RHEEDEA
Journal of the Indian Association for Angiosperm Taxonomy
RESEARCH ARTICLE
Vol. 33(2): 74–82 (2023)
ISSN: 0971-2313 (Print edition)
ISSN: 2582-2438 (Online edition)
https://dx.doi.org/10.22244/rheedea.2023.33.02.04

Taxonomy and lectotypification of *Lepidagathis hamiltoniana* (Acanthaceae: Barlerieae), an endemic species of India

King A.F.J.[1], Prajapati S.R.[2], Patel R.M.[3], Gnanasekaran G.[1]*, Darbyshire I.[4] & W. Arisdason[5]

[1]Department of Botany, Madras Christian College (Autonomous), Tambaram East, Chennai, Tamil Nadu – 600 059, India
[2]Department of Botany, Government Science College, Limkheda, Dahod, Gujarat – 389 140, India
[3]Department of Botany, Government Science College, Gandhinagar, Gujarat – 382 016, India
[4]Royal Botanic Gardens, Kew, Richmond, Surrey, TW9 3AE, UK
[5]Botanical Survey of India, Southern Regional Centre, TNAU Campus, Lawley Road, Coimbatore, Tamil Nadu – 641 003, India
*E-mail: gnanasekaran@mcc.edu.in

Abstract: The taxonomy of *Lepidagathis hamiltoniana* Wall. ex Nees (Acanthaceae: Barlerieae) is discussed, along with a detailed description, illustration and photo plates. The taxonomic complexities among *L. collina* (Endl.) Milne-Redh., *L. cristata* Willd. and *L. hamiltoniana* are clarified. Lectotypes for the names, *L. beddomei* T.Anderson and *L. hamiltoniana* are designated here.

Keywords: Africa, Lectotype, *Lepidagathis collina*, *Lepidagathis cristata*, Taxonomic complex.

Introduction

Lepidagathis Willd. (Acanthaceae: Barlerieae) is distributed in pantropical and subtropical regions (Manzitto-Tripp *et al*., 2021), with 151 accepted species globally (POWO, 2023). The genus is represented by 31 species and seven varieties in India, of which 19 species and one variety are endemic (Arisdason *et al*., 2020; Gnanasekaran *et al*., 2022, 2023).

Nees von Esenbeck (1832) described *Lepidagathis hamiltoniana* based on a specimen collected from Nuni in West Bengal, India, and distinguished it from the type of the genus, *L. cristata* Willd., by having elongated and winged stems, 10–12 cm long subfalcate leaves distributed only on the upper nodes, many spikes at basal nodes, compact bracts and bracteoles highly variable in size and shape, *c*. 6 mm long flower with a pale yellow throat. Morton (1988) treated this Indian endemic species as conspecific with the western African form of *L. collina* (Endl.) Milne-Redh., whilst the eastern African form of *L. collina* (including the type specimen from Sudan) as a separate subspecies of *L. hamiltoniana* subsp. *collina* (Endl.) J.K.Morton. Furthermore, he noted that the latter subspecies has its counterpart in India in the form of *L. cristata*, although he had not gone for treating *L. hamiltoniana* subsp. *collina* and *L. cristata* as conspecific. He differentiated these two subspecies based on habit (decumbent to erect, 30–60 cm high *vs.* prostrate, up to 15 cm long), leaves (linear, 6–12 cm long with 3 parallel veins *vs.* narrowly elliptic, 4–6 cm long with pinnate lateral veins) and inflorescence size (*c*. 6 cm in diam. *vs. c*. 3 cm diam.).

Darbyshire *et al*. (2010) reassessed this complex by critical examination of fresh and herbarium specimens from tropical Africa and pointed out that the aforementioned differences in habit, leaves and inflorescence are either clinical or highly variable across the African range of "*L. collina*". Furthermore, he stated that *L. collina* could be distinguished from *L. hamiltoniana* by having a larger corolla and a hairy ovary. Therefore, Darbyshire *et al*. (2010) reinstated *L. collina*, but highlighted the need for a detailed study to confirm these differences.

During the present study on the systematics of *Lepidagathis* in India, besides fresh collections of *L. hamiltoniana* the authors examined the herbarium specimens collected from different parts of India and deposited in BM, BSI, BSID, CAL, E, K, L, MH, NY, SKU and US herbaria (Thiers, updated continuously). A detailed description, illustration and photo plates are prepared. A critical examination of the relevant literature (Morton, 1988; Darbyshire *et al*., 2010), confirmed the view

Received: 23.12.2022; *Revised & Accepted*: 05.06.2023
Published Online: 30.06.2023

of Darbyshire *et al*. (2010) that *L. hamiltoniana* is distinct from both *L. collina* and *L. cristata* (Table 1). Therefore, a detailed account on the taxonomy and distribution of *L. hamiltoniana* is given, along with a table to differentiate all these species. Additionally, lectotypes are designated here for the names, *L. beddomei* T.Anderson and *L. hamiltoniana*.

