Collections at Leiden

* 1. Malaya, Johore, 2nd mile also at 6th mile (2 specimens) Kota Tinggi - Mawai Rd. EJH Corner SFN 34947. Tree 60 ft. (L) & (K)
2. Malaya, Johore. Sungai Kayer near Sungai Sedili, Saleh SFN 32202, 1.11.1936 (fl.). M. longipetiolata (L) & (K)
3. Malaya, Johore, Mawai Rd., Ngadiman SFN 34756A, 15.1.1938 (fl.). M. microphylla
4. Malaya, S. Kelantan, Sg. Anak Ketil, south of G. Rabong. Flood plain, High forest (800 ft.). Whitmore FRI (Kepong) 20693, 16.3.1972, young green fruits. Vern. machang
5. Malaya, Perak, open jungle, Gulod hills (200-300 ft.), Dr. King's Collector, Jan 1886 (fl.) (L), (P) & (G)
6. Malaya, Singapore, Upper Mandai, west end Seletar Reservoir. Sinclair 39994, 22.8.1953
7. Malaya, Chior For. res., Kinta, Hillside primary forest. K.M.K. 80625 (Kepong), 30.5.1935 (with fruits). Vern. machang (L) & (K)
8. Sumatra, Belimbing, Riouw en ond. Indragirische bovenlanden. Neth. Ind. For. Serv. No. 285087, 2.7.1939 (leaf)
9. Sumatra, Palembang, Banjoeasin, Koeboe (i) Streeken Endert. 143 EIP 834., May 1920 (leaf) (ii) 143 EIP 931, 21.8.1920 (fl.) Vern. sempiat
10. Sumatra, Palembang, Moesi Oeloe and Rawas, Loebook Pandau (22 m). Neth. Ind. For. Ser. No. 20298, 23.12.1935 (leaf)

T 11. Type (Lecto) for M. rigida Bl. Korthal's specimen from Sumatra at Herb. Lugd. Batav. No. 897,363 - 564/566/565 (3 specimens)

T 12. Type - M. langong Miq. collected by Diepenhorst (HB2333) from Rau, W. Sumatra, Herb. Lugd. Bat. 897,363-498

13. Sumatra, Palembang, Lematang Oeloe Res. (150 m). Lambach 1344, 8.12.1916 (leaf). Vern. Masam Koembang
14. Sumatra, Eastern, Beneden, Langkat (50 m), Neth. Ind. For. Serv. 16423, 23.3.1932 (leaf)

** 15. Sumatra, S. of Palembang, Kaju Agung, along Musi River. A. Kosterm. 14096, Sept. 1958 (fl.). Vern. Asam Kumbang. "Tree 40 m fruit fist size 7-9 cm inside yellow, outside black dotted, acid sweet" (L) & (K)

16. W. Sumatra, Sipora Isl., near Sioban, Iboet 354, 7.10.1924 (small fruits)

APPENDIX I
(Continued)

17. Sumatra, Bangka Isl., Banka, G. Mangkol (50 m). Kosterm. & Anta 800, 19.9.1949 (with half mature fruits). Tree 30 m Vern. Asem rawa (L) & (K)

* 18. Sumatra, Palembang, along Musi River 'common in marshy places'. Kosterm. 14090, Sept. 1958. Fruit black when ripe. Vern. Asam rarawa (young fruits in Sept., ripe in Oct.-Nov.) (L) & (K)

19. Sumatra, Simaloer Isl., Achmad 497, 18.6.1918 (fl.). Vern. Banan, Ampelam

20. Sumatra, Palembang, Lematang, Ilir Semangoes. Neth. Ind. For. Serv. 31943, 14.6.1940 (leaf) (b) another specimen fruiting 25.10.1921

21. Sumatra, Res., Palembang ond afd. Banjoeasin en Koiboestreken (15 m). Boschproefstn. No. 143EIP834, 15.5.1921 (fl.) (b) another specimen same area 16.8.1921 (with small fruits)

22. N. Sumatra, Atjeh, Gunung Leuser Nature Reserve, Ketambe, valley of Lau Alas, near tributary of Lau-Ketambe, about 35 NW of Kutatjane (200-400 m). Wilde & Wilde 14469, 3.2.1975 (fl.) (L) & (K)

** 23. Java, Bogor, near face of palace, along path, Dipterocarpaceae lawn. A. Kosterm. Aug. 1953 (fl.). check Bogor Bot. Garden for collection

* 24. N. Borneo, Sandakan, Lahad Datu Dist., Block 62/Sb. 8, Ken. Bay (Silabu forest, hillside), Aegidius Sitiol SAN 33412, 11.2.1963 (fl.). Tree 140 ft. Vern. Mangga Hutan (L) & (K)

* 25. Sabah, Sandakan dist., Along road track 87-88 Labuk Rd., (600 ft.). Mikil 46690, 24.6.1964 (fl.) (L) & (K)

26. Sabah, Sandakan, Kabili For. Res. level land near river bank, Agama 9952, 14.9.1938. Vern. Damaran (Bajan)

* 27 Sabah, Sandakan, Beaufort dist., Beaufort Padang. Meijer 55651, 17.10.1967 (fl.). Planted tree. Vern. Baab (Brunei) (L) & (K)

28. Sabah, Lahad Datu dist., Kenbay, Bagahak Range top, Primary forest, stony blackish soil. Ahmad Talip 47656, 26.1.1965 (fl.). (L) & (K)

T 29. Lecto-Type - M. spathulaefolia Bl., (1) Korthal's spec. in Herb. Lugd. Batav No. 897,363-576 (fl.) from Borneo, (2) Herb. Lugd. Batav No. 897,363-577 (leaf), (3) Herb. Ludg. Batav. No. 897,363-579 (fl.), (4) Herb. Lugd. Batav. No. 897,363-578 (fl.), (5) Herb. Ludg. Batav. No. 897,363-580 (fl.) (L) & (K)

** 30 Indonesia, Bogor, culta in Hort. Bogor. sub VIIE 8a (e Bangka). Kosterm. 18903, Sept. 1961 (fl.). (M. rigida Bl.). Contact Hort. Bogor (L) & (K)

31 Sabah, Sandakan dist., Sepilok For. Res., Primary forest, low undulating country. J. Singh SAN 22552, 24.8.1960 (fl. & small fruits). Vern. Asam (L) & (K)

32 Sabah, Tawau distr., summit of Quoin Hill, Balong area, 15 miles NE of Tawau, (1900 ft.). Wood SAN 16487, 20.10.1955 (fl.). Tree 130 ft. (L) & (K)

33 Brunei, Tanjong Maya, Tutong, riverside, Hamid (Kepong) 37065, 1.3.1939 (fl.). Vern. Rancha-rancha (L) & (K)

34 East Borneo, Balikpapan sub-dist, Mentawir River basin, devastated primary forest, scarce, scattered. Sauveur 95, 11.7.1951 (fl.). Tree 36 m Vern. Asam putaran (Banjar - Malay lang.) (L) & (K)

35. Borneo, Tdg. Bangko region, mouth of Mahakam river (20 m), low ridge, sandy soil. Kosterm. 7175, 5.6.1952 (fl.). Vern. Asam putaran. Tree 30 m

Collections at Kew

T 36. Malaya, Herb. Maingay No. 472, Malacca, 6.3.1867 (fl.). Syntype M. maingayi

37. Malaya, Kedah, Chutch 21503, 4.1.1930 (fl.). Vern. Paoh

38. Malaya, Pahang, Bukit Beserah Kuantan, Yeop 848, 17.3.1920 (fr., about 1"). Vern. Asam Kumbang

39. Malaya, Perak, Parit Buntar, Agric. Officer 34901, 5.2.1938 (leaf). Vern. Machang Pulasan (M. maingayi)

T 40. Malaya, Perak, Larut (2500 3000 ft.), Dr. King's collector 7266, Feb. 1885 (fl.). Tree 40-60 ft. Type for M. longipetiolata (K), (BM) & (P).

41. Malaya, Malacca, Maingay 472, 26.7.1867 (leaf), marked as M. longifolia

42. Malaya, Larut Perak, No. KEP 63472, 28.2.1952 (fr., fruits about 1 1/2")

APPENDIX I
(Continued)

43. Malaya, Trengganu mountains, South Bank (1320 ft.), T.C. Whitmore FRI 20348, 1.7.1971 (unripe fruit 2"), fruit 2" long, unripe, Vern. Machang
44. Malaya, Johore, Sungai Sedili, corner SFN 32436, 28.3.1937 (fl.)
45. Malaya, Maingay No. 468 (fl.)
46. Sabah, Sandakan, Sg. Ruku-ruku, near camp site, Telupid; logged forest, on river bank; Aban Gibot SAN 94008, 4.8.1981 (fl.), Vern. Bahab
47. North Borneo (British), Goklin 2233, 19.5.1932 (fl.). Vern. Rancha Rancha (Brunei). M. quadrifida Jack. var. spathulaefolia Bl.
48. Sarawak, on side slope of mixed Dipterocarp forest, yellow sandy loam (800 m), Othman Ismawi S.37807, 31.12.1976 (fr.). Fruits green. M. longipetiolata
49. E. Borneo, Balikpapan dist., Mentawir, River region, low sandy ridges, Kosterm. 9739, 14.7.1954 (fl.). Tree 35 m
50. E. Borneo, Bangko region, mouth of Mahakam river, Kosterm. 10753, 13.9.1954 (fl.). Tree 20 m

30. Mangifera reba Pierre; Flore du Cambodge, du Laos et du Vietnam (1962) 2 pp. 94-95

Collections at Paris
1. Indochina (no locality), Chevalier 36747, March 1918 (fl.). Vern. Queo
2. Indochina, Vietnam (Sud), Bien Hoa prov., Pho Qua, Pierre 1648, March 1877 (fr.). Fruits big, 8-10 cm (mature in March). Vern. Reba

Note - In Monograph by Mukherji (1949) it was kept as sp. dubia as flowers were not known. As the flower has been described in Flore du Cambodge (1962), presumably from the single specimen by Chevalier, it may be regarded as a distinct species especially for its distinct large fruits, which are edible. It is an endemic and endangered species

31. Mangifera siamensis Warb. ex Craib; Mukherji, Lloydia (1949) 12 p. 93. Not included in Flora Malesiana; allied to M. indica

Collections at Kew
T 1. Thailand, S. Schmidt 374 (Type?) (fl.)
2. Solomon Isl., Bougainville, Waterhouse 153 (fl.)
3. Solomon Isl., New Georgia, coast, Waterhouse 305, 26.8.1939 (fl.). An indigenous species of mango. Fruit edible. Vern. Rereke
4. Solomon Isl., Guadal Canal near Malimby river, in rain forest, Walker & White 37, 16.7.1945 (leaf)
5. Solomon Isl., Bougainville, Siwai, Waterhouse 799B, Nov. 1932 (fl.). An indigenous mango. Vern. Konsi
6. Solomon Isl., S.E. New Georgia, Patutiva, primary forest, L. Maenu'v 6439, 24.7.1965 (fl.). Vern. Asai (Kwarae)

Note - examine Forest Herbarium Bangkok before collection

32. Mangifera similis Bl.; Ding Hou, Flora Malesiana (1978) 8 p. 429; Mukherji, Lloydia (1949) 12 p. 105; allied to M. quadrifida (Ding Hou)

Collections at Leiden
1. Sumatra, Bangka, Lobok Besak (30 m). A. Kosterm. 3406, 18.9.1949 (small fruit). Primary forest, rather scanty
2. Sumatra, Palembang, Banjoeasin en Koeboestrechen, (i) Endert 51EIP 553 (leaves), (ii) Endert 51EIP 609, 21.8.1921 (fl.). Vern. Tajas
3. Sumatra, Palembang, Lematang Ilir, Semangoes,(i) Neth. Ind. For. Serv. 32102, 26.6.1940 (leaf),(ii) Neth. Ind. Boschproefstn. 566, 22.8.1923 (fl.).

APPENDIX I
(Continued)

4. S.E. Borneo, E. Kutei, Sg. Tiram, old primary forest, very scanty, scattered. A. Kosterm. 35018, 15.4.1952 (leaf). Tree 36 m Vern. Asam pipit (Kutei lang.)

5. Borneo, Loa Djanan, west of Samarinda, sandy loam soil ridge. Kosterm. 6594, 22.4.1957 (with big fruits). "Fruit, green, flesh very juicy, acid, very fibrous", roundish about 1 1/2" diam. When fruits cut into two (Putaran = to turn) seeds come out. Vern. Asam Putaran. (L) & (K)

T 6. Korthal's specimen from Borneo in Herb. Ludg. Bat. No. 897,363-570 Lecto-Type, M. similis.

T 7. East Borneo, West Kutei, Tandjung Plateau, Padang Luwai, white, acid sands. A. Kosterm. No. 12533, 25.7.1956 (fl.) (Isotype for M. torquenda Kosterm. = M. similis Bl.). Tree 30 m "Fruit 10 cm dia., globular, smooth, yellowish green; rind thin; pulp pale yellow, sweet acid. Stone biconvex, about 4 cm thick, culta". Vern. Asam putaran (L), (K) & (BM)

** 8. Indonesia, Bogor. "Plants cultivated in the Botanic Garden". Garden no. VI. D.8. 12.3.1960. Unripe fruit

9. Sabah, Tawau dist., Tawau Hill F.R., NE of Waterfall (1500 ft.). Meijer No. 62918, 17.4.1968 (with unripe fruit). Primary forest, blackish soil

* 10. Sabah, Sandakan South Dist., Comp. 415, Kretam F.R. Disturbed forest. Low undulating country. John Hui SAN 18210, 1.12.1962 (with large fruit). Fruit yellowish green. Vern. Asam (L) & (K)

Collection at Kew

11. S.E. Borneo, Balikpapan, Mentawir River basin, E.G. Sauveur 34971, 27.6.1951 (leaf). Sandy clay. Primary forest, rare, scattered. Vern. Hambawang

33. Mangifera superba Hook f.; Ding Hou, Flora Malesiana (1978) 8 p. 439; Mukherji, Lloydia (1949) 12 p. 128. Closely allied to M. caesia with 5 stamens fertile. It has the largest flower of all Mangifera species

Collections at Leiden and Kew

1. Malaya, Johore, Sungai Bedok, Yong Pong, EJH Corner SFN 34969, 8.5.1938 (leaf) (L)

T 2. Malaya, Malacca, Maingay 476, 17.1.1866 (fl.). Type (K)

Note - One leafy specimen in Leiden; only 2 specimens at Kew (Type)

34. Mangifera sylvatica Roxb.; Mukherji, Lloydia (1949) 12 p. 94. Not included in Flora Malesiana

Collections at Leiden

1. India, Sikkim, Rangit Valley, S. Kurz, Herb Sulp. Kur (fl.)

2. India, Herb. Wall Cat. No. 8487 (L) & (K)

* 3. Ceylon, Road Bibile to Mahyangane. Dry zone. Kosterm. 24407, 4.6.1971 (fl.) "Wild mango". New record for Flora of Ceylon

Collections at Kew

** 4.. Bangladesh, Chittagong, Chwah R.F., S. 1.4.1976 (fl.) (K) & (G)

5. India, Sikkim (1-4000 ft.), J.D. Hooker (leaf only, very big leaf)

** 6. India, Gt. Rangit, Darjeeling, J.S. Gamble 1297A, 6/1874 (small fr.), wild

7. India, Sikkim, Mungpoo (3000 ft.), G. King, 3.7.1876 (fr.)

* 8. India, Andamans South, S. Kurz (leaves only)

9. Thailand, Muak Lek, Saraburi, Kerr 10006, 19.1.25 (fl.) Vern. Mak Muang

** 10. India, Khasi Hills (2-3000 ft.), J.D. Hooker & Thompson, Herb. Ind. Or. Hook. f. & Thomp (wild)

APPENDIX I
(Continued)

11. India, Darjeeling, Chunbati (3000 ft.), Sykes Gamble 573A, 28.4.1876 (fl.), wild
12. Sikkim, Sikkim, Yankeung (3000 ft.), C.B. Clarke
13. Cambodia, Kamput prov., (200 m), Pierre 1652, April 1874 (fl.)
14. Thailand, Doi Pa Kao (1500 m), Kerr 5380, 7.5.1921 (fl.), evergreen forest
15. Thailand, Baw Rai (1200 m), Kerr 9510, 30.4.1924 (fl.), in evergreen forest by stream. Vern. Mamuang Ki tai

Collections at British Museum

16. Nepal East, Soktim Tea Estate, Mai Khola (1500 ft.), J.D.A. Stainton 6784, 18.4.1971 (fl.), in a shady evergreen gulley
17. Nepal East, Tamur valley, Mewa Khola (3500 ft.), J.D.A. Stainton 5872, 20.4.1967 (fl), in mixed moist subtropical forest. Tree 40 ft.
18. Sikkim, Legship (2000 ft.), Stainton 5372, 28.4.1966 (fl.), in subtropical forest. Tree 30 ft.
19. Thailand, Pak Chong (300 m), A. Marcan 1592, 2.1.1924 (fr.), jungle, riverside. Vern. Makmuang Kasaw
20. Thailand, Ban Rai, Krat (200 m), Kerr 9510, 30.11.1924 (fl.), evergreen forest by stream. Vern. Mamuang Ki tai
21. Thailand, Doi Pa Kao, (1500 m), Kerr 5380, 7.5.1921 (fl.), evergreen forest

Collections at Geneva

22. India, E. Himalaya, Birick (Mirik?) (2000 ft.), G.H. Cave 1.5.1913 (fl.)
23. India, E. Himalaya, Sivoke, Terai, G.H. Cave, 16.4.1912 (fl.)

35. Mangifera timorensis Bl.; Ding Hou, Flora Malesiana (1978) 8 p. 432; Mukherji, Lloydia (1949) 12 p. 114

Collections at Leiden and Kew

1. Celebes, sub. div. Malili, Oesoe (150 m). Neth. Ind. For. Serv. No. Cel-II - 123, 5.7.1934 (leaf) (L)
2. Celebes, Malili, Kanata, Boschproefst. No. Cel/II-448, 12.12.1930 (fl.) (L)
* 3. Celebes, Malili, Oesoe, Bosch. No. Cel/II-473. 19.1.1931/9.3.1931 (Fruits small) (L)
4. Sunda Isl., W. Flores Isl., Manau near Ruteng (1200 m). Kosterm. & Wirawan 616A, 24.4.1965 (leaf) (L) & (K)
5. Sunda Isl., W. Sumbawa Isl., Mt. Batulante, trail from Batudulang to Punik and Pusa (900-1000 m). Kosterm. 19115, 25.10.1961 (fl. & fruit), scattered from 400-700 m alt. in river valleys, large tree "Fruit not edible, hard". Vern. Mangga latar. (L) & (K)
6. Timor, Harte valley, Lahane Castro (fl.) (L)
7. Sunda Isl., W. Flores Isl., south part near Dalur (800 m), along river, large tree. Kosterm. 22143A, 12.5.1965 (leaf) (L)
* 8. Sunda Isl., W. Sumbawa Isl., Mt. Batulante, trail from Batudulang to Pusu (900-1000 m). "Tree 45 m Fruit roundish, yellow and reddish when ripe, yellowish inside". Kosterm. 19096, 24.10.1962 (fruiting). Vern. Mangga olat (L)
9. Sunda Isl., W. Sumbawa Isl., Mt. Batulante, (N.W. part), andesite, Moist forest (7-1000 m). Kosterm. 18543, 27.4.1961 (fl.). Tree 40 m (L) & (BM)
T 10. Timor, type duplicate, M. timorensis (i) Herb. Lugd. Bat. No. 7,899-169, fruiting, (ii) Herb. Ludg. Bat. No. 897,363-582 (fl.), (iii) Herb. Ludg. Bat. No. 897,363-583 (fl. & fruit) (L)
* 11. Indonesia, Bogor, culta in Hort. Bogor sub. Vii.E.22a, Kosterm. 8900, Sept. 1961 (fl.). Tree 20 m (L)
12. Molucca, Tanimber Isl., Ilgnei Otimer, Neth. Ind. For. Serv. No. 24294, 17.3.1938 (leaf) (L)
13. Molucca, Tanimber Isl., Jamdena, Laurang, Borssum, 3347, 11.4.1956 (fl.). Tree 15 m (L) & (K)

APPENDIX I
(Continued)

36. Mangifera zeylanica Hook. f.; Mukherji, Lloydia (1949) 12 p. 97. Not included in Flora Malesiana

Collections at Kew

** 1. Ceylon, N.W., Wilpattu National Park, between Etambagaha and Dangaha Uraniya in Plot W32, M. Wirawan 1077, 11.7.1969. "Tree up to 20 m high, fruit green about 1-1 1/2 long", like wild mango. Vern. Attamba

2. Ceylon, Anuradhapur dist., Fosberg & Bala Krishnan 53460, 9.12.1970 (small fruit)

3. Ceylon, Dambatenna, Kitulgala, J.M. Silva 216, 17.3.1928 (fl.)

4. Ceylon, Kandy dist., Bible rock (2618 fl.), Sumithraarachchi and Fernando DBS 122, 19.3.1974 (fl.)

** 5. Ceylon, Ratnapura dist., Sri-Palabaddala, I.B.P. Plot, S. Waas 4, 29.9.1973 (fl.). "Tree about 12 m, in primary forest"

6. Ceylon, Illukkumbura (500 m), Jayasuriya and Bandarnayake 1775. "Tree 15 m tall, in Intermediate forest", (fr., about 1-1 1/2)

* 7. Ceylon, Kalawana - Moropitya Road, Kosterm. 24636, 27.4.1973 (fr.). "Low, wet evergreen forest, along rivulet. Tree 12 m, fruit green". Vern. Etamba (K), (BM) & (G)

8. Ceylon, Hunasgiria, near village, road ;to Corbets gap, in ravine (800 m), Kosterm. 27390, Feb. 1979 (profuse flowering). Tree 15 m tall, 160 cm diagiant tree (K) & (G)

Collections at British Museum

9. Ceylon, Nawalapitiya, T.B. Worthington 373, 1.5.1939 (leaf). Vern. Etamba

10. Ceylon, Habarane (600 ft.), Worthington 5178, 20.3.1951 (fl.), anywhere in Ceylon

11. Ceylon, Bataphola Galle, Roadside (50 ft.), Worthington 2463, 21.1.1947 (fl.). Vern. Etamba

12. Ceylon, Dotelaya Dolosbage (3100 ft.), Worthington 1918, 13.6.1946 (leaf), stream side in big jungle

13. Ceylon, Hautane (3500 ft.), Worthington 254, 19.5.1939 (fl.). Vern. Et Amba

Collection at Paris

14. Ceylon, Road Bibuile to Mahyangane, dry zone, Kosterm. 24410, 4.6.1971 (fr.). Tree 35 m "Ripe fruit 2-4 cm long, yellow and red, sweet". Vern. Etambe (P) & (G)

