

Review of the genus *Plocoglottis* (Orchidaceae) in Cambodia, Laos and Vietnam

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Summary: The genus *Plocoglottis* is represented in Cambodia, Laos and Vietnam by three species. *Plocoglottis bokorensis* is known from several localities scattered within these three countries. *Plocoglottis javanica* and *P. quadrifolia* are presently found each in two localities in Southern Vietnam, being widely distributed in the Malesian region. The latter species is reported here for Cambodia, Laos and Vietnam for the first time with both of its Vietnamese populations located about 1000 km away from the nearest previously known collection. Details of distribution, illustrations and an identification key for these species are provided.

Keywords: *Plocoglottis*, Indochina, flora, nature conservation, plant diversity, plant taxonomy

The genus *Plocoglottis* Blume (Orchidaceae) comprises 40–45 species distributed in Malesia, Thailand, Eastern Indochina, Solomon and Andaman Islands as well as Peninsular Myanmar (SEIDENFADEN 1972, 1986, 1992; SEIDENFADEN & WOOD 1992; SCHUITEMAN & DE VOGEL 2000; PRIDGEON et al. 2005; SCHUITEMAN et al. 2008; CHONG et al. 2009; KURZWEIL 2009; AVERYANOV 2013a, b). The most recent accounts (GOVAERTS 2014; CHASE et al. 2015) accept 41 species of *Plocoglottis*. This genus is currently placed within tribe Collabieae of subfamily Epidendroideae (CHASE et al. 2015). Most of the species of *Plocoglottis* occur in the Malesian biogeographic region sensu TAKHTAJAN (1986) (PRIDGEON et al. 2005; KURZWEIL 2009). In respect to continental Asia, five species are known from Thailand and the genus is also believed to occur in Southern Myanmar (KURZWEIL 2009). In Vietnam, two species of *Plocoglottis* have been reported to date, namely *P. bokorensis* (Gagnep.) Seidenf. and *P. javanica* Blume (AVERYANOV 2002, 2013b; AVERYANOV & AVERYANOVA 2003). For both Cambodia (SEIDENFADEN 1992; SCHUITEMAN & DE VOGEL 2000) and Laos (SCHUITEMAN et al. 2008; AVERYANOV 2013a) only one species, *P. bokorensis*, is known. The diversity of *Plocoglottis* in Thailand fully covers that of the other continental Asia areas.

During the past decades, the knowledge of distribution area of *Plocoglottis* within continental Asia has been greatly improved. For instance, it was recently found for the first time in Northern Thailand (KURZWEIL 2009). This genus has been supposed to be absent from Vietnam and Laos till recent years and it is not included in the appropriate regional accounts published before 2003 and 2008 respectively (SEIDENFADEN 1992; PHAM HOANG HO 2000; SCHUITEMAN & DE VOGEL 2000; NGUYEN TIEN BAN et al. 2005; NEWMAN et al. 2007).

Here we provide an account of the genus *Plocoglottis* in Cambodia, Laos and Vietnam with a report of one more newly discovered species of this genus in the flora of Eastern Indochina. A population of *Plocoglottis quadrifolia* J.J. Sm. was found in late May 2014 in the mountains of Southern Vietnam, in Chu Yang Sin National Park. The population consisted of more than ten

plants (possibly several tens, some of them flowering), which occupied a rather compact area on an islet of a small river. Another recent collection of this species was made in 2015 in Khanh Hoa province. Along with the description of the new findings, we revise the taxonomy and distribution of *Plocoglottis* in Cambodia, Laos and Vietnam and provide an identification key for the species occurring in this region.

Taxonomic treatment

Plocoglottis Blume

Bijdr. Fl. Ned. Ind. **8**: 380 (1825)

Type. *P. javanica* Blume.

40–45 species in India (Andaman Islands), Myanmar, Thailand, Laos, Cambodia, Vietnam, Malaysia, Singapore, Brunei, Philippines, Indonesia, Papua New Guinea, Solomon Islands. In Eastern Indochina (Cambodia, Laos and Vietnam) 3 species.