Taxonomic Treatment

Lepidagathis hamiltoniana Wall. ex Nees in Wall., Pl. Asiat. Rar. 3: 96. 1832 & in DC., Prodr. 11: 255. 1847; C.B. Clarke in Hook.f., Fl. Brit. India 4: 516. 1885. *Lectotype* (designated here): INDIA. **West Bengal**, Nuni, 27.11.1810, *Hamilton s.n.* (Wall., Numer. List: n. 2422; K [K001115892 digital image!]; isolecto: E [E01024248 digital image!], GZU [GZU000251624 digital image!]). **Figs. 1–3**

Lepidagathis beddomei T.Anderson, J. Linn. Soc., Bot. 9: 499. 1867. *Lectotype* (designated here): INDIA. **Madhya Pradesh**, Jubbulpore, 1858, *R.H. Beddome s.n.* (CAL [CAL0000020097 digital image!]); isolecto: BM [BM013860249 digital image!]. **Fig. 4**

Perennial herbs, erect to decumbent, up to 75 cm high. Stems well-branched towards apex, 4-angled when young, cylindrical with 4 wings when old; internodal distance 0.8–3.2 cm long, glabrous throughout except hairy nodes. Leaves sessile, decussate, linear to narrowly elliptic, 4.2–12 × 0.6–1.1 cm, base rounded, margins entire to serrulate due to swollen hair bases, acute and mucronulate at apex, glabrescent on upper surface, pubescent at veins of lower surface; venation eucamptodromous, midvein broad at base, lateral veins 3–8 pairs, conspicuous on lower surface. Spike basal and in the lower axils of branching nodes, compounded into dense synflorescences to form globose heads or cushions with scale-like sterile bracts at the base, each up to 6 cm in diam. Bracts: sterile ones in 4–10 (2–5 pairs) at the base of each spike, lanceolate to lance-ovate, 10.2–11.5 × 1.8–3.3 mm, base truncate, margins sparsely ciliate, apex acuminate with spinose apical process, sparsely sericeous throughout; fertile bract 1 per flower, lance-ovate to narrowly oblong, 11–13.6 × 1.8–3.5 mm, base obtuse or truncate, margins ciliate with short glandular hairs towards apex, apex acuminate to cuspidate with spinose process, sericeous hairs on outer surface, glabrescent on inner surface. Bracteoles 2 per flower, heteromorphic, lanceolate to oblanceolate, 11.3–14.2 × 1.4–2.3 mm, base cuneate or obtuse, margins ciliate with short glandular hairs towards apex, apex acuminate with spinose process, sericeous at midvein of outer surface, glabrescent on inner surface. Calyx 5-lobed; lobes heteromorphic, acuminate or caudate at apex, margins ciliate with short glandular hairs intermixed towards apex, sericeous throughout; anticous lobes 2, elliptic (oblong in fruiting calyx), 8.5–13 × 3–4 mm, connate at base (almost three quarters of its total length, *i.e*., 4.2–9.7 mm), overlapping; posticous lobe 1, elliptic to oblanceolate-ovate (oblong in fruiting calyx), 8.9–13.9 × 2.7–4 mm; lateral lobes 2, linear, 7–12.2 × 0.8–1.9 mm. Corolla bilabiate, 9.6–13.5 mm long, pinkish white with many purple markings on throat and limb inside and yellowish brown dots or patches on the palate; tube 6.3–6.7 mm long, cylindric below, 3.3–3.8 mm long, glabrous inside, abruptly expanded above, 2.7–2.9 mm long, retrorsely hairy outside; upper lip arcuate, 1.5–1.9 × 2.5–3.2 mm, entire at margins, minutely 2-lobed (0.2–0.35 mm long) at apex, each lobe 3-veined; lower lip 3-lobed, with a membranous portion on either side of the centre of the palate with an adjacent line of silky hairs, 3.3–4.5 mm long, including lobes, lobes spreading at throat for 5.9–7.1 mm long; middle lobe broader than the lateral lobes, sub-orbicular, 1.9–2.3 × 3.2–3.7 mm, crenulate, 3-veined; lateral lobes broadly oblong, 2–2.2 × 1.8–2.5 mm, 3-veined. Stamens 4, didynamous, adnate at the base of expanded corolla tube; filaments purple to white, glabrous; anticous (longer) filaments 1.3–1.7 mm long; posticous (shorter) filaments 1–1.2 mm long; anthers oblong, 0.7–1 mm long, white, sparsely hairy at base of the suture, scabrous at the connectives, longitudinally dehiscing. Ovary sub-globose, *c.* 1.3 × *c.* 1 mm, glabrous, 2-loculed; ovules 2 in each locule; nectary disk cupulate; style 6–6.2 mm long, bristled glandular-hairy; stigma entire to bilobed. Capsules ovoid in face view, 6.5–7.5 × 3.1–3.5 mm, glabrous, green to yellowish-brown; retinacula *c.* 1.6 mm long. Seeds 2 or 1 per capsule, fertile, ovoid in face view, 3.7–3.9 × 2.7–3.2 mm, flat, densely clothed with hygroscopic white hairs (longer than seeds) on both surfaces.

Flowering & fruiting: Flowering from October to January and fruiting from November to February.

