TAXONOMIC REVISION OF THE GENUS *COMMELINA* L. (COMMELINACEAE) IN INDIA

THESIS
Submitted to the University of Calicut in partial fulfillment of the requirement for the degree of DOCTOR OF PHILOSOPHY

by

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CERTIFICATE

This is to certify that the thesis entitled **Taxonomic revision of the genus *Commelina* L. (Commelinaceae) in India** submitted to the University of Calicut by **Mrs. Sheba M. Joseph** in partial fulfillment for the award of the degree of Doctor of Philosophy in Botany is the bonafide record of research work done under my guidance and supervision. No part of this work has been presented elsewhere for any degree or diploma previously.

SANTHOSH NAMPY
(Supervising Teacher)

DECLARATION

I hereby declare that the thesis entitled **Taxonomic revision of the genus *Commelina* L. (Commelinaceae) in India** submitted by me in partial fulfillment for the award of degree of Doctor of Philosophy of the University of Calicut, incorporates the results of the original work done by me in the Department of Botany, St. Joseph's College, Devagiri, Kozhikode-8. No part of the work has formed the basis for the award of any other degree or diploma previously.

Devagiri,
19/09/2012

Sheba M. Joseph

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CHAPTER I

INTRODUCTION

Commelinaceae, commonly known as the spiderwort family, are the eighth largest family of monocotyledons in India (after Poaceae, Orchidaceae, Cyperaceae, Liliaceae, Zingiberaceae, Araceae and Arecaceae). They are represented by 41 genera and 650 species distributed mainly in the tropical and warm temperate regions of the world (Faden, 1998). Fourteen genera and approximately 100 taxa occur in India. The major centers of diversity are Mexico and northern Central America, Tropical Africa, Peninsular India and the foot hills of Himalayas to Thailand and Southwestern China and South America (Faden, *l.c.*).

The family is economically less significant, but some members like *Tradescantia* (= *Rhoeo*) are used to study cytoplasmic streaming and chromosome structure, species of *Zebrina*, *Setcreasea* and *Callisia* are grown as ornamentals while species of *Commelina*, *Cyanotis* and *Murdannia* are often found as weeds of agricultural fields.

The family is taxonomically neglected with the absence of modern floristic treatments and monographs. Subsequent to Hooker's (1892) treatment of the family in Flora of British India which is based on C.B. Clarke's (1881) worldwide monograph, there has been no revision of Indian Commelinaceae. The only other work, after Hooker (*l.c.*) that covers the family for the whole of India is the mere enumeration published by Karthikeyan *et al*. (1989) in the *Florae Indicae Enumeratio Monocotyledonae*. Further, the treatments of this family in most

regional floras also providing confusing ideas. It is in this backdrop that we undertook a revision of the family in India. Being a large family with considerable diversity, endemism and rarity in India, the revision is a challenging task. And because of the time constraints that usually go with a Ph. D. programme, I restrict my studies to the revision of the genus *Commelina* in India.

Commelina is the largest genus in the Commelinaceae and comprises about 206 species in the world (Govaerts & Faden, 2012). The genus is important for several reasons. It is the second largest genus of Commelinaceae, after *Murdannia* Royle, with 25 species in India. It is one of only six genera (out of 41) that occur in both the Old and New Worlds. India has the second largest number of species of this genus in the world.

Commelina is commonly called day flowers due to the short span of their flowers. It is easily distinguished from related genera by its terminal and leaf opposed inflorescences composed of 1 or 2 cincinni enclosed in a folded spathe, strongly zygomorphic flowers, unequal petals with 2 anterior large clawed petals and 1 posterior reduced petal, 3 stamens and 2–3 staminodes, usually 4–6 lobed antherodes and bi-or tri loculed capsules with 1 or 2 seeds per locule.

According to Barnes (1946), the published descriptions and the reference herbarium material of the genus are often found incomplete. The situation has not improved much even after these time. Since the flowers are deliquescent and difficult to preserve, adequate information on its members are not often obtained from herbarium materials. This has slowed down or resulted in improper

documentation of the genus in India. The present study aims at the following objectives.

i. Field exploration and assessment of present distributional status of all species and infraspecific taxa of *Commelina* in India.

ii. Maintenance of live specimens in the botanical gardens for further study. Preparation of herbarium specimens for future reference.

iii. Identification of each taxon in consultation with type or other authentic collections and relevant literature.

iv. Establishment of database on the genus in India

v. Study the seed micromorphology with the help of SEM.

vi. Study the leaf anatomy of *Commelina* in India.

vii. Preparation of an illustrated, taxonomic revision of the species and infraspecific diversity of the genus in India.

Commelina is economically less important. But some species like *C. coelestis* is grown as ornamentals, *C. benghalensis* is used for the preparation of oil cakes (Pakoras) while some other species are used by Orangutans as anti inflammatory balm or by humans to treat muscular pain, sore bones and swellings (Morrogh-Bernard, 2008).

Review of literature

The genus *Commelina* was established by Linnaeus in 1753 (*Species Plantarum*: 40), but without an accompanying diagnosis or description. He originally included 9 species under this genus, of which only 5 belong to the

circumscription of present day *Commelina*. Subsequently, Linnaeus (1754) provided a detailed description for the genus in his *Genera Plantarum.*

Account of this genus can be found in various floristic treatments. Burmann (1768) in his *Flora Indica* treated eleven species, which include two new species, *viz*., *C. nervosa* Burm.f. (= *C. benghalensis* L.) and *C. diffusa* Burm.f. Walter (1788) in *Flora Caroliniana* treated 3 species of *Commelina*, including his own new species *C. caroliniana*. Lamarck (1791) and Linnaeus (1796) included 15 and 18 species respectively in their *Tableau encyclopedique et methodique* and *Systema Vegetabilium*.

Brief accounts of this genus are found in the treatments of various authors (Persoon, 1805; Vahl, 1805; Willdenow, 1809; Brown, 1810; Roxburgh, 1820; Roth, 1821; Steudel, 1821, 1841; Blume, 1827; Don, 1825; Presl, 1830; Bojer, 1837; Graham, 1839; Kunth, 1843; Edgeworth, 1851; Wight, 1853; Miquel, 1855; Dalzell & Gibson, 1861; Thwaites, 1864).

Hasskarl (1852, 1863, 1867, 1870) made significant contributions in the understanding of this genus. Hasskarl's (1870) *Commelinaceae Indicae* still remains to be one of the major works on Commelinaceae in which he described several new genera, many of them subsequently been merged under *Commelina*.

C.B. Clarke (1871, 1874, 1881, 1897) also made significant contribution on the taxonomy of *Commelina*. He described several new species from the Indian region. In his treatment of Commelinaceae of Bengal, he (1871) included 8 species of *Commelina* of which 4 were new and in *Commelynaceae et Cyrtandraceae*

Bengalenses (1874) treated 11 species of which 3 were new. In the worldwide monograph of the genus, Clarke (1881) proposed an infrageneric classification, one of its kind till this date, treating 109 species under 2 subgenera: 1). Subgen. *Didymoon* with 63 species under 3 sections *viz*., *Eucommelina*, *Heterocarpus* and *Dissecocarpus* and 2). Subgen. *Monoon* with 25 species under 3 sections *viz*., *Trithyrocarpus*, *Heteropyxis* and *Spathodithyros*. The remaining 21 species, which are unfamiliar to him were placed under a separate category called '*species mihi ignotae*'. However, his classification is no longer used by any subsequent authors.

The publication of *Flora of British India* by J.D. Hooker (1892) inspired the botanical studies in India. His treatment is mostly based on Clarke's (*l.c*.) monograph and included 17 species of *Commelina* from India. This is followed by treatments in regional Floras by Duthie (1915), Cooke (1907), Fischer (1932), *etc*. Barnes (1946) described 2 new species *viz*., *C. indehiscens* and *C. tricolor* and treated 11 species from South India. Karthikeyan *et al*. (1989) in his enumeration of Monocots of India, listed 24 species and 1 variety from India. The distribution and taxonomy of *Commelina* in the neighbouring countries are discussed by various authors (Nasir & Ali, 1975; Faden, 2000; Noltie, 1994).

Cytology

The cytological and cytotaxonomic aspects of the family including members of this genus were done by Murthy (1934), Islam and Baten (1952), Sharma (1955), Sharma and Sharma (1958), Rao *et al*. (1960, 1970), Kammathy and Rao (1961a, 1961b, 1964), Raghavan and Rao (1961), Shetty and Subramanyan (1962), Panigrahi and Kammathy (1963a, 1963b), Rao (1964, 1966b), Rao and Kammathy

(1961, 1962, 1966), Faden and Suda (1980) *etc*. Commelinaceae showed wide variation in both number and form of chromosomes. Jones and Jopling (1972), proposed a new approach to the classification of some genera of this family.

Cytology of Indian *Commelina* was reviewed by Rao *et al.* (1968) and those of African species by Morton (1956, 1966, 1967), Lewis (1964) and Lewis and Tadesse (1964). The chromosome numbers in some Australian species were reported by Briggs (1966) and in Malewian species by Chimphamba (1973). The chromosome numbers reported for Indian species by various authors are provided in Appendix-VII.

C. benghalensis and *C. caroliniana* vary in their breeding and meiotic systems (Kaul *et al*., 2000, 2002, 2007). Meiotic system of *C. caroliniana* provides a higher recombination index, characterised by its high chromosome number and higher chiasmata frequency. But *C. benghalensis* with fewer chromosome number and closed breeding system generates only a little genetic variability. This difference qualifies *C. benghalensis* as a specialist and *C. caroliniana* as a generalist (Kaul *et al.*, 2007).

Palynology

In *Commelina*, *the* pollen grains may be dimorphic in different anthers of the same flower. They are single, heteropolar and monosulcate (Poole & Hunt, 1979) and differ from other genera in having 3 colpi (Rowley, 1959). Various exine patterns were reported by Poole and Hunt (1980). Faden and Hunt (1991) combined them into two general types: spinulose and lacking spines. According to Koul *et al*.

(2007), the pollen output varies with the type and position of the flower. In *C. benghalensis*, flowers borne on the aerial branches have higher pollen–ovule ratio than those on the subterranean branches. It is highest in the male flowers borne on aerial branches and least in the cleistogamous flowers. In *C. caroliniana* pollen-ovule ratio is highest in the first and least in the fourth order bisexual flowers.

Pollination

The two outstanding features of Commelinaceae flowers that affect the reproductive biology are the lack of nectar and brief flowering times. The lack of nectar has two important consequences: the flowers rarely attract whole classes of pollinators and the pollen must serve two functions - pollination and rewarding the pollinator.

Commelinaceae flowers are chiefly entomophilous or autogamous. Their main insect visitors are social and solitary bees and syrphid (Faden, 1992). According to Kaul *et al*. (2007), many hymenopterian bees are attracted by the colourful petals, anthers and profuse pollen production in *Commelina*. The only specialized pollination system to have been documented in the family is the buzz mechanism. The yellow antherodes or nearly pollen-less anthers in *Commelina* may dissectively attract pollinators (Vogel, 1978).

Embryology

Stevenson and Owens (1978) reported embryosac variability in the family Commelinaceae. Davis (1966) reported the occurrence of allium type embryosac in *C. stricta*, adoxa type in *C. angustifolia* and polygonum type in *C. subulata*.

Phytochemistry

The information about the phytochemsitry of Commelinaceae was surveyed by Hegnauer (1963, 1986). Hayashi *et al.* (1958) isolated the blue pigment commelinin in crystal form from the blue petals of *C. communis*. But, Bayer *et al*. (1966) questioned the existence of such a blue coloured magnesium complex in this species. Hondo *et al.* (1992) discussed the structural basis of blue colour development in the petals of *C. communis.* The phytochemical screening of *C. benghalensis* by Ibrahim *et al*. (2010) revealed the presence of phloba tannins, carbohydrates, tannins, glycosides, volatile oils, resins, flavanoids and saponins.

Anatomy

Anatomical information particularly that from the leaf blade, is quite useful for systematic purposes. Staudermann (1924), Bruckner (1926, 1930) and Solereder and Meyer (1929) made preliminary surveys on the anatomy of Commelinaceae.

Tomlinson (1966, 1974) recognized two main types of hairs in *Commelina*: 3 celled glandular micro hairs and macro hairs. Calcium oxalate crystals in the form of raphides are also reported in some species. Studies on the foliar epidermis of 5 members of *Commelina* were done by Kaushik (1970).

AREA OF STUDY

The area of present study is the entire political boundary of India, representing 28 states and 7 union territories. It lies entirely to the north of the equator lying between latitudes 8° 4' and 37° 6' North and between longitudes 68° 7'

and 97° 25' East. The country occupies the largest peninsula of Asia and covers an area of 32, 87, 263 sq km. The natural boundaries are the Great wall of Himalayas in the north, the Thar desert of Rajasthan in the north west, Indian Ocean in the south, Bay of Bengal (wherein lie Andaman Nicobar islands) in the eastern side of Peninsula, Arabian Sea (wherein lie Lakshadweep islands) in the south western side of Peninsula and the mountain ranges in the east separating Myanmar from India. The countries that touch India's border from the west to east are Pakistan, Afghanistan, Nepal, Bhutan, China, Tibet, Bangladesh and Myanmar (Murthy *et al*., 1996).

India can be divided into three major physiographic zones: 1. the Peninsula, a triangular plateau bordered by the Vindhyan ranges in the north. The Western Ghats (Sahyadri) and the Eastern Ghats are the major ranges in the Peninsula lying along the western coast and eastern coast respectively. 2. the Extra-Peninsula, constitutes the Himalayas and other mountains in the northern extremity. It consists of the Hindukush, the Karakoram and the Himalayas. 3. the North Indian Plains, located between the Peninsula and Extra-Peninsula and comprises extensive plains of Assam, West Bengal, Bihar, Uttar Pradesh and Punjab (Murthy *et al*., 1996).

Soils in India are grouped into eight categories: 1. Lateritic soil 2. Black cotton soil 3. Red soils 4. Alluvial soils 5. Alkali soils and saline soils 6. Peaty and other organic soils 7. Desert soil or arid soil 8. Scanty soils of mountains and hills (Venu *et al*., 1996). The lateritic soils are generally reddish or yellowish-red and turns black on expsre to sun. They are well developed on hill tops and have higher content of humus. The black soils are mostly dark grey to black and formed by the

decomposition of trap rocks. The red soils are mainly found in the peninsular regions and are low in humus and other organic nutrients. Alluvial soils are the largest and the most important soil group of India derived from the silt laid by numerous tributeries of the Indus, the Ganges and the Brahmaputra systems. The alkali and saline soils have a higher percentage of salts while the peaty soils are characterised by excessive organic matter accumulated in poorly decomposed conditions. The desert soils found on arid and semi-arid zones are salty and contain good amount of alkalies. The mountain soils which are lose and young or immature are distributed from north-west to eastern part of the country.

Forests in India encompass 67. 83 million hectares of area which represents 20. 64 % of the nation's geographical territory. Different types of forests are found in the Indian sub-continent, varying from the arid zone forests to Himalayan temperate forests. Primarily, there are six major groups of forests, namely, moist tropical, dry tropical, montane sub tropical, montane temperate, sub alpine and alpine. These are further divided into 16 major types of forests. The eastern part of India consists of moist, deciduous and wet evergreen forests, western part comprises mainly of thorn and dry deciduous forests, northern and central area consists of mostly dry and moist deciduous forests and southern parts incorporates characteristics of both western and central zones.

The rivers of India fall into two major groups. 1. The Extra-Peninsular rivers: These are the Himalayan rivers. There are 19 major rivers of which, the Indus, the Ganges and the Brahmaputra are the largest. Among the 19 rivers, 6 belong to the Indus system, 9 belong to the Ganges system and 4 belong to the Brahmaputra

system. 2. The Peninsular rivers: These rivers are entirely fed by monsoon and often more or less dry in summer. They fall into two groups. a. the coastal rivers: These are relatively small streams, drain the western side of the Western Ghats, pass through the narrow plains and flow in to the Arabian sea. There are over 600 on the west coast from Gujarat in the north to Kanyakumari in the south. The inland rivers include the west flowing Narmada and Tapti and the east flowing Mahanadi, Godavari, Krishna and Kauvery (Murthy *et al*., 1996).

Climate is one of the basic components in the natural environment. The Himalayan ranges act as a great climatic divide. They obstruct south west monsoon winds to shed their moisture as heavy rainfall along the submontain areas north of the Indo gangetic plains and as snowfall on the further north. It also obstructs the direct entry of extreme continental winds from Tibet Plateau into India, so that up to 30º north, the plains experience warmer climate in winter, whereas other parts of the world at the same latitude experience cold winters. The Peninsular India is flanked by the Bay of Bengal on the east, Arabian Sea on the west and the Indian Ocean on the south. The Peninsula is also flanked by Western Ghats along the west coast and Eastern Ghats along the east coast. These two mountain ranges play a significant role in ensuring rains on their windward slopes (Murthy *et al*., 1996).

India's climate is affected by two seasonal winds, the south-west monsoon and north-east monsoon. The south-west monsoon (summer monsoon) blows from the sea to land whereas the north-east monsoon (winter monsoon) blows from land to sea. Though India is often referred to as a tropical country, half of it is in the tropics and half in the North Temperate Zone. But there is some form of unity in the

climatic conditions. This is due to the influence of Himalayas and monsoons. The climate may be broadly described as tropical monsoon type. Four seasons found in India are: 1. Summer or Pre monsoon 2. Monsoon 3. Post monsoon 4. Winter (Murthy *et al*., 1996).

Temperature, rainfall and humidity are the chief climatic factors. In India, the mean annual temperature exceeds 24°C, except hilly areas and extreme north west. The latitude, altitude, humidity, winds *etc*. have influence on the temperature. Hill stations, coastal areas and plateau regions have differing temperature conditions. The hill stations have the lowest temperature averaging between 15.7^{o}C and 16.9^{o}C. In coastal areas, on the west coast has an average temperature of 30.5^{o}C (Mumbai) while on the east coast goes up to 33.4^{o}C (Chennai). In the plateau, Nagpur registers an average of 35.5^{o}C (Murthy *et al*., 1996).

The south west monsoon and north east monsoon bring good rains into India. It varies from place to place. There are four broad climatic regions based on rainfall. 1. Areas like the west coast lying at the foothills of the Western Ghats, Bengal, Assam get the heaviest rainfall over 200 cm annually. 2. Places like Maharashtra, Madhya Pradesh and Bihar along the Vindhyan mountains receive 100–200 cm rainfall. 3. South coastal plains, North western Deccan and upper Gangetic plain have 50–100 cm rainfall. 4. Rajasthan desert, extending to Kutch, the high Ladak plateau in Kashmir constituting the arid zone receive only nominal rainfall of 15 cm annually. Thus in India about 30% of the country receives 15–80 cm, 40% area gets 80–120 cm, 20% area gets 120–200 cm and only 10% area receives over 200 cm of annual rainfall (Murthy *et al*., 1996).

According to Thornthwaite (1933), there are 5 humidity zones in India based on total monthly precipitation and total monthly evaporation ratio (P/E ratio). They are perhumid (P/E ratio > 128), humid (P/E ratio 64-127), subhumid (P/E ratio 32-63), semiarid (P/E ratio 16-31) and arid zones (P/E ratio < 16). The present account of the area of study is mostly based on Murthy *et al*. (1996) and Venu *et al*. (1996).

Distribution of *Commelina* in India

The genus *Commelina* comprises about 206 species and occurs in both the eastern and western hemispheres (Govaerts & Faden, 2012). It is more or less cosmopolitan, but best represented in Africa. The genus is represented by 25 species in India. It is significant that all except 2 species found in the neighbouring countries are also occurring in India. The neighbouring countries with respective number of species of *Commelina* is as follows: 10 species in Sri Lanka, 9 in Bhutan, 8 in China, 7 in Myanmar, 6 in Nepal, 4 in Pakistan and only 1 in Afganistan.

Among the 25 species, 5 (20 %) are endemic (*C. andamanica, C. clavatoides, C. ekabeeja, C. tricolor, C. wightii*), 10 (40 %) are widely distributed occurring in almost all states (*C. attenuata, C. benghalensis, C. caroliniana, C. diffusa, C. forskalaei, C. kurzii, C. longifolia, C. maculata, C. paludosa, C. suffruticosa*) and the remaining 10 (40%) have a localized distribution. *C. clavata, C. ensifolia, C. indehiscens, C. paleata, C. petersii* and *C. subulata* in the peninsular Indian states, *C. appendiculata* and *C. sikkimensis* in North East India, *C. albescens* in North West India and *C. coelestis* under cultivation in botanical gardens only. Thus, Peninsular India with 20 species (80 %), has highest number of species followed by 14 species (56 %) in North Eastern India. State wise, Tamil Nadu have

the maximum diversity with 20 species (80%) followed by Kerala with 18 species (76%). From the Andaman and Nicobar islands, 7 species (28%) are reported, this includes 1 new species (*C. andamanica*) and 3 new reports (*C. attenuata*, *C. clavata* and *C. longifolia*). The distribution of *Commelina* in India is given in Table 1. Most of the species occur in forest areas but a few like *C. attenuata, C. forskalaei, C. longifolia, C. subulata* and *C. wightii* are non-forest habitats. Species like *C. benghalensis, C. caroliniana, C. diffusa* and *C. sikkimensis* occur both in forest and nonforest habitats.

Table 1. State wise distribution of *Commelina* species in India

Species \ States	Andhra Pradesh	Arunachal Pradesh	Assam	Bihar	Chattisgarh	Goa	Gujarat	Haryana	Himachal Pradesh	Jammu & Kashmir	Jharkhand	Karnataka	Kerala	Madhya Pradesh	Maharashtra	Manipur	Meghalaya	Mizoram	Nagaland	Orissa	Punjab	Rajasthan	Sikkim	Tamil Nadu	Tripura	Uttar Pradesh	Uttarakhand	West Bengal	Union Territories
C. albescens							√															√							
C. andamanica																													√
C. appendiculata		√	√														√			√			√				√	
C. attenuata	√			√	√	√						√	√	√	√					√				√		√			
C. benghalensis	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√			√	√	√	√	√	√	√	√	√	
C. caroliniana	√		√	√	√	√			√		√	√	√	√	√	√	√			√	√	√				√	√	√	
C. clavata	√											√	√		√									√					
C. clavatoides													√																
C. coelestis																							√	√			√	√	
C. diffusa	√	√	√	√	√	√	√					√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	
C. ekabeeja																								√					
C. ensifolia	√			√								√	√											√				√	
C. forskalaei	√					√	√					√	√	√	√						√	√		√					
C. indehiscens												√	√											√					
C. kurzii	√	√		√		√	√		√			√	√	√	√					√	√	√		√		√	√	√	

States / Species	Andhra Pradesh	Arunachal Pradesh	Assam	Bihar	Chattisgarh	Goa	Gujarat	Haryana	Himachal Pradesh	Jammu & Kashmir	Jharkhand	Karnataka	Kerala	Madhya Pradesh	Maharashtra	Manipur	Meghalaya	Mizoram	Nagaland	Orissa	Punjab	Rajasthan	Sikkim	Tamil Nadu	Tripura	Uttar Pradesh	Uttarakhand	West Bengal	Union Territories
C. longifolia	√		√	√		√						√	√	√	√	√	√			√	√		√	√		√		√	
C. maculata	√	√	√	√					√	√		√	√		√	√	√		√	√			√	√		√	√	√	
C. paleata	√	√										√	√		√									√					
C. paludosa	√	√	√	√					√			√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	
C. petersii	√												√							√				√					
C. sikkimensis		√	√										C			√	√		√				√				√	√	
C. subulata	√											√			√									√					
C. suffruticosa	√		√	√							√	√	√	√	√		√			√			√		√	√	√	√	
C. tricolor													√											√					
C. wightii													√											√					

SHEBA M. JOSEPH. “TAXONOMIC REVISION OF THE GENUS COMMELINA L. (COMMELINACEAE) IN INDIA” THESIS. DEPARTMENT OF BOTANY PLANT SYSTEMATICS AND FLORISTICS LABST. JOSEPH’S COLLEGE, DEVAGIRI, KOZHIKODE-8, UNIVERSITY OF CALICUT, 2012.

CHAPTER 2
MATERIALS AND METHODS

The present work is the result of extensive field studies in different parts of India during 2008-2012, spending 150 days in the field. Specimens collected are being maintained in the Botanical Garden of St. Joseph's College, Devagiri, Kozhikode for all except *Commelina albescens*, *C. appendiculata*, *C. coelestis* and *C. ekabeeja*. In addition to the personal collection of the author, materials housed at ASSAM, BLAT, BSD, BSI, BSJO, CAL, CALI, DD, DEV, JCB, MH, PBL, RRLB, RHT, SKU, TBGT, MEL, herbarium of North Bengal University, West Bengal and S.N. College, Kollam have also been consulted to study the variation and distribution pattern (list of herbaria consulted with their details are provided at the end as Appendix III). Acronyms of herbaria are according to Index Herbariorum (Thiers, 2011). Two thousand eight hundred and eighty six herbarium specimens are examined and four hundred and twenty three populations are observed in the field.

Ecological notes are made for every population studied. Since the flowers are short lived and deliquescent, the details of the flowers are recorded in the field itself. Data sheets are prepared for recording field and floral characters, a model of data sheet is provided at the end as appendix IV.

Identification of each species is done in consultation with types and protologues. In the case of non availability of type specimens, cibachromes, microfisches and images obtained from K, US, BM, BR, C, G, L, P have been consulted. Morphological characters of every specimen have been critically

examined and variations are recorded. Description and identification of each species is done after examining a wide range of specimens. Illustrations are prepared based on live specimens except for *Commelina albescens*, *C. appendiculata, C. coelestis* and *C. ekabeeja*. The most typical form is illustrated in all cases.

The literature for the present study is collected from various sources such as libraries of institutions and information retrieval systems like internet. The literature retrieval systems of BHL of New York Botanical garden (http://www. biodiversitylibrary.org), botanical literature from Missouri Botanical garden library (http://botanicus.org) are also utilized.

The citation of taxa follow Index Kewensis and IPNI. The database of the International Plant Name Index (http://www.ipni.org) and world checklist of Selected Plant Families, a database of Royal botanic Garden Kew (http://apps. kew.org) are also utilized. The nomenclature of each species is updated as per the Vienna code (McNeill *et al*., 2006). Author citations follow Brummitt and Powell (1992). For description of taxa, the terminology follows Lawrence (1951), Radford & Bell (1968) and Simpson (2006). The terminology for testa ornamentation follows Faden (1991). The distribution map is prepared based on specimens examined during the present investigation.

Herbarium specimens are prepared by the conventional method (Formann and Bridson, 1989). All the specimens collected during the course of the work are deposited at St. Joseph's College Herbarium (DEV). Some of the specimens referred to Dr. Robert Faden (Smithsonian Institution) are retained at U.S. In addition to dried and live collections, wet preservations in FAA are also maintained.

The specimens are examined with Leica MZ 7.5 binocular microscope. Dried specimens soaked in water for 1–2 hours and boiled in water prior to microscopic observations. Metric system has been followed in all kinds of measurements. Data on phenology have been gathered mostly from field study and rarely from the literature and herbarium sheets.

The epidermal features and their taxonomic utility in the systematics of the genus are also attempted in the present study. This study is conducted in 21 species. All the samples are procured afresh from cultivated materials at St. Joseph's College Botanical Garden. The detailed methodology used in anatomical studies have been explained in chapter 3 on Foliar Epidermal Studies.

Scanning Electron Micrographs are taken to study the surface ornamentation of seeds. Dried seeds are directly fixed to aluminium stubs, layered with 10-15 nm of gold by sputtering Blazers and samples are examined using Hitachi Su 600 and digital electro photo micrographs obtained. SEM of seeds is taken at NIIT, Kozhikode.

Morphometric analysis of 25 Indian species are performed with NTSYS software. A total of 52 characters are selected for the cluster analysis from each species. All data inferred during the current study- either from the field or herbaria as well as the experimental garden at St. Joseph's College Botanical Garden, are used for the present analysis.

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CHAPTER 3
FOLIAR EPIDERMAL STUDIES

The application of anatomical characters in solving taxonomic problems is not new but not thoroughly explored. The epidermal pattern and distribution of hairs on the lamina show close relationship between the species. Twenty one out of the twenty five species are studied for the foliar anatomical characters. Four species which were not collected in the present study are excluded from the investigation.

Materials and Methods

Epidermal peelings of the fresh leaves are taken for the present study. Peelings of both abaxial and adaxial surfaces are taken from the basal, middle and apical region of the lamina by making oblique incision with the help of sharp razor blade and pulling it out with fine tweezers. The preparations are stained with toluidine blue and mounted in glycerine. Distribution of stomata and micro hairs are recorded. Photographs of sections and peelings are taken using Leica DFC 290 Camera attached to Leica DM 1000 Trinocular Research Microscope. The parameters studied are stomatal types, stomatal index and trichome features. Stomatal index are calculated using the standard formula. For every species, 10 samples are analysed.

Observations

1. ***Commelina andamanica*** Sheba & Nampy

Plate 2a–d

Abaxial epidermis: Epidermal cells polygonal, dissimilar. Stomata irregularly oriented, ±1.99 µm long; subsidiary cells 6. Microhairs sparsely arranged, 3 celled, ±9.11 µm long, glandular cell spathulate. Hooked hairs ±12.78 µm long; acicular hairs ±15.01 µm long. Raphides, needle like.

Adaxial epidermis: Epidermal cells rectangular, similar. Stomata distributed only through the veins, ±1.93 µm long. Microhairs sparsely arranged, 3 celled, ±8.92 µm long, glandular cell spathulate. Acicular hair ±15.71 µm long. Raphides scattered, needle like.

2. ***Commelina attenuata*** Vahl

Plate 2 e–h

Abaxial epidermis: Epidermal cells polygonal, dissimilar. Stomata irregularly oriented, ±2.29 µm long; subsidiary cells 6. Microhairs sparsely arranged, 3 celled, ±7.11 µm long, glandular cell spathulate. Macrohairs absent. Raphides scattered, needle like.

Adaxial epidermis: Epidermal cells rectangular, similar. Stomata irregularly oriented, ±2.23 µm long. Microhairs sparsely arranged, 3 celled, ±7.92 µm long, glandular cell spathulate. Macrohairs absent. Raphides absent.

3. ***Commelina benghalensis*** L**.**

Plate 3a–f

Abaxial epidermis: Epidermal cells polygonal, dissimilar. Stomata irregularly oriented, ±1.57 µm long; subsidiary cells 6. Microhairs sparsely arranged, 3 celled,

±6.70 µm long, glandular cell spathulate. Acicular hairs ±9.30 µm long, near the margins only. Raphides scattered, needle like.

Adaxial epidermis: Epidermal cells rectangular, similar. Stomata distributed only through the veins, ±1.53 µm long. Microhairs sparsely arranged, 3 celled, ±6.90 µm long, glandular cell spathulate. Hooked hairs ±3.83 µm long; acicular hairs ±11.43 µm long in the margins, ±25.19 µm long on the lamina. Raphides absent.

4. ***Commelina caroliniana*** Walter

Plate 3g–h

Abaxial epidermis: Epidermal cells polygonal, dissimilar. Stomata irregularly oriented, ±2.19 µm long; subsidiary cells 6. Microhairs sparsely arranged, 3 celled, ±5.98 µm long, glandular cell spathulate. Macrohairs absent. Raphides absent.

Adaxial epidermis: Epidermal cells polygonal, similar. Stomata irregularly oriented, ±2.82 µm long. Microhairs sparsely arranged, 3 celled, ±5.78 µm long, glandular cell spathulate. Macrohairs absent. Raphides absent.

5a. ***Commelina clavata*** C.B.Clarke (from idukki)

Plate 4 a–d

Abaxial epidermis: Epidermal cells polygonal, dissimilar. Stomata irregularly oriented, ±1.99 µm long; subsidiary cells 6. Microhairs sparsely arranged, 3 celled, ±6.76 µm long, glandular cell spathulate. Acicular hair sparsely arranged, ±25.99 µm long. Raphides scattered, needle like.

Adaxial epidermis: Epidermal cells rectangular, similar. Stomata irregularly oriented, ±2.42 µm long. Microhairs sparsely arranged, 3 celled, ±9.22 µm long, glandular cell spathulate. Acicular hair ±4.31 µm long, prickled. Raphides absent.

5b. ***Commelina clavata*** C.B. Clarke (from Nilgiri)

Plate 4e–h

Abaxial epidermis: Epidermal cells polygonal, dissimilar. Stomata oriented in all directions, ±2.37 µm long; subsidiary cells 6. Microhairs sparsely arranged, 3 celled, ±6.57 µm long, glandular cell spathulate. Macrohairs absent. Raphides absent.

Adaxial epidermis: Epidermal cells polygonal, similar. Stomata irregularly oriented, ±2.12 µm long. Microhairs sparsely arranged, 3 celled, ±5.83 µm long, glandular cell spathulate. Acicular hair ±4.92 µm long, prickled, throughout the surface. Raphides absent.

5c. ***Commelina clavata*** C.B. Clarke (from Vythiri)

Plate 5a–d

Abaxial epidermis: Epidermal cells polygonal, dissimilar. Stomata irregularly oriented, ±2.25 µm long; subsidiary cells 6. Microhairs sparsely arranged, 3 celled, ±7.12 µm long, glandular cell spathulate. Acicular hair closely arranged, ±20.93 µm. Raphides absent.

Adaxial epidermis: Epidermal cells polygonal, similar. Stomata regularly oriented through the veins, ±2.12 µm long. Microhairs sparsely arranged, 3 celled, ±7.22 µm long, glandular cell spathulate. Acicular hair ±19.70 µm long, throughout the surface. Raphides absent.

6. ***Commelina clavatoides*** Nampy & Sheba

Plate 5e–h

Abaxial epidermis: Epidermal cells polygonal, dissimilar. Stomata irregularly oriented, ±2.44 µm long; subsidiary cells 6. Microhairs sparsely arranged, 3 celled, ±5.85 µm long, glandular cell spathulate. Macrohairs absent. Raphides absent.

Adaxial epidermis: Epidermal cells polygonal, similar. Stomata irregularly oriented, ±2.25 µm long. Microhairs sparsely arranged, 3 celled, ±7.53 µm long, glandular cell spathulate. Acicular hair throughout the surface, ±3.24 µm long, prickled. Raphides absent.

7. ***Commelina diffusa*** Burm.f.

Plate 6a–b

Abaxial epidermis: Epidermal cells polygonal, dissimilar. Stomata irregularly oriented, ±1.59 µm long; subsidiary cells 6. Microhairs sparsely arranged, 3 celled, ±6.53 µm long, glandular cell spathulate. Macrohairs absent. Raphides absent.

Adaxial epidermis: Epidermal cells polygonal, similar. Stomata regularly oriented, ±1.55 µm long. Microhairs sparsely arranged, 3 celled, ±5.48 µm. long, glandular cell spathulate. Macrohairs absent. Raphides absent.

8. ***Commelina ensifolia*** R. Br.

Plate 6c–d

Abaxial epidermis: Epidermal cells polygonal, dissimilar. Stomata irregularly oriented, ±2.31 µm long; subsidiary cells 6. Microhairs sparsely arranged, 3 celled, ±7.53 µm long, glandular cell spathulate. Hooked hairs ±7.93 µm long. Raphides scattered, needle like.

Adaxial epidermis: Epidermal cells polygonal, similar. Stomata regularly oriented, ±2.05 µm long. Microhairs sparsely arranged, 3 celled, ±11.95 µm long, glandular cell spathulate. Macrohairs absent. Raphides absent.

9. ***Commelina forskalaei*** Vahl

Plate 6e–h, 7a–b

Abaxial epidermis: Epidermal cells polygonal, dissimilar. Stomata irregularly

oriented, ±2.03 µm long; subsidiary cells 6. Microhairs sparsely arranged, 3 celled, ±6.02 µm long, glandular cell spathulate. Acicular hair ±39.33 µm long. Hooked hairs ±4.97 µm long. Raphides scattered, needle like.

Adaxial epidermis: Epidermal cells rectangular, similar. Stomata irregularly oriented, ±2.23 µm long. Microhairs sparsely arranged, 3 celled, ±6.74 µm long, glandular cell spathulate. Acicular hair throughout the surface, ±28.65 µm long. Raphides absent.

10. ***Commelina indehiscens*** E. Barnes

Plate 7c–h

Abaxial epidermis: Epidermal cells polygonal, dissimilar. Stomata irregularly oriented, ±2.38 µm; subsidiary cells 6. Microhairs sparsely arranged, 3 celled, ±10.24 µm long, glandular cell spathulate. Acicular hair ±2.65 µm long, prickled. Raphides absent.

Adaxial epidermis: Epidermal cells polygonal, similar. Stomata regularly oriented, ±2.49 µm long. Microhairs sparsely arranged, 3 celled, ±10.65 µm long, glandular cell spathulate. Acicular hair throughout the surface, ±3.08 µm long, prickled. Raphides absent.

11a. ***Commelina kurzii*** C.B. Clarke (from Gudalore)

Plate 8a–d

Abaxial epidermis: Epidermal cells polygonal, dissimilar. Stomata irregularly oriented, ±2.42 µm long; subsidiary cells 6. Microhairs sparsely arranged, 3 celled, ±9.53 µm long, glandular cell spathulate. Hooked hairs ±10.02 µm long. Raphides scattered, granular.

Adaxial epidermis: Epidermal cells polygonal, similar. Stomata distributed through the veins, ±2.05 µm long. Microhairs sparsely arranged, 3 celled, ±5.91µm long, glandular cell spathulate. Acicular hair througouht the surface and margins, ±2.98 µm long, prickled. Raphides absent.

11b. ***Commelina kurzii*** C.B. Clarke (from Kodaikanal)

Plate 8e–h

Abaxial epidermis: Epidermal cells polygonal, dissimilar. Stomata irregularly oriented, ±2.03 µm long; subsidiary cells 6. Microhairs sparsely arranged, 3 celled, ±6.93 µm long, glandular cell spathulate. Acicular hairs ±25.65 µm long. Hooked hairs ±9.02 µm long. Raphides scattered, needle like.

Adaxial epidermis: Epidermal cells polygonal, similar. Stomata distributed through the veins, ±2.05 µm. Microhairs sparsely arranged, 3 celled, ±7.07µm long, glandular cell spathulate. Acicular hairs ±8.65 µm long. Hooked hairs ±4.32 µm long. Raphides absent.

11c. ***Commelina kurzii*** C.B. Clarke (from Maruthamalai)

Plate 9a–d

Abaxial epidermis: Epidermal cells polygonal, dissimilar. Stomata irregularly oriented, ±1.99 µm long; subsidiary cells 6. Microhairs sparsely arranged, 3 celled, ±7.93 µm. long, glandular cell spathulate. Macrohairs absent. Raphides scattered, needle like.

Adaxial epidermis: Epidermal cells polygonal, similar. Stomata distributed through the veins, comparatively less, ±1.85 µm long. Microhairs sparsely arranged, 3

celled, ±7.61 µm long, glandular cell spathulate. Macrohairs absent. Raphides absent.

11d. ***Commelina kurzii*** C.B. Clarke (from Thannithode)

Plate 9e–h

Abaxial epidermis: Epidermal cells polygonal, dissimilar. Stomata irregularly oriented, ±2. 29 µm long; subsidiary cells 6. Microhairs sparsely arranged, 3 celled, ±9.93 µm long, glandular cell spathulate. Hooked hairs ±10.42 µm long. Raphides scattered, needle like.

Adaxial epidermis: Epidermal cells polygonal, similar. Stomata distributed through the veins, ±2.05 µm long. Microhairs sparsely arranged, 3 celled, ±8.07 µm long, glandular cell spathulate. Acicular hairs throughout the surface and margin, ±4.16 µm long, prickled. Hooked hairs ±9.32 µm long. Raphides absent.

12. ***Commelina longifolia*** Lam.