Collection at Geneva

* 15. Ceylon, Ratnapura; dist., Sabaragamuwa prov., Tumbagoda, above Balangoda, Adam's Peak jungle, along river (500 m). Kosterm. 24468, 9.6.1971 (fr.). Tree 30 m

APPENDIX II

Distribution, ecology, vernacular names, flowering and fruiting time and uses of Mangifera species

1. Mangifera altissima Blanco

i) DISTRIBUTION
Widely distributed
New Guinea (Manokwari, Tiporrah, Kebar Valley, Adi Island, Morobe, Sepik, Vogelkop, Misool),
Moluccas (Ceram),
Celebes (Malili),
Philippines (Luzon, Rizal, Mindoro, Mt. Yagaw, Sibuyan),
Papua (North district),
Solomon Islands (Guadal Canal)

ii) ECOLOGY
Chiefly in primary inland forests, sometimes in coastal forests

iii) VERNACULAR NAMES
New Guinea: Boeja (Manokwari), Wa wa (Karastaal), Waromet (Amberbaken language), Bissap (Kebar language), Karmesan (Biak language), Wommie (Manikiong language),
Papua: Poliok,
Philippines: Pahu (Mindoro), Pahutan

iv) FLOWERING AND FRUITING TIME
Flowering: Nov.-Dec. in New Guinea; Feb.-April in Philippines
Fruiting: Dec.-Jan. (Philippines)

v) USES
Fruits edible, used in Philippines for making pickles. Fruits purplish yellow while ripe in New Guinea, Sepik district

Notes - It is a distinct species with 25 collections at Leiden, 12 at Kew and 2 at Paris. It occurs in Philippines and New Guinea. "It is of wide distribution in the northern and central parts of the Philippines" (Merrill), especially in Luzon. A sylvan species. It is "not threatened"

2. Mangifera andamanica King

i) DISTRIBUTION
Endemic, rare
Andamans (Mt. Harriet, Hilly jungle, Holedaypur, Jhirkatang)

ii) ECOLOGY
In primary forests

iii) VERNACULAR NAMES
Not reported

iv) FLOWERING AND FRUITING TIME
Flowering: Jan.-April
Fruiting: Nov.

v) USES
Not reported

APPENDIX II
(Continued)

Notes - It is an endemic and "rare" species, known only from 2 collections at Kew, of which 1 is a Type collected in 1884 and the other in 1891. It may become "endangered" and requires protection

3. Mangifera caesia Jack.

i) DISTRIBUTION
Widely distributed
Malaya (Kedah, Penang, Johore, Singapore, Malacca, Pahang, Bantam, Trenggann),
Sumatra (north),
Java (Batavia, Buitenzorg),
Sabah (Ranau, Sandakan, Jesselton),
Sarawak (Kuching),
Brunei (Labu),
Bali (Negara),
Philippines (Mindanao, Kahibaan)

ii) ECOLOGY
In lowland primary forests, swamp forests, or in periodically inundated areas along rivers, up to 450 m

iii) VERNACULAR NAMES
Sumatra: Bindjai (Malayan),
Sarawak: Binjai pulut,
Brunei: Beluno (Kedayan language),
Sabah: Beluno (Sandakan),
Malaya: Beenjai, Kemang

iv) FLOWERING AND FRUITING TIME
Flowering: usually May-Aug.
Fruiting: Dec.-June; in Malaysia April-June (Ding Hou)

v) USES
A well known fruit tree common in orchards in Malacca. A sweet fruited variety in Malaysia is Binjai manis

Notes - About 35 specimens in Leiden, the majority from Borneo and Java; 10 collections at Kew, 4 at British Museum and 3 at Paris. It is a distinct species, widely distributed from Malaysia to the Philippines. It is also cultivated as the fruits are used by local people. It is "not threatened"

4. Mangifera caloneura Kurz.

i) DISTRIBUTION
Restricted
Burma (Pegu Yomah, Martaban, Mergui),
Thailand

ii) ECOLOGY
Frequently in low and lower mixed forests of Pegu Yomah and dry deciduous forests and savannah of Thailand

iii) VERNACULAR NAMES
Burma: Taw thayet,
Thailand: Mamuang pa, Mamuang kau

APPENDIX II
(Continued)

iv) FLOWERING AND FRUITING TIME
Flowering: April and Aug. (Burma); Nov.-Feb. (Thailand)
Fruiting: Jan.-April (Thailand)

v) USES
Not reported

Notes - No collections from Burma after 1913. It is "insufficiently known". It is restricted to Burma and Thailand; 11 specimens at Kew

5. Mangifera camptosperma Pierre

i) DISTRIBUTION
Restricted
Cochinchina (Saigon, Taynin),
Burma (Mergui, North Pegu (Baingda Reserve) Salween (Mewang Reserve), south Tenasserim, Bassein),
Thailand (eastern province, Chaiaphum district)

ii) ECOLOGY
On hillside along river and in reserve forests (Mukherji)

iii) VERNACULAR NAMES
Burma: Thayet pya,
Thailand: Mak muang,
Vietnam: Bui

iv) FLOWERING AND FRUITING TIME
Flowering: Dec.-April
Fruiting: March-April

v) USES
Fruit not edible

Notes - It is rare in the herbarium collections. Common tree on hills near Tenasserim River, Burma. The species has distinctive fruits. The author states that it is also found in the Andamans. It is a "rare" species

6. Mangifera cochinchinensis Engl.

i) DISTRIBUTION
Endemic
Indochina (Thudaumot, Saigon, Cambodge, Mekong)

ii) ECOLOGY
In forests

iii) VERNACULAR NAME
Indochina: Xoay nut (Annam)

iv) FLOWERING AND FRUITING TIME
Flowering: Jan.-May
Fruiting: March-May

v) USES
Fruits, though of inferior quality, are liked by native people (Pierre)

APPENDIX II
(Continued)

Notes - Phylogenetically important because of 5 fertile stamens. It is reported only from 4 specimens from Cochinchina and 4 from Vietnam collected mainly 1862-1869. It is in urgent need of survey and conservation. It is an "endangered" species

7. Mangifera decandra Ding Hou

i) DISTRIBUTION
Restricted
Sumatra (Palembang, Pakanbaru),
Sabah (Sandakan, Sibuga, Tawau, Kuala belait),
Brunei (Andulan, Kuala belulong),
Sarawak (Bintulu)

ii) ECOLOGY
Lowland primary forests, sometimes in freshwater swamp forests, occasionally in secondary forests up to 100 m

iii) VERNACULAR NAMES
Sumatra: Biendjai,
Sabah: Beluno (Dusun language), Binjay (Tidang language),
Sarawak: Mawong (Iban language)

iv) FLOWERING AND FRUITING TIME
Flowering: May-July
Fruiting: Sept.-Oct.

v) USES
Fruits edible, sour

Notes - It is a species with scattered distribution, restricted mainly to Sabah. It is "not threatened"

8. Mangifera dongnaiensis Pierre

i) DISTRIBUTION
Rare, restricted, endemic
Indochina,
Vietnam (Bien Hoa, Giaray, Djiring)

ii) ECOLOGY
In forests

iii) VERNACULAR NAMES
Indochina: Queo

(iv) FLOWERING AND FRUITING TIME
Flowering: Feb.-March
Fruiting: May-June

(v) USES
Not known

Notes - It is known only from 4 collections at Paris. From the description in Flore Cambodge it appears to be closely allied to M. indica. It is a doubtful species and "insufficiently known". It is rare and endemic

APPENDIX II
(Continued)

9. Mangifera duperreana Pierre

i) DISTRIBUTION
Restricted
Indochina (Isie of Phu-quoc, Taynin. Thudaumot, Bienhoa, Ca Na, Samrongtong),
Thailand (Ta Ngaw, Chumpawn, Chantaburi, Surin)

ii) ECOLOGY
Edge of evergreen forests

iii) VERNACULAR NAMES
Indochina: Queo (Annamite), Svai prey, Sa vai, Xoai lina, Xoai,
Thailand: Mamuang kau

iv) FLOWERING AND FRUITING TIME
Flowering: Dec.-March
Fruiting: April-May

v) USES
Fruits, though smaller and inferior, eaten by native people

Notes - Phylogenetically important because of 10-12 stamens, 5-6 fertile. It has restricted distribution and is rare. Only 2 collections have been made after 1927. It may become "endangered". It requires immediate survey and conservation

10. Mangifera flava Evrard

i) DISTRIBUTION
Rare, restricted, endemic
Indochina,
Cambodge (Pursat province),
Vietnam (Quang Nam, Phaurang, col/Massif du Brian)

ii) ECOLOGY
In forests

iii) VERNACULAR NAMES
Not known

iv) FLOWERING AND FRUITING TIME
Flowering: Feb.-March
Fruiting: March-April

(v) USES
Not known

Notes - It is allied to M. sylvatica but with long petiole like M. longipetiolata. It differs from M. sylvatica in 4 cm long roundish fruits with protruded prominent beak at the side and not at apex (as in M. sylvatica). It is rare, endemic and "endangered". Flowers appear to be bigger than M. sylvatica

APPENDIX II
(Continued)

11. Mangifera foetida Lour.

i) DISTRIBUTION
Widely distributed and showing great variation
Malaya (Pahang, Perak, Johore, Selangor, Malacca, Singapore, Bentong),
Burma (Tenasserim),
Sumatra (Palembang, Riow, Tapenoeli, Indragiri, Lampung),
Java (Yapara, Pekalongan, Pasar Mingoe, Sangrawa),
Sabah (Sandakan, Sipitang, Lahad Datu, Ranau),
Sarawak (Kuching),
east Borneo (west Koetai, Balikpapan),
Celebes (Malili),
New Guinea (Manokwari),
Cochinchina (Tonkin),
Thailand (Ta Rong Chang)

ii) ECOLOGY
Widely cultivated in Malesia, sometimes as village trees. Escapes are naturalized or indigenous in dryland, lowland primary forests, also on hill ridges. Very common in west Koetai in central east Borneo

iii) VERNACULAR NAMES
Malaya: Machang, Machang utan, Bachang,
Sumatra: Ambatjang, Batjang, Embachang, Limus,
Java: Batjang, Pelem bawang, Limoes,
Sabah: Asam,
Sarawak: Pudu, Pelam (Kayan), Machang,
east Borneo: Tempajang, (Mangga Batjang),
Celebes: Mangga hoetan,
Thailand: Ma mut, La mut,
Burma: La mote,
Cochinchina: Xoai hoi, Soai ca lam,
New Guinea: Boeja

iv) FLOWERING AND FRUITING TIME
Flowering: almost throughout the year in different localities, but mainly in two flushes once during Dec.-March and again during May-July
Fruiting: maturity in May-July and again in November

v) USES
The fruit is much eaten when ripe. It is also used in curries or as pickles. Bark has some reputed medicinal value

Notes - A distinct species with wide variability. It is widely distributed and also cultivated. Fruits are large. There is little danger of its extinction. It is "not threatened"

12. Mangifera gedebe Miq.

i) DISTRIBUTION
Widely distributed
Sumatra (Palembang, Lampung),
Java (Bantam, Serang),
east Borneo (very common in west Koetai)

ii) ECOLOGY
Riverbanks and lowland forest below 100 m. It is a distinct constituent of 'rapak' type of swamp forest, which is inundated during most of the year

APPENDIX II
(Continued)

iii) VERNACULAR NAMES
Sumatra: Kedepir or gedepir,
west Java: Kedepir,
Borneo: Kutei (Kepih),

iv) FLOWERING AND FRUITING TIME
Flowering: June-Sept.
Fruiting: Aug.-Nov.

v) USES
Fruits are of inferior quality, only edible when unripe; when ripe the pulp is too scanty and hard to eat (Kosterm.)

Notes - It is widely distributed but populations are small. It requires urgent conservation in East Borneo (Kutei region). It is a "rare" species, but may become "vulnerable"

13. Mangifera gracilipes Hook. f.

i) DISTRIBUTION
Endemic, rare
Malacca (very scarce, no one seems to have found it again after Maingay's collection from Malacca (Ridley))

ii) ECOLOGY
Not known

iii) VERNACULAR NAME
Malacca: Medang

iv) FLOWERING AND FRUITING TIME
Not known

v) USES
Not known

Notes - Rare and in any case a doubtful species. It is known only from the Type collection by Maingay at Kew. It requires survey. It is endemic and an "insufficiently known" species

14. Mangifera griffithii Hook. f.

i) DISTRIBUTION
Widely distributed especially in Malaya
Sumatra (Palembang),
Malaya (Perak, Pahang, Selangor, Johore, Malacca),
Singapore (Jurong),
Borneo (Sabah, Sarawak)

ii) ECOLOGY
Scattered in lowland forests up to 360 m

iii) VERNACULAR NAMES
Malay: Rawa, Buak rawa rawa, Labuk

APPENDIX II
(Continued)

iv) FLOWERING AND FRUITING TIME
Flowering: Oct.-Nov., March
Fruiting: Jan.-Oct.

v) USES
Fruits are edible for which it is cultivated

Notes - There is considerable variability due to merger of 3 species by Ding Hou. The leaves are small in M. microphylla and thick in M. sclerophylla. It is an "insufficiently known" species

15. Mangifera havilandii Ridl.

i) DISTRIBUTION
Widely distributed in Borneo
Sarawak (Semangoh, Sadong, Rejang delta),
Sabah (Ranau, Lahad Datu, Tawau),
Malaya (Perak)

ii) ECOLOGY
Freshwater swamp forests or inundated areas, also in primary lowland forests on dryland up to 300 m

iii) VERNACULAR NAMES
Sarawak: Raba, Asam raba,
Sabah: Asam damaran (Tungku), Rancha rancha (Ranau),
Kalimantan: Asam bulitisan,
Malaya: Rengas

iv) FLOWERING AND FRUITING TIME
Flowering: Sept.-Nov.
Fruiting: March-Oct., ripen mainly in May

v) USES
Edible, fruits small

Notes - It has restricted distribution in Borneo, mainly in Sarawak. Its occurrence in Peninsular Malaysia is doubtful. The species is "insufficiently known"

16. Mangifera indica L.

i) DISTRIBUTION
Very widely distributed and showing considerable variation
Wild in India, Bangladesh, Burma, Malaya, Thailand and Indochina. Naturalized, possibly introduced in Java, Sumatra, Sunda Isl., Borneo, Indonesia and Philippines. From the specimens at Kew, it is also found wild in China (Fukien, Yunan, Hainan), Malaya (Kuantan Pakang, Perak), and Ceylon

ii) ECOLOGY
Present in primary and secondary lowland forests on hill slopes; scattered, not gregarious

iii) VERNACULAR NAMES
Many. See Mukherji, Lloydia (1949) 12 p. 84 and Ding Hou, Flora Malesiana (1978) 8 p. 428

APPENDIX II
(Continued)

iv) FLOWERING AND FRUITING TIME
Flowering: Dec.-April in India
Fruiting: May-Aug. also Oct.-Nov. in India

v) USES
This species provides many varieties of the important tropical fruit mango. Most important in India. Widely cultivated in India, Burma, Indonesia, Philippines, Egypt, Pakistan, Bangladesh, Tropical Africa and the Americas. Wood is also used for various purposes

Notes - It is a distinct species, growing wild in India, Bangladesh, Burma, Thailand and China. Commonly found as scattered plants with very small fruits in northeast India, India-Burma border and Bangladesh (Chittagong Hill Tracts). It is "not threatened"

17. Mangifera inocarpoides Merr. & Perry.

i) DISTRIBUTION
Endemic
New Guinea (southern part),
Papua (west district)

ii) ECOLOGY
Lowland rain forest along rivers and creeks at low altitude.
Abundant in rain forest along creeks in west Papua

iii) VERNACULAR NAMES
Papua: Begbegere (Cocodala dialect), Pranprh (Hamoa language), Wabmu (Pomboa language)

iv) FLOWERING AND FRUITING TIME
Flowering: July-Dec.
Fruiting: Nov.-Jan.

v) USES
Fruits said to be edible, compressed

Notes - It is an endemic and "vulnerable" species. Although it is reported by Brass to be "abundant in rain forests along creeks between Morehead and Wassi Kussa river in Papua" there are only 4 collections in herbaria since the species was described in 1941. Hence there is necessity for survey and conservation

18. Mangifera khasiana Pierre

i) DISTRIBUTION
Endemic, very rare
India (Assam, Khasi Hills)

ii) ECOLOGY
On hill slopes at 4000 ft.

iii) VERNACULAR NAMES
Not known

iv) FLOWERING AND FRUITING TIME
Flowering: May
Fruiting: not known

APPENDIX II
(Continued)

v) USES
Not known

Notes - Since establishment of the species in 1897, it is known only from the Type specimen of Kurz. No further collection has been made. It is very rare, endemic and "insufficiently known"

19. Mangifera lagenifera Griff.

i) DISTRIBUTION
Widely distributed
Malaya (Johore, Perak, Malacca),
Sumatra (Riouw, Karimun),
Thailand

ii) ECOLOGY
Lowland forests up to 150 m sometimes in temporarily inundated places

iii) VERNACULAR NAMES
Sumatra: Landjut,
Malaya: Langoot, Lanjut

iv) FLOWERING AND FRUITING TIME
Flowering: Jan.-Sept.
Fruiting: March-May

v) USES
The fruit is used but it is not well liked as it is coarse

Notes - The species is distinct and occurs mainly in Peninsular Malaysia. Sumatra and Sarawak should be explored to investigate whether it is allied to M. sylvatica. It is an "endangered" species

20. Mangifera longipes Griff.

i) DISTRIBUTION
Widely distributed and showing variation
Malaya (Singapore, Perak, Pahang, Malacca, Trengganu, Bukit Timah, Kelantan).
Burma (Pegu, Mergui),
Java (Pasoeroean, Bawean Isl., Pentjang Isl., Besoeki, Pekalongan),
Sumatra (Tapianoeli, Sibolangit, Palembang, Pajakumbuh),
Sabah (Sandakan, Lahad Datu, Kudat, Tawau, Mostyn),
Sarawak (Kuching),
east Borneo (Balikpapan, E. Kutei),
west Flores Isl.,
Timor,
Indonesia (Mt. Batulante),
Philippines (perhaps introduced),
Indochina (Cambodia (Kampot), Vietnam (Mt. Chua Hae))

ii) ECOLOGY
In lowland primary forests, sometimes also in secondary forests, rarely on coral limestone up to 400 m

APPENDIX II
(Continued)

iii) VERNACULAR NAMES
Malaya: Machang, Machang api, Boa pow,
Burma: Thayet the nee, Thayet,
Java: Mangga pari, Parih,
Sumatra: Asam pun, Ampelan dotan, Mangga tiakar, Pauh gadang,
Sabah: Manga hutan, Pauh kijang,
Sarwak: Emplam,
west Flores Isl., Pauh pong,
Vietnam: Xoai nui, Quec

iv) FLOWERING AND FRUITING TIME
Flowering: Feb.-Nov.
Fruiting: fruits ripen in Oct.-Dec.

v) USES
Sometimes cultivated near villages

Notes - It is a distinct species, widely distributed, common in Borneo. It is also planted. It is "not threatened"

21. Mangifera macrocarpa Bl.

i) DISTRIBUTION
Widely distributed but sparse
Malaya (Perak, Kelantan, Negri Sembilan, Trengganu, Malacca, Pahang),
Sumatra (Simaloer Isl.,),
Java (Batavia, Anambas and Loa Djanan Isl.),
Sabah (Sipitang, Beaufort, Kabili-Sepilok)

ii) ECOLOGY
Lowland and hill ridges in primary forests

iii) VERNACULAR NAMES
Malaya: Machang api, Machang lavid,
Sumatra: Hadju, Mangga utan,
Java: Gompohr, Asan,
north Borneo: Kayu bansiku

iv) FLOWERING AND FRUITING TIME
Flowering/Fruiting: Kosterm. has not seen flowering or fruiting in 10 years. One specimen from Beaufort district, Sandakan, has small fruits in April. Kew specimens indicate flowering in October and January, fruiting in October

v) USES
Fruits large, green; may be eaten

Notes - It is sparsely distributed in Malaysia, Java and Sabah. Fruits are edible and used. It is "not threatened"

APPENDIX II
(Continued)

22. Mangifera minor Bl.

i) DISTRIBUTION
Widely distributed, especially in New Guinea
Celebes (Ban Dan, Raha, Loeoek),
Sunda Isl. (Flores, Solomons),
Molucca (Soela),
New Guinea/Papua (Manokwari, New Britain, Madang, Morobe, Milne Bay, Sorong, Misima Isl.),
Solomon Isl. (Bougainville, Guadal canal, New Georgia, Fragaria Bay)

ii) ECOLOGY
In lowland primary forests, also sometimes in secondary forests, up to 400-700 m; sometimes planted near villages. Rather common in Manokwari (New Guinea) and Milne Bay (Papua)

iii) VERNACULAR NAMES
New Guinea: Kaoe or Koai (Mooi language), Koesi or Koeti (Manikiong language), Wai (Karoon language), Yuwi (Labu language), Bie (Kebar language),
Papua: Abudar (Onjob language), Mogari (Tapio language),
Solomon Isl.: Asai, also Susai (Kawara'ae name), Rereke (also see Ding Hou p. 400)

iv) FLOWERING AND FRUITING TIME
Flowering: July-Nov.
Fruiting: Sept.-Nov.

v) USES
"Natives eat fruits about 3.5-4" long, which have a strong astringent taste", Solomon Isl. (Kajewski 2157)

Notes - Although it is restricted to New Guinea, Papua and Solomon Islands it is common. It is also cultivated. It is "not threatened"

23. Mangifera minutifolia Evrard

i) DISTRIBUTION
Vietnam (Nhatrang)

ii) ECOLOGY
In forests

iii) VERNACULAR NAMES
Vietnam: Xoai rung

iv) FLOWERING AND FRUITING TIME
Not known

v) USES
Fruits edible

Notes - It is very rare and endemic. It is known only from the Type specimen of Poilane, which has no flower. It is a doubtful species and "insufficiently known"

APPENDIX II
(Continued)

24. Mangifera monandra Merr.

i) DISTRIBUTION
Endemic, restricted
Philippines (Luzon, Samar, Guimaras Isl., Leyte, Zambales)

ii) ECOLOGY
Lowland primary forests

iii) VERNACULAR NAMES
Philippines: Malapaho (Bik), Pangi (Bis Dongo dialect)

iv) FLOWERING AND FRUITING TIME
Flowering: Jan.-April
Fruiting: June-July

v) USES
"Drupe ellipsoid, 3.5 x 1.8 cm, the pulp very thin" (Merrill)

Notes - It is an endemic species reported only from Philippines. Out of 18 collections, 7 are from Kew. Only 2 collections made after 1916. It is a "vulnerable" species

25. Mangifera odorata Griff.

i) DISTRIBUTION
Widely distributed
Malaya (Perak, Kelantan, Malacca, Pahang, Singapore),
Sumatra (Lampong, Sibolangit),
Java (Pekalongan, Bantam, Batavia),
Sabah (Sandakan, Sipitang, Buit Penampang),
Indochina (Annam)

ii) ECOLOGY
Lowland mixed forests, mainly cultivated

iii) VERNACULAR NAMES
Malaya: Kwini boli, Kwini, Koenii,
Java: Kebembem, Kwini,
Sumatra: Embachang, Ambachang,
Sabah: Manga wani; Wani,
Indochina: Xoai huong, Cay muong (Annam)
For other vernacular names see Ding Hou, Flora Malesiana, (1978) 8 p. 437

iv) FLOWERING AND FRUITING TIME
Flowering: March-Dec.
Fruiting: Sept.-Nov.

v) USES
Grown for its edible fruits, of which good cultivars exist; common in orchards in Malaysia and widely cultivated. The fruits are of yellow colour and best among the species other than M. indica

Notes - "Native country unknown, possibly of cultivated and/or hybrid origin, sometimes found in lowland forest. Chiefly found in cultivation" (Ding Hou). "Widely cultivated in Java, Malaya, Philippines and Indochina for its fruits" (Mukherji). There is considerable variation. It is also collected from Philippines, perhaps cultivated (Kew). It is widely distributed, more common in

APPENDIX II
(Continued)

Peninsular Malaysia, Java and Sabah. The fruits are best among all the species, other than M. indica. There is need to evolve better varieties of this species, adaptable to Malaysian conditions. Its natural occurrence in the Philippines is doubtful. It is "not threatened". Its occurrence in Indochina is known from only 1 specimen

26. Mangifera pajang Kosterm.

1) DISTRIBUTION
Sarawak (Kapit, Long Silat),
Sabah (Sipitang, Sandakan, Beaufort),
Brunei (Jalan Berakas),
east Borneo (Sangkulirang, west Kutei)

ii) ECOLOGY
Chiefly in primary lowland forests, sometimes in mixed Dipterocarp forest

iii) VERNACULAR NAMES
Sabah and Brunei: Banbangan, Membanbangan (Kedayan language),
Sarawak: Embang (Kayan language),
east Borneo: Asem pajang

iv) FLOWERING AND FRUITING TIME
Flowering: Feb.-July
Fruiting: April-May, Aug.-Sept.

v) USES
In high esteem for its edible fruits, which are 15-17 cm long. Very thick rind about 1 cm is peeled off the yellowish white, sweet acid pulp like banana (Kosterm.)

