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Chamaegastrodia poilanei – an interesting mycoheterotrophic orchid from India

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Abstract: *Chamaegastrodia poilanei* (Gagnep.) Seidenf. is reported from Arunachal Pradesh, India, with a detailed description, notes on taxonomy, provision of its differentiating characters from *C. asraoa* (J.Joseph & Abbar.) Seidenf. & A.N.Rao, supplemented with a colour photographic plate, and a conservation assessment.

Keywords: Arunachal Pradesh, Mycoheterotrophic, *Odontochilus asraoa*.

Introduction

Chamaegastrodia Makino & F.Maek. (Maekawa, 1935) is a genus of terrestrial, mycoheterotrophic orchids comprising five species (Pridgeon *et al*., 2003) distributed in Bhutan, China, Japan, Korea, Myanmar, Nepal, Thailand and Vietnam (Govaerts *et al*., 2021). The generic placement of the members of *Chamaegastrodia* has been a subject of controversy among taxonomists and orchidologists for a long time.

Seidenfaden (1978) treated *Evrardia* Gagnep. (Gagnepain, 1932) as a valid genus, without being aware of the placement of this genus under *Hetaeria* Lindl. by Tang and Wang (1951) and subsequently under *Chamaegastrodia* by Brieger (1974). The name, *Evrardia* Gagnep. is a later homonym of *Evrardia* Adans. belonging to family Anacardiaceae (Adanson, 1763), hence a new name *Evrardianthe* Rauschert was proposed by Rauschert (1983). Later, Seidenfaden (1994) transferred the genus *Evrardia* (Orchidaceae) to *Chamaegastrodia*. Ormerod (2002) transferred *Chamaegastrodia* to *Odontochilus* Blume based on the similarity in some characters of the column, claiming that the members of the former are just mycoheterotrophic forms of the latter and accordingly he created three sections under the genus: *Odontochilus* sect. *Odontochilus* (column with confluent to connate stigmatic lobes), sect. *Evrardia* (column twisted with separate stigmatic lobes), and sect. *Physopus* (column not twisted but with separate stigmatic lobes). Ormerod (2002) also claimed that the placement of *Evrardia* in *Chamaegastrodia* is incorrect because "the latter differs in its column wings, which are apical on the lateral margins of the column, whereas they are ventral and intra-marginal in the former as in *Odontochilus*". Bhattacharjee and Chowdhery (2018) followed Seidenfaden's (1978) concept and treated *Chamaegastrodia* as a distinct genus in their work, due to its mycoheterotrophic habit with a leafless stem, non-resupinate flowers and column wings situated on the lower apical margin of the column, which is followed here. We provide a detailed taxonomic account of *Chamaegastrodia poilanei* (Gagnep.) Seidenf. & A.N.Rao based on literature (including protologue), specimens (including types), and freshly collected plants from Arunachal Pradesh, northeast India by the first author (ULT). A molecular study on the entire

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genus *Chamaegastrodia* and *Odontochilus* is needed to confirm the placement of *C. poilanei*. We also provide information on the distribution of the species, phenology, habit and a conservation assessment.

Taxonomic Treatment

Chamaegastrodia poilanei (Gagnep.) Seidenf. & A.N.Rao, Nordic J. Bot. 14: 297. 1994. *Evrardia poilanei* Gagnep., Bull. Mus. Natl. Hist. Nat., sér. 2, 4: 596. 1932. *Hetaeria poilanei* (Gagnep.) Tang & F.T.Wang, Acta Phytotax. Sin. 1: 71. 1951. *Evrardianthe poilanei* (Gagnep.) Rauschert, Feddes Repert. 94: 433. 1983. *Evrardiana poilanei* (Gagnep.) Aver., Bot. Zhurn. (Moscow & Leningrad) 73: 432. 1988. *Odontochilus poilanei* (Gagnep.) Ormerod, Lindleyana 17: 225. 2002. *Syntypes*: VIETNAM, **Annam**, Dalat, 15.11.1924, *F. Evrard* 1807 (P [P00345030!]); Kontum, Montagne Mam Ray, 02.09.1930, *E. Poilane* 18204 (P [P00345029!]).

