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FRANCO PUPULIN &amp; GILBERTO MERINO

## Two new species of *Kefersteinia* (Orchidaceae: Zygopetalinae)

### Abstract

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Two new species of the genus *Kefersteinia*, *K. saccata* and *K. medinae*, are described and illustrated from Costa Rica and Ecuador, respectively. *K. saccata* has apparently no close relatives; among the species with truly cylindrical-umbonate callus, it is compared with *K. retanae* and *K. wercklei*, from which it differs in the procoracoid petals, the saccate, ovate-subrhombic lip, shorter than the column, and the obreniform basal callus. *K. medinae* belongs to a group of species of mainly Central American distribution, ranging southward to Ecuador. It differs from its closest relative, *K. costaricensis*, by the lateral almost horizontal sepals, the immaculate sepals and petals, and the distinctly obovate, truncate lip, provided with a triangular apicule.

Additional key words: orchids, *Kefersteinia medinae*, *Kefersteinia saccata*, Costa Rica, Ecuador, taxonomy.

### Introduction

Species of the genus *Kefersteinia* Rchb. f. occur as small to medium sized epiphytes in shady habitats from southern Mexico to Panama, and from Venezuela and Colombia to Surinam and Bolivia in South America. Although the habitat of *Kefersteinia* ranges from tropical warm to submontane, extremely wet forests, at elevations of 100-2500 metres, most of the species are found in premontane forests at mid elevations (900-1500 m). The genus presents its highest diversity along the Andes of Ecuador and Peru (with 20 and 16 species recorded, respectively), while species diversity rapidly diminishes toward the north, with a single species known from Guatemala and southern Mexico. In Central America, *Kefersteinia* is well represented in mountainous areas, with 10 species so far recorded in the small area of Costa Rica (Pupulin 2001).

As actually circumscribed, *Kefersteinia* includes a large assemblage of species, often with different flower morphology, mostly characterized by the presence of one or more prominent teeth or a distinct infrastigmatic keel on the ventral surface of the column. The pollinarium has four ovoid to narrowly linear-sigmoid pollinia, connected to a rhombic to obtriangular-peltate viscidium through a very reduced tegula. The relative variability in flower shape renders the genus difficult to define in terms of single, morphological features. Among the characters useful to

identify *Kefersteinia* are the usually small plants without pseudobulbs, the very slender, mostly pendent inflorescences, the basal and mostly bilobed callus, and the column provided with a ventral, laminar plate and a central keel, often extending to the rear into a tooth (Pupulin 2001). In the molecular analyses by Whitten & al. (2005) *Kefersteinia* forms a highly supported, monophyletic clade, which is sister group to *Echinorhyncha* Dressler and consecutively sister group to *Euryblema* Dressler and *Benzingia* Dodson ex Dodson.

On the basis of gross flower morphology, two main groups of species may be recognized: in the mostly Andean group close to *Kefersteinia graminea* (Lindl.) Rchb. f. (providing the type of the genus name), the lip blade folds back abruptly at the middle and the callus is sessile, low-laminar, while in the species close to *K. wercklei* (mostly Central American in distribution) the lamina of the lip is straight, and the short and high callus is born on a distinct stipe. However, the distinctiveness among the two groups is often obscured by the presence of species with highly anomalous flower morphology, such as *K. endresii* Pupulin, *K. expansa* Rchb. f., *K. hirtzii* Dodson, *K. mystacina* (Rchb. f.) Rchb. f., *K. parvilabris* Schltr. and *K. stevensonii* Dressler. This precludes the use of sharply defined formal subgroupings. Senghas & Gerlach (1992: 1641) gave recognition to the group of *Kefersteinia* species with solid, stipitate callus, creating *K. sect. Umbonatae*, and Szlachetko (2003) elevated the section to generic rank with the name of *Senghasia*. The concept of *Senghasia* is somewhat broader than the original circumscription of *K. sect. Umbonatae*, and with the additional transfers to the genus (Szlachetko & Romowicz 2006) it also includes species with laminate callus traditionally assigned to the core of *Kefersteinia* (e.g., *Senghasia lactea*, based on *K. lactea* Rchb. f.). Molecular data (Whitten & al. 2005), however, do not support the distinctiveness of *Senghasia*, and show that sections *Kefersteinia* and *Umbonatae* are not monophyletic, suggesting retaining the sole genus *Kefersteinia* for this monophyletic and morphologically distinctive group of plants.