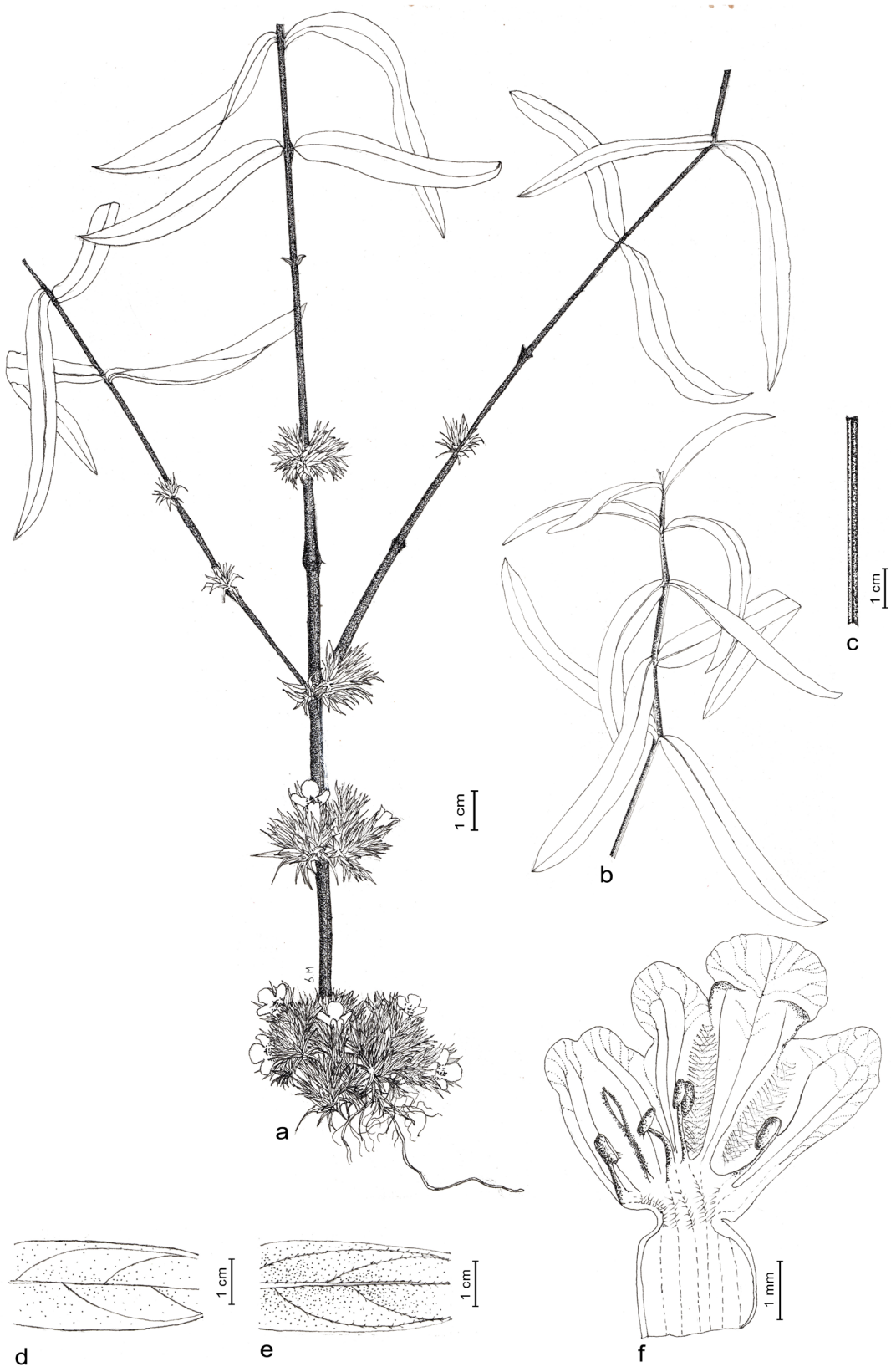

Fig. 1. *Lepidagathis hamiltoniana* Wall. ex Nees: **a**. Habit; **b**. Branch; **c**. Portion of stem; **d**. Leaf–upper surface; **e**. Leaf–lower surface; **f**. Corolla split open (from *Sujitkumar & Rohitkumar* 12828, Madras Christian College Herbarium, Chennai; drawn by S. Madhura).