Key to the species in the flora of Cambodia, Laos and Vietnam

- 1 Stem exclusively pseudobulbous, with 1(2) internode(s), 10 cm long,
1–1.5 cm in diam., without conspicuous narrowing to the apex,
apically bearing 1 leaf (rarely 2 leaves) *P. javanica*
- Stem basally pseudobulbous with an elongated proximal part,
with several internodes, 12 cm or usually more (up to 100 cm) long,
bearing four or more distant leaves 2
- 2 Lip margin entire *P. bokorensis*
- Lip margin fimbriate *P. quadrifolia*

Plocoglottis bokorensis (Gagnep.) Seidenf. (Fig. 1)

Dansk Bot. Ark. 33(3): 219 (1979); id., Opera Bot. 89: 71, fig. 38 (1986); id., Opera Bot. 114: 105, fig. 56 (1992); Aver., J. Sci. (Hanoi) 18(1): 3, fig. 3 (2002); id., Turczaninowia 16(4): 42 (2013a); id., Turczaninowia 16(1): 26, fig. 7i, 11 (2013b); Aver., Averyanova, Updated Checkl. Orchids Vietnam: 53 (2003); Sittisujatham, Wild Orchid Thailand 1: 1–495 (2006); Schuit. et al., Nordic J. Bot. 26: 306 (2008); Kurzweil, Gard. Bull. Singapore 61(1): 89, fig. 2 (2009). – *Bulbophyllum bokorense* Gagnep., Bull. Mus. Natl. Hist. Nat. ser. 2, 22: 399 (1950). – **Type.** Cambodia: Kampot, Bokor, *Porée-Maspero s.n.* [P!].

– *Plocoglottis mirabilis* Seidenf., Bot. Tidsskr. 65: 336, fig. 14 (1970); id., Bot. Tidsskr. 67: 109 (1972); Senghas, in Brieger et al., Die Orchideen: 903, fig. 699 (1984). – **Type.** Thailand: Khao Yai National Park, 1300 m, *Cumberlege 926* [C].

Ecology and phenology. Terrestrial herb. Primary humid, evergreen, broad-leaved, submontane forests on silicate rocks, commonly in shady places on deep soils rich in humus. 700–1300 m. Flowering in August–October. Occasional, locally common. Estimated IUCN Red list status – VU (IUCN 2015).

Distribution (Fig. 4). Cambodia: Kampot (Kampot district), Siem Reap (Angkor Thom district). Laos: Bolikhamxai, Khammouane (Boualapha district). Southern Vietnam: Dak Lak (Krong