We describe here two new species of the genus, as a result of the ongoing work on the systematics of subtribe *Zygopetalinae* carried out by the first author.

***Kefersteinia saccata* Pupulin, sp. nov.**

Holotype: Preserved from a plant in flower cultivated by A. Alfaro H. and originally collected in January 2006 by Alberto Rodríguez in Costa Rica, Alajuela, San Carlos, Río Cuarto, La Española, 4 km N of Santa Rita, 10°26'34"N, 84°11'73"W, 200 m, epiphytic on slender tree, c. 2.5 m from the soil, growing in shade close to a stream, 23.4.2007, *F. Pupulin 6549* (CR [spirit]) – Fig. 1.

Species *Kefersteiniae retanae* G. Gerlach similis, labello integro saccato ovato-subrhombico acuto, apice recurvo, callo obreniformi recedit.

*Herb* epiphytic, erect, caespitose, to about 12 cm tall. *Roots* terete, thick, 3-4 mm in diameter, produced from the short rhizome. *Stem* abbreviated, enclosed by 4-5 imbricating sheaths provided with hyaline, scarious margins, the upper ones foliaceous, to 3 cm long. *Leaves* elliptic, acute, 6-10 cm long, 2.5-3.2 cm wide, narrowing at the base into a conduplicate petiole 0.7-2 cm long. *Inflorescence* a slender, arched to pendent, solitary flower; peduncle terete, to 3.5 cm long, with 1-2 triangular-infundibuliform, acute, membranous to scarious bracts. *Floral bract* double, the outer one broadly ovate, acute, 5-6 mm long, 4 mm wide, the subopposite internal bractlet narrowly lanceolate-ligulate, 5 mm long, 1.5 mm wide. *Ovary* subclavate, distinctly winged, 9 mm long including the pedicel. *Flowers* small for the genus, the dorsal sepal and the petals ringent, greenish cream, translucent, the petals with sparse, minute purple spots, the lip white with purple spots arranged in a few radiating lines, the callus pale yellow. *Dorsal sepal* narrowly elliptic, acute, strongly concave, abaxially subcarinate, 9 mm long, 3.5 mm wide. *Lateral sepals* lanceolate-elliptic, acute, minutely apiculate, concave, inrolled-folded toward the base, 10.5 mm long, 4.5 mm wide. *Petals* obliquely elliptic, acute, 10 mm long, 4.5 mm wide. *Lip* with a short cuneate claw, ovate-subtrapezoidal, acute, deeply concave-cymbiform, 9 mm long, 8 mm wide, the margins irregularly crenate, the apex upcurved; callus subbasal, pedicellate, obreniform, bilobed, 1.6 mm long, 3 mm wide, about 2.5 mm high. *Column* semiterete from a narrow base,