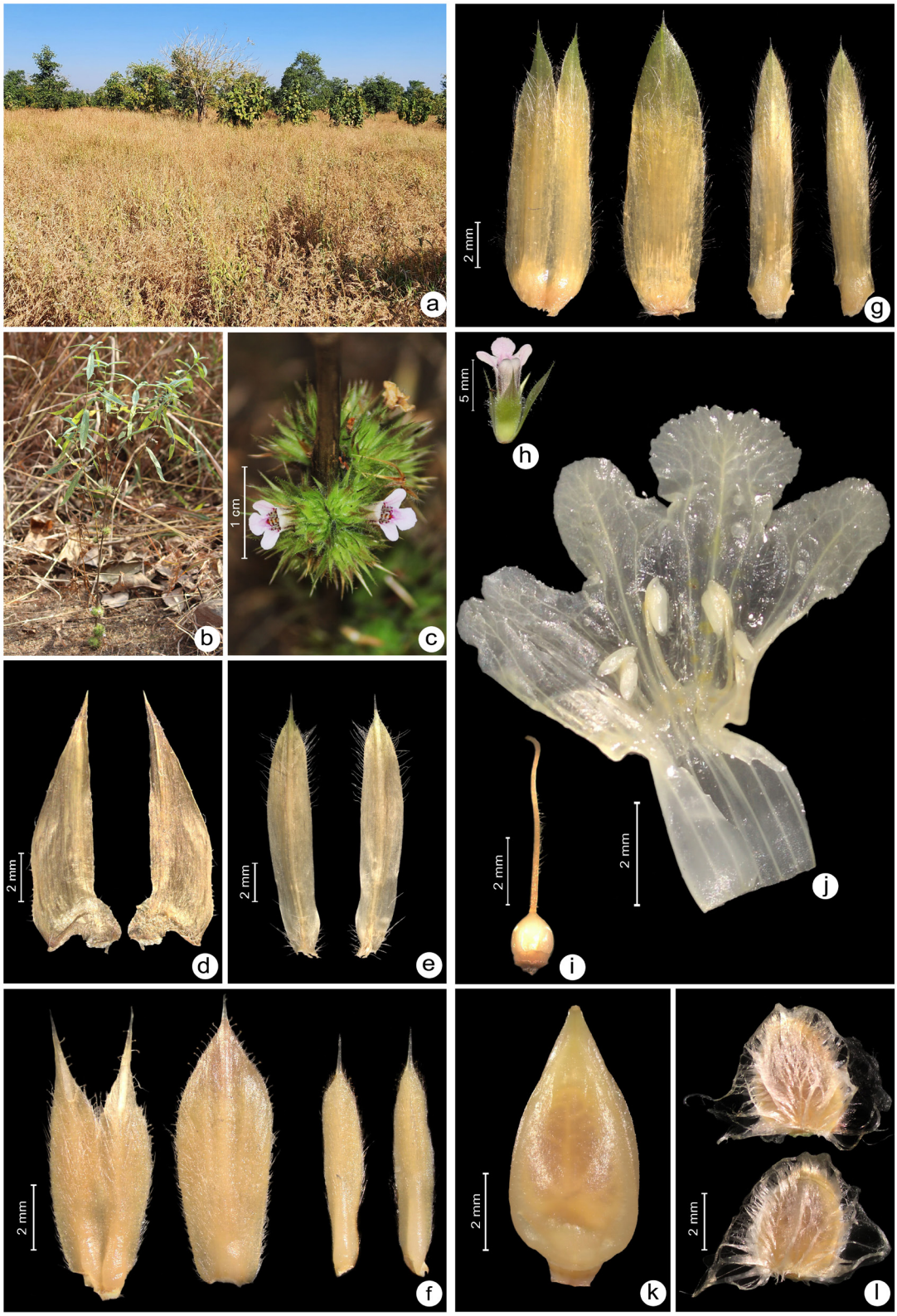

Fig. 2. *Lepidagathis hamiltoniana* Wall. ex Nees: **a**. Habitat; **b**. Habit; **c**. Inflorescence close-up; **d**. Outer (left) and inner (right) surfaces of sterile bract; **e**. Outer (left) and inner (right) surfaces of fertile bract; **f**. Outer surface of flowering calyx lobes; **g**. Outer surface of fruiting calyx lobes; **h**. Flower; **i**. Pistil; **j**. Corolla split open; **k**. Capsule; **l**. Seeds with hygroscopic hairs (from *Sujitkumar & Rohitkumar* 12828, Madras Christian College Herbarium, Chennai; photos a & b by Sujitkumar, c & h by Rohitkumar; d–g & i–l by A.F.J. King).

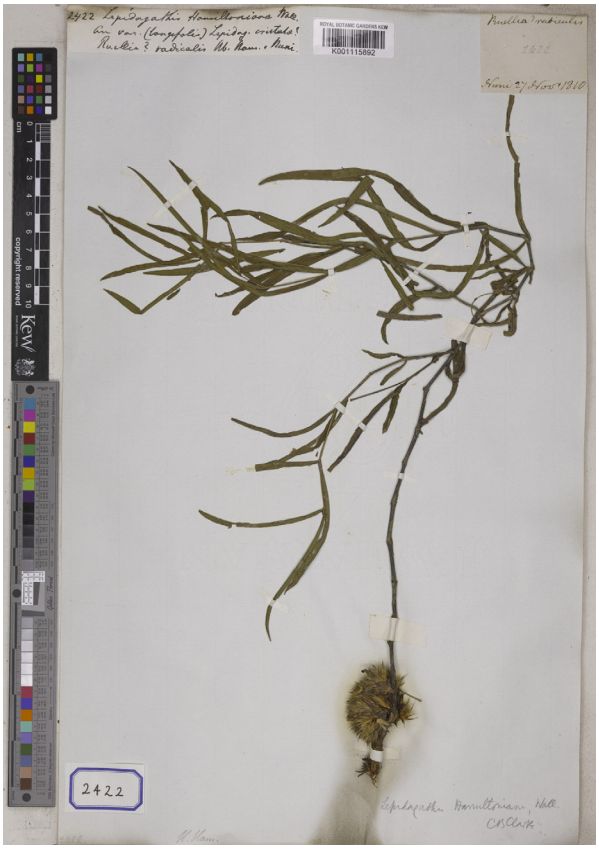

Fig. 3. Lectotype of *Lepidagathis hamiltoniana* Wall. ex Nees (K, K001115892). © The Board of Trustees for the Royal Botanic Gardens, Kew. Reproduced with permission.

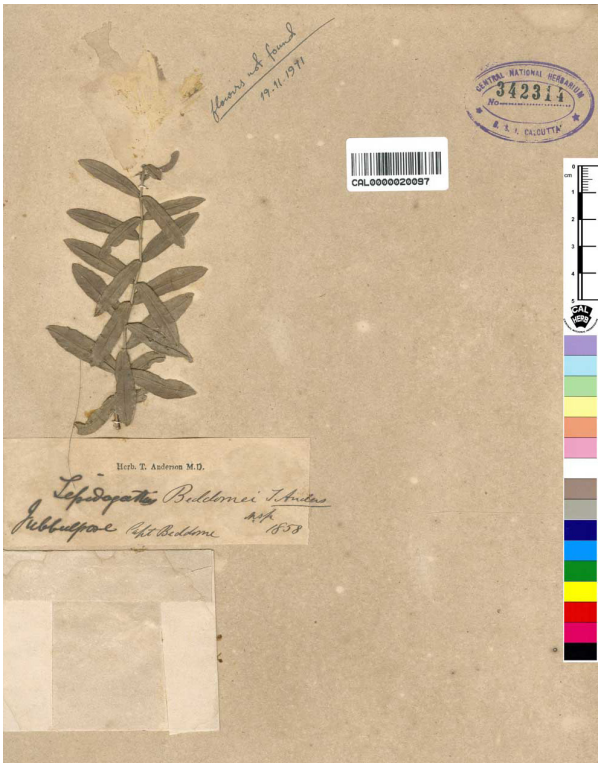

Fig. 4. Lectotype of *Lepidagathis beddomei* T.Anderson (CAL, CAL0000020097). © The Director, Botanical Survey of India. Reproduced with permission.