Fig. 1

Plants mycoheterophic, erect, up to 20 cm tall. Rhizome creeping, up to 5 cm long, terete. Stems erect, dark red, leafless but covered with scaly, red, overlapping sheaths. Rachis terete, up to 7 cm long, pubescent, flowers clustered towards apex. Flowers up to 10, non-resupinate, up to 1.5 cm wide and 1.5 cm long. Pedicel and ovary red, densely pubescent, fusiform. Bracts red, elongate-ovate, acute, as long as ovary, 1.4–0.8 cm long, 0.4–0.6 cm wide, sparsely hairy towards the lower 1/3rd on the outer side. Dorsal sepal pubescent on outer surface, forming a hood with the lateral sepals over the column, 0.6–0.7 cm long, up to 0.5 cm wide, triangular, acute. Lateral sepals red, obliquely falcate, 0.4–0.5 cm wide, up to 1.0 cm long, acute, sparsely pubescent on outer surface, slightly rough on shorter margin. Petals red with transparent or white bands, ovate, spreading, sickle-shaped, 0.6–0.7 cm long, up to 0.2 cm wide, acute. Labellum in shades of yellow and red, Y- or T-shaped, 1.7–1.9 cm long; hypochile saccate, up to 0.2 cm wide with a sessile globular calli at the base on each side; mesochile 0.6–0.8 cm long, with flanges, 0.1–0.3 cm long, not deeply but irregularly laciniate; epichile 2-lobed, V-shaped, 0.2–1.7 cm wide, up to 0.4 cm long; lobules diverging laterally almost at right angles, 0.5 cm wide in middle to up to 1.0 cm wide towards edge, minutely papillose, slightly concave towards the centre bearing lacerate margin towards the edge with irregular lacinia, the inner most segment of the lobule-margin (*i.e.*, the terminal lobules of epichile wings) much longer than others, up to 0.7 cm long, 0.1–0.2 cm wide. Column short, stout, with lamellate wings; pollinia lobes ovate, up to 0.3 cm long, acuminate; rostellum erect, 2-lobed, 2.0 – 2.5 mm long.

Flowering: Flowering from August to October, fruiting not observed.

Habitat: In subtropical moist broadleaved evergreen forests at elevations between 1200–1600 m, under the shade of *Bambusa multiplex* (Lour.) Raeusch. ex Schult.f., *Dendrocalamus hamiltonii* Nees & Arn. ex Munro, *Drepanostachyum intermedium* (Munro) Keng f. (all Poaceae), *Saurauia napaulensis* DC. (Actinidiaceae) *etc*. Being a mycoheterotropic orchid, it may be dependent on a specific mycorrhizal fungus and therefore is habitat limited (Bidartondo, 2005).

Distribution: Bhutan, China, India, Myanmar, Nepal, Taiwan, Thailand and Vietnam (Govaerts *et al*., 2021).

Specimens examined: CHINA, **Hainan**, Lingshui, Baishuiling under evergreen broad-leaved forest by the side of valley, 700 m, 26.07.2006, *A.Hu, L Lin & H.Z. Tian* 140 (IBSC); **Tibet**, Motuo, near old Motuo district, 1000 m, 23.08.1974, *Qing Zang team* 74-4455 (PE [PE00271146, PE00271147], KUN [KUN0019486]); **Yunnan**, Hekou County, Hekou city, the forest behind the fourth Dujiaotang, 1810 m, 14.08.1953, *W. Liu* 622 (PE [PE00271136]). INDIA, **Arunachal Pradesh**, East Kameng district, Jayang Baggang village, 25.08.2018, *U.L. Tiwari* 40665; Pakhe Kessang, 30.08.2018, *U.L. Tiwari* 40758 (ARUN). MYANMAR. **National Kandawgyi Garden**, Pine forest, *P.U. Lwin & S. Lwin s.n.* (TNS).