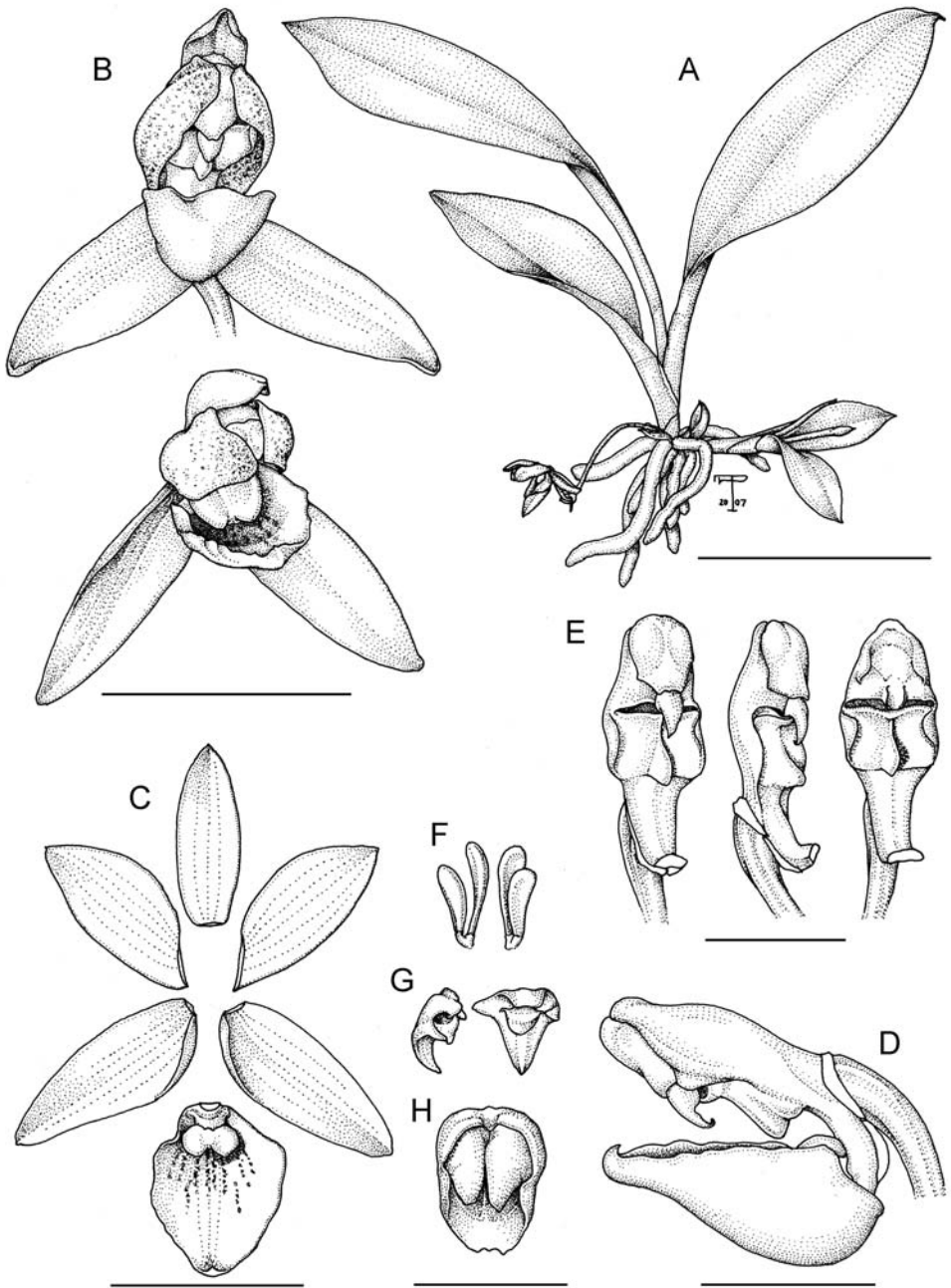


Fig. 1. *Kefersteinia saccata* – A: habit; B: flower (two views); C: dissected perianth; D: column and lip, lateral view; E: column, ventral and three quarters views (the anther in place), and ventral view (emasculate); F: pollinia and caudicles; G: stipe and viscidium (lateral and ventral views); H: anther cap. – Drawn by F. Pupulin from the holotype. – Scale bars: A = 5 cm, B-C = 1 cm, D-E = 5 mm, F-H = 3 mm.

stout, with a c. 2.5 mm long foot, 6.5 mm long excluding the foot, 3.5 mm wide at the middle, the ventral surface forming a transversely elliptic-subrectangular plate, the lateral margins infolded, provided with a median, longitudinal, infrastigmatic keel projecting at the rear into a high, thick, obtuse tooth. *Anther cap* cucullate, ovate, flattened, 3-dentate at apex, 2-celled. *Pollinia* 4 in two pairs of different size, linear-oblong, on a cross-shaped, folded stipe; viscidium hyaline, rounded.

*Etymology.* – From Latin *saccatus*, “saccate, sac-shaped”, in allusion to the saccate base of the lip.

*Distribution and habitat.* – Known only from the type locality in Costa Rica. The plant providing the type specimen was found growing as an epiphyte in shaded places in the tropical wet forests of the San Carlos plain, in northern Costa Rica, at about 200 m elevation.

*Phenology.* – Flowering occurs at least in May, at the beginning of the rainy season in Costa Rica.

*Relationship.* – The porrect petals, flanking the column up to the apex, the saccate, ovate-subrhombic lip, shorter than the column, acute and recurved at apex, and the obreniform basal callus reminiscent of that of *Kefersteinia costaricensis* Schltr., distinguish *K. saccata* from its relatives, namely *K. retanae* G. Gerlach and *K. wercklei* Schltr. *K. saccata* is the smallest species of the genus in Mesoamerica. It belongs to a group of species characterized by the truly stipitate, cylindrical-umbonate callus, and by the lateral lobes of the lip erect and flanking the column. However, the deeply saccate base of the lip, as well as the lip blade ending in a retrorse tooth, are unique features among species of *Kefersteinia* native to Central America (Pupulin 2001).