Habitat: This species usually grows on grasslands with sandy or gravelly soils, at elevations ranging from 250 to 390 m.

Distribution: Endemic to India. A critical study of the description provided in the state and regional Floras of India, and examination of specimens housed at the national and international herbaria (digital images) show that this species is endemic to India with an almost country-wide distribution, except for the northeastern region. The species is distributed in the following states: West Bengal (Nees von Esenbeck, 1832; Prain, 1903), Punjab (Nair, 1978), Rajasthan (Pandey & Singh, 1991), Odisha (Saxena & Brahmam, 1995), Uttar Pradesh (Sharma & Dhakre, 1995), Andhra Pradesh (Pullaiah & Moulali, 1997), Madhya Pradesh (Khanna *et al*., 1997), Bihar (Singh *et al*., 2001), Maharashtra (Moorthy, 2001), Chhattisgarh (Khanna *et al*., 2005), Jharkhand (Paria & Chattopadhyay, 2005) and Telangana (Pullaiah, 2015). During the present study, a specimen of *L. hamiltoniana* was collected from Dahod and Kutch districts in Gujarat. The occurrence of this species has never been reported from the state until now, thus the present collection forms an addition to the flora of Gujarat state. However, a critical scrutiny of the description provided in the 'Flora of Gujarat State' by Shah (1978) shows that this species was erroneously identified and documented as *L. cristata*. Furthermore, we have come across a specimen of this species collected from Mysore (MH [MH00110039]), which forms a new record of distribution of this species to the flora of Karnataka. However, an extensive field exploration is required to confirm its present distribution in Karnataka.

Specimens examined: INDIA. **Andhra Pradesh**, Chittoor district, Kambakam hills, 07.05.1913, *s.coll*., 8967 (MH); East Godavari district, Donkarayi near Mangampadu, 325 m, 31.12.1967, *G.V. Subba Rao* 29679 (MH); Nellore district, Rudrakota, 373 m, 18.11.1997, *B.R.P. Rao & S. Swetha* 20178 (SKU); Rudrakota to Nallamalais, 13.02.2004, *S.K. Nazeeruddin* 27606 (SKU); Visakhapatnam district, Chinagora Reserve Forest, 12.12.1923, *K.C. Jacob*