Plate 10a–d

Abaxial epidermis: Epidermal cells polygonal, dissimilar. Stomata irregularly oriented, ±2.09 µm long; subsidiary cells 6. Micro hairs sparsely arranged, 3 celled, ±7.03 µm. long, glandular cell spathulate. Macrohairs absent. Raphides scattered, needle like.

Adaxial epidermis: Epidermal cells polygonal, similar. Stomata distributed through the veins, ±2.15 µm long. Micro hairs sparsely arranged, 3 celled, ±7.61 µm long, glandular cell spathulate. Macrohairs absent. Raphides absent.

13. ***Commelina maculata*** Edgew.

Plate 10e–h

Abaxial epidermis: Epidermal cells polygonal, dissimilar. Stomata irregularly

oriented, ±2. 37 µm long; subsidiary cells 6. Microhairs sparsely arranged, 3 celled, ±7.09 µm long, glandular cell spathulate. Macrohairs absent. Raphides absent.

Adaxial epidermis: Epidermal cells polygonal, similar. Stomata distributed through the veins, ±2.15 µm long. Microhairs sparsely arranged, 3 celled, ±9.17 µm long, glandular cell spathulate. Macrohairs absent. Raphides absent.

14. ***Commelina paleata*** Hassk.

Plate 11a–d

Abaxial epidermis: Epidermal cells polygonal, dissimilar. Stomata irregularly oriented, ±2.42 µm long; subsidiary cells 6. Microhairs sparsely arranged, 3 celled, ±6.95 µm. long, glandular cell spathulate. Hooked hairs ±8.92 µm long. Raphides scattered, granular.

Adaxial epidermis: Epidermal cells polygonal, similar. Stomata distributed through the veins, ±2.05 µm long. Microhairs sparsely arranged, 3 celled, ±6.91 µm. long, glandular cell spathulate. Macrohairs absent. Raphides absent.

15. ***Commelina paludosa*** Blume

Plate 11e–h

Abaxial epidermis: Epidermal cells polygonal, dissimilar. Stomata irregularly oriented, ±1.96 µm long; subsidiary cells 6. Microhairs sparsely arranged, 3 celled, ±12.09 µm long, glandular cell spathulate. Macrohairs absent. Raphides absent.

Adaxial epidermis: Epidermal cells polygonal, similar. Stomata distributed through the veins, ±1.95 µm long. Microhairs sparsely arranged, 3 celled, ±5.91µm long, glandular cell spathulate. Macrohairs absent. Raphides absent.

16. ***Commelina petersii*** Hassk.

Plate 12a–d

Abaxial epidermis: Epidermal cells polygonal, dissimilar. Stomata irregularly oriented, ±1.84 µm long; subsidiary cells 6. Microhairs sparsely arranged, 3 celled, ±4.57 µm long, glandular cell spathulate. Hooked hairs ±5.06 µm long. Raphides absent.

Adaxial epidermis: Epidermal cells polygonal, similar. Stomata distributed through the veins, ±1.95 µm long. Microhairs sparsely arranged, 3 celled, ±9.45 µm long, glandular cell spathulate. Hooked hairs sparsely arranged, ±2.37 µm long. Raphides absent.

17. ***Commelina sikkimensis*** C.B. Clarke

Plate 12e–h

Abaxial epidermis: Epidermal cells polygonal, dissimilar. Stomata irregularly oriented, ±2.13 µm long; subsidiary cells 6. Microhairs sparsely arranged, 3 celled, ±7.27 µm long, glandular cell spathulate. Acicular hairs throughout the margins and at the veins, ±3.16 µm long, prickled. Raphides scattered, needle like.

Adaxial epidermis: Epidermal cells polygonal, similar. Stomata distributed through the veins, ±2.05 µm long. Microhairs sparsely arranged, 3 celled, ±7.45 µm long, glandular cell spathulate. Acicular hairs throughout the margins and at the veins, ±2.36 µm long, prickled. Raphides scattered, needle like.

18. ***Commelina subulata*** Roth

Plate 13a–b

Abaxial epidermis: Epidermal cells polygonal, dissimilar. Stomata irregularly oriented, ±2.67 µm long; subsidiary cells 6. Microhairs sparsely arranged, 3 celled,

±10.9 µm long, glandular cell spathulate. Macrohairs absent. Raphides absent.

Adaxial epidermis: Epidermal cells polygonal, similar. Stomata distributed through the veins, ±2.15 µm long. Microhairs sparsely arranged, 3 celled, ±9.17 µm long, glandular cell spathulate. Macrohairs absent. Raphides absent.

19. ***Commelina suffruticosa*** Blume

Plate 13c–d

Abaxial epidermis: Epidermal cells polygonal, dissimilar. Stomata irregularly oriented, ±1.81 µm long; subsidiary cells 6. Microhairs sparsely arranged, 3 celled, ±7.32 µm. long, glandular cell spathulate. Macrohairs absent. Raphides absent. Marginal papillae present.

Adaxial epidermis: Epidermal cells polygonal, similar. Stomata distributed through the veins, ±1.89 µm long. Microhairs sparsely arranged, 3 celled, ±. 6.57 µm long, glandular cell spathulate. Macrohairs absent. Raphides absent.

20. ***Commelina tricolor*** E. Barnes

Plate 13e–f

Abaxial epidermis: Epidermal cells polygonal, dissimilar. Stomata irregularly oriented, ±2.37 µm long; subsidiary cells 6. Microhairs sparsely arranged, 3 celled, ±5.08 µm. long, glandular cell spathulate. Macrohairs absent. Raphides scattered, needle like.

Adaxial epidermis: Epidermal cells polygonal, similar. Stomata distributed through the veins, ±2.19 µm long. Microhairs sparsely arranged, 3 celled, ±4.87 µm. long, glandular cell spathulate. Macrohairs absent. Raphides scattered, needle like.

21. ***Commelina wightii*** R.S.Rao

Plate 13g–h

Abaxial epidermis: Epidermal cells polygonal, dissimilar. Stomata irregularly oriented, ±2.23 µm long; subsidiary cells 6. Microhairs sparsely arranged, 3 celled, ±9.32 µm long, glandular cell spathulate. Macrohairs absent. Raphides absent.

Adaxial epidermis: Epidermal cells polygonal, similar. Stomata distributed through the veins, ±2.19 µm long. Microhairs sparsely arranged, 3 celled, ±11.57 µm long, glandular cell spathulate. Macrohairs absent. Raphides absent.

DISCUSSION

Epidermis

Epidermis is the outermost tissue covering the primary plant body which is in direct contact with the changing environment. Epidermis of *Commelina* is composed of single layer of cells covered with a smooth cuticle, which is thick on the adaxial surface and thin on the abaxial surface. The cells are usually polygonal, rectangular or irregular in shape. Cells of the abaxial epidermis are dissimilar in size and those of adaxial epidermis are similar and regularly arranged. Though a general consistency is observed in the size, number and shape of epidermal cells in each species, there is variation in the intercoastal cells of marginal and middle region of the lamina.

Stomatal complex

Stomata are a group of specialized epidermal cells with a lot of variations are being met within distribution, ontogeny and development in different groups of plants. According to de Candolle (1827), stoma is the pore seen in the epidermis which consists of a pair of guard cells and varying number of subsidiary cells.

Table 2. Stomatal index of *Commelina* species

No.	Name	Adaxial			Abaxial		
		Epidermal cells	Stomata	SI	Epidermal cells	Stomata	SI
1	*C. andamanica*	77	3	4	63	13	17
2	*C. attenuata*	47	4	8	36	7	16
3	*C. benghalensis*	74	1	1	81	14	15
4	*C. caroliniana*	57	3	5	44	8	15
5	*C. clavata*	57	2	3	32	9	22
6	*C. clavatoides*	53	5	9	31	11	26
7	*C. diffusa*	71	1	1	38	5	12
8	*C. ensifolia*	53	2	4	45	9	17
9	*C. forskalaei*	28	3	10	31	9	23
10	*C. indehiscens*	67	2	3	77	15	16
11	*C. kurzii*	60	2	3	52	9	15
12	*C. longifolia*	40	5	11	50	12	19
13	*C. maculata*	56	1	2	50	10	17
14	*C. paleata*	43	1	2	65	13	16
15	*C. paludosa*	34	1	3	68	16	19
16	*C. petersii*	56	2	3	46	11	19
17	*C. sikkimensis*	35	2	5	49	5	9
18	*C. subulata*	44	2	4	43	8	16
19	*C. suffruticosa*	66	1	1	66	13	16
20	*C. tricolor*	18	1	5	36	6	14
21	*C. wightii*	43	5	10	53	14	20

Table 3. Trichomes in foliar epidermis of *Commelina* species. (√Mark represent the presence and × denotes absence).

No	Name	Adaxial epidermis			Abaxial epidermis		
		Glandular	Acicular	Hooked	Glandular	Acicular	Hooked
1	*C. andamanica*	√	√	×	√	√	√
2	*C. attenuata*	√	×	×	√	×	×
3	*C. benghalensis*	√	√	√	√	×	×
4	*C. caroliniana*	√	×	×	√	×	×
5	*C. clavata*	√	√	×	√	√	×
6	*C. clavatoides*	√	√	×	√	×	×
7	*C. diffusa*	√	×	×	√	×	×
8	*C. ensifolia*	√	×	×	√	×	√
9	*C. forskalaei*	√	√	×	√	√	√
10	*C. indehiscens*	√	√	×	√	×	×
11	*C. kurzii*	√	√	√	√	√	√
12	*C. longifolia*	√	×	×	√	×	×
13	*C. maculata*	√	×	×	√	×	×
14	*C. paleata*	√	×	√	√	×	√
15	*C. paludosa*	√	×	×	√	×	×
16	*C. petersii*	√	×	√	√	×	√
17	*C. sikkimensis*	√	√	×	√	×	√
18	*C. subulata*	√	×	×	√	×	×
19	*C. suffruticosa*	√	×	×	√	×	×
20	*C. tricolor*	√	×	×	√	×	×
21	*C. wightii*	√	×	×	√	×	×

Table 4. Size of hairs on adaxial and abaxial epidermis of *Commelina* species.

No.	Name		Adaxial epidermis			Abaxial epidermis		
			Glandular	**Acicular**	**Hooked**	**Glandular**	**Acicular**	**Hooked**
1	*C. andamanica*		8.92µm	15.71µm		9.11 µm	15.1 µm	12.78 µm
2	*C. attenuata*		7.92 µm			7.11 µm		
3	*C. benghalensis*		6.90 µm	25.19 µm 11.43 µm	3.83µm	6.70 µm	9.30 µm	
4	*C. caroliniana*		5.78 µm			5.98 µm		
5	*C. clavata*	Idukki	9.22 µm	4.31 µm		6.76 µm	25.99 µm	
		Vythiri	7.22 µm	19.70 µm		7.12 µm	20.93 µm	
		nilghiri	5.83 µm	4.92 µm		6.57 µm		
6	*C. clavatoides*		7. µm	3.24 µm		5.85 µm		
7	*C. diffusa*		5. µm			6.53 µm		
8	*C. ensifolia*		11.95 µm			7.53 µm		7.93 µm
9	*C. forskalaei*		6.74 µm	28.65 µm		6.02 µm	39.33 µm	4.97 µm
10	*C. indehiscens*		10.65 µm	3.08 µm		10.24 µm	2.65 µm	
11	*C. kurzii*	Gudalur	5.91 µm	2.98 µm		9.53 µm		10.02 µm
		kodaikanal	7.07 µm	8.65 µm	4.32 µm	6.93 µm	25.65 µm	9.02 µm
		Tannithode	8.07 µm	4.16 µm	9.32 µm	9.93 µm		10.02 µm
		maruthamala	7.61 µm			7.93 µm		
12	*C. longifolia*		7.61 µm			7.03 µm		
13	*C. maculata*		9.17 µm			7.09 µm		
14	*C. paleata*		6.91 µm			6.95 µm		8.92 µm
15	*C. paludosa*		5.91 µm			12.09 µm		
16	*C. petersii*		9.45 µm		2.37 µm	4.57 µm		5.06 µm
17	*C. sikkimensis*		7.45 µm	2.36 µm		7.27 µm	3.16 µm	
18	*C. subulata*		9.17 µm			10.9 µm		
19	*C. suffruticosa*		6.57 µm			7.32 µm		
20	*C. tricolor*		4.87 µm			5.08 µm		
21	*C. wightii*		11.57 µm			9.32µm		

In *Commelina*, the stomata is paracytic type and typically have six subsidiary cells, two lateral pairs and one terminal pair (Tomlinson, 1969). They are more abundant on the abaxial surface than the adaxial surface. The size of the subsidiary cells varies according to the species. The stomatal index of both the surfaces are calculated by using the formula, Stomatal index = 100 x S/ E + S (E = frequency of epidermal cells; S = frequency of stomata).

The stomatal index of all except 4 Indian species of *Commelina* are presented in table 2. The adaxial epidermis with lowest stomatal index (1) is noticed in *C. benghalensis*, *C. diffusa* and *C. suffruticosa* the highest (11) in *C. longifolia*. In abaxial epidermis the least (9) in *C. sikkimensis* and highest (26) in *C. clavatoides*. So the stomatal index ranges from 1–11 on the adaxial epidermis and 9–26 on the abaxial epidermis.

Trichomes

Trichomes are the emergences from the epidermal cells. They are usually of cellulose, but may be cutinised, occasionally lignified and impregnated with silica or calcium carbonate. Hairs are of two types, microhairs and macrohairs. Microhairs are glandular and macrohairs are hooked, acicular or prickled.

Hairs may occur on both the abaxial and adaxial surfaces and the type and distribution of hairs varies according to the species. The following hair types are recognized on the lamina of *Commelina* species.

1. Glandular microhairs: These are short, three celled hairs with a basal, middle cell and an elongate spathulate glandular apical cell. They are present in all species of *Commelina*.
2. Hooked hairs: In these hairs, the terminal cell is hooked. Hooked hairs are found only in some species.
3. Prickle hairs: These hairs have a broad basal cell and a short, stiff, pointed apical cell, not exceeding the basal cell in length.
4. Uniseriate or acicular hairs: Two to five celled hairs with sharply pointed apical cells. These are the cilia on the lamina or leaf margins.

The glandular microhairs are present on both the surfaces of almost all species of *Commelina*. The long uniseriate acicular hairs are found in *Commelina andamanica*, *C. benghalensis*, *C. clavata, C. forskalaei*. Small prickle hairs are found in *C. clavata, C. clavatoides, C. indehiscens* and the margins and veins of *C. sikkimensis*. The hooked hairs are found in lower surface of *C. andamanica, C. forskalaei* and *C. paleata,* upper surface of *C. benghalensis*, both the surfaces of *C. kurzii* and C. *petersii*. Macro hairs are absent in *C. attenuata*, *C. caroliniana*, *C. diffusa*, *C. longifolia*, *C. maculata*, *C. paludosa*, *C. suffruticosa*, *C. tricolor* and *C. wightii*. The texture on the surface of *C. clavata* and *C. kurzii* in different populations show some variations. The leaves of *C. clavata* from Idukki and Nilgiris have scabrous upper surface due to the presence of prickled hairs on the adaxial surface. But the materials from Vythiri (Wayanad) growing near the forest margins, have wooly lamina due to the presence of large number of acicular macrohairs throughout the surface.

In the specimens of *C. kurzii* from Maruthamalai, the macrohairs are absent but those from Gudalore, Thannithode and Kodaikanal have both acicular and hooked hairs. The acicular hairs are prickled in Gudalore and Thannithode specimens and surfaces are scabrous while from Kodaikanal have long acicular hairs and wooly texture.

In the case of *C. longifolia* from Pulpally and Pune, shows no difference in the epidermal features.

Raphides are present in the epidermis of 9 species. They are not found in *C. caroliniana*, *C. clavatoides*, *C. indehiscens*, *C. paludosa*, *C. petersii*, *C. suffruticosa* and *C. wightii*.

SHEBA M. JOSEPH. “TAXONOMIC REVISION OF THE GENUS COMMELINA L. (COMMELINACEAE) IN INDIA” THESIS. DEPARTMENT OF BOTANY PLANT SYSTEMATICS AND FLORISTICS LABST. JOSEPH’S COLLEGE, DEVAGIRI, KOZHIKODE-8, UNIVERSITY OF CALICUT, 2012.

CHAPTER 4
CAPSULE AND SEED MORPHOLOGY

The capsule of *Commelina* is trilocular with one dorsal locule and two ventral locules. The dorsal locule is 1-seeded or aborted and mostly indehiscent. The ventral locules are 2-seeded or 1-seeded and very rarely 1 is aborted. The seeds possess a lateral embryotega and a linear hilum. These characters are constant among species. Nearly all species of *Commelina* occurring in India can be identified with characters of capsule and seed.

Light microscopic observations on the capsules and scanning electron microscopic studies on seeds of 22 species are conducted in the present investigation. The characters of capsules studied include the size and shape and the number of capsules within a spathe. Similarly, the seed characters studied include the number, shape and size and colour and ornamentation of testa.

Materials and Methods

Capsules and seeds for the present study are obtained from fresh and herbarium samples. The voucher specimens are deposited at St. Joseph's College herbarium (DEV). Mature and dry capsules are mounted on clean glass slides and observed under Leica MZ 7.5 Stereo zoom microscope. SEM of seeds (except *C. albescens*, *C. appendiculata*, *C. coelestis* and *C. paleata*) is taken by Hitachi su-6600. Detailed data sheets on the capsule and seed morphology are prepared by thorough observation. Capsules are drawn with Camera Lucida attached to Leica

MZ 7.5 Stereo zoom microscope. The data obtained are compared and presented separately for capsule and seeds (Table 5 & 6).

The terminology used for the capsule and seed surface follows Faden (1991): dorsal locule, towards the abaxial; ventral locule, towards the adaxial. Seeds ventral, the surface bearing hilum; dorsal, the surface opposite the ventral; apical and basal, the surfaces facing the apex and base of capsule, respectively; lateral, the surfaces, one of which bearing the embryotega, directed towards the dorsal and ventral surfaces of the capsule. Seed length is the distance between apical and basal surfaces; width, the distances between the lateral surfaces; and thickness, the distance between the ventral and dorsal surfaces. Seed shape is the linear out line viewed from the dorsal surface (Plate 14).

Observations

1. ***Commelina albescens*** Hassk. **Plate 15a**

Capsules 1 or 2 per spathe, *ca*. 4 × 3 mm, ovate, compressed, trilocular or bilocular, dorsal locule aborted, ventral locules 1or 2-seeded. Seeds rounded, 2–2.5 mm, testa dull black, smooth with white farinose, hilum linear, embryotega lateral (under LM).

2. ***Commelina andamanica*** Sheba & Nampy **Plate 15b, 18a & b**

Capsule single in a spathe, 2–3 × 1–2 mm, obovate, bilocular, shortly apiculate, ventral locules 1-seeded, sometimes one ventral locule aborted, dorsal locule absent. Seeds sub globose, almost planar on the ventral surface, 2.3–2.5 × 2–

2.2 mm; testa brown, smooth with patches of soft light brown material scattered over the surface, white farinose; hilum linear; embryotega lateral.

3. ***Commelina appendiculata*** C.B. Clarke

Capsule 1 or 2 per spathe, *ca*. 10 × 4.5 mm, globose, trilocular, basal ventral ovules aborted, upper ventral ovules developing into seeds, dorsal locule indehiscent. Seeds oblong, 4.5–6 × 2.2–2.3 mm, testa brown, smooth, appendaged at both ends, white farinose, hilum linear, embryotega lateral (under LM).

4. ***Commelina attenuata*** Vahl **Fig**. **1a**; **Plate 15c, 18c & d**

Capsule 1 per spathe, ca. 4 × 3 mm, ovoid, bilocualr, dorsal locule aborted, ventral locules 1-seeded. Seeds elliptic, appendaged at both end, 3 × 1 mm, testa dark brown, smooth under LM and reticulate under SEM with farinose granules, hilum linear and embryotega lateral.

5. ***Commelina benghalensis*** L. **Fig. 1b; Plate 15d, 18e & f**

Capsule 1 per spathe, 5–6 × 3–4 mm, oblong-elliptic, trilocular, dorsal locule 1-seeded, ventral locules 2-seeded. Seeds ovoid, 2 × 1.5 mm, testa black-brown, reticulately furrowed with white farinose, hilum linear, embryotega lateral.

6. ***Commelina caroliniana*** Walter **Fig. 1c; Plate 15e, 18g & h**

Capsule 1 or 2 per spathe, 5–6 × 2–3 mm, ovate-elliptic, trilocular, dorsal locule 1-seeded, ventral locules 2-seeded. Seeds ovate-pyriform, *ca*. 3 × 2 mm, truncate at one end, sub-acute at the other end, testa dark brown, smooth, white farinose, hilum linear, embryotega lateral.

7. ***Commelina clavata*** C.B. Clarke **Fig. 1d; Plate 15f, 19a & b**

Capsule 2-3 per spathe, 8–9 × 4.5–6 mm, oblong-elliptic, compressed, bilocular, dorsal locule absent, ventral locules 2-seeded. Seeds elliptic, 2.5–3 × 2–2.2 mm, testa dark brown, shallowly reticulate, hilum linear and embryotega lateral.

8. ***Commelina clavatoides*** Nampy & Sheba **Plate 15g, 19c & d**

Capsule 5 or 6 per spathe, 8.5–9.5 × 5.5–6.5 mm, oblong-elliptic, compressed, bilocular, dorsal locule absent, ventral locules 2-seeded. Seeds ovoid-oblong, *ca*. 3 × 1 mm, testa dark brown, shallowly pitted, hilum linear and embryotega lateral.

9. ***Commelina coelestis*** Willd. **Plate 15h**

Capsule 3 or 4 per spathe, 6–7.5 × 4 mm, oblong, trilocular, dorsal locule 1-seeded, ventral locules 2-seeded. Seeds triangular, *ca*. 3.4 × 2.3 mm, testa brown or black, pitted, hilum linear, embryotega lateral (under LM).

10. ***Commelina diffusa*** Burm.f. **Fig. 1e; Plate 16a, 19e & f**

Capsule 1–3 per spathe, 8–9 × 4–5 mm, oblong, trilocular, dorsal locule 1-seeded, ventral locules 2-seeded. Seeds oblong, *ca*. 4 × 2 mm, testa brown, doubly reticulate, hilum linear, embryotega lateral.

11. ***Commelina ensifolia*** R. Br**.** **Fig. 1f; Plate 16b, 19 g & h**

Capsule 1–2 per spathe, 5–6 × 4–5 mm, elliptic-obovoid, bi or trilocular, rarely dorsal locule absent, ventral locules 1-seeded. Seeds ovoid, 2.5–3.5 × 2–3 mm, testa mottled light and dark brown, smooth under LM and coarsely reticulate

under SEM, a torus of soft whitish brown material around the periphery, hilum linear, embryotega lateral.

12. ***Commelina forskalaei*** **Vahl** **Fig. 1g; Plate 16c & d, 20a & b**

Capsule 1 per spathe, 5–6 × 3.5–4 mm, obovoid, trilocular, dorsal locule 1-seeded ventral locule 2-seeded. Seeds globose, *ca*. 2.5 × 2 mm, testa brown, smooth under LM and coarsely reticulate under SEM, hilum linear, embryotega lateral. Capsules of cleistogamous flowers 1 or 2-seeded, indehiscent. Seeds smooth with furrows and ridges.

13. ***Commelina indehiscens*** E. Barnes **Fig. 1h; Plate 16e, 20c & d**

Capsules 1–3 per spathe, 1–1.2 × 0.3– 0.4 cm, oblong, trilocular, indehiscent, laterally compressed, dorsal locule 1-seeded, ventral locules aborted. Seeds ovoid, 6.5 × 2 mm, testa black-dark brown with light brown reticulations, hilum linear, embryotega lateral.

14. ***Commelina kurzii*** C.B. Clarke **Fig. 1i; Plate 16f, 20e & f**

Capsule 1 or 2 per spathe, 7–8 × 5–6 mm, globose, trilocular, locules 1-seeded, rarely dorsal locule aborted. Seeds ovate, *ca*. 3 × 2 mm, testa brown, smooth, torus of brown material around the periphery, hilum linear, embryotega lateral.

15. ***Commelina longifolia*** Lam. **Fig. 1j; Plate 16g, 20g & h**

Capsule 1or 2 per spathe, 8–9 × 3–4 mm, oblong, trilocular, dorsal locule 1-seeded, ventral locules 2-seeded. Seeds ovoid, *ca*.3 × 2 mm, testa brown, smooth

with white farinose, whitish appendage at the rounded end, hilum linear, embryotega lateral.

16. ***Commelina maculata*** Edgew. **Fig. 1k; Plate 16h, 21a & b**

Capsule 1 or 2 per spathe, 6–7 × 5 mm, ovoid, trilocular, locules 1-seeded. Seeds oblong, *ca*. 3 × 2 mm, testa reddish brown, smooth, hilum linear, embryotega lateral.

17. ***Commelina paleata*** Hassk. **Plate 17a**

Capsule 1 or 2 per spathe, *ca*. 6 × 4 mm, oblong, trilocular, locules 1-seeded. Seeds oblong, 3 × 1 mm, testa dark brown, smooth with white farinose, hilum linear, embryotega lateral (under LM).

18. ***Commelina paludosa*** Blume **Fig. 1l; Plate 17b, 21c & d**

Capsule 1–3 per spathe, 4 × 3 mm, obovoid, trilocular, locules equal, 1-seeded. Seeds ellipsoid, 3–4 × 2.5 mm, testa dark brown, smooth under LM and coarsely reticulate under SEM, minutely white farinose, hilum linear, embryotega lateral.

19. ***Commelina petersii*** Hassk. **Fig. 1m; Plate 17c, 21e & f**

Capsule 1 or 2 per spathe, 9–10 × 3–4 mm, ovate elliptic, compressed, trilocular or bilocular, dorsal locule 1-seeded, rarely absent, ventral locules 2-seeded. Seeds ovate- pyriform, 1.75 × 1 mm, testa dark brown, mottled with black, 3–6 transverse furrows, the intervening ridges with 2-many white-light brown tubercles, hilum linear, embryotega lateral.

20. ***Commelina sikkimensis*** C.B. Clarke **Fig. 1n; Plate 17d, 21 g & h**

Capsule 1 or 2 per spathe, 5–6 × 2–3 mm, oblong, trilocular, dorsal locule 1-seeded, ventral locules 2-seeded. Seeds ovoid-oblong, 3–4 × 2–3 mm, testa dark brown, reticulately pitted, hilum linear, embryotega lateral.

21. ***Commelina subulata*** Roth **Fig. 1o; Plate 17e, 22a & b**

Capsule 2 per spathe, 4.5 × 2.5 mm, oblong, trilocular, dorsal locule 1-seeded, ventral locules 2-seeded. Seeds ovoid, compressed, *ca*. 2 mm, testa black, transversely pitted, white farinose, hilum linear, embryotega lateral.

22. ***Commelina suffruticosa*** Blume **Fig. 1p; Plate 17f, 22c & d**

Capsule 5 or 6 per spathe, *ca*. 5 × 5 mm, globose, trilocular, dorsal locule aborted, ventral locules 1-seeded. Seeds elliptic 3 × 2 mm, testa dark brown, foveate reticulate, white farinose, hilum linear, embryotega lateral.

23. ***Commelina tricolor*** E. Barnes **Fig. 1q; Plate 17g, 22e & f**

Capsule 1or 2 per spathe, 9–10 × 3–3.5 mm, ovoid-oblong, compressed, bilocular, dorsal locule absent, ventral locules 2-seeded. Seeds ovoid-oblong, 4 × 1.5 mm, testa pale brown, smooth with farinose granules, hilum linear, embryotega lateral.

24. ***Commelina wightii*** R.S. Rao **Fig. 1r; Plate 17 h, 22g & h**

Capsule 1 per spathe, 5–5.5 × 3.5–4 mm, globose, dorsal locule and 1 ventral locule aborted, 1 ventral locule 1-seeded. Seed globose, 2 × 2 mm, testa brown, smooth under LM, coarsely reticulate under SEM, hilum linear, embryotega lateral.

Table 5: Morphological characters of the capsules of *Commelina* species

No.	Name	No. of Capsule/ Spathe	Shape	No. of locules	No. of seeds		Size
					Dorsal locule	Ventral locules	
1	*C. albescens*	1 or 2	Ovate	3 or 2	Absent	2 or 4	4 × 3 mm
2	*C. appendiculata*	1 or 2	Globose	3	1	2	10 × 4.5 mm
3	C. *attenuata*	1	Ovoid	2	Absent	2	4–6 × 3–4 mm
4	C. *benghalensis*	1	Elliptic	3	1	4	5–6 × 3–4 mm
5	C. *caroliniana*	1 or 2	Ovate-elliptic	3	1	4	5–6 × 2–3 mm
6	C. *clavata*	2 or 3	Oblong-elliptic	2	Absent	4	8–9 × 4.5–6 mm
7	C. *coelestis.*	3 or 4	Oblong	3	1	4	6–7.5 × 4 mm
8	C.*diffusa*	1–3	Oblong	3	1	4	8–9 × 4–5 mm
9	C. *ensifolia*	1 or 2	Elliptic-obovoid	2 or 3	Absent or 1	2	5–6 × 4–5 mm
10	C. *forskalaei*	1	Obovoid	3	1	4	5–6 × 3.5–4 mm
11	C. *indehiscens*	1–3	Oblong	3	1	Absent	1–1.2 × 0.3–0.4 cm
12	*C. kurzii*	1 or 2	Globose	3 or 2	Absent or 1	2	7–8 × 5–6mm
13	C. *longifolia*	1 or 2	Oblong	3	1	4	8–9 × 3–4 mm
14	C. *maculata*	1 or 2	Ovoid	3	1	2	6–7 × 5 mm
15	C. *paleata*	1 or 2	Oblong	3	1	2	6 × 4 mm
16	C. *paludosa*	1–3	Obovoid	3	1	2	4 × 3 mm
17	C. *petersii*	1 or 2	Ovate-elliptic	2 or 3	Absent or 1	4	9–10 × 3–4 mm
18	C. *sikkimensis*	1 or 2	Oblong	3	1	4	5–6 × 2–3 mm
19	C.*subulata*	2	Oblong	3	1	4	4.5 × 2.5 mm
20	C. *suffruticosa*	5 or 6	Globose	2	Absent	2	5 × 5 mm
21	C. *tricolor*	1 or 2	Ovoid-oblong	2	Absent	4	9–10 × 3–3.5 mm
22	C. *wightii*	1	Globose	3	Absent	1	5–5.5 × 3.5–4 mm

Table 6: Morphological characters of the seeds of *Commelina* species

No.	Name	Seed no	Seed shape	Colour of testa	Orna-mentation LM/SEM	Size	External
1	C. *albescens*	2–4	Rounded	Dull black	Smooth	2–2.5 × 2 mm	White farinose
2	C. *appendiculata*	3	Oblong	Brown	Smooth	4.5–6 × 2.2–2.3 mm	White farinose
3	C. *attenuata*	2	Elliptic	Dark brown	Smooth/ Reticulate	2–4 × 1–2 mm	Appendage at both ends
4	C. *benghalensis*	5	Ovoid	Black-brown	Furrowed reticulate	2 × 1.5 mm	White farinose
5	C. *caroliniana*	5	Ovate pyriform	Dark brown	Smooth	3 × 2 mm	White farinose
6	C. *clavata*	4	Elliptic	Dark brown	Shallowly reticulate	2.5 × 2–2.2 mm	
7	C. *coelestis*	5	Triangular	Brown/ Black	Pitted	3.4 × 2.3 mm	
8	C. *diffusa*	5	Oblong	Brown	Doubly reticulate	3–4 × 1.2 mm	White farinose
9	C. *ensifolia*	2 or 3	Ovoid	Dark brown	Smooth/ coarsely reticulate	2.5–3.5 × 2–3 mm	Torus of white material
10	C. *forskalaii*	5	globose	Brown	Smooth / coarsely reticulate	2.5 × 2 mm	
11	C. *indehiscens*	1	Ovoid	Black-dark brown	Reticulate	5 × 2 mm	Reticulations brown
12	C. *longifolia*	5	Ovoid	Brown	Smooth	3 × 2 mm	White farinose
13	C. *kurzii*	3 or 2	Ovate	Brown	Smooth	3 × 2 mm	Torus of brown material
14	C. *maculata*	3	Oblong	Reddish brown	Smooth	3 × 2 mm	
15	C. *paleata*	3	Oblong	Dark brown	Smooth	3 × 2 mm	White farinose

No.	Name	Seed no	Seed shape	Colour of testa	Orna-mentation LM/SEM	Size	External
16	C. *paludosa*	3	Ellipsoid	Dark Brown	Smooth / coarsely reticulate	3–4 × 2.5 mm	White farinose
17	C. *petersii*.	4 or 5	Ovate-pyriform	Dark brown	Ridges & furrows	4–4.5 × 2.5 mm	White-light brown tubercles,
18	C. *sikkimensis*	5	Ovoid-oblong	Dark brown	Pitted reticulate	3–4 × 2–3 mm	
19	C. *subulata*	5	Ovoid	Black	Tranverse pits	1.5 × 1 mm	White farinose
20	C. *suffruticosa*	2	Elliptic	Dark brown	Shallowly reticulate	3 × 2 mm	White farinose
20	C. *tricolor*	4	Ovoid-oblong	Pale brown	Smooth	4 × 1.5 mm	White farinose
22	C. *wightii*	1	globose	Brown	Smooth/ coarsely reticulate	2 × 2 mm	

Discussion

The capsule and seed morphology of 22 Indian species *Commelina* are investigated. They provide taxonomically useful characters for species delimitation.

The size of the capsule varies from 4–10 × 2–6 mm. The longest capsule is found in *C. appendiculata* and *C. indehiscens* and the smallest in *C. subulata*. The tip of the capsule is long and pointed in *C. indehiscens*.

The shape of the capsule varies from globose, ovoid, obovoid, oblong to elliptic. Globose capsules are found in *C. kurzii, C. wightii, C. appendiculata* and *C. suffruticosa*. In *C. albescens, C. maculata* and *C. attenuata*, the capsules are ovoid while in *C. paludosa* and *C. forskalaei* the capsules are obovoid. Capsules are ovate-

elliptic in *C. petersii* and *C. caroliniana* but in *C.clavata*, it is oblong-elliptic. It is obovoid elliptic in *C. ensifolia* and ovoid-oblong in *C. tricolor*. All the others are with oblong capsule.

The capsules are either 1 or 2 within a spathe generally but it is always one in *C. attenuata, C. benghalensis, C. forskalaei* and *C. wightii*. It is always two in *C. subulata*, 3 or 4 in *C. coelestis* and 5 or 6 in *C. suffruticosa*.

The capsule is trilocular in most species, but it is bilocular in *C. clavata*, *C, suffruticosa, C. tricolor* and *C. attenuata*. Only one locule is functional in *C. wightii* due to the abortion of the dorsal and one of the ventral locule. In *C. kurzii, C. ensifolia, C. petersii* and *C. albescens,* the second flower produces bilocular capsule.

The two ventral locules are 2 seeded usually, but they are aborted in *C. indehiscens*. In *C. wightii* one of the ventral locule is aborted while the other is 1 seeded. In *C. ensifolia, C. maculata, C. paludosa C. suffruticosa C. undulata C. appendiculata* and *C. paleata* the ventral locules are always one seeded.

The size of the seeds varies from 2–6 × 1–3 mm. Largest seed is in *C. appendiculata* and *C. indehiscens* and the smallest seed is found in *C. subulata*.

The seed also shows variation in shape, size, number, colour of the testa and ornamentation. The seed is triangular in *C. coelestis*, ovoid-oblong in *C. sikkimensis* and *C. tricolor*, globular in *C. forskalaei, C. wightii* and *C. albescens*, elliptic in *C. attenuata, C. suffruticosa*, *C. paludosa* and *C. clavata*, ovoid in *C. benghalensis, C. ensifolia, C. indehiscens, C. longifolia, C. subulata* and *C. kurzii, oblong* in *C.*

diffusa, C. maculata and *C. paleata* and ovate-pyriform in C. *caroliniana* and *C. petersii*.

The ornamentation of the seed surface under LM is smooth, reticulate, pitted or ridged. At SEM, the surface is granulate, rugulate, reticulate or perforate with or without farinose granules. The surface is irregularly pitted in *C. coelestis,* transversely pitted in *C. subulata*, reticulately pitted in *C. sikkimensis*. In *C. petersii* the surface with tubercles on ridges and in *C. benghalensis* shows furrowed reticulations. The seed of C. suffruticosa is foveoate reticulate, *C. clavata* is shallowly reticulate and *C.diffusa* is doubly reticulate. In all the other species the surface is smooth.

Farinose granules are absent in *C. coelestis, C. kurzii, C. wightii, C. sikkimensis, C. indehiscens,C. forskalaei, C. clavata* and *C. petersii*. In all others, the farinose granules are scattered in different manner. It may be thickly arranged or irregularly scattered. Comparatively larger farinose outgrowths are seen in *C. ensifolia, C. maculata C. paludosa* and *C. suffruticosa*.

The seeds are appendaged at both ends in *C. appendiculata* and *C. attenuata* and single appendaged in *C. longifolia.* The appendages are honey comb like in *C. attenuata*. Tubercles are found through the ridges in *C. petersii*. In all Indian species studied, the hilum is linear and the embryotega is lateral.

SHEBA M. JOSEPH. “TAXONOMIC REVISION OF THE GENUS COMMELINA L. (COMMELINACEAE) IN INDIA” THESIS. DEPARTMENT OF BOTANY PLANT SYSTEMATICS AND FLORISTICS LABST. JOSEPH’S COLLEGE, DEVAGIRI, KOZHIKODE-8, UNIVERSITY OF CALICUT, 2012.

CHAPTER 5

SYSTEMATIC TREATMENT

COMMELINA L.

The genus *Commelina* was described by Linnaeus in 1753 (*Species Plantarum*: 40) and included 9 species under it. Unfortunately, he didn't provide a description for the genus. Later Linnaeus (1754) gave a detailed description for this genus. There exists some ambiguity regarding the year of publication of *Commelina*. Some authors consider it as 1753 (Karthikeyan *et al.*, 1989; Faden, 2006) while others as 1754 (Faden, 2000; Jyoti & Shrestha, 2009). According to Article 41. 2 of ICBN (McNeil *et al*., 2006), all the generic names published without an accompanying description in *Species Plantarum* (Edition I, 1753 and Edition II, 1762) are treated as valid names. Hence, the year of publication of *Commelina* L. is 1753 and is used in the present treatment.

Among the 9 species originally included by Linnaeus in *Species Plantarum* (1753), only 5 belong to the circumscription of present day *Commelina*. Among them, *C. communis* L. cited first is subsequently designated as the lectotype by Faden and Reveal (Jarvis *et al*., 1993: 36).

The name 'Commelina' commemorates two Dutch botanists Jan Commelijn (1629-1692) and his nephew Caspar Commelijn (1667/1668-1731), referring to the 2 large showy petals of the plant symbolizing them (Plumier, 1703).