***Kefersteinia medinae* Pupulin & G. Merino, sp. nov.**

Holotype: Preserved from a plant in flower cultivated in the collection of Ecuagenera at Gualaceo and originally collected in 2002 by G. Merino & H. Medina in Ecuador, Zamora-Chinchiipe, Zumba, El Progreso, c. 4°52'S, 79°09'W, 1200 m, 11.5.2007, *F. Pupulin 6571* (Ángel Andretta Research Center on Andean Orchids, Gualaceo [spirit]) – Fig. 2-3A.

Species *Kefersteiniae costaricensi* Schltr. similis, sepalis lateralibus subhorizontaliter dispositis, sepalis petalisque immaculatis, labello obovato truncato apiculo triangulari instructo recedit.

*Herb epiphytic*, erect, caespitose, to about 10 cm tall. *Roots* terete, thick, 2.5 mm in diameter, produced from the short rhizome. *Stem* abbreviated, enclosed by 4-6 imbricating sheaths provided with hyaline, scarious margins, the upper ones foliaceous, to 2.2 cm long. *Leaves* narrowly oblanceolate-elliptic, acute to abruptly acuminate, 3-9 cm long, 0.6-1.3 cm wide, narrowing at the base into a conduplicate petiole to 1 cm long. *Inflorescence* slender, suberect to arched-pendent, single-flowered, to 2.5 cm long; peduncle terete, with 2 membranous, aging papyraceous, triangular-ovate, acute bracts, 3 mm long, 2 mm wide. *Floral bract* double, the outer one broadly ovate, shortly acuminate, 4.5 mm long, 3 mm wide, the subopposite internal bractlet smaller, narrowly lanceolate, acute, 4.5 mm long, 1.5 mm wide. *Ovary* terete-subclavate, rounded in section, to 8 mm long including the pedicel. *Flowers* white, the lip marked with small purple blotches and spots arranged in longitudinal lines, the callus white spotted purple, the column white sparsely spotted with rose-purple. *Dorsal sepal* elliptic, acute, slightly incurved toward the column, concave distally, abaxially subcarinate, 8-9 mm long, 4 mm wide. *Lateral sepals* inserted along the margins of the column foot, almost horizontal in natural position, distinctly larger than the dorsal sepal, lanceolate, obtuse to subacute, minutely apiculate, gently subporrect, concave apically, dorsally slightly carinate along the mid-nerve, 11 mm long, 5 mm wide. *Petals* obliquely elliptic, constricted toward the apex, acute, 8-9 mm long, 3.5 mm wide. *Lip* with a short, linear claw, obovate, truncate, with a triangular apicule, concave at the base, the apical half gently reflexed, the distal portion thickened centrally, 7.5 mm long, 6.5 mm wide, the apical margins slightly undulate, suberect; callus basal, pedicellate, projecting, the pedicel subquadrate in transversal sec-