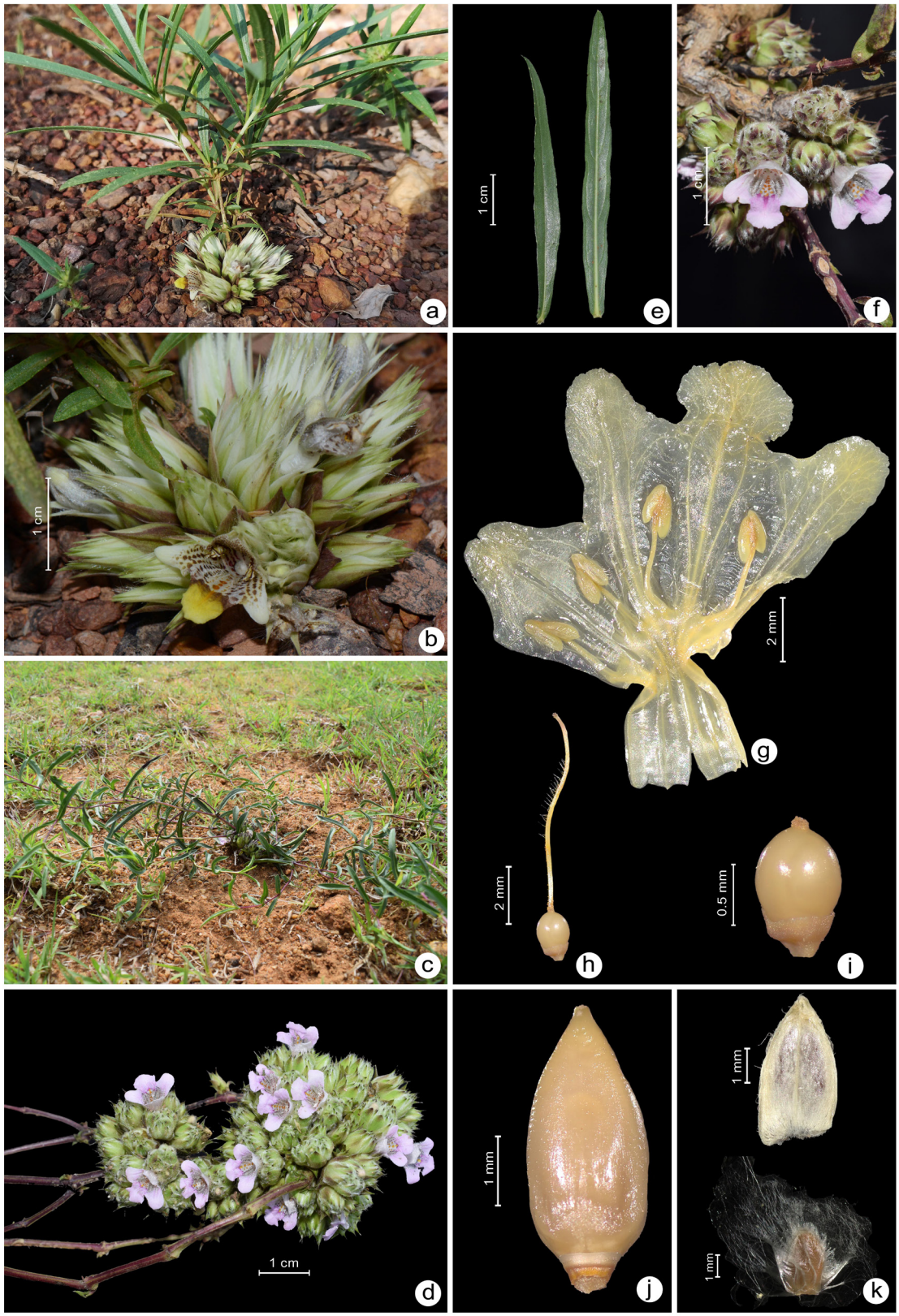

Fig. 5. a & b: *Lepidagathis collina* (Endl.) Milne-Redh.: **a**. Habit; **b**. Inflorescence close-up. **c-k**: *Lepidagathis cristata* Willd.; **c**. Habit; **d**. Inflorescence twig; **e**. Leaves upper (left) and lower (right) surfaces; **f**. Flowers–front view showing lower lip; **g**. Corolla split open; **h**. Pistil; **i**. Ovary with nectary disk; **j**. Capsule; **k**. Seeds with hygroscopic hairs (from *G. Gnanasekaran & A.F.J. King* 12854, Madras Christian College Herbarium, Chennai; photos a & b by Warren McCleland; c–f by G. Gnanasekaran; g–k by A.F.J. King).

17194 (MH). **Chhattisgarh**, Chota Nagpur, 10.10.1873, *C.B. Clarke* 21017 (US [US02863703 digital image]); *C.B. Clarke* 21022 (BM [BM013860250 digital image]); *Ibid.,* 04.11.1883, *C.B. Clarke* 34079 (BM [BM013860248 digital image]); south bank of Konar river, 04.11.1951, *F.H.W. Kerr* 1293 (BM [BM013860246 digital image]); *Ibid.,* 11.11.1951, *F.H.W. Kerr* 2146 (BM [BM013860247 digital image]). **Gujarat**, Dahod district, Rampura Grassland, N 22°47'34.4148", E 74°10'1.6248", 18.12.2021, *Sujitkumar & Rohitkumar* 12828 (Madras Christian College Herbarium, Chennai); Dahod district, Rampura Grassland, N 22°48'12.7116", E 74°10'9.482", 25.03.2023, *A.F.J. King & Sujitkumar* 12991 (Madras Christian College Herbarium, Chennai); Lakhpat, Near Kateshwa Buddha caves, N 23°46'25.3992", E 68°52'36.606", 23.03.2023, *A.F.J. King & Rohitkumar* 12987 (Madras Christian College Herbarium, Chennai); Bhachau, Sarasla, N 23°27'14.8644", E 70°31'24.3948", 24.03.2023, *A.F.J. King & Sujitkumar* 12988 (Madras Christian College Herbarium, Chennai). **Karnataka**, Mysore, 1857, *s.coll. s.n.* (MH). **Madhya Pradesh**, Barwani district, West of Choral to Balwadi road, 21.10.1962, *A.S. Rao* 83971 (BSI); Jabalpur district, Jabalpur, 1000 ft, 24.12.1875, *O. Kuntze* 7321 (NY [NYBG04204668 digital image]); Narsinghpur district, Narsinghpur, 1000 ft, 24.12.1875, *O. Kuntze* 740 (NY [NYBG04204661, NYBG04204655 digital images]). **Maharashtra**, Akola district, Chikhalwal, 20.02.1978, *S.Y. Kamble* 152700 (BSI); Patur to Akola, 19.02.1978, *S.Y. Kamble* 152663A (BSI); Buldhana district, Gaumal forests, 15.12.1982, *P.G. Diwakar* 163066 (BSI); Chandrapur district, Mohrale Range, North Chanda Forest, 12.12.1957, *Sethi & Negi Raizada* 25745 (L [L2838013 digital image]); Mohrale Range to Chandrapur district, 21.10.1972, *B.M. Wadhwa* 130282 (BSI); Vasalher nele, 26.10.1972, *B.M. Wadhwa* 127352 (BSI); Nanded district, Rampur to Nagz, 14.10.1966, *R.D. Pataskar* 110073 (BSI). **Odisha**, Ganjam district, Bindogorha, 1000 ft, March 1884, *J.S. Gamble* 14073 (MH). **Punjab**, *s.loc*., *s.die, J.R. Drummond* 26446 (E [E01024275 digital image]). **Rajasthan**, Kota district, Kota to Darah, 26.10.1957, *Jain* 28793 (BSI). **Telangana**, Khammam district, Edurallapalli forest, ± 250 m, 17.11.1993, *R. Chandrasekaran* 98757 (BSID [BSID0005357 digital image], MH); Nizamabad district, Ibrahimpet block, 27.09.1987, *T. Pullaiah & B.R.P. Rao* 6127 (SKU); Gandhari Reserve forest, 09.10.1988, *B.R.P. Rao & C.P. Raju* 7233 (SKU); Mamidipally Reserve forest, 05.11.1989, *B.R.P. Rao & S.P. Balu* 9605 (SKU). **Uttar Pradesh**, Jalaun district, Kalpi block near Kalpi, 05.02.1950, *W.W. Sen* (NY [NYBG04204634 digital image]).

Conservation status: The species is provisionally assessed here as 'Least Concern' [LC] as per the IUCN Red List Categories and Criteria version 15.1 (IUCN, 2022).

