

The Diversity of *Ficus* L. (Moraceae) in Khao Ang Reu Nai Wildlife Sanctuary, Thailand

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ABSTRACT.- The diversity of *Ficus* (Moraceae) was conducted at Khao Ang Reu Nai Wildlife Sanctuary during 2003. Line transects were used for monitoring in which ten line transects were established and each line extended 10 km. Recensus was done every month which species and site distribution including environmental data were recorded. The result showed that 39 *Ficus* species were founded, representing all subgenera; *Urostigma* with 17 species; *Pharmacosycea* with 5 species; *Sycomorus* with 5 species; *Ficus* with 2 species; *Synoecia* with 5 species and *Sycidium* with 5 species.

KEY WORDS : *Ficus* L., Khao Ang Reu Nai Wildlife Sanctuary, Thailand, Moraceae.

INTRODUCTION

Species diversity of *Ficus* L. (Moraceae) has diverse in Thailand. Fruit (syconium) of fig tree are the most valuable to wildlife especially, birds and primate. And they could be the hemi-epiphytic by killed the host tree in the forest depended on fig species. However, less documented has been reported. Thus the objective of this study aims to clarify the diversity of fig in Thailand, especially in eastern forest complex with included in southeastern part of Thailand floristic regions.

Khao Ang Reu Nai Wildlife Sanctuary is situated in the eastern forest complex, the area adjoined by five provinces; Sa Kaeo, Chachoengsao, Chon Buri, Rayong and Chanthaburi. (lat. 13°00' - 14°00'; long. 101°35' - 102°05'). Altitudes 30 - 763 m. Average rainfall in 30-year period (1956-1986) is 1,890 mm per month and the average temperature is 26.7 °C. The main vegetation types are dry evergreen forest, mixed

deciduous forest, deciduous dipterocarp forest, vegetation as limestone outcrops, old farmland, and area with shifting cultivation.

Description of *Ficus* L.: trees, shrubs or climbers, often with adventitious roots, monoecious or dioecious; with milky, sometimes colorless sap. Leaves alternate and spiral, distichous or opposite, stipulate. Inflorescences with an urceolate receptacle (syconium), bracts mostly 3 subtending the receptacle or sometime scatter on the peduncle, mostly 2 or 3. Flower unisexual (staminate, pistillate, or terming galls), or pseudo-hermaphrodite. Male flowers with 1, 2 or rarely 3 exerted or included the anthers can be ovate not stamens, sometimes with a rudimentary pistil, the perianth 2 to 6 distinct pieces or gamophyllous or absent. Fertile female flower with a single pistil and without rudimentary stamens, the ovary 1-celled with 1 pendulous ovule, the style more or less lateral, with a clavate, cylindrical, peltate, or bifid stigma. Gall flower similar to the fertile female, but do not produce seeds, and often occupied by the insect pupa, the style shorter than in the fertile female. Neuter flower with

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perianth like those of the males but not pistillate or stamens (King, 1887).

MATERIALS AND METHODS

Line transects were used for monitoring in which ten line transects were established and each line extended 10 km. Recensus was done every month which species and site distribution including environmental data were recorded. Monthly survey works were conducted to collect all required data. The species identification followed mainly the monumental works of Berg (2003a, 2003b, 2003c, 2003d, 2004a, 2004b), Corner (1960, 1961, 1965), King (1887, 1888), Ridley (1924) and carefully compared to the labelled materials in many herbaria, i.e. BK., BKF. and others.

RESULTS

From the survey result, 39 species of *Ficus* L. were collected and positively identified as shown below in 6 particular subgenera.

Subgenus *Urostigma*: Hemi-epiphytic (or hemi-epilithic) trees (or shrubs) with an extensive system of aerial adventitious roots (stranglers), monoecious. Lamina with the margin entire and a single waxy gland at the base of the midrib beneath (Berg, 2004b).

Seventeen species were found in Khao Ang Reu Nai Wildlife Sanctuary, as shown in table 1. Evergreen or deciduous. They are usually hemi-epiphytic but in some species are climbers (*Ficus globosa* Blume).