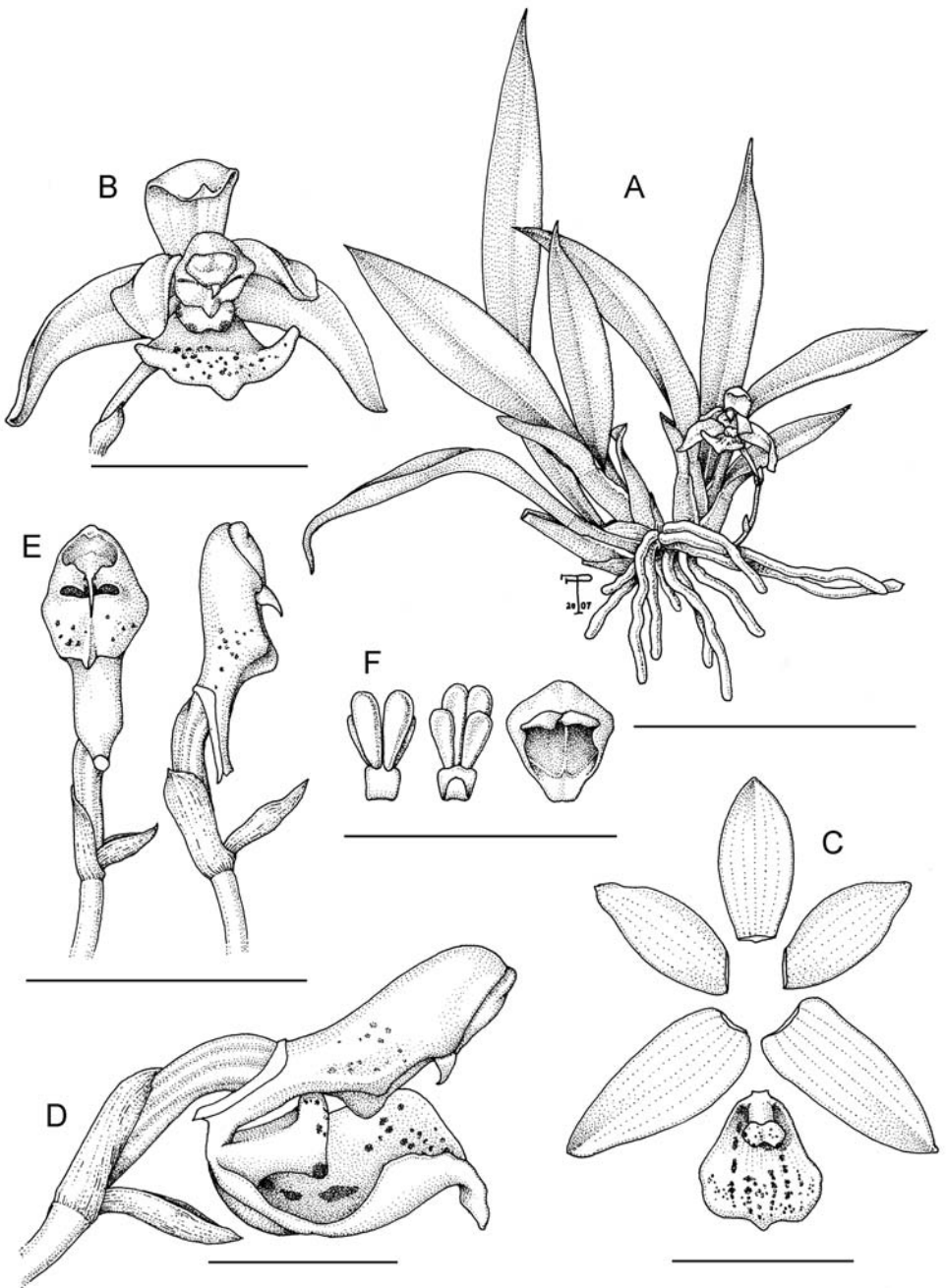


Fig. 2. *Kefersteinia medinae* – A: habit; B: flower; C: dissected perianth; D: column and lip, lateral view; E: column, ventral view (emasculate) and lateral view (the anther in place); F: pollinarium (dorsal and ventral views) and anther cap. – Drawn by F. Pupulin from the holotype. – Scale bars: A = 5 cm, B-C, E = 1 cm, D, F = 5 mm.



