

Anoectochilus malipoensis (Orchidaceae), a new species from Yunnan, China

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Anoectochilus malipoensis W.H. Chen & Y.M. Shui *sp. nova* (Orchidaceae) from Yunnan, China, is described and illustrated. It is similar to *A. emeiensis* but differs by having a narrow membranaceous rim in the anther cap, obovate epichile lobes with acuminate apex and crenulate margins, a narrow rim inside hypochile lobes, two 1–1.2 mm long cornua on the end of the spur, and broadly cupulate calli in the spur. These differences in flower morphology were observed in the holotype specimens. We also revise some characteristics of *A. emeiensis* based on examination of its holotype. The relationship between *A. malipoensis* and *A. papillosus* is discussed. Furthermore, a new identification key to the fourteen species of *Anoectochilus* (excluding *Odontochilus*) from China and Vietnam is given here.

Key words: *Anoectochilus*, new species, Orchidaceae, taxonomy

The genus *Anoectochilus* (Orchidaceae) is distributed in tropical Asia and tropical Australasia (Wu *et al.* 2006). Globally this genus, including *Odontochilus*, contains 40–60 species. In China, more than 20 species exist, ranging from Taiwan and S China to E and W China (Lang 1999, Su 2000). *Anoectochilus* belongs to the subtribe Goodyerinae in the tribe Neottieae, which is characterized by having two stigma lobes, free sepals, spur or sac of labellum with a septum inside, and calli in spur or sac sessile or with an inconspicuous stalk.

The terrain in southeast Yunnan is characterized by deeply incised valleys, karst formations and long-term steady climates. It harbors ca. 7000 native species of seed plants, including numerous endemic and ancient relic taxa (Shui

& Chen 2006). More than 400 species of orchids grow in this region, and undescribed species new to Yunnan or China are regularly discovered. A high proportion of orchid species of SE Yunnan also occur in the adjacent regions of Hainan, Guangxi and Vietnam (Chen & Shui 2003); this is especially true for species growing in limestone environments. Examples are *Liparis bautingensis* and *Bulbophyllum ledungense* (Hainan Province and SE Yunnan), *Tsaiorchis neottianthoides* (Guangxi and SE Yunnan), *Goodyera hispida* (NE India, Thailand, Vietnam, Peninsular Malaysia and SE Yunnan) and *Pteroceras simondianum* (Vietnam and SE Yunnan).

We report here a species from the limestone regions, collected by the authors in 2004. Based on the examination and comparison with similar

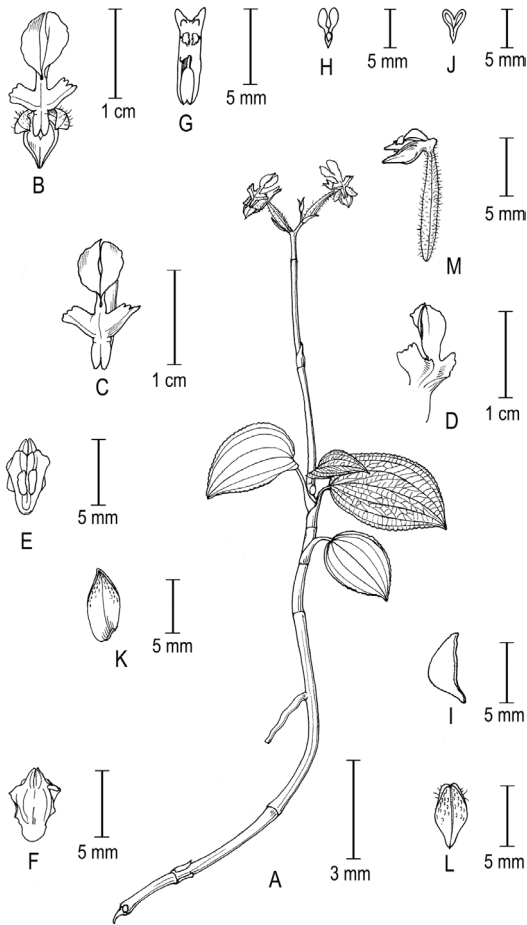


Fig. 1. *Anoectochilus malipoensis* (from the holotype, drawn by X. L. Wu). — **A:** Habit. — **B:** Flower. — **C:** Ventral view of labellum. — **D:** Dorsal view of mesochile and epichile. — **E:** Ventral view of column. — **F:** Dorsal view of column. — **G:** Spur showing septum and calli. — **H:** Pollinia. — **I:** Petal. — **J:** Anther. — **K:** Lateral sepal. — **L:** Dorsal sepal. — **M:** Lateral view of flower and ovary.