Table 1 List of *Ficus* species in the Subg. *Urostigma*

Species	Vernacular name	Dominant characters
<i>Ficus altissima</i> Blume	กร่าง, ลุง, ไทรทอง	evergreen; fig sessile; receptacle globose to oblong, 1.2 – 1.5 cm in diameter, glabrous, yellow to orange when ripe.
<i>Ficus annulata</i> Blume	ไทร, ไทรเขียว	evergreen; fig pedunculate, 0.5 – 1 cm long; receptacle ovate, 2.5 – 3 cm in diameter, glabrous, pale green to pale yellow when ripe.
<i>Ficus benjamina</i> L.	ไทรย้อยใบแหลม	evergreen; fig sessile; receptacle globose to obovate, 0.8 – 1 cm in diameter, glabrous, yellow to orange to black when fully ripe.
<i>Ficus calcicola</i> Corner	ไทรเขาปูน	deciduous; bark white; fig sub-sessile; receptacle depressed-globose, 0.7 – 1 cm in diameter, glabrous, yellow-green (dark) when ripe.
<i>Ficus callophylla</i> Blume	ไทรใบสารภี	evergreen; fig sessile; receptacle ovate to globose, 1 – 1.2 cm in diameter, glabrous, orange to red or to dark brown (sometime pink) when ripe.
<i>Ficus crassiramea</i> (Miq.) Miq. subsp. <i>crassiramea</i>	ไทรใหญ่	evergreen; fig sessile; receptacle ovate, 1 – 1.5 cm in diameter, glabrous, orange-red to dark brown when ripe; basal bracts large, 0.5 – 0.7 cm long, glabrous.

Table 1 Continued.

Species	Vernacular name	Dominant characters
<i>Ficus drupacea</i> Thunb.	ลุงขน	deciduous; young branch tomentose; fig sessile; receptacle oblong, 1.3 – 1.6 cm in diameter, tomentose (when young), glabrous (when older), yellow to orange-red when ripe.
<i>Ficus geniculata</i> Kurz	ไต่	deciduous; lamina ovate to oblong; petiole slender, 5 – 10 cm long; fig sub-sessile; receptacle globose, 0.7 – 1.2 cm in diameter, glabrous, at first ripening white to black when fully ripe.
<i>Ficus globosa</i> Blume	ไทรลูกกลม	Woody climber; evergreen, lamina elliptic to ovate; fig pedunculate 0.4 – 0.6 cm long; receptacle globose, 1.5 – 2.1 cm in diameter, glabrous, pale green to pink when ripe.
<i>Ficus kurzii</i> King	ไทรยอดย้อย	evergreen; fig sessile (or stipe); receptacle obovate, 1.2 – 1.8 cm in diameter, glabrous, at first ripening red to black at maturity.
<i>Ficus microcarpa</i> L.f.	ไทรย้อยใบหูก	evergreen; fig sessile; receptacle globose, 0.8 – 1 cm in diameter, glabrous, black when ripe.
<i>Ficus pubilimba</i> Merr.	ไทรใบขน	evergreen; young parts pubescent; surface of lamina pubescent; fig sessile; receptacle ovate to globose, 0.5 – 1 cm in diameter, when young pubescent, nearly glabrous at maturity, orange to red when ripe; basal bract pubescent.
<i>Ficus rumphii</i> Blume	โพต้นก. โพประสาท	evergreen; lamina heart-shaped; fig sessile; receptacle obovate to globose, glabrous, 1.2 – 1.6 cm in diameter, black when ripe.
<i>Ficus subcordata</i> Blume	ไทร	evergreen, fig sessile; receptacle oblong, glabrous, 1.4 – 1.8 cm in diameter, yellow to orange when ripe.
<i>Ficus sumatrana</i> Miq.	ไทรเล็กกลมดรา	evergreen; lamina elliptic, not long than 10 cm; fig sessile; receptacle ovate, glabrous, 0.7 – 0.8 cm in diameter, dark red when ripe.
<i>Ficus virens</i> Aiton.	ผักเลือด	deciduous; fig sub-sessile receptacle ovate or globose, glabrous, 0.8 – 1 cm in diameter, at first white and black when fully ripe.

Subgenus *Pharmacosycea*: Terrestrial trees (often buttressed), without aerial adventitious roots. monoecious. Evergreen or deciduous. Lamina entire (when adult), with waxy glands in the axils

of the basal lateral veins or without waxy glands. (Berg, 2003a).

Five species were found in Khao Ang Reu Nai Wildlife Sanctuary. As shown in table 2.

