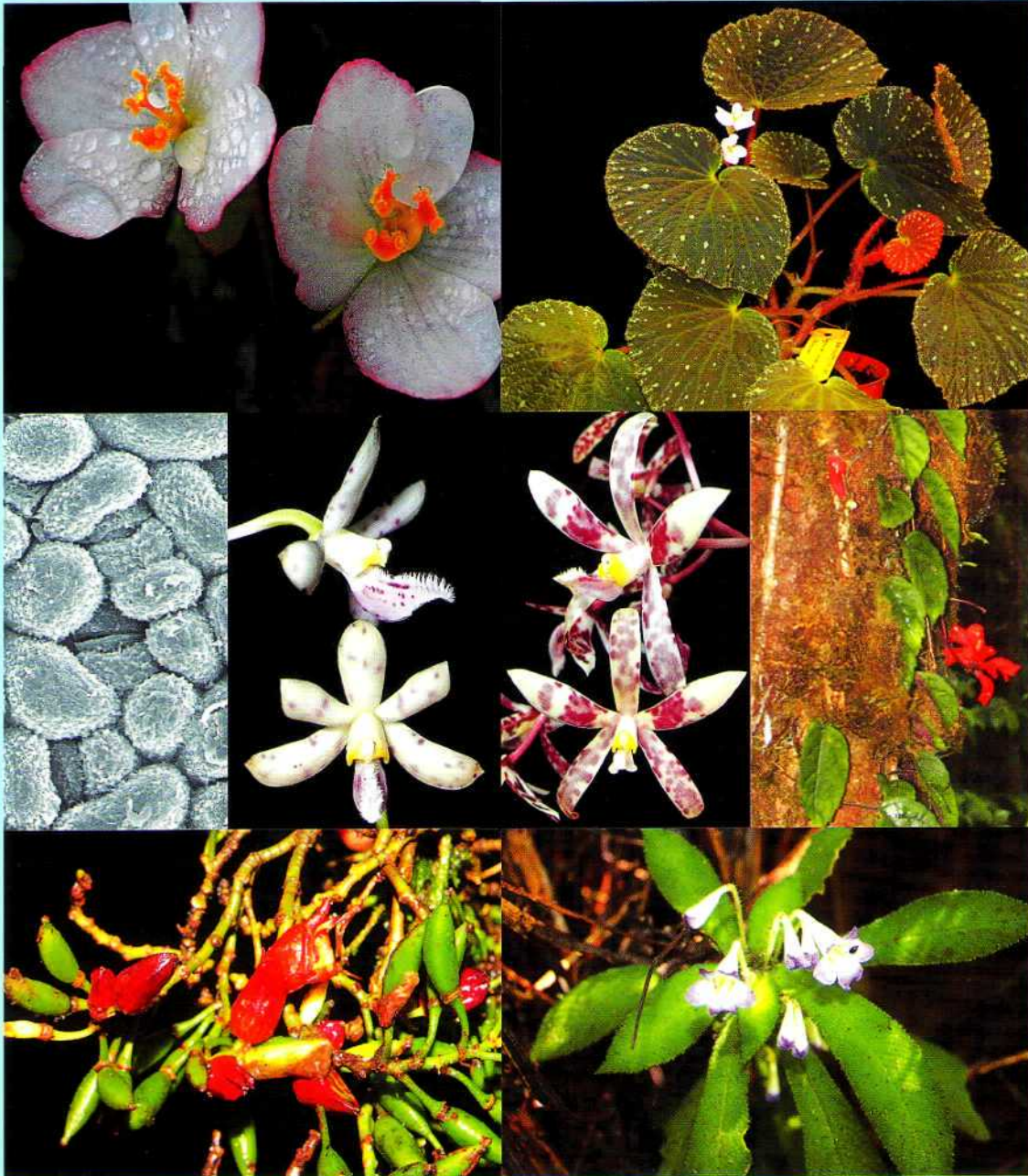




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Cover images: 1. *Begonia holosericeoides* (female flower and habit) (Begoniaceae; Ardi *et al.*); 2. Abaxial cuticles of *Alseodaphne rhododendropsis* (Lauraceae; Nishida & van der Werff); 3. *Dipodium puspitae*, *Dipodium purpureum* (Orchidaceae; O'Byrne); 4. *Agalmyla exannulata*, *Cyrtandra coccinea* var. *celebica*, *Codonoboea kjellbergii* (Gesneriaceae; Kartonegoro & Potter).

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TAXONOMIC REVISION OF ASIAN GENUS GLYPTOPETALUM THWAITES (CELASTRACEAE R. BR.)

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ABSTRACT

SAVINOV, I. A. 2014. Taxonomic revision of Asian genus *Glyptopetalum* Thwaites (*Celastraceae* R. Br.). *Reinwardtia* 14(1): 183 – 192. — Taxonomic survey of Asian genus *Glyptopetalum* Thwaites (*Celastraceae* R. Br.) is presented. Thirty five species taxa of *Glyptopetalum* are accepted, including one new species, *G. vidalii* I. Savinov (Laos, Thailand), a new record for China, *G. tonkinense* Pitard (SE Yunnan) and a new record for Cambodia, *G. quadrangulare* Prain ex King, a new record for Indonesia – *G. euonymoides* Merr. and a new record for Philippines, Mindanao island – *G. loheri* Merr.