Notes - It is known only from 8 collections in Leiden, from Borneo. The author has seen it in Sarawak. Distribution restricted to Sabah, Sarawak, Brunei and east Borneo (in Kutei region). Fruit is liked by people. Although it is "in high esteem for its edible fruit" and "occurs in cultivation" (Ding Hou), it is "insufficiently known" and probably requires conservation

27. Mangifera parvifolia Boerl. & Koord.

i) DISTRIBUTION
Limited, rare
Sumatra (Bengkalis, P. rangsang, Palembang, Batu Isl.),
Singapore (Jurong)

ii) ECOLOGY
In forests on dryland or in temporarily inundated areas

iii) VERNACULAR NAMES
Sumatra: Embatjang hutan, Mempelam kera, Pelam kara

iv) FLOWERING AND FRUITING TIME
Flowering: Oct.
Fruiting: Nov.-Dec.

v) USES
Not reported

APPENDIX II
(Continued)

Notes - It was considered as sp. dubia by Mukherji (1949). According to Ding Hou it is allied to M. griffithii and M. havilandii. It is considered "insufficiently known"

28. Mangifera pentandra Hook. f.

i) DISTRIBUTION
Limited
Malay (Kedah, Perak, Pahang, Johore, Kelantan, Malacca),
Singapore

ii) ECOLOGY
In lowland areas or forests near sea. A common village tree in Kedah

iii) VERNACULAR NAMES
Malaya: Manga dodol, Mempelam bemban, Pauh, Pauh dahar, Pauh puteh

iv) FLOWERING AND FRUITING TIME
Flowering: Jan.-March
Fruiting: March-April, also Dec.

v) USES
Round fruit of good taste

Notes - It is phytogenetically important due to 5 stamens being fertile. It is an endemic and "endangered" species

29. Mangifera quadrifida Jack.

i) DISTRIBUTION
Widely distributed and showing variation
Malaya (Johore, Perak, South Kelantan),
Singapore (Upper Mandai),
Sumatra (Riouw, Palembang, Beneden, Bangka Isl., Ketambe, Rau),
Java (Bogor),
Sabah (Lahad Datu, Sandakan, Beaufort, Sepilok, Tawau),
Brunei (Tutong),
east Borneo (Balikpapan, Bangko)

ii) ECOLOGY
Lowland forests on inundated land or along riversides, rarely on limestone ridges up to 900 m

iii) VERNACULAR NAMES
Malaya: Machang, Asam kumbang,
Sumatra: Sempiat, Masam koembang, Asam kumbang, Asem rawa, Asam rarawa,
Sabah: Mangga hutan, Damaran (Bajan), Asam,
Brunei: Rancha rancha,
east Borneo: Asam putaran

iv) FLOWERING AND FRUITING TIME
Flowering: Jan.-Nov.
Fruiting: Feb.-Nov.

v) USES
Fruits edible, 7-8 cm long, black dotted outside, inside yellow, acid sweet; mature in Oct.-Nov. at south Palembang, Sumatra (Kosterm. 14096)

APPENDIX II
(Continued)

Notes - There are 35 collections at Leiden, mostly from Borneo and Sumatra, and 15 at Kew. Common in Sumatra around Palembang. There is wide variability as Ding Hou has merged 4 species in it. It is a distinct species and "not threatened"

30. Mangifera reba Pierre

i) DISTRIBUTION
Vietnam (Bien Hoa)

ii) ECOLOGY
In forests

iii) VERNACULAR NAMES
Indochina: Svai reba, Svai meas

iv) FLOWERING AND FRUITING TIME
Flowering: Feb.-March
Fruiting: March-April

v) USES
Fruits edible

Notes - It has distinct large fruits. It is endemic, very rare and "endangered"

31. Mangifera siamensis Warb. ex Craib

i) DISTRIBUTION
Endemic and rare
Thailand (Koh Chang, Klung),
Solomon Isl. (Bougainville, Guadal Canal, New Georgia)

ii) ECOLOGY
In primary forests and rain forests

iii) VERNACULAR NAMES
Solomon Isl.: Rereke, Asia (Kwaraa)

iv) FLOWFRING AND FRUITING TIME
Flowering: July-August
Fruiting: not known

v) USES
Fruits edible

Notes - It is a doubtful species. Its occurrence in Solomon Isl. is perhaps based on wrong identification. It is "insufficiently known"

32. Mangifera similis Bl.

i) DISTRIBUTION
Scattered, mainly in Borneo
Sumatra (Bangka, Palembang, Bengkalis),
east Borneo (Kutei, Samarinda, Balikpapan),
Sabah (Sandakan, Tawau)

APPENDIX II
(Continued)

ii) ECOLOGY
Lowland forests up to 150 m

iii) VERNACULAR NAMES
Sumatra: Tajas, Masam humbang, Pais, Asam rawa (Bangka),
east Borneo: Asam pipit (Kutei language), Asam putaran,
Sabah: Asam (Sandakan)

iv) FLOWERING AND FRUITING TIME
Flowering: July-Aug.
Fruiting: April, Sept.-Dec.

v) USES
Fruit globular, 10 cm diameter yellowish green; rind thin; pulp pale yellow; sweet acid (Kosterm.)

Notes - It has restricted distribution and is "insufficiently known"

33. Mangifera superba Hook. f.

i) DISTRIBUTION
Endemic and very rare
Malay (Johore, Malacca),
Singapore (cultivated)

ii) ECOLOGY
In lowland forests

iii) VERNACULAR NAMES
Singapore: Beechee

iv) FLOWERING AND FRUITING TIME
Flowering: June
Fruiting: May (Ding Hou)

v) USES
Not reported

Notes - Rare. It is endemic and "endangered". "It has the biggest flower among Mangifera, and seems to be a polyploid gigas form of M. caesia" (Ding Hou)

34. Mangifera sylvatica Roxb.

i) DISTRIBUTION
northeast India (Assam, west Bengal, Tripura, Manipur, etc.),
Bangladesh (Chittagong),
Burma (Martaban),
Thailand (Saraburi, Pak Chong, Dai Pa Kao),
Cambodia (Kampot)

ii) ECOLOGY
In lowland primary and secondary forests on hillsides

iii) VERNACULAR NAMES
India: Ban am, Lakshmi am, Vekek (Mikir), Haibamin (Tripura),
Burma: Siminthayet,
Thailand: Mamnang ki tai

APPENDIX II
(Continued)

iv) FLOWERING AND FRUITING TIME
Flowering: Jan.-March, Sept.-Oct.
Fruiting: May-June, Dec.-Jan.

v) USES
Fruit small size, edible

Notes - It is a distinct species with small beaked fruits. Widely distributed as scattered individuals in forests of northeast India, Bangladesh and Burma. It is "not threatened"

35. Mangifera timorensis Bl.

i) DISTRIBUTION
Restricted
Celebes (Malili),
Lesser Sunda Isl. (west Flores Isl., west Sumbawa Isl., Timor Isl.),
Moluccas (Banda, Tenimber Isl.)

ii) ECOLOGY
In forests, 300-1000 m, rarely in beach forests

iii) VERNACULAR NAMES
Lesser Sunda Isl.: Mangga latar, Mangaa olat (Sumbawa Isl.), Pautah,
Celebes: Lumisi, Morotoiba

iv) FLOWERING AND FRUITING TIME
Flowering: March-Dec.
Fruiting: Oct.-March

v) USES
Fruits not edible, hard (Kosterm.), yellow and reddish when ripe, yellowish inside

Notes - It is restricted to Celebes and Sunda Isl. (endemic) and "vulnerable"

36. Mangifera zeylanica Hook. f.

i) DISTRIBUTION
Endemic
Sri Lanka (up to 3000 ft.), Wilpattu National Park, Anuradhapur, Kandy, Ratnapura

ii) ECOLOGY
In forests

iii) VERNACULAR NAMES
Sri Lanka: Etamba

iv) FLOWERING AND FRUITING TIME
Flowering: Feb.-Sept.
Fruiting: April-July

v) USES
Fruits edible

Notes - It is endemic and "vulnerable"

APPENDIX III

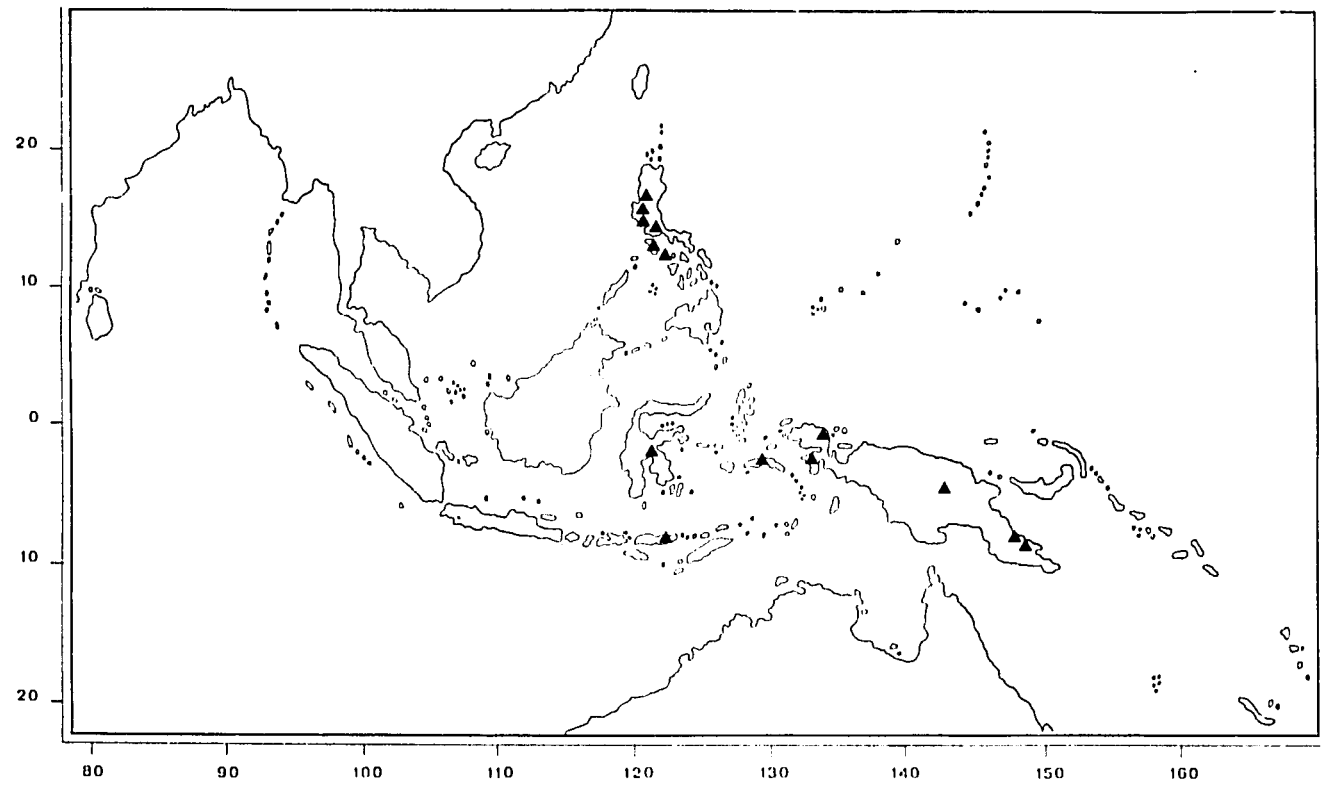

Fig. 5. Distribution map of Mangifera altissima

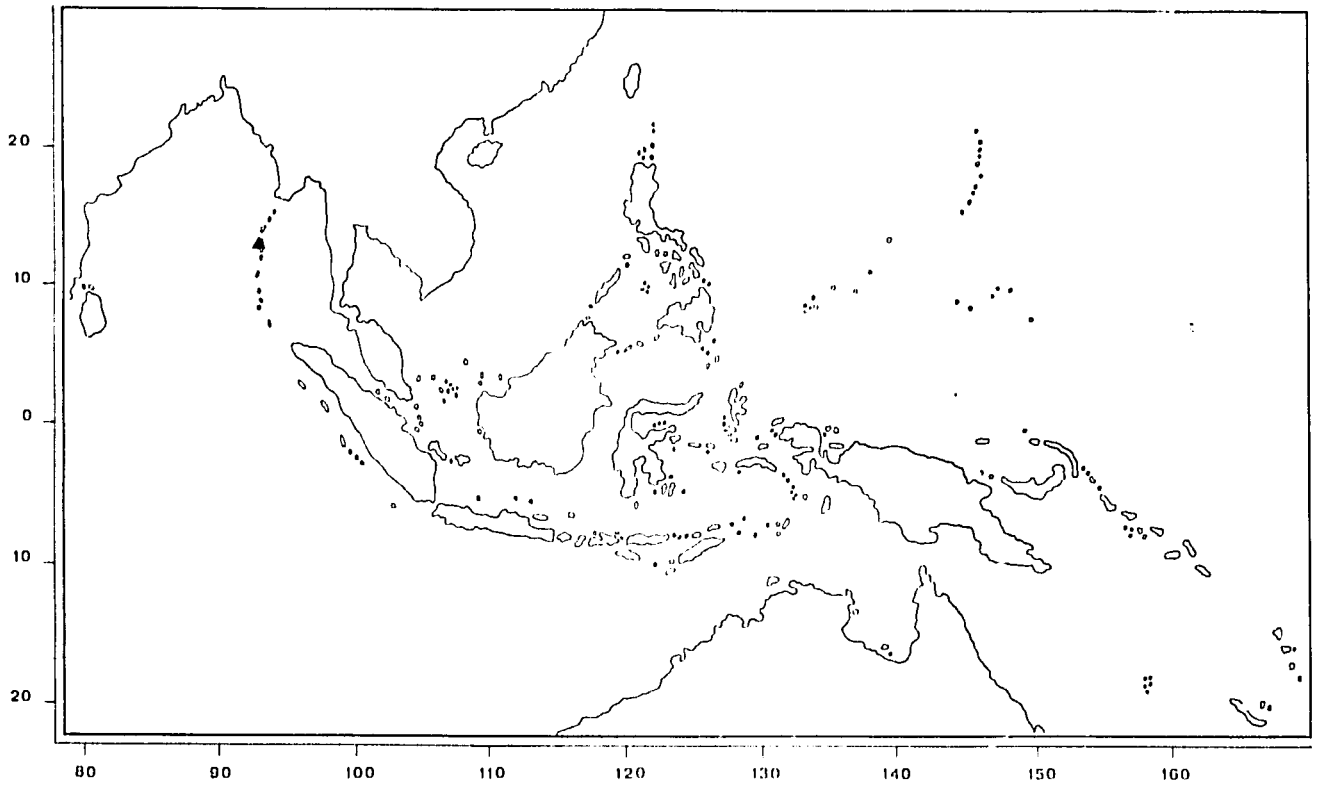

Fig. 6. Distribution map of Mangifera andamanica

APPENDIX III
(Continued)

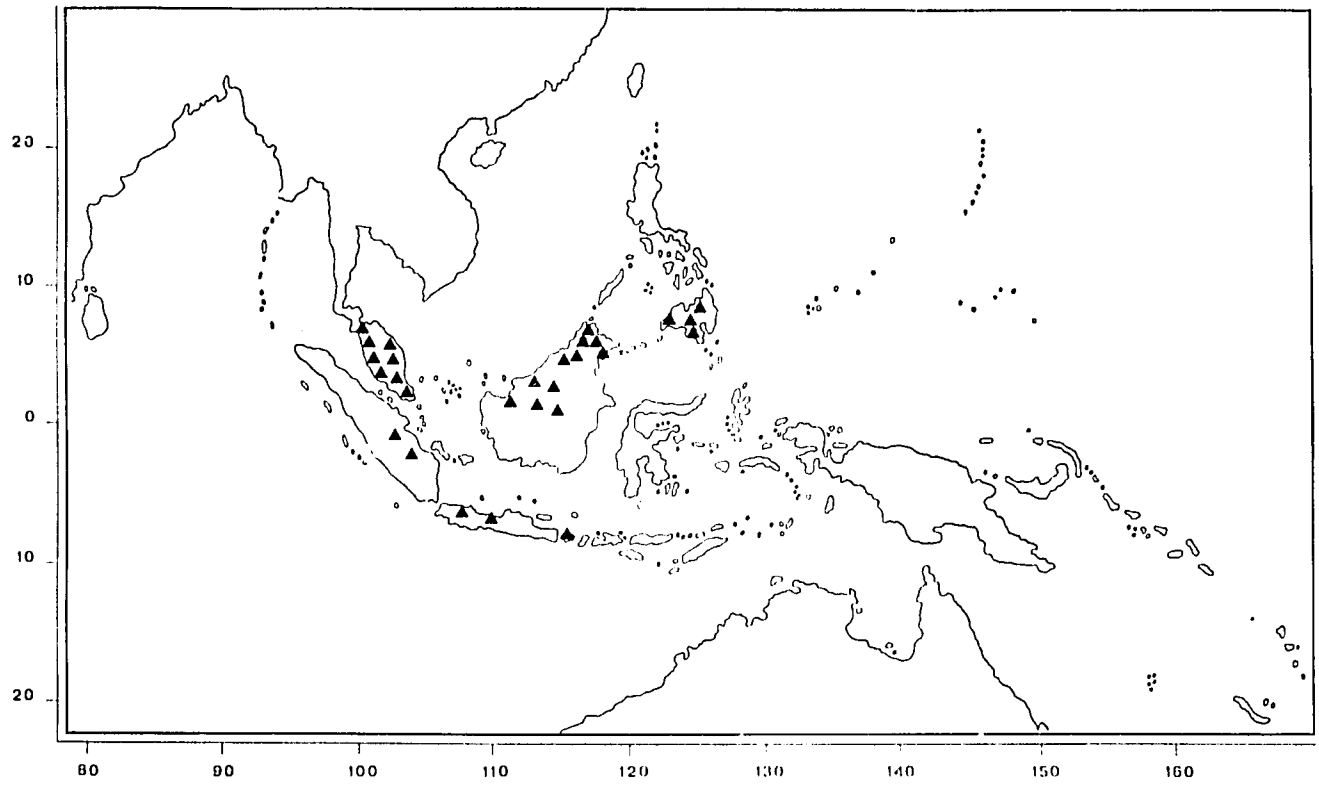

Fig. 7. Distribution map of Mangifera caesia

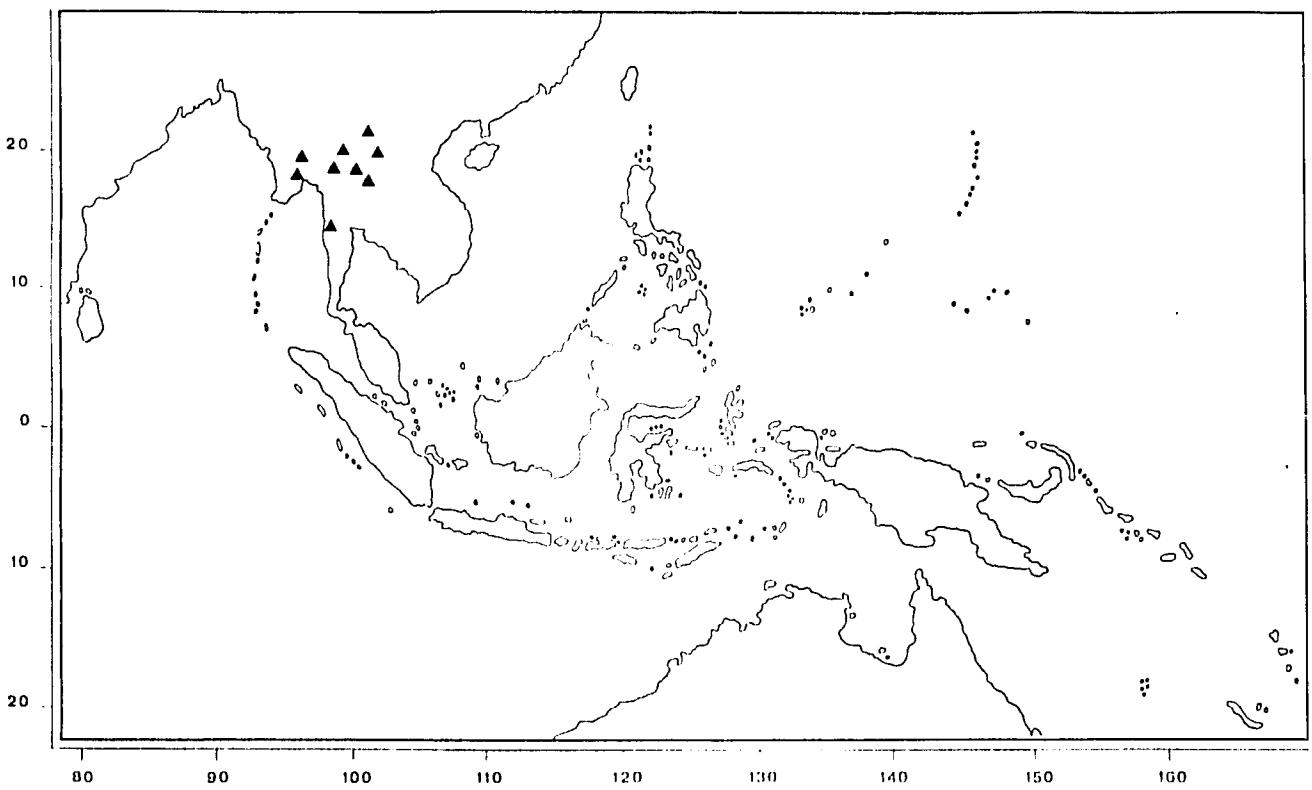

Fig. 8. Distribution map of Mangifera caloneura

APPENDIX III
(Continued)