Lectotypifications

Nees von Esenbeck (1832) described *L. hamiltoniana* based on a specimen collected by Hamilton from Nuni (presently in West Bengal) on 27 November, 1810 [Wallich's Numer. List: n. 2422 (Wallich, 1830)] with a detailed description of habit, leaves, inflorescence and flower. A search in various herbaria resulted in locating three relevant specimens, one each at E (E0124248), K (K001115892) and GZU (GZU000251624). Among them, a specimen with the annotation of Wallich's Numer. List: n. 2422 (K001115892) is designated here as the lectotype for this name in accordance with the article 9.3 of the ICN (Turland *et al*., 2018) as it matches well with the identity and description provided in the protologue. The other two specimens (E0124248 and GZU000251624) are considered isolectotypes.

Anderson (1867) described *L. beddomei* based on specimens collected by R.H. Beddome from Jubbulpore (Jabalpur in Madhya Pradesh) in 1858 and he considered it as allied to *L. cristata*. Furthermore, he stated that this species resembles *L. heudelotiana* Nees, a species endemic from west to central Africa in having terminal inflorescences. Since a proper type was not designated while describing the species, a lectotype is designated here from the syntypes following article 9.3 of the ICN (Turland *et al*., 2018). We found duplicate specimens of *R.H. Beddome* 454(?) devoid of flowers or fruits housed at BM (BM013860249) and CAL (CAL0000020097). Of these, the specimen at BM is with the following annotation of Clarke (1885): "I have reduced *L. beddomei* T.Anderson in the faith that this was the plant; though T. Anderson says inflorescence terminal". The other specimen at CAL is with an annotation "*L. beddomei* n. sp. (1858)" made by T. Anderson. Therefore, the latter specimen bearing the annotation "*L. beddomei* n. sp. (1858)" by T. Anderson (CAL0000020097),

Table 1. Comparison of diagnostic characters among *L. hamiltoniana*, *L. collina* and *L. cristata* (measurements for *L. collina* are derived from Darbyshire *et al*., 2010).

Characters	*L. hamiltoniana* Wall. ex Nees	*L. collina* (Endl.) Milne-Redh. Fig. 5 a & b	*L. cristata* Willd. Fig. 5 c-k
Habit	Erect to decumbent herb	Prostrate, procumbent or occasionally erect pyrophytic herb	Prostrate herb
Leaves	Linear to narrowly elliptic, 4.2–12 × 0.6–1.1 cm, pubescent on veins of lower surface	Linear, oblanceolate, narrowly oblong or (ovate-)elliptic, 2–8 × 0.4–1.5 cm, glabrous	Linear to narrowly oblong, rarely oblanceolate, 1.5–6 × 0.3–0.5 cm, glabrous
Calyx	Lobes 7–13.9 mm long, apex acuminate or caudate; posticous lobe elliptic to oblanceolate-ovate	Lobes 10.5–16 mm long, apex acuminate or caudate; posticous lobe oblong-ovate (-lanceolate)	Lobes 5.8–11 mm long, apex acute or cuspidate; posticous lobe oblance-ovate
Corolla	9.6–13.5 mm long, pinkish white	14.5–19 mm long, white to yellow	12–16.3 mm long, white to pink
Anticous Stamen	Filaments 1.3–1.7 mm long; anthers 0.7–1 mm long	Filaments 3.5–5 mm long; anthers 1.4–1.8 mm long	Filaments 2–3.5 mm long; anthers 1.1–1.5 mm long
Ovary	Sub-globose, glabrous	Ovoid, pubescent in upper half	Oblongoid or subglobose, glabrous
Capsule	6.5–7.5 mm long, glabrous	6.5–7 mm long, shortly hairy towards apex	5.1–6.5 mm long, glabrous

is designated here as the lectotype. The other specimen at BM (BM013860249) is considered a isolectotype. A perusal of literature (Anderson, 1867; Clarke, 1885) and examination of *R.H. Beddome* 454(?) and other specimens from Jubbulpore (Jabalpur) and Chota Nagpore (Chota Nagpur) (*C.B. Clarke* 21022 [BM013860250], *C.B. Clarke* 34079 [BM013860248], *F.H.W. Kerr* 1293, 2146 [BM013860246, BM013860247] and *Kuntze* 7321 [NYBG04204668]) reveals that they are not with terminal inflorescence as stated by Anderson (1867) that corroborates the views of Clarke (1885) to treat the species, *L. beddomei* as conspecific with *L. hamiltoniana*.

Acknowledgements

AFJK and GG are thankful to the Science and Engineering Research Board (SERB), Government of India for funding the Core Research Grant (File Number CRG/2020/001605) and to the Principal and Head of the Department of Botany, Madras Christian College (Autonomous), Chennai for facilities. Authors are grateful to the Curators and Directors of BM, BSI, BSID, CAL, E, K, L, MH, NY, SKU and US for granting permission to consult the specimens either personally or access to the digital images. Authors are thankful to Mr. Warren McCleland, Botanist, Kogelberg Biosphere Reserve, for providing the images of *L. collina*.

Literature Cited

ANDERSON T. 1867. An enumeration of the Indian species of Acanthaceae. *Journal of the Linnean Society* 9(39): 425–499.

ARISDASON W., LAKSHMINARASIMHAN P., KARTHIGEYAN K., KRISHNA G., ALBERTSON D.W., VENU P., PANJA D., GHOSH T., DEBNATH H.S., GNANASEKARAN G., MURTHY G.V.S. & D.K. ROY 2020. Acanthaceae. *In*: MAO A.A. & S.S. DASH (eds.), *Flowering plants of India an annotated checklist (Dicotyledons).* Volume 2. Botanical Survey of India, Kolkata. pp. 270–319.

CLARKE C.B. 1885. Acanthaceae. *In*: HOOKER J.D. (ed.), *The flora of British India*. Volume 4. L. Reeve & Co., London. pp. 387-558.