Key words: Asia, *Celastraceae*, *Glyptopetalum*, *G. vidalii* I. Savinov, *spec. nov.*, taxonomic treatment.

ABSTRAK

SAVINOV, I. A. 2014. Revisi taksonomi marga *Glyptopetalum* Thwaites (*Celastraceae* R. Br.) di Asia. *Reinwardtia* 14(1): 183 – 192. — Survey taksonomi marga *Glyptopetalum* Thwaites (*Celastraceae* R. Br.) di Asia disajikan. Tiga puluh lima jenis *Glyptopetalum* diterima, termasuk satu jenis baru, *G. vidalii* I. Savinov (Laos, Thailand), satu rekaman baru untuk China, *G. tonkinense* Pitard (SE Yunnan), dan dua rekaman baru untuk Kamboja, *G. quadrangulare* Prain ex King, rekaman baru untuk Indonesia – *G. euonymoides* Merr. dan rekaman baru untuk Filipina, pulau Mindanao – *G. loheri* Merr.

Kata Kunci: Asia, *Celastraceae*, *Glyptopetalum*, *G. vidalii* I. Savinov, jenis baru, perlakuan taksonomi.

INTRODUCTION

Glyptopetalum is one of smaller genera of the family Celastraceae, comprises about 30 species morphologically similar from Sri Lanka (1 species), India (3 species), Bangladesh?, Myanmar (3 species), Thailand (5 species), China (11 species, 8 - endemic)*, Cambodia, Laos and Vietnam (12 species), Philippines, Malaysia and Indonesia (8 species). The genus is a shrubs or small trees. They are growing in different types of forests from the lowland up to 1400 m. The species are all rare and local in the region (Ding Hou, 1962).

Genus *Glyptopetalum* was described by Thwaites in 1856 with one type species – *G. zeylanicum* Thwaites from Ceylon. G. Bentham and J. D. Hooker in “Genera Plantarum” (1862) considered *Euonymus* and *Glyptopetalum* as closely related genera in *Euonymae* subtribus and mentioned only slight differences between them. M. A. Lawson in J. D. Hooker's «Flora of British India» (1875) published descriptions of three species of *Glyptopetalum* – *G. zeylanicum*, *G. sclerocarpum* and *G. grandiflorum*. However, genus *Glyptopetalum* was not supported as separate by H. Baillon (1877). Then, in Loesener's *Celastraceae*

revision (1942) both genera was supported as separates. In *Celastraceae* revision for “Flora Malesiana” Ding Hou (1962) mentioned 8 species of *Glyptopetalum* from the region and approximately 20 species in the world. Many new species was opened from Indochina (Pierre, 1894; Pitard, 1907-1912a; Tardieu-Blot, 1948) and from Philippines by Elmer D. Merrill (1967). Further, it was received a new materials on the genus, including described a new species (Ding Hou, 1963; Cheng *et* Ma, 1999; Liu *et* Funston, 2008). In the last time closely relations between *Euonymus* and *Glyptopetalum* was well supported by molecular data (Simmons *et al.*, 2012).

Glyptopetalum is closely related (and very similar) to genus *Euonymus* Tournef. ex L., both genera are confused very often, especially on dry herbarium materials. Actual problem is searching of new morphological diagnostic characters and realizing of new taxonomic revision, with analysis of all accumulated materials.

MATERIALS AND METHODS

This taxonomic treatment founded on critical study of herbarium materials deposited in E, K, P, C, BKF, CMU, PNH, HN, PE, CDBI, KUN,

Table 1. The morphology characters of *Glyptopetalum* and *Euonymus*.

Characters	<i>Euonymus</i>	<i>Glyptopetalum</i>
Flowers	4- or 5-merous	Always 4-merous
Disk	4-5-angular or 4-5-lobed	4-angular or slightly 4-lobed
Ovule per cell	2 or more	Always 1
Capsule form	Usual slightly or deep-lobed, ovate, globose, sometimes winged or echinate	Globose or subglobose (flattened out), slightly lobed
Capsule when open	(3-)4-5-lobed or angular, without columella, with 2 seeds in each locule	4-1-celled, valves splitting from the central axis leaving a persistent columella, with 1 seed in each locule
Seeds	Small, complete or incomplete covered by aril, with raphe not branched	Big (in 1,5-2 ones more than in <i>Euonymus</i>), incomplete covered by aril, with many branches (from 3 to 6) of raphe

IBSC, BO, and also on field trips in different countries of Southeastern Asia. Author also examined a new herbarium collections from Cambodia by Shuichiro Tagane with colleagues (Japan) and from Vietnam by Maxim Nuraliev (Russia).