Table 2 List of *Ficus* L. species in the Subg. *Pharmacosycea*

Species	Vernacular name	Dominant characters
<i>Ficus albipila</i> (Miq.) King	เลียงผิ้ง	deciduous; bark white; lamina heart-shaped, pubescent; fig pedunculate; receptacle globose, 0.9 – 1.3 cm in diameter, glabrous, yellow to orange when ripe.
<i>Ficus callosa</i> Willd.	มะเดื่อกลาง	deciduous; fig pedunculate; receptacle globose, 2 – 3 cm in diameter, glabrous, pale green when ripe.
<i>Ficus callilipes</i> Gagnep.	กะเหรี่ยง	deciduous; fig pedunculate; receptacle globose, 1.4 – 1.8 cm in diameter when fresh, glabrous or pubescent, orange to dark red when ripe.
<i>Ficus nervosa</i> B. Heyne ex Roth subsp. <i>nervosa</i>	โพขนุ่น	evergreen; fig pedunculate; receptacle globose, 1.2 – 1.6 cm in diameter, glabrous, orange to red when ripe.
<i>Ficus vasculosa</i> Wall. ex Miq.	มะเดื่อทอง	evergreen; fig pedunculate; receptacle globose, 1.1 – 1.3 cm in diameter, glabrous, yellow to orange when ripe.

Subgenus *Ficus*: Shrub or tree with intermittent growth, without or with “Terminalia branching” (the first internodes long, the successive ones gradually shorter), dioecious. Lamina symmetric. Waxy glands often present, mostly in the axils of the basal lateral veins.

Stipules usually fully amplexicaul (rarely some or all semi-amplexicaul). Fig in the leaf axils or from previous season’s growth, with 3 verticillate basal bracts; lateral bracts absent (Berg, 2003b).

Two species were found in Khao Ang Reu Nai Wildlife Sanctuary, shown in table 3.

Table 3 List of *Ficus* species in the Subg. *Ficus*.

Species	Vernacular name	Dominant characters
<i>Ficus hirta</i> Vahl subsp. <i>hirta</i>	มะเดื่อหอม	fig sessile; receptacle ovate to oblong, hirsute, 0.7 – 1.3 cm in diameter, orange red or dark red when ripe.
<i>Ficus lamponga</i> Miq.	-	fig pedunculate; receptacle globose to ovate, 1 – 1.2 cm in diameter, orange to red to dark red when ripe.

Subgenus *Synoecia*: Root-climbers, mostly with dimorphy of leaves, those on the branches with short aerial roots (bathyphylls), different from those on the usually fig-bearing and not rooting branches (acrophylls), dioecious. Leaves mostly distichous, acrophyll leaves usually symmetric

and the margin entire. Stipules fully amplexicaul. Figs axillary or branch with below the leaf (sometimes cauliflorous), with 3 verticillate basal bracts; lateral bract absent (Berg, 2003c).

Five species were found in Khao Ang Reu Nai Wildlife Sanctuary, shown in table 4.

Table 4 List of *Ficus* species in the Subg. *Synoecia*.

Species	Vernacular name	Dominant characters
<i>Ficus laevis</i> Blume	มะเดื่อเทา	lamina usually heart-shaped; fig pedunculate, 1.5 – 2.5 cm long, receptacle depress globose, glabrous, 2.5 – 4 cm in diameter, yellow when ripe.
<i>Ficus punctata</i> Thunb.	เดื่อเถาไม้ใหญ่	fig pedunculate, born on main stem, 0.4 – 1.5 cm long; receptacle globose, glabrous, 3 – 4.5 cm in diameter, black when ripe.
<i>Ficus sagittata</i> J. König ex Vahl	เดื่อเถาไม้หอก	lamina sagittate when young; fig pedunculate, 0.5 – 1 cm long, receptacle depress-globose, 1.3 – 1.5 cm in diameter, orange when ripe.
<i>Ficus trichocarpa</i> Blume	เดื่อเถาขนใหญ่	surface of lamina tomentose; fig pedunculate, 0.6 – 1.2 cm long, receptacle globose to depressly globose, tomentum, 1.3 – 1.5 cm in diameter, dark red when ripe.
<i>Ficus villosa</i> Blume	เดื่อเถาไม้ขน	branch and surface of lamina villose; fig pedunculate, 0.5 – 1 cm long, receptacle sub-globose, villose, 0.8 -0.9 cm in diameter, yellow-orange when ripe.