Plocoglottis (Orchidaceae) in Cambodia, Laos and Vietnam

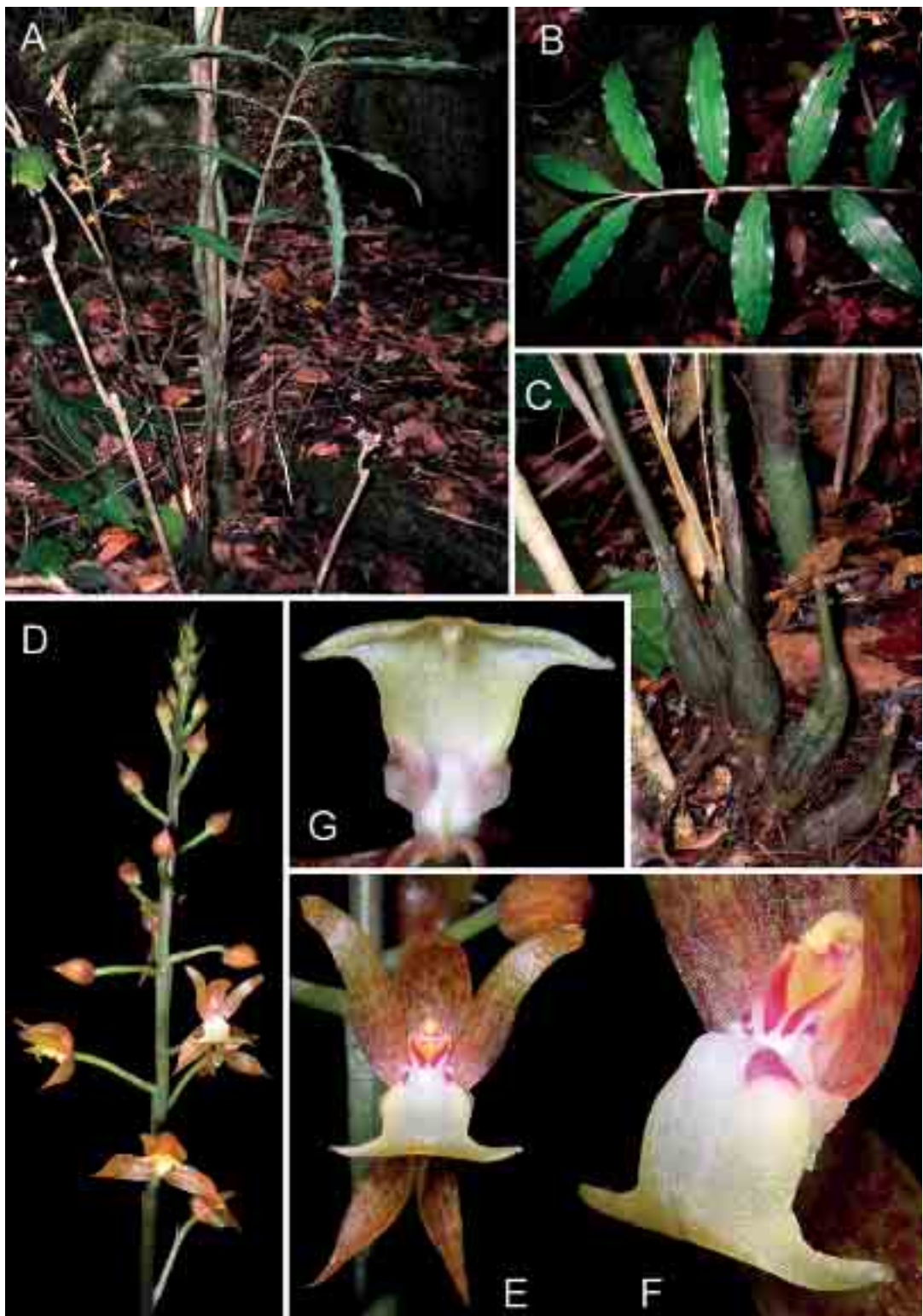


Figure 1. *Plocoglottis bokorensis* in Chu Yang Sin National Park (Vietnam): A – plant in natural habitat; B – elongated distal part of stem with leaves; C – pseudobulbs; D – inflorescence; E, F – flower; G – lip, abaxial view. *Kuznetsov, Kuznetsova, Nuraliev 942*. Photos by M. Nuraliev.