RESULTS AND DISCUSSION

Below are listed all species of *Glyptopetalum*, which are accepted in this study. Thirty five species taxa of *Glyptopetalum* are accepted here. Main morphological characters of *Glyptopetalum* and *Euonymus* are summarized in table 1.

TAXONOMIC TREATMENT

GLYPTOPETALUM Thwaites

Glyptopetalum Thwaites, Hooker's J. Bot. Kew Gard. Misc. 8: 267. 1856. — Type: *G. zeylanicum* Thwaites subsp. *zeylanicum* Zeylon, Thwaites.

Shrubs or small trees. *Stipules* small, caducous. *Leaves* decussate or opposite. *Inflorescences* cymose, simple or multi-circled (compound) dichasia, axillary or extra-axillary. *Flowers* bisexual. *Calyx* 4-lobed. *Petals* 4. *Disk* fleshy, flat, 4-angular or slightly 4-lobed. *Stamens* 4, inserted on the disk; filaments free. *Ovary* immersed in the disk, 4-loculed. *Ovules* 1 in each locule, pendulous. *Fruits* capsular, globose or subglobose, loculicidal, when dehiscing the valves splitting from the central axis leaving a persistent columella. *Seeds* wingless, with incomplete, fleshy basal aril, the raphe branched into 3-6 bands on the surface.

Distribution. 35 species in Southern and South-eastern Asia: India and Sri Lanka (3 endemics species), Bangladesh (?), data is absent),

Myanmar (4 species), Thailand (6 species, 1 – endemic), Indochina (13 species, 7 – endemics), China (11 species, 8 – endemics), Taiwan (1 endemic species), Philippines and Indonesia (7 species, 6 – endemics), Malaysia (2 species, 1 endemic subspecies).

CONSPECTUS OF *GLYPTOPETALUM* IN SOUTH AND SOUTHEASTERN ASIA

Because many species of the genus are rare and local in Asia and mostly known from a few specimens, below they are considered on geographic regions with indication of the number of species, including endemic taxa.

INDIA AND SRI LANKA, 3 endemics species

1. GLYPTOPETALUM LAWSONII Gamble

Glyptopetalum lawsonii Gamble, Bull. Misc. Inform. Kew 1916, 131; Gamble, Fl. Pres. Madras 204 (147). 1918; M. Mohanan & Henry, Fl. Thiruvanthapuram 115. 1994; K. Ramam. in N.P. Singh *et al.*, Fl. India 5: 112. 2000. — Type: Ind or. (Madras).

2. GLYPTOPETALUM GRANDIFLORUM Bedd.

G. grandiflorum Bedd. Icon. Pl. Ind. Or. 1: 21 1871. — Type: Western Peninsula, damp forests on the Wynnaad, alt. 2-2800 ft., Beddome.

3. GLYPTOPETALUM ZEYLANICUM Thwaites

G. zeylanicum Thwaites in Hooker's J. Bot. Kew Gard. Misc. 8: 268 1856. — Type: Zeylan. var. *zeylanicum*.

MYANMAR, 4 species, 1 – endemic

4. GLYPTOPETALUM CALOCARPUM (Kurz) Prain

KEY TO THE SPECIES OF *GLYPTOPETALUM* IN SOUTHERN AND SOUTHEASTERN ASIA
(mainly according to: Pitard, 1907-1912a; Tardieu-Blot, 1948; Ding Hou, 1962, 1963; Liu *et* Funston, 2008; Savinov, orig. data)