Commelina L., Sp. Pl.40. 1753, Gen. Pl. ed. 5. 25. 1754; Burm.f., Fl. Ind. 16. 1768; Lour., Fl. Cochinch. 38. 1790; Lam., Tabl. Encycl. 128. 1791; J.F. Gmel., Syst. Veg. 120. 1796; Ruiz & Pav., Fl. Peruv. 44. 1798; Pers., Syn. Pl. 55. 1805; Vahl, Enum. Pl. 165. 1805; Willd., Enum. Pl. 1809; R. Br., Prodr. Fl. Nov. Holland. 269. 1810; Nov. Gen. Sp. Pl. 258. 1815; Lam., Encycl. 5: 624. 1817; Roth, Nov. Pl. Sp. 21. 1821; Steud., Nomencl. Bot. 214. 1821; Spreng., Syst. Veg. 4: 174. 1824; D. Don, Prodr. Fl. Nepal. 44. 1825; Blume, Enum. Pl. Javae 1. 1827; Presl., Reliq. Haenk. 136. 1830; Roxb., Fl. Ind. 1: 170. 1832; Steud., Nomencl. Bot. ed. 2. 400. 1841; Kunth, Enum. Pl. 4: 35. 1843; Edgew., Trans. Linn. Soc. 20: 89. 1851; A. Rich., Tent. Fl. Abyss. 2: 340. 1851; Hassk. in Miq., Pl. Jungh. 156. 1853; Miq., Fl. Ned. Ind. 530. 1855; Hassk., Fl. 46: 385. 1863; Miq., Ann. Mus. Bot. Ludgno-Batavi 3: 142. 1867; Hassk. in Schweinf., Beitr. Fl. Aithiop. 206. 1867; Hassk., Commelin. Ind. 26. 1870; C.B. Clarke, J. Linn. Soc., Bot. 9: 439. 1871; Mart., & Eichler, Fl. Bras. 3: 260. 1871; C.B. Clarke, Commelyn. Cyrtandr. Bengal 9. 1874; in A. DC & C. DC., Monogr. Phan. 138. 1881; Hook.f., Fl. Brit. India 368. 1892; Rendle, Fl. East. Trop. Africa 429. 1895; Hook.f. in Trimen, Handb. Fl. Ceylon 4: 300. 1898; C.B. Clarke in Dyer, Fl. Cape. 7: 8. 1897; Fl. Trop. Africa 8: 33. 1901; C.B. Clarke, Bull. Herb. Boissier 2: 245. 1903; T.S. Palmer & Steyerm., Ann. Missouri Bot. Gard. 22: 496. 1935; E. Barnes, J. Bombay Nat. Hist. Soc., 46: 70. 1946; J.K. Morton, J. Linn. Soc., Bot. 60: 171. 1967; Faden in Dassan., Rev. Handb. Fl. Ceylon 14: 179. 2000; Karth. *et al*., Fl. Ind. Enum. Mon. 24. 1989. *Lechea* Lour., Fl. Cochinch.: 60. 1790.

Isanthina Rchb. ex Steud., Nomencl. Bot. ed. 2. 1: 400. 1840.

Heterocarpus Wight, Icon. Pl. Ind. Orient. 6: 29. 1853.

Disecocarpus Hassk., Flora 41: 211. 1866.

Phaeosphaerion Hassk., Flora 49: 212. 1866.

Athyrocarpus Schltdl. ex Benth., Gen. Pl. 3: 847. 1883.

Spathodithyros Hassk., Flora 49: 211. 1866.

Trithyrocarpus Hassk., Flora 49: 211. 1866.

Type: *Commelina communis* L. (lectotype designated by Faden & Reveal, 1993).

Annual or perennial herbs with thin, thick or tuberous roots. Stems creeping, ascending or erect, branched, sometimes with cleistogamous flower–bearing underground stolons. Leaves distichous or spirally arranged; sheaths mostly closed, usually ciliate at the mouth; blade variable, mostly linear–lanceolate. Inflorescence terminal and leaf–opposed, composed of 1 or 2 cincinni enclosed in spathes; spathes with margins free, although folded or proximal margins partially or completely fused, often filled with a mucilaginous liquid; upper cincinnus 1 (–2–3) flowered, usually male (occasionally some perfect) flowers, exserted or vestigial; lower cincinnus usually several flowered, all flowers bisexual or a few male. Sepals 3, free or lateral 2 basally fused. Petals 3, free, 2 large clawed, blue, lilac, mauve, white, yellow or orange coloured; odd one without or very rarely with a short claw or reduced. Stamens 6(-5); lower 3 fertile, the lateral ones with slightly longer filaments and smaller anthers than the middle one; upper 3 (-2) staminodial, filaments reduced, antherodes mostly cruciform and yellow with lateral outgrowths. Ovary 3 (–2) loculed, 2 ventral locules each with 2 or rarely 1 ovule and the dorsal locule with 1 ovule or reduced and sterile; style filiform; stigma capitate or trifid. Capsules bi- or trilocular (occasionally unilocular), loculicidal, 1–5 seeded, all

locules dehiscent or in some species dorsal locule indehiscent with capsule wall fused to seed coat. Seeds variable in shape and size, ellipsoid, globose or oblong, testa mostly smooth, reticulate or furrowed or reticulate foveolate; hilum linear and embryotega lateral. x = 11–15.

Species about 206, most diverse in Africa (Govaerts & Faden, 2012). Twenty five species in the present treatment, six endemic.

The terminology used for describing inflorescence and flower follows Simpson (2006): Spathe, the bract subtending cyme; cincinnus (scorpioid cyme), a monochasium in which the branches develop on alternating sides of each sequential axis; peduncle, stalk of the inflorescence; cincinnus peduncle, stalk of the cincinnus; lateral sepal, towards the adaxial region; medial sepal, towards the abaxial region; odd petal, towards the adaxial region; clawed petals, petals towards abaxial region with attenuate base; medial stamen, towards the abaxial region; lateral stamens, towards the adaxial region; stamindoes, sterile stamens; antherodes, sterile anthers. (Plate 23 & 24).

Key to the species

1. Spathes conduplicate, margins free at the base 2
1. Spathes cucullate, margins fused at the base..... 16
2. Capsules 1-seeded..... 3
2. Capsules 2–5-seeded..... 5
3. Flowers blue; dorsal capsule locule 1-seeded,

   ventral locules aborted…… ……..4
3. Flowers yellow; dorsal capsule locule and 1 ventral locule aborted . **25**. *C.wightii*

4. Plants with definite base; lamina linear-lanceolate, densely hirsute on both surfaces; upper cincinnus usually present……..**11**. *C. ekabeeja*

4. Plants without a definite base; lamina ovate-lanceolate, pubescent on both surfaces; upper cincinnus usually absent…**14**. *C. indehiscens*

5. Seeds appendaged 6

5. Seeds not appendaged 7

6. Appendages on seeds honey comb like; spathes hastate at base .... **4.** *C. attenuata*

6. Appendages on seeds not honey comb like; spathes deeply cordate at base.....**3.** *C. appendiculata*

7. Seeds smooth 8

7. Seeds not smooth 10

8. Spathes ciliate at margin..... 9

8. Spathes not ciliate at margin.....**16.** *C. longifolia*

9. Capsules 4-seeded; peduncle of spathe more than 2 cm long ..... **24.** *C. tricolor*

9. Capsules 5-seeded; peduncle of spathe less than 2 cm long .....**6.** *C. caroliniana*

10. Plants with a definite base 11

10. Plants without a definite base 15

11. Flowers blue 12

11. Flowers white or chrome yellow 13

12. Roots tuberous, plants erect..... **9.** *C. coelestis*

12. Roots thick; plants extensively scrambling 14

13. Capsules 5- seeded; flowers chrome yellow ..... **22.** *C. subulata*

13. Capsules 2- seeded; flowers white .....**23.** *C. suffruticosa*

14. Capsules 5 or 6 within a spathe; leaves up to 14 cm long;

internodes up to 15 cm long ..... **8.** *C. clavatoides*

14. Capsules 2 or 3 within a spathe; leaves upto 10 cm long;

internodes up to 9 cm long ..... **7.** *C. clavata*

15. Leaf base oblique; upper cincinnus 2–6- flowered;

Seeds pitted reticulate..... **21.** *C. sikkimensis*

15. Leafbase not oblique; upper cincinnus 1–2- flowered;

seeds doubly reticulate ..... **10.** *C. diffusa*

16. Ventral capsule locules usually 2-seeded 17

16. Ventral capsule locules 1-seeded..... 20

17. Spathe falcate distally..... **1.** *C. albescens*

17. Spathe not falcate distally..... 18

18. Seeds smooth, staminal filaments flattened ..... **13.** *C. forskalaei*

18. Seeds ridged, staminal filaments slender 19

19. Spathes pedunculate, up to 2.5 cm..... **20**. *C. petersii*

19. Spathe subsessile..... **5.** *C. benghalensis*

20. Plants subscandent or erect with a definite base..... 21

20. Plants trailing, lacking a definite base..... **2.** *C. andamanica*

21. Roots tuberous, testa of the seed reddish brown..... **17.** *C. maculata*

21. Roots not tuberous, testa of the seed dark brown 22

22. Spathes solitary..... 23

22. Spathes clustered..... 24

23. Spathes prominent green veined; peduncle < 1cm long;

flowers lilac-light blue ..... **12.** *C. ensifolia*

23. Spathes without green prominent veins; peduncle >1cm long;

flowers always blue..... **18.** *C. paleata*

24. Seeds sub-orbicular with peripheral outgrowth;

spathes pilose to puberulous..... **15.** *C. kurzii*

24. Seeds ellipsoid, without peripheral outgrowth;

spathes glabrous .....**19.** *C. paludosa*

1. *Commelina albescens* Hassk. in Schweinf., Beitr. Fl. Aethiop. 210. 1867; C.B. Clarke in A. DC & C. DC., Monogr. Phan. 3: 184. 1881; Hook.f., Fl. Brit. India 6: 373. 1892; T. Cooke, Fl. Bombay 3: 294. 1906; R.S. Rao, Blumea 14: 354. 1966; Bhandari, Fl. Indian Desert 355. 1978; Karth. *et al.*, Fl. Ind. Enum. Mon. 24. 1989.

Type: Abyssinia, Montet Gageros, 1200 m alt., 08/09/1854, *Schimper 2268* (BR!).

Plate 25, 29a; Fig. 2

Extensively branched, sub-scandent, perennial herb with a definite base; roots thick, tuberous. Stems thickened at the base, terete, green; internodes 5–6 cm long. Leaves distichous; sheath 1–1.5 cm long, ciliate at apex, green-purple veined, pilose on one side; lamina linear–lanceolate, 7–10 × 0.4–1 cm, acute–acuminate at apex, cuneate at base, scabrous at margins, both surfaces pubescent. Spathes 1–3 in each axil at the end of branches, semi-ovate, 1–2 × 1–1.5 cm, cucullate, margins fused basally, acute–acuminate at apex, strongly falcate, ciliate out, glabrous in, green; peduncle 0.5 cm long, white, strigose; upper cincinnus absent; lower cincinnus *ca.* 0.5 cm long, glabrous, 3–4 bisexual flowered. Sepals 3, transparent; medial boat shaped, narrowed at apex; laterals broadly ovate, 3 × 2.5 mm, fused

3/4th of their length. Petals 3, blue; paired petals deltoid, 10 × 7 mm, claws 3 mm long; odd petal scale like, 2 mm long. Stamens 3; lateral stamen filament slender, 8 mm long, anthers blue; median stamen with a little shorter filament, anthers yellow, curved. Staminodes 3; filaments slender, 4 mm long; antherodes yellow, 4–lobed with 2 lateral appendages. Ovary ovate, green; style white, 9 mm long; stigma capitate. Capsules 1 or 2 per spathe, ovate, compressed, tri–bilocular, 4 or 5 seeded; dorsal locule sometimes aborted; ventral locules 2 seeded. Seeds orbicular, 2–2.5 mm long; testa dull black; hilum linear; embryotega lateral.

Chromosome number: n = 30 (Lewis & Tadesse, 1964), n = 15 (Rao, 1966b).

Flowering period: August–November.

Flowering time: 8.00–11.00 am.

Ecology: Desert areas and in rock crevices.

Distribution: Eritrea–Malawi, Arabian Peninsula, Pakistan to India. Rare in India, restricted to Rajasthan, Gujarat and Saurashtra coast.

Specimens examined: **DIU**: Diu district, Nagoa Village, 17/09/1964, *R.S. Rao 102427, 102600* (CAL). **GUJARAT**: Jamnagar district, Dwarka, 15/08/1850, *J.C. Dhasma D 13* (DD, CAL); *Ibid.*, 16/10/1961, *T.A. Rao 419* (CAL), *T.A. Rao 76568* (BLAT). **RAJASTHAN**: Churu district, Gopalpura Hill, 17/07/1976, *G.P. Roy 2682* (BLAT, BSJO). Jaisalmer district, Jaisalmer, Bada Bag, 11/1917, *s.coll. 9191, 9192* (BLAT); Shali, Isitawal, *s. die*, *Dalzell 677I* (DD). Jodhpur district, Kailana Compt. V, 12/09/1972, *B.V. Shetty 92* (CAL, BSJO); Mandore Garden, 14/09/1973, *G.L. Tiwari 629* (CAL). Nagaur district, Balsamund, 10/1917, *s.coll. 9183, 9184, 9186, 9188, 9190* (BLAT). Pali district, Sarandana, Near Beswar, 12/08/1975, *B.V. Shetty 1784* (BSJO).

Notes: *Commelina albescens* is easily recognized by its thick stem base, tuberous roots and falcate spathes. Hasskarl (1867), described this species as "tota albescens…. loculi dorsali abortive…", but these characters are not found in Indian materials. The specimens studied by me are not at all albescent and their dorsal locules contain viable seeds.

2. *Commelina andamanica* Sheba & Nampy *sp. nov.*

Commelina andamanica is close to *C. suffruticosa* Blume and *C. benghalensis* L. but differs from them in its trailing habit without a definite base, solitary and terminal, cucullate spathe with a single cincinnus and 2 smooth seeds within the capsule.

Type: INDIA. Andman & Nicobar islands: South Andaman, Chidiya Tapu, 20 m alt., 24/09/2010, *Santhosh Nampy & Manudev 3131* (holotype, DEV!; isotypes, CALI!, US!). **Plate 26, 27, 29b; Fig. 3**

A much branched, trailing, perennial herb, rooting at the nodes, lacking a definite base; branches *ca*. 7–10 cm long; roots long, thin, fibrous. Cleistogamous flowers absent. Stems terete, prostrate, green or brown; internodes 3–5 cm long with a fine line of strigose hairs below the node. Leaves distichous; sheath 5–8 mm long, strigose, ciliate at apex; cilia 0.25–1 mm long, white; petiole *ca*. 3 mm long, white stiff hairy on the lower surface; lamina ovate, 1–3 × 1–1.5 cm, acuminate at apex, oblique at base; upper surface pubescent, sparsely ciliate on the midrib; lower surface acicular hairy along the midrib and hooked hairy throughout. Spathes terminal, solitary, cucullate, 9–12 × 6.5–10 mm, ciliate on the surfaces and margin,

green; peduncle 3–5 mm long, white, strigose; upper cincinnus absent; lower cincinnus *ca*. 5 mm long, strigose, 2-flowered. Sepals 3, hyaline; medial boat shaped, 2–3 × 1–2 mm, narrowed at apex; laterals orbicular, 2.5–4 × 2–3 mm, fused ½ of its length at the base. Petals blue; paired petals orbicular, claws 3.5–4 mm long, limb 3.5–4 × 5–6.8 mm; odd petal lanceolate, 1.6–2 × 0.6–1 mm. Stamens 3, subequal; lateral stamens with filaments 5–6 mm long, blue, anthers ovate, 0.75–1 × 0.5–0.6 mm, yellow; medial stamen with filaments 4–5 mm long, blue, anther elliptic-oblong, 1.2–1.5 × 0.75–1 mm, curved, yellow, connective yellow. Staminodes 3, equal; filaments 3–3.5 mm long; antherodes yellow, cruciform with lateral appendages, 0.4–0.5 × 0.6–0.7 mm. Ovary ovate-elliptic, 0.8–1.5 × 0.75–1 mm, pale green; style slender, 5–6 mm long, basally hyaline, distally pale violet; stigma trilobed, pale violet. Capsule single in a spathe, obovate, bilocular, shortly apiculate, 1 or 2 seeded; ventral locules 1-seeded, sometimes one ventral locule aborted; dorsal locule absent. Seeds sub globose, almost planar on the ventral surface, 2.3–2.5 × 2–2.2 mm; testa brown, smooth with patches of soft light brown material scattered over the surface, white farinose; hilum linear; embryotega lateral.

Chromosome number: Not reported.

Flowering period: July–January.

Flowering time: 8.30–10.00 am.

Etymology: The species is named after ‘Andaman’ to which the type locality Chidiya Tapu belongs.

Ecology: Rocky margins of forest stream, partially exposed.

Distribution: Known only from the type locality. The range of this local endemic species is hitherto restricted to a single location (IUCN B1a) and consisted of a few plants.

Specimens examined: Kerala: Kozhikode district, St. Joseph's College Botanical Garden (cultivated), 60 m alt., 12/12/2011, *Sheba M. Joseph & Santhosh Nampy 3751*; *Ibid*., 24/02/2012, *Sheba M. Joseph & Santhosh Nampy 4560*; *Ibid*., 31/03/2012, *Manudev & Santhosh Nampy 5243* (DEV).

Notes: *C. andamanica* is close to *C. suffruticosa* by its terminal spathe and 2-seeded capsule and to *C. benghalensis* by its terminal and cucullate spathe but differs from the former in its trailing habit without a definite base, cucullate spathe, blue flowers and smooth seeds as opposed to erect habit with a definite base, navicular spathe, white flowers and foveate reticulate seeds and from the latter by its solitary spathe, white hairs on the sheath summit and 2 smooth seeds with in a capsule as opposed to clustered (3-5) spathe, red hairs on the sheath summit and 5 furrowed-reticulate seeds within a capsule .

3. *Commelina appendiculata* C.B. Clarke, Commelyn. Cyrtandr. Bengal t. 13. 1874, in A. DC & C. DC., Monogr. Phan. 3: 186. 1881; Trimen, Cat. 95. 1885; Hook.f., Fl. Brit. India 6: 374. 1892, in Trimen, Handb. Fl. Ceylon 4: 304. 1898; Panigrahi & Kammathy, J. Indian Bot. Soc. 43: 305. 1962; R.S. Rao & D.M. Verma, Bull. Bot. Surv. India 16: 12. 1974; Karth. *et al.,* Fl. Ind. Enum. Mon. 24. 1989; Faden in Dassan., Rev. Handb. Fl. Ceylon 14: 189. 2000.

Type: India, Darjeeling district, *s.loc*., 13/06/1870, *C.B. Clarke 12065 R* (CAL, lectotype designated here!). **Plate 28, 29c; Fig. 4**

A much branched, scandent perennial herb up to 1 m tall, with a definite base, rooting at the basal nodes; roots thick, long, fibrous. Stems terete, *ca*. 0.5 cm in dia., green, glabrous. Leaves distichous; sheaths 6 cm long, strongly veined; lamina linear–lanceolate, 8–19 × 0.4–1.2 cm, acuminate at apex, cuneate at base, glabrous on both surfaces. Spathes leaf opposed, slightly falcate, 5–10 × 0.7–1.2 cm, conduplicate, caudate–attenuate at apex, deeply cordate–rounded at base, glabrous out, sparsely pilose in, green; peduncle 2.5–7.5 cm long, green; upper cincinnus 1 cm long, exserted, 1 male flowered; lower cincinnus 2 bisexual flowered. Sepals 3, transparent, oblong. Petals blue, paired petals deltoid, claws 2 mm long, odd petal ovate–orbicular. Stamens 3; lateral stamen filaments slender, anthers yellow, medial stamen anther curved. Staminodes 3; filaments slender; antherodes yellow. Ovary globose, green, style white; stigma capitate. Capsules 1 or 2 per spathe, globose, trilocular, 3 seeded, locules all 1-seeded; dorsal locule indehiscent; ventral locules dehiscent. Seeds oblong, 4.5–6 × 2.2–2.3 mm, appendaged at both ends; testa brown, smooth; hilum linear; embryotega lateral.

Chromosome number: Not reported.

Flowering period: July–October.

Flowering time: 9.00–12.30 pm.

Ecology: Rock outcrops, in partial shade.

Distribution: Eastern Himalaya to North Vietnam, Sri Lanka and India.

Specimens examined: **ARUNACHAL PRADESH**: West Kameng district, Kalaktanig, 07/05/1958, *G. Panigrahi 15128* (ASSAM). **ASSAM**: Goalpara district, Kukulong, 18/05/1947, *M.M. Sreenivasan 22407*; Motharguri, 08/06/1974, *P.K.*

Hajra 57611 (DD). Hailakandi district, Nunai, 22/04/1958*, B.K. Nath s.n*. (CAL). Kamrup district, Lukhikhar Forest, 26/06/1964, *A.S. Rao 39124*, *39136*, 24/04/1958, *B.K. Nath 13243* (ASSAM). Udalguri district, Udalguri, 03/1902, *A.C. Chatterjee s.n*. (CAL). **MEGHALAYA**: Ribhoi district, Nongpoh, 22/08/1964, *N.P. Balakrishnan 39386* (CAL). South Garo Hills district, Raitang, 24/08/1968*, N.P. Balakrishnan 47069* (ASSAM). **ORISSA**: Dhenkanal district, Joranda, 05/05/1981, *H.O. Saxena & R. Brahmam 4364* (RRLB). **SIKKIM**: District unknown, *s.loc*., *J.D. Hooker s.n*. (CAL). **WEST BENGAL**: Darjeeling district, *s.loc.,* 13/06/1870, *C.B. Clarke 12065, 12065 M, E, P*. (CAL), *12065 A* (K photo!), *12065* (DD), 12065 G, F (MEL). Jalpaiguri district, Saraswatipur, 22/05/1944, *S.K. Mukherjee 905* (DD). Malda district, Hatimari, 24/08/1966, *R.M. Dutta 483* (CAL).

Notes: *Commelina appendiculata* was described by Clarke (1874) based on materials collected from Darjeeling in India. There are five sheets at CAL and a few at K and MEL, all bear same field number and are duplicates of the same collection. Among them, *C.B. Clarke 12065 R* at CAL matches exactly with the protologue and hence designated here as the lectotype.

C. appendiculata shows affinities to *C. attenuata* from which it differs by deeply cordate spathe, exserted upper cincinnus (*ca*.1 cm long) and long peduncle (2.5–7.5 cm long). Spathe of this species is supposed to be the longest among all Indian species. Even after extensive survey, I failed to relocate this species anywhere from India.

4. *Commelina attenuata* Vahl, Enum. Pl. 2: 168. 1805; Roth, Sp. Pl. 24. 1821; C.B. Clarke in A. DC & C. DC., Monogr. Phan. 3: 172. 1881; Hook.f., Fl. Brit. India 6: 372. 1892; T. Cooke, Fl. Bombay 3: 293. 1906; C.E.C. Fisch. in Gamble, Fl. Madras 3: 1536. 1931; E. Barnes, J. Bombay Nat. Hist. Soc. 46: 80. 1946; K.M. Matthew &

Britto in K.M. Matthew, Fl. Tamil Nadu Carnatic 2: 1656. 1981; Manilal & Sivar., Fl. Calicut 298. 1982; Chandrab. & N.C. Nair, Fl. Coimbatore 299. 1987; Karth. *et al.*, Fl. Ind. Enum. Mon. 24. 1989; B.D. Sharma *et al.*, Fl. Maharashtra 149. 1996; T. Pullaiah, Fl. Andhra Pradesh 3: 999. 1997; Faden in Dassan., Rev. Handb. Fl. Ceylon 14: 188. 2000.

Commelina clavata var. *attenuata* (Vahl) Trimen, Syst. Cat. Fl. Pl. Ceylon: 95. 1885.

Type: India Orientalis, *s. die*, *Koenig s.n.* (C!, holotype)

Plate 30, 31, 29d; Fig. 5

Densely branched, scandent annual herb, rooting at the basal nodes, with a definite base; roots long, thin, fibrous. Stems terete, green, pubescent or glabrous; internodes 1.5–7.5 cm long. Leaves cauline; sheath 0.4–1 cm long, ciliate, green; lamina lanceolate, 2–9.5 × 0.5–1.5 cm, acute at apex, cuneate at base, entire at margins, upper surface pubescent, lower surface glabrous. Spathes leaf opposed, 1.2–4.5 × 0.2–0.5 cm, conduplicate, acute-attenuate at apex, hastate, ciliate towards base, puberulent out, pilose in, green; peduncle 0.8–2.5 cm long, green, strigose; upper cincinnus 3–5 mm long, ciliate, 1 male flowered; lower cincinnus 3–4 mm long, glabrous, 2 or 3 bisexual flowered. Sepals 3, transparent; medial boat shaped, narrowed at apex; laterals basally fused $1/4^{th}$ of its length, orbicular. Petals 3, blue; paired petals ovate–orbicular, claws 1 mm long; odd petal ovate, apex pointed. Stamens 3; lateral stamen filaments blue, 4 mm long, anthers yellow; median stamen filament blue, 3 mm long, anther curved, connective white. Staminodes 3; filaments slender, blue, sub equal; antherodes yellow, 4–lobed with 2 lateral appendages.

Ovary oblong, green; style white, 4 mm long; stigma trilobed. Capsule 1 per spathe, ovoid–oblong, bilocular, 2-seeded, dorsal locule aborted; ventral locules 1–2 seeded. Seeds elliptic, 2–4 × 1.5–2 mm, honey comb like appendages at both ends; testa dark brown, often mottled with light brown, smooth with farinose granules present; hilum linear; embryotega lateral.

Chromosome number: n = 24 (Kammathy & Rao, 1961a).

Flowering period: July–January.

Flowering time: 9.00–11.30 am.

Ecology: Edges of paddy fields, grasslands, open sandy areas, roadsides, seashores and moist shady to exposed areas.

Distribution: India, Sri Lanka, Singapore and Bangladesh.

Specimens examined: **ANDAMAN & NICOBAR ISLANDS**: Little Andaman, Hut Bay, 01/01/1976, *N. Bhargava 3284*; *Ibid*., 20/11/1977, *N. Bhargava 6517* (PBL). South Andaman, Hombray gung, 18/04/1964, *J.L. Ellis & K. Ramamurthy 18816* (PBL). **ANDHRA PRADESH**: Anantapur district, Alurikona–Tadpatri, 14/11/1982, *T. Pullaiah & N. Yesoda 1131* (MH, SKU); Anantapur, 30/09/1962, *R.V. Kammathy 73955* (BSI); Gundumala R.F., 30/09/1982, *T. Pullaiah & N. Yesoda 737* (MH); Reddipalli Farm, 15/08/1981, *N. Yesoda* 3*02*; Saurathagram, 03/07/1981, *N. Yesoda 202*; S.K.U Campus, 21/10/1982, *N. Yesoda 863*, *867* (SKU). Chittoor district, Kambakkam Hills, 16/10/1987, *Ranga Charyulu 1716* (CAL); Mukkinavaripally, *A. Lakshmaiah 28509* (SKU). Cuddapha district, *s.loc.*, 09/1889, *J.S. Gamble 21350*; Tanarla, 08/1889, *J.S. Gamble 21192* (CAL). Guntur district, Madinipad, 07/09/1924, *s.coll. 17461* (MH). Karimnagar district, Aklaspur, 23/09/1965, *G.V. Subba Rao 25633* (MH). Krishna district, Agripalle, 10/08/1984, *P. Venkanna 5222*; Kollitikota, 09/11/1985, *P. Venkanna 5833*; Krishnapatanam, 24/12/1970, *T.A. Rao & A.R.K. Sastry 7540* (CAL); Machilipatanam, 08/1883, *J.S.*

Gamble 12593, 19/11/1984, *P. Venkanna 5373* (MH). Kurnool district, Ahobilam, 29/08/1965*, J.L. Ellis 25565*; Chelama, 16/10/1964, *J.L. Ellis 22056*; Namalani-Mahanadi, 22/08/1965, *J.L. Ellis 25463* (CAL, MH). Nellore district, Tada, 18/02/1901, *Bourne 2199* (CAL). Nizamabad district, Alisagar, 15/09/1961, *R.V. Kammathy 81282* (BSI); Mudheli R.F., 18/08/1988, *B. Raviprasad Rao 7122* (SKU). Vishakhapatanam district, Anakapally, 25/09/1921, *s.coll. s.n.* (MH); Waltair University Campus, 21/10/1956, *H. Santapau 21346*, 21/10/1956, *S.K. Wagh 4680* (BLAT). **CHATTISGARH**: Bastar district, Bijapur ghats, 11/10/1987, *Anandkumar 16646* (CAL). **GOA**: Panaji district, Panaji, 05/09/2003, *Santhosh Nampy & Joby 841* (DEV). **KARNATAKA**: Belgam district, Badami Hills, *s. die*, *s.coll. s.n.*; *Ibid.,* 02/12/1961, *M.Y. Ansari & R.V. Kammathy 78773* (JCB); Gokak, *Gaikawad G.Y. s.n.* (BSI). Bellary district, Mangala, Huvinahadagally, 01/09/1978, *Hemaraddi 12* (JCB). Bijapur district, Aihole–Kerur, 15/09/1979, *S.R. Ramesh & B.R. Ramesh KFP 9319* (JCB); Bijapore 17/10/1892, *W.A. Talbot 2789* (CAL, BSI). Chittradurga district, Ranganalliguddi Gua, 27/08/1961, *R.S. Rao 73185* (BSI). Mysore district, Mysore-Carnatic, *s. die*, *G. Thomson s.n.* (CAL). Tumkur district, Tumkur, 30/08/1961, *R.S. Rao 73999* (BSI). **KERALA**: Alappuzha district, Muhamma, 30/07/2002, *Anusha & Cini DC 5159*; Pathiramanal, 30/07/2003, *Aneesha DC 5150* (DEV); Cherthalai, 08/09/1961, *R.V. Kammathy s.n.* (BSI). Kollam district, Kollam, 05/10/1985, *Smitha 7* (SNC). Kozhikode district, Beypore, 09/07/1971, *V.V. Sivarajan 1265* (CALI); Thikkodi, 30/08/2002, *Santhosh Nampy & Joby 478*; *Ibid*., 02/12/2011, *Manudev 5057* (DEV); West hill, 08/10/1970, *V.V. Sivarajan 552* (CALI). Pathanamthitta district, Gurunathanam, 06/10/1994, *Anilkumar 14915* (TBGT). Thiruvananthapuram district, Veli, 11/10/2009, *Sheba & Santhosh Nampy 2281* (DEV). Thrissur district, Chalakkudi, 27/01/2011, *Ancy & Sheba 4041*; Kumaranpadi, 12/10/2009, *Sheba & Santhosh Nampy 2300*; Mullurkara, 15/08/2003, *Aneesha & Joby 938*; Vilangankunnu, 02/10/2010, *Shahina & Sheba 3062* (DEV). **MADHYA PRADESH**: Harda district, Dhawa, 21/07/1964, *G. Panigrahi 4331*; Rohatgaon, 22/12/1962, *G. Panigrahi s.n.* (CAL). **MAHARASHTRA**: Akola district, Karanja, 03/09/1977, *S.Y. Kamble 150420;* Kashmar, 03/08/1977, *S.Y. Kamble 150301* (BSI). Bhandara district, Sarvatra Nagar, 14/09/1963, *R.S. Rao 91651* (BSI). Chandrapur district, Chichpalli Forest,

08/09/1963, *R.S. Rao 91334*; Khatasla Road, 13/08/1973*, B.M. Wadhwar 137314*; *Ibid.,* 22/08/1973, *B.M. Wadhwar 137452* (BSI). Dhule district, Northern Deccan, *s. die*, *D. Cloghora s.n.* (CAL). Osmanabad district, Ghatangiri Hills, 12/09/1964, *K.P. Janardhanan 100650*; Kasapkhori, 27/08/1963 *s.coll. s.n.* (BSI). Parbhani district, Aundha Hillslopes, 31/08/1963, *R.S. Rao 90927*; Jintoor, Chandandara Hills, 30/08/1963, *R.S. Rao 90874* (BSI). Pune district, Hadapsar Road, 20/08/1960, *K.C. Kanodia 65747*; Umberwadi felling series, 27/08/1977, *S.Y. Kamble 150162* (BSI). Wardha district, Arvi Range, 03/09/1962, *R.S. Rao 90665* (BSI). Yavatmal district, Khandala Forest, 01/09/1963, *R.S. Rao 90966* (BSI). **ORISSA**: Bhubaneswar district, Bhubaneswar, 27/08/1982, *H.O. Saxena 4983* (RRLB). Cuttack district, Katishy, 04/09/1968, *L.K. Banerjee 592*; Kuzang, 11/10/1971, *L.K. Banerjee 8383* (CAL). Ganjam district, Banji, Gandhamardan Hills, 18/10/1987, *Saxena & Brahmam 6042*; Ganjam, 15/08/1977, *Brahmam 2759* (RRLB). Sambalpur district, *s.loc*., 03/10/1949, *H.F. Mooney 3694*; Nayagarh, 20/08/1939, *H.F. Mooney s.n.* (DD). **TAMIL NADU**: Chennai district, Aliyar Beach, 30/09/1970, *T.A. Rao 7653*; Mahabalipuram, 27/09/1970, *T.A. Rao & A.R.K. Sastry 7580*; Venad Island, 27/02/1971, *A.R.K. Sastry 7830* (CAL); Nungambakam, 11/1900, *s.coll. s.n*. (MH). Coimbatore district, Agri. College Campus, 07/09/1968, *M. Chandrabose 29768*; Anamoolamalai, 16/08/1962, *C.P. Sreemadhavan 80* (MH); Bharatiyar University Campus, 27/11/2010, *Sheba & Santhosh Nampy 3981* (DEV); Maruthamalai, 09/09/1961, *R.V. Kammathy 73923* (BSI). Cuddalore district, Chidambaram, Killa, 28/12/1981, *K.M. Matthew, S.J. Britto & N. Rani 28665, 28669*; Cuddalore, 29/12/1981, *K.M. Matthew & S.J. Britto 28728* (RHT); Kollaimadu, 20/08/1930, *V. Narayanaswamy 4058* (MH). Dharmapuri district, Anchetty, 05/09/1978, *K.M. Matthew & N. Venugopal 16883*; Emanoor, Cauvery Banks, 07/12/1978, *K.M. Matthew 19770* (RHT, CAL). Dindigal district, Dindigal, 11/1962, *K.N. Subramanian 77539* (BSI); Kodaikanal, 21/10/2009, *Sheba & Santhosh Nampy 2286*; Palani, 09/11/2011, *Shahina & Sheba 4549* (DEV). Kanchipuram district, Chingalpet, *s. die*, *E. Barnes s.n.* (DD); Karikili Waterfall, 27/01/1976, *A.N. Henry 47087* (CAL, MH); Sithamur, 28/10/1914, s.*coll. 11184* (MH). Pudukkotai district, Kulathur, 09/03/1984, *K.M. Matthew & S.J. Britto 29672* (RHT); Poi Kari, 20/09/1957, *K. Subramanyam 4284* (CAL, MH). Ramanathapuram district,

Karaikkudi, 28/11/1977, *N.C. Nair 51764*; Paramakudi, 22/02/1933, *J. Sekharan Rao 21739* (MH); Vellamalai, 13/09/1965, *K. Ramamurthy 24700* (CAL, MH). Salem district, Krishnagiri, 24/12/1916, *s.coll. 13886* (MH). Tanjavore district, Point Calimere, 17/01/1961, *J.L. Ellis 11746*; Thiruthuaiponde, 11/11/1987, *S. Regupathy 481* (CAL, MH); *Ibid*., 11/1956, *Beddome 109* (CAL). Thirunelveli district, Thirunelveli, 13/11/2011, *Ancy & Sheba 5074* (DEV). Thiruvannamalai district, Tippukadu R.F., 20/11/1963, *K. Ramamurthy 17608* (CAL, MH); *Ibid*., 22/11/1963, *K. Ramamurthy 17670* (MH). Vellore district, Vellore, 18/12/1968, *s.coll. 15736* (MH). **UTTAR PRADESH**: Allahabad district, Allahabad, 21/10/1962, *G. Panigrahi 5529* (CAL). **WEST BENGAL**: Manbhum district, Gurlima, Shardiyeja, 08/11/1883, *C.B. Clarke 34343*; Manbhum, *s. die*, *Reed. J. Campbell 8175* (CAL). Puralia district, *s.loc.*, 15/11/1873, *C.B. Clarke 20874*; Ranaghur, Sohardugga, 11/10/1873, *C.B. Clarke 20903 D* (CAL).

Notes: *Commelina attenuata* and *C. appendiculata* are the only Indian species with seeds appendaged at both ends. But they are easily distinguished in the field by their spathe characters. The spathe is hastate at base and shortly pedunculate (0.8–2.5 cm long) in the former as opposed to deeply cordate–rounded at base and long pedunculate (2.5–7.5 cm long) in the latter.

5. Commelina benghalensis L., Sp. Pl. 41. 1753; Vahl, Enum. Pl. 174. 1805; Roth, Pl. Sp. 21. 1821; Wight, Ic. 29. t. 2065. 1853; Miq., Fl. Ned. Ind. 533. 1855; C.B. Clarke in A. DC & C. DC., Monogr. Phan. 3: 159. 1881; Hook.f., Fl. Brit. India 6: 370. 1892, in Trimen, Handb. Fl. Ceylon 4: 301. 1898; T. Cooke, Fl. Bombay 3: 291. 1906; C.E.C. Fisch. in Gamble, Fl. Madras 3: 1537. 1931; Panigrahi & Kammathy, J. Indian Bot. Soc. 43: 302. 1962; Mahesw., Fl. Delhi 340. 1963; Naik, Fl. Osmanabad 340. 1963; Mahesw., III. Fl. Delhi 203. 1966; R.S. Rao & D.M. Verma, Bull. Bot. Surv. India 16: 11. 1974; C.J. Saldanha & Nicolson, Fl. Hassan

Dt. 644. 1976; T.N. Srivast., Fl. Gorakhpurensis 321. 1976; Bennet, Fl. Howrah Dt. 103. 1979; B.M. Sharma & Kachroo, Fl. Jammu Pl. 1: 307. 1981; Manilal & Sivar., Fl. Calicut 297. 1982; N.P. Balakr., Fl. Jowai 2: 547. 1983; K.M. Matthew & Britto in K.M. Matthew, Fl. Tamil Nadu Carnatic 2: 1657. 1983; V. Singh, Fl. Banswara, Rajasthan 226. 1983; Blatt. & Hallb., Fl. Indian Desert 973. 1984; H.J. Chowdhary & Wadhwa, Fl. Himachal Pradesh 720. 1984; Guha Bakshi, Fl. Murshidabad Dt. West Bengal 325. 1984; B.D Sharma *et al.,* Fl. Karnataka 288. 1984; B.D. Naithani, Fl. Chamoli 2: 661. 1985; D.M. Verma & P.C. Pant, Fl. Raipur Durg & Rajnandgaon 388. 1985; P.C. Pant, Fl. Corbet National Park 157. 1986; R.S. Rao, Fl. Goa Diu Damen Dadra & Nagarhaveli 2: 443. 1986; Chandrab. & N.C. Nair, Fl. Coimbatore 298. 1987; V.S. Ramach. & V.J. Nair, Fl. Cannanore 481. 1988; P.V. Bole & J.M. Pathak, Fl. Saurashtra 3: 323. 1988; Kamble & S.G. Pradhan, Fl. Akola Dt. 229. 1988; A.N. Henry *et al*., Fl. Tamil Nadu 43. 1989; Karth. *et al*., Fl. Ind. Enum. Mon. 24. 1989; M. Islam, Fl. Majuli 326. 1990; Kesh. Murthy & Yogan., Fl. Coorg 479. 1990; Vajr., Fl. Palghat 516. 1990; Lakshmin. & B.D. Sharma, Fl. Nasik Dt. 479. 1991; S.K. Malhotra & Moorthy, Fl. Taroba National Park 137. 1992; G.P. Roy *et al*., Fl. Madhya Pradesh 440. 1992; L.K. Banerjee, Pl. Resources Jaldapara Rhino Sanctuary 60. 1993; Kumudranjan Naskar, Pl. Wealth Lower Ganga Delta 2: 642. 1993; B.V. Shetty & V. Singh, Fl. Rajasthan 2: 849. 1993; Noltie, Fl. Bhutan 3: 238. 1994; M.N. Sanyal, Fl. Bankuara Dt. West Bengal 441. 1994; A.K. Sharma & J.S. Dhakre, Fl. Agra Dt. 263. 1995; B.D. Uniyal *et al*., Pl. Diversity in Tehri Dam 116. 1995; B.D. Sharma *et al*., Fl. Maharashtra 3: 149. 1996; P.K. Hajra & D.M. Varma, Fl. Sikkim 1: 168. 1996; K.M. Matthew, III. Fl. Palni Hills 751. 1996; Sasidh. & Sivar., Fl. Thrissur Forest 473. 1996; Sivar. & P. Mathew, Fl. Nilambur

734. 1996; T. Pullaiah, Fl. Andhra Pradesh 3: 999. 1997; K.K. Singh, Fl. Dudhwa National Park 415. 1997; Ajaiswamy & B.K. Gupta, Fl. Udhampur 365. 1998; P.K. Bhattach., & Krishnendu Sarkar, Fl. West Champarani Dt., Bihar 407. 1998; K.M. Matthew, Fl. Palni Hills 3: 1340. 1999; P.G. Diwakar & B.D. Sharma, Fl. Buldhana Dt., Maharashtra 308. 2000; Faden in Dassan., Rev. Handb. Fl. Ceylon 14: 190. 2000; P. Daniel & Umamaheswari, Fl. Gulf Mannar 429. 2001; N.P. Singh *et al*., Fl. Bihar–Analysis 532. 2001; T.K. Sharma & A.K. Sarkar, Fl. Palamau Dt., Jharkhand 612. 2002; V.P. Singh & Ashok Kaul, Biodiv. & Veg. Pachmarhi Hills 177. 2002; P.J. Bora & Yogendra Kumar, Fl. Diversity Assam 360. 2003; S. Panda & A.P. Das, Fl. Sambalpur Orissa 376. 2004; N.D. Pararia & S.P. Chattopadhyay, Fl. Hazaribagh Dt. 964. 2005; H. Hara, Fl. East. Himalaya 400. 2008; Subba Rao & Kumari, Fl. Vishakhapatanam 290. 2008.