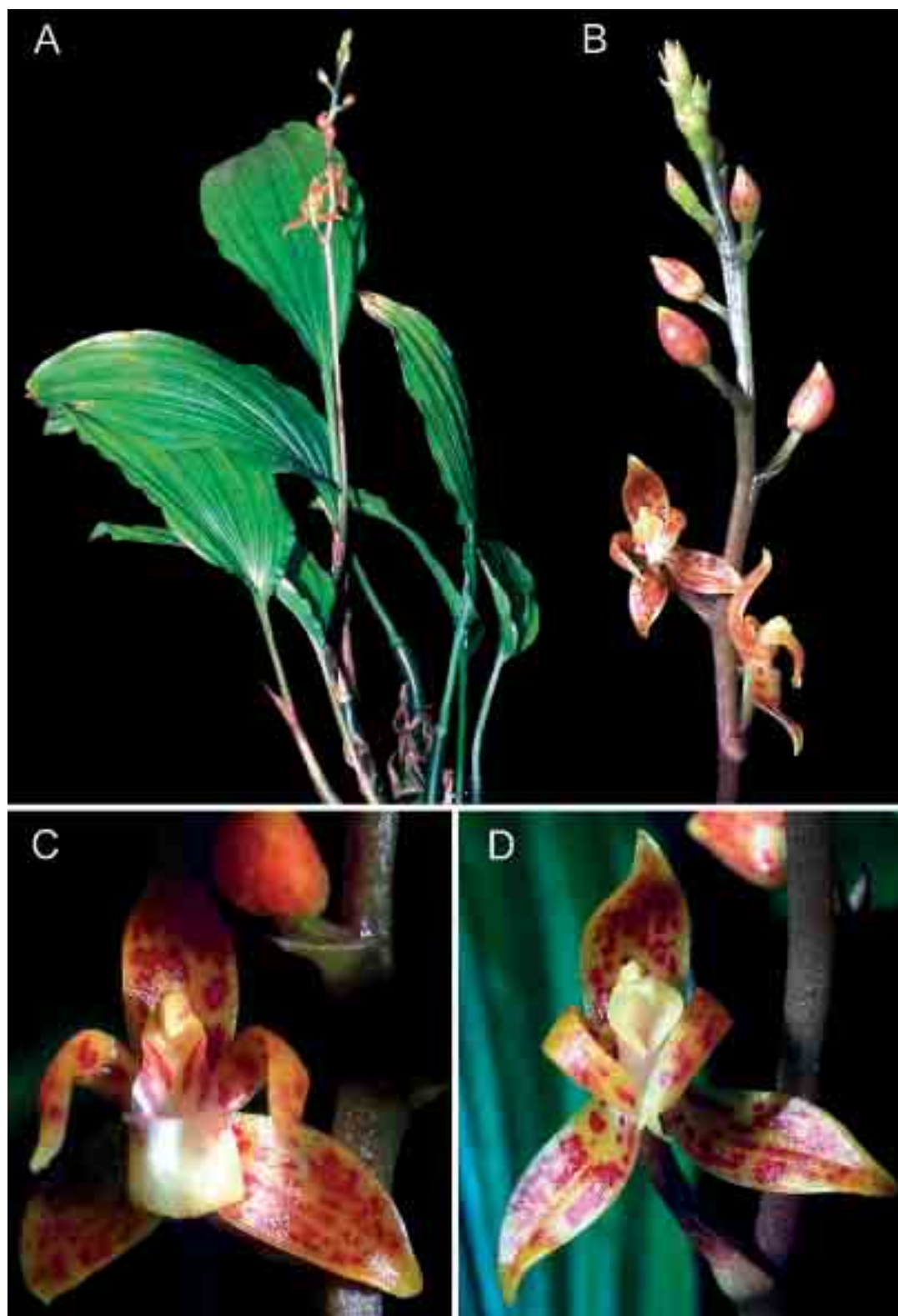


Figure 2. *Plocoglottis javanica* in cultivation, collected in Khanh Hoa province (Vietnam): A – habit; B – inflorescence; C, D – flower. *Averyanov & Hiep VN2483/a*. Photos by L. Averyanov.

Plocoglottis (Orchidaceae) in Cambodia, Laos and Vietnam

Bong, Lak districts), Dak Nong (Dak Glong district), Khanh Hoa (Khanh Vinh district). Thailand (from northern to southern).

Studied specimens. Cambodia: Siem Reap province, Angkor Thom district, vicinities of Siem Reap City, ancient ruins of Angkor Wat, 15.12.2008, *Kurzweil s.n.* [RUPP?]. Laos: Khammouane province, Boualapha district, Thong Sam village, Hin Nam No National Protected Area, Pu Pha Song Mt., around point 17°35'13.2"N 105°47'49.8"E, 500–1000 m, 09.03.2013, *Averyanov, Hiep, Lamxay, Khang, The, Lorphengsy LA-VN 284* [LE!, CPC!¹, HNL!, FOF!]. Vietnam: Dak Nong province, Dak Glong district, Dak Plao municipality, Ta Dung Mt., around point 11°52'30"N 108°01'12"E, 1000–1250 m, 09.11.2005, *Averyanov, Loc, Thao, Vinh HLF 5569* [HN!, LE!]; Dak Lak province, Krong Bong district, Chu Yang Sin National Park, elevation from Dak Tour village along Dak Tour river, 12.05.2000, *Averyanov, Hiep, Hieu et al. VN 6435* [HN!, LE!, MO!]; Dak Lak province, Lak district, Chu Yang Sin National Park, 10 km SSE of Krong Kmar village, at 12°25'48"N 108°22'19"E, 1050 m, 18.05.2014, *Kuznetsov, Kuznetsova, Nuraliev 942* [LE!, MW!]; Khanh Hoa province, Khanh Vinh district, near Hon Ba nature reserve, Khanh Le municipality, 15.12.1995, *Averyanov & Hiep VH 2483/c*, [LE!].