- | | | | |
|-----|----|---|-----------------------------|
| 1. | a. | Leaf blade margin with coarse spiny teeth | 2 |
| | b. | Leaf blade margin dentate, denticulate, serrate, or nearly entire | 3 |
| 2. | a. | Leaf blade obovate or elliptic, with petiole 2–6 mm | <i>G. ilicifolium</i> |
| | b. | Leaf blade ovate or oblong-ovate, sessile | <i>G. aquifolium</i> |
| 3. | a. | Leaves dentate | 4 |
| | b. | Leaves entire | 21 |
| 4. | a. | Leaves sessile or subsessile; base of blade subcordate | <i>G. subcordatum</i> |
| | b. | Leaves distinctly petiolate, more than 3 mm long; base of blade usually cuneate, sometimes obtuse or rounded | 5 |
| 5. | a. | Leaves with apices obtuse to rounded sometimes slightly notched | 6 |
| | b. | Leaves with apices acute to acuminate | 7 |
| 6. | a. | Leaves broad-elliptic, ovate or obovate, 4.5–6 by 3 ¹ / ₃ –3.5 cm. Pedicels of the lateral fruits of each cyme at most 1 mm long above the articulation with the bracteoles | <i>G. euonymoides</i> |
| | b. | Leaves obovate to obovate-oblong, 10–14 by 5–8 cm. Lateral fruits <i>ca.</i> 6 mm pedicelled | <i>G. palawanense</i> |
| 7. | a. | Branchlets often distinctly 4-angled, sometimes sharply winged. Leaves with nerves and veins depressed above, blade appearing as subbullate | <i>G. quadrangulare</i> |
| | b. | Branchlets usually terete, very rarely slightly 4-angular. Leaves with nerves and veins visible or obscure, sometimes distinct on both surfaces, not bullate | 8 |
| 8. | a. | Leaves lanceolate to narrow-lanceolate, 20–23 by 4–7 cm, veins and veinlets obscure or invisible on both surfaces, margin remotely denticulate | <i>G. acuminatissimum</i> |
| | b. | Leaves usually elliptic to elliptic-oblong, ovate-oblong, rarely lanceolate, 4–17.5 by 2–6 ³ / ₄ cm, veins and veinlets distinctly reticulate on both surfaces | 9 |
| 9. | a. | Inflorescences <i>c.</i> 2 cm long. Leaf margin subentire, repandous, or with obscure, small black teeth | <i>G. loheri</i> |
| | b. | Inflorescences usually longer, up to 10 cm long. Leaf margin usually crenulate | 10 |
| 10. | a. | Inflorescences rather small, few branched, 2.5–5 cm long, peduncles 2–3 cm. Fruits smaller 7–11 by 12–16 mm, smooth | 11 |
| | b. | Inflorescences large, many branched, up to 10 cm long | 13 |
| 11. | a. | Leaves elliptic, nerves 5–10 per side. Capsule yellowish orange-brown, smooth | <i>G. gracilipes</i> |
| | b. | Leaves oblong, oblong-ovate or oblong-lanceolate, nerves 7–9 or 8–18 per side. Capsule pallid, maculate, macula squarrose | 12 |
| 12. | a. | Leaf blade oblong, oblong-ovate, or narrowly elliptic; lateral nerves 7–9 pairs | <i>G. feddei</i> |
| | b. | Leaf blade narrowly oblong or oblong-lanceolate, rarely oblong-elliptic or narrowly obovate, margin ones or twice serrate; lateral nerves 8–18 pairs | <i>G. rhytidophyllum</i> |
| 13. | a. | Inflorescences 8–10 cm long, peduncles 6–8 cm | <i>G. longepedunculatum</i> |
| | b. | Inflorescences lesser (2–7 cm long), peduncles 0.5–4.5 cm | 14 |
| 14. | a. | Pedicels 1.5–20 mm | 15 |
| | b. | Pedicels longer, 20–35 mm | <i>G. longipedicellatum</i> |
| | c. | *Pedicels 5–10 mm | <i>G. reticulinerve</i> |
| | d. | *Pedicels 2–3 mm | <i>G. integrifolium</i> |

- | | | | |
|-----|----|--|--|
| 15. | a. | Fruit surface is wrinkled (and then with minute tubercles) or cracked | 16 |
| | b. | Fruit surface is smooth (rarely slightly wrinkled) | 17 |
| 16. | a. | Fruits 15–18 by 15–23 mm, with scurfy warts or rough with minute tubercles | <i>G. sclerocarpum</i> |
| | b. | Fruit often lesser, its surface is cracked | <i>G. vidalii</i> |
| 17. | a. | Pedicels about 20 mm long | <i>G. poilanei</i> |
| | b. | Pedicels 1.5–5 mm long | 18 |
| 18. | a. | Petals bifoveolate at the upper part inside. Pistil evidently united with the disk, short-conical | 19 |
| | b. | Petals smooth inside. Disk distinctly fleshy, flat, pistil immersed in the disk and slightly above it | 20 |
| 19. | a. | Inflorescences less spreading dichotomously branched. Flower stalk is articulated in the lower one fifth, the pedicel proper being 9–12 mm | <i>G. zeylanicum</i> var. <i>zeylanicum</i> |
| | b. | Inflorescences more lax, spreading dichotomously branched. Flower stalks is articulated at about the upper one fifth, the pedicel proper being only 2–3 mm | <i>G. zeylanicum</i> var. <i>brevipedicellatum</i> |
| 20. | a. | Fruits small, subglobose, c. 8 mm diam. | <i>G. euphlebiium</i> |
| | b. | Fruits larger, depressed-globose, c. 15 mm diam. | <i>G. marivelense</i> |
| 21. | a. | Inflorescences long 2–3 cm | <i>G. chaudocense</i> |
| | b. | Inflorescences more 3 cm long | 22 |
| 22. | a. | Leaf margin crispatе | <i>G. geloniifolium</i> |
| | b. | Leaf margin other | 23 |
| 23. | a. | Stamens with filaments long 2 mm | <i>G. fengii</i> |
| | b. | Anthers sessile | 24 |
| 24. | a. | Leaf apex obtuse to rounded | <i>G. calyptratium</i> |
| | b. | Leaf apex often acuminate | 25 |
| 25. | a. | Leaves contracted suddenly on the apex | 26 |
| | b. | Leaves are not contracted suddenly on the apex | 27 |
| 26. | a. | Leaf surface brilliant | <i>G. thorelii</i> |
| | b. | Leaf surface mates | <i>G. tonkinensis</i> |
| 27. | a. | Petioles long 0.1–0.5 cm | 28 |
| | b. | Petioles long 0.4–1 cm | 30 |
| 28. | a. | Nerves 16 or more | 29 |
| | b. | Nerves 5–6 | <i>G. angulatum</i> |
| 29. | a. | Petioles long 0.3–0.5 cm | <i>G. strixifolium</i> |
| | b. | Petioles long 0.1–0.15 cm | <i>G. harmandianum</i> |
| 30. | a. | Nerves 5–8 per side. Main peduncle 1–3 cm long, flowers small, light greenish | <i>G. calocarpum</i> |
| | b. | Nerves 8–12 per side. Peduncles filiform, slender, 10–16 cm long, flowers big, yellow | <i>G. grandiflorum</i> |
| | c. | Secondary nerves 7–9 pairs. Tertiary nerves broadly reticulate | <i>G. lawsonii</i> |
| | d. | Leaf margin entire and revolute, lateral veins and veinlets invisible | <i>G. pallidifolium</i> |