Type: India, *s.loc*., *s. die*, *s.coll*., Herb. Linneaus No. 65. 16 (LINN!)

Commelina nervosa Burm.f., Fl. Ind. 18. 1768.

Commelina cucullata L., Mant. Pl. 2: 176. 1771.

Commelina mollis Jacq., Collectanea 3: 235. 1789.

Plate 32, 33, 29e; Fig. 6

A much branched, sub-scandent annual herb, rooting from the basal nodes, with a definite base; roots long, thin fibrous. Cleistogamous flowers seen on underground stems. Stems terete, green with red striations; internodes *ca*. 11 cm long. Leaves distichous, petiole upto 1 cm long; sheath *ca*. 1. 5 cm long, strigose, ciliate at the summit with red hairs; lamina ovate or ovate-lanceolate, 4–9 × 2–4 cm, acute-rounded at apex, obtuse at base, undulate at margin, both surfaces puberulous.

Spathe basally fused, 0.5–1.7 × 0.5–1.2 cm, cucullate, pilose out, glabrous in, green; peduncle subsessile; upper cincinnus vestigial or exserted, *ca.* 10 mm long, ciliate, 1-male flowered; lower cincinnus *ca.* 6 mm long, glabrous 2 bisexual flowered. Sepals 3, white; medial boat shaped; laterals oblong, tinged with lavender, fused $3/4^{th}$ of its length. Petals 3; paired petals lilac or blue, widely ovate–deltoid, claws 2–3 mm long; odd petal light blue or white. Stamens 3; lateral stamen filaments slender, 4 mm long, anther blue, pollen white; medial stamen filament 3 mm long, lilac, anther yellow, curved, connective white, pollen yellow. Staminodes 3; filaments slender, lilac or blue, 2 mm long; antherodes yellow, 4 lobed with 2 lateral appendages. Ovary globose, yellow; style lilac-white, 4 mm long; stigma capitate. Capsule 1 per spathe, oblong-elliptic, trilocular, 5-seeded; dorsal locule 1 seeded; ventral locules 2 seeded. Seeds ovoid 2 × 1.5 mm; testa black–brown, furrowed reticulate, white farinose; hilum linear; embryotega lateral.

Chromosome numbers: n = 11, 2n = 22 (Ganguly, 1946; Sharma, 1955; Kammathy & Rao, 1961a; Shetty & Subramanyam, 1962; Panigrahi & Kammathy, 1964), 2n = 28 (Morton, 1956).

Flowering period: July–February.

Flowering time: 8.30–11.00 am.

Ecology: A common weed of agricultural fields; also found in road sides, seacoasts and in exposed shady or partially shady areas.

Distribution: Palaeotropical, also naturalized in the New World.

Specimens examined: **ANDAMAN & NICOBAR ISLANDS**: Middle Andaman, Mayabunder, 01/08/1974, *N. Bhargava. 2/1983* (PBL). South Andaman,

Brookesabad, 13/05/1973, *N.P. Balakrishnan 130* (PBL); Chidiya tapu, 24/09/2010, *Santhosh Nampy* & *Manudev 3127* (DEV); Havelock islands, 30/08/1977, *R.K. Premanath 5974* (CAL, PBL), 11/10/1985, *Barin Ghosh 11573* (PBL); Port Blair, Nayagaon, 28/09/2010 *Santhosh Nampy & Manudev 3193* (DEV). Great Nicobar, Campbell Bay, 02/10/2010, *Santhosh Nampy & Manudev 3580* (DEV); Car Nicobar, Head Quarters, 23/09/1976, *N.G. Nair 4498* (CAL, PBL). **ANDHRA PRADESH**: Adilabad district, Mirzapur, 08/12/1985, *T. Pullaiah & P.V. Prasanna 4113* (SKU). Anantapur district, Gooty Railway Station, 31/08/2010, *Sheba & Santhosh Nampy 3414* (DEV); Kalasamudram, 13/10/1984, *T. Pullaiah & E. Chennaiah 2815*; Mudigubba, 20/10/1990, *K.N. Ramakrishna 9822; Ibid.,* 20/10/1990, *Lakshmiaiah 27327* (SKU); Reddipalli Farm, 15/08/1981, *N. Yesoda 258* (MH); S.K. University Campus, 21/10/1982, *N. Yesoda 855* (MH, SKU). Chittoor district, Jammalakona, 27/09/1974, *G.V. Subba Rao 45820*; Neelithottikandriga, Satyavidu, 08/10/1974, *M. Chandrabose 45266* (MH). Cuddapah district, *s.loc*. 12/10/1938, *E.K. Krishnan s.n.* (DD); Lankomollegwara East, 27/11/1994, *S.R.S. Reddy 13388*; Palakonda Hills, 14/10/1988, *C. Subbarayudu 7722* (SKU); Sidhavattom Fort, 21/08/1958, *K. Subramanyam 6364* (MH). East Godavari district, Devarapalli, 30/07/2000, *K. Sampathkumar 23458* (SKU); Gaddada, 22/08/1995, *M. Mohanan 105090*; Gurjugulam, 13/08/1914, M.S. Ramaswamy *1676* (CAL); Sanalkotta, 30/04/1913, *s.coll. 80858* (MH). Hyderabad district, Osmania University Campus, 17/09/1961, *R.V. Kammathy 73968* (BSI). Karimnagar district, Bhupatipur, 23/07/1964, *G.V. Subba Rao 20203* (MH). Krishna district, Kondappalli R.F., 14/09/1984, *P. Venkanna 5312* (CAL, MH). Kurnool district, Ahobilam, 13/10/1996, *K. Indira 18713* (SKU); Budhawarpett, 16/09/1961, *R.V. Kammathy 73958* (BSI); Kamalapore, 09/1910, *A. Meebold 11375* (CAL); Kambagirikonda, 20/10/1997, *B.R.P. Rao 20008* (SKU); Nallamalai, 19/08/1921, *C.E.C. Fischer 4673* (CAL); Nisamsagar, 01/10/1962, *R.V. Kammathy 81295* (BSI); Pathalaganga–Srisailam, 20/10/1964, *J.L. Ellis 22110* (CAL, MH); Ponniaru, 29/08/1965, *J.L. Ellis 25567* (MH); Vengannabavi, 06/05/1984, *Ameer Ahammad 2062* (SKU). Medak district, Toopram, 27/09/1991, *B.R.P. Rao 11280* (SKU). Medinipur district, Alisagar, Flower Garden 30/09/1962, *R.V. Kammathy 81276* (BSI). Nellore district, Leguntapadu, 09/07/1995, *P.M. Rajeswaramma 16423* (SKU). Nizamabad district,

Morra–Malkagour Road, 26/09/1987, *T. Pullaiah & B.R.P. Rao 6097* (SKU). Prakasam district, Polavaram Agency, 20/09/1962, *P.C.S. Raju 333*; Yellampalli, 28/08/1983, *R.K. Mohan 0112* (CAL). Vishakapatanam district, Anakkapalli, 24/09/1921, *s.coll. 85619* (MH): Anantagiri, 24/09/1961, *N.P. Balakrishnan 786*; Nagarjunahonda Valley, 29/11/1961, *K. Thothathri 9836* (CAL); Simhachalam Hill, 07/10/1964, *G.V. Subba Rao 21497* (MH). **ARUNACHAL PRADESH**: Dibang Valley district, 13/08/2000, *Manas Bhaumik 2737* (CAL). Lohit district, Dalai Bridge, 24/09/1969, *A.S. Rao 48052* (ASSAM, CAL). District unknown, *s.loc.,* 1934, *N.L. Bor 27250* (ASSAM). **ASSAM**: Kamrup district, Guwahati, 05/09/2009, *Sheba & Santhosh Nampy 2259* (DEV); Singra River, 24/06/1964, *A.S. Rao 39074* (CAL). Lakhimpur district, Dergaon, Sibsagar, 19/10/1960, *G. Panigrahi 25899* (ASSAM); Lakhimpur, 31/08/2009, *Sheba & Santhosh Nampy 2242*, Opp. Siva Temple, 03/09/2009, *Sheba & Santhosh Nampy 2254*; Lakhimpur North, 31/08/2009, *Sheba & Santhosh Nampy 2243*; Laluk, 19/05/1966, *D.M. Verma 46521*; Prasaddhawa, 21/06/1964, *A.S. Rao 39018*; Sonaikhush, 21/08/1964, *N.P. Balakrishnan 39342* (ASSAM); Way to Tezpur, 04/09/2009, *Sheba & Santhosh Nampy 2258* (DEV); District unknown, *s.loc*., *s.die, Masters s.n*. (ASSAM). *s.loc*., *Bal 289* (CAL). **BIHAR**: Bhagalpur district, Bhagalpur–Patna Road, 13/11/2003, *Joby & Santhosh Nampy 1095* (DEV). Champaran district, Bhainsalatan, 11/08/1964, *S.P. Banerjee 98*; *Ibid*., 18/09/1965, *s.coll. 637*; Hazaria Colony, 11/11/1963, *B.V. Shetty 228*; Motihari, 18/08/1964, *S.P. Banerjee 216*; Naurangia, 12/09/1965, *S.P. Banerjee 439* (CAL). Gaya district, Gaya 10/10/1902, *J.D. Hooker 12* (CAL); *Ibid*., 10/10/1902, *Prain s.n.* (BSI). District unknown, *s.loc.,* 19/06/1965, *K.C. Kanodia 1269* (BSI). **CHATTISGARH**: Bastar district, Amkut, 08/09/1957, *G.S. Puri 23585* (BSI); Palahood, 15/11/1984, *G.P. Roy 35488* (CAL); Sardi, 08/09/1957, *G.S. Puri 23572* (BSI). **DAMAN**: Daman district, Murvar, 24/09/1963, *M.Y. Ansari 93525* (CAL); *Ibid*., 24/09/1963, *s.coll. 93525* (BSI). **GOA**: North Goa district, Basai, Tudal, 21/04/1963, *K.C. Kanodia 88200* (CAL, BSI); Chopora, 07/09/1965, *P.J. Cheriyan 106003*; Dudhsagar, 17/09/1970, *M.Y. Ansari 124075* (BSI); Panaji, St. Inez, 28/09/2002, *Joby & Santhosh Nampy 837* (DEV). **GUJARAT**: Barmal district, Baoda, 25/09/1958, *G.S. Puri 44344*; Chotar, 26/08/1951, *W.J. Stows s.n.*; Deshalpur, 16/09/1968, *R.S. Raghavan 114886* (BSI).

Bhavnagar district, Palitana, Chatruja Hill, 19/08/1960, *R.S. Rao 63777* (CAL, BSI); Ibid, *R.S. Rao 63727* (CAL). Kheda district, Kapadurg, 22/09/1957, *S.K. Jain 24423* (BSI). Rajkot district, Valamira, *A.V. Muro 63* (DD). Sabarkantha district, Raigharh, 24/09/2005, *P.J. Parmar 22754* (BSJO). Tapi district, Aho, 11/1915, *H. Sedquida 1103* (CAL). **HARIYANA**: Hissar district, Hissar, 17/10/1962, *N.C. Nair 24809, 24890*; *Ibid*., 18/10/1962, *N.C. Nair 24971* (CAL); *Ibid*., 18/10/1967, *V.J. Nair 36643* (BSD, CAL). **HIMACHAL PRADESH**: Champa district, Champa, 05/09/1898, *J.H. Lace 1832* (DD); *Ibid*., 20/09/1985, *Harndu 14084*; Durghatti, 23/07/1963*, V.J. Nair & C.L. Malhotra 28089*; Jogindar Nagar, 19/08/1977, *S.K. Murti & R. Prasad 61828*; Neerat, 21/08/1963, *N.C. Nair 28840*; Tissa, 30/07/1964, *N.C. Nair*, *32908* (BSD). Hamirpur district, Hamirpur, 01/08/1977, *M.V. Viswanathan 61419* (BSD). Kangra district, Dharamashala, 21/07/1963, *S.K. Malhotra 28765* (BSD, CAL). Kinnaur district, Jeori, 28/08/1963*, N.C. Nair*, *30008, 30024* (BSD, CAL); Sholtu, 13/10/1971, *K.P. Janardhanam 46675*; Wagtoo, 29/08/1963, *N.C. Nair 30039* (BSD). Lahul and Spiti district, Lara, Pin Valley National Park, 05/09/2002, *K. Chandra Sekhar 100797* (BSD). Shimla district, Boroji, 21/08/1963, *N.C. Nair 27854*; Mahasu, Rohru, 29/07/1965, *N.C. Nair 36196* (BSD). **JAMMU & KASHMIR**: Chenab Valley district, Balot–Chenab Valley, 10/09/1958, *T.A. Rao 7394* (BSD, CAL). Udhampur district, Basholi, 15/08/1986, *P.K. Hajra 82588*; Kud, 09/09/1958, *T. A. Rao 7321* (BSD). **JHARKHAND**: Hazaribagh district, Hazaribagh, 12/10/1883, *C.B. Clarke 33851* (DD). **KARNATAKA**: Belgam district, Jottibetta, Biligarirangan, 27/04/1962, *A.S. Rao 80373*; Sutargath, 04/11/1957, *S.D. Mahajan 24935* (BSI). Bengaluru district, Bengaluru, 10/1916, *R.D. Acland 210* (MH). Bidar district, Homnabad, 18/11/1978, *S.R. Ramesh & K.P. Sreenath KFP 4519* (CAL, JCB). Bijapur district, Badami, 15/09/1979, *S.R. Ramesh & B.R. Ramesh KFP 9292* (JCB). Hassan district, Hanbal, 07/10/1965, *C.J. Saldanha CS 10184, 10185, 10186, 10187*; *Ibid*., 20/09/1971, *K.N. Gandhi HFP 2057*; Hanchahalli, 06/07/1971, *T.P. Ramamoorthy HFP 1845*; Hassan, 13/08/1967, *C.J. Saldanha 10835* (JCB). Kolar district, Kolar, 10/07/1979, *P. Prakash KFP 8259* (JCB). Mangalore district, Kankanadi, 24/10/2010, *Sheba & Santhosh Nampy 3288* (DEV). Mysore district, Kakanara, 26/08/1964, *B.D. Naithani 21227* (CAL, MH); Mysore, 06/06/2010, *Sheba & Santhosh Nampy 3237*

(DEV); *Ibid*., 29/10/1964, *R.S. Raghavan 104032*; Nagarhola, 02/11/1963, *A.S. Rao 95451* (BSI). Raichur district, Lingsugar, 09/09/1974, *N.P. Singh 132795* (BSI). Tumkur district, Devarayanadurga, 15/05/1978, *C.J. Saldanha KFP 2131* (JCB); Namadachecheon, 30/08/1961, *R.S. Rao 73990* (BSI). **KERALA**: Alappuzha district, Alappuzha, 20/11/2010, *Sheba & Santhosh Nampy 4020*; Eramallur, 14/10/2001, *Santhosh Nampy 143* (DEV); *Ibid*., 08/09/1961, *R.V. Kammathy 73920* (BSI). Idukki district, Kattappana, Nedumkayam, 27/12/2001, *Santhosh Nampy 437*; Vagamon, 09/12/2010, *Shahina & Sheba 4048* (DEV). Kannur district, Muzhippilangadi, 13/09/1979, *V.S. Ramachandran 64085* (CAL, MH). Kollam district, Kodumon, 25/05/1978, *C.N. Mohanan 55697* (MH); Kollam, 18/11/1972, *Madhusudanan Pillai s.n.* (SNC); Opp. Sree Narayana College, 03/11/2010, *Sheba & Santhosh Nampy 4004* (DEV); Palaruvi, 10/09/2003, *Joby & Santhosh Nampy 958* (DEV). Kottayam district, Mukkuttuthara, 29/05/2010, *Sheba & Santhosh Nampy 3217* (DEV); Perunna, 26/07/1984, *V.T. Antony 575* (MH). Kozhikode district, Ambumala, Kakadampoil, 12/12/2001, *Santhosh Nampy s.n.*; Chelari, 02/08/2010, *Santhosh Nampy & Sheba 3247*; Chelannur, 10/12/2010, *Shahina & Sheba 4049*; Devagiri Botanical Garden, 03/12/2010, *Sheba & Santhosh Nampy 4047*; *Ibid*., 10/10/2001, *Santhosh Nampy 141*; Devagiri Campus, 04/11/2003, *Joby & Santhosh Nampy 1068*; Erappanthode, 29/07/2010, *Santhosh Nampy & Sheba 3245* (DEV); Medical College Campus, 24/06/2002, *Joby & Aneesha 445*; Muthappanpuzha, 18/07/2010, *Manudev & Sheba 3241*; Nandy, 03/08/2002, *Joby & Santhosh Nampy 484*; Thikkodi Beach, 03/08/2002, *Joby & Santhosh Nampy 482*; Ummalathurkavu, 28/10/2010, *Manudev & Sheba 3293* (DEV). Malappuram district, Adyanpara Waterfalls, 19/09/2004, *Joby & Binu 1087* (DEV); Calicut University Campus, 20/06/1971, *V.V. Sivarajan 1238* (CALI); *Ibid*., 08/12/2003, *Santhosh Nampy DC 519*; Chenekkal, 13/11/2001, *Santhosh Nampy 166*; Parappanangadi, 31/07/2003, *Joby & Santhosh Nampy 903* (DEV); Vadapuram, *Philip Mathew 34557* (CALI). Palakkad district, Nelliyampathy, 19/11/2010, *Shahina & Sheba 4023* (DEV); Olavakkode, 16/10/1963, *J. Joseph 17707* (MH). Pathanamthitta district, Achenkovil, 11/09/2003, *Joby & Santhosh Nampy 971*; Chengannur, 01/11/2010, *Sheba & Santhosh Nampy 4002*; Kizhakkupuram, 06/11/2010, *Sheba & Santhosh Nampy 4010*; Laha, 30/05/2010, *Sheba & Santhosh*

Nampy 3227; Mannaramala, 08/11/2010, *Sheba & Santhosh Nampy 4013* (DEV); Pathanamthitta, 03/11/1994, *Anilkumar 16075* (TBGT). Thiruvananthapuram district, Ponmudi, 20/12/2003, Joby *&* *Santhosh Nampy 1181* (DEV); Thiruvananthapuram, 07/11/1918, *R.D. Acland 448* (MH); *Ibid*., 03/03/1952, *K. Rajappan s.n*. (SNC). Thrissur district, Athirappally, 16/08/2003, *Aneesha & Joby 943*; *Ibid*., 21/10/2009, *Santhosh Nampy 1579*, 21/11/2010, *Sheba & Santhosh Nampy 4021* (DEV); Kannamkuzhi, 14/04/1977, *K. Ramamurthy 49342* (CAL, MH). Wayanad district, Muthanga, 29/11/2003, *Rathish & Shibin 1232*; Poomala, 26/10/2010, *Sheba & Santhosh Nampy 3291*; Vythiri, 19/01/2010, *Santhosh Nampy & Sheba 3209* (DEV). **LAKSHADWEEP**: Kalpeni island, 23/11/1960, *B.M. Wadhwa 64814* (BSI). **MADHYA PRADESH**: Guna district, Dongar, 26/01/1964, *C.M. Arora 5506* (CAL). Hoshangabad district, Bori R.F., Pachmari Road, 06/10/1960, *J. Joseph 11262* (CAL, MH); Hoshangabad, 28/09/1960, *J. Joseph 11088* (MH). Mahasu district, Rampar–Geori, 14/09/1963, *N.C. Nair 30669*; Robru, 29/07/1965, *N.C. Nair 36196* (CAL). Mandla district, Babhara, 07/09/1957, G.S. *Puri 23089*; Gadatha, 08/09/1957, *S.B. Bhagawat* 23746 (BSI); Mandu, 11/09/1959, *G.S. Puri 26368* (BSI); Mangalkanj, 21/08/1962, *J. Joseph 14490* (CAL, MH); Tikamargh district, Kolivillage, 15/09/1980, *D.M. Verma 30750* (CAL). **MAHARASHTRA**: Aurangabad district, Ajantha caves, 03/09/2010, *Santhosh Nampy & Sheba 4280* (DEV). Chandrapur district, Chichpalli, 08/09/1963, *R.S. Rao 91320* (BSI). Mumbai district, Araey Milk Colony, Goregaon, 22/09/1958, *S.C. Tavakari T1786 a & b*; Baroda Public Park, 16/10/1954, *G.L. Shah Shah 884*; Byculla, 09/1925, *R.D. Acland ACK 1227*; Central Diary, 22/09/1958, *S.C. Tavakari 1787A*; Chotila Plains, 24/08/1952, *H. Santapau 14793*; Kondapalli, Krishna, 24/08/1956, *S.K. Wagh SKW 3184*; Malad, Ghod Bulu Road, 10/08/1954, *G.L. Shah Shah 171*; Marve, Malad, *G.L. Shah Shah 7847*; Mora, 11/09/1960, *P. Divakar PD 1459*, *D.R. Patel s.n*. (BLAT); Rajkot, Jubilee Gardens, 25/08/1952, *H. Santapau 14816*; Sadivayal, 09/07/1961, *A.N. Henry ANH 1477*; Shahapur, 14/10/1967, *K.V. Billore 111805* (BSI). Nasik district, Chopadra, 07/09/1965, *P.J. Cherian 106003* (CAL); Sawarna, 15/09/1967, *John Cherian 111384* (BSI). Parbhani district, Aundh, 31/08/1963, *R.S. Rao 90904*; Bombay–Agra Road 481st Point, 27/09/1963, *R.S. Rao 92462* (BSI). Pune district, Hadapsar, 02/09/2010, *Sheba & Santhosh Nampy 3259*;

Koregaon Park, 05/09/2010, *Sheba & Santhosh Nampy 3275*; Manjari, 02/09/2010, *Sheba & Santhosh Nampy 3258*; Nigadi, 03/09/2010, *Sheba & Santhosh Nampy 3265*; Parvati Hill, 22/07/1960, *B.M. Wadhwa 64399*; Purandhar, 20/07/1963, *R.S. Rao 88643* (BSI); Rajgurunagar, 05/09/2010, *Sheba & Santhosh Nampy 3271*; Ramtekady, 02/09/2010, *Sheba & Santhosh Nampy 3262* (DEV); Singhaghad, 09/08/1956, *G.S. Puri 6003* (CAL); *Ibid*., 05/09/2010, *Sheba & Santhosh Nampy 3424* (DEV). Raigarh district, Panvel, 05/10/1963, *M.Y. Ansari 94224* (BSI). Satara district, Mahabaleswar, 04/09/2010, *Sheba & Santhosh Nampy 3370* (DEV). Thane district, Sholapur, 14/10/1967, *K.V. Billore 111803* (CAL). **MANIPUR**: Thoubal district, Thoubal, 11/1907, *A. Meebold 6195* (CAL). **MEGHALAYA**: East Khasi Hills district, *s.loc.,* 27/09/1960, *H. Deka 18189* (ASSAM). Jowai district, Jowai, 09/09/2009, *Sheba & Santhosh Nampy 2273*; *Ibid*., 01/09/2011, *Santhosh Nampy 4730* (DEV). Ribhoi district, Nongpoh, 27/06/1962, *R.V. Kammathy 81216* (BSI). West Khasi Hills district, Umsaw, 14/11/1957, *G.K. Deka 9165* (CAL). **ORISSA**: Bhubaneswar district, Bhubaneswar, 27/09/1971, *H.O. Saxena* 187; *Ibid*., 20/01/1972, *H.O. Saxena 285* (RRLB); *Ibid*., 03/12/2011, *Sheba & Santhosh Nampy 3753* (DEV). Ganjam district, Bhitarkanika, 06/02/1962, *G. Panigrahi 23736* (ASSAM, CAL); Blaugaon, Chilka Lake, 08/08/1913, *J.D. Hooker 39558*; Ekrapur, 06/09/1995, *U.P. Samadder 224* (CAL); Ghatkunda Forest, 08/12/1962, *G.V.S. Rao 30055* (ASSAM, CAL); Paikmal, 10/1959, *G. Panigrahi* 21054 (CAL). Puri district, Puri, 20/03/1964, *V. Abraham 237* (CAL). **PONDICHERRY**: Pondicherry, Auroville, 16/07/1989, *R. Rajan 91531* (MH). **PUNJAB**: Bilaspur district, Bilaspur, 26/09/1977, *Pritamlal 63368*; Nalah Bus Stand 27/09/1977, *Pritam lal 63010*; Tanda, 13/09/1979, *P. Daniel 67390* (BSD). Gurdaspur district, Batala–Khanuwan, 24/06/1969, *V.C. Bhattacharya 37785* (BSD, CAL). Hisar district, Between Jaid & Hansi, 17/10/1962, *N.C. Nair 24809*; Bitmada, Cattle grazing area, 17/10/1962, *N.C. Nair 24890*; *Ibid*., 20/10/1962, *N.C. Nair 25025*; Hisar, 18/10/1962*, N.C. Nair 24971* (BSD). Hoshiarpur district, Lajapatrai Road, 26/08/1970, *O.P. Misra 41522* (BSD, CAL); Khansala, 14/08/1962, *V.J. Nair 23234*; Nangal, 13/07/1971, *O.P. Misra 44479*; Nara, F.R.H, 20/08/1977, *J. N. Vohra & P. Daniel 60304*; (BSD). Karnal district, *s.loc*., 25/08/1959, *J.N. Vohra 8891* (BSD). District unknown, Punjab, 09/1872, *J.E.T. Aitchinson 169* (CAL). **RAJASTHAN**: Alwar district,

Minak Forest, 27/10/1983, *P.J. Parmar 9615* (CAL, BSJO); Lohargal, 09/1960, *N.C. Nair 979* (BSD); Pandupole, 23/10/1983, *P.J. Parmar 9487* (BSJO). Banaswara district, Deriwali Dondgri, 24/09/1961, *K.C. Kanodia 75170* (BSI); Paloda, 18/08/1976, *V. Singh 2840* (CAL, BSJO). Barmer district, Baletra–Barmer Road, 17/10/1975, *B.V. Shetty 2218* (CAL, BSJO). Churu district, Blutiajodi, 28/07/1976, *G.P. Roy 2779* (CAL, BSJO). Jaipur district, Amer, 20/09/1964, *S. Sharma 832* (CAL). Jaisalmer district, Phalsand, 22/08/1964, *B.M. Wadhwa 4785* (CAL). Jhunjhunu district, Ajit Sagar Dam, 12/09/1992, *P.J. Parmar 11011*; Kho Village, 05/10/1994, *P.J. Parmar 12295* (BSJO). Jodhpur district, Kailana–Cazri Afforestration Camp V, 12/09/1972, B.V. Shetty *84* (BSJO); Mondore Garden, 14/09/1973, *G.L. Tiwari 628* (CAL, BSJO). Kota district, Jhalwan, 16/09/1964, *B.M. Wadhwa 7439*; Puraniya, 18/08/1963, *D.M. Verma 764* (CAL). Pali district, Bijapur R.F., 30/08/1975, *B.V. Shetty 1955* (CAL, BSJO); Eripura, 01/10/1960, *R.S. Rao, 66798* (BSI); Shaliabad, 13/08/1963, *D.M. Verma 635* (CAL). Sirohi district, Mount Abu, 28/09/1953, *M.B. Raizada 20590* (DD); *Ibid*., 28/09/1960, *R.S. Rao 67244* (BSI). Sri Garganagar district, Loyalpuriya, 11/10/1977, *G.P. Roy 4994* (CAL, BSJO). **SIKKIM**: East Sikkim district, Rungpo, 25/05/1909, *Kari 1480*; *Ibid*., 07/05/1885, *G.K. Gammie s.n.* (CAL). North Sikkim district, *s.loc*., *s. die, N.C. Mazumder & R.M. Dutta 254* (CAL). **TAMIL NADU**: Chennai district, Egmore, Museum Camp, 12/1899, *s.coll. s.n.* (MH); Layola Campus, 07/06/1955, *J. Pallithanam 378*; *Ibid.,* 17/07/1955, *J. Pallithanam 544* (RHT); Madras Christian College Campus, 06/10/2010, *Santhosh Nampy & Manudev 4238* (DEV). Coimbatore district, Agri. College Campus, 14/11/1965, *M. Chandrabose 28811* (MH); *Ibid*., 21/11/1965, *M. Chandrabose 28835* (CAL); Aliyar Submergible Area, 28/07/1962, *K.M. Sebastine 14682* (CAL, MH); Amaravati House, 09/11/1986, *K.M. Matthew 47060*; Amaravati Dam, 10/11/1986, *K.M. Matthew 47197* (RHT); Anamalai, 12/09/1961, *J. Joseph 13314* (MH); Attakatti, 05/07/1961, *J. Joseph 12717* (CAL, MH); Bharatiyar University Campus, 27/11/2010, *Sheba & Santhosh Nampy 3980* (DEV); Chinnathadagam, 22/08/1956, *K.M. Sebastine 582* (MH); Coimbatore, 14/11/1905, *C.E.C. Fischer 648* (CAL); Ganapathy, 27/12/1964, *M. Chandrabose 28662*; Gobichettipalayam, 28/11/1931, *S.R. Raja 6217*; Hassanur, 21/08/1914, *K.C. Jacob 10539*; Kurudimalai, 27/08/1956, *K. Subramanyan 624*;

Madukkarai, 09/08/1962, *C.P. Sreemadhavan 33* (MH); Maruthamalai, 28/11/2010, *Sheba & Santhosh Nampy 4028* (DEV); Noyil Riverside, 01/08/1968, *M. Chandrabose 30545*; Palamalai, 23/08/1929, *V. Narayanaswamy 19115*; *Ibid*., 05/09/1969, *M.V. Viswanathan 123*; Saibaba Colony, 03/07/1968, *M. Chandrabose 30506*; *Ibid.,* 03/08/1968, *M. Chandrabose 30598*; Siruvani, 13/08/1960*, A.N. Henry ANH 165* (BLAT); *Ibid*., 26/01/1932, *M. Ramavelu 49*; Siruvani–Sandivayal, 13/08/1960, *A.N. Henry 164*; Thekkumalai, 09/07/1956, *K.M. Sebastine 197* (MH). Dharmapuri district, Bommidi, 26/08/1978, *G. Perumal & C. Manoharan 16770*; Dharmapuri, 16/11/1979, *K.M. Matthew 24651*; Harur, Alavur, 12/08/1978, *K.M. Matthew 16327*; Kalrayan, 23/08/1978, *K.M. Matthew, Perumal & Manoharan 16491*; Thirthamalai–Kottappati, 16/01/1979, *N. Venugopal 21071* (RHT). Dindigul district, Adalur road, 06/08/1985, *K. M. Matthew 4196* (RHT); Gandhigram Campus, 20/09/2001, *Jojo & Santhosh Nampy 134* (DEV); Kodaikanal, 29/09/1956, *J. Pallithanam 2512* (RHT); *Ibid*., 16/10/2009*, Sheba & Santhosh Nampy 3279* (DEV); Kodaikanal Ghat, Mile-6, 02/07/1901, *Bourne 2071* (MH); Kodaikanal, Malakottai, 04/01/1963, *R.V. Kammathy 82641* (BSI); Kumbakarai, 17/09/1961, *K.M. Sebastine 12945* (CAL, MH); Law's Ghat Road, 08/08/1987, *K.M. Matthew & K.T. Matthew 49982*, *49984*; *Ibid*., 02/11/1987, *K.M. Matthew 50957*; Palani, 27/11/1985, *K.M. Matthew & N. Rajendran 43233*, *43240*; Shambaganur-Periakulam, 05/07/1987, *K.M. Matthew 49856*, *49865* (RHT); Sirumalai, *J. Pallithanam 773*, *3027,* 11/1958, *J. Pallithanam 3569, 3593*; *Ibid*., 17/12/1959, *J. Pallithanam 5441*; Theni to Veerappankoil, 19/11/1987, *K.M. Matthew 51492* (RHT). Kanchipuram district, Chingelpet, Vedanthangal, 27/09/1974, *A.N. Henry 45473* (MH). Nilgiri district, Bandipore, 11/1889, *s.coll. 52168* (MH); Castle Rock, 10/1908, *A. Meebold 10302*; Coonoor, 15/12/1976, *D.I. Arockiasamy 5569* (RHT); Komatipallam, 23/08/1970, *G.V. Subba Rao 36241*; Segur Riverbank, 25/08/1970, *G.V. Subba Rao 36320* (MH). Ramanathapuram district, Erani Forest, 12/09/1965, *K. Ramamurthy 24686* (MH); Mathur, Karaikudi, 28/11/1977, *N.C. Nair 51762* (CAL, MH); Northern part of Island, 21/12/1960, *T.A. Rao 562* (CAL); Paramakudi, 23/12/1989, *V. Balasubramaniam 2291*; Periyankulam, 21/08/1964, *K. Ramamurthy 21016* (MH); Sethukarai, 23/12/1986, *V. Balasubramaniam 1158*; Uttarakosamangai, 01/01/1988, *V. Balasubramaniam 1520* (MH). Salem district,

Kolli Hills, 09/02/1979, *P. Perumal 21737*; Mettur, 17/12/1976, *K.M. Matthew, 5742*; *Ibid*., 20/12/1976, *K.M. Matthew & V. Alphonse Raj 5940*; Namakkal, 16/10/1978*, M. Venugopal, 18231*; *Ibid*., 10/12/1978, *K.M. Matthew 19958*; Omellur, Jalekandapuram, 08/12/1978, *K.M. Matthew 19820* (RHT); Pagoda Point, Yercadu, 05/05/1965, *S. Karthikeyan 26829* (CAL, MH); Palamalai Estate, 03/12/1987, *K.M. Matthew 51845* (RHT). Thanjavore district, Kodikkarni, 01/02/1987, *S. Regupathy 103* (MH); Mullakudy, 24/09/1967, *K.M. Matthew 7843*, 01/10/1967, *K.M. Matthew 7913* (RHT). Theni district, High wavy mountain, *Blatter & Hallberg 844* (CAL); Periakulam, Below Dam Site, 23/11/1985, *K.M. Matthew, A. Usha & N. Rajendran 43204* (RHT); Vannathiparai, 18/09/1925*, K.C. Jacob 17736* (CAL, MH). Tiruchirappally district, Ammasatram, 30/01/1969, *s.coll 9857*; Gunaseelam, 14/11/1975, *K.M. Matthew & C. Rajamani 84*; Lalgudi, 17/11/1978, *K.M. Matthew, C. Manoharan & S. Alamelu 19133*; Narthamalai, 20/10/1970, *K.M. Matthew 12845*; Oosipalam, 28/12/1976, *K.M. Matthew 5656* (RHT); Perumal, 04/02/1913, *Saulieres 63*; *Ibid.,* 20/03/1913, *Saulieres 801* (CAL); Pithadiyankoil, 20/11/1976*, K.M. Matthew 4897*; Sengattupatty, *K.M. Matthew 11976*; S.J. College, 16/11/1982, *S.J. Britto 29285*; Srirangam, 29/08/1968, *K.M. Matthew 8820*; *Ibid*., 15/12/1975, *K.M. Matthew 309* (RHT); Trichy, 20/06/2009, *Sheba & Santhosh Nampy 3206* (DEV); *Ibid*., 1884, *s.coll. 72895* (MH); Shevaroy Hills, *s. die*, *Perottet 198* (CAL). Thirunelveli district, Courtallam, 01/10/1975, *K.K.N. Nair 1253* (CALI); Palayamkottai, 10/1835, *Wight 2848* (MEL); Papanasam, 05/07/1959, *K.M. Sebastine 8296* (CAL, MH); Valavallam, 28/12/1943*, D. Daniel s.n.* (MH). Thirupur district, Amaravati Sangaram, 22/06/1968, *D.B. Deb 30116* (CAL, MH). Thiruvannamalai district, Kanguindi, 05/1914, *s.coll 10325* (MH); Komattiyur, 14/12/1958, *K. Subramanyam 7477* (CAL, MH); Madencherry, 21/01/1985, *M.B. Viswanathan 793* (MH). District unknown, *s. die*, Herb. *Wight 1152* (CAL). **TRIPURA**: Agarthala district, Tipperah Hill, 26/09/1914, *P.M. Debbarmann 46* (CAL). **UTTARAKHAND**: Bageswar district, Kumaon Tawaghat, 04/10/1975, *C.M. Arora 56701*; Vikas Nagar, 20/07/1985, *J.P. Sharma 77879* (BSD). Chamoli district, Bhyundar Valley, 09/1973*, B.M. Wadwa 62407*; Nandprayag, 27/08/1978, *Panigrahi & Wadhwa 65449* (BSD). Dehradun district, Bimolal, 30/07/1964, *C.R. Babu 33275*; Bridalrao, 20/09/1961, *S.K. Malhotra 18017*

(BSD, CAL); Dehradun, 01/10/1947*, H.F. Mooney 2899*; *Ibid*., 15/10/1966, *H.B. Naithani s.n.*; Harbanuwalla, 1879, *W. Bell s.n*. (DD); Kaularghat Road, 08/1994, *Surendra Singh 89132*; Kulhal, 29/07/1985, *J.P. Sharma 77930*; Mothranwala, 30/08/1958, *K.M.M. Dakshini 7243* (BSD); Near Forest, 09/1938, *M.B. Raizada s.n.* (DD). Mussoorie district, Mussoorie, 07/09/1961, *Hari Om Saxena 1095* (DD); Sahastradhara, 23/09/1961, *S.K. Malhotra 17203*; Sarbanowalla, 02/1879, *W. Bell s.n.* (CAL); *Ibid*., 03/08/1962, *S.K. Malhotra 22793* (BSD, CAL); Tastares, *E. Barnes s.n.* (DD). Nainital district, Haldwani, Kumvarpur, 01/10/1987, *V. Singh 313* (BSD). Tehri district, Chamm, 02/1979, *A.K. Goel 67864* (BSD); Tehri–Garhwal, Riafil, 23/10/1890, *J.D. Hooker 2099* (DD). Uttarkashi district, Mori-Natwar, 17/09/1985, *S. Singh 89936* (BSD). **UTTAR PRADESH**: Allahabad district, Agra, 09/1842, *Jameson s.n*. (DD); C.C. Compound, 28/08/1962, *C.M. Arora 3881*; Kulbhaskar Ashram, 13/12/1964, *s.coll. s.n.* (CAL). Banda district, Chitrakut, 26/10/1961, *M.A. Rao 18213* (BSD). Bijnore district, Najibabad, 04/11/1979, *J.P. Sharma 67165* (BSD). Faizabad district, Ghaghra, 06/08/1959, *Y.K. Sarin 8474* (BSD). Hoshiarpur district, Nangal, 13/07/1971, *O.P. Misra 44479* (CAL). Jyotiba Phule Nagar district, Basipur, 09/1864, *Brandis 3337* (CAL). Kheri district, Lakhimpur, 31/08/1962, *C.L. Malhotra 23575* (BSD). Meerut district, Meerut, 15/08/1961, *Y.S. Murthy & V. Singh 1223* (BSI). Mirzapur district, Mirzapur, 18/09/1961, *Bhattacharya 17594* (BSD); Minatpura, 06/06/1898, *Inayat 22843* (DD). Muzaffarnagar district, Tissa, 30/07/1964, *N.C. Nair 32908* (CAL). Pilibhit district, *s.loc*., 01/10/1970, *C.L. Malhotra 42356* (BSD, CAL); Kotwa Rest House Campus, 19/10/1964, *G. Panigrahi 3051* (CAL); Mallowrao, 15/10/1970, *G.V.S. Rao 40088* (BSI). Rewa district, Jarwa, Nepal boarder, 28/08/1960, *M.A. Rao 12082* (BSD); Piparli, 10/08/1986, *R. Prasad 38272, 38287* (CAL). Sharanpur district, Behat, 06/1983, *Y.S. Murti & A.K. Goel 305* (BSD). Udampur district, Udampur, 06/10/1986, *Ajay Swami 622*; Aerodrome Road, 03/07/1986*, Ajay Swami 740*; Bauda, 30/09/1961, *U.C. Bhattacharya 17970* (BSD). **WEST BENGAL**: Birbhum district, *s.loc.*, 28/08/1877, *G. King s.n.*; Kotasur, 23/07/1966, *R.K. Basak 445* (CAL). Burdwan district, Tejguj Burdhwan, 12/05/1960, *A.K. Dutta 163* (CAL). Darjeeling district, Darjeeling*, s. die, s.coll. 00606* (NBU); Kalimpong, 03/06/1959, *s. coll s.n.* (CAL); Kurseong, Way to Darjeeling, 29/08/2009, *Sheba & Santhosh*

Nampy 2232; Siliguri, 28/08/2009, *Sheba & Santhosh Nampy 2226* (DEV), *ibid*., *s. die*, *s.coll. 2975* (NBU). Jalpaiguri district, Madari Hat, 27/051944, *S.K. Mukharjee* 1071 (DD). Hoogly district, Chandan Nagar, 13/12/1964, *M.K. Ghosh 2627*; Gobba, 26/11/1967, *Aubir Jew s.n.*; Gonghat, 08/1902, *G. Hosein s.n.*; Pargopamager, 11/08/1969, *K.C. Malick 6* (CAL). Howrah district, Baluhati, 05/11/1963, *S.S.R. Bennet 418*; Botanic Garden, 13/07/1958, *D. Chatterjee 711* (CAL); *Ibid*., 01/12/1959, *G.K. Dek 1968* (ASSAM); Howrah, 10/1953, *J.N. Naskar s.n.* (CAL). Malda district, Gour Roadside, 18/11/1965, *R.M. Dutta 33*; Madhebpur, 23/10/1983, *R.N. Banerjee 159110*; Manikchand, 21/08/1966, *R.M. Dutta 399* (CAL). Murshidabad district, Murshidabad, *s. die*, *D.N. Guhabakshi 250* (CAL). 24–Parganas district, 24 Pergumah, Gobardanga, 09/08/1961, *G. Sengupta 58* (CAL). Purulia district, Bishanpur Shana, Coch Bina River, 03/10/1964, *M.N. Sanyal 318*; Karyar Hill, 25/07/1963, *U. Chatterjee & D.K. Banerjee 340*; Panchkot, 27/08/1966, *K.P. Malik 456*; Sriniketan, 11/1964, *G.P. Guha s.n.* (CAL). West Dinajpur district, Balurghat, 26/10/1983, *R.N. Banerjee 15990* A; *Ibid*., 21/10/1961*, D.K. Banerjee 46*; Deshurgarh, 26/09/1972, *R.N. Banerjee 117* (CAL). District unknown, Chotanagar, 05/10/1873, *C.B. Clarke 10177* (CAL); *s.loc*., 12/1866, *S. Kurz s.n*. (CAL).