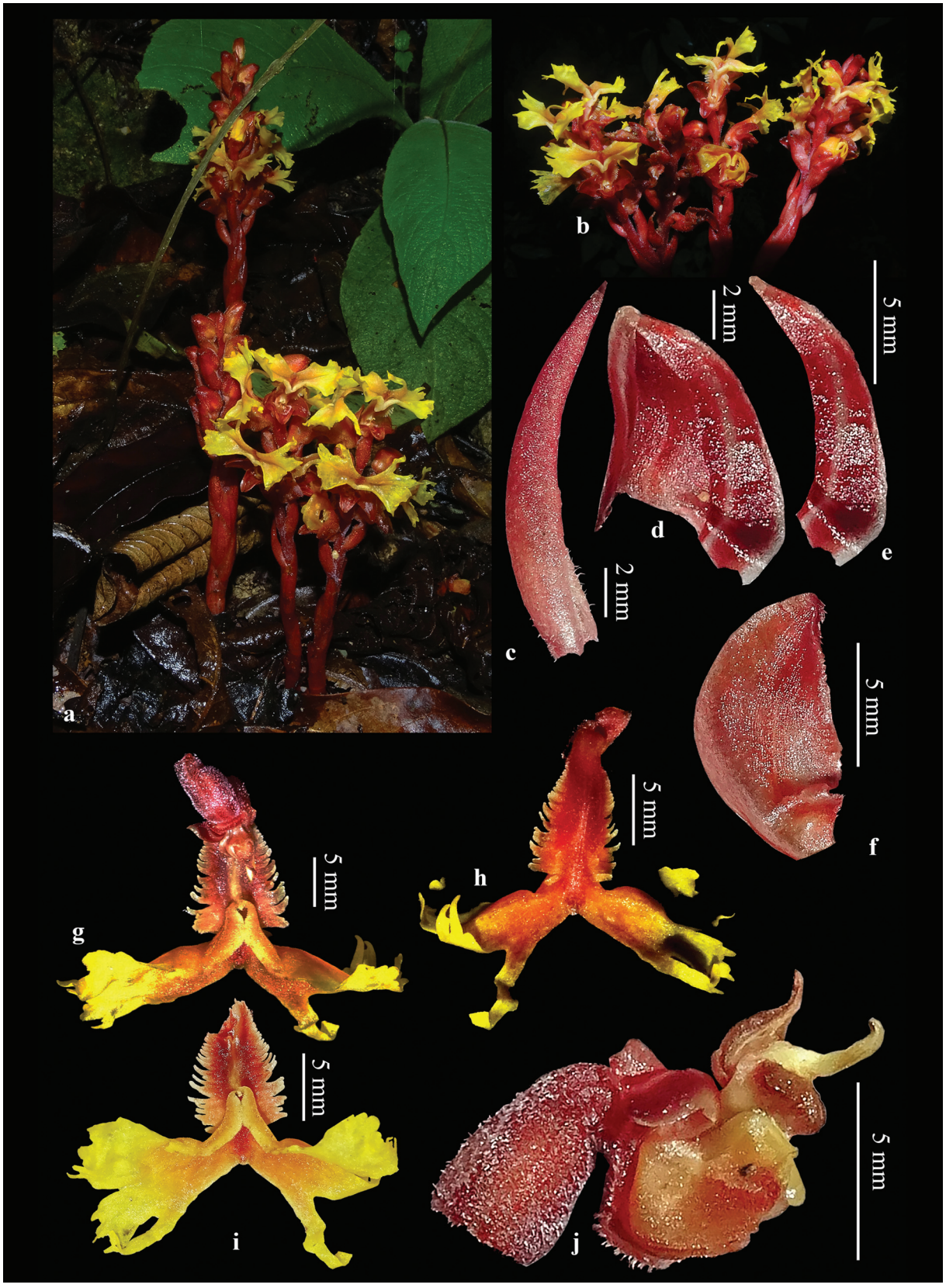

Fig. 1. *Chamaegastrodia poilanei* (Gagnep.) Seidenf. & A.N.Rao: **a.** Plant; **b.** Close-up of inflorescence; **c.** Bract; **d.** Dorsal sepal with petals; **e.** Petal; **f.** Lateral sepal; **g.** Labellum with ovary–top view; **h.** Labellum–ventral view; **i.** Labellum–dorsal view; **j.** Column with pollinarium and anther cap–side view (from *U.L. Tiwari* 40665; photos by U.L. Tiwari).

TAIWAN. **Nantou County**, Lugu Township, 19.08.2013, *C.K. Yang & H.T. Yeh* 1890 (TNU-detailed sketch and coloured plates seen).