G. calocarpum (Kurz) Prain, J. Asiat. Soc. Bengal 60 : 209. 1891; Craib, Fl. Siam. 1: 280. 1926.— *Euonymus calocarpus* Kurz, J. Asiat. Soc. Bengal 41: 299. 1872; J. Asiat. Soc. Bengal 44: 159. 1875; M. A. Lawson in Hook.f., Fl. Brit. India 1: 609. 1875; Kurz, Forest Fl. Burma 1: 249. 1877. — Type: Burma.

5. GLYPTOPETALUM QUADRANGULARE

Prain ex King

G. quadrangulare Prain ex King, J. Asiat. Soc. Bengal 65: 345. 1896; Ridl., Fl. Malay Penin. 1: 446. 1922; Symington, J. Malay Branch Roy. Asiat. Soc. 14: 350. 1936; Ding Hou in Steenis, Fl. Males. ser. 1, 6: 257, fig. 7a—g. 1963; Kochummen, Tree Fl. Sabah Sarawak 1: 122, fig. 4. 1995. — Type: Penins. Mal.

6. GLYPTOPETALUM SCLEROCARPUM

(Kurz) M.A. Lawson in Hook. f.

G. sclerocarpum (Kurz) M.A. Lawson in Hook. f., Fl. Brit. India 1: 613. 1875; Prain, J. Asiat. Soc. Bengal 60: 210. 1891; Craib, Fl. Siam. 1: 280. 1926; Tardieu in Lecomte, Fl. Indo-Chine Suppl.: 785. 1948; Gardner, Sidisunthorn & Anusarnsunthorn, Field Guide For. Trees N. Thailand: 128, fig. & photo 255. 2000. — Ma et al., Flora of China [Web-version] 11. 2007 (as *G. sclerocarpum* (Kurz) M.A. Lawson). — *Euonymus sclerocarpus* Kurz, J. Asiat. Soc. Bengal 41: 299. 1872; Forest Fl. Burma 1: 250. 1877. — Type: Pegu, Kurz.

7. GLYPTOPETALUM ANGULATUM (Griff.)

Chakrab. & M.G. Gangop.

Glyptopetalum angulatum (Griff.) Chakrab. & M.G. Gangop. in *J. Econ. Taxon. Bot.* 14: 129 1990. — *Euonymus griffithii* Kurz in J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 41(2): 73 1872. — *Glyptopetalum griffithii* (Kurz) Prain in *J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist.* 60 (2): 209 1891. — *Hippocratea angulata* Griff. in Not. Pl. Asiat. 4: 473 1854. — Endemic of Myanmar (probably, is distributed in NE India?).

THAILAND, 6 species, 1 - endemic

GLYPTOPETALUM CALOCARPUM (Kurz)
Prain

8. GLYPTOPETALUM SUBCORDATUM Ding Hou

G. subcordatum Ding Hou, Blumea 12: 57, fig. 1j—p. 1963. Holotype: L, isotype: BO!

GLYPTOPETALUM QUADRANGULARE
Prain ex King

9. GLYPTOPETALUM GRACILIPES Pierre

G. gracilipes Pierre, Fl. Forest. Cochinch.: t. 311B. 1894; Pit. in Lecomte, Fl. Indo-Chine 1: 864. 1912; Craib, Fl. Siam. 1: 280. 1926; Tardieu in Lecomte, Fl. Indo-Chine Suppl.: 785. 1948.— *Glyptopetalum annamense* Tardieu [in Lecomte, Fl. Indo-Chine Suppl.: 783,

fig. 94: 4-6, without latin description, 1948.] Not. Syst. 14: 47. 1950.

GLYPTOPETALUM SCLEROCARPUM
(Kurz) M.A. Lawson

10. *Glyptopetalum vidalii* I. Savinov, *spec. nov.* — Fig. 1(a-b).