Notes: *Commelina benghalensis* is the widely distributed species in India. It is easily distinguished by its cleistogamous flowers from subterranean stems, usually ovate and puberulous leaves, red hairs on the sheath summit and furrowed reticulate seeds. The flowers are generally blue, but also lilac, pale purple and lavender.

6. Commelina caroliniana Walter, Fl. Carol. 68. 1788; Faden, Taxon 38: 45. 1989; Ann. Missouri Bot. Gard. 80: 208. 1993; Noltie, Fl. Bhutan 237. 1994; V. Kaul & A.K. Kaul, Rheedea 17: 56. 2007.

Type: United States, South Carolina, *Walter* (or Fraser?) *s.n.,* Walter Herbarium, P. 35 upper right hand corner (BM! lectotype designated by Faden, 1989).

Commelina hasskarlii C.B. Clarke, Commelyn. Cyrtandr. Bengal 13, t.3. 1874; in A. DC & C. DC., Monogr. Phan. 3: 157. 1881; Hook.f., Fl. Brit. India 6: 370. 1892; Woodr., J. Bombay Nat. Hist. Soc. 12: 524. 1899; T. Cooke, Fl. Bombay 291. 1906; Bamber, Pl. Punjab 281. 1916; C.E.C. Fisch. in Gamble, Fl. Madras 3: 1535. 1931; Haines, Bot. Bihar Orissa 3: 1125. 1961; Panigrahi & Kammathy, J. Indian Bot. Soc. 43: 301. 1962; Maheshw, Fl. Delhi 340. 1963; R.S. Rao & D.M. Verma, Bull. Bot. Surv. India 16: 11. 1974; N.P. Balakr., Fl. Jowai. 2: 549. 1983; B.V. Shetty & R.P. Pandey, Fl. Tonk, Rajasthan 189. 1983; V. Singh, Fl. Banswara Rajasthan 227. 1983; B.D. Sharma *et al.,* Fl. Karnataka 289. 1984; Karth. *et al.,* Fl. Ind. Enum. Mon. 25. 1989; S.K. Malhotra & S. Moorthy, Fl. Taroba National Park 137. 1992; B.V. Shetty & V. Singh, Fl. Rajasthan 2: 849. 1993; B.D. Sharma *et al*., Fl. Maharashtra 154. 1996; T. Pullaiah, Fl. Andhra Pradesh 3: 1002. 1997; P.G. Diwakar & B.D. Sharma, Fl. Buldhana Dt. Maharashtra 309. 2000; V.P. Singh & Ashok Kaul, Biod. Veg. Pachmarhi Hills 178. 2002; N.D. Paria & S.P. Chattopadhyay, Fl. Hazaribagh Bihar 965. 2005.

Type: India, West Bengal, Purulia district, Rajmahal Hills, *C.B. Clarke s.n.* (CAL!, lectotype designated here).

Commelina rajmahlensis C.B. Clarke, J. Linn. Soc., Bot. 11: 444. 1871, Cyrtandr. Bengal. t.7. 1874.

Type: India, West Bengal, Purulia district, Rajmahal Hills, 10/1867, *S. Kurz s.n.* (CAL!, lectotype designated here). **Plate 34, 29f; Fig. 7**

Diffusely spreading, perennial herb, rooting at the nodes, lacking a definite base; roots long, thin, fibrous. Stems terete, green with red striations; internodes 5–6

cm long. Leaves distichous; sheath *ca*. 1 cm long, strigose, ciliate at apex, mottled with red striations; lamina ovate–lanceolate, 2–6 × 0.5–1 cm, acute at apex, cuneate at base, serrulate at margins, both surfaces glabrous. Spathes leaf opposed, broadly cordate, 1.5–2 × 0.5 cm, conduplicate, acuminate at apex, ciliate towards base and margin, serrulate, pubescent out, glabrous in, green; peduncle *ca*. 1 cm long, strigose; upper cincinnus vestigial, 0.5–1 cm long, rarely exserted, ciliate; lower cincinnus 0.5 cm long, ciliate, 1–3 bisexual flowered. Sepals 3, free, transparent; medial boat shaped; laterals orbicular. Petals 3, pale blue; paired petals deltoid, claws *ca*. 2 mm long; odd petal obtuse, claw absent, apex blunt. Stamens 3; lateral stamen filaments slender, 4 mm long, pale blue, anthers brown at the dehiscing area; medial stamen anther yellow, curved, connective white. Staminodes 3; filaments slender, 3 mm long, pale blue; antherode yellow, 4–lobed with 2 lateral appendages, red at centre; Ovary elliptic, oblong, yellow; style lilac–white, 4 mm long; stigma yellow, capitate. Capsule 1 or 2 per spathe, ovate–elliptic, trilocular, 5-seeded; dorsal locule 1 seeded; ventral locules 2 seeded. Seeds 5, ovate–elliptic, truncate at one end, sub–acute at the other end; testa dark brown, smooth, white farinose; hilum linear; embryotega lateral.

Chromosome number: n = 45 (Raghavan & Rao, 1961; Kammathy & Rao, 1964; 1965).

Flowering period: July–November.

Flowering time: 8.00–11.00 am.

Ecology: Edge of wet paddy fields, roadsides, ditches and stream sides.

Distribution: Native to India and Bangladesh. Also in Guam, Philippines and United States.

Specimens examined: ANDAMAN NICOBAR ISLANDS: Middle Andaman, Nimbundera, 26/07/1974, *N. Bhargava 1870* (CAL, PBL), *1879* (PBL). South Andaman, Chidiya Tapu, 24/09/2010, *Santhosh Nampy & Manudev 3142*; Kadamthala, 25/09/2010, *Santhosh Nampy & Manudev 3155*, *3156* (DEV); Nallah, 25/07/1976, *N. Bhargava 4234* (PBL). **ANDHRA PRADESH**: Adilabad district, Basara–Pergumah, 13/12/1883, *C.B. Clarke 34470 C*; Bijjur, 27/08/1987, *Obelasu & P.V. Prasanna 4852*; Birsaipet R.F., 14/12/1986, *Obelasu & P.V. Prasanna 4596*; Sattanapalli Beat, 08/12/1985, *T. Pullaiah & P.V. Prasanna 4099* (DD). East Godavari district, Bhadrachalam, 02/1885, *J.S. Gamble 16036* (CAL, MH). Karimnagar district, Pechapalli, 23/12/1964, *G.V. Subba Rao 22263* (CAL, MH). Kurnool district, Chelema Riverside, 8/12/1963*, J.L. Ellis 17999* (CAL, MH). Warangal district, Kanapur R.F., 24/11/1960, *K.M. Sebastine 11580* (CAL, MH). **ASSAM**: Marigauon district, Amlighat, 22/08/1964, *N.P. Balakrishnan 39366* (ASSAM, CAL). **BIHAR**: Bhagalpur district, Bhagalpur-Patna Road, 14/11/2001*, Joby & Santhosh Nampy 1094* **(**DEV). Champaran district, Kulli & Sibanpur, 05/12/1917, *H.K. Sen 25*; Mazaria Colony, 11/11/1963, *B.V. Shetty 229*; Ramghurghat, Loghailagga, 19/10/1883, *C.B. Clarke 33911* (CAL). District unknown, South Bihar, *s.loc*., 21/06/1965, *K.C. Kanodia 1243*; Udaipur, 10/11/1963, *B.V. Shetty 205* (CAL). **CHATTISGARH**: Bastar district, Kondagaon, 19/11/1958, K. *Subramaniam 7192* (CAL, MH); Kutru, 12/10/1987, *Anandkumar 16671* (CAL). **DAMAN**: Daman district, Dadra, 29/09/1963, *M.Y. Ansari 93896*; Dundorta, 25/09/1963, *M.Y. Ansari 93619* (CAL). **DELHI**: Central Delhi district, Delhi, 23/10/1874, *C.B. Clarke 23352 F* (CAL); New Delhi, R.K. Puram, 04/10/1971, *Naithani 3215* (DD). **GOA**: North Goa district, Panaji, Goa University Campus, 29/09/2002, *Joby & Santhosh Nampy 841* (DEV); Panda–Margoa, 20/11/1962, *R.S. Rao 84968*; Santa Cruz, 08/11/1962, *R.S. Rao 84423* (CAL); St. Inez, 28/09/2002, *Joby & Santhosh Nampy 838* (DEV); **GUJARAT**: Tapi district, Girjunsanea, 05/10/1953, *M.B. Raizada 21380* (DD). **HIMACHAL PRADESH**: Mandi district, Joginder Nagar, 19/08/1977, *S.K. Murti & R. Prasad 61829* (BSD).

JHARKHAND: Hazaribagh district, Chota Nagpur, 22/11/1875, *J.J. Wood s.n.* (CAL); Hazaribagh, 13/06/1883, C.B. Clarke *33799 E* (DD, CAL); Kaldam, 15/12/1957, *G. Panigrahi 11793* (ASSAM, CAL). Palamau district, Batat, Kamla, 02/02/1991, *Duthie 10575* (DD). **KARNATAKA**: Belgam district, Belgam, 24/11/1962, *R.S. Rao 85081* (CAL). North Canara district, Katgal, 11/1919, *Ambo 6857* (CAL). District unknown, Concon, *s. die*, *Stocks Law s.n.* (CAL). **KERALA**: Thiruvanathapuram district, Pongalapara, 28/08/1988, *Anil 9795* **(**TBGT). Wayanad district, Kabani River Side, 30/11/2002, *Joby & Santhosh Nampy* DC *5103*; Kalloor, 08/08/2010, *Sheba & Santhosh Nampy 3250*, *3251*; Muthanga, 29/11/2002, *Santhosh Nampy & Joby 893* (DEV). **MADHYA PRADESH**: Bilaspur district, Malania, 23/10/1960, *J.K. Maheswari 4084* (CAL). Hoshangabad district, Banglapur-Churna, 02/10/1960, *J. Joseph 11199* (CAL, MH). Khargaon district, Ray Sagar, 08/02/1987, *M. Prasad 39420* (CAL). Mandla district, Mandla, 1901, *J. Martin s.n.* (DD); Khasi R.F, 28/11/1961, *J. Joseph 13462* (CAL, MH). Sagar district, Dahra–Gwalior, 12/11/1962, *G. Panigrahi 5769* (CAL). Satna district, Satna Town, 22/09/1959, *K.M. Sebastine 8924* (CAL, MH). Mohlitank, 07/11/1960, *N.P. Balakrishnan 11517* (CAL, MH). **MAHARASHTRA**: Mehsana district, Ambavada, 04/11/1955, *V.D. Vartak 1883*; Ambave, 25/12/1963, *Reddi 93478*; Bharvanddara–Junnar, 30/09/1965, *K. Hemadri 107504*; Ishapur, 06/03/1962, *R.S. Rao 77649*; Mhaismal Hill, 01/09/1964, *K.P. Janardhanan 100106*; Sherwadi, 10/08/1961, *K.P. Janardhanan 72390*, *72422*; Shivaji–Lonawala, 25/12/1962, *R. S. Rao 85266* (BSI). Mumbai district, Borile, 02/01/1956, *P.S. Herbert SH 1237*; Borivili, 21/09/1952, *R. Fernandez R 628*; Byculla, 09/1925, *R.D. Acland ACK 1218*; Diary Colony, 01/09/1958, *S.C. Tavakari 1636*; Ghatkopar, 23/08/1945, *H. Santapau 7037*; Khandala, 03/1917, *s.coll. 26231*; Khandvi, 09/10/1960, *N.Y. Das NYD 2511*; Madh Island, 23/07/1956, *G.L. Shah Shah 7171*; Malad, 12/08/1954, *G.L. Shah Shah 192*; Mandvi, 28/09/1961, *N.Y. Das NYD 4029*; Marve Road, 04/08/1956, *G.L. Shah Shah 7247*; Matunga, 08/1925, *R.D. Acland ACK 1221*; Mova, 11/09/1960, *P. Divakar PD 1457, PD 1458*; Mumbra, 08/09/1954, *K.V. Shinoy KVS 4310*; Sangir, 05/10/1953, *H. Santapau 16331; Ibid*., 22/09/1951, *H. Santapau 13469*; Sativille, 27/11/1960, *N.Y. Das NYD 2748*; Tungar Hill, 29/09/1941, *H. Santapau 21917*; Vicinity of Co-diary, 08/09/1958, *S.C. Tavakari 1674*; Wagai, 01/09/1954, *H.*

Santapau 19019 (BLAT). Nagpur district, Nagpur, 14/11/1957, *K. Subramaniam 4601* (CAL, MH); Telankerifarm, 20/11/1957, *K. Subramanyam 4718* (MH). Nagarhaveli district, Khanvel, 05/10/1963, *M.Y. Ansari 94194*; Silvassa, 01/10/1963, *M.Y. Ansari 94040* (CAL). Nasik district, Jhari, 20/09/1967, *John Cherian 111527*; Karanji, 22/02/1977, *S. Karthikeyan 149199*; Patri, 23/09/1978, *S. Karthikeyan 156554*; Purandhar Hill, 14/10/1962, *M.K. Janardhanan & R.V. Kammathy 78306*; Taldeo, Koyna 22/04/1979, *R.K. Kochar 154718* (BSI). Osmanabad district, Yedshi, 11/09/1964, *K.P. Janardhanan 100598* (BSI). Pune district, Arvi, 20/11/1964, *M.Y. Ansari 10916*; Bhinasarkar, 12/10/1962, *K.P. Janardhanan 81890*; Bhogav, 16/11/1960, *K.N. Subramanian 64943*; Bhosari, 16/10/1956, *S.D. Mahajan 8342* (BSI); *Ibid*., 05/09/2010, *Sheba & Santhosh Nampy 3273*; Bushi Dam, 03/09/2010, *Sheba & Santhosh Nampy 3360*; Kamshed, 03/09/2010, *Sheba & Santhosh Nampy 3342*; Lonawala, 03/09/2010, *Sheba & Santhosh Nampy 3339* (DEV); Pune, 02/09/1919, *B.M. Wadhwa 64698*; *Ibid*., 19/10/1956, *S.K. Jain 7680* (CAL); Rajguru Nagar, 05/09/2010, *Sheba & Santhosh Nampy 3270* (DEV); Sagar Island, Handelketki, 15/10/1971, *A.K. Mukherjee 8784* (CAL); Sinhagad, 10/09/1964, *M.Y. Ansari 101593*; Valwan Dam–Lonawala*, s. die, Venketta Reddi 98732* (BSI). Satara district, Khandala Forest, 01/09/1963, *R. S. Rao 90982* (BSI); Panchguni, Table Top Land, 04/09/2010, *Sheba & Santhosh Nampy 3266* (DEV). Thane district, Dahi, 11/09/1968, *K.V. Billore 116630* (CAL). **MEGHALAYA**: East Khasi Hills district, Shillong, 04/06/1965, *N.P. Balakrishnan 42737* **(**ASSAM). **ORISSA**: Jashpur district, Dumarkona, 29/09/1941, *H.J. Mooney 1880* (DD); Padampur, 29/10/1959, *G. Panigrahi 20550* (ASSAM, CAL). Malda district, Malda, 30/10/1959, *G. Panigrahi 20603* (ASSAM, CAL). Sundargarh district, Liang, 14/09/1988, *D. Namhata 3883* (CAL). **PUNJAB**: Hoshiarpur district, Mukerian, 16/09/1970, *O.P. Misra 41828* (BSD). **RAJASTHAN**: Banswara district, Kotharia, 21/10/1976, *V. Singh 3760* (CAL, BSJO). Kota district, Kota, 08/1963, *R.S. Gupta s.n.* (BSD). Madhopur district, Bondali, 26/12/1963*, D.M. Verma 1918* (CAL). Sirohi district, Mt. Abu, Oriya Village, 29/10/1960, *C.R. Rao 2175* (CAL). Tonk district, Way to Rajmahal, Deoli, 11/09/1974, *B.V. Shetty 1214 A* (BSJO). **TAMIL NADU**: Chennai district, Saint Thomas, 1878, *J. Abboy Aidoo s.n.* (MH). **UTTARAKHAND**: Almora district, Chakrata, 30/07/1961, *V.C. Bhattacharya*

13096 (CAL); Deoraht, 06/10/1975*, B.M. Wadwa 57445* (BSD). Dehradun district, 27/09/1972, *H.B. Naithani 3937* (DD); Harbans Wala Tea Estate, 07/11/1963, *N.P. Singh 31652*; Mohand, 27/09/1969, *V.C. Bhattacharya 39191*; Nirnyanpur, 08/11/1962, *N.P. Singh 23070*; *Ibid.,* 07/11/1963, *N.P. Singh 31624*; Rispana, 06/09/1964, *C.R. Babu 34054*; Sahasradhara, 13/10/1964, *S.K. Malhotra 34867* (BSD, CAL); Timly Forest, 17/09/1957, *M.A. Rao 3393* (BSD). **UTTAR PRADESH**: Allahabad district, Dandupur, Pratapgarh, 16/01/1962, *N.P. Singh & C.L. Malhotra 19565* (BSD); Daragang, 18/10/1964, *T. Rajagopal 6131*; Maepharson, 06/09/1964, *T. Rajagopal 3185* (CAL). Banda district, Banda, 08/01/1901, *A.S. Bell 116* (DD). Bijnore district, Chandpur, 12/11/1979, *J.P. Sharma 70312* (BSD). Gorakhpur district, Pharmeda, 31/10/1963, *C.M. Arora 1419*; *Ibid*., 01/11/1963, *C.M. Arora 1427* (CAL). Homirpur district, Bahraich, Jammaha, 05/02/1965, *O.P. Misra 7846*; Dehia, 03/1894, *J.S. Gamble 24573* (CAL, BSD); Gobal, 15/09/1972, *C.L. Malhotra 50837* (CAL); Mohoba, 28/09/1961, *V.C. Bhattacharya 17868*; *Ibid.,* 27/03/1962, *V.C. Bhattacharya 20471* (CAL, BSD). Kheri district, Lakhimpur, Mailami, 17/12/1960, *C.L. Malhotra 13321* (BSD). Mirzapur district, Kutwa, 10/02/1961, *V.C. Bhattacharya 13660*; Robertagurga, 22/09/1961, *V.C. Bhattacharya 17729* (BSD). Moradabad district, Moradabad, 07/1843, *Thomson s.n.* (CAL). Pilibhit district, Amaria, 02/10/1970, *C.L. Malhotra 42434* (BSD); *Ibid*., 21/09/1972*, C.L. Malhotra 50946* (CAL, BSD); Buland Shabr, 19/10/1962, *N.P. Singh 25316* (CAL); Deoha River Bed, 30/09/1970, *C.L. Malhotra 42302* (BSD); Mohoba–Hamispur, 28/09/1961, *V.C. Bhattacharya 20471* (CAL). **WEST BENGAL**: Dhakshin Dinjapur district, Balurghat, 26/10/1983, *R.N. Banerjee 15990* (CAL). Hoogly district, Goghat, 08/1902, *A. Hosein s.n.* (CAL). Howrah district, Kolkata, 08/11/1874, *C.B. Clarke s.n.* (CAL). District unknown, Baraset, 23/12/1883, *C.B. Clarke 34470* (CAL). *s.loc.,* Herb. Ind. Or. *Hook. f & T. Thomson s.n*. (K!).

Notes: *Commelina caroliniana* has long been known in Indian Floras as *C. hasskarlii* C.B. Clarke. Since the former name was published almost hundred years

earlier to *C. haskarlii*, it has priority over the latter name and was adopted as the correct name for the species (Faden, 1989).

C. caroliniana is close to *C. diffusa* and often confused with it. The characters that often used to separate *C. caroliniana* were the more erect habit, narrower and longer leaves, longer more acuminate spathe and larger, smooth seeds.

7. ***Commelina clavata*** C.B. Clarke, Commelyn. Cyrtandr. Bengal t.5. 1874; in A. DC & C. DC., Monogr. Phan. 3: 171. 1881; Hook.f., Fl. Brit. India 6: 371. 1892, p.p.; T. Cooke, Fl. Bombay 3: 292. 1906, p.p.; Rama Rao, Fl. Pl. Travancore 417. 1914; E. Barnes, J. Bombay Nat. Hist. Soc. 46: 77. 1946; K.M. Matthew & Britto in K.M. Matthew, Fl. Tamil Nadu Carnatic 1657. 1983; A.N. Henry *et al*., Fl. Tamil Nadu 3: 44. 1989; Karth. *et al*., Fl. Ind. Enum. Mon. 24. 1989; M. Mohanan & A.N. Henry, Fl. Thiruvananthapuram 485. 1994; B.D. Sharma *et al.,* Fl. Maharashtra 151. 1996; Sivar. & P. Mathew, Fl. Nilambur 735. 1996; T. Pullaiah, Fl. Andhra Pradesh 3: 1000. 1997; K.M. Matthew, Fl. Palni Hills 340. 1999; T.S. Nayar *et al.,* Fl. Pl. Kerala 659. 2006.

Type: India, Tamil Nadu, Nilgiri, 18/03/1870, *C.B. Clarke 11012 A* (CAL!, lectotype designated here).

Commelina salicifolia var. *angustata* Thwaites, Enum. Pl. Zeyl. 321. 1864.

Type: Sri Lanka, Maturata, 09/1853, *Thwaites s.n.* (C.P. 3215, PDA).

Commelina thwaitesii Hook.f. in Trimen, Handb. Fl. Ceylon 4: 302. 1898.

Type: *s.loc.*, 09/1853, *Thwaites s.n. B* (C.P. 3215, PDA). **Plate 35, 39a; Fig. 8**

Much branched, extensively scrambling, perennial herb, rooting at nodes in touch with the soil, with a definite base; roots thick. Stems terete, *ca.* 0.6 cm diam., green with purple striations; internodes 7–9 cm long. Leaves distichous; sheath 2–2.5 cm long, strigose, ciliate at apex, mottled with red striations; lamina ovate–lanceolate, 3–10 × 0.4–1.5 cm, acuminate at apex, cuneate at base, serrate at margins, upper surface scabrous, lower surface glabrous. Spathes leaf opposed, cordate, 2–4 × 0.5–0.7 cm, conduplicate, acute at apex, ciliate at base, surfaces glabrous to pilose, green; peduncle 2.5–4.5 cm long, green, with a band of hairs on one side; upper cincinnus 1.3–2 cm long, exserted, ciliate, 2 male flowered; lower cincinnus 1 cm long, glabrous, 2–3 bisexual flowered. Sepals 3, transparent; medial boat shaped; laterals oblong, basally fused, tinged with blue. Petals bright blue; paired petals orbicular, claws 5 mm long; odd petal deltoid, without claw. Stamens 3; lateral stamen filament 5 mm long, slender blue filaments, anthers yellow with central maroon spots; medial stamen filament 4 mm long, anther lobe curved, connective white. Staminodes 3; filaments 5 mm long, slender, blue; antherodes yellow, 4 lobed with lateral appendage, central region deep red or maroon coloured; Ovary globose–elliptic, 2 mm long, green; style white, 8 mm long; stigma blunt. Capsules 2–3 per spathe, oblong–elliptic, 8–9 × 4.5–6 mm bilocular, 4-seeded; dorsal locule absent; ventral locules 2 seeded. Seeds ovoid–oblong, 2.5–3 × 2–2.2 mm; testa dark brown, shallow–reticulate; hilum linear; embryotega lateral.

Chromosome number: n = 45 (Kammathy & Rao, 1961a; Raghavan & Rao, 1961).

Flowering period: March–December.

Flowering time: 8.00–12.00 pm.

Ecology: Near forest margins, waysides and grasslands, in exposed and partial shady habitats, usually above 800 m altitudes.

Distribution: India, Sri Lanka and Indo-china to W. Malesia.

Specimens examined: ANDAMAN & NICOBAR ISLANDS: South Andaman, Chidiya Tapu, 24/09/2010, *Santhosh Nampy & Manudev 3124* (DEV); Mount Harriot, 16/01/1974, *N.G. Nair 789* (PBL). **ANDHRA PRADESH**: Anantapur district, Samathagram, 03/07/1981, *N. Yesoda 202* (MH). Kurnool district, Kalvabugga, 05/12/1983, *R.R.V. Raju 1875* (CAL, SKU). **KARNATAKA**: Bellari district, Kudligi, 08/09/1961, *R.S. Rao. 73774* (BSI). Bengaluru district, Chikaragi Halli, 27/07/1975, *C.J. Saldanha 18572* (JCB). Chikmagalore district, Bababuddangiri Hills, 18/12/1978, *A.L. Thaktajan, C.J. Saldanha & K.R. Keshavamurthy KFP 4604* (JCB); *Ibid*., 04/10/2003*, Joby & Santhosh Nampy DC5174* (DEV). Hassan district, Nagpuri, 02/07/1969, *C.J. Saldanha 13923*; 13/08/1971, *T.P. Ramamoorthy HFP 1935* (JCB). Mysore district, Kammangudi, 21/10/1964, *R.S. Raghavan 103639, 73793* (BSI). South Canara district, Chermadi Ghat, 28/10/1960, *C.J. Saldanaha CS6283* (BLAT). **KERALA**: Idukki district, Anamalai Hills, Tunakadavu Falls, 11/01/1916, *C.E.C Fischer 3858* (DD); Devicolam, 10/08/1967, B.V. Shetty *28367* (CAL); *Ibid*., 11/09/1968, *D.B. Deb 30724* (CAL, MH); Elaveezhappoonchira, 25/08/2002, *Joby & Santhosh Nampy 805*; Eravikulam, 19/11/2010, *Sheba & Santhosh Nampy 4017*; Munnar, 08/12/2010, *Shahina & Sheba 3706*; Nedumkandam, 19/10/2010, *Sheba & Santhosh Nampy 3282* (DEV); Uppupara, 26/09/1972*, B.D. Sharma 41688*; Vagavurraai–Devicolam, 10/08/1967*, B.V. Shetty 28367* (MH). Kannur district, Aralam, Ambalappara, 25/08/2011, *Dantas 25434* (KFRI); Chandanathode, 23/02/1979, *V.S. Ramachandran 61322*; *Ibid*., 17/06/1979, *V.S. Ramachandran 62650* (MH); Paithalmala, 14/09/2002, *Joby & Santhosh Nampy 829* (DEV). Kasargod district, Kottencherry, 26/01/2011, *Ancy & Sheba 4040* (DEV). Kottayam district, Vagamon, 07/12/2010, *Shahina & Sheba 4026* (DEV). Kozhikode district, Deavagiri Botanical Garden (introduced), 04/12/2010, *Sheba & Santhosh Nampy 3705*; Kattullamala, 29/07/2010, *Sheba & Santhosh Nampy 3246*; Muthappanpuzha, 25/02/2001*,*

Santhosh Nampy 565; Thamarassery Pass, 03/12/2010, *Sheba & Santhosh Nampy 3704*; Ummalathoorkavu, 28/10/2010, *Shahina & Sheba 3294*; Vellarimala, 16/01/2003, *Joby & Santhosh Nampy 5136* (DEV). Palakkad district, Nelliyampathy, 08/12/2001, *Santhosh Nampy 183*, *185* (DEV); Panthanthode, 18/12/1969, *E. Vajravelu 33099* (MH); Silent Valley, Chembotti, 09/03/1982, *Sathish Kumar 10504* (CALI). Pathanamthitta district, Pamba, 24/06/1968, *D.B. Deb 30304* (CAL, MH); *Ibid*., 13/02/1988, *Anilkumar N 394* (MH). Thiruvananthapuram district, Chemungi, 08/03/1979, *M. Mohanan 61747* (CAL, MH). Trichur district, Karimala Hills, 23/10/1990, *N. Sasidharan 5737* (CALI). Wayanad district, Chembra Hills, 26/11/2002, *Joby & Santhosh Nampy 874*; *Ibid*., 20/032011, *Manudev & Sheba 3714*; Meppadi, 26/01/2011, *Sheba & Santhosh Nampy 4038*; Vythiri, Amba, 19/01/2010*, Sheba & Santhosh Nampy 3214* (DEV). **MAHARASHTRA**: Pune district, Khadgaon, 10/1986, *s.coll*. 860 (BLAT); Pune, 19/02/1962, *R.V. Kammathy 73909*; *Ibid*., 12/02/1962, *R.V. Kammathy 73910, 73946* (BSI). **TAMIL NADU**: Coimbatore district, Bellagi, 20/11/1906, *C.E.C. Fischer 1308* (CAL); Coimbatore, near the Bridge, 31/01/1962, *J. Joseph 13847* (MH); Hassanur, 01/12/1906, *C.E.C. Fischer 1377* (CAL); *Ibid*., 10/03/1931, *K.C. Jacob 232*; Velliangiri Hills, 23/02/1932, *S.R. Raju & Ratnavelu 259* (MH). Dindigal district, Bear shola, 23/03/2002, *Joby & Santhosh Nampy 87, 88* (DEV); Brijam, 05/11/1987, *K.M. Matthew & K.T. Mathew 51130*; Kodaikanal, 1938, *s. coll. s.n.*; *Ibid*., 19/03/1956*, J. Pallithanam 1525*; *Ibid*., 24/07/1984, *K.M. Matthew 40532* (RHT); *Ibid*., 22/03/2002, *Joby & Santhosh Nampy 78*; *Ibid*., 10/11/2011, *Shahina & Sheba 4551*; Ghat Road, mile -8, 02/07/1901, *Bourne 2077* (MH); *Ibid*., 21/10/2009, *Sheba & Santhosh Nampy 2285* (DEV); *Ibid*., 07/08/1985, *K.M. Matthew 41866*; Gundar, 27/08/1987, *K.M. Matthew & N. Rajendran 50353* (RHT); High way, 06/09/1925, *K.C. Jacob 17543* (MH); Levinga Path, 21/09/1959, *K.M. Matthew 1224*; Observatory road, 01/06/1984, *K.M. Matthew & S.J. Britto 40164*; Palni Hills, 13/12/1986, *K.M. Matthew 47977*; Palani Road, 15/05/1987, *K.M. Matthew & N. Rajendran 49475* (RHT); *Ibid*., 21/10/2009, *Sheba & Santhosh Nampy 2288* (DEV); Periyashola, 18/06/1898, *Bourne 1234* (CAL); Perumal Malai, 16/06/1986, *K.M. Matthew 45563*; Perumal–Palamalai, 01/12/1987, *K.M. Matthew 51727*; Perumal Malai–Vadakavunchi road, 03/12/1986, *K.M. Matthew & M.*

Charles 47814; Perumbarai, Batlagundu, 01/02/1986, *K.M. Matthew & N. Rajendran 43781* (RHT); Pulneys, 21/07/1920, *s.coll. 16602* (MH); Thalayan banks, 11/08/1987, *K.M. Matthew & K.T. Mathew 50066*; Tiger Shola, 11/06/1986, *K.M. Matthew 45413*; *Ibid*., 08/07/1987, *K.T. Mathew 49924* (RHT); *Ibid*., 23/03/2002, *Joby & Santhosh Nampy 82* (DEV); Varattaru Bridge, 12/08/1985, *K.M. Matthew 41909*. Kanchipuram district, Chingalpet, Vandalur, 07/02/1915, *s.coll. 11492* (MH). Kanyakumari district, Mahendragiri, 30/07/1966, *B.V. Shetty 28044* (CAL, MH). Nilgiri district, Cunnoor, 15/03/1870, *C.B. Clarke 10850 A* (CAL, K!); *Ibid*., 15/03/1870, 05/04/1870, *C.B. Clarke 11556* (CAL), *11556 B* (MEL); *Ibid*., 19/03/1870, *C.B. Clarke 11052* (CAL); *Ibid*., 06/1883, *J.S. Gamble 12155*; *Ibid*., 01/1899, *D. Prain s.n.* (DD); *Ibid*., 11/02/1899, *D. Prain s.n*. (CAL); Devala, 11/1884, *J.S. Gamble 15673* (CAL, MH); Gudalur, 17/11/1958, *K.M. Sebastine 7324* (MH); *Ibid*., 26/09/2010, *Sheba & Santhosh Nampy 3454* (DEV); Gudalur-Naduvattom, 17/11/1958, *K.M. Sebastine 7324*; Laucho Rocks, 04/1883, *J.S. Gamble 11310* (BSD); Naduvattom, 22/07/1960, *K. Subramaniam 10544* (CAL, MH); *Ibid*., 03/09/1961, *R.V. Kammathy 73912* (BSI); *Ibid*., 30/08/1970, *B.D. Sharma 35933* (MH); *Ibid*., 17/10/2010, *P.S. George 3707*; *Ibid*., 23/02/2010, *Sheba & Santhosh Nampy 2753, 2759; Ibid*., 26/09/2010, *Sheba & Santhosh Nampy 3458* (DEV); Needle point, 25/10/2003, *Joby & Santhosh Nampy DC5179*; *Ibid*., 26/09/2010, *Sheba & Santhosh Nampy 3484* (DEV); Nilgiri, 06/1883, *J.S. Gamble 12163* (CAL); Kalhatti, 27/08/1970, *B.D. Sharma 35809*; Ooty, 30/07/1883, *s.coll. s.n.*; *Ibid*., 10/1884, *s.coll. s.n.* (MH); *Ibid*., 02/09/1961, *R.V. Kammathy 73901* (BSI), *Nisha & Dineshraj 846*; Ooty-Pykara, 26/09/2010, *Sheba & Santhosh Nampy 3475* (DEV); Perumal, 08/04/1913, *Saulieres 311*; *Ibid*., 26/03/1913, *Saulieres 329* (CAL); Segur River Bank, 25/08/1970, *G.V. Subba Rao 36279*; Sokanalli, 15/03/1972, *G.V. Subba Rao 40240* (MH); Way to Ooty, 20/11/2001, *Santhosh Nampy 170*; *Ibid*., 26/09/2010, *Sheba & Santhosh Nampy 3470* (DEV). Salem district, Kaka Sholai, 30/06/1979, *K.M. Matthew 23363*; Nammakkal, 26/04/1984, *K.M. Matthew & S.J. Britto 30147*; Shevaroy Hill, 1870, *G. Bidie. s.n*. (MH); Shevaroy Temple, 08/11/1978, *N. Venugopal 19124* (RHT); Yercadu, 14/03/1976, *K.M. Matthew & V. Alphonse 1549* (MH). Tiruneveli district, Agasthyamalai Peak, 01/07/1964, *A.N. Henry & M. Chandrabose 19204* (MH); Naterikal, 23/09/1916,

s.coll. s.n.; Near Martins Hut, 24/09/1945, *S.V. Parthasarathy & D.D. Sunderraj 20733* (MH). Theni district, High Wavy Mountain Hills, 05/1917, *Blatter & Hallberg 171* (CAL), *272* (DD). Vellore district, Amirthi, 10/02/1986, *M.B. Viswanathan 1075* (MH).

Notes: Clarke (1874) in *Commelynaceae et Cyrtandraceae Bengalenses* described and illustrated *Commelina clavata* as "folia subglabra angusto lanceolata…….. semina 4 out ruguso reticulata" based on his collections from Nilgiris (Tamil Nadu) in 1870. In the present investigation, Clarke's materials at CAL, K (image) and MEL have been critically studied. Among the five sheets at CAL, *C.B. Clarke 11012 A*, agrees with the protologue in every respect, is designated here as the lectotype.