Conservation assessment: *Chamaegastrodia poilanei* is widely distributed from northeast India, Bhutan, and China to Japan and Taiwan in the East, and to Myanmar, Thailand and Vietnam in the South (Govaerts *et al*., 2021). The species is already believed to be extinct in Japan and there are less than ten plants known to occur at a single locality in Taiwan (Yang *et al*. 2014). Accordingly the species was assessed as Critically Endangered in Taiwan by Yang *et al*. (2014). It is likely that this species is yet to be discovered in adjacent areas in Cambodia Laos and parts of south China with suitable habitat. Being a mycoheterotrophic orchid, it is assumed that this species is very habitat specific (Jacquemyn *et al*., 2016). As such this species does not face any poaching threat like most of the other jewel orchids do (*i.e*., members of subtribe Goodyerinae). Although habitat loss could be one of the potential threats for this species which has such widespread distribution range, not enough information is available from the major part of its distribution range to come to any appropriate conclusion. Hence, with available information this species can only be assessed as DD based on IUCN (2019) guidelines.

Notes: *Chamaegastrodia poilanei* was originally described as *Evrardia poilanei* from Vietnam and has subsequently been found in Bhutan, China, Japan, Myanmar, Nepal, Taiwan, Thailand (Govaerts *et al*., 2021) and in Arunachal Pradesh, India (this study). While the protologue lacks line drawings, there are some detailed line drawings on the syntypes (*F. Evrard* 1807, P [P00345030]). A few of these drawings were later reproduced by Gagnepain (1934). In the protologue, the labellum was mentioned as having a denticulate margin, which corresponds with the sketch on P00345030 as well as with the description provided by Gagnepain (1934). The same illustration was used by Seidenfaden (1978: fig. 33). It was referenced by Joseph and Abbareddy (1985) when they described *Evrardia asraoa* J. Joseph & Abbar. [= *C. asraoa* (J. Joseph & Abbar.) Seidenf. & A.N.Rao] from Meghalaya in northeast India, which is very closely allied to *C. poilanei*. The new species was differentiated from *C. poilanei* on the basis of absence of elongate terminal lobules of epichile wings (*vs.* presence of long terminal lobules of epichile wings in *C. poilanei*), presence of deeply irregular erose mesochile flanges (*vs*. irregularly dented mesochile flanges in *C. poilanei*), and the presence of simple rostellar process (*vs*. forked rostellar process in *C. poilanei*). However, the description of the mesochile flanges of *C. asraoa* as irregularly denticulate according to the protologue may be an artifact of the poorly preserved herbarium specimen. Chen *et al*. (2009) described *C. poilanei* (as *Odontochilus poilanei*) with bifurcate rostellar processes, two horn-like, divergent, V-shaped lacunae at the apex of the epichile and narrow, irregularly erose-crenulate flanges on the mesochile.

Freshly collected plants (*U.L. Tiwari* 40665, 40758) have distinct terminal lobules on the epichile but the mesochile flanges are deeply and irregularly erose (like that of *C. asraoa*) and the rostellar processes are bifurcated lying parallel to one another (V-shaped in protologue). Although the presence of deeply erose versus irregularly denticulate flanges can be an artifact or variation, the presence and absence of terminal lobules on the epichile of the labellum makes *C. asraoa* distinct from *C. poilanei*. According to the protologue of *C. asraoa* the rostellum is simple, *i.e*., not bifurcated like that of *C. poilanei*. Since its type collection, *C. asraoa* has not be recollected until now and due to the lack of workable material of *C. asraoa* it could not be verified whether the rostellum is simple throughout its flowering stage or it is so in less mature stage of flowers only.

Xu *et al*. (2011) presented an image under the name *O. poilanei*, but the labellum is lacking terminal

lobules and hence this may be a misidentification and it could be *C. asraoa*. *Chamaegastrodia poilanei* and *C. asraoa* were also reported from Bhutan (Dalström *et al*., 2013). However, from the image provided in this publication, it is not possible to confirm the plant's identity. Swami (2016, 2017) provided a photo of a pale yellow plant identified as *O. asraoa* on the cover of his book, 'Orchids of Ziro'. The image clearly shows the presence of terminal lobules on the epichile, which points towards two facts: firstly, that the identification of this image is wrong (and the plant is in fact *C. poilanei*), and secondly, that *C. poilanei* occurs in two colour forms, one being the more typical yellow and red colour form commonly reported under this name as also in this manuscript, and the second being a pale yellow form (with no red markings), as on the cover of 'Orchids of Ziro'. Swami (2016, 2017) reported *C. poilanei* (as *Odontochilus poilanei*) from Arunachal Pradesh, but due to lack of any voucher specimen, Bhattacharjee and Chowdhery (2018) treated this report as doubtful. However, the present collections from East Kameng district of Arunachal Pradesh by the first author confirm its occurrence in India.

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