Small tree. Leaves sclerified, with glossy surface. Inflorescences dichasial, up to 10 cm long. Fruits a capsule with cracked (with fissures) surface, 1-nested, 13x8 mm. Seed 1, 9 mm long, with branches of raphe. — Type: *J.E. Vidal 5434*, Laos, prov. Vientiane (Vang Vieng) 1971 (P!).

Distribution. Central Lao PDR, Northern and SW Thailand (CMU!).

Habitat and ecology. Seasonal mixed forests, on the limestone bedrock (alt. 800-900 m). Fl. unknown; Fr. October-December.

Specimens examined. LAOS: *J.E. Vidal 5434* (P). THAILAND. *Martin van der Bult 636, 711* (CMU), *R. Pooma 1369* (CMU).

Notes. The examined specimens are very similar to *G. sclerocarpum* (Kurz) M.A. Lawson in Hook. f., but differ by the surface of capsule, which is cracked (fissured) (in *G. sclerocarpum* — with scurfy warts or rough with minute tubercles), and by the leaves which are more sclerified. The new species differs from *G. sclerocarpum* ecologically also. It grows in seasonal mixed forests, on limestone bedrock (alt. 800-900 m), whilst *G. sclerocarpum* grows in lowland evergreen or mixed forests. Moreover, *G. sclerocarpum* does not occur in Laos, whereas *G. vidalii* is distributed in Central Lao PDR (P!), Northern and SW Thailand (CMU!). The species is named after the French botanist, Prof. Jule Vidal, who collected unusual specimen in Laos.

INDOCHINA, 13 species, 7 - endemics

G. annamense Tardieu: *Poilane 27690*, Vietnam, 1939, — Type et isotype (P!) = *G. gracilipes* Pierre

11. GLYPTOPETALUM CALYPTRATUM Pierre

G. calyptratum Pierre, Fl. Forest. Cochinch. sub t. 311 (1894). *Pierre 4074*, Cochinchina, 1866. — Holotype et isotypes (Det.: Ivan Savinov, 23 June 2009, P!).

12. GLYPTOPETALUM CHAUDOCENSE Pierre
G. chaudocense Pierre, Fl. Forest. Cochinch. sub t. 310 (1894). *Harmand 530 et 634* (Herb. Pierre 4076), Cochinchina, 1875-77. — Holotype et isotype (Det.: Ivan Savinov, 23 June 2009, P!).

GLYPTOPETALUM GRACILIPES Pierre
Pierre 4083, Cochinchina, 1868. — Holotype et isotypes (Det.: Ivan Savinov, 23 June 2009, P!).

13. GLYPTOPETALUM HARMANDIANUM
Pierre
G. harmandianum Pierre, Fl. Forest. Cochinch. sub t. 310 (1894). *Harmand 5830*, Cochinchina. — Holotype et isotype (Det.: Ivan Savinov, 23 June 2009, P!).

14. GLYPTOPETALUM INTEGRIFOLIUM
Q.W. Lin, Z.X. Zhang & Q.R. Liu
G. integrifolium Q.W. Lin, Z.X. Zhang et Q.R. Liu, nom. nov. (Guihaia 29(2): 162) = *Microtropis poilanei* Tardieu: *Poilane 10963*, Vietnam, 1924. — Type: Vietnam, Annam, massif de Dong tri, prov. de quang tri, alt. 700M, 1926-2-16, *Poilane 10.963* (holotype et isotype, P)

15. GLYPTOPETALUM LONGEPEDUNCULATUM Tardieu
G. longepedunculatum Tardieu, Flore Générale de l'Indo-Chine 1: 783. 1949. Annotation: sine descr. lat., et in Notul. Syst. (Paris) 14(1): 47, 1950. *Poilane 9072 et 9207*, Vietnam, 1923. — Lectotype et isolectotype (Det.: Ivan Savinov, 23 June 2009, P!).

16. GLYPTOPETALUM POILANEI Tardieu
G. poilanei Tardieu, Notulae Systematicae. Herbarium du Museum de Paris 14(1): 47. 1950. *Poilane 10044*, Vietnam, 1924. — Type et isotypes (P!).

GLYPTOPETALUM QUADRANGULARE
Prain ex King

Distribution in region. Cambodia, Vietnam – Cao Bang + Bu Gia Map.

Habitat. in evergreen forest. Koh Kong, Cambodia. FU!, The Kyushu University Museum, Japan.

Specimen examined. (No T 3510, May 18, 2012; 11°33'27.95"N 103°10'39.84"E); Alt. 235m. Coll.: Toyama H., Tagane S., Kajisa T., Tsujino R., Shinozuka K., Mishima T., Tagawa K., Zang M., Phourin C., Iwanaga F., Nagamasu H., Yahara T.

Note. A new record for Cambodia

GLYPTOPETALUM SCLEROCARPUM
(Kurz) M. A. Lawson

GLYPTOPETALUM VIDALII I. Savinov
spec. nov.