species (Gagnepain & Guillaumin 1932, Lang 1982, 1999, Lang & Siu 2002, Averyanov & Averyanova 2003, Averyanov 2007), we concluded that our material represented an unknown species. It is only known from two populations (nine individuals in total) growing in a limestone forest in Malipo County of Yunnan Province, China, bordering Vietnam.

Some morphological characters of *A. emeiensis*, morphologically the most similar species to *A. malipoensis*, are unsatisfactorily described in

the protologue. When Lang (1982) described it, some flower characters were either ignored or wrongly described, such as the anther cap, the hypochile lobe and the calli in the spur. Thus, we carefully observed the holotype specimens under a Stereoscopic Microscope (Nikon SMZ1000). At the same time, we also compared this species with the new species. As a result, not only some characters of *A. emeiensis* are revised, but the case for a new species status of *A. malipoensis* was strengthened.

***Anoectochilus malipoensis* W.H. Chen & Y.M. Shui, sp. nova** (Figs. 1 and 2B)

Haec species similis A. emeiensis, sed thecis antherae magine angusto et membrano productis (in illa lato et membrano) lobis epichiliis obovatis apice acuminatis or acute margine crenulatis (in illa oblongis vel oblanceolatis apice obtusis margine integris), lobis hypochilis interiore marginibus parce angustis productis (in illa interiore laminis triangulatis productis); calcaribus apice cornibus majoribus 1–1.2 mm longis instructis (in illa cornibus minoribus 0.7–0.8 mm longis) callis calcaris late poculiformibus (in illa cuneiformibus) valde differt.

TYPE: China. Yunnan Province, Malipo County, in limestone evergreen broad-leaved forest along the slope of the cliff, alt. 1650 m, 26.VII.2004 Y.M. Shui et al. 46051 (holotype KUN).

ADDITIONAL SPECIMEN EXAMINED (paratype): **China.** Yunnan Province, Malipo County, Jinchang Xiang, Xiajinchang to Zhongzhai, in evergreen broad-leaved forest, alt. 1600 m, 14.VII.2007 H. Jiang 04625 (YAF).

ETYMOLOGY. The new species is named after the type locality, Malipo County. Malipo is the type locality of about 24 taxa according to IPNI (<http://www.ipni.org>), such as *Begonia malipoensis*, *Impatiens malipoensis*, *Microtropis malipoensis*, and *Paphiopedilum malipoense*, etc. (Chen & Tsi 1984, Huang & Shui 1994, Shui & Chen 2002, Huang et al. 2003).

Terrestrial herb, ca. 15 cm tall. Rhizome creeping, fleshy, with internodes 2.6–2.7 cm long, producing roots from nodes. Stem ascending, cylindric, 8–10 cm long, 0.2–0.22 cm in diam. when fresh, glabrous, with 3–4 leaves. Petiole 1.0–1.2 cm long, glabrous, base dilated and sheathing, sheath cylindrical, 3–5 mm long,