Clarke (1881) in de Candolle's Monograph of Commelinaceae recognized another variety, *C. clavata* var. *hohenackeri* distinguished by oblong, subacute leaves and smaller acuminate spathes based on Hohenacker's plants No. 1066 from Nilgiris. Since the type is unable to locate during the study, this variety has been excluded from the current treatment.

C. clavata is closely allied to *C. diffusa* and *C. clavatoides* but differs from the former in its scabrous leaves, ciliate spathe, pubescent peduncle, pedicel and shallow reticulate seeds and from the latter by its short peduncles (2.5–4.5 cm long), basally fused lateral sepals, 2 or 3 capsules per spathe and shallow reticulate seeds.

Three populations of *C. clavata*, all with hirsute leaves were recorded from Vythiri, Idukki and Nilgiris. They also show differences in their foliar epidermal characters (see chapter 3).

8. Commelina clavatoides Nampy & Sheba, J. Bot. Res. Inst. Texas 6:119. 2012.

Type: India, Kerala, Idukki district, Adimali–Munnar Roadside, 19/11/2010, *Sheba M. Joseph & Santhosh Nampy 4016* (DEV!, holotype; CALI!, BRIT!, isotypes).

Plate 36, 37, 39b; Fig. 9

A much branched, extensively scrambling, perennial herb with a definite base; roots long, thick, fibrous. Stems terete, *ca.* 8 mm in diam., green with red striations; internodes 6–15 cm long. Leaves distichous; sheath *ca.* 3 cm long, strigose, ciliate at apex, mottled with red striations; lamina linear lanceolate, 10–14 × 1–2 cm, acuminate at apex, cuneate at base, serrulate at margins, upper surface scabrous, lower surface glabrous. Spathes leaf-opposed, broadly cordate, 4–5.5 × 1.5 cm, conduplicate, acute at apex, ciliate towards base, puberulent on both surfaces, lower half pale green, upper half dark green; peduncle 6–10 cm long, green, strigose; upper cincinnus 2–2.5 cm long, exserted, ciliate, 1 or rarely 2 male flowered; lower cincinnus 1.5–2 cm long, glabrous, 6 or 7 bisexual flowered. Sepals free, transparent; medial boat-shaped; laterals oblong. Petals bright blue; paired petals orbicular, claws 2 mm long; odd petal deltoid, claw 1 mm long. Stamens 3; lateral stamen anthers straight; medial stamen anther curved. Staminodes 3, equal; filaments slender; antherodes yellow, 4-lobed with 2 lateral appendages; central spot cream or purple. Ovary elliptic, green; style white, 3 mm long, slightly curved; stigma capitate. Capsules 5–6 per spathe, oblong, compressed, bilocular, 4-seeded; dorsal locule absent; ventral locules 2-seeded. Seeds 4, ovoid-oblong, *ca.* 3 × 1 mm; testa black, pits shallow; hilum linear; embryotega lateral.

Chromosome number: Not reported.

Flowering period: September–November.

Flowering time: 9.00–12.00 pm.

Ecology: Usually adapted to high altitudes (above 1750 m). It grows on vertical earth cuttings along the margins of wet evergreen forests.

Distribution: South India (Kerala), endemic.

Specimens examined: **KERALA**: Idukki district, Marayoor, 21/10/2009, *Santhosh Nampy 2293* (DEV). Kannur district, Paithalmala, 14/09/2002, *Santhosh Nampy & Joby Paul 829* (DEV). Kozhikode district, Devagiri College Botanical Garden (cultivated), 03/12/2011, *Sheba 4044* (DEV). Palakkad district, Nelliyampathy, 19/11/2010, *Shahina P.M. & Sheba 4024* (DEV).

Notes*:* This species has been recently described by Sheba *et al*. (2012). It is closely related to *C. clavata* but can be easily seperated by its 6–10 cm long peduncle, free lateral sepals, 5–6 capsules per spathe and shallow-pitted, ovoid to oblong seeds.

9. Commelina coelestis Willd., Enum. Pl. 69. 1809; Bamber, Pl. Punjab 281. 1916; Fyson, Fl. Nilgiri & Pulney3: 266. 1986; Noltie, Fl. Bhutan 3: 238. 1994.

Type: Mexico, Pres. Des. Bains d' arumbaro, *s. die*, *H. G. Galeotii 4944* (holotype, BR!; isotype, BM!). **Plate 38, 39c; Fig. 10**

Erect, branched, perennial herb with a definite stout base; roots thick, tuberous, 2–8 × 0.5–1 cm. Stems terete, green; internodes 12–14 × 0.6 cm. Leaves distichous; sheath 2–3.5 cm long, widely cylindric, strigose at the margins, ciliate near the summit; lamina ovate-lanceolate, 7–17 × 2–4 cm, acuminate at apex, broad at base, undulate at margins, both surfaces glabrous. Spathes leaf opposed, terminal

and from upper axils, broadly ovate, 3–4 × 1.5–2 cm, conduplicate, acuminate at apex, cordate and ciliate at base, densely hairy, strongly veined; peduncle 4–8 cm long, green, pubescent; upper cincinnus lacking; lower cincinnus 3–5(–8) bisexual flowered. Sepals 3, transparent; medial lanceolate; laterals oblong. Petals 3, deep blue, all similar, ovate, narrowed into short claw. Stamens 3; lateral stamen filaments slender, *ca*. 10 mm long, anthers yellow; medial stamen anther large, curved. Staminodes 3; filaments slender, 7–9 mm long; antherodes golden yellow, 4 lobed with lateral appendages. Ovary oblong, green; style white, 10–12 mm long; stigma capitate. Capsules 5 per spathe, oblong, 6–8 × 4 mm, trilocular, 5–seeded; dorsal locule 1-seeded; ventral locule 2-seeded. Seeds 5, triangular, 2–3 × 2 mm; testa brown–black, irregularly pitted; hilum linear; embryotega lateral.

Chromosome number: 2n = 90 (Anderson & Sax, 1936).

Flowering period: July–January.

Flowering time: 9.30–12.30 pm.

Ecology: Cultivated in the botanical gardens for its showy flowers.

Distribution: Native of Central and South America; earlier reported from a few gardens in India.

Specimens examined: **HIMACHAL PRADESH**: Shimla district, Jaku, 09/1940, *M.B. Raizada s.n.* (DD); Simla, 09/1892, *s.coll. s.n.* (MH). **TAMIL NADU**: Nilgiri district, Ooty, 12/08/1878, *G. King s.n*. (MH); *Ibid*., 07/1883, *s.coll. s.n*. (CAL). **UTTARAKHAND**: Dehradun district, Landour hill, 04/08/1898, *P.W. Macki s.n*. (CAL); *Ibid*., 06/01/1942, *Mnyahud s.n*. (DD); Mussoorie, Tehri–Garhwal, 21/07/1964, *V.C. Bhattacharya 31155* (BSD, CAL); Jabbanklet, 09/1930, *M.B. Raizada 193*; *Ibid*., 11/09/1935, *M.B. Raizada 6590*; *Ibid*., 10/09/1961, *Hari Om*

Saxena s.n., Near Mussorie, 30/07/1998, *P.W. Machim s.n.*; Above Barbowgary, 09/09/1935*, M.B. Raizada 5523* (DD). Tehri district, Suakholi, 27/08/1980, *A.K. Goel 72631* (BSD). **WEST BENGAL**: Darjeeling district, 11/07/1862*, T. Anderson 1315* (DD, CAL); *Ibid*., 17/09/1869, *C.B. Clarke 9362* A, B.; *Ibid*., 22/08/1914, *s.coll. 40708* (CAL). **SIKKIM**: District unknown, Himalaya, *s.loc*., 1877, *G. King s.n.*; 1878, *G. King s.n.* (MH); Sanadeh, *S. Kurz s.n.*; *Ibid*., *s. loc*., 13/08/1875*, G. King 2239*; *Ibid*., 25/08/1877, *G. King s.n.* (CAL); Sonada, 02/07/1809, *R.E. Cooper 749* (MEL).

Notes: *Commelina coelestis* is not found wild anywhere in India and is the only species grown as ornamental in gardens. It is a perennial herb with a stout base, thick tuberous roots and strongly veinded hairy spathes with several attractive blue flowers.

10. ***Commelina diffusa*** Burm.f., Fl. Ind. t.7 f. 2. 1768; Panigrahi & Kammathy, J. Indian Bot. Soc. 43: 299. 1962; R.S. Rao, Notes Roy. Bot. Gard. Edinburgh 25: 179. 1964; R.S. Rao & D.M. Verma, Bull. Bot. Surv. India 16: 9. 1974; C.J. Saldanha & Nicolson, Fl. Hassan Dt. 644. 1976; T.N. Srivast., Fl. Gorakhpurensis 322. 1976; Bennet, Fl. Howrah Dt. 102. 1979; Manilal & Sivar., Fl. Calicut 298. 1982; K.M. Matthew & Britto in K.M. Matthew, Fl. Tamil Nadu Carnatic 2: 1658. 1983; Chandrab. & N.C. Nair, Fl. Coimbatore 299. 1987; Ramach. & V.J. Nair, Fl. Cannanore 481. 1988; Karth. *et al*., Fl. Ind. Enum. Mon. 24. 1989; Kesh. Murthy & Yogan., Fl. Coorg 479. 1990; B.V. Shetty & V. Singh, Fl. Rajasthan 2: 853. 1993; Noltie, Fl. Bhutan 3: 237. 1994; B.D. Sharma *et al.,* Fl. Maharashtra 151. 1996; T. Pullaiah, Fl. Andhra Pradesh 3: 1000. 1997; P.K. Hajra & P.S.N. Rao, Fl. Great Nicobar Isl. 457. 1999; Murti & Panigrahi, Fl. Bilaspur 2: 633. 1999; Faden in Dassan., Rev. Handb. Fl. Ceylon 14: 182. 2000; N.P. Singh *et al.,* Fl. Bihar Analysis

532. 2001; P.J. Bora & Yogendra Kumar, Fl. Div. Assam 360. 2003; Subba Rao & Kumari, Fl. Visakhapatanam 291. 2008.

Type: India, *s.loc*., *s. die*, *Burman s.n*. (holotype, G!)

Commelina nudiflora of C.B. Clarke in A. DC & C. DC., Monogr. Phan. 3: 144. 1881; Hook.f., Fl. Brit. India 6: 369. 1892; Woodrow, J. Bombay Nat. Hist. Soc. 12: 524 . 1899; Duthie, Fl. Gangetic Plain. 3: 272. 1903; T. Cooke, Fl. Bombay 3: 290. 1906; C.E.C. Fisch. in Gamble, Fl. Madras 3: 1535. 1931; Haines, Bot. Bihar Orissa 3: 1123. 1961; Santapau & K.P. Janardh., Fl. Saurashtra Checklist 47. 1966; Prain, Veg. Hughly–Howrah. 291. 1977, non L. 1753. **Plate 40, 39d; Fig. 11**

Diffusely branched, extensively spreading, decumbent, annual herb, rooting at the nodes, lacking a definite base; roots long, thin, fibrous. Stems terete, green, puberulous; internodes 3–6 cm long. Leaves distichous; sheath *ca.* 1.5 cm long, strigose, ciliate at apex, mottled with red striations; lamina ovate–lanceolate or elliptic-lanceolate, 4–8 × 1.5–2.5 cm, acute–acuminate at apex, cuneate at base, serrulate at margins, upper surface glabrous or puberulous, lower surface glabrous. Spathe leaf opposed, cordate at base, *ca* 3.5 × 1 cm, conduplicate, acute at apex, margins serrulate, both surfaces glabrous, green; peduncle *ca*. 1. 5 cm long, green, strigose; upper cincinnus *ca*. 1.5 cm long, exserted, ciliate, 1 or 2 flowered; lower cincinnus *ca*. 1 cm long, glabrous, 2–5 bisexual flowered. Sepals 3, white; medial boat shaped; laterals basally fused ½ of its length, oblong. Petals 3, blue; paired petals deltoid, claws 4 mm long; odd petal with blunt apex. Stamen 3; lateral stamen filaments 6 mm long, anthers brown; medial stamen anther yellow, curved; connective white. Staminodes 2 or 3, filaments slender, 4 mm long, blue; antherodes

yellow, 4–lobed with 2 lateral appendages. Ovary elliptic, green; style white, 6 mm long; stigma capitate, purple. Capsules 1–3 per spathe, oblong, trilocular, 5-seeded; dorsal locule 1-seeded, ventral locules 2-seeded. Seeds 5, oblong; testa dark brown, doubly reticulate; hilum linear; embryotega lateral.

Chromosome number: n = 15, 2n = 30 (Simmonds, 1954; Sharma, 1955; Kammathy & Rao, 1961a; Raghavan & Rao, 1961; Panigrahi & Kammathy, 1964; Kammathy & Rao, 1964); 2n = 28 (Morton, 1956) and 2n = 56 (Darlington, 1929).

Flowering period: March–January.

Flowering time: 8.00–10.30 am.

Ecology: A common weed of agricultural fields, margin of pools, on road sides, open scrab, evergreen forests and seacoasts.

Distribution: Tropics and Subtropics.

Specimens examined: **ANDAMAN & NICOBAR ISLANDS**: Little Andaman, Hut Bay, 20/11/1977, *N. Bhargava 4234* (CAL). Middle Andaman, Mayabunder, 01/08/1974, *N. Bhargava* 01/*1983* (PBL); Polobjig camp No.15, 16/07/1974, *N. Bhargava 1736* (CAL, PBL). South Andaman, *Ibid*., 6/11/2001, *M.C. Porwal s.n.*; Boriwali, 25/09/2010, *Santhosh Nampy & Manudev 3163* (DEV), Campbell Bay, 18/08/1975, *N.P. Balakrishnan 2760* (CAL); *Ibid*., 01/10/2010, *Santhosh Nampy & Manudev 3544*, Chidiya Tapu, 24/09/2010, *Santhosh Nampy & Manudev 3121, 3124, 3130* (DEV); Dhanikari, 14/07/1973, *N.P. Balakrishnan 311*; Dundas point, 31/01/1974, *N.G. Nair 816* (PBL); Elphinstone Harbor, 24/01/1959, *K. Thothathri 9129* (CAL, MH); Hado, Port blair, 22/09/2010, *Santhosh Nampy & Manudev 3117* (DEV); Havelock islands, 20/05/1974, *R. Ansari 1462* (CAL, PBL). Homfray Fung, 15/04/1904, *J.L. Ellis & K. Ramamurthy 18816* (MH); Hopalakabang, 1890, *King 21* (CAL); Kadamthala, 25/09/2010, *Santhosh Nampy & Manudev 3156*; Nayagaon, 28/09/2010*, Santhosh Nampy & Manudev 3163* (DEV); Nilambur, Baratang,

20/07/1975, *N. Bhargava 2461* (CAL, PBL); Poona Nallah, 25/07/1976, *N. Bhargava 4234* (CAL); Port Blair, 17/05/2008, *S. Kumar 26943* (PBL); Viper island, 29/07/1978, *P. Basu 6678* (CAL, PBL). South Nicobar Islands, Baludera, 11/10/1979, *D.K. Hore 6754*; Magar Nallah, 10/10/1980, *R.P. Dwedi 8043* (CAL); Pugmalion, Point Road, 19/06/1977, *N.P. Balakrishnan 5864*; *s.loc*., 24/09/1980, *D.K. Hore 7996* (CAL, PBL). **ANDHRA PRADESH**: Chittoor district, Horselykonda, 03/09/1918, *C.E.C. Fischer 4444 A* (CAL). East Godavari district, Rampa Hills, 30/12/1990, *K.N. Ramakrishna 10605* (SKU); Samalkota, 07/01/1917, *s.coll. s.n.* (MH). Kurnool district, Srisailam, 27/03/1965, *J.L. Ellis 23791* (MH). Nellore district, Ramayapatanam, 26/01/1929, *K.C. Jacob 18355* (MH). Vishakapatanam district, Khotnighada, 12/05/1964, *G.V. Subba Rao 19518*; Minumuluru, 02/06/1968, *G.V. Subba Rao 30063* (MH); Simhachalam, 24/12/1990, *K.N. Ramakrishna 9876* (SKU). **ARUNACHAL PRADESH**: Dibang Valley district, Halin, 06/05/1998, *M. Bhaminik & M.K. Pathak 1639* (CAL). Subansiri district, Front of L & T. Company, 02/09/2009, *Sheba & Santhosh Nampy 2250* (DEV); Kimin, 24/09/1969, *A.S. Rao E.C. 1926* (ASSAM); Subansiri, 02/09/2009, *Sheba & Santhosh Nampy 2247, 2248* (DEV). **ASSAM**: Goalpara district, Goalpara, 06/09/2009, *Sheba & Santhosh Nampy 2262* (DEV). Kamrup district, Guwahati, 16/05/1957, *G. Panigrahi 9321* (ASSAM, CAL); Jabalpuri, Guwahati, 05/09/2009, *Sheba & Santhosh Nampy 2260* (DEV); Jorhat. Agri. College Campus, 07/07/1959, *s.coll s.n.* (ASSAM); Singra river, 24/06/1964, *A.S. Rao 39072* (CAL). Lakhimpur district, Dhamoji, 01/09/2009, *Sheba & Santhosh Nampy 2244, 2245*; Lakhimpur, 30/08/2009, *Sheba & Santhosh Nampy 2253*, Opp. Ganesha Temple, 03/09/2009, *Sheba & Santhosh Nampy 2255*; Way to Tezpur, 04/09/2009, *Sheba & Santhosh Nampy 2257*, Lakhimpur North, 31/08/2009, *Sheba & Santhosh Nampy 2241* (DEV); Laluk–Dromuk, 16/05/1966, *D.M. Verma 46383* (CAL). Lasai Hills district, South Lasai Hills, 04/1899, *A.T. Gage 264* (BSD). District unknown, *s.loc., s. die, Bal 288*; *s.loc*., *Jenkins s.n.*; Tittaborh, 03/1902, *A.C. Chaterjee s.n.* (CAL); Dhumbara, 31/08/2009, *Sheba & Santhosh Nampy 2240* (DEV); Haflong, 19/04/1908, *William G. Craib 311* (CAL). **BIHAR**: Gaya district, South Bihar, 21/06/1965, *K.C. Kanodia 1129* (CAL). Sonitpur district, Chardwar, 19/02/1957, *G. Panigrahi 5766* (ASSAM, CAL). District unknown, Chottanagar, 04/01/1961,

G.V.S. Rao 23155; Ladaburu, 28/12/1960, *G.V.S. Rao 22850* (ASSAM, CAL). **GOA**: North Goa district, Borim, 15/09/1965, *P.J. Cherian 106178*; Budsara, Goundugugarha, 10/11/1962, *R.S. Rao 84587* (BSI); Margoa, Borda Village, 22/08/1963, *K.C. Kanodia 89462* (BSI, CAL); Palli Village, 02/09/1963, *K.C. Kanodia 89720* (CAL); Sanweda Railway Station, 29/08/1963, *K.C. Kanodia s.n*. (BSI), *89620* (CAL). **GUJARAT**: Navsari district, Chikhli, 10/09/1968, *R.S. Raghavan 114506* (BSI). **KARNATAKA**: Belgam district, Belgam, 27/11/1961, *M.Y. Ansari & R.V. Kammathy 78581* (BSI). Bellari district, Agumbe, 03/11/1960, *R.S. Raghavan 68088*; Amboli Village, 27/11/1961, *M.Y. Ansari & R.V. Kammathy 78554*; (BSI); Bellari, 28/08/1883, *W.A. Talbot 665* (CAL); Kudligi–Hospat Road, 19/01/1979, *S.B. Manohar & S.R. Ramesh KFP 5908* (JCB). Bengaluru district, Bannergatta, 12/09/1976, *C. Saldanha 19141*; Heltur, 15/05/1968, *C. Saldanha 11738* (JCB); Bengaluru, 16/12/1961, *R.D. Acland 84564* (MH); Lalbag, 23/10/2010*, Sheba & Santhosh Nampy 3284* (DEV). Bijapore district, Aihole, Keuir, 15/09/1979, *S.R. Ramesh 9319* (CAL). Coorg district, Kajoor Forest, 12/02/1963, *A.S. Rao 85508*; Karavala Badiga, Mercara, 22/09/1961, *A.S. Rao 94809*; Nagarhola, 02/11/1963, *K.N. Subramanian 95494*; Kattethubetta, 21/04/1962, *K.N. Subramanian 80162* (BSI). Hassan district, Belur-Sakleshpur Road, 02/11/1976, *R.B & A.J Faden & Saldanha 76/220*; Byrapura, 06/07/1971, *T.P. Ramamoorthy HFP 1850*; Channapatana, 29/01/1971, *T.P. Ramamoorthy HFP 1399* (JCB). Mandya district, Maddur, 04/03/1978, *Syed Magsood Ahmed KFP 343*; Srirangapatana, 25/11/1978, *K.R. Keshavamurthy & P. Prakash KFP 4538* (JCB). Mangalore district, Mangalore, 23/10/2010, *Sheba & Santhosh Nampy 3285*; Kankanadi, 23/10/2010, *Sheba & Santhosh Nampy 3286*; Kottarachawki, 23/10/2010, *Sheba & Santhosh Nampy 3287*; Panampur, 23/10/2010, *Sheba & Santhosh Nampy 3283* (DEV). North Canara district, *s. die*, *s.coll. 1508* (BSI); Carwar, 28/08/1885, *W.A. Talbot 1908* (DD); Sirsi, 04/02/1980, *K.M. Hegde KFP 12620* (JCB); Tondaikesa, 26/04/1962, *A.S. Rao 80384* (BSI). South Canara district, Jahalsur, 22/11/1900, *C.A. Barber 2507* (CAL, MH); Kadly, 19/08/1920, *s.coll. 16746* ; *Ibid*., 29/09/1920, *s.coll. 16745* (MH); Kuloor, 29/11/1981, *C.J. Saldanha, P.W. Michael & S.R. Ramesh KFP 13994*; Someswara Beach, 19/04/1979, *C.J. Saldanha & P. Prakash KFP 7007* (JCB); Sullia, 25/10/1900, *C.A. Barber 2156*

(CAL, MH). Tumkur district, Namada, 26/02/1975, *N.P. Singh 132680*; Tumkur–Bengaluru, 26/02/1975, *N.P. Singh 133238* (BSI). **KERALA**: Alappuzha district, Alappuzha, 20/11/2010, *Sheba & Santhosh Nampy 4018*; Kuppappuram, 20/11/2010, *Sheba & Santhosh Nampy 4019*; Pathiramanal, 30/07/2003, *Aneesha DC 5151* (DEV); Thamarakkadavu, 30/12/1990, *M.S. Swaminathan & V.P. Prasad 95668* (MH). Eranakulam district, Cochin Harbour Terminal, 21/01/1961, *R. V. Kammathy s.n*. (BSI); Kaloor, 12/10/2010, *Sheba & Santhosh Nampy 2299* (DEV). Idukki district, Adimali, 19/11/2010, *Sheba & Santhosh Nampy 4014*; Kaliyar, 27/10/2001, *Santhosh Nampy 154*; Kallar, 27/12/2001, *Santhosh Nampy 440* (DEV); Thekkadi Forest, 09/05/1958, *S. K. Jain 36720*; Vandipperiyar, 18/02/1957, *G.S. Puri 15376* (BSI). Kannur district, Beckal, 28/01/1979, *V.S. Ramachandran 60015* (MH); Chandanathode, *Ibid*., 23/02/1979, *V.S. Ramachandran 61322*; *Ibid*., 17/06/1979, *V.S. Ramachandran 62650*; (CAL); Kannur, 10/1883, *s.coll. s.n.* (MH); Pakramthalam, 28/09/2010, *Sheba & Santhosh Nampy 3242*; Madaippara, 28/09/2010, *Sheba & Santhosh Nampy 3495* (DEV); Muzhappilangadi, 13/12/1979, *V.S. Ramachandran 64086* (MH); Kottuparambu, 03/02/1970, *V.V. Sivarajan 53* (CALI); Tolpetty R.F., 08/02/1978, *V.S. Ramachandran 52399* (CAL, MH); Kasargod district, Kasargod, 13/12/1931, *G.V. Narayana 6379*; Payyannur, 25/09/1982, *R. Ansari 73989* (MH). Kollam district, Ayur, 05/11/2010, *Sheba & Santhosh Nampy 4008* (DEV); Edamon Railway Track, 22/11/1961, *K.N. Subramaninan 77049*; Palaruvi, Thenmala, 28/11/1961, *K.N. Subramanian 77192* (BSI). Kottayam district, Edakadathi, 29/05/2010, *Sheba & Santhosh Nampy 3218* (DEV); Kumarakam, 28/12/1983, *Fr. Kadavil 21* (MH). Kozhikkode district, Areecode, *Philip Mathew 34490* (CALI); Chelari, 02/08/2010, *Sheba & Santhosh Nampy 3248* (DEV); Cheruvannur, 27/10/1970, *V.V. Sivarajan 731* (CALI); Devagiri, 07/10/2001, *Santhosh Nampy 140*, *Ibid*., Botanical Garden (Cultivated); *Ibid*., 15/08/2011, *Sheba & Manudev 3766*; Edakkad, 09/07/2002, *Nisha 450* (DEV); Kappadu, 28/10/2010, *Sheba & Santhosh Nampy 3298*; Palazhi, 12/02/2003, *Joby & Santhosh Nampy 95*; Peruvayal, 23/05/2002, *Aneesh & Aneesha 200*; Kodanchery, 07/11/2002, *Siljo 868*; Mayanad, 17/12/2009, *Sheba & Santhosh Nampy 2298*; Muthapanpuzha, 18/07/2010, *Sheba & Manudev 3240*; Nandhi Beach, 03/08/2002, *Joby & Santhosh Nampy 483*; Thamarassery Pass, 18/07/2010, *Sheba &*

Santhosh Nampy 3239; Thikkodi beach, 01/11/2001, *Santhosh Nampy 161*; *Ibid*., 30/04/2002, *Joby & Santhosh Nampy 442*; *Ibid*., 28/10/2010, *Sheba & Santhosh Nampy 3296* (DEV). Malappuram district, Bharanikkotta, Parapanangadi, 31/07/2003, *Joby & Santhosh Nampy 906* (DEV); Calicut University Campus, 28/03/1970, *V.V. Sivarajan 413*; *Ibid*., 12/08/1970, *V.V. Sivarajan 352*; *Ibid*., 31/05/1978, *Mitha Krishnan 24899*; Nilambur, Vadapuram, *s. die*, *Philip Mathew 34543*; Tanur, *s. die*, *Rajasree 2858* (CALI). Palakkad district, Kanjirappuzha, 07/08/2003, *Joby & Santhosh Nampy 1099*; Vattapara, Palakkayam, 08/08/2003, *Joby & Santhosh Nampy 1185* (DEV); Walayar Jungle, 10/1883, *s.coll. 72898* (MH). Pathanamthitta district, Aranmula, 01/11/2010, *Sheba & Santhosh Nampy 4001*; Elimullu–Thannithode, 31/05/2010, *Sheba & Santhosh Nampy 3233*; Kozhencherry, 14/11/2009, *Sheba & Santhosh Nampy 2295*; Kumbazha, 30/05/2010, *Sheba & Santhosh Nampy 3221*; Madamon, Vadasserikkara, 30/05/2010, *Sheba & Santhosh Nampy 3224*; Mannaramala, 08/11/2010, *Sheba & Santhosh Nampy 4012*; Mannarakkulanji, 30/05/2010, *Sheba & Santhosh Nampy 3222*; Mylapra, 30/05/2010, *Sheba & Santhosh Nampy 3223*; Pathanamthitta, 04/11/2010, *Sheba & Santhosh Nampy 4005*; Perunadu, Sabarimala, 30/03/2010, *Sheba & Santhosh Nampy 3226* (DEV); Ranni, 10/09/1988, *Anilkumar, N. 2016* (SNC); *Ibid*., 29/05/2010, *Sheba & Santhosh Nampy 3220* (DEV). Thiruvanathapuram district, Pulimath, 02/12/1977*, M. Mohanan 52671* (MH); Thiruvananthapuram, 12/1932, *K. Narayana Iyer 01745* (TBGT); *Ibid*., 12/12/1977*, M. Mohanan 52745* (MH); Vembayam, 11/10/2009, *Sheba & Santhosh Nampy 2280*; Venjaramood 05/11/2010, *Sheba & Santhosh Nampy 4007* (DEV). Thrissur district, Thippalikkayam, 12/01/2011, *Santhosh Nampy & Manudev* 4302 (DEV); Thunakkadavu, 10/03/1965, *K.M. Sebastine 22861* (MH); Vazhani Forest, 15/08/2003, *Aneesha & Joby 942*; Vettikkattiri, 31/10/2010, *Sheba & Santhosh Nampy 3936*; Vilangankunnu, 02/10/2010, *Sheba & Santhosh Nampy 3064* (DEV). Wayanad district, Kabani river side, 30/11/2002, *Joby & Santhosh Nampy 5102*; Kuruwa, 28/12/2010, *Sheba & Santhosh Nampy 403*; Pulpally, 18/06/2010, *Sheba & Santhosh Nampy 3202*; Pumala, 26/10/2010, *Sheba & Santhosh Nampy 3290*; Seethamount, 30/11/2002, *Joby & Santhosh Nampy 900* (DEV). **LAKSHADWEEP**: Androth Island, 30/11/1960, *B.M. Wadhwa 68461* (BSI).

MADHYA PRADESH: Bilaspur district, Achanakarma, 31/10/1970*, G. Panigrahi 13219* (CAL). **MAHARASHTRA**: Aurangabad district, Sadia, 25/03/1894, *G.A. Gammie 201* (CAL). Mumbai district, Khed, Bibi, 08/10/1962, *K.P. Janardhanan 81895* (BSI); Malad, Marve, 25/08/1956, *G.L. Shah Shah 7346* (BLAT); Matheran, 06/10/1959, *N.A. Irani NI 4651*; *Ibid*., 17/11/1960, *N.A. Irani NI 5418* (BLAT). Nasik district, Juari, 30/09/1967, *John Cherian 111535* (BSI); Pecheruvu, 23/02/1957, *S.K. Wagh SKW 5188* (BLAT). Pune district, Bushi Dam, 03/09/2010, *Sheba & Santhosh Nampy 3360* (DEV); Chopora, 07/09/1965, *P.J. Cherian 106002*; Jungulu Kangar Society, 23/10/1967, *K.V. Billore 113198* (CAL); Manjari, 02/09/2010, *Sheba & Santhosh Nampy 3257* (DEV); Sawa, 23/10/1967, *K.V. Billore 113214* (BSI, CAL); Wagai, 12/03/1954, *H. Santapau 18409, 18410* (BLAT). Satara district, Khanapur, Haveli, 04/09/1963, *M.Y. Ansari 87857* (BSI); Khandala, 05/1919, *Blatter & Hallberg 28534* (DD); Khandala, 04/10/1969, *Hemadri K 85196* (CAL); *Ibid*., 04/1941*, H. Santapau H. 219. 2* (BLAT); Mahabaleshwar, 04/09/2010, *Sheba & Santhosh Nampy 3389* (DEV). **MANIPUR**: Thombal district, Thombal, 20/12/1942, *N.L. Bore 16971* (DD). Manipur, *s.loc.,* 04/1882, *G. Watt 7434* (CAL). **MEGHALAYA**: East Khasi Hills district, Khasi Hill, 11/1877, *C.B. Clarke 417* (CAL); Shillong, Barapani Dam Site, 08/09/2009, *Sheba & Santhosh Nampy 2264*; *Ibid*., 31/08/2011, *Santhosh Nampy 4710* (DEV). Jowai district, Jowai, 09/09/2009, *Sheba & Santhosh Nampy 2275* (DEV). Ribhoi district, Nonpogh 27/09/1960, *H. Deka E.C. 19988* (ASSAM); Nonpogh forest, 27/06/1962*, R.V. Kammathy 81218* (BSI); Upper Diling, 08/07/1959, *G. Panigrahi 8778* (ASSAM, CAL); Lohit Valley Road, 03/04/1916, *E. Alexander 3* (CAL); Rangsha, 24/06/1964, *E.C. 39072* (ASSAM). **MIZORAM**: Hailakandi district, Panchagram, 31/01/1963, *D.B. Deb 31488* (ASSAM, CAL); *N.E. Parry s.n.* (CAL). **NAGALAND**: Mokokchung district, Kononia, Naga Hills, 05/1895, *G. Watt 11623* (CAL); Mokokchung, 02/09/2011, *Santhosh Nampy 4740* (DEV). **ORISSA**: Bhubaneswar district, Bhubaneswar, 03/12/2011, *Sheba & Santhosh Nampy 3732* (DEV); Ganjam, 06/04/1977, *Saxena & Brahmam 2472* (RRLB); Guptheshwar, 20/12/1962, *G.V.S. Rao* E.C. *36191*; Kajalpatia E.C. *26815*; Pottangi, 04/12/1962, *G.V.S. Rao 36188* (ASSAM); Kasalpeti False Point, 30/01/1965, *G. Panigrahi 23581* (CAL). **PUNJAB**: Hoshiarpur district, UNA, 09/09/1970, *O.P. Misra 41774* (BSD).

RAJASTHAN: Jaipur district, Ajmir Road, 19/08/1964, *B.M. Wadhwa 4811* (CAL). Udaipur district, Kamblighat, 08/10/1967, *K.C. Kanodia 82443* (BSI); Hindoli, 23/12/1963, *D.M. Verma 1880*; Kota, 15/09/1964, *B.M. Wadhwa 1969* (CAL). **SIKKIM**: East Sikkim district, Kalimpong Way, 16/07/1962, *R.V. Kammathy 81261* (BSI); Riang, 25/03/1908, *Ribu 661*; Rungpo, 25/05/1909, *Viori 1488*; Sikkim, *s.loc*., *s. die*, *N.C. Mazumder 194*; *s.loc*., *s. die*, *B.D. Sharma 122* (CAL). **TAMIL NADU**: Coimbatore district, Agri. College Campus, 21/11/1968, *M. Chandrabose 28833* (CAL, MH); Anabetta, 10/07/1930, *V. Narayanaswamy 3858*; Ayinigiribetta, Geddesal, 15/03/1931, *K.C. Jacob 362*; Girmalam, 17/03/1931, *K.C. Jacob 414*; Madeswaranmalai, 10/02/1930, *V. Narayanaswamy 19761*; Selvapuram, 11/10/1964, *M. Chandrabose 28581* (MH). Cuddalore district, Bhuvanagiri, 12/03/1989, *K. Ramamurthy 90419* (MH); Chidambaram, 09/01/1978, *A. Mohanan 11104*; *Ibid*., 06/04/1978, *K.M. Matthew 12849* (CAL); Kallakurichi, Serappatty, 17/03/1984, *K.M. Matthew & S.J. Britto 29801*; Kattumannar, 30/01/1980, *K.M. Matthew 26167*; Pachavaram Road, 15/01/1977, *K.M. Matthew & D.I. Arockiasamy 6228*; Veeranam Lake Exit, 05/04/1978, *K.M. Matthew 12789*; Ullundurpet, 13/12/1978, *K.M. Matthew & P. Perumal 20109* (RHT). Kanchipuram district, Chingalpet, Vaudalur, 07/02/1915, *s.coll. 11492* (MH); Vedanthangal, 26/01/1976, *A.N. Henry 47034* (CAL, MH). Kanyakumari district, Amaravila Check Post, 10/10/2009, *Sheba & Santhosh Nampy 2272* (DEV); Arom, 02/08/1962, *P. Divakar PD 4806* (BLAT). Dindigul district, Kodaikanal, 15/09/1956, *J. Pallithanam 2151*; *Ibid*., 29/09/1956, *J. Pallithanam 2500* (RHT); *Ibid*., 10/11/2011, *Shahina & Sheba 4550* (DEV); Sivakasi, 17/04/1987, *S. Regupathy 397* (CAL, MH). Nilgiri district, Ebanadkoilbetta, 10/09/1970, *G.V. Subba Rao 36623* (MH); Devarshola, 26/09/2010, *Sheba & Santhosh Nampy 3464* (DEV); Kottabettu–Kotagiri, 07/10/1956, *K.M. Sebastine 932* (CAL, MH); Loest Brook, 19/05/1954 *C.J. Saldhana 1265* (BLAT); Loz Falls, 12/03/1969, *D.B. Deb 31700* (MH); Naduvattom, 03/09/1961, *R. V. Kammathy 73910B* (BSI); Paikara, 26/09/2010, *Sheba & Santhosh Nampy 3484* (DEV); Talakadu, 30/12/1960, *T.A. Rao s.n.* (CAL). Ramanathapuram district, Peruvayal, 16/01/1989, *V. Balasubramanyam 2115* (MH). Salem district, Attur, Pattivalavu, 17/12/1976, *D.I. Arockiasamy 5616*; Namakkal, Solakkadu, 26/04/1984, *K.M. Matthew & S.J. Britto 30137*; Rasipuram, Balapatty,

30/07/1978*, N. Venugopal 15802*; Vengayakurichi, 25/08/1976, *K.M. Matthew & D.I. Arockiasamy 3495* (RHT). Tiruchirappalli district, Lalgudi, 17/11/1978, *K.M. Matthew, C. Manoharan & S. Alamelu 19166*; Mullakudy, 03/03/1984, *K.M. Matthew & S.J. Britto 29600*; Melur, 10/03/1984, *K.M. Matthew & S.J. Britto 29689*; Oosipalam, 28/12/1976, *K.M. Matthew 5661*; Sembur, 18/03/1978, *K.M. Matthew 12405*; Srirangam, 14/02/1978, *Rajendran & Dijaviam 11864*; *Ibid*., 21/02/1978, *Perianayagam 12035* (RHT); Thuranjur, Sembur, 18/03/1978, *K.M. Matthew 12405* (CAL). **TRIPURA**: Agarthala district, Tipperah Hill, 26/09/1914, *P.M. Debbarmann 272* (CAL). **UTTARAKHAND**: Dehradun district, Bellapur Road, 30/08/1971, *Naithani 3159* (DD). **UTTAR PRADESH**: Bijnore district, Railway Station, 06/11/1979, *J.P. Sharma 67223* (BSD). Hamirpur district, Mohoba, 28/09/1961, *V.C. Bhattacharya 17868*; Churk, 10/03/1970, *G. Panigrahi 9671*; Pharendra, 31/10/1963, *C.M. Arora 1419* (CAL). Pilibhit district, Gobal, 15/09/1972, *C.L. Malhotra 50837* (BSD). **WEST BENGAL**: Howrah district, Adhama, Near Buxa, 24/05/1949, *V. Narayanaswamy 2976*; Bhakultala, 05/04/1963, *S.S.R. Bennet 8* (CAL). CNH Campus, 16/11/2003, *Joby & Santhosh Nampy 1096* (DEV); Jalpaiguri district, N.B. University Campus, *Sheba & Santhosh Nampy 2225* (DEV); Siliguri, 13/11/1960, *K. Thothathri 9540*. Hoogly district, Polba Village, 15/11/1962, *Kammathy 807* (CAL). West Dinajpore district, Chandernagar, 08/1902, *Abu Hosein s.n.*; Raiguraj, 21/08/1984, *R.N. Banerjee 18615* (CAL); Rangoon, Kumayut, 26/08/1932, *Parkinson 14850*; 20/09/1932, *U.F. 15056* (DD).

Notes: *Commelina diffusa* is widespread in India. It is allied to *C. sikkimensis* but differs by its cuneate leaf base, few flowered upper cincinni (1 or 2 flowered) and doubly reticulate seeds. The size of the leaf, internode and spathe vary according to habitat.

11. *Commelina ekabeeja* Sheba & Nampy *nom. nov*.

Heterocarpus hirsutus Wight, Ic. 29. t.2067. 1853.