17. GLYPTOPETALUM STRIXIFOLIUM Pierre
G. stixifolium Pierre, Fl. Forest. Cochinch. sub t. 310 (1894). *Harmand 1186* (Herb. Pierre 3284), Laos: Champasak, 1877 [Newman et al., 2007]. — Holotype et isotypes (Det.: Ivan Savinov, 23 June 2009, P!).

Note. Very similar to *G. harmandianum* Pierre.

18. GLYPTOPETALUM THORELII Pitard
G. thorelii Pitard, Fl. Indo-Chine [P.H. Lecomte et al.] 1: 867. 1912. *Thorel*, Laos: Xaignabouri, 1866-1868 [Newman et al., 2007]. — Holotype et isotypes (Det.: Ivan Savinov, 23 June 2009, P!).

19. GLYPTOPETALUM TONKINENSIS Pitard
G. tonkinense Pitard, Fl. Indo-Chine [P.H. Lecomte et al.] 1: 865. 1912. *Balansa 3144*, Vietnam, 1888. — Holotype (Det.: Ivan Savinov, 23 June 2009, P!).

CHINA, 11 species, 8 – endemics*

20. GLYPTOPETALUM AQUIFOLIUM (Loes. & Rehd.) C.Y. Cheng & Q.S. Ma
G. aquifolium (Loesener & Rehder) C. Y. Cheng & Q. S. Ma, in C. Y. Cheng & P. H. Huang, Fl. Reipubl. Popularis Sin. 45(3): 93. 1999.

21. GLYPTOPETALUM FEDDEI (H. Léveillé) Ding Hou
G. feddei (H. Léveillé) Ding Hou, Blumea 12: 59. 1963.

22. GLYPTOPETALUM FENGII (Chun & F.C. How) Ding Hou
G. fengii (Chun & F. C. How) Ding Hou, in Fl. Males. Ser. 1. Spermat. 6: 256 1962.

23. GLYPTOPETALUM GELONIIFOLIUM (Chun & F. C. How) C. Y. Cheng
G. geloniifolium (Chun & F. C. How) C. Y. Cheng, in C. Y. Cheng & P. H. Huang, Fl. Reipubl. Popularis Sin. 45(3): 94. 1999.

24. GLYPTOPETALUM ILICIFOLIUM Franchet) C. Y. Cheng & Q. S. Ma
G. ilicifolium (Franchet) C. Y. Cheng & Q. S. Ma, in C. Y. Cheng & P. H. Huang, Fl. Reipubl. Popularis Sin. 45(3): 92. 1999.

GLYPTOPETALUM LONGEPEDUNCULATUM Tardieu

25. GLYPTOPETALUM LONGIPEDICELLATUM (Merrill & Chun) C. Y. Cheng
G. longipedicellatum (Merrill & Chun) C. Y. Cheng, in C. Y. Cheng & P. H. Huang, Fl. Reipubl. Popularis Sin. 45(3): 90. 1999.

26. GLYPTOPETALUM RETICULINERVE
 C. Y. Wu ex G. S. Fan & Y. J. Xu
G. reticulinerve C. Y. Wu ex G. S. Fan & Y. J. Xu, in Bull. Bot. Res., 2007 Harbin 27: 129. — Holo- et paratype in KUN!

27. GLYPTOPETALUM RHYTIDOPHYLLUM
 (Chun & F. C. How) C. Y. Cheng
G. rhytidophyllum (Chun & F. C. How) C. Y. Cheng, in C. Y. Cheng & P. H. Huang, Fl. Reipubl. Popularis Sin. 45(3): 89. 1999. — Isotype in KUN!

GLYPTOPETALUM SCLEROCARPUM
 (Kurz) M. A. Lawson

GLYPTOPETALUM TONKINENSIS Pitard
 (SE Yunnan).

Note. A new record for China! (IBSC!, № 743457).

TAIWAN, 1 endemic species

28. GLYPTOPETALUM PALLIDIFOLIUM
 (Hayata) Q. R. Liu & S. Y. Meng
G. pallidifolium (Hayata) Q.R. Liu & S.Y. Meng, in Ann. Bot. Fennici 2011 48(2): 186. = *Euonymus pallidifolius* Hayata Icon. Pl. Formos. 3:57. 1913.

Note. Closely related to *G. fengii*.

PHILIPPINES AND INDONESIA, 7 species, 6 – endemics

29. GLYPTOPETALUM ACUMINATISSIMUM
 Merr.
G. acuminatissimum Merr., PJS 29 (1926) 481; Ding Hou, Fl. Males. ser. 1, 6 (1962) 257. — Type: FB 29373 Azurin (UC*, holo). Luzon: Isabela prov., Mar-Apr 1923.

30. GLYPTOPETALUM EUONYMOIDES Merr.
G. euonymoides Merr., PJS 12 c (1917) Bot. 276; EPFP 2 (1923) 481; Ding Hou, Fl. Males. Ser. 1, 6 (1962) 256. — Type: BS 27546 Ramos (A, BM, K, L*, NY*, P!, PNH (photo)!, US*, iso). Luzon: Ilocos Norte prov., Bangui, Feb-Mar 1917.