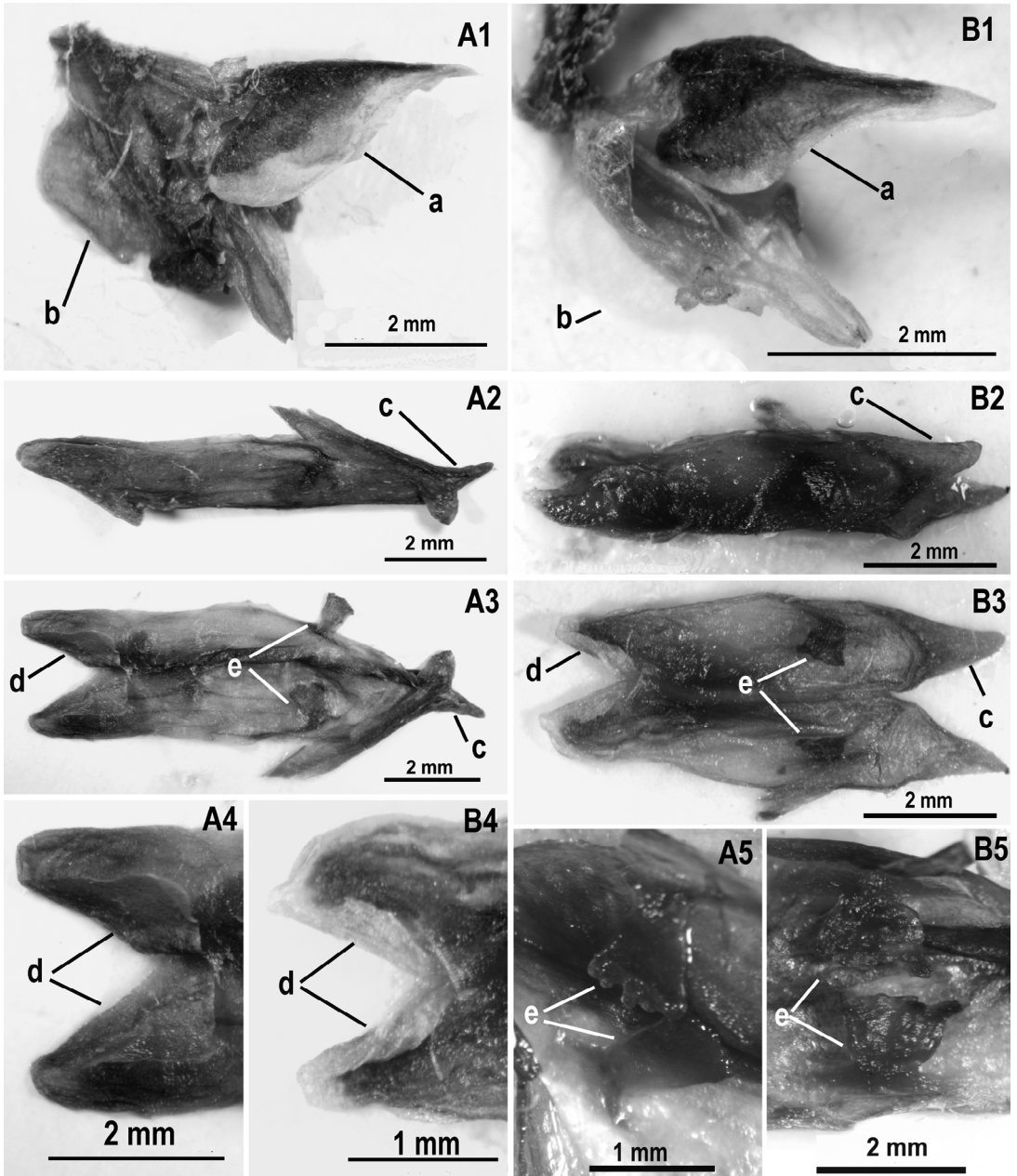


Fig. 2. Comparison of flowers of *Anoectochilus emeiensis* and *A. malipoensis*. — **A:** Flower of *A. emeiensis* (from the holotype G.X. Xin & K.Y. Lang 1243, PE, code bar 00017154). — **B:** Flower of *A. malipoensis* (from the holotype). 1: column, 2: hypochile and spur, 3: interior view of hypochile and spur showing calli, 4: base of hypochile, 5: calli. a = anther cap, b = lobes of ventral column, c = spur, d = rim inside hypochile lobes, e = calli.