Note. According to our personal observations, *P. bokorensis* is common on the eastern slopes of Chu Yang Sin Mountains (Vietnam, Dak Lak province) and also in Angkor Wat temple complex area (Cambodia, Siem Reap province).

Plocoglottis javanica Blume (Fig. 2)

Bijdr. Fl. Ned. Ind. 8: 381, fig. 21 (1825); Seidenf., Bot. Tidsskr. 67: 108 (1972); id., Opera Bot. 89: 69, fig. 34 (1986); Comber, Orchids Java: 104, fig. (1990); id., Orchids Sumatra: 292, fig. (2001); Seidenf., Wood, Orchids Penins. Malaysia Singapore: 181, fig. 78a (1992); Wood, Cribb, Orchids Borneo: 136 (1994); Aver., Journ. Sci. (Hanoi), 18(1): 2, fig. 2 (2002); id., Turczaninowia 16(1): 25, fig. 10, 12a,b (2013b); Aver., Averyanova, Updated Checkl. Orchids Vietnam: 53 (2003); Kurzweil, Gard. Bull. Singapore 61(1): 83, fig. 1 (2009); Ang et al., Nature Singapore 4: 73–77, figs. 1–5 (2011). – **Syntypes.** Indonesia: Java, Seribu, *Blume s.n.* [syn-, L]; Indonesia: Java, Mt. Salak, Pantjar, *Blume 590* [syn-, L].

– *Plocoglottis fimbriata* Teijsm. & Binn., Natuurk. Tijdschr. Ned.-Indië 5: 493 (1854); Miquel, Fl. Ind. Bat. 3: 677 (1859). – **Type.** not designated and not located.

– *Plocoglottis acuminata* auct., non Blume: Ridley, Fl. Malay Penins. 4: 143 (1924); Holttum, Fl. Malaya 1: 158 (1953).

Ecology and phenology. Terrestrial herb. Primary humid, evergreen, broad-leaved, submontane forests on granite and gneiss, commonly in shady places on deep soils rich in humus. 700–900 m. Flowering in April–October. Rare. Estimated IUCN Red list status – VU (IUCN 2015).

Distribution (Fig. 4). Southern Vietnam: Dak Lak (Chu Yang Sin mt.), Khanh Hoa (Khanh Vinh district). India (Andaman Islands), Peninsular Thailand, Peninsular Malaysia, Singapore, Indonesia (Sumatra, Java, Borneo).

Studied specimens. Vietnam: Dak Lak province, Chu Yang Sin National Park, NE slopes of Chu Yang Sin Mountains, evergreen submontane forest, collected as living plant by a friend of

1 CPC is not a registered acronym, which refers to Center for Plant Conservation, Vietnam Union of Science and Technology Associations (Hanoi, Vietnam).



Figure 3. *Plocoglottis quadrifolia* in Chu Yang Sin National Park (Vietnam): A – plant in natural habitat; B – flower, bottom view; C – flower, top view; D – details of lip and column; E – lip and column, adaxial view; F – lip, abaxial view; G – lip and column, abaxial view. *Nuraliev 1010*. Photos by M. Nuraliev.

Plocoglottis (Orchidaceae) in Cambodia, Laos and Vietnam

Nguyen Van Canh in January 2015 and cultivated by Nguyen Van Canh in his orchid garden in Buon Ma Thuot, 26.04.2015, *Nguyen Van Canh, Averyanov & Maisak AL 20* [LE!]; Khanh Hoa province, Khanh Vinh district, near Hon Ba Nature Reserve, 8 km from Khanh Le municipality, 15.12.1995, *Averyanov & Hiep VN2483/a* [LE!].

Note. According to recent observations (Nguyen Van Canh, pers. comm. 2015), *P. javanica* is locally very common in some localities on the NE slopes of Chu Yang Sin Mountains (Vietnam, Dak Lak province).