Lesser Sunda Island: Flores, Mumang, 700 m, 15 August 1980, Schmutz 6066, L, K!).

Note. A new record for Indonesia!

31. GLYPTOPETALUM EUPHLEBIUM (Merr.)
 Merr.

G. euphlebiium (Merr.) Merr., PJS 12 c (1917) Bot. 280; EPFP 2 (1923) 481; Ding Hou, Fl. Males. ser. 1, 6 (1962) 258; *Glyptopetalum marivelense* Merr. var. *euphlebiium* Merr., PJS 10 c (1915) Bot. 322. Tapulao (=High Peak), in forests, altitude “100-1400 m” (probably 1400 m), 15 Dec 1907. - *Glyptopetalum remotinervium* Merr., PJS 12 c (1917) Bot. 280; EPFP 2 (1923) 481. — Type: Merrill 741 (US*, syntype). Palawan: Ewiig (=Iwahig) River, in forest, altitude ca. 300 m, 18 Feb. 1903.

32. GLYPTOPETALUM LOHERI Merr.
G. loheri Merr., PJS 10 c (1915) Bot. 321; EPFP 2 (1923) 481; Ding Hou, Fl. Males. Ser. 1, 6 (1962) 257. — Type: Tulisan, Feb 1904. Luzon, SE Celebes.

Note. A new record for Mindanao. Specimen examined: *Gaerlan, Sageal & Romero 11046* (K!).

33. GLYPTOPETALUM MARIVELENSE
 (Elmer) Merr.
G. marivelense (Elmer) Merr., PJS 10 c (1915) Bot. 321; EPFP 2 (1923) 481; Ding Hou, Fl. Males. Ser. 1, 6 (1962) 258; *Euonymus marivelensis* Elmer, LPB 7 (1915) 2580. — Type: Elmer 6644 (not seen). Luzon: Bataan prov., Mt Mariveles, Nov 1904. - *Glyptopetalum reticulatum* Merr., PJS 12 c (1917) Bot. 277; EPFP 2 (1923) 482. — Type: BS 27043 Ramos (US*, iso). Luzon: Abra prov., Mt Posuey, damp forested slopes, altitude c. 300m, 4 Feb 1917.

34. GLYPTOPETALUM PALAWANENSE Merr.
G. palawanense Merr., PJS 26 (1925) 466; EPFP 4 (1925) 249; Ding Hou, Fl. Males. ser. 1, 6 (1962) Princessa, primary forests at low altitude, 27 Dec 1922. — Type: Palawan, 29181, iso – P!, PNH (photo)!

GLYPTOPETALUM QUADRANGULARE
 Prain ex King

Distribution in region. Kalimantan (BO!).

MALAYSIA, 2 species, 1 endemic subspecies

35. GLYPTOPETALUM ZEYLANICUM
 Thwaites

G. zeylanicum var. *brevipedicellatum* Ding Hou, Fl. Males. Ser. 1, 6: 257 (1962), fig. 7m-p. — Type: Malay Peninsula, Pahang, Kota Glanggi, Ridley, 2652, SING.

GLYPTOPETALUM QUADRANGULARE
 Prain ex King

Distribution in region. Kalimantan.

CONCLUSION

We have determined there are two general centers of species diversity: China and Indochina (21 species) and Philippines (6 species).

Glyptopetalum is closely related (and very similar) to genus *Euonymus* Tournef. ex L. The genus differs from *Euonymus* by one ovule per cell (against at least 2 in *Euonymus*), columella in capsule (its morphological nature unclear) and raphe branches on the seed.

Species of *Glyptopetalum* are differs from each other by form and surface character of loculicidal capsule (smooth, wrinkled, covered by small warts, crack-like), in which developed only one seed more often and also by seed form, its size and peculiarities of its covered by aril (covered lower part of seed on 1/2 or 1/3) and raphe branches (from 3 until 6 branches; for some southern Asian species raphe as separate, sometimes poorly divergent belts across all seed length and meeting in one point on seed top and seed base).

The species of *Glyptopetalum* are not to use in medicinal or as food (their fruits are poisonous!). But because it taxon is closely allied to *Euonymus*, it may be used as source of bark latex (gutta-perca) and some other biological active substances. This question needed future studies.

ACKNOWLEDGEMENTS

I am very grateful to my dear colleagues and friends from different countries who have supported of current taxonomic studies of Celastraceae (especially of *Glyptopetalum*) in Southeastern Asia (China, Laos, Vietnam, Cambodia, Thailand, Malaysia, Philippines, Singapore, Indonesia) and also in European Herbarium collections.

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Fig. 1a. View of herbarium type specimen of the *Glyptopetalum vidalii* I. Savinov, spec. nov. (P).



Fig. 1b. View of fruit of the *Glyptopetalum vidalii* I. Savinov, spec. nov. (P).

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