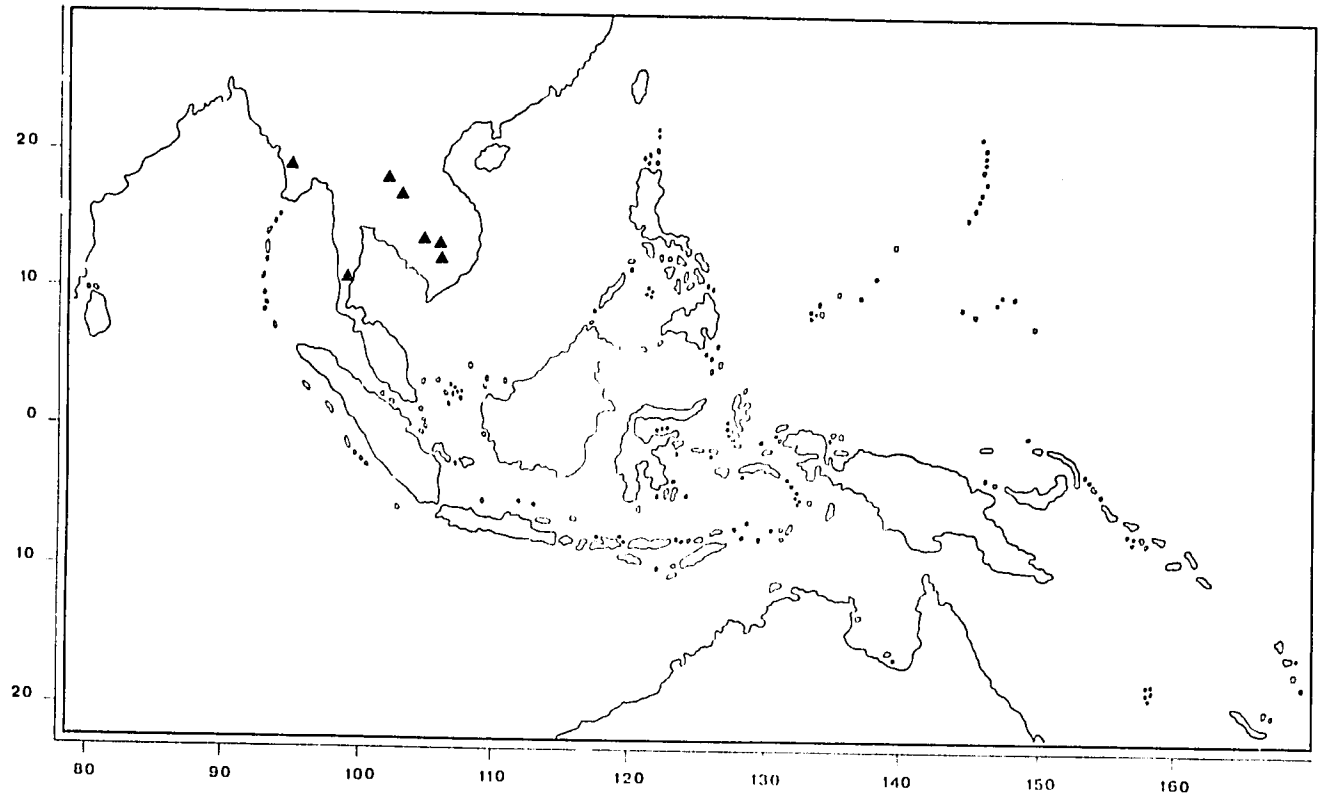

Fig. 9. Distribution map of Mangifera camptosperma

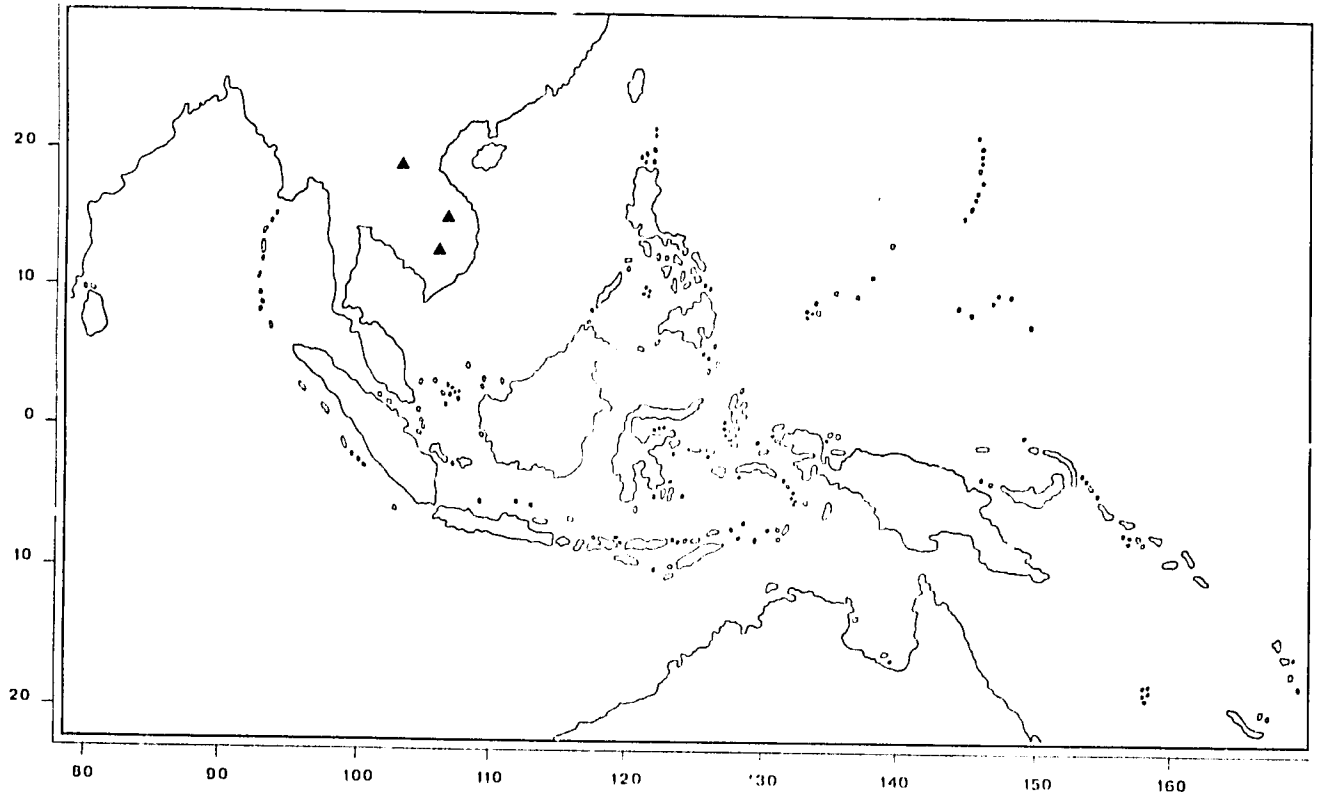

Fig. 10. Distribution map of Mangifera cochinchinensis

APPENDIX III
(Continued)

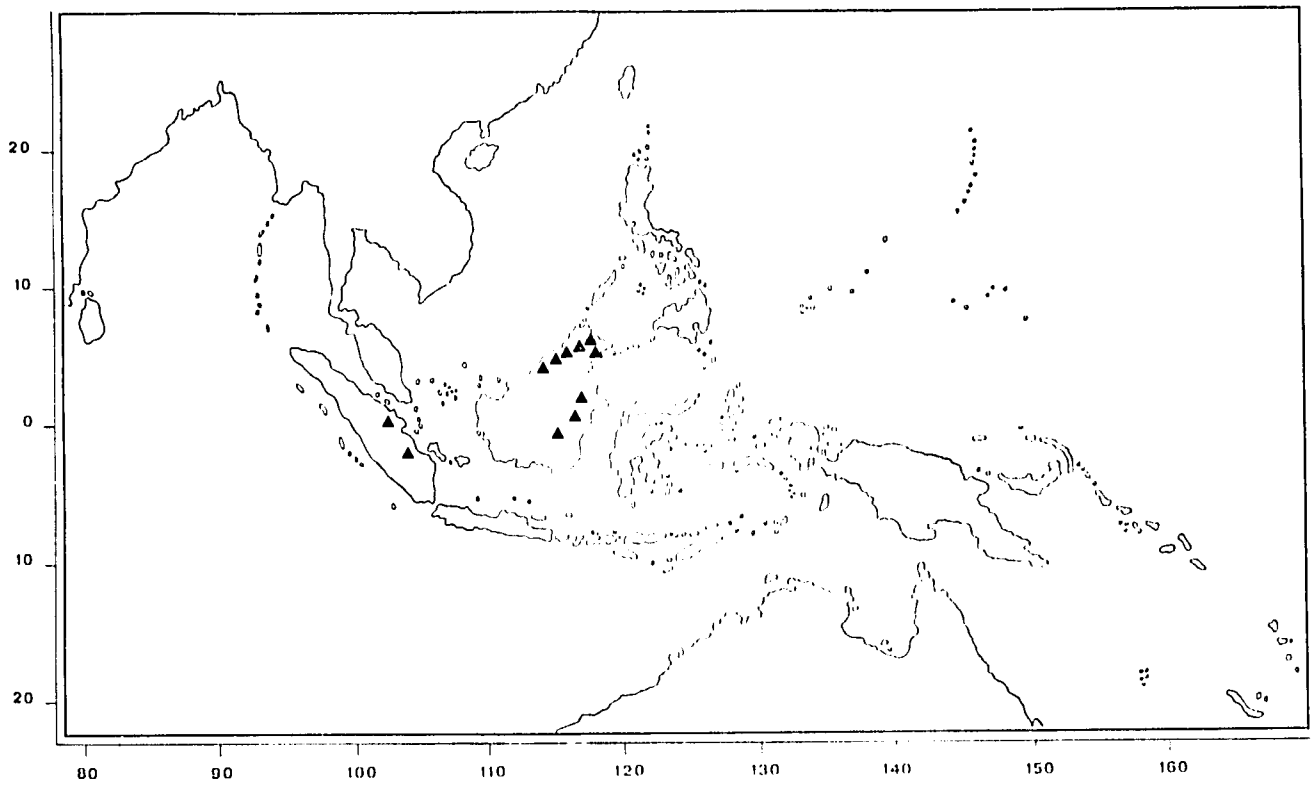

Fig. 11. Distribution map of Mangifera decandra

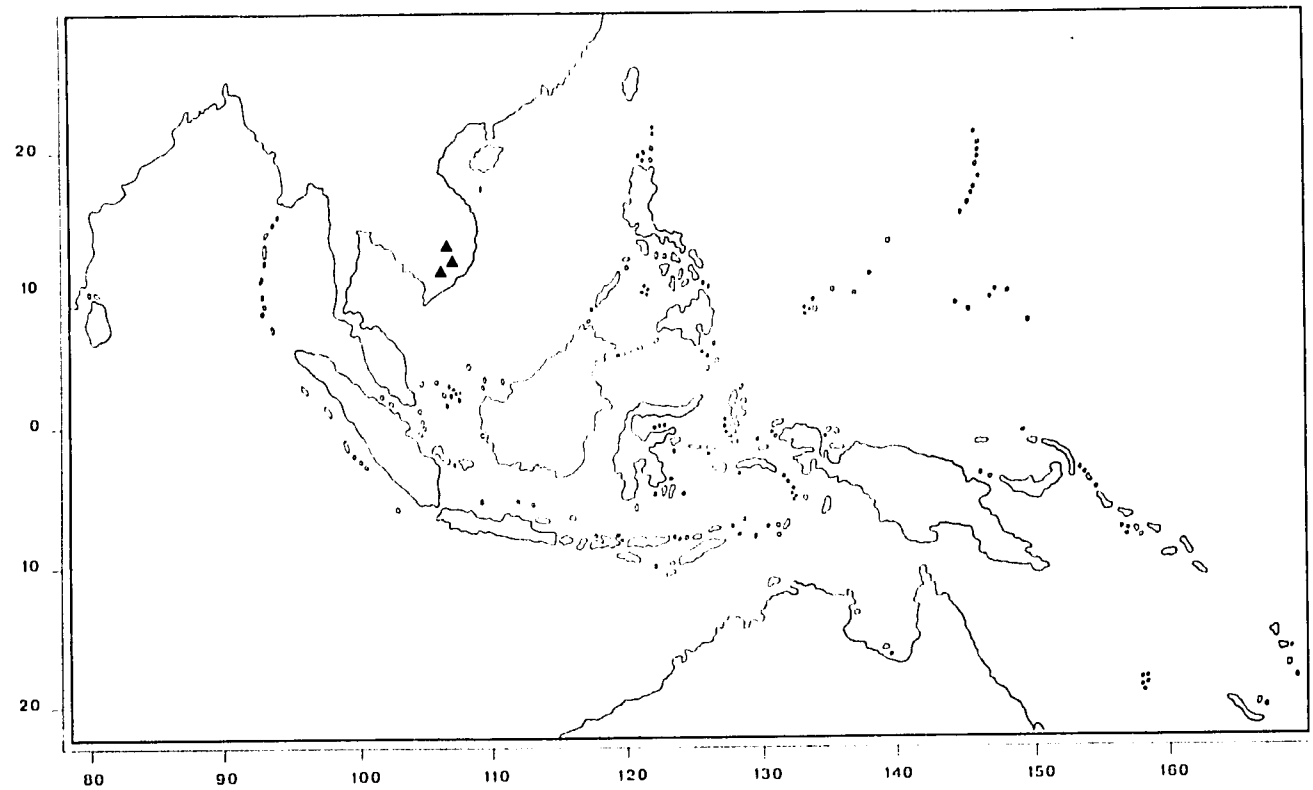

Fig. 12. Distribution map of Mangifera dongnaiensis

APPENDIX III
(Continued)

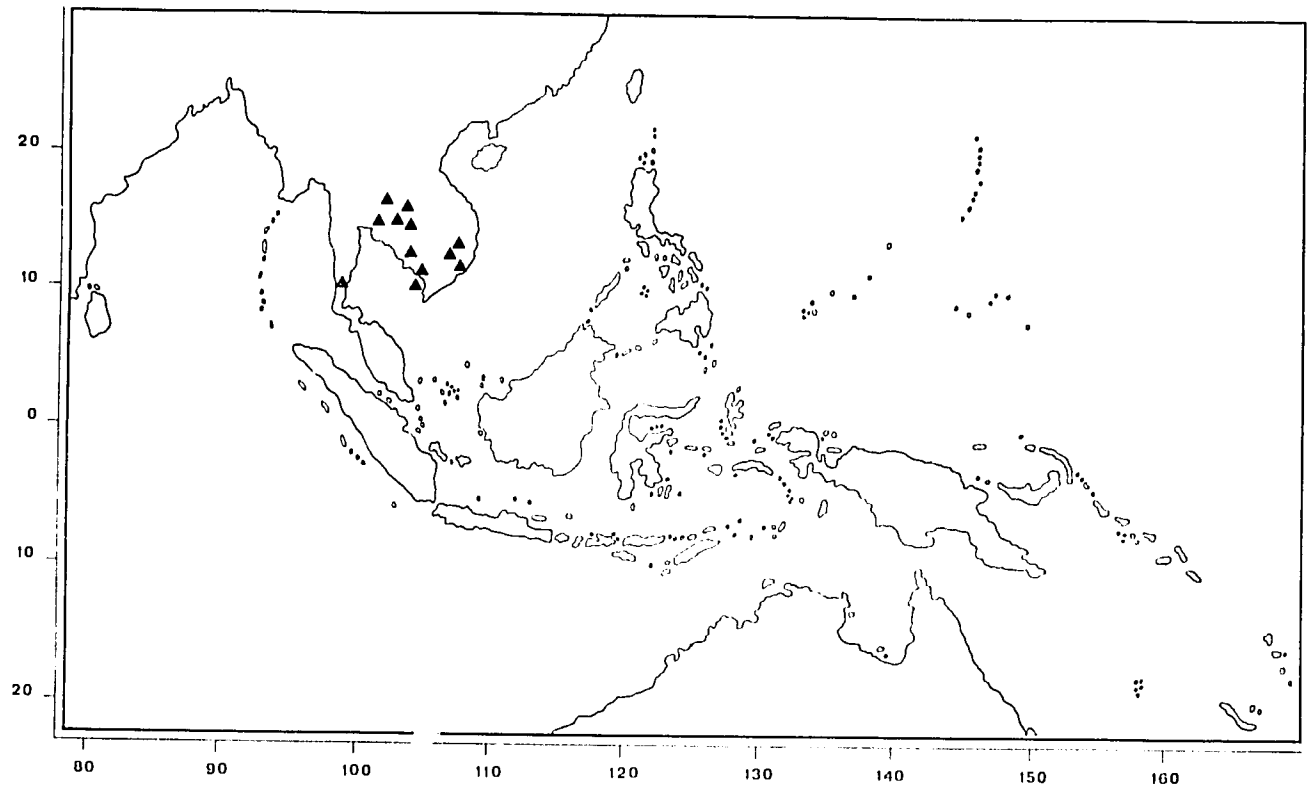

Fig. 13. Distribution map of Mangifera duperreana

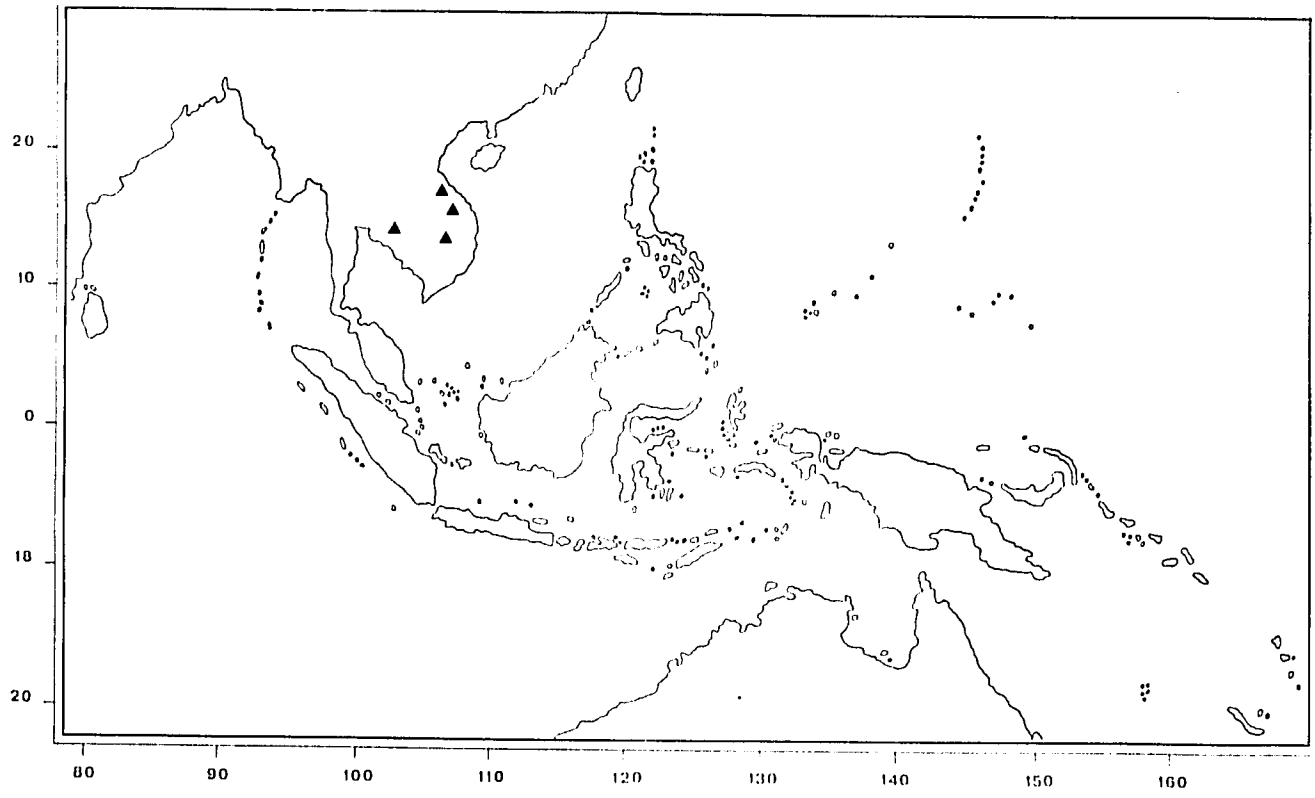

Fig. 14. Distribution map of Mangifera flava

APPENDIX III
(Continued)