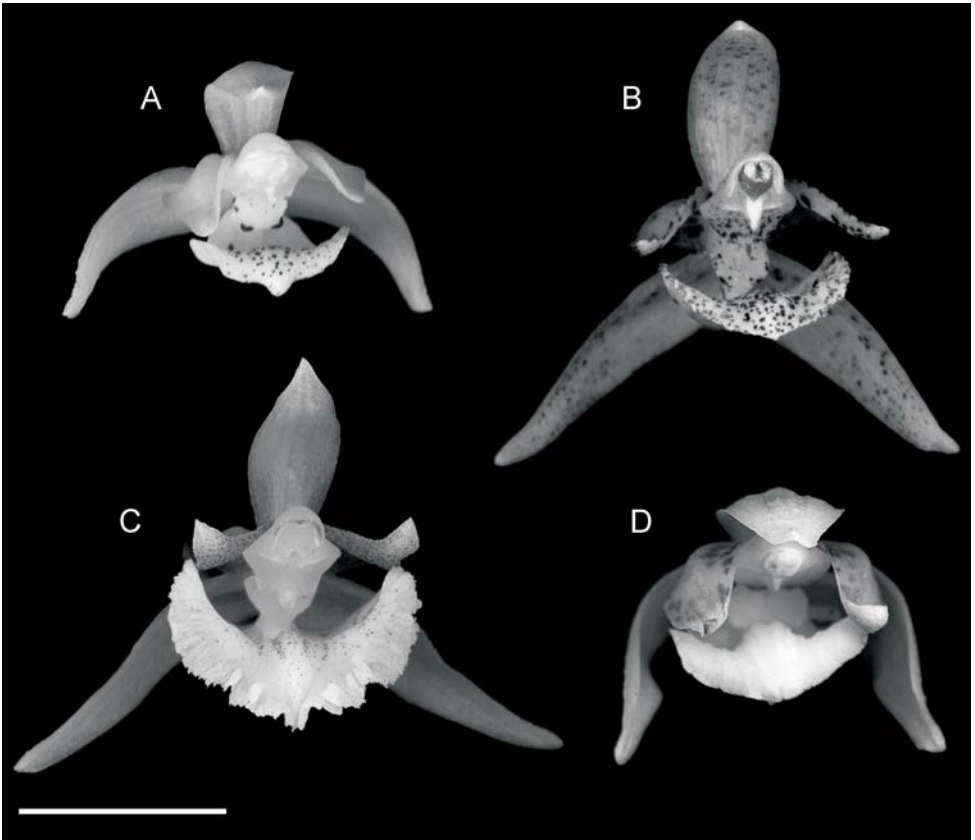


Fig. 3. Comparison of *Kefersteinia medinae* with some related species – A: *K. medinae* (Pupulin 6571); B: *K. costaricensis* (Pupulin 6166); C: *K. orbicularis* (Pupulin 2095); D: *K. auriculata* (Dressler 6831). – Scale bar = 1 cm.

tion, the dilated apex bilobed, transversely subrhombic, 1.5 mm long, 2 mm wide, 3 mm high. *Column* semiterete from a narrow base, stout, with a distinct, c. 2.5 mm long foot, 6 mm long excluding the foot, 4 mm wide at the middle, the ventral surface forming a trapezoid-elliptic plate, the lateral margins projecting in 2 broadly triangular, rounded wings, provided with a median, longitudinal, infrastigmatic keel projecting at the rear into a high, slender, rounded tooth. *Anther cap* cucullate, ovate, flattened, 2-celled. *Pollinia* 4 in two pairs of different size, linear-oblong, on a triangular, folded stipe; viscidium hyaline, indistinct.

*Eponymy.* – Named in honour of Hugo Medina, who participated in the collection of the plant of which the type specimen was preserved.

*Distribution and habitat.* – The species is known only from Ecuador, but due to the close proximity of the type locality to the Peruvian border, it is to be expected also in northern Peru. At the type locality, plants of *Kefersteinia medinae* grow in the open shadow of the middle canopy in mature secondary vegetation, rooting among lichens and mosses. Although the western slopes of the Andes in southern Ecuador are among the rainiest regions in the country, the Zumba valley and the basin of Río Mayo (a tributary of Río Marañón) are comparatively dry, with a wet season restricted to the months of February to April and a generally temperate climate (average temperatures 14 to 25 °C).

*Phenology.* – Flowering occurs from April to June, which grossly corresponds to the beginning of the dry season in southern Ecuador.

*Relationship.* – *Kefersteinia medinae* belongs to a group of species mostly Central American in distribution, including *K. alata* Pupulin and *K. auriculata* Dressler (both endemic to Panama, Fig. 3D), *K. chocoensis* G. Gerlach & Senghas (Colombia), *K. costaricensis* Schltr. (Nicaragua to Panama, Fig. 3B) and *K. orbicularis* Pupulin (Costa Rica and probably western Panama, Fig. 3C). The group is mainly characterized by the orbicular-elliptic lip that does not fold abruptly at the middle, the thickening of the distal portion of the lip and the stipitate callus transversely bilobed at apex. Among the species of this complex, *K. medinae* is most similar to *K. costaricensis*, from which it may be recognized by the lateral sepals inserted almost horizontally on the column foot, the immaculate tepals, and the distinctly obovate lip, truncate at apex and provided with a triangular apicule.

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We are indebted with Antonio Alfaro and the owners of Ecuagenera, who kindly provided the living plants and pickled flowers which served for this study. The research assistants at CIOA helped in producing digital documentation of *Kefersteinia medinae*. We acknowledge the officers of the Ministry of Environment and Energy (MINAE) and the National System of Protected Areas (SINAC) of Costa Rica, for extending the scientific passport No. 1281 to collect and manage plant specimens from the field, and the Ministerio del Ambiente of Ecuador for the permits extended to Ecuagenera for the management of the firm's ex-situ collections.

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