3.2–3.5 mm in diam.; leaf blade ovate, 2.5–3 × 1.5–2 cm, glabrous, green with white, silky-glossy and convex venation on adaxial surface, purplish red on abaxial surface, margin slightly repand, base subrotund or broadly cuneate, apex

acute. Inflorescence terminal, racemose, ca. 7 cm long, 2–4-flowered. Peduncle 5.5–5.7 cm long and slender, pale purplish red, carrying 2 small bract-like leaves that are pale purplish red, sheathing, triangular-ovate, 0.8–0.9 × 0.5–0.6



Fig. 3. Distribution of *Anoectochilus malipoensis* (■), *A. emeiensis* (★) and *A. papillosus* (▲).

cm. Rachis 1.5–1.7 cm long, with white glandular hairs; floral bracts lanceolate, 2–5 × 1–2 mm, shorter than ovaries, abaxially with white glandular hairs, apex acuminate. Pedicel and ovary cylindrical-fusiform, not twisted, 9–10 mm long, with white glandular hairs. Flowers not resupinate (labellum upward). Sepals purplish red, 1-veined, abaxially with white glandular hairs; dorsal sepal ovate, ca. 5 × 3 mm, apex obtuse with a mucronation, forming a hood with petals; lateral sepals extending forth, obliquely elliptic-lanceolate, ca. 7 × 3 mm, embracing the base of labellum, apex acute; petals whitish, membranous, falcately lanceolate, ca. 6 × 2 mm, glabrous, 1-veined, base narrow, apex acute. Labellum adnate to base of column, white, ascending, 1.2–1.3 cm long; hypochile abaxially with a conical spur and adaxially slightly bilobed; lobes parallel, ca. 3 mm long, with a narrow rim when spreading; spur exerted backward, 6–7 mm long, with a septum and 2 calli inside, apex divided into two cornua 1–1.2 mm long; calli situated near the middle of spur, broadly cupulate apex truncate and 3- or 4-serrate; mesochile ca. 4 mm long, each side with a obliquely subquadrate, apically serrate lobe measuring ca. 3 ×

2 mm; epichile ca. 8.5 mm long, deeply bilobed above the base; base ca. 1.5 mm long; lobes obovate, ca. 6 × 2.5–3 mm, margin crenulate, base cuneate, apex acuminate to acute. Column short and thick, ca. 5 mm long, with 2 column wings on ventral side; column wings elliptic, parallel, ca. 1.5 × 0.8 mm; anther with 2 thecae, cordate, ca. 5 × 2 mm; anther cap with 0.6–0.7 mm narrow membranaceous rim; pollinia obovate-oblongate, ca. 2 × 1 mm, attached to a large, sublanceolate viscidium by short caudicles; rostellum erect, deeply cleft (cleft ca. 0.6 mm long); stigmas 2. Flowering in July–August.

DISTRIBUTION AND HABITAT. The only known locality of the new species is in an evergreen broad-leaved forest among the numerous limestone hills in Malipo County of SE Yunnan, China (Fig. 3). The dominant tree species of the forest include *Pinus wangii*, *Platycarya strobilacea* and *Quercus engleriana*. The main associated trees are *Cyclobalanopsis glauca*, *Ficus trivialis*, *Michelia fulva* var. *calcicola* and *Tsuga chinensis*; the main associated shrubs are *Agapetes rubrobracteata*, *Lyonia ovalifolia*, *Myrsine semiserrata* and *Rhododendron densifolium*; and the main associated herbs are *Burmannia nepalensis* and the orchids *Bulbophyllum retusiusculum*, *Epigeneium amplum*, *Gastrochilus pseudodistichus*, *Luisia teres*, *Paphiopedilum micranthum* and *Pholidota missionariorum*.

In 2003, *A. malipoensis* had a population size of about five individuals in an area of about one square meter. In 2005, the population was extinguished through local usage for medicine and horticulture. During our four years of investigation no further population or individual was found again in the field or in cultivation, and thus the species was regarded as extinct. However, in July 2007, a colleague, Mr. H. Jiang, Yunnan Forestry Academy, encountered four individuals nearby the type locality (see paratype, cited below). He explained that the plant had always been rare in the field due to its collection for medicinal purposes. Thus, this species may require classification as Critically Endangered (CR) according to the IUCN (2001) categorization (<http://www.iucn.org/themes/ssc/redlist/RLcats2001booklet.html>). If some living individuals would be found in the future, urgent

efforts should be undertaken, such as tissue culture (Zhou *et al.* 1999, Liu *et al.* 2003, Zhang *et al.* 2006), to conserve this species.