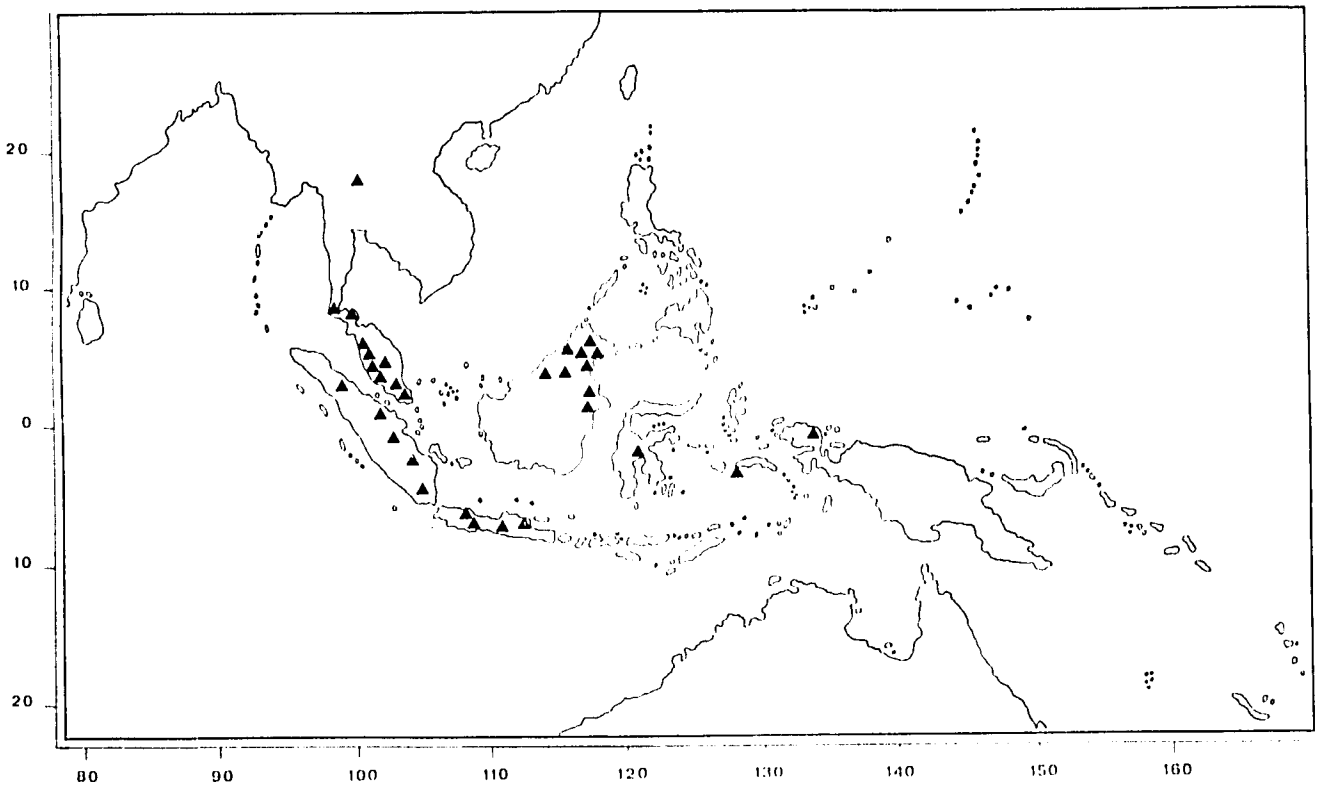

Fig. 15. Distribution map of Mangifera foetida

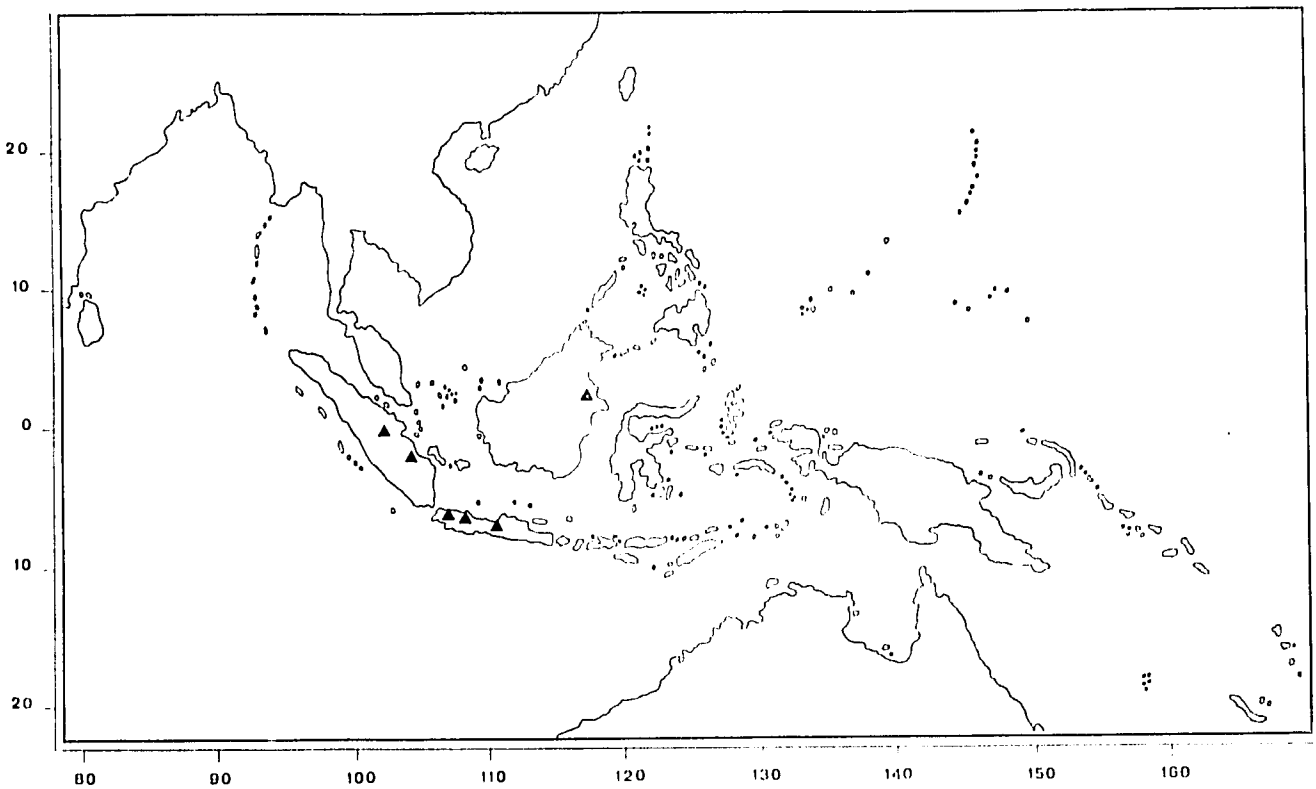

Fig. 16. Distribution map of Mangifera gedebe

APPENDIX III
(Continued)

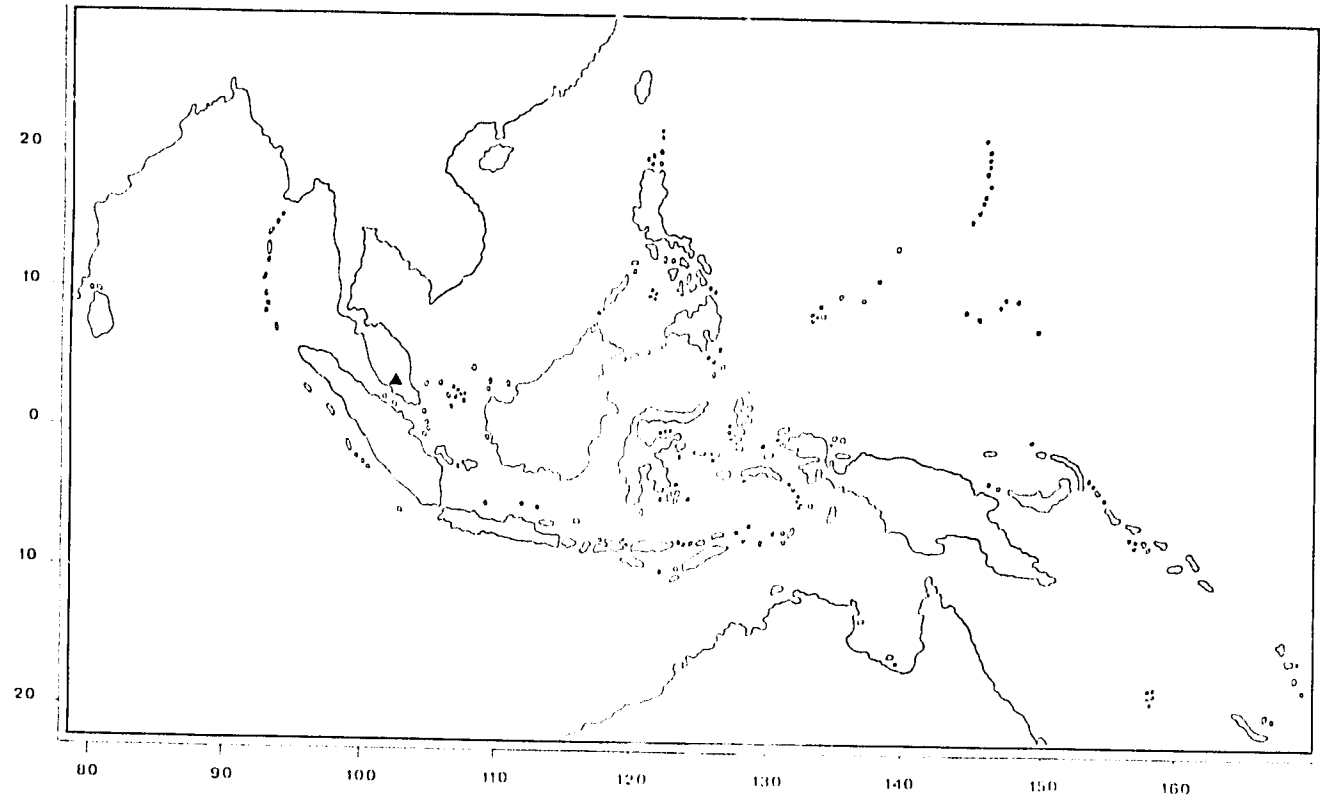

Fig. 17. Distribution map of Mangifera gracilipes

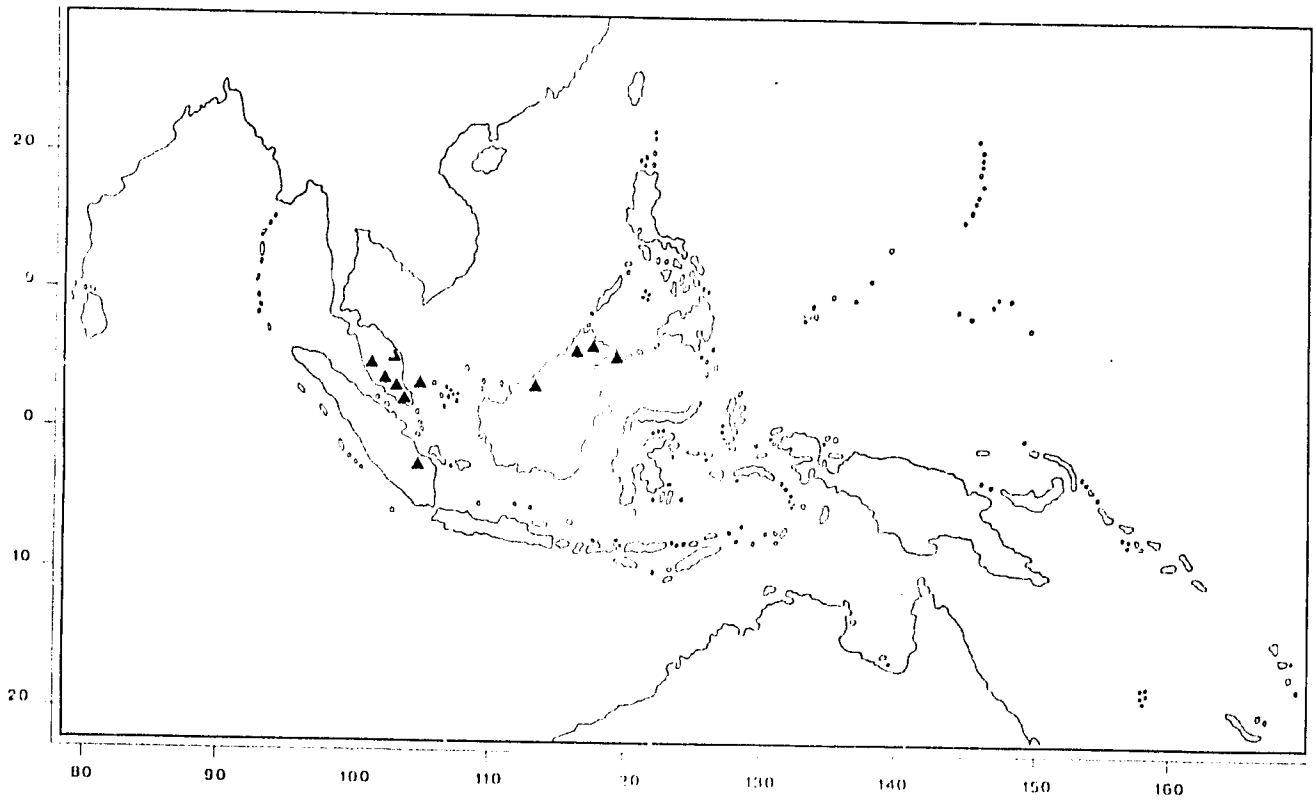

Fig. 18. Distribution map of Mangifera griffithii

APPENDIX III
(Continued)

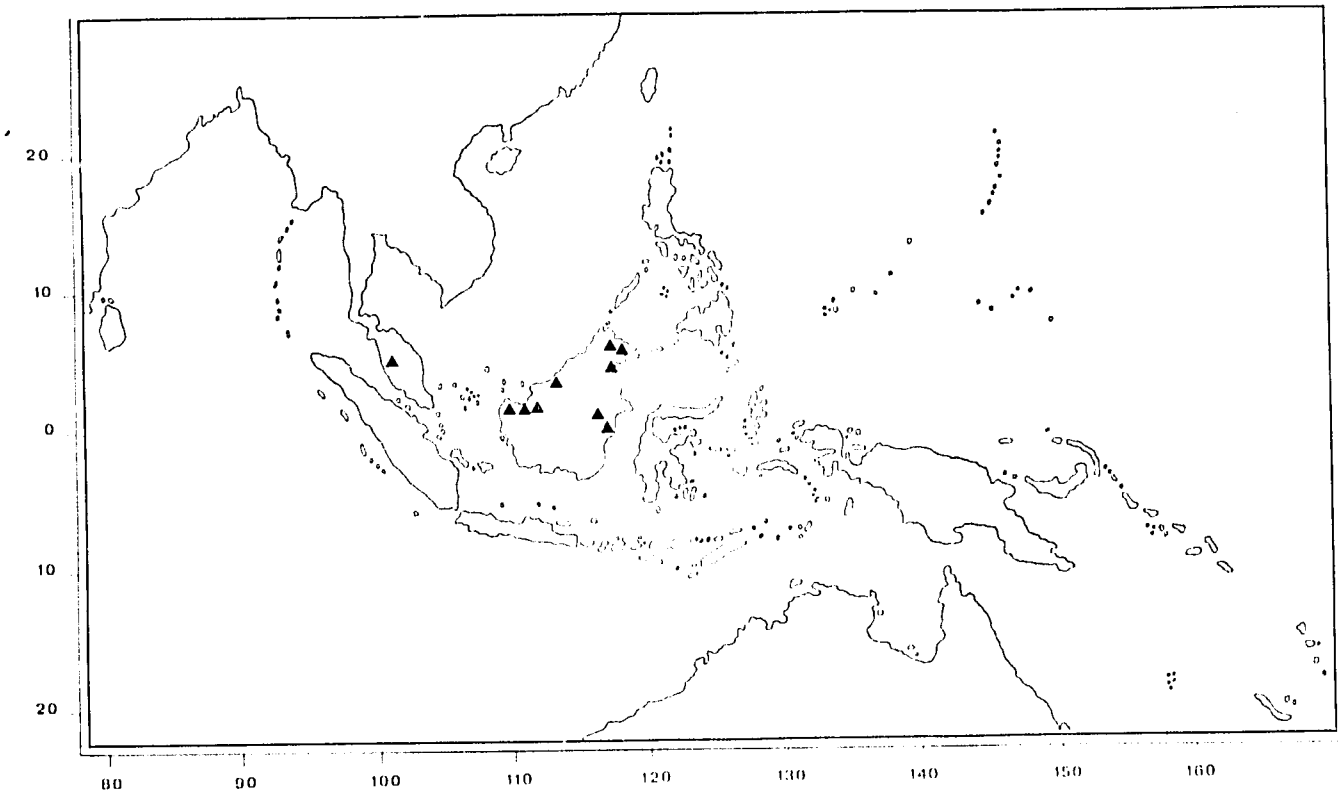

Fig. 19. Distribution map of Mangifera havilandii

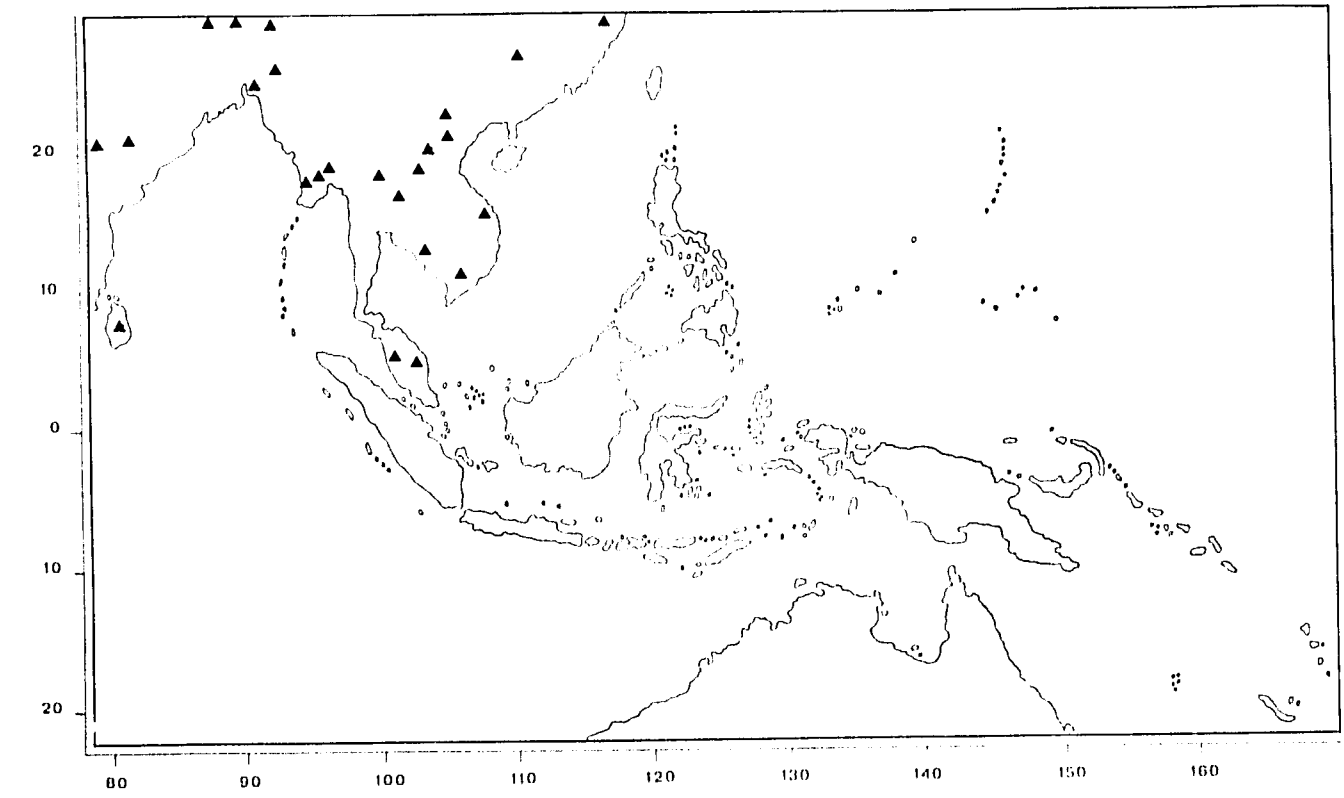

Fig. 20. Distribution map of Mangifera indica

APPENDIX III
(Continued)