Commelina hirsuta (Wight) C.B. Clarke in A. DC & C. DC., Monogr. Phan. 3: 163. 1881; Woodrow, J. Bombay Nat. Hist. Soc. 12: 524. 1899; Hook.f., Fl. Brit. India 371. 1892; T. Cooke, Fl. Bombay 204. 1906; Rama Rao, Fl. Pl. Travancore 417. 1914; C.E.C. Fisch. in Gamble, Fl. Madras 3: 1536. 1931; Fyson, Fl. S. Ind. Hill Sta. 2: 537. 1977; K.M. Matthew & Britto in K.M. Matthew, Fl. Tamil Nadu Carnatic 2: 1657. 1983; B.D. Sharma *et al*., Fl. Karnataka 288. 1984; M.P. Nayar & Sastry, Red Data Book Ind. Pl. 1: 125. 1987; Ahmedulla & M.P. Nayar, End. Pl. Ind. 1: 208. 1987; Karth. *et al*., Fl. Ind. Enum. Mon. 24. 1989; A.N. Henry *et al*., Fl. Tamil Nadu 44. 1989; Lakshmin. & B.D. Sharma Fl. Nasik Dt. 481. 1991; B.D. Sharma *et al*., Fl. Maharashtra 149. 1996; Pullaiah, Fl. Andhra Pradesh 3: 1002. 1997; K.M. Matthew, Fl. Palni Hills 1341. 1999; *nom. illeg.* Non Kunth 1837; non R. Br., 1810.

Type: India, Tamil Nadu, Avalangy, 10/1852, *Wight s.n.*'A' (K!, lectotype designated here). **Plate 41, 39b; Fig.12**

Extensively branched, erect perennial herb *ca*. 20–40 cm long, with a definite base; roots thick. Stems thickened at the base, terete, green; internodes *ca*. 5–6 cm long. Leaves distichous; sheath *ca*. 2 cm long, hirsute; lamina linear–lanceolate, 5–7 × 0.4–1 cm, acute–acuminate at apex, rounded at base, minutely hairy at margins, both surfaces hirsute. Spathes leaf opposed, lanceolate, 1.5–3.5(-5) × 0.5–0.7 cm, conduplicate, acute–acuminate at apex, cordate at base, hirsute out, glabrous in, green; peduncle 3–4(-7) cm long, green, hirsute; upper cincinnus not exserted; lower cincinnus *ca.* 0.5 cm long, 3–4 bisexual flowered. Sepals 3,

transparent; medial narrowly elliptic *ca*. 4 mm long; laterals *ca*. 5 mm long, rounded. Petals 3, deep blue; paired petals clawed, deltoid; odd petal much reduced, scaly. Stamens 3; lateral stamen filaments slender, *ca*. 3 mm long, anthers *ca*. 1.5 mm long, blue; median stamen with a little shorter filament, anthers yellow, curved. Staminodes 3; filaments slender, 2 mm long; antherodes yellow, 4–lobed with 2 lateral appendages. Ovary ovate, green; style white; stigma capitate. Capsules 1 or 2 per spathe, ellipsoid, *ca*. 5 mm long, tri–locular; dorsal locule 1 seeded; ventral locules empty. Seeds ellipsoid-oblong, *ca*. 4 × 2.5 mm; testa dull black; hilum linear; embryotega lateral.

Chromosome number: Not reported.

Flowering period: July–Ocotber.

Flowering time: 8.30–1.00 pm.

Ecology: On exposed bare slopes.

Distribution: South India, endemic.

Specimen examined: ANDHRA PRADESH: Karimnagar district, Aklaspur, 26/07/1964, *G.V. Subba Rao 20213* (MH). **TAMIL NADU**: Dindigal district, Kodaikanal, 14/07/1898, *s.coll. 72869*; *Ibid*., 1872, *Bowha s.n.*; *Ibid*., 05/1937, *s.coll. s.n.* (RHT); Kodaikanal-Kukal Pulneys, 17/07/1920, *s.coll. 16519* (MH); Konalar, 06/08/1984, *K.M. Matthew 40634*; Mahil kundiam, 11/09/1986, *K.M. Matthew 46835*; Mannavanur Sheep Farm, 28/08/1987, *K.M. Matthew 50474* (RHT); Pulney, Curdon Valley, 23/06/1898, *A.G. Bourne 1233* (CAL); Vembadi Peak, 07/08/1984, *K.M. Matthew 40710*; *Ibid*., 04/07/1987, *K.M. Matthew 49849*; *Ibid*., 27/08/1987, *K.M. Matthew & N. Rajendran 50413*; La providence, Marian Shola, 06/10/1966, *K.M.Matthew 7452*, *7453* (RHT). Nilgiri district, Dodabetta, 08/1883, *s.coll. 52246* ; Mukusti, 14/07/1970, *J.L. Ellis 34670* (MH); Naduvattom,

18/08/1878, *G. King s.n.* (DD, CAL); *Ibid*., 10/1884, *Gamble 14868*, *14879* (DD); Pandian Damsite, 28/10/1972, *J.L. Ellis 43427*; Pykara, 12/09/1930, *V. Narayanaswami 4753*; *Ibid*., 31/08/1970, *B.D. Sharma* 35965 (MH); Oottacamund, 08/08/1878, *G. King s.n.* (DD); *Ibid*., 12/08/1878, *G. King s.n.* (CAL); Ootty, 07/1883, *s.coll. s.n.* (MH).

Notes: Robert Wight (1853, *Icones Plantarum Indiae Orientalis* 29. t.2067) described *Heterocarpus hirsutus* as "diffuse, everywhere pilose especially on the sheaths and undersurface of the leaves,……leaves linear lanceolate ..... spathes long acuminate, ciliate at the base …….". This species is further distinguished by its one seeded capsules. Clarke (1881) placed this species under *Commelina* as *C. hirsuta* (Wight) C.B. Clarke and this name was subsequently been used by various authors in their Floras (Hooker, 1892; Woodrow, 1899; Cooke, 1907; Rama Rao, 1914; Gamble, 1931; Nayar & Sastry, 1987; Ahmedullah & Nayar, 1987; Karthikeyan *et al*., 1989; Henry *et al*., 1989; Lakshminarasimhan & Sharma, 1991; Sharma *et al*., 1996; Pullaiah, 1997; Matthew, 1999). However, the name *Commelina hirsuta* (Wight) C.B. Clarke being a later homonym of *C. hirsuta* R. Br. (1814) or Willd. ex Spreng. (1820) or Kunth (1843) or Hochst. ex A. Rich. (1850) is illegitimate (Article 58.3 of ICBN, McNiell *et al*., 2006). Hence a new name *C. ekabeeja* Sheba & Nampy is proposed here.

Wight (*l.c.*) described this species from Nilgiris (India) and there are three sheets at K, all seems to be part of a single collection. There is also one sheet at MH, but this lacks any label or name in Wight's handwriting. According to Noltie (2005), there are no possible types at E. Of the three sheets at K, one lacks anything in Wight's handwriting, second bears a description by Wight while the third sheet had a field ticket annotated 'Avalangy, October 1852'. This third sheet contains five

specimens which are marked here as A–E. Among them, specimen 'A' is a perfect match for the description, is designated here as the lectotype.

The flower colour of *C. ekabeeja* (= *H. hirsutus*) is described differently by various authors. Wight (1853) described it as yellow, Fischer (1931) as yellow drying deep-blue and Matthew (1999) as blue. During the present investigation, I haven't collected this species anywhere from South India.

According to Fyson (1919), the yellow flowered species of Wight (1853) *Heterocarpus glaber* (= *Commelina wightii*) and *H. hirsutus* (= *Commelina ekabeeja*) produce orange flowers on the lower slopes and blue flowers on the higher and he assumed them as two varieties– a glabrous and a hairy of one species. However, *C. wightii* and *C. ekabeeja* are quite distinct and the latter can be separated from the former by its pilose habit, tuberous roots, linear-lanceolate leaves, long acuminate spathes and hairy ovary.

12. *Commelina ensifolia* R. Br., Prodr. Fl. Nov. Holland. 269. 1810; C.B. Clarke in A. DC & C. DC., Monogr. Phan. 3: 188. 1881; Hook.f., Fl. Brit. India 6: 374. 1892; R.S. Rao & Kammathy, J. Bombay Nat. Hist. Soc. 59: 65. 1959; R.S. Rao, Blumea 14: 352. 1966; C.J. Saldanha & Nicolson, Fl. Hassan Dt. 645. 1976; K.M. Matthew & Britto in K.M. Matthew, Fl. Tamil Nadu Carnatic 2: 1658. 1983; Chandrab. & N.C. Nair, Fl. Coimbatore 300. 1987; A.N. Henry *et al.,* Fl. Tamil Nadu 3: 44. 1989; Karth. *et al*., Fl. Ind. Enum. Mon. 25. 1989; Kesh. Murthy & Yogan., Fl. Coorg 480. 1990; M. Mohanan & A.N. Henry, Fl. Thiruvananthapuram 485. 1994; T. Pullaiah, Fl. Andhra Pradesh 3: 1001. 1997; Faden in Dassan., Rev. Handb. Fl.

Ceylon 14: 195. 2000; T.S. Nayar *et al*., Fl. Pl. Kerala 659. 2006; Sunil & Sivad., Fl. Alappuzha Dt. 703. 2009.

Type: Australia, Carpentaria Island, 21/11/1802, *R. Brown 5733* (BM!).

Commelina ensifolia var. *pubescens* R. Br. ex C.B. Clarke in A. DC & C. DC., Monogr. Phan. 189. 1881.

Commelina undulata var. *setosa* C.B. Clarke in A. DC & C. DC., Monogr. Phan. 3: 179. 1881; C.E.C. Fisch. in Gamble, Fl. Madras 3: 1539. 1931.

Plate 42, 43, 39e; Fig. 13

A much branched, sub-scandent rhizomatous perennial herb, with a definite base; roots thick. Stem terete, green; internodes 2–10 cm long. Leaves distichous; sheath 1–4 cm long, pubescent, ciliate at apex; lamina linear–lanceolate, 5–15 × 0.6–1.4 cm, acute– acuminate at apex, narrowed at base, entire at margins, upper surface glabrous or puberulous, lower surface puberulous. Spathe solitary, triangular, 1–1.8 × 0.5–1.5 cm, cucullate, acute at apex, margins fused basally, surfaces hirsute-puberulous, pale green with darker green veins; peduncle 0.5–0.7 cm long, green, pubescent; upper cincinnus usually absent; lower cincinnus *ca*. 0.6 cm long, glabrous, 2–3 bisexual flowered. Sepals 3, white; medial boat shaped; laterals fused basally, oblong. Petals 3; paired petals lilac–light blue, orbicular, held in a lateral position *ca*. 10 × 13 mm; odd petal white, lanceolate, *ca*. 2 mm long. Stamens 3; lateral stamen filament *ca.* 10 mm long, anthers white; pollen white, medial stamen filament *ca*. 8 mm long, anther yellow, large, connective white. Staminodes 3; filaments slender; antherodes yellow, 4-lobed with 2 lateral appendage. Ovary globose; style white, 11 mm long; stigma trilobed. Capsules 1–2 per spathe, elliptic–

obovoid, bi or trilocular; dorsal locule rarely absent; ventral locules 1- seeded. Seeds ovoid, 2.5–3.5 × 2–3 mm; testa mottled light and dark brown, smooth, farinose white, a torus of soft whitish brown material around the periphery; hilum linear; embryotega lateral.

Chromosome number: n = 45 (Kammathy & Rao, 1961a; 1964; 1965).

Flowering period: March–February.

Flowering time: 7.30–11.30 am.

Ecology: Road sides, rock crevices, railway tracks, weedy areas and forest way sides.

Distribution: Australia, India and Sri Lanka.

Specimens examined: **ANDHRA PRADESH**: Anantapur district, Dharmapuri, 24/10/1982, *N. Yesoda 1008* (MH); Patakoteswar, 07/1889, *Gamble 20923* (BSD). Chittoor district, Brahmadevudu Gundam, 03/10/1974, *G.V. Subba Rao 45965*; Nagarjunakonda, 14/07/1961*, K. Thothathri 9648*; *Ibid*., 15/07/1961, *K. Thothathri 9698* (CAL); Nallathippa, Kambakam Range, 28/09/1974, *M. Chandrabose 45173* (MH); Pathankottacheruma, 07/1889, *J.S. Gamble 20923* (CAL); Puthur–Kailasakona, 26/06/1969, *G.V. Subba Rao 32033B* (CAL, MH). Cuddapha district, Cuddaph, 08/1889, *J.S. Gamble 21199* (CAL); Horselybunda, 07/1884, *J.S. Gamble 15114* (MH). Guntur district, Bothapalla R.F., 30/08/1924, *s.coll. 17404* (MH); Kondvidu, 07/09/1956, *S.K. Wagh 3781, 3782*(BLAT). Nellore district, Kadirmiarua Falls, 26/07/1914*, M.S. Ramaswamy 1219* (DD). Prakasam district, Daovalarvarura, 09/10/1983, *R.K. Mohan 0228*; Medarametta, 01/10/1983, *R.K. Mohan 0158* (CAL). **BIHAR**: Hazaribagh district, Cannary Hills, 11/09/1993, *J.K. Das 22523* (CAL). **KARNATAKA**: Bengaluru district, Bengaluru, 07/1916, *R.D. Acland 193*; *Ibid*., 10/1916, *R.D. Acland 211* (MH); Devarayadurga, 28/08/1961*, R.S. Rao 73302* (BSI); Kanakapura, 19/07/1978*, N.S. Ravindra 1554* (CAL, JCB). Bijapur district, Badami, 15/09/1979, *S.R. Ramesh & B.R. Ramesh KFP 9301* (JCB). Hassan district,

Arassikkara–Hassan Road, 31/10/1976, *A.J. Faden & C.J. Saldanha* 76201; Bourdalboore, 09/07/1971, *T.P. Ramamurthy HFP 1930* (JCB). Kolar district, Udappanahalli, 07/07/1978, *S.R. Ramesh & N.S. Ravindra KFP 1474* (JCB). Mandya district, Malavally–Kollegal, 24/10/1978, *S.R. Ramesh & Manohar KFP 3807* (JCB). Mysore district, Bandipur, 26/08/1964, *B.D. Naithani 21233* (MH); Chamarajnagar–Satyamangala road, 02/08/1979, *S.B. Manohar & B.R. Ramesh KFP 8688* (JCB); Manasagangotri, 04/11/2009, *Sheba & Santhosh Nampy 2294*; Mysore Zoo, 06/06/2010, *Sheba & Santhosh Nampy 3236* (DEV). **KERALA**: Kollam district, Thenmalai, 17/05/1978, *M. Mohanan 54848* (MH); *Ibid*., 10/09/2003*, Joby & Santhosh Nampy 954* (DEV). Kozhikode district, Devagiri Botanical Garden (cultivated), 26/07/2004, *Joby& Santhosh Nampy 1227*; *Ibid*., 04/06/2010, *Sheba & Santhosh Nampy 3234* (DEV). Pathanamthitta district, Elimullu, 31/05/2010, *Sheba & Santhosh Nampy 3229* (DEV); Ranni, 10/09/1988, *Anilkumar 845* (SNC). Thiruvanathapuram district, Museum, 11/10/2009, *Sheba & Santhosh Nampy 2282*; *Ibid*., 05/11/2010, *Sheba & Santhosh Nampy 4006* (DEV); Kallupparamalai, 03/02/1913, *M. Rama Rao s.n.*(CAL); Kottur R.F., 26/09/1973, *J. Joseph 41988* (MH); Naduvanthumurchi, 26/08/1913, *C.C. Calder & M.S. Ramaswamy 165* (CAL); Palode, TBGRI, 19/10/2009, *Sheba & Santhosh Nampy 2283* (DEV); Ponmudi Estate, 13/09/1977, *N.C. Nair 51010* (CAL, MH). Thrissur district, Parambikkulam, 07/04/1963, *K. Ramamurthy 16129* (CAL). **PONDICHERRY**: Pondicherry, Auroville, 11/11/1988, *R. Raja* 88077 (MH). **TAMIL NADU**: Chennai district, Chennai, 07/1886, *J.S. Gamble 17621*; *Ibid*., 12/01/1899, *C.A. Barber 72* (MH); Mahabalipuram, 03/09/1878, *G. King s.n.*; *Ibid*., 27/09/1970, *T.A. Rao 7612* (CAL); Museum Compound, 10/12/1899, *s.coll. s.n.* (MH). Coimbatore district, Arepalayam, Kollegal, 04/07/1930, *V. Narayanaswamy 3469*; Agri. College Farm, 01/12/1966, *M. Chandrabose 28915*; Anakkatti, 13/10/1971, *M.V. Viswanathan 1060*; Ethanibetta, 04/07/1930, *V. Narayanaswamy 3477*; Hassanur, 21/08/1914, *s.coll. 10538*; Kurudimalai, 16/09/1956, *K. Subramanyam 706*; *Ibid*., 13/12/1956, *K. Subramanyam 1771*; Madeswaram Malai, 13/12/1930, *V. Narayanaswamy 3477*; Maruthamalai, 14/11/1956, *K.M. Sebastine 1296* (MH); *Ibid*., 30/06/2002, *Joby & Santhosh Nampy 4043*; *Ibid*., 28/11/2010, *Sheba & Santhosh Nampy 443* (DEV); Nellimalai R.F., 18/10/1962, *K. Ramamurthy 14800* (CAL, MH); Rangaswamikoil,

24/01/1931, *S.R. Raja & Naganathan 4895* (MH); Valparai, Konalar, 02/10/1984, *K.M. Matthew 18310* (RHT). Cuddalore district, Vellapparai, 13/06/1978, *K.M. Matthew & Venugopal 13905* (RHT). Dharmapuri district, Harur, Peria Bottumalai, 12/08/1978, *K.M. Matthew 16380*; Mari, 09/09/11978, *K.M. Matthew & Venugopal 17185* (RHT). Dindigul district, Alagar Hills, 26/09/1975, *K.M. Matthew 14878* (RHT); Kodaikanal, 19/09/2001, *Jojo Joseph 135*; *Ibid*., 16/10/2010, *Sibichen 3278*; Dindigal road, 24/03/2002, *Joby & Santhosh Nampy 92* (DEV); Kodaikanal Ghat, Mile–3, 07/07/1901, *Bourne 2267* (MH); Kodaikanal, Palani Road, 22/03/2002, *Joby & Santhosh Nampy 76*; *Ibid*., 21/10/2009, *Sheba & Santhosh Nampy 2289* (DEV); Lower Pulneys, 09, *Rd. G. Rodrignez 1958* (CAL); Sirumalai, 07/1913, *s.coll. 9108* (MH); *Ibid*., 04/01/1963, *R.V. Kammathy 82646, 82647* (BSI); *Ibid*., 11/1958, *J. Pallithanam 3568*; *Ibid*., 12/10/1959, *J. Pallithanam 5224*; *Ibid*., *s. die*, *J. Pallithanam 35, 863* (RHT). Kanchipuram district, Chingelpet, *E. Barnes s.n.* (BSD); *Ibid*., 07/1883, *J.S. Gamble 12199* (CAL); Vedanthangal Waterbirds Sanctuary, 25/09/1974, *A.N. Henry 45418* (MH). Kanyakumari district, Tadikarankonam, 01/01/1963, *R.V. Kammathy 82625* (BSI). Nilgiri district, Adderley, 06/12/1971, *N.C. Radhakrishnan 39162* (MH); High Wavy Mountain, 05/1917, *Blatter & Hallberg 843* (CAL); Naduvattom, 20/11/2001, *Santhosh Nampy 177* (DEV); Virapulli Reserve Forest, 12/10/1958, *M.Y. Ansari s.n*. (BSI). Ramanathapuram district, Thavalazhapperumalkuttam, 16/02/1979, *N.C. Nair 60846* (MH). Salem district, Attur, 12/05/1977, *D.I. Arockiasamy 7995* (RHT); Hosur Cattle Farm, 06/06/1930, *V. Narayanaswamy 2908*; *Ibid*., 07/06/1930, *V. Narayanaswamy 2962* (MH); Kochikoopitan, 27/06/1978, *N. Venugopal 14371*; Palliapparai, 30/07/1978, *N. Venugopal 15824*; Kolli Hills, 06/04/1976, *V. Alphonse & C. Rajamani 1915*; Thalakkarai, 01/08/1978, *N. Venugopal 15981*; Vellakkappatty, 30/06/1978, *N. Venugopal 14550*; Watchukkal Aaru, 01/08/1978, *N. Venugopal 15946* (RHT). Thanjavore district, Adiramapatanam, 22/06/1978, *V.J. Nair 57049* (MH); Papanasam, 19/09/1977, *K. Ramamurthy 51326* (CAL, MH). Tiruchirappally district, Karuppankadu Thittu, 15/12/1977, *K.M. Matthew 10617* (RHT); Pachamalai, 06/08/1958, *K.M. Sebastine 6160* (MH); Sengattupatty, 10/07/1976, *K.M. Matthew 2413*; Sobhanapuram, 27/11/1978, *K.M. Matthew*, *V.S. Manickam & Manoharan 19408* (RHT). Tirunelveli district, Ayilandampalli Estate,

24/07/1966, *B.V.Shetty 27950*; Courtallam, 13/09/1915, *s.coll. 12073* (MH); Chittaruvi, 26/09/1975, *K.K.N. Nair 1118*; Thekkumalai, 29/09/1975, *K.K.N. Nair 1207* (CAL); Kalakkadi R.F., 08/03/1963, *J. Joseph 15833*; Kannikkatti, 05/07/1964, *A.N. Henry & M. Chandrabose 19290*; Kodamady, 06/02/1921, *s.coll. 16774*; Mahendragiri, 17/09/1916, *s.coll. 13148*; *Ibid*., 18/09/1916, *s.coll. 13208*; Mancholai, 17/10/1957, *K.M. Sebastine 4518*; Naterikal, 21/09/1916, *s.coll. 13295*; *Ibid*., 26/09/1916, *s.coll. 13272*; Papanasam Above Lower Dam, 07/07/1959, *K.M. Sebastine 8366* (MH); Sengaltheri-Kalakad Ghat, 26/01/1979, *K.M. Matthew 16406* (RHT). Thiruvannamalai district, Elagiris, Deel, *E. Barnes s.n.* (DD); Nagari, 18/03/1917, *s.coll. 14754* (MH). **WEST BENGAL**: Herb. Hort. Bot. Culcuttensis. (CAL).

Notes: *Commelina ensifolia* is close to *C. paleata* in having rhizomatous base, cucullate spathe and smooth seeds, but can be easily seperated by its dark veined spathes, lilac to light blue flowers and seeds with a torus of white material along the periphery.

13. *Commelina forskalaei* Vahl, Enum. Pl. 2: 172. 1805; Hassk., Flora 46: 387. 1863, in Schweinf., Beitr. Fl. Aethiop. 208. 1863; C.B. Clarke in A. DC & C. DC., Monogr. Phan. 168. 1881 (excl. varieties); Hook.f., Fl. Brit. India 6: 371. 1892; T. Cooke, Fl. Bombay 3: 292. 1906; C.E.C. Fisch. in Gamble, Fl. Madras 3: 1537. 1931; E. Barnes, J. Bombay Nat. Hist. Soc. 46: 84. 1946; Maheshw., Fl. Delhi 339. 1963; J.K. Morton, J. Linn. Soc., Bot. 60: 185. 1967; Maheshw., Fl. Delhi Ill. 3: 204. 1966; V. Singh, Fl. Banswara Rajasthan 227. 1983; Chandrab., & N.C. Nair, Fl. Coimbatore 298. 1987; Kamble & S.G. Pradhan, Fl. Akola Maharashtra 230. 1988; Karth. *et al.,* Fl. Ind. Enum. Mon. 25. 1989; B.V. Shetty & V. Singh, Fl. Rajasthan

2: 850. 1993; B.D. Sharma, *et al.,* Fl. Maharashtra Mon. 153. 1996; T. Pullaiah, Fl. Andhra Pradesh 3: 1001. 1997; Murti & Panigrahi, Fl. Bilaspur 2: 634. 1999.

Type: Asia, *s.loc*., *s. die*, *Forsskal 35* (holotype, C).

Commelina falcata Hassk., Fl. 46: 387. 1863. **Plate 44, 39f; Fig. 14**

A much branched, slender annual herb, rooting at the nodes, with a definite base; roots long, thin, fibrous. Cleistogamous flowers produced from the basal nodes on underground shoot. Stems terete, green; internodes 4–10 cm long. Leaves distichous; sheath *ca*. 1.5 cm long, densely ciliate, mottled with dark green striations; lamina ovate–oblong, 5–8 × 1–1.5 cm, acute at apex, cuneate at base, wrinkled at margins, both surfaces densely pilose. Spathes leaf opposed, *ca*. 1.5 × 0.7 cm, cucullate, acute at apex, basally fused, pilose, green; peduncle *ca*. 0.6 cm long, green, strigose; upper cincinnus *ca*. 1 cm long, exserted, 1 or 2 male flowered; lower cincinnus *ca*. 0.5 cm long, glabrous, 4 or 5 bisexual flowered. Sepals 3, free, white; medial narrowed at apex; laterals ovate. Petals 3, bright blue tinged with pink; paired petals orbicular, oblique, claws *ca*. 1mm long, odd petal lanceolate. Stamens 3; lateral stamen filament dark blue, flat or winged, 11 mm long; anther copper blue, pollen white; medial stamen filament *ca*. 5 mm long, anther curved, copper blue with yellow globular outgrowth, connective lilac. Staminodes 3 or 2; filaments slender, *ca*. 3 mm long, basally pink and deep blue distally, antherodes yellow, poorly developed; Ovary globose, green; style white, *ca*. 11 mm long; stigma capitate. Capsule 1 per spathe, obovoid, trilocular; dorsal locule 1-seeded; ventral locule 2-seeded. Seeds 5, globose-orbicular, *ca*. 2.5 × 2 mm; testa brown,

smooth; hilum linear; embryotega lateral. Capsule of cleistogamous flowers 1 or 2 seeded, indehiscent; seeds ridged and furrowed.

Chromosome number: n = 15 (Raghavan & Rao, 1961; Kammathy & Rao, 1961a; Shetty & Subramanyam, 1962).

Flowering period: July–November.

Flowering time: 8.00–11.00 am.

Ecology: Road sides, paddy fields, railway tracks and in exposed or partially shady areas.

Distribution: Africa, Arabian Peninsula, South India and Indochina.

Specimens examined: **ANDHRA PRADESH**: Anantapur district, Anantapur, 15/09/1961, *R.V. Kammathy 73954* (BSI); Carladinne, 12/09/1981, *Pullaiah & Yesoda 309* (SKU); Guntkal Railway Station, 31/08/2010, *Sheba & Santhosh Nampy 3415* (DEV); S.K.U Campus, 22/06/2009, *B. Raviprasad Rao 36177*; *Ibid*., 18/01/2010 *B. Raviprasad Rao 36898*; Thanakallu, 20/10/1990, *K.N. Ramakrishna & D. Ali Moulali 9827* (SKU). Hyderabad district, Osmania University, 18/09/1961, *R.V. Kammathy 73978* (BSI). Kurnool district, Erramalai Hills, 05/12/1983, *R.R.V. Raju 1889* (SKU); Kurnool, 16/09/1961, *R.V. Kammathy 73957* (BSI). Mahabubnagar district, Marchala R.F., 25/12/1985, *Ramakrishnaiar 3914* (SKU). **DAMAN**: Daman district, Daman, 24/09/1963, *M.Y. Ansari 93502* (CAL, BSI); *Ibid*., 26/09/1963, *M.Y. Ansari 93654*; Zawar Mines, Udaipur, *N.C. Aery s.n.* (CAL). **DIU**: Diu district, Castle Area, 18/09/1964, *R.S. Rao 102518*; Diu, 22/11/1962, *T.A. Rao 1994*; Diu Island, 22/11/1962, *T.A. Rao 1991*; Gogals, 21/09/1964, *R.S. Rao 102752*; Jalandhar, 18/09/1964, *R.S. Rao 102466* (CAL). **GOA**: North Goa district, Nagaon, 20/09/1964, *R.S. Rao 102646, 102705* (CAL, BSI); *Ibid*., 04/09/1967, *P.J. Cherian 88542*; Panaji, Castle Area, 18/09/1964, *R.S. Rao 102518* (BSI); St. Inez Beach, 29/09/2002, *Joby & Santhosh Nampy 839* (DEV); Panjim, 06/11/1962, *R.S. Rao 84361* (CAL). **GUJARAT**: Ahammedabad district, Ahammedabad,

24/10/1903, *G.A. Gammie 16395*; Ankleshwar, 25/09/1963, *G.S. Puri 44327*; Bhong, 17/10/1959, *W.J.C. Stower 53*; Kaira, 22/09/1957, *S.K. Jain 24427*; Kunkaria Garden, 16/08/1957, *G.S. Puri 23908*; Nandrad, 08/08/1957, *P.S. Toor 14267* (BSI). Bahadurpur district, Dattivara Dam Site, 23/12/1977, *V. Singh 5355* (BSJO). Jamnagar district, Dwarka, 22/08/1952, *Santapau 16601*; *Ibid*., 12/10/1953, *Santapau 14754*; Gaudal, Iringetian Lake, 21/08/1952, *Santapau 14657* (BLAT); Varvala, 30/03/1954, *J.C. Dhruna D. 196*; *Ibid*., 03/08/1958, *J.C. Dhruna D. 243* (DD). Kutch district, Narayan Sarovar, Mindiyari R.F., 23/09/2000, *V. Singh 15741*; *Ibid*., 27/09/2000, *V. Singh 15904* (BSJO). Mahesana district, Chasai, 28/12/1977, *V. Singh 5517* (CAL, BSJO); Sonasautold, 11/1915, *Sedgwick 1102* (CAL). Surat district, Madhuva Shore, 10/10/1964, *T.A. Rao 2123* (CAL); Okha, 13/10/1953, *Santapau 16659* (BLAT); Sasan, 16/10/1953, *Santapau 16411*; Saurashtra, Girnar, Junagadh, 03/10/1953, *M.B. Raizada 21260* (DD); Saurashtra Coast, Piran Island, 04/10/1964, *T.A. Rao 2016* (CAL); Sonala, 14/11/1983, *P.G. Diwakar 171068* (BSI); Surat, 12/10/1957, *P.S. Toor 25654* (BSI). District unknown, *s.loc., s.die, S. Kurz s.n.* (CAL). **HARYANA**: Panipat district, Panipat, 16/10/1962, *N.C. Nair 24686* (CAL). **HIMACHAL PRADESH**: Solan district, Konana, 22/10/1962, *N.C. Nair 25154* (CALI). **KARNATAKA**: Bellary district, Bellary, 19/01/1976, *N.P. Singh 142619* (BSI); Govt. Farm, 11/01/1905, *C.A. Barber 6560* (CAL, MH); Hampi, 14/10/1919, *s.coll. 15997* (MH); Kamalapore, 09/1910, *A. Meebold 11381* (CAL). Bijapur district, Amingad, 14/09/1979, *S.R. Ramesh & B.R. Ramesh KFP 9222*; Khatijapur Road, 17/09/1979, *B.R. Ramesh & S.R. Ramesh KFP 9368* (JCB). Chitradurga district, Chitradurga, 06/11/1975, *N.P. Singh 141435* (BSI). Mysore district, Badami Hills, 01/09/1912, *Aranjiya s.n*.; Badami Village, 06/08/1958, *B.M. Wadhwa 39677* (BSI); Zoo, 04/10/2001, *Santhosh Nampy 138*; *Ibid*., 06/06/2010, *Sheba & Santhosh Nampy 3235* (DEV). **KERALA**: Kozhikode district, Kappadu Beach, 28/10/2010, *Sheba & Santhosh Nampy 3297*; Kozhikode, 09/11/2009, *Santhosh Nampy 3194*; *Ibid*., 12/11/2010, *Manudev & Sheba 5050*; Nandy Beach, 03/08/2002, *Joby & Santhosh Nampy 480, 483* (DEV). **MADHYA PRADESH**: Bilaspur district, Koenchi, 02/1972, *S.K. Murti 15378*; Gwalior, 1889, *C. Mariscus s.n.* (CAL); Umarai, 14/09/1957, *G.S. Puri 26524* (BSI). **MAHARASHTRA**: Dharwar district, Hubly, 12/1918, *L.J. Sedgwick & T.R.D. Bell 4911* (CAL).

Kohlapur district, East Khandesh, Erandol, 19/08/1956, *S.D. Mahajan 6446*; Hillock, Beyond Moshi, 24/03/1956, *G.S. Puri 6044*; Khandesh, Mahaswa, 21/08/1956, *S.D. Mahajan 6699* (CAL); Kohlapur, 11/1927, *R.D. Acland ACK 1246* (BLAT); Laling, 06/07/1956, *G.S. Puri 3932*; Rohata–Anagar Road, 01/09/1956, *G.S. Puri 5821* (CAL). Mumbai district, Bombay Flora, 12/1906*, N.J. Dalzell 21* (DD); Broach, 27/01/1955, *G.L. Shah Shah 1583*; *Ibid.*, 02/11/1955, *G.L. Shah Shah 6246*; *Ibid*., 22/11/1955, *G.L. Shah Shah 6229* (BLAT); Buldana Nandura, 23/09/1963, *R.S. Rao 92201* (BSI); Chotila, 15/05/1952, *Santapau 14389* (BLAT); Dhond, Garkantha, 06/09/1956, *S.K. Jain 6149* (CAL); Dhulghat, 13/11/1979, *M.Y. Ansari 159982* (BSI); Goregaon, Araye Milk Colony, 22/09/1958, *S.C. Tavakari T. 1785* (BLAT); Junnar, Kukkadi, 01/11/1964, *Hemadri 104320* (BSI); Juragadh, Guuai Hill, 25/08/1952, *P.V. Bole 709*; Khetri, Ajit Sagar, 25/08/1957, *K.C. Kanodia 85*; *Ibid*., 20/09/1957, *K.C. Kanodia 230* (DD); Malad, *s. die*, *G.L. Shah Shah 8944*; Malad, Kandivali, 06/08/1955, *G.L. Shah Shah 4768*; Matunga, 11/1924, *Acland ACK 1216* (BLAT). Nasik district, Nasik Road, 21/08/1956, *K.B. Eangurde 9916* (CAL). Pune district, Hadapsar, 02/09/2010, *Sheba & Santhosh Nampy 3260*; Haveli, 02/09/2010, *Sheba & Santhosh Nampy 3256* (DEV); Kirkee, 16/09/1898, *F.I. Jenkin s.n*. (CAL); Koregaon Park, 05/09/2010, *Sheba & Santhosh Nampy 3276* (DEV); Mundhwa, 07/10/1961, *P.J. Cherian 68284* (CAL); Rajgurunagar, 05/09/2010, *Sheba & Santhosh Nampy 3269* (DEV); Rajkot Riverbed, 20/10/1951, *Santapau 13617* (BLAT); Ramtekadi, 02/09/2010, *Sheba & Santhosh Nampy 3261*; Shiroli, 05/09/2010, *Sheba & Santhosh Nampy 3268* (DEV); Wadha, 30/09/1956, *S.K. Jain 6572, Dalzell s.n*. (CAL). **RAJASTHAN**: Ajmir district, Merwara, 09/1884, *A.E. Lourie 4894* (DD). Banswara district, Banswara, 26/07/1961*, K.C. Kanodia 75314* (BSI); Churiyavara, 23/08/1976, *V. Singh 2999*; Hasara, 14/10/1976, *V. Singh 3619* (CAL, BSJO); Paloda, 18/08/1976, *V. Singh 2839* (BSJO). Barmer district, Dhorimanna Hills, 28/10/1975, *B.V. Shetty 2337* (CAL, BSJO). Bhilwara district, Amarpura, 19/09/1978, *A.N. Singh 6216*; Deccan, 1884, *T. Cooke 95* (CAL); Umedsagar, 06/10/1978, *A.N. Singh 5763* (CAL, BSJO). Chittargarh district, Roppura, 14/08/1979, *V. Singh & R.P. Pandey 6907* (BSJO). Jaipur district, Jaipur, 11/07/1955, *M.B. Raizada s.n.* (DD); University Residency, 02/08/1964, *S. Sharma 557* (CAL). Jalor district, Agwari Village, 14/10/1977, *B.L. Vyas 4558*; Marwarkori,

21/09/1979, *B.L. Vyas 7328*; Sunda Hill, Rajpura, 24/10/1977, *B.L. Vyas 5188*; *Ibid*., 11/08/1978, *B.L. Vyas 6313* (CAL, BSJO). Jhalawar district, Pirwa, 27/09/1964, *B.M. Wadhwa 7681* (CAL). Jhunjhunu district, Ajit Sagar Dam, 12/09/1992, *P.J. Parmar 11023*; Khaskhara F.B., 28/09/1994, *P.J. Parmar 12332*; Khetri F.B., 30/09/1994, *P.J. Parmar 12394* (BSJO). Jodhpur district, Birai Dam, 26/08/1977, *A.N. Singh 4394* (CAL, BSJO). Pali district, Bala village, 07/11/1974, *B.V. Shetty 1372* (BSJO); Pali, 12/08/1958, *S.K. Jain 40949* (BSI); Sarandha, 18/08/1975, *B.V. Shetty 1787* (CAL, BSJO). Raipur district, 07/07/1959, *Stower 42* (BSI). Tonk district, Rajmahal R.F., Deoli, 11/09/1974, *B.V. Shetty 1214*; Siras Forest, 17/11/1973, *B.V. Shetty 1020* (BSJO). Udaipur district, Bagdara, 04/10/1962, *K.C. Kanodia 82343* (BSI). **TAMIL NADU**: Chennai district, Allusuram Compound, 1879, *G. Bidie s.n.* (MH). Coimbatore district, Aliyar Nagar, 30/10/1964, *K.M. Sebastine 22400* (MH); Bharatiyar University Campus, 27/11/2010, *Sheba & Santhosh Nampy 4262* (DEV); BSI Campus, 09/05/1965, *M. Chandrabose 28769* (MH); *Ibid*., 17/11/ 2010, *Manudev & Santhosh Nampy 4261* (DEV); Central Farm, 10/1920, *s.coll. s.n.*; 09/1925, *Fischer s.n.*; *Ibid*., 18/10/1939, *Raja s.n*. (MH); Coimbatore, 09/01/1963, *R.V. Kammathy 82665*; Dabok, 06/10/1963, *K.C. Kanodia 82366* (BSI); Distillary Road, 03/05/1964, *M. Chandrabose 28425* (CAL, MH); Emmanur, 10/01/1953, *K.M. Vaid 23283* (BSD); Forest College Campus, 29/11/1964, *M. Chandrabose 28639*; Hospet, 09/1987, *s.coll. s.n.*; Madukkara, 09/08/1962, *C. Sreemadhavan CPS7*; Selvapuram, 23/05/1965, *M. Chandrabose 28868*; Sewage Farm, 16/06/1957, *K. Subramanyam 5919* (MH); TNAU Campus, 13/09/1964, *M. Chandrabose 28516* (CAL, MH); *Ibid*., 06/08/1968, *M. Chandrabose 30641* (MH); *Ibid*., 30/05/2002, *Joby & Santhosh Nampy 866* (DEV); Valparai, 24/08/1963, *K.N. Subramanian 788* (DD). Ramanathapuram district, Athipatti, 11/03/1953, *G.H. Maduram s.n.*; Essani Forest, Sivaganga, 14/08/1964, *K. Ramamurthy* 20796; Visuvannoor, 30/10/1988, *V. Balasubramanyam 1944* (MH). Salem district, 1930, *E.K. Krishnan s.n.* (BSD). Tinnevelly district, Tinnevelly, 29/12/1944, *Daniel Sundar Raj s.n*. (MH).

Notes: *Commelina forskalaei* is nearer to *C. benghalensis* in having cleistogamous flowers and cucullate spathes but it differs from the latter in having pedunculate

spathes and smooth seeds. Winged staminal filaments and pilose spathes easily distinguishes this species in the field.