DARBYSHIRE I., VOLLESEN K. & E. KELBESSA 2010. *Flora of Tropical East Africa, Acanthaceae* (Part 2). Royal Botanic Gardens, Kew.

GNANASEKARAN G., KING A.F.J. & W. ARISDASON 2022. *Lepidagathis spinosa* (Barlerieae: Acanthaceae), a steno-endemic species of Tamil Nadu, India: its taxonomy, lectotypification and distribution. *Rheedea* 32(3): 201–208. https://dx.doi.org/10.22244/rheedea.2022.32.03.05

GNANASEKARAN G., KING A.F.J., KASIM S.M. & W. ARISDASON 2023. *Lepidagathis gandhii* (Barlerieae: Acanthaceae), a new species from Tamil Nadu, India. *Kew Bulletin* 78: 203–212. https://doi.org/10.1007/s12225-023-10086-z

IUCN 2022. *Guidelines for using the IUCN Red List Categories and Criteria*. Version 15.1. Prepared by the Standards and Petitions Committee. Available at: http://www.iucnredlist.org/documents/RedListGuidelines.pdf. (Accessed on 23.12.2022).

KHANNA K.K., TRIPATHI A.K. & V. MUDGAL 1997. Acanthaceae. *In*: MUDGAL V., KHANNA K.K. & P.K. HAJRA (eds.), *Flora of Madhya Pradesh.* Volume 2. Botanical Survey of India, Kolkata. pp. 333–339.

KHANNA K.K., KUMAR A. & A.K. JHA 2005. *Floristic diversity of Chhattisgarh (Angiosperms)*. Bishen Singh Mahendra Pal Singh, Dehra Dun.

MANZITTO-TRIPP E.A., DARBYSHIRE I., DANIEL T.F., KIEL C.A. & L.A. MCDADE 2021. Revised classification of Acanthaceae and worldwide dichotomous keys. *Taxon* 71: 103–153. https://doi.org/10.1002/tax.12600

MOORTHY S. 2001. Acanthaceae. *In*: SINGH N.P., LAKSHMINARASIMHAN P., KARTHIKEYAN S. & P.V. PRASANNA (eds.), *Flora of Maharashtra State*. *Dicotyledons.* Volume 2. Botanical Survey of India, Kolkata. pp. 643–651.

MORTON J.K. 1988. The *Lepidagathis hamiltoniana-collina* complex (Acanthaceae) in Africa and Asia. *Botanical Journal of the Linnean Society* 96(4): 333–344.

NAIR N.C. 1978. *Flora of the Punjab plains*. Botanical Survey of India, Kolkata.

NEES VON ESENBECK C.G.D. 1832. Acanthaceae Indiae Orientalis. *In*: WALLICH N. (ed.), *Plantae Asiaticae rariores*. Volume 3. Treuttel, Würtz & Ritter, London. pp. 70–117.

PANDEY R.P. & V. SINGH 1991. Acanthaceae. *In*: SHETTY B.V. & V. SINGH (eds.), *Flora of Rajasthan.* Volume 2. Botanical Survey of India, Kolkata. pp. 661–665.

PARIA N.D. & S.P. CHATTOPADHYAY 2005. *Flora of Hazaribagh District, Jharkhand*. Volume 2. (Tropaelaceae to Orchidaceae). Botanical Survey of India, Kolkata.

POWO 2023. *Plants of the World Online*. Facilitated by the Royal Botanic Gardens, Kew. Available at: https://powo.science.kew.org/ (Accessed on 30.05.2023).

PRAIN D. 1903. *Bengal plants*. West, Newman & Co., London.

PULLAIAH T. 2015. *Flora of Telangana*. Volume 2. Regency Publications, New Delhi.

PULLAIAH T. & D.A. MOULALI 1997. *Flora of Andhra Pradesh.* Volume 2. Rubiaceae–Ceratophyllaceae. Scientific Publishers, Jodhpur.

SAXENA H.O. & M. BRAHMAM 1995. *The flora of Orissa*. Volume 3. Regional Research Laboratory, Bhubaneswar.

SHAH G.L. 1978. *Flora of Gujarat State.* Part 1. Sardar Patel University, Vallabh Vidyanagar.

SHARMA A.K. & J.S. DHAKRE 1995. *Flora of Agra district*. Botanical Survey of India, Kolkata.

SINGHN.P.,MUDGALV.,KHANNAK.K.,SRIVASTAVA S.C., SAHOO A.K., BANDOPADHYAY S., AZIZ N., DAS M., BHATTACHARYA R.P. & P.K. HAJRA 2001. *Flora of Bihar*, *analysis*. Botanical Survey of India, Kolkata.

THIERS B.M. updatedcontinuously. Index Herbariorum: a global directory of public Herbaria and associated staff. New York Botanical Garden's Virtual Herbarium. Available at: http://sweetgum.nybg.org/ih (Accessed on 25.06..2023).

TURLAND N.J., WIERSEMA J.H., BARRIE F.R., GREUTER W., HAWKSWORTH D.L., HERENDEEN P.S., KNAPP S., KUSBER W.H., LI D.Z., MARHOLD K., MAY T.W., MCNEILL J., MONRO A.M., PRADO J., PRICE M.J. & G.F. SMITH (eds.) 2018. *International Code of Nomenclature for algae, fungi, and plants (Shenzhen Code) adopted by the Nineteenth International Botanical Congress Shenzhen, China, July 2017.* Regnum Vegetabile 159. Volume 38. Koeltz Botanical Books, Glashütten. https://doi.org/10.12705/Code.2018

WALLICH N. 1830. *A numerical list of dried specimens of plants in the East India Company's museum*, London. Numbers 2154–2603.