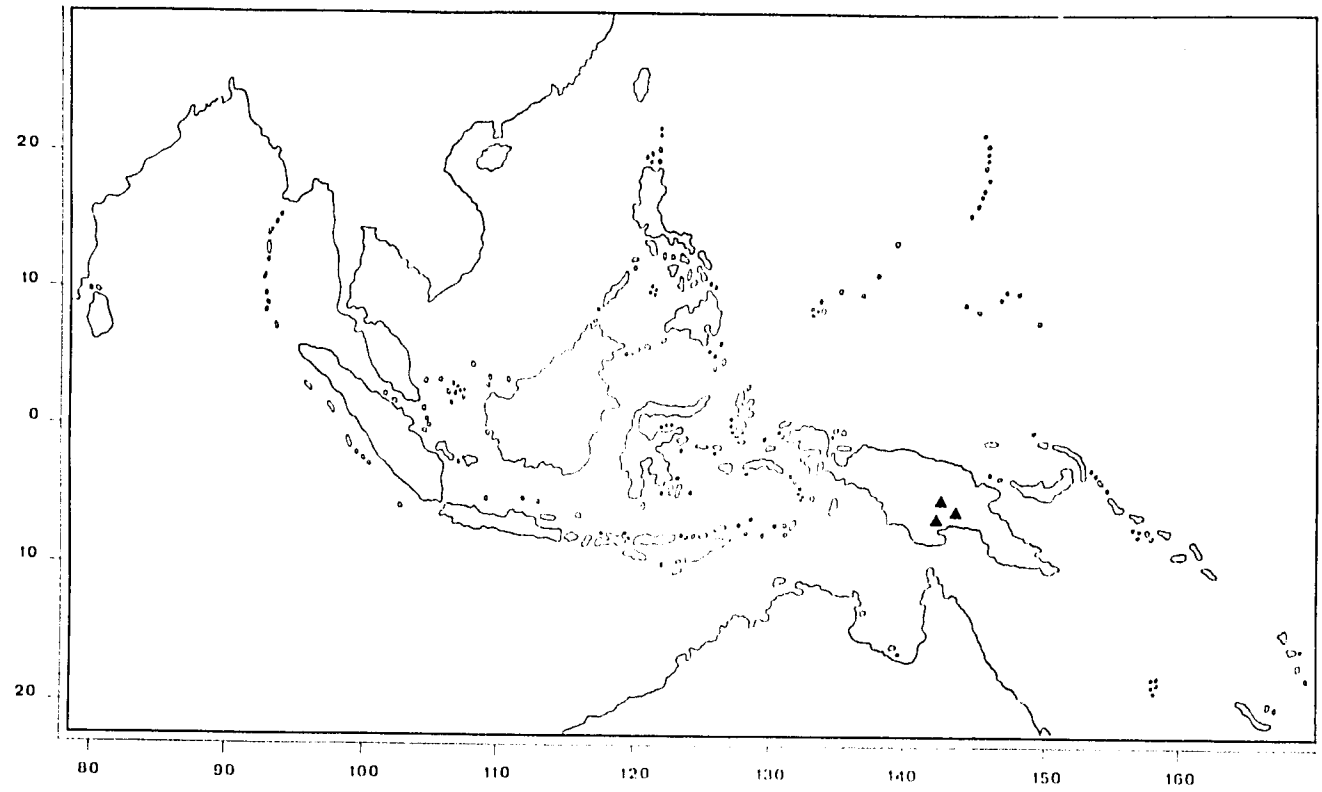

Fig. 21. Distribution map of Mangifera inocarpoides

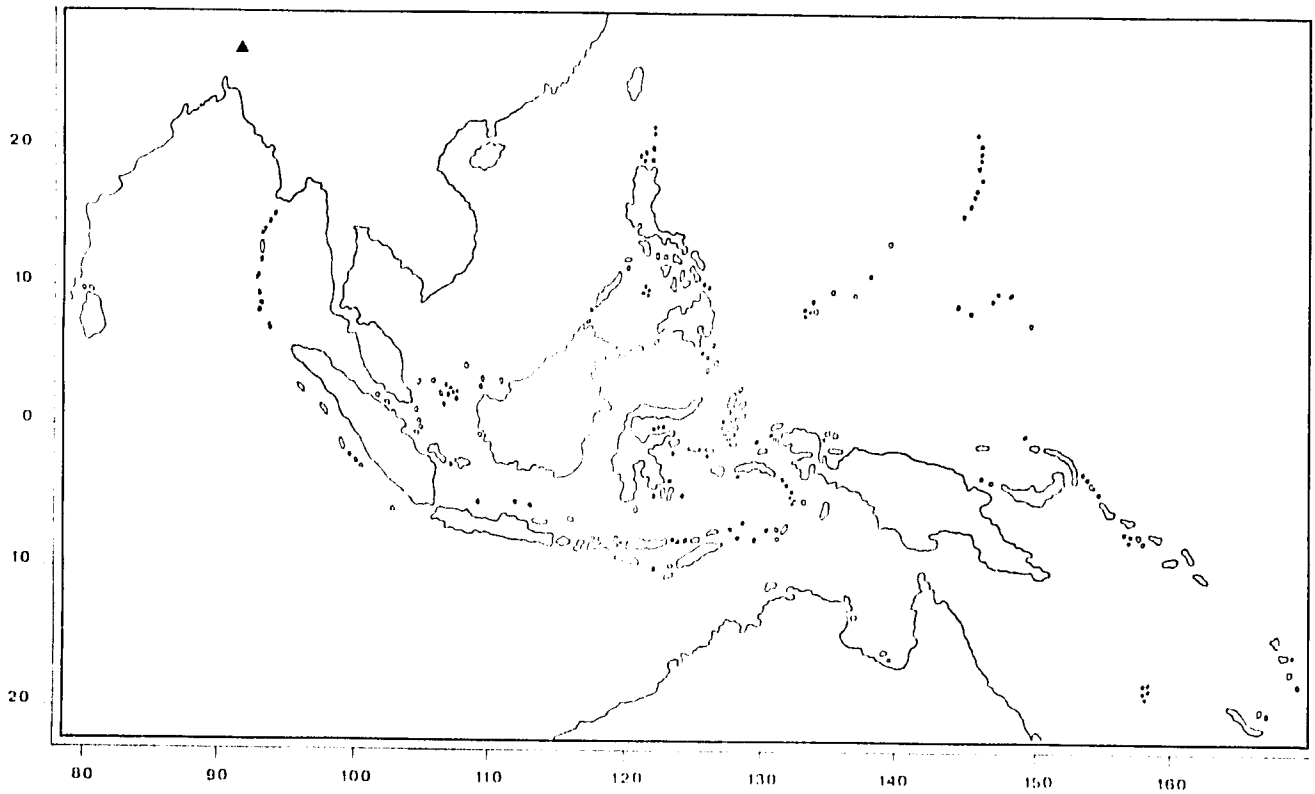

Fig. 22. Distribution map of Mangifera khasiana

APPENDIX III
(Continued)

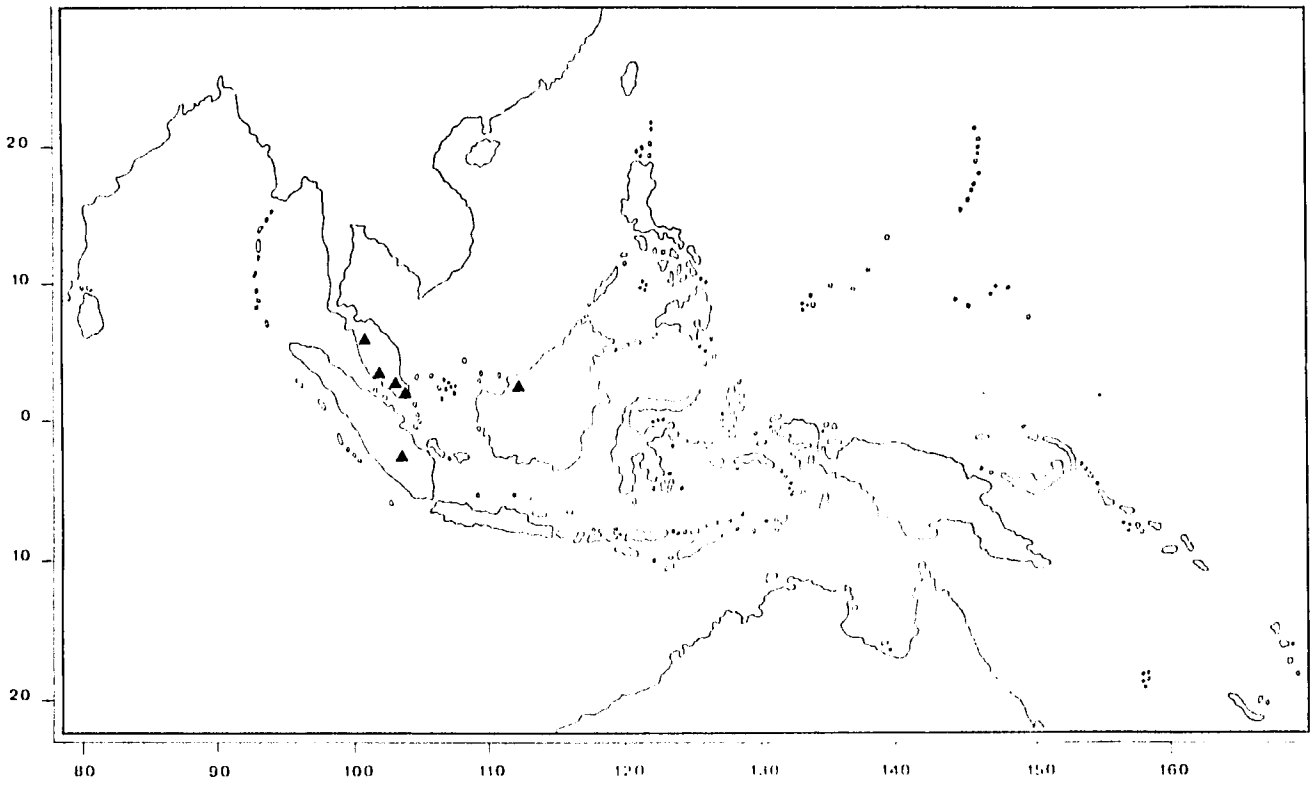

Fig. 23. Distribution map of Mangifera lagenifera

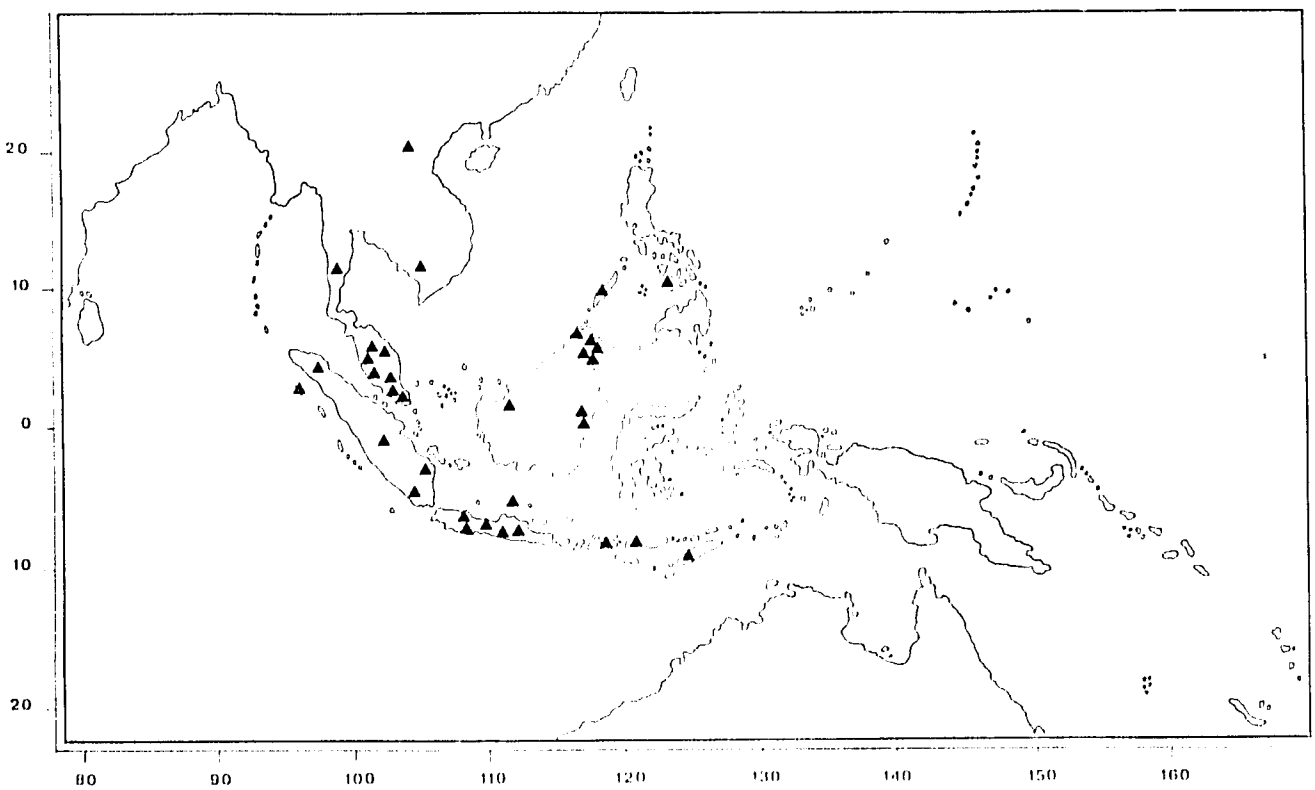

Fig. 24. Distribution map of Mangifera longipes

APPENDIX III
(Continued)

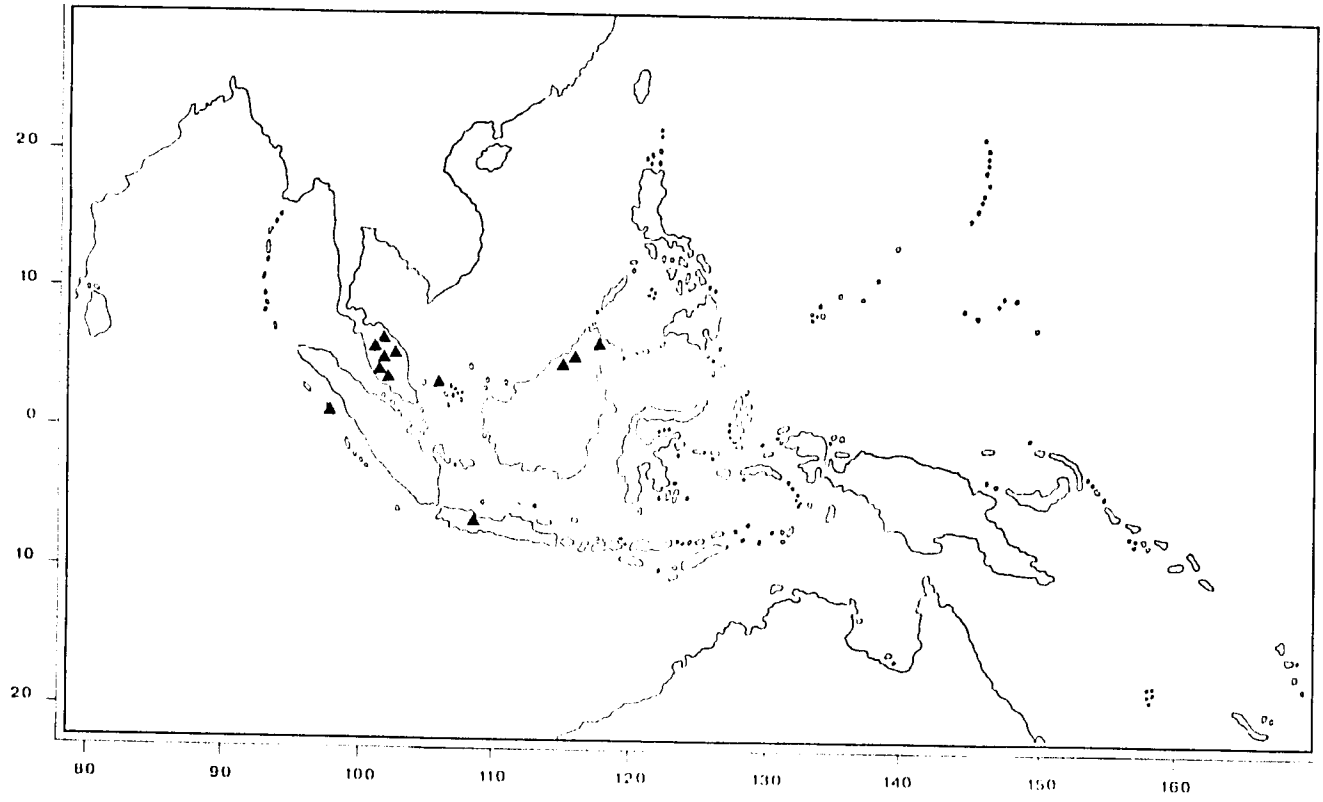

Fig. 25. Distribution map of Mangifera macrocarpa

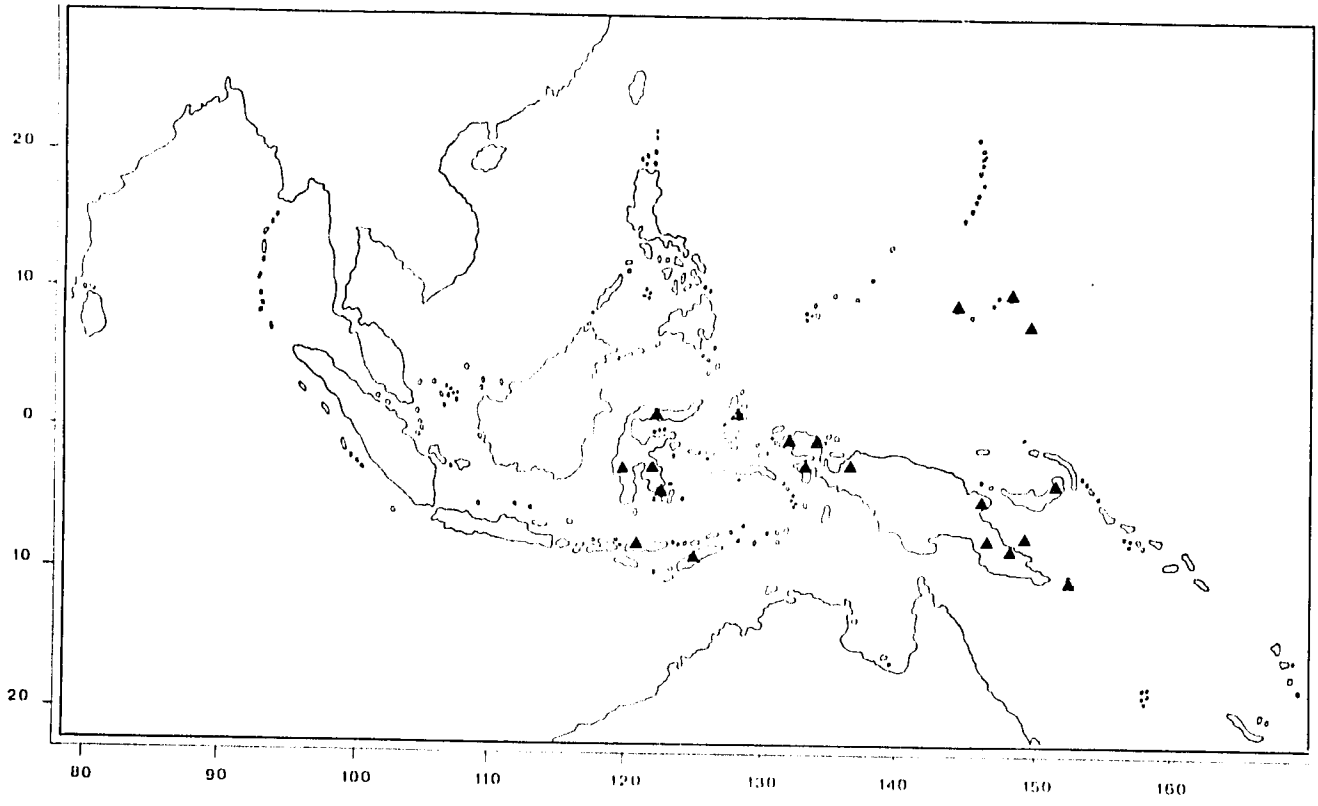

Fig. 26. Distribution map of Mangifera minor

APPENDIX III
(Continued)