Plocoglottis quadrifolia J.J. Sm. (Fig. 3)

Bull. Jard. Bot. Buitenzorg 3(8): 36 (1926); Seidenf., Bot. Tidsskr. 67: 109 (1972); id., Opera Bot. 89: 70, fig. 36 (1986); Seidenf., Wood, Orchids Penins. Malaysia Singapore: 181, fig. 78f (1992); Comber, Orchids Sumatra: 290, figs. (2001); Kurzweil, Gard. Bull. Singapore 61(1): 86 (2009). – **Type.** Indonesia: Sumatra, west coast, Agam, Boekit Batoe Banting, *Groeneveldt 873* [holo-, L].

– *Phaius longipes* auct., non (Hook. f.) Holttum: Seidenf., Smitinand, Orchids Thailand: 329, fig. 252 (1961).

Description. Terrestrial sympodial herb with creeping thick epigeous rhizome bearing erect or ascending stems. Rhizome 6–8 mm in diam. Stem with several internodes, 12–45 cm tall, basally thickened (pseudobulbous), apically elongated and bearing 4–6(7) leaves. Leaves plicate, shortly petiolate, dark green; petiole 1.2–1.6 cm long; leaf blade narrowly elliptic to elliptic, acuminate, 15–25 cm long, 5–8 cm wide. Inflorescence many-flowered erect lateral raceme, arising from base of pseudobulb, softly pubescent, 60–90 cm long; peduncle stout basally, with 3–4 distant sterile sheaths; rachis rather slender bearing 10–20 distant flowers. Floral bracts narrowly triangular, acute, 0.8–1 cm long. Flowers opening successively, resupinate, widely opening, asymmetric, fleshy, 2–2.3 cm long and 2.5–2.9 cm across; sepals and petals free, spreading. Dorsal sepal reflexed and recurved, narrowly oblong, shortly acuminate, 18 mm long, 6 mm wide, puberulent abaxially, pale yellow or mauve, flushed red. Lateral sepals obliquely elliptic, acute, falcate, concave, 13 mm long, 6–8 mm wide, puberulent abaxially, pale yellow or mauve distally, shiny red at base. Lateral petals spreading, linear-lanceolate, 18–19 mm long, 4 mm wide, similar to lateral sepals but almost glabrous. Lip spurless, fleshy; blade subquadrate, narrowed toward base, 9 mm long, 12 mm wide when flattened; apical tooth reflexed to the abaxial side, triangular, with obscure callus on each side; margin distinctly long fimbriate; lip yellow with red or purple streaks over most of the flat part, with red apical tooth. Column slender, slightly twisted, club-shaped, 11 mm long, white. Pollinia 4, solid, with caudicles and common viscidium.

Ecology and phenology. Grows in primary mixed and broad-leaved, evergreen, shady submontane valley forest along stream on sandy soils, derived from granite with granite gravel on the surface. 900 m. Flowering in March–June. Rare. Estimated IUCN Red list status – VU (IUCN 2015).

Distribution (Fig. 4). Southern Vietnam: Dak Lak (Lak district), Khanh Hoa (Khanh Vinh district). Peninsular Myanmar, Peninsular Thailand, Peninsular Malaysia, Indonesia (Sumatra).

Studied specimens. Vietnam: Dak Lak province, Lak district, Bong Krang municipality, Chu Yang Sin National Park, 9 km S of Krong Kmar village, at 12°25'25"N 108°21'15"E, 900 m, in the open forest, on the river islet, among granite rocks, 30.05.2014, *Nuraliev 1010* [LE!, MW!];



Figure 4. Distribution of *Plocoglottis* species in Cambodia, Laos and Vietnam.

Khanh Hoa province, Khanh Vinh district, Khanh Dong municipality, around point 12°25'N 109°00'E, among rocks along stream bank, collected as living plants by local people, bought by Tran Thanh Tung in Nha Trang city in January 2015 and cultivated in his orchid nursery near Nha Trang city, January 2015, *Tran Thanh Tung* 31 [LE!].

Notes. This species is reported here for the flora of Cambodia, Laos and Vietnam for the first time.