Subgenus *Sycidium*: Terrestrial shrubs, trees or climbers or hemi-epilitic (but without strong and extensive systems of aerial adventitious roots), dioecious. Leaves in spiral, distichous or opposite; lamina often asymmetric, often scabrous, and the margin often dentate (to lobate). Stipules often semi-amplexicaul

to lateral. Fig axillary or rami-cauliflorous, the fig-bearing branchlets usually short; the “basal bracts” mostly not verticillate but scattered on the peduncle; lateral bract often present (Berg, 2003d).

Five species were found in Khao Ang Reu Nai Wildlife Sanctuary, shown in table 5.

Table 5 List of *Ficus* species in the Subg. *Sycidium*.

Species	Vernacular name	Dominant characters
<i>Ficus heterophylla</i> L.f.	สลอดน้ำ	lamina variable in shape; fig pedunculate; receptacle globose to ellipsoid, 1.2 – 1.8 cm in diameter, orange to red when ripe.
<i>Ficus montana</i> Burm.f.	มะเดื่อหิน	lamina almost asymmetry; fig pedunculate; receptacle globose 0.7 – 1 in diameter, orange to red when ripe.
<i>Ficus heteropleura</i> Blume	สลอดหิน	lamina almost asymmetry, apex of lamina caudate or longtailed; fig pedunculate; receptacle globose, scabrous, 0.5 – 0.8 cm in diameter, orange to red when ripe.
<i>Ficus subulata</i> Blume	เดื่อเลื้อย	lamina asymmetry; fig pedunculate; receptacle globose, glabrous, 0.6 – 0.8 cm in diameter, yellow to orange to red when ripe.
<i>Ficus tinctoria</i> Forst. f. subsp. <i>gibbosa</i> (Blume) Corner	गर่าง	lamina asymmetry (usually almost rhomboid); fig pedunculate; receptacle globose, glabrous, 0.8 – 1.2 cm in diameter, dark red when ripe.

Subgenus *Sycomorus*: Terrestrial trees or shrubs, dioecious or monoecious. Leaves often asymmetric and the margin dentate. Waxy glands in the axils of the basal and/or lateral veins, and (also) furcation of lateral veins, or (also) on the nodes of leafy twigs. Stipules fully amplexicaul. Fig axillary, but mostly cauliflorous and the fig-

bearing branches often becoming long or flagelliflorous on stolon departing from the base of the trunk; basal bracts mostly 3 and verticillate; lateral bracts often present (Berg, 2004).

Five species were found in Khao Ang Reu Nai Wildlife Sanctuary, show in table 6.

Table 6 List of *Ficus* species in the Subg. *Sycomorus*.

Species	Vernacular name	Dominant characters
<i>Ficus auriculata</i> Lour.	เตื่อหัว	dioecious; fig born on main branches or stem, pedunculate; receptacle pear-shaped, 3.5 – 4.5 cm in diameter, orange to red when ripe.
<i>Ficus fistulosa</i> Reinw.	ซิ่ง	dioecious; fig born on main branches or stem or axillary, pedunculate; receptacle pear-shaped, 1.1 – 1.9 cm in diameter, yellow when ripe.
<i>Ficus hispida</i> L.f.	มะเตื่อปล้อง	dioecious; fig born on main branches or stem or axillary or on stolon, pedunculate; receptacle globose to pear-shaped, 2 – 4 cm in diameter, yellow when ripe.
<i>Ficus racemosa</i> L.	มะเตื่ออุทุมพร	monoecious; fig born on main branches or stem, pedunculate; receptacle sub-globose, 2.2 – 3 cm in diameter, orange to red when ripe.
<i>Ficus variegata</i> Blume	สุภา	dioecious; fig born on main branches or stem, pedunculate; receptacle sub-globose, 2 – 3 cm in diameter, orange to red when ripe.

DISCUSSION AND CONCLUSION

In this study, we found 39 species of *Ficus* L. in Khao Ang Reu Nai Wildlife Sanctuary, and 6 species are new locality records, i.e. *Ficus callilipes* Gagnep. *F. vasculosa* Wall., *F. laevis* Blume, *F. villosa* Blume, *F. montana* Burm.f. and *F. subulata* Blume. But 2 species have not been found of Fig; *Ficus hederacea* Roxb. known from Khao Soi Dao area, Chanthaburi Province, and *Ficus fulva* Reinw. ex Blume collected from Makhm District, Chanthaburi Province. It could be assumed that both species might present here in very low scattered populations; with further searches in the near future, they would be encountered by us.