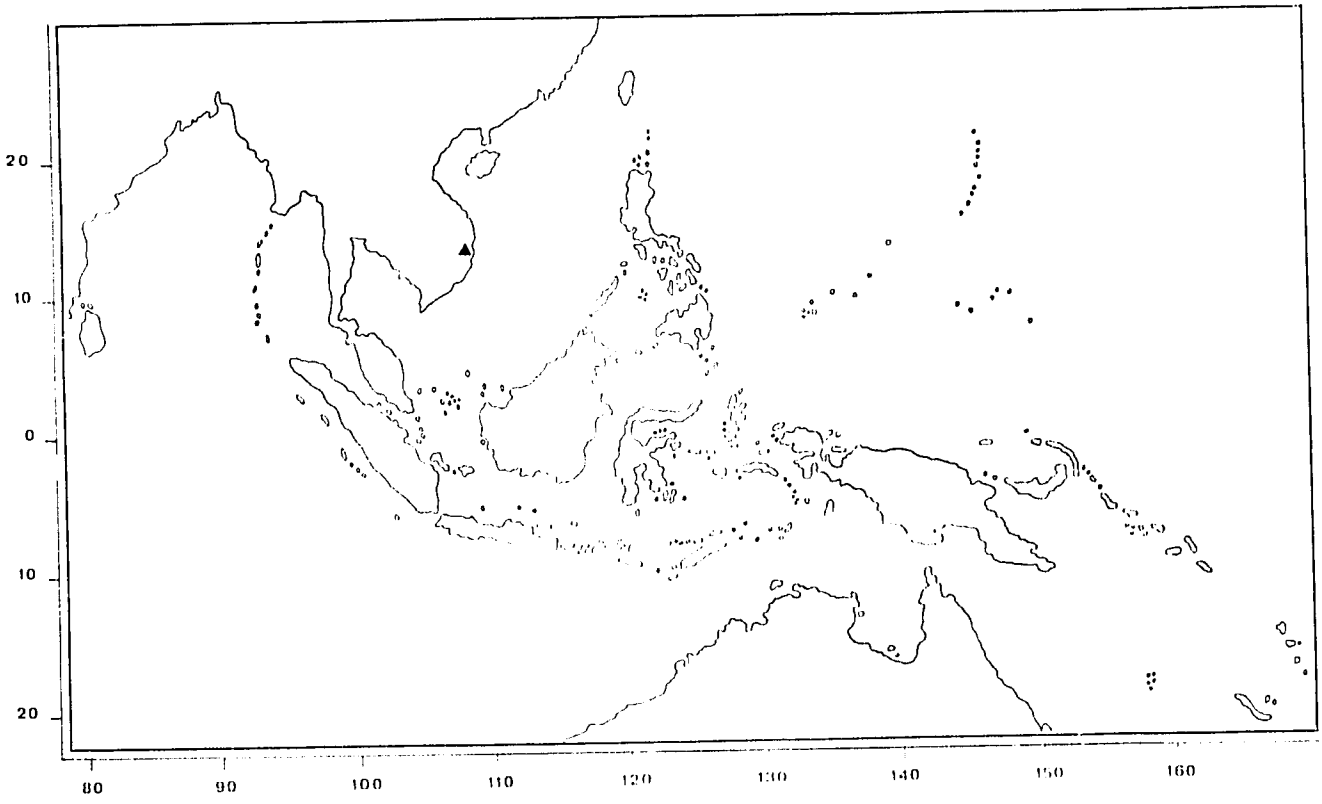

Fig. 27. Distribution map of Mangifera minutifolia

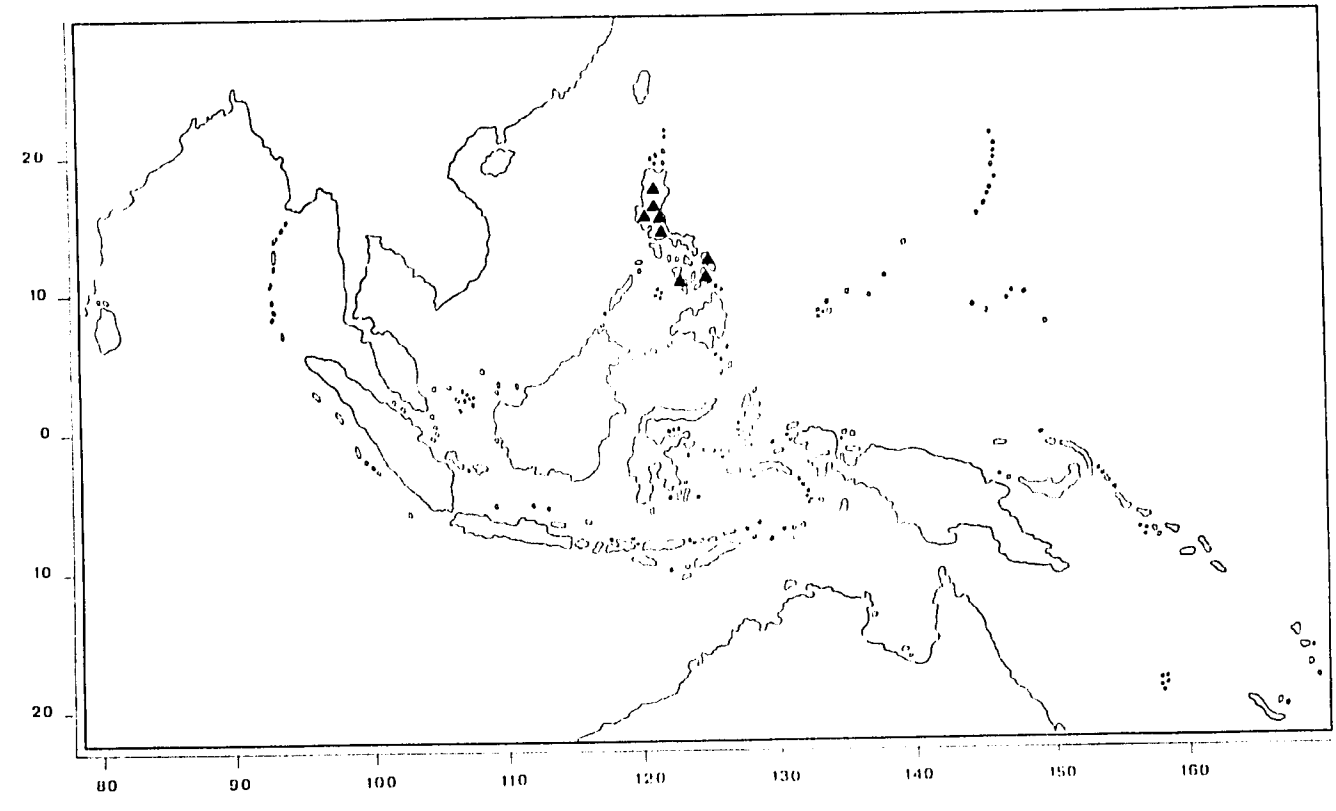

Fig. 28. Distribution map of Mangifera monandra

APPENDIX III
(Continued)

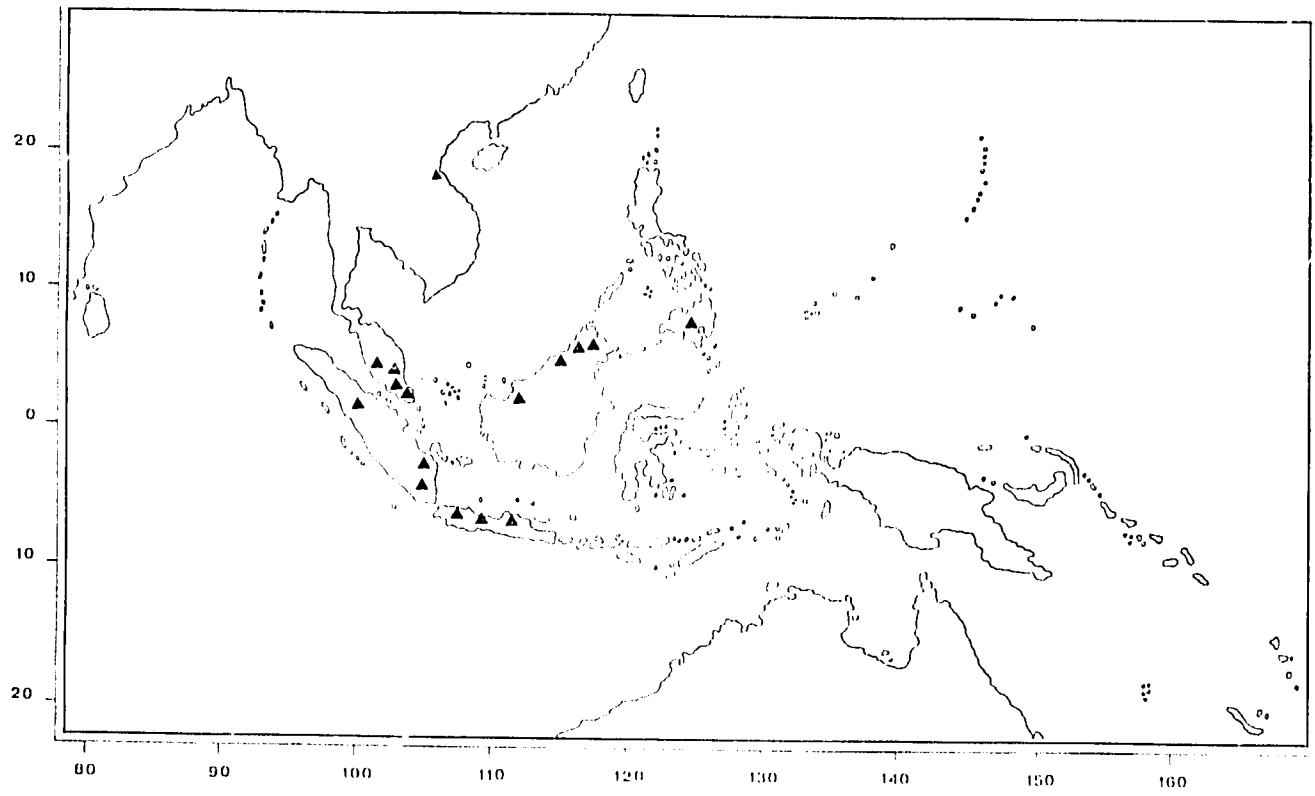

Fig. 29. Distribution map of Mangifera odorata

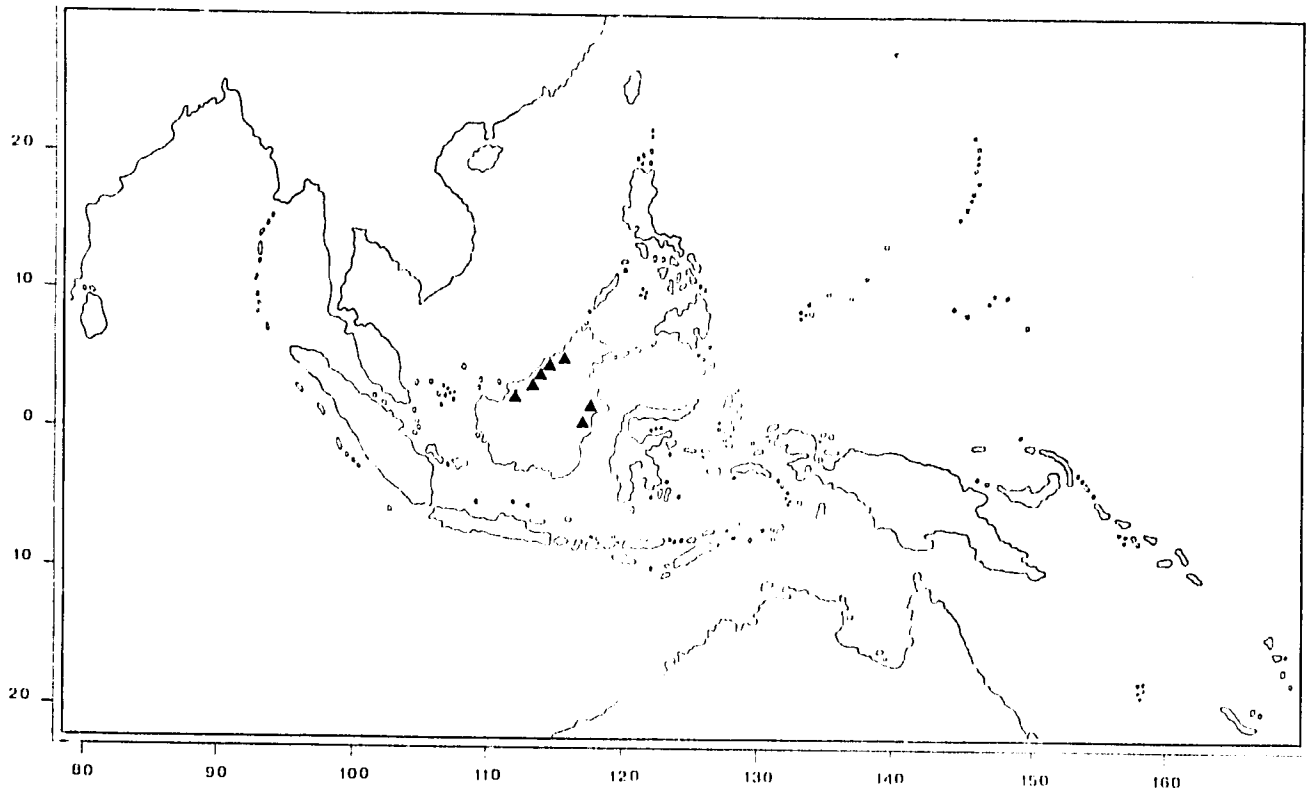

Fig. 30. Distribution map of Mangifera pajang

APPENDIX III
(Continued)

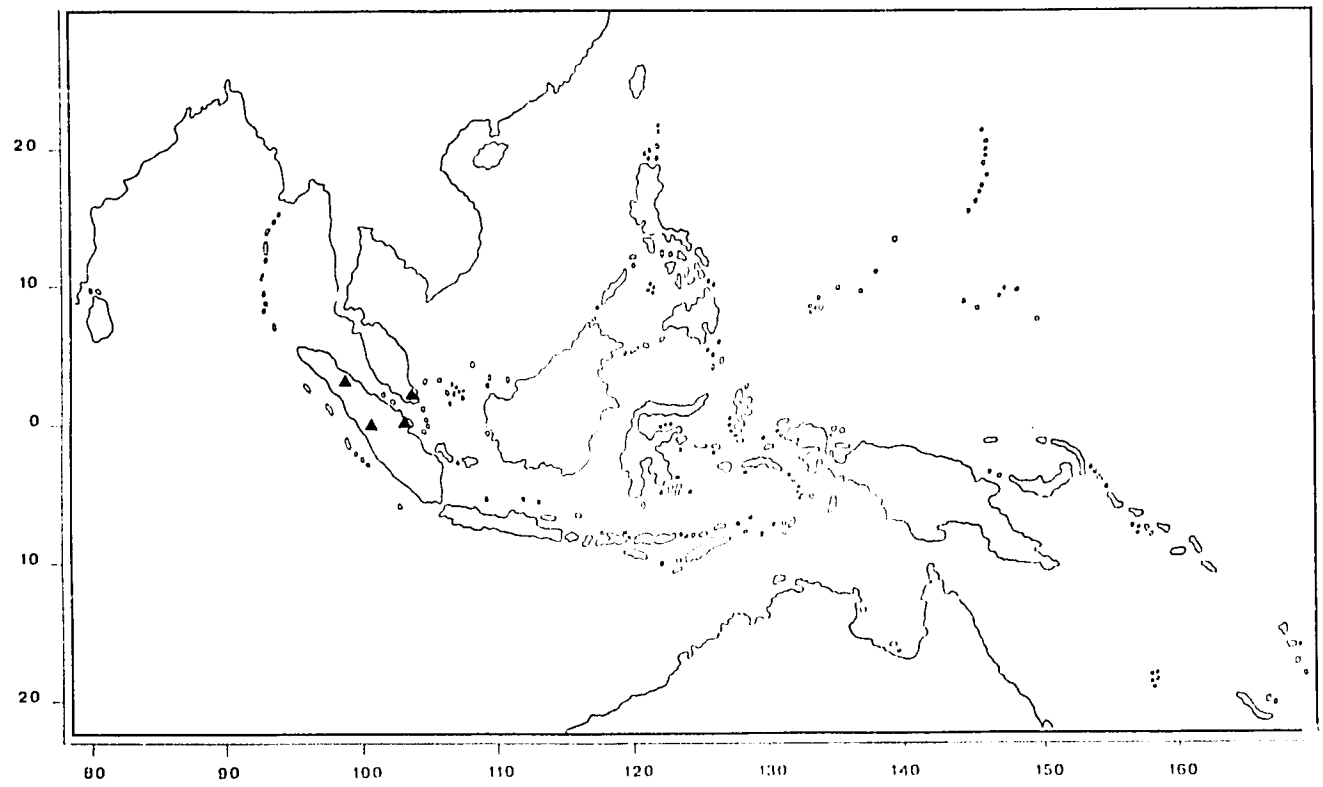

Fig. 31. Distribution map of Mangifera parvifolia

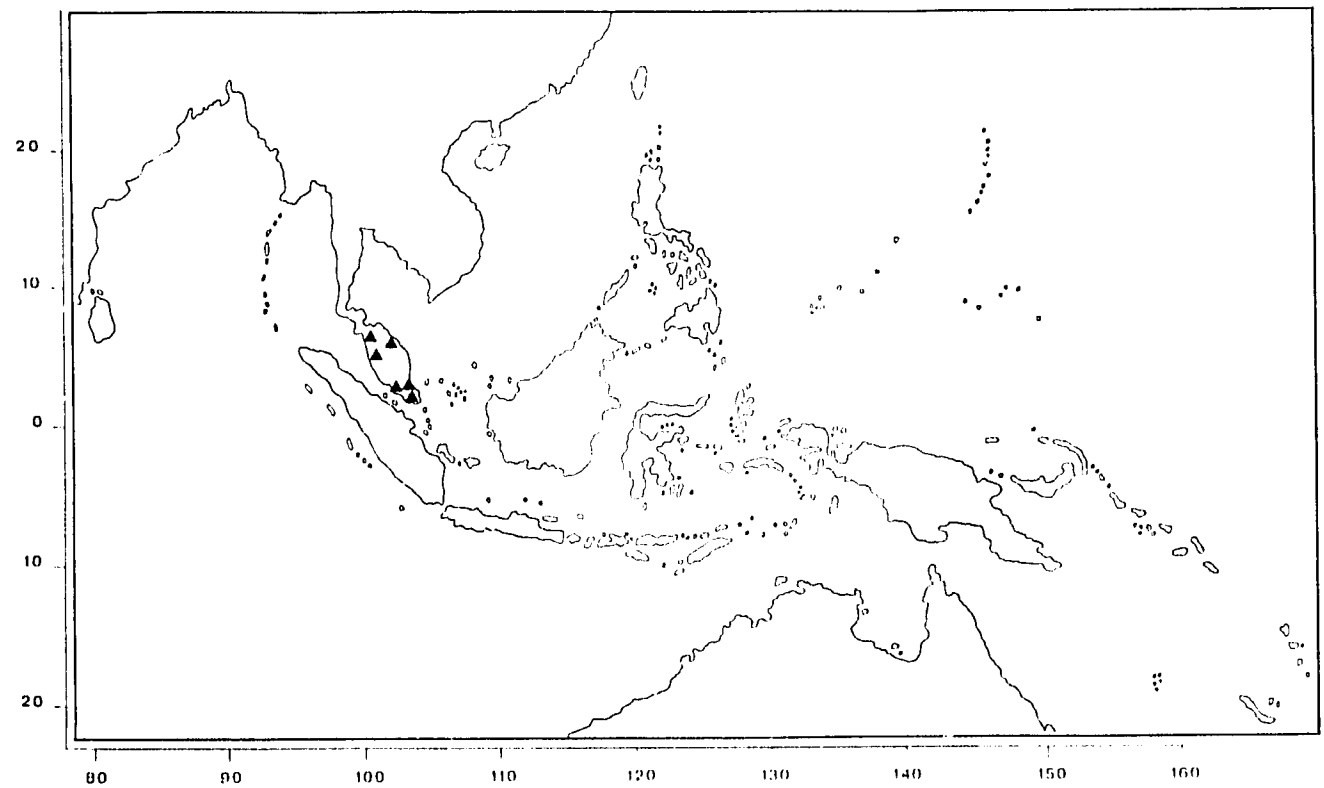

Fig. 32. Distribution map of Mangifera pentandra

APPENDIX III
(Continued)

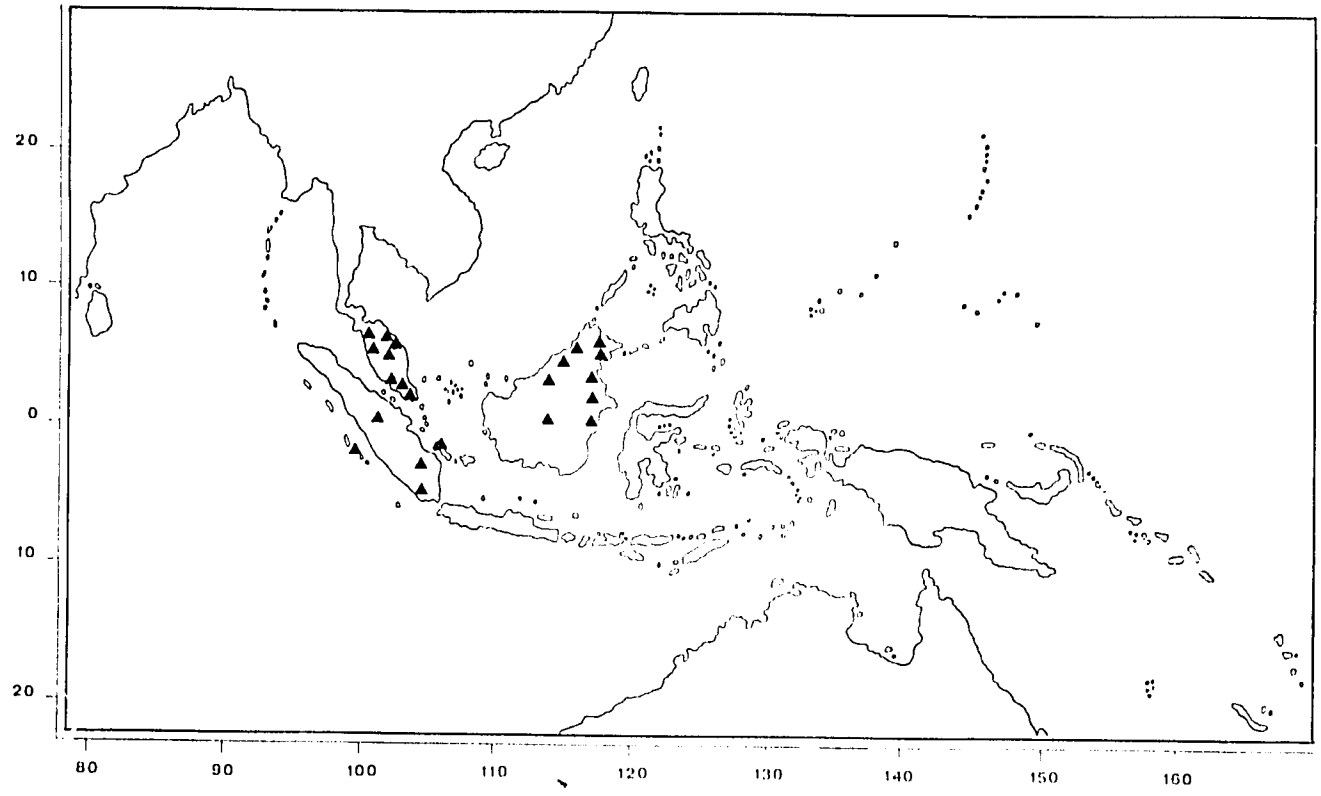

Fig. 33. Distribution map of Mangifera quadrifida

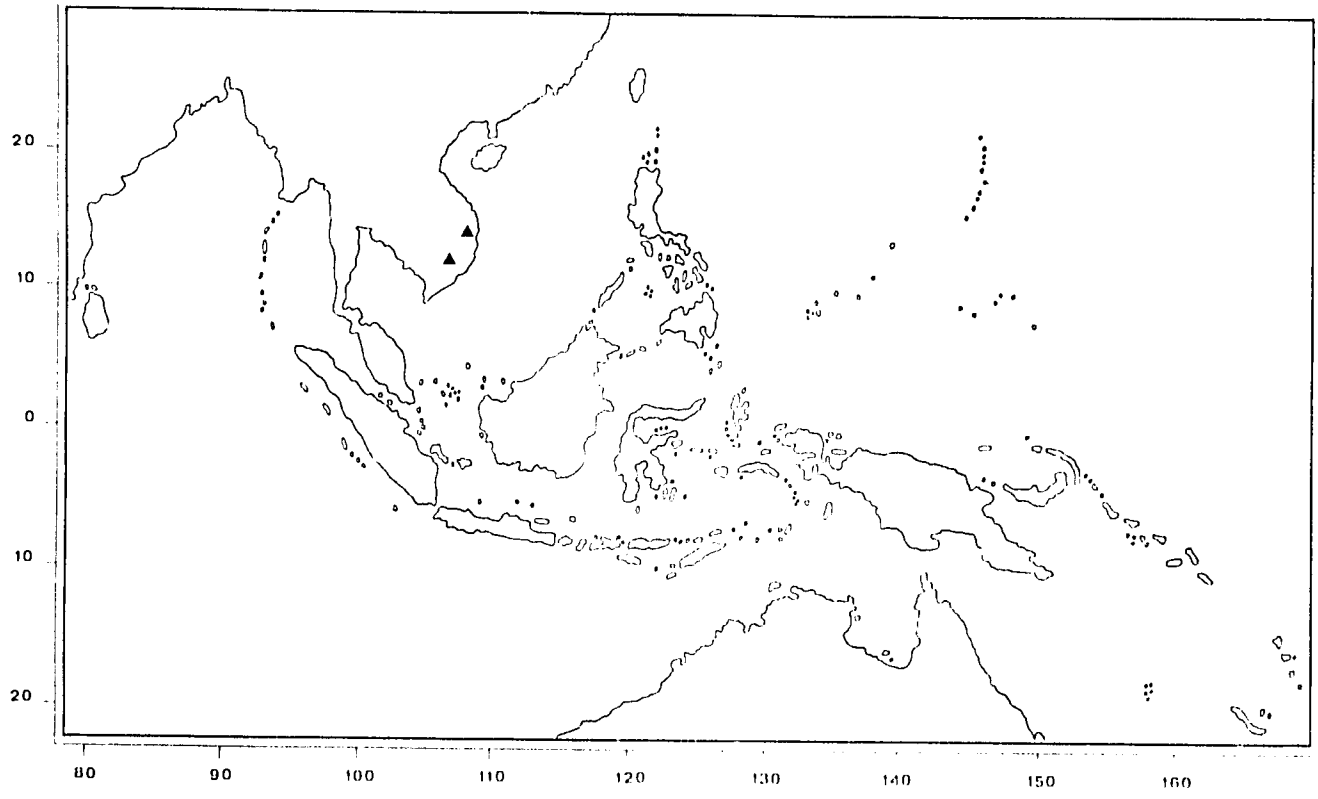

Fig. 34. Distribution map of Mangifera reba

APPENDIX III
(Continued)