This species is perhaps the best example of the insect pollination mechanism involving 'flip-lip', or mousetrap type lip (SEIDENFADEN 1986; COMBER 2001; AVERYANOV 2002; PRIDGEON et al. 2005).

Plocoglottis (Orchidaceae) in Cambodia, Laos and Vietnam

Plocoglottis quadrifolia was previously believed to be distributed mostly in Malesia, with collections from Sumatra and the Malay Peninsula (SMITH 1933; SEIDENFADEN 1986; SEIDENFADEN & WOOD 1992; VADDHANAPHUTI 2005; KURZWEIL 2009; INUTHAI 2010). The collection from Ko Phangan island in the Gulf of Thailand (Thailand, Surat Thani province, *Put* 756) is probably the nearest to the Vietnamese populations reported here. The distance between the Vietnamese and Ko Phangan populations is about 960 km for Dak Lak and 1020 km for Khanh Hoa. Thus, the new Vietnamese findings essentially increase the known distribution area of *P. quadrifolia*, establishing also a new northern border.

Interestingly, *P. quadrifolia* shows similar distribution patterns to that of another species of this genus, *P. javanica*. The latter, being the type species of *Plocoglottis*, is widely distributed in Malesia and was quite recently reported for Eastern Indochina (AVERYANOV 2002, 2013b; also Vietnam listed by KURZWEIL 2009). Each of these two species is currently known from two localities within Vietnam, Chu Yang Sin National Park in Dak Lak province and Khanh Vinh district in the neighboring Khanh Hoa province. *Plocoglottis quadrifolia* and *P. javanica* also co-occur in these localities with the third and the most common Indochinese species, *P. bokorensis* (for instance, specimen *Kuznetsov, Kuznetsova, Nuraliev 942* was found 2 km far from population of *P. quadrifolia* in Chu Yang Sin).

The Vietnamese population of *P. quadrifolia* in Dak Lak province (Chu Yang Sin National Park) grows in a forest with the following characteristics: Trees of the first forest stratum 14–18 m high, with trunks 30–80 cm DBH, canopies 4–10 m in diam., canopy density 0.7–0.9. Vertical structure comprises 2–3 storeys. The upper storey is formed by species of *Magnolia* (Magnoliaceae), *Cinnamomum* (Lauraceae), *Altingia* (Altingiaceae), *Exbucklandia*, *Rhodoleia* (Hamamelidaceae), *Elaeocarpus*, *Sloanea* (Elaeocarpaceae), *Endospermum* (Euphorbiaceae), *Artocarpus* (Moraceae), *Lithocarpus* (Fagaceae), *Carpinus* (Betulaceae), *Duabanga* (Lythraceae), *Choerospondias*, *Mangifera* (Anacardiaceae), *Anneslea*, *Schima* (Theaceae), *Caryota* (Arecaceae) and the conifers *Keteleeria evelyniana*, *Pinus kesiya* (Pinaceae), *Dacrydium elatum*, *Nageia wallichiana* (Podocarpaceae), *Calocedrus macrolepis* (Cupressaceae). Lower storeys consist of species of *Archidendron* (Fabaceae), *Calophyllum*, *Garcinia* (Clusiaceae), *Syzygium* (Myrtaceae), *Eurycoma* (Simaroubaceae), *Kydia* (Malvaceae), *Sterculia* (Sterculiaceae), *Ardisia* (Myrsinaceae), *Lasianthus* (Rubiaceae), *Tabernaemontana* (Apocynaceae), *Schefflera*, *Trevesia* (Araliaceae), *Licuala*, *Pinanga* (Arecaceae). The most common lianas are species of *Calamus*, *Plectocomia* (Arecaceae), *Fissistigma* (Annonaceae), *Tetracera* (Dilleniaceae), *Abrus*, *Bauhinia*, *Entada*, *Mucuna* (Fabaceae) and *Mussaenda* (Rubiaceae). Epiphytes are represented mainly by species of *Asplenium* (Aspleniaceae), *Drynaria* (Polypodiaceae), *Vittaria* (Pteridaceae) and Orchidaceae; hemiepiphytes observed here are *Ficus* spp. (Moraceae) and *Schefflera subintegra* (Araliaceae).

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