Anoetochilus malipoensis is similar to *A. emeiensis*, a species considered endemic to the Emei Mt. of the Sichuan Province in China (Fig. 3). The new species differs by having a narrow membranaceous rim in the anther cap, obovate epichile lobes with acuminate apex and crenulate margins, a narrow rim inside hypochile lobes, two 1–1.2 mm long cornua on the end of spur, and broadly cupulate calli in its spur (Figs. 1 and 2B). In *A. emeiensis*, the anther cap is rimmed by a wide membranaceous margin (undescribed in the protologue), the hypochile lobe is rimmed by triangulate laminae (illustrated but undescribed in the protologue), the lobes of the epichile are oblong to oblanceolate with an obtuse apex (described in the protologue), there are two cornua on the end of the spur, 0.6–0.7 mm long, and the calli in the spur are cuneiform (partly illustrated but described obscurely in the protologue) (Fig. 2A; Lang 1982).

Anoetochilus malipoensis is also similar to *A. papillosus*, described from N Vietnam (Averyanov 2007). The latter is distributed in the limestone region of Hoabinh, which is close to the locality of *A. malipoensis* (Fig. 3). *Anoetochilus papillosus* is very similar to *A. malipoensis* in the dorsal and lateral sepals, but can easily be distinguished by its petals having a short longitudinal ridge covered with numerous forked capitate papillae, an oblique rectangular epichile lobe with a truncate apex, and hemispheric calli in the spur.

Thus, *A. papillosus*, *A. emeiensis* and *A. malipoensis* form a morphologically coherent group. They may be diagnostic by their wide lobes from a mesochile flange. *Anoetochilus papillosus* has capitate papillae on the petals, which are a unique within the genus. The group might also include *A. chapaensis*, which has only slightly narrower lobes of the mesochile flange. *Anoetochilus chapaensis* also has two filaments and numerous teeth on the mesochile flange, a character which may connect this group with other species in the genus. The following key shows the main differences of the fourteen Chinese and Vietnamese species of *Anoetochilus*.

Identification key to species of *Anoetochilus* in China and Vietnam

1. Mesochile of lip with wide wings on both sides, wings with pectinate or notched flanges 2
1. Mesochile of lip with narrow wings on both sides, wings with entire, pectinate, notched or filamentous flanges .. 4
2. Petals dorsally bearing short longitudinal ridge ornamented with massive, often forked capitate papillae *A. papillosus*
2. Petals dorsally lacking the above characters 3
3. Epichile lobes obovate, cornua on the end of spur bigger, 1–1.2 mm long, the calli in its spur broadly cupulate *A. malipoensis*
3. Epichile oblong or ob-lanceolate, cornua on the end of spur smaller, 0.6–0.7 mm long, the calli in the spur cuneiform *A. emeiensis*
4. Mesochile flange filamentous 5
4. Mesochile flange entire, notched or pectinate 11
5. Filaments of mesochile flange 1–3, 2–5 mm long 6
5. Filaments of mesochile flange 5 or more, 2–6 mm long 8
6. Mesochile flange with 2 filaments and pectinate margin *A. chapaensis*
6. Mesochile flange with 1 or 3 filaments and without pectinate margin 7
7. Filaments of mesochile flange 1, ca. 5 mm long *A. koshunensis*
7. Filaments of mesochile flange 3, 2–3.5 mm long *A. baotingensis*
8. Lip T-shaped *A. pingbianensis*
8. Lip Y-shaped 9
9. Epichile lobes acuminate at the apex *A. siamensis*
9. Epichile lobes obtuse at the apex 10
10. Flowers resupinate, lip pale yellowish white *A. formosanus*
10. Flowers erect, lip pinkish white *A. roxburghii*
11. Mesochile flange notched or pectinate 12
11. Mesochile flange entire *A. burmannicus*
12. Lobes of lip lanceolate, 4–5 times as long as wide *A. lylei*
12. Lobes of lip flabellate, less than 3 times as long as wide 13
13. Spur of lip U-shaped, mesochile flange with 2–5 teeth, teeth ca. 2 mm long *A. zhejiangensis*
13. Spur of lip erect, mesochile flange with 4–8 teeth, teeth ca. 1 mm long *A. xingrenensis*

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