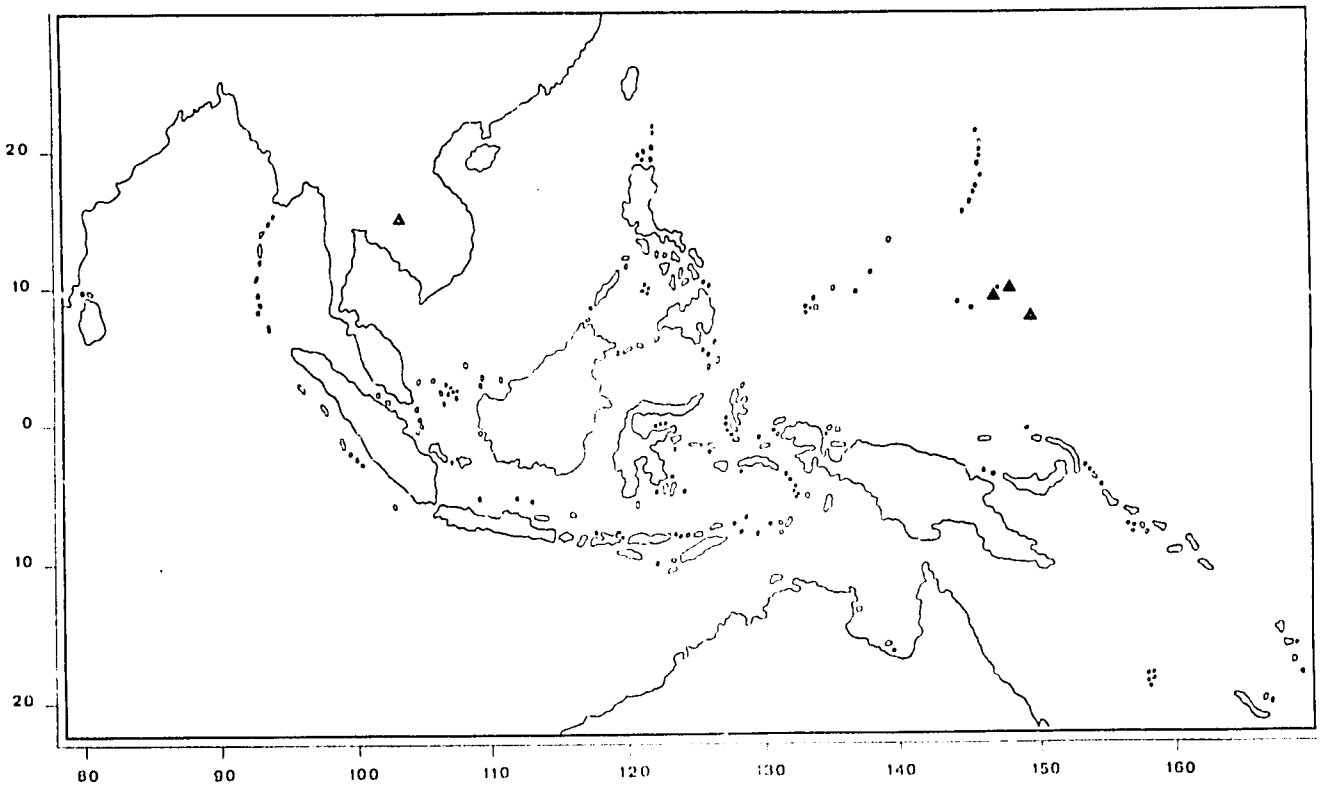

Fig. 35. Distribution map of Mangifera siamensis

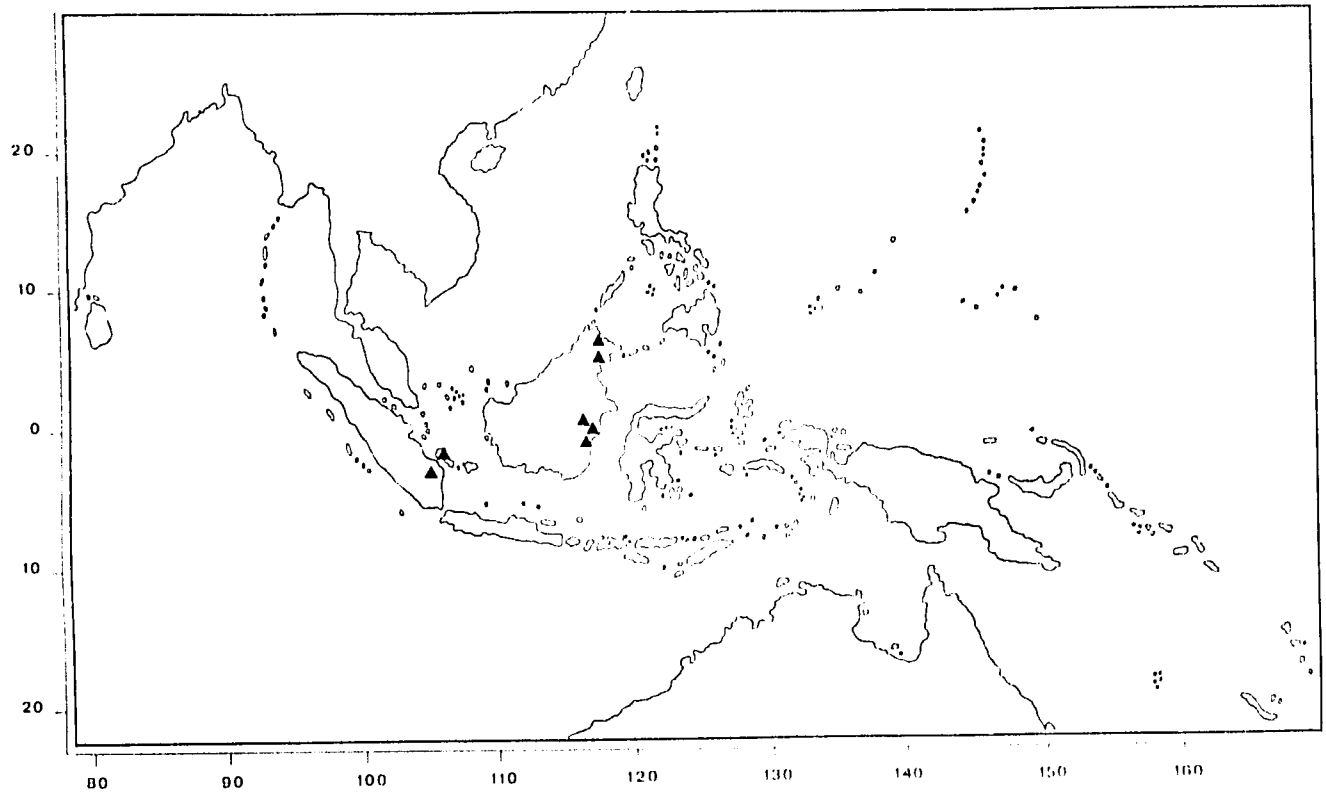

Fig. 36. Distribution map of Mangifera similis

APPENDIX III
(Continued)

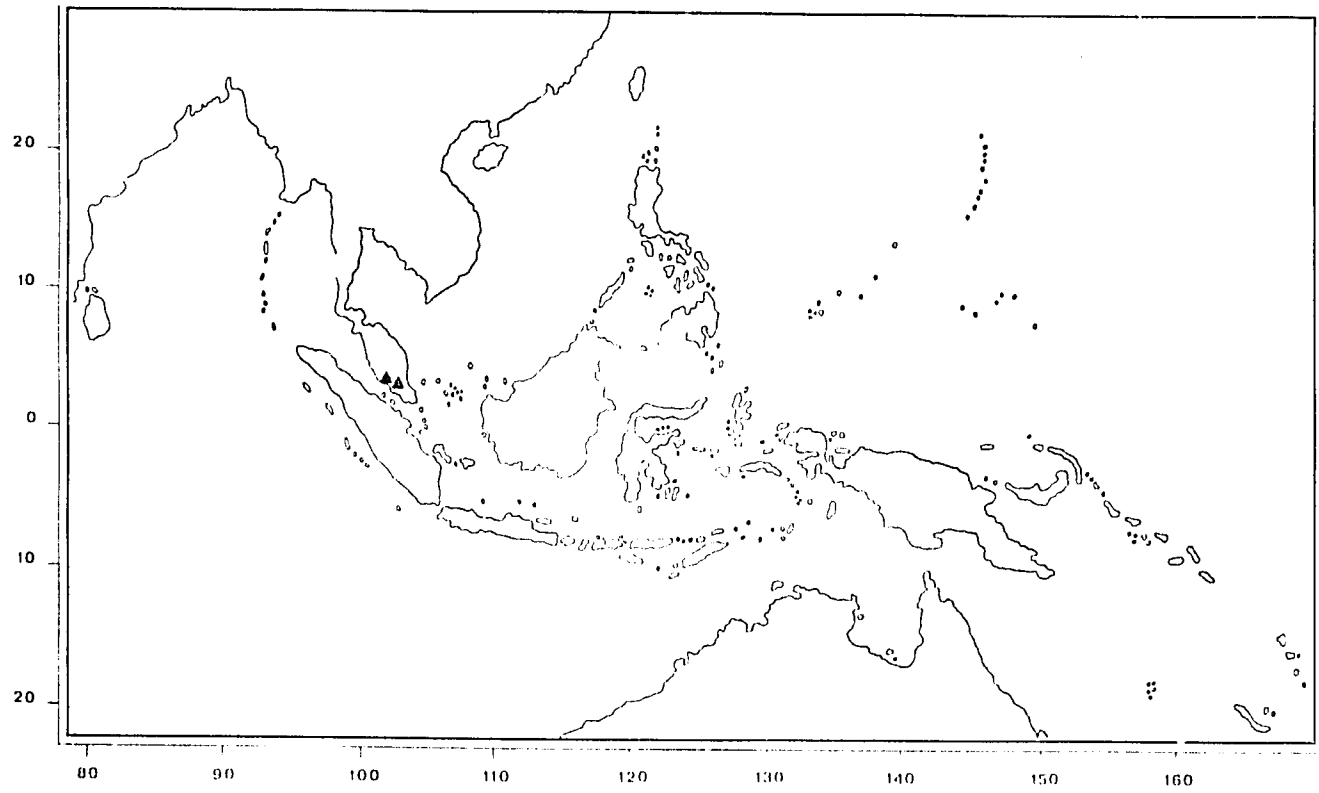

Fig. 37. Distribution map of Mangifera superba

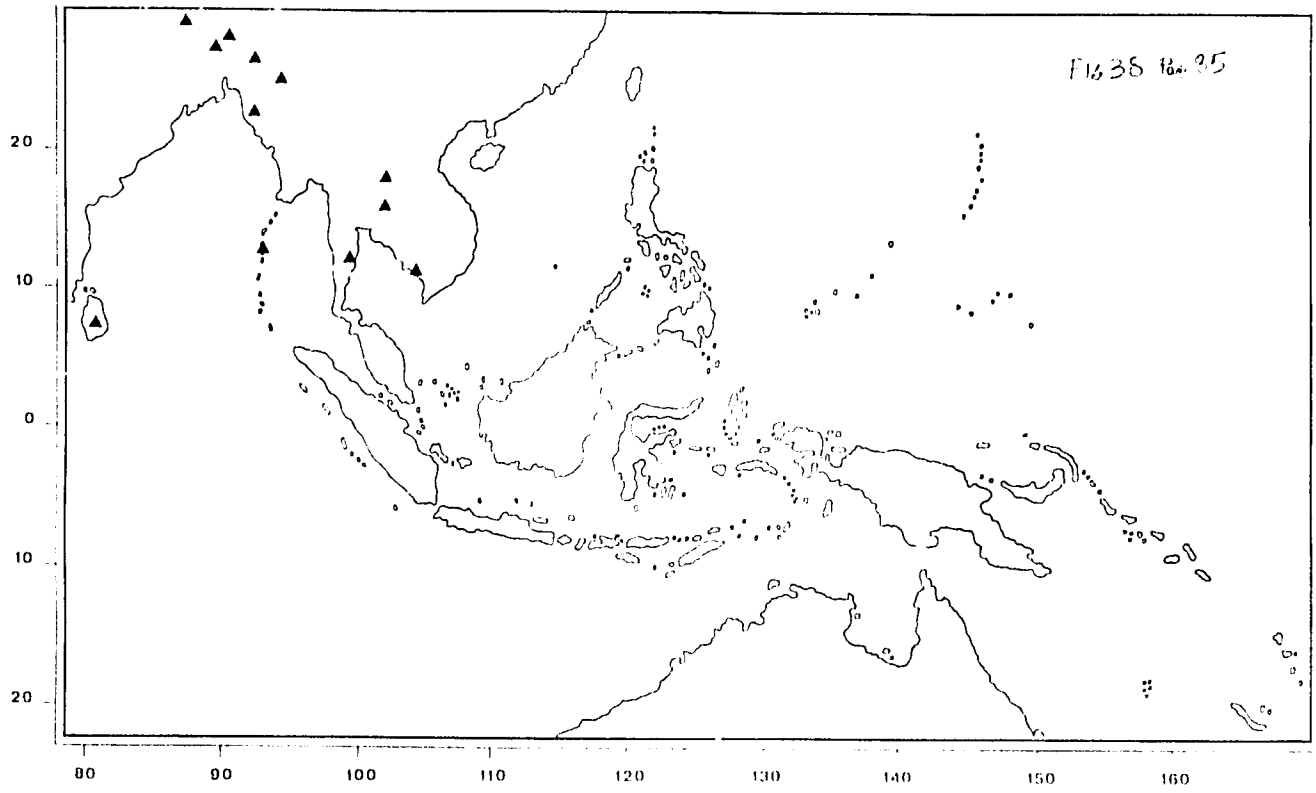

Fig. 38. Distribution map of Mangifera sylvatica

APPENDIX III
(Continued)

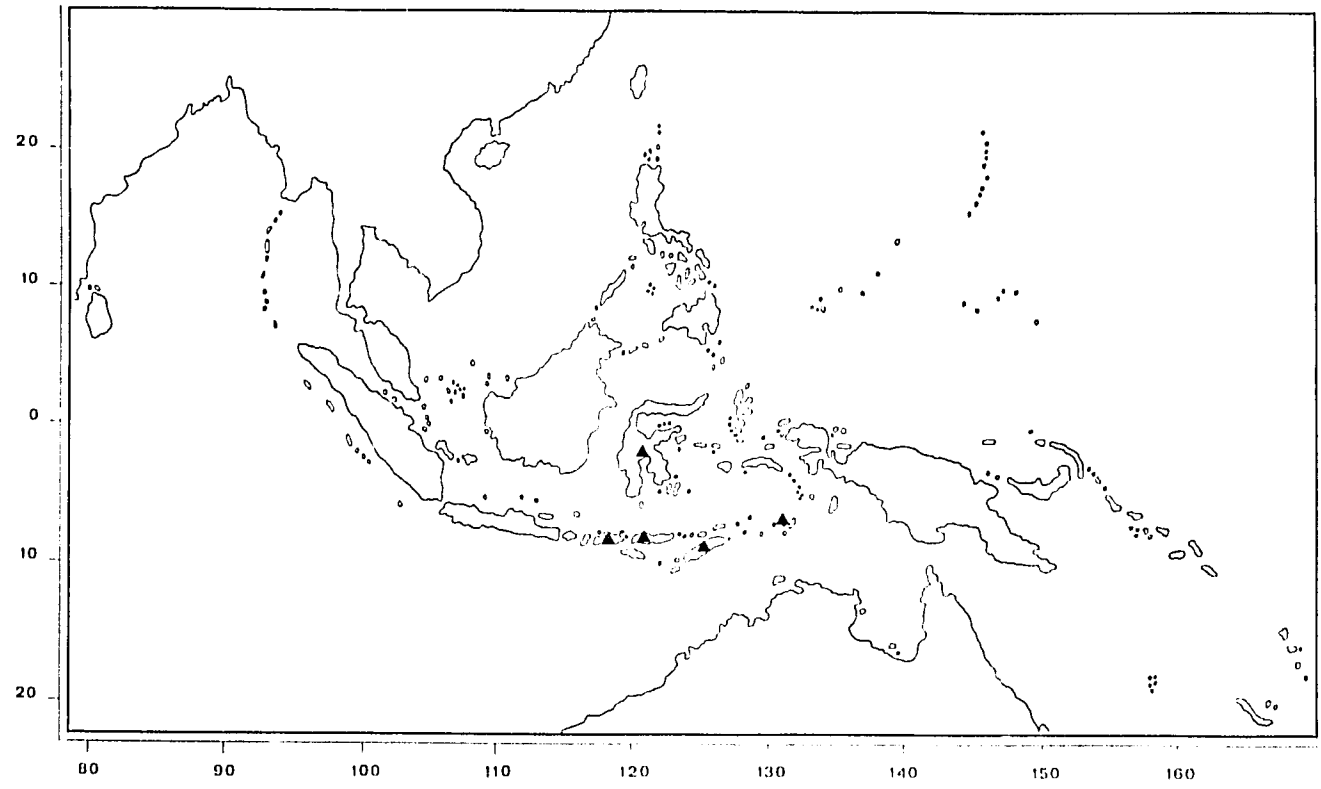

Fig. 39. Distribution map of Mangifera timorensis

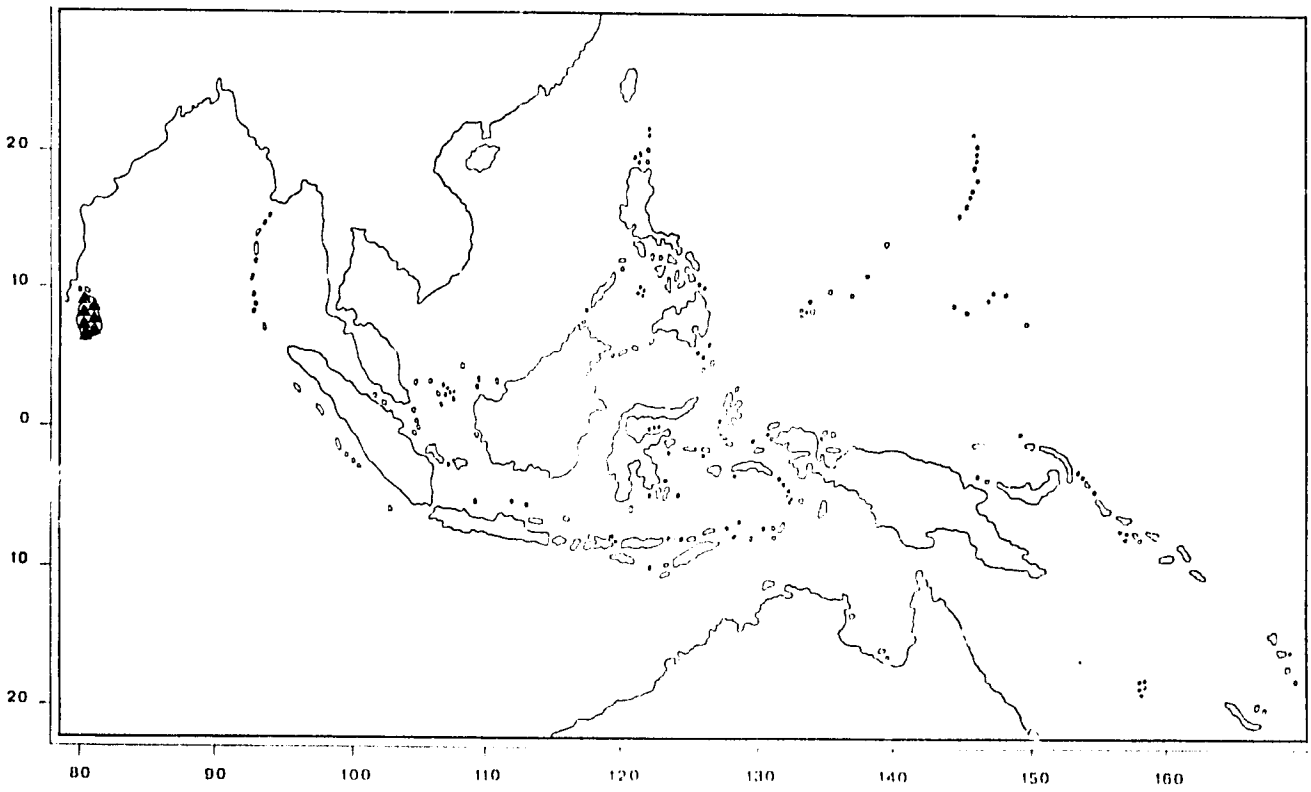

Fig. 40. Distribution map of Mangifera zeylanica