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APPENDIX

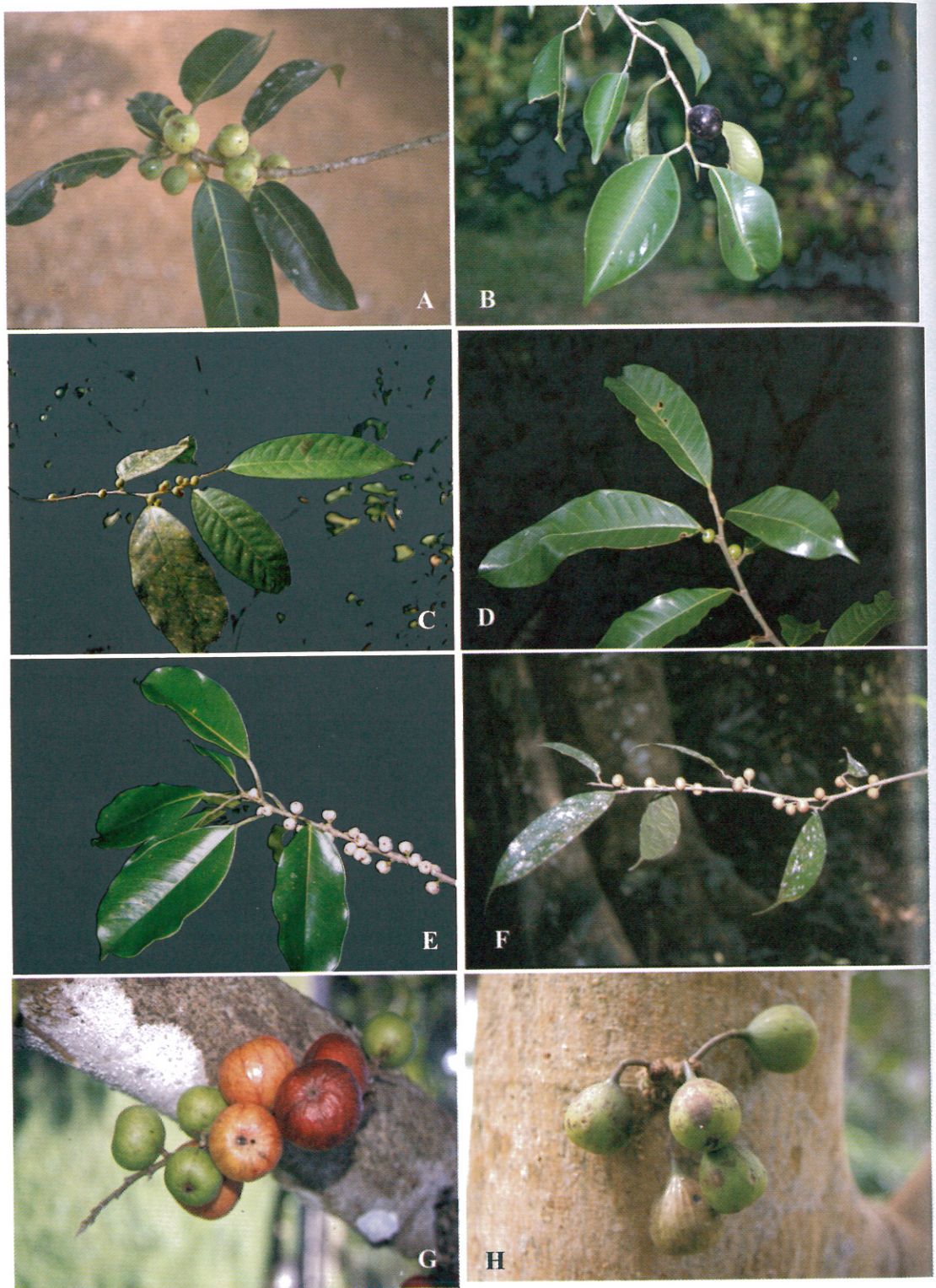


Figure 1 Showing fruits of fig species: A = *Ficus globosa* Blume, B = *Ficus kurzii* King, C = *Ficus subulata* Blume, D = *Ficus nervosa* B. Heyne ex Roth subsp. *nervosa*, E = *Ficus virens* Aiton., F = *Ficus heteropleura* Blume, G = *Ficus racemosa* L.f., H = *Ficus variegata* Blume