14. ***Commelina indehiscens*** E. Barnes, J. Bombay Nat. Hist. Soc. 46: 74. 1946; V.S. Ramach. & V.J. nair, Fl. Cannanore 482. 1988; Karth. *et al.,* Fl. Ind. Enum. Mon. 25. 1989; Vajr. Fl. Palghat 516. 1990; Faden in Dassan., A Rev. Handb. Fl. Ceylon 14: 181. 2000.

Type: India, Karnataka, Mysore district, Biligirirangan hills, Bedaguli, 05/1939, *E. Barnes 2135* (DD!, lectotype designated here).

Paralectotypes: India, Karnataka, Mysore district, Biligirirangan Hills, Bedaguli, 06/1939, *E. Barnes 2163* (MH! designated here); Minchiguli Valley, 06/1939, *E. Barnes 2164*, *2137*(K! designated here).

Commelina clavata of C.B. Clarke in A. DC & C. DC., Monogr. Phan. 3: 171. 1881, p.p.; of Hook.f., Fl. Brit. India 6: 371: 1892, p.p., non C.B. Clarke, 1874.

Plate 45, 46, 50a; Fig. 15

A much branched, extensively scrambling, decumbent perennial herb, rooting at the nodes, lacking a definite base; roots thin, long, fibrous. Cleistogamous flowers present at the basal nodes. Stems terete, green with red longitudinal striations; internodes 4–12 cm long, puberulous. Leaves distichous; sheath *ca.* 2 cm long, puberulous to pilose, ciliate at apex, mottled with red striations; lamina sub–petiolate, ovate–lanceolate, 6–10 × 3–4 cm, acuminate at apex, rounded at base, slightly unequal sided, serrulate at margins, both surfaces pubescent. Spathe leaf opposed, broadly cordate, 2–3 × 1–1.2 cm, conduplicate, acuminate at apex, pilose

out, puberulous in, green; peduncle 2.5–3 cm, green, strigose; upper cincinnus usually lacking, when present, 1–1.2 cm long, exserted, puberulous, 1–2 male flowered, green; lower cincinnus *ca*. 1 cm long, glabrous, 3–6 bisexual flowered. Sepals 3, free, transparent; medial boat shaped; laterals orbicular. Petals 3, blue, paired petals deltoid, claw *ca*.5 mm long; odd petal orbicular, claw *ca*. 1 mm long. Stamens 3; lateral stamen filament slender, anthers white, medial stamen anther curved, yellow. Staminode 3 or 2, medial staminode vestigial with a white–pale blue filament or lacking; antherodes yellow, 4-lobed with 2 lateral appendages. Ovary globose, yellow; style white, 9 mm long; stigma capitate. Capsules 1–3 per spathe, oblong, apiculate, trilocular, indehiscent, laterally compressed; dorsal locule 1-seeded; ventral locules aborted. Seeds 1, ovoid-elliptic, *ca*. 5 mm long; testa dark brown-black, surface reticulately pitted, reticulations light brown; hilum linear; embryotega lateral.

Chromosome number: n = 75 (Kammathy & Rao, 1964; 1965).

Flowering period: June–March.

Flowering time: 8.00–13.00 pm.

Ecology: Evergreen forest, roadsides and hedges near small streams.

Distribution: Sri Lank and South India.

Specimens examined: **KARNATAKA**: Coorg district, Coorg, 07/05/2010, *Santhosh Nampy 3216* (DEV); Hosur 15/10/1963, *A.S. Rao 94657*; Kajoor, 12/02/1963, *A.S. Rao 94657* (BSI). Makkammada district, Beduguli, 14/04/1962, *K.N. Subramanian 79847* (BSI). Mangalore district, Mangalore, 11/1908, *A. Meebold 10725* (CAL). Mysore district, Biligirirangan Hills, Bedaguli, 19/02/1962, *R.V. Kammathy 73768*; Tondaikerakan, 27/04/1962, *A.S. Rao 80382* (BSI).

KERALA: Idukki district, Adimali, 19/11/2010, *Santhosh Nampy & Sheba 4015*; Poopara–Munnar Roadside, 27/12/2001, *Santhosh Nampy 438*; Thodupuzha, 16/10/2010, *Sheba & Santhosh Nampy 3830*; Vagamon, 07/12/2010, *Shahina & Sheba 4031* (DEV). Kannur district, Aralam, 11/11/1978, *V.S. Ramachandran 58677* (CAL). Kollam district, Ariyenkavu, Palaruvi, 10/05/1961, *K.N. Subramanian 71557*; Talapara, Thenmalai, 13/05/1961, *K.N. Subramanian 71093*; Thenmalai, 12/1962, *R.V. Kammathy 82657* (BSI). Kozhikode district, Ambumala, Kakadampoil, 12/12/2001, *Santhosh Nampy 191*; Muthappanpuzha, 19/08/2010, *Sheba & Santhosh Nampy 3255*; Tamarassery Pass, 03/12/2010, *Sheba & Manudev 4043*; Ummalathurkavu, 28/10/2010, *Manudev & Sheba 3295* (DEV). Malappuram district, Nedumkayam, 02/09/1981, *Philip Mathew 28740* (CALI); Nilambur, 29/12/1957, *Sethi & Negi 25993* (DD); *Ibid*., 13/07/2003, *Joby DC 5109* (DEV); Vadapuram, *s. die*, *Philip Mathew 34599* (CALI). Palakkad district, Karapara Riverside, 20/12/1980, *N.C. Nair 69661*; Karivara Forest, 28/11/1973, *E. Vajravelu 44868* (MH). Thiruvananthapuram district, Anamalai, 12/09/1961, *R.V. Kammathy 73947* (BSI). Wayanad district, Ambalavayal, 20/06/2010, *Sheba & Santhosh Nampy 3205*; Kalpetta, 06/11/2010, *Shahina & Sheba* 3957; Kalloor, 20/06/2010, *Sheba & Santhosh Nampy 3203, 3207* (DEV); Kuppadi, 06/02/1964, *J.L. Ellis 18566* (MH); *Ibid*., 20/06/2009, *Sheba & Santhosh Nampy 3208*; Meppadi, 26/01/2011, *Sheba & Santhosh Nampy 4037*; Muthanga, 08/08/2010, *Sheba & Santhosh Nampy 3249*; Poomala, 26/10/2010, *Sheba & Santhosh Nampy 3289*; Pulpally, Kuruva, 28/12/2010, *Sheba & Santhosh Nampy 4034*; Suchippara Water Fall 16/11/2002, *Joby 882*; Sulthan Bathery, College Road, 20/06/2009, *Sheba & Santhosh Nampy 3208*; Thirunelly, 18/07/2003, *Dineshraj DC5157*; *Ibid*., 30/09/2003, *Joby* 982, Vythiri, Amba 19/01/2010, *Sheba & Santhosh Nampy 3210, 3212* (DEV). **TAMIL NADU**: Coimbatore district, Ayrigiribetta, 15/03/1931, *K.C. Jacob 362* (MH); Siruvani, 30/11/1956, *K. Subramanyam 1534* (CAL); Vellapathy, 01/08/1929, *S.R. Raju & Rajnandan 18682* (MH). Dindigal district, Sirumalai, 04/01/1963, *R.V. Kammathy 82649* (BSI). Madurai district, Aruna Estate, 28/04/1960, *B.V. Shetty 10334*; Cumbam R.F., 29/09/1925, *K.C. Jacob 177797* (MH). **SOUTH INDIA**: Herb. Wight, Peninsular Ind. Orient., 04/1835, *Wight 2848, 2849* (CAL).

Notes: *C. indehiscens* was described by Barnes (1946) as "capsule 1-sperma indehiscent, floribus cleistogamia….." based on specimens from different localities in South India. Among them, Barnes' collection 2135 from Biligirirangan hills, Karnataka at DD exactly matches with the protologue is designated here as the lectotype. This species can be easily distinguished by its cleistogamous flowers, 1-seeded indehiscent capsules and reticulately pitted seeds. However cleistogamous flowers not reported in Sri Lankan specimens (Faden, 2000). The shoots are dimorphic in In *C. indehiscens*. Their vegetative shoots are 2–3 metres long with moderately large leaves (6–10 × 3–4 cm) while the reproductive shoots are only 15–30 cm long with smaller (3–4 × 2–3 cm) leaves.

15. ***Commelina kurzii*** C.B. Clarke, J. Linn. Soc. Bot. 11. 444. 1871; Commelyn. Cyrtandr. Bengal 18. t.8. 1874; in A. DC & C. DC., Monogr. Phan. 3: 185. 1881; R.S. Rao & Kammathy, J. Bombay Nat. Hist. Soc. 59: 59. 1962; Panigrahi & Kammathy, J. Indian Bot. Soc. 43: 304. 1962; Maheshw., Fl. Delhi 339. 1963; Ill. Fl. Delhi 202. 1966; B.M. Sharma & Kachroo, Fl. Jammu 277. 1983; Faden in Dassan., Rev. Handb. Fl. Ceylon. 14: 193. 2000.

Type: India. Jharkhand (North Bengal, Jahibgurj), Rajmahal Hills, 05/1867, *S. Kurz 5167* (CAL!, holotype).

Commelina erecta of Manilal & Sivar., Fl. Calicut 297. 1982; K.M. Matthew & Britto in K.M. Matthew, Fl. Tamil Nadu Carnatic 2: 1659. 1983; V. Singh, Fl. Banswara Dt. Rajasthan 226. 1983; Kamble & S.G. Pradhan, Fl. Akola Dt. Maharashtra 230. 1988; Karth. *et al*., Fl. Ind. Enum. Mon. 25. 1989; B.V. Shetty &

V. Singh, Fl. Rajasthan 2: 854. 1991; B.D. Sharma *et al*., Fl. Maharashtra 151. 1996; T. Pullaiah, Fl. Andhra Pradesh 3: 1001. 1997; K.M. Matthew, Fl. Palni Hills 1341. 1999; Subba Rao & Kumari, Fl. Visakhapatanam 291. 2008, non L., 1753.

Commelina undulata of C.B. Clarke in Hook.f., Fl. Brit. India 6: 373. 1892; E. Barnes, J. Bombay Nat. Hist. Soc. 46: 85. 1946; R.S. Rao, Blumea 14: 1966; Chandrab. & N.C. Nair, Fl. Coimbatore 299. 1987; Bole & J.M. Pathak, Fl. Saurashtra 3: 325. 1988; V.P. Singh & A. Kaul, Biodiv. Veg. Pachmarhi Hills 178. 2002, non R. Br., 1827.

Commelina obliqua var. *mathewii* C.B. Clarke in A. DC & C. DC., Monogr. Phan. 3: 178. 1881.

Commelina paludosa var. *mathewii* (C.B. Clarke) R.S. Rao & Kammathy, Bull. Bot. Surv. India 3: 168. 1961. **Plate 47, 50b; Fig. 16**

Sub-scandent perennial herb, with a definite base; roots long, thick, fibrous. Stems terete, *ca.* 0.6 cm in diam., green; internodes 7–12 cm long. Leaves distichous; sheath *ca*. 2 cm long, strigose, ciliate at apex; lamina lanceolate, 9–11 × 2–3 cm, apex acuminate, cuneate and oblique at base, undulate at margins, upper surface scabrous, lower surface glabrous. Spathes terminal, clustered, basally fused, 2.5–3 × 1–1.5 cm, cucullate, apex acute, pilose–puberulous out, glabrous in, green; peduncle 1–3 mm; upper cincinnus usually lacking; lower cincinnus *ca*. 1 cm long, 2–5 bisexual flowered. Sepals 3, transparent; medial boat shaped; laterals fused, orbicular. Petals 3, blue, lilac or violet; paired petals orbicular, claws 4–5 mm long; odd petal lanceolate, white. Stamens 3; lateral stamen filaments slender, *ca*. 9 mm long, anthers black–brown; median stamen filament *ca*. 6 mm long, anther large,

yellow, curved, connective white–lilac. Staminodes 3; filaments slender, *ca*. 5 mm long, lilac–yellow; antherodes yellow, 4-lobed with 2 lateral appendages. Ovary globose–elliptic, green; style 1–12 mm long, white; stigma capitate, purple. Capsules 1 or 2 per spathe, globose, trilocular; locules all 1-seeded. Seeds 3, ovate-suborbicular, *ca*. 3 × 2 mm; testa brown, smooth, brown material around the periphery; hilum linear; embryotega lateral.

Chromosome number: n = 45 (Malik, 1961; Raghavan & Rao, 1961).

Flowering Period: July–April.

Flowering Time: 8.00–11.00 am.

Ecology: Forest margins, rocky banks, hills, river & stream banks, exposed among grasses and hedges or in partial shades,

Distribution: Tropical–subtropical Asia.

Specimens examined: **ANDHRA PRADESH**: Anantapur district, Tadpatri–Bugga, 07/10/1981, *Pullaiah 437* (SKU). Cuddaph district, Horslykunda, 07/1884, *J.S. Gamble 15113*; *Ibid*., 08/1889, *J.S. Gamble 21280* (CAL); Janmala Hills, 08/1889, *J.S. Gamble 20958* (DD, CAL). East Godavari district, Godavari Gorge, 06/01/1902, *Bourne 3517*; Kondapudi, 08/12/1902, *C.A. Barber 5226* (MH); Rampachodavaram, 28/06/1965, *G.V. Subba Rao 24464* (CAL, MH); Rampa Hills, 09/07/1914, *M.S. Ramaswamy 1581*; *Ibid*., 17/09/1920, *Narayanaswamy 228*; *Ibid*., 25/09/1920, *Narayanaswamy 56* (CAL). Guntur district, Karampadi, 04/09/1924, *s.coll. 17449* (MH). Hyderabad district, Amangal, 08/1979, *L.J.G. Van der Maesen 3880* (CAL). Krishna district, Collapudi, 11/08/1984, *P. Venkanna 5279* (MH); Kondappalli, 24/08/1956, *S.K. Wagh SKW 3212, SKW 3214* (BLAT). Kurnool district, Ahobilam, 29/09/1984, *T. Pullaiah 2709* (CAL); Chelama, 04/07/1963, *J.L. Ellis 16734* (CAL, MH); Diguvametta, 07/08/1972, *J.L. Ellis 42175* (MH); Erramalai Hills, 03/07/1983, *R.R.V. Raju 1540*; *Ibid*., 10/10/1983, *R.R.V. Raju 1639* (SKU);

Gabbuneruchelu–Mahanadi, 21/08/1965, *J.L. Ellis 25437*; Isagundam River, 19/11/1969, *J.L. Ellis 32549* (CAL, MH); Kolanibharathi, 17/11/1992, *B.R.P. Rao 20150* (SKU); Namalane–Mahanadi, 22/08/1965, *J.L. Ellis 25459* (CAL, MH); Ramaslakota R.F., 04/12/1983, *R.R.V. Raju 1831* (SKU); Upper Ahobilam, 29/08/1965, *J.L. Ellis 25590* (CAL, MH); *Ibid*., 29/09/1984, *T. Pullaiah & R.R.V. Raju 2709* (SKU). Prakasam district, Bainnachela, Nallamalais, 24/09/1985, *R.K. Mohan 0849* (CAL); Ramenapeta, Nallamalai, 29/08/1917, *s.coll. 14967* (MH). Medak district, Pegaukutta, 24/09/1958, *K.M. Sebastine 6711* (MH). Srikakulam district, Elwinpeta Block, 20/05/1979, *G.V. Subba Rao 62468* (MH). Vishakapatanam district, Anantagiri, 12/05/1964, *G.V. Subba Rao 19500*; Araku, 24/08/1960*, N.P. Balakrishnan*, *10798*; Barnakonda R.F., 08/08/1923, *K.C. Jacob 17029*; *Ibid.,* 09/12/1923, *K.C. Jacob 17129*; Chintapalli, 13/11/1970, *J.L. Ellis 37133*; Circuit House, 04/10/1964, *G.V. Subba Rao 21442*; Karakakondai, 20/05/1900*, C.A. Barber 1711*; Kilageda, 20/08/1973, *G.V. Subba Rao 44413*; Krishnapuram, 06/1900, *C.A. Barber 1963* (MH); Madgole–Panderu, 25/08/1966, *G.V. Subba Rao 28080* (CAL, MH); Sapparla, 08/06/1968, *G.V. Subba Rao 30091*; Simhachalam, 09/03/1956*, S.K. Wagh SKW 2014, SKW 2015* (BLAT); *Ibid.,* 06/05/1964*, G.V. Subba Rao 19373*; *Ibid.,* 07/10/ 1964, *G.V. Subba Rao 21495* (MH); *Ibid.,* 24/12/1990, *K.N. Ramakrishna & B.R.P. Rao 9878, 9879* (SKU); South Kota, 23/12/1969, *G.V. Subba Rao 32768* (MH); Tyada R.F., 27/12/1990, *B.R.P. Rao & K. N. Ramakrishna 9892* (SKU); Vatalumandi, 18/05/1956, *H. Santapau 20714* (BLAT); Vishakhapatanam, 07/03/1965, *G.V. Subba Rao 22557* (MH). Vizianagaram district, Punyagiri Hills, 14/10/1996, *M. Chuma Kesavulu 18816* (SKU). Warangal district, Pakral, 27/11/1960, *K.M. Sebastine 11628* (MH). **ARUNACHAL PRADESH**: Lohit district, Dalai Riverside, 24/09/1969, *A.S. Rao 48054* (CAL, ASSAM). **BIHAR**: Giridih district, Parasanath Hill, 18/11/1890, *s.coll. s.n*. (CAL); District unknown, Chotanapra, 03/01/1961, *G.V.S. Rao 23128* (ASSAM, CAL). **DAMAN**: Daman district, Grandi, 02/05/1963, *S.R. Rolla 88908* (CAL); *Ibid.,* 06/05/1963, *R. S. Rao 89039*; *Ibid.,* 26/09/1963, *R.V. Kammathy 93653*; Silvasa, 01/10/1963, *R.V. Kammathy 94022* (BSI). **GUJARAT**: Saoangir, 22/08/1960, *R.S. Rao 63835* (CAL, BSI). West Godhavari district, Narsapur, 19/09/1961, *R.V. Kammathy 73985* (BSI). **HIMACHAL PRADESH**: Una district,

Dhundla, 21/07/1977, *B.P. Uniyal 61155* (BSD). **KARNATAKA**: Belgam district, Ramadurga Hills, 17/09/1979, *B.R. Ramesh & S.R. Ramesh KFP 9389* (JCB). Bellary district, Gadguin, 07/1885, *J.S. Gamble 16523* (MH). Bidar district, Homnabad, 18/11/1978, *S.R. Ramesh & K.P. Sreenath KFP 4520* (JCB). Chickmagalur district, Gangegiri Road, 16/08/1980, *C.J. Saldanha KFP 11980*; Kammangundi–Tarikere, 05/09/1980, *C.J. Saldanha KFP 12166*; Muthodi, 29/07/1980, *C.J. Saldanha KFP 11695* (JCB). Mysore district, Biligirirangan Hills, 01/08/1979, *B.R. Ramesh & S.B. Manohar KFP 8634* (JCB); Begur R.F., 19/08/1980, *V.S. Ramachandran 68273* (MH); Sagat, 10/1908, *A. Meebold 10669* (DD). North Canara district, Yellapore, *s. die*, *W.A. Talbot 1882* (BSI). **KERALA**: Kottayam district, Erumeli, 29/05/2010, *Sheba & Santhosh Nampy 3221* (DEV). Kozhikode district, Devagiri Botanical Garden (introduced), 27/11/2003, *Joby & Santhosh Nampy 1235*; *Ibid.,* 11/12/2010, *Sheba & Santhosh Nampy 4051*; Edekkadu, 09/07/2002, *Nisha & Santhosh Nampy 450*; Medical College Campus, 17/06/2010, *Sheba & Santhosh Nampy 3238*; Padanilam, 28/09/2010, *Sheba & Santhosh Nampy 3499* (DEV); Pavangadu, 12/05/1965, *J.L. Ellis 24076* (MH). Malappuram district, Calicut University Campus, 12/08/1970, *V.V. Sivarajan 353*, 15/07/1971, *V.V. Sivarajan 1326*; *Ibid.,* 14/10/1989, *Solly George 3276* (CALI), Chelari, 10/06/2009, *Santhosh Nampy & Sheba 2204*; *Ibid.,* 10/06/2009, *Santhosh Nampy & Sheba 2223* (DEV); Nilambur, Nedumkayam, 02/09/1981, *Philip Mathew 28740* (CALI); Parappanangadi, Ullanam, 31/07/2003, *Joby & Santhosh Nampy 907* (DEV). Palakkad district, Cheenikkappara, 08/08/2003, *Joby & Santhosh Nampy 930*; Cherunelly, Nelliyampathy, 12/12/2002, *Joby & Santhosh Nampy 5115* (DEV); Panthanthode, 21/08/1966, *E. Vajravelu 27573* (CAL, MH); Walayar, 28/07/ 1929, *S.R. Raja & Rajnandan 18634*; Walayar Dam, 12/07/1963, *J. Joseph 17111* (MH). Pathanamthitta district, Chakkappara, 10/09/1988, *N. Anilkumar 851* (CAL, SNC); Perunad–Sabarimala, 30/05/2010, *Sheba & Santhosh Nampy 3225*; Elimullu–Thannithode, 31/05/2010, *Sheba & Santhosh Nampy 3230, 3231* (DEV); Ranni, 10/09/1988, *N. Anilkumar, 823* (SNC). Thiruvananthapuram district, Etumadhtham, 03/09/1913, *C.C. Calder & M.S. Ramaswamy 531*; Karippanthode, 28/08/1913, *M. Rama Rao 1505*; Mundamurlu, 26/08/1913, *C.C. Calder & M.S. Ramaswamy 222* (CAL). Thrissur district, Athirappally, 21/11/2010, *Sheba & Santhosh Nampy 4022*;

Thunakadu, 24/07/1964, *K.M. Sebastine 20908* (MH); Vettikkattiri, 31/10/2010, *Shahina & Sheba 3975*; Vyasa College Campus, 10/12/2010, *Shahina & Sheba 4050*; Wadakancherry, 20/11/2010, *Shahina & Sheba 4025* (DEV). Wayanad district, Ambalavayal, Edakkal, 10/08/2009, *Santhosh Nampy & Sheba 2224*; Kalloor, 29/11/2002, *Joby & Santhosh Nampy 886*; Kuruva, 28/12/2010, *Sheba & Santhosh Nampy 4033*; Muthanga, 23/07/2003, *Dinesh Raj & Santhosh Nampy DC 5154*; Muthanga, 27/09/2019, *Sheba & Santhosh Nampy 2277* (DEV). **LAKSHADWEEP**: Minikoy, 12/1891, *H.M.I.M. s.n.* (CAL). **MADHYA PRADESH**: Hoshangabad district, Banglapore, 24/07/1961, *J. Joseph 12865* (CAL, MH); Amkut, 08/09/1957, *G.S. Puri 23584*; Bagh, 11/09/1957, *S.B. Bhagawat 23830*; Bhopal Hills, 21/08/1958, *G.S. Puri 41604*; Patalpani, 19/07/1959, *B.M. Wadhwa 53746* (BSI), Sagar district, Tigorda, Hirapur R.F., 01/11/1960, *N.P. Balakrishnan 11450* (MH); Gwaliar, 1890, *Clhanes 395*; Mai ki bagiya, 28/10/1960, *J.K. Maheswari 4267*; Chanda Jitrat, 13/01/1890, *J.F. Duthie 9794*; *Ibid*., *s. die*, *Thwaites 3224* (CAL). **MAHARASHTRA**: Aurangabad district, Junnar, Shivneri Hill, 12/10/1962, *R.S. Rao 83749* (BSI). Dharwad district, Dharwad, 08/1919, *Sedgwick 6179* (CAL); Mumbai district, Andheri, 27/01/1952, *H. Santapau 14023, 14024* (BLAT); Allapali Range, 08/12/1957, *Sethi & Negi 25651* (DD); Baudra, 09/1925, *R.D. Acland ACK 1225*; Goregaon, 25/07/1955, *G.L. Shah Shah 4701*; Juwagadh, 29/08/1952, *H. Santapau 14906*; Karwar, 10/1919, *Hall & Mc. Cann 34966*; Kandivali, 06/08/1955, *G.L. Shah Shah 4769;* Lammasingi, 20/05/1956, *H. Santapau 20758*; Madh Island, 29/07/1956, *G.L. Shah Shah 7197*; Malad, 09/09/1956, *G.L. Shah Shah 7476*; Manori Island, 21/08/1954, *G.L. Shah Shah 373*; Marol Checknaka, 13/03/1958, *S.C. Tavakari T 857*; *Ibid*., 25/07/1958, *S.C. Tavakari T 1420*; Morawian, 23/08/1960, *P. Divakar PD 1162, PD 1165*; *Ibid*., 11/09/1960, *P. Divakar PD 1419*; *Ibid*., 03/10/1961, *P. Divakar PD 2785*; *Ibid*., 31/08/1960, *P. Divakar PD 1271*; Papikonda, 29/02/1956*, S.K. Wagh SKW 1900*; Parel, 02/1917, *s.coll. 13303*; Parsik, 10/1925, *R.D. Acland ACK 1236*; Sion, 07/1925, *R.D. Acland ACK 1222*; Sion Hill, 01/07/1941, *H. Santapau 219.4. H* (BLAT); Trombay, 09/1907, *A. Meebold 9040* (CAL). Ratnagiri district, Ratnagiri, 13/05/1956, *H. Santapau 20671*; Sasan, 06/10/1953, *H. Santapau 16416*, 12/05/1956, *H. Santapau 20597*; Unai, Dangs, 30/10/1953, *H. Santapau 16989*;

Valley Garden, 17/10/1956, *S.K. Wagh SKW 4633, SKW 4634*; Wagai, 06/09/1954, *H. Santapau 19273* (BLAT). Nagarhaveli district, Silivassa–Athal Forest, 01/10/1963, *M.Y. Ansari 94022* (CAL). Osmanabad district, Kasapkhari, 27/08/1963, *R. S. Rao 90683* (BSI). Parbhani district, Chandardara Hill, 30/08/1963, *R. S. Rao 90901* (BSI). Pune district, Katraj Ghat, *s. die*, *R.V. Kammathy 71251*; Katraj, 08/1956, *G.S.Puri 2912*; Sanbhu Hill, Bibi, *s. die*, *R.S. Rao 81652* (BSI). Satara district, Mahabeleswar, 04/09/2010, *Sheba & Santhosh Nampy 3371* (DEV). Thane district, Kalva, Palghar Range, 13/01/1967, *K.V. Billore 113493* (CAL). District unknown, Deccan, Dorjin Gang, 1884, *T. Cooke 96* (CAL). **ORISSA**: Bhubaneswar district, Barang Botanical Garden, *H.O. Saxena 856*; Bhubaneswar, *836*; Dudurchampa–Badomukkabadi, 25/08/1982, *Saxena & Brahmam 4753*; Gandhamardhan Hills, Way to Pattar from Harisankar, 15/10/1987, *H.O. Saxena & Brahmam 6062, 6096*; Gupteswar, 20/12/1962, *G.V.S. Rao 30406* (CAL, ASSAM); Khandagiri, 15/12/1973, *Brahmam 1472*; Salapapahad, 10/07/1977, *Brahmam 2615*; Similipahar, Chinguda Waterfall, 08/05/1981, *Saxena & Brahmam 4451*; Udaigiri, 05/09/1972*, H.O. Saxena 882* (RRLB). Gajapati district, Mahendragiri, 16/08/1931, *V. Narayanaswamy 5669* (MH). Ganjam district, Chilka, Ghantasila, 24/10/1991; *H.O. Saxena & Brahmam 7304* (RRLB); Norsingpur, *s. die*, *J.K. Das & U.P. Samadar 22616* (CAL). Malda district, Borasambar, 30/10/1959, *G. Panigrahi 20612* (CAL, ASSAM); Taptapane Base & Ghat, 13/07/1996, *J.K. Das & U.P. Samadar 22699* (CAL). Rampur district, Dhenkanalal, Rupabalia Hill, 25/09/1993, *N.K. Dhal & N.C. Rant 8189* (RRLB). Kalahandi, Jakom, 22/08/1983, *B. Safni 13434* (CAL); Thuamul, 30/11/1991, *Brahmam & N.K. Dhal 7659*; Malkanguri, Sitakund, 23/11/2007, *M. Brahmam, S. Biswas & D.K. Sahu 10429* (RRLB). **PUNJAB**: Hoshiarpur district, Bantehandi, 11/07/1971, *O.P. Misra 44428* (BSD, CAL); Hoshiarpur, 22/09/1979, *P. Daniel 67590*; Karnal, 15/10/1962, *N.C. Nair 24612*; Murthal, Rohtak, 15/08/1962, *V.J. Nair 24612* (BSD); Yoiyon, 08/07/1971, *O.P. Misra 44378* (BSD, CAL); Talwara–Bamboo R.F., 19/09/1979, *P. Daniel 67534* (BSD). Una district, Bhakranangal, 13/11/1959, *T.A. Rao 10825* (BSD). District unknown, *s.loc*., 09/1870*, J.E.T. Aitchison 170* (CAL). **PONDICHERRY**: Pondicherry, 09/01/1987, *V.S. Beena 1966* (CALI). **RAJASTHAN:** Alwar district, Keraska Forest Block, 23/10/1983, *P.J. Parmar 8774* (BSJO). Banswara district,

Anand Sagar Forest Block, 22/08/1976, *V. Singh 2968* (CAL, BSJO); Chitalda, 25/07/1978, *M.Y.Ansari 149370* (BSI). Barmer district, Haldwar, Mahadev R.F., 14/11/1981, *R.P. Pandey 7940* (BSJO); Haldeswar, 15/11/1981, *R.P. Pandey 8007*; Kundal, 15/11/1981, *R.P. Pandey 8020* (CAL, BSJO). Jalore district, Sunda Hill, Dandalavar, 24/09/1978, *B.V. Shetty 6723*; Rajpura, 11/08/1978, *B.L. Vyas 5889* (CAL, BSJO). Jhunjhunu district, Babai Kheri, 15/09/1992, *P.J. Parmar 10430*; Kho Village, Near Mansa Devi R.F., 05/10/1994, *P.J. Parmar 12292* (BSJO). Sirohi district, Kalakesh, 15/12/1963, *D.M. Verma 1757*; Mt. Abu, 29/09/1960, *R.S. Rao 66661*; Puriyal, 18/08/1963, *D.M. Verma 763* (BSI); Shahabad, 13/08/1963, *D.M. Verma 641*; Zawar Mines, *s. die*, *N.C. Aeray s.n.* (CAL). Pali district, Parasram Mahadev R.F., 27/02/1975, *B.V. Shetty 1921* (CAL, BSJO); Univer. Res. For Hills, 02/08/1964, *S. Sharma 597* (CAL). Tonk district, Nayagaon, 13/09/1974, *B.V. Shetty 1236* (CAL, BSJO). **TAMIL NADU**: Coimbatore district, Anamalai, 12/09/1961, *J. Joseph 13317* (CAL, MH); Agri. Campus, 21/11/1965, *M. Chandrabose 28835, 28848* (MH); Coimbatore, 10/09/1961, *R.V. Kammathy 82648* (BSI); Kurudimalai, 30/06/1970, *M.V. Viswanathan 680* (MH); Nellimalai R.F., 23/05/1962, *K. Ramamurthy 14093*; *Ibid*., 18/10/1962, *K. Ramamurthy 14798* (CAL, MH); Maruthamalai, 15/04/1970, *M.V. Viswanathan 534* (MH), 28/11/2010, *Sheba & Santhosh Nampy 4030* (DEV); Poonachi, 07/07/1961, *J. Joseph 12756*; Selvapuram, 11/10/1964, *M. Chandrabose 28595*; Thekkumalai, 06/09/1956, *K.M. Sebastine 680*; *Ibid*.,19/11/1956, *K.M. Sebastine 1376*; Varapalayam, 06/07/1956, *K. Subramanyam 103* (MH). Dharmapuri district, Harur, 23/08/1978, *K. M. Matthew*, *Perumal P. & C. Manoharan 16500*; *Ibid*., 07/01/1980, *K. M. Matthew 25517* (RHT). Dindigal district, Kariar Top Stop, 08/09/1974, *K.M. Matthew 14546* (RHT); Kodaikanal, 07/08/1985, *K.M. Matthew 41864*; *Ibid*., 21/10/2009, *Sheba & Santhosh Nampy 2290*; *Ibid*., 16/10/10, *Sibichen 3277* (DEV); Kodaikanal Ghat, Mile-4, 07/07/1901, *Bourne 2255* (MH); *Ibid*., 08/12/1971, *M.S. Suresh Babu, s.n.* (SNC); Kondappalli R.F., 08/12/1902, *s.coll. 5226* (CAL); Kodaikanal Road, 13/06/1961, *K.M. Sebastine 12537* (MH); Law's Ghat Road, 08/09/1985, *K.M. Matthew, S.J. Britto & A. Usha 42178,42204*; *Ibid*., 08/08/1987, *K.M. Matthew & K.T. Mathew 49979, 49993*; *Ibid*., 04/12/1987, *K.M. Matthew 51938*; Panayapuram, 19/10/1967, *K.M. Matthew 8004*; Periakulam, 23/11/1985, *K.M. Matthew, A. Usha & N. Rajendran 43175*; Sirumalai,

04/01/1963, *R.V. Kammathy 82648* (BSI); Srirangam, 29/08/1968, *K.M. Matthew 8821*; Tandigudi Ghat Road, 03/07/1987, *K.M. Matthew 49793*; Thalayar Banks, 09/05/1986, *K.M. Matthew & N. Rajendran 44858*; Udumalpet, Parappalar Dam, 12/11/1986, *K.M. Matthew 47358* (RHT). Nilgiri district, Bithrakad, 26/09/2010, *Sheba & Santhosh Nampy 3441* (DEV); Connoor, 08/1884, *s.coll. s.n.* (MH); Connoor Ghat, 07/1883, *J.S. Gamble 12181* (DD); Gudalur, Gokulmalai, 07/01/1963, *R.V. Kammathy 82659* (BSI); Kudini, 02/08/1972, *G.V. Subba Rao 41612* (MH); Moyar R.F., 18/08/1970, *B.D. Sharma 35592* (MH); Naduvattom, 26/09/2010, *Sheba & Santhosh Nampy 3452*; *Ibid.,* 17/10/2010, *Sheba & Santhosh Nampy 3280*, Needle Point, 25/10/2003, *Joby & Santhosh Nampy 5180* (DEV); Northern Hay R.F., 15/08/1970, *B.D. Sharma 35498*; Periachodi-Ouchterlony Valley, 27/07/1970, *J.L. Ellis 34833*; Runneymede, 30/04/1971, *V.C. Rathakrishnan 38149* (MH). Ramanathapuram district, Ayyanarkovil, 24/02/1979, *N.C. Nair 61410* (CAL, MH); Perunazhi, 14/01/1989, *V. Balasubramaniam 2076* (MH). Salem district, Attur, 14/05/1977, *D.I. Arockiasamy*, *8107*; *Ibid*., 12/04/1980, *K.M. Matthew 27504*; Namakkal, 21/12/1979, *K.M. Matthew 25334* (RHT); Pennagaram R.F., 24/07/1964, *E. Vajravelu 20742* (MH); Rasipuram, 01/08/1978, *N. Venugopal 15959*; Thiruchangode, 09/12/1978, *K.M. Matthew 19881* (RHT). Thiruchirappalli district, Cauvery Banks, 10/02/1978, *K.M. Matthew 11793* (RHT); Chengattupatti, 09/08/1958, *K.M. Sebastine 6247* (MH); Karuppankaduthittu, 24/03/1977, *D.I. Arockiasamy 7019*; Lalgudi, 04/04/1977, *K.M. Matthew 7128*; Srirangam, 07/11/1979, *Perianayagam 24484*; Thuraiyur, 29/11/1978, *C. Manoharan 19493* (RHT). Thirunelveli district, Courtallum, 16/12/1957, *K. Subramanyam 4936* (MH); *Ibid*., 02/10/1975, *K.K.N. Nair 1301* (CALI); *Ibid*., 11/09/2003, *Joby & Santhosh Nampy 962, 969* (DEV); Naterikal, 21/09/1916, *s.coll. 13296*; Naterikal–Sangalteri, 25/09/1916, *s.coll. 13593* (MH); Yercadu, 30/04/1977, *D.I. Arockiasamy 7876* (RHT). Thiruvannamalai district, Kathavunachimmankoil, 11/10/1986, *M.B. Viswanathan 1106* (MH). **UTTARAKHAND**: Dehradun district, Mussoorie Hill Top, 09/08/1978, *Panigrahi 65057*; Saharapur Road, 13/08/1957, *M.A. Rau 3108*; Sahastradha, 22/07/1964, *S.K. Malhotra 33927* (BSD); *Ibid*., 04/08/1964, *S.K. Malhotra 33948* (BSD, CAL). **UTTAR PRADESH**: Mirzapur district, Mirzapur Town, 24/08/1958, *M.A. Rao 6157* (BSD). Faizabad district, Bahraich, 14/06/1898,

Hassakh 22842 (CAL). Rewa district, Chechai Falls, 12/08/1906*, R. Prasad 38325* (CAL); Mohand, 07/08/1969, *G.V.S. Rao 38971* (BSD, CAL); Rajaji Sanctuary, 15/10/1970, *J.V.S. Rao 40092* (BSD). **WEST BENGAL**: Howrah district, Bhakultala, 04/06/1964, *S.S.R. Bennet 744*; Howrah, *s. die*, *T. Anderson s.n*; Kolkata, 31/10/1866, *C.B. Clarke 3955*; *Ibid*., 21/08/1914, *P.M. Debbarmann s.n.*; Jahibgurj, Rajmahal Hills, 05/1867, *S. Kurz 5167* (CAL). Jalpaiguri district, Chilapatty, 07/09/1981, *B. Safni 10388*; Jalpaiguri, 15/07/2002, *J. Bhattacharya 31110, 32309* (CAL); Sibpore Botanical Garden, 08/03/1960, *R.V. Kammathy 2005* (ASSAM); *Ibid*., 16/06/1961, *K.C. Kanodia 39494*. District unknown, Herb. Culcuttensis, Herb. Dalzel (DD). State unknown: Malabar, Concon Regoin, *Stocks & Law s.n.* (CAL).

Notes: *Commelina kurzii* was described by Clarke (1871) as "folia angusta, lanceolata, cum spathes villosa-hirsuta…….. semina 3…." based on Kurz's material from Rajmahal hills, India. Some authors in India consider this species as conspecific to *C. erecta* L. or to *C. undulata* R. Br. However, the distinction of the three species needs further studies. In the present treatment, I consider *C. kurzii* as a distinct species. It can be easily recognized in having lavender or white flowers, 3-seeded capsule with an indehiscent dorsal locule and smooth seeds with a torus of brown material around the periphery.

16. *Commelina longifolia* Lam., Tabl. Encycl. 1: 129. 1791; D. Don, Prodr. Fl. Nepal. 43. 1825; Thwaites, Enum. Pl. Zeyl. 322. 1864; R.S. Rao, Taxon 10: 254. 1961, Notes Roy. Bot. Gard. Edinburgh. 25: 179. 1964; R.S. Rao & D.M. Verma, Bull. Bot. Surv. India 16: 11. 1974; K.M. Matthew & Britto in K.M. Matthew, Fl. Tamil Nadu Carnatic 2: 1659. 1983; Karth. *et al*., Fl. Ind. Enum. Mon. 25. 1989; B.D. Sharma *et al*., Fl. Maharashtra 157. 1996; T. Pullaiah, Fl. Andhra Pradesh 3:

1003. 1997; K.M. Matthew, Fl. Palni Hills 3: 1342. 1999; P.J. Bora & Y. Kumar, Floristic Div. Assam 361. 2003; S. Panda & A.P. Das, Fl. Sambalpur 377. 2004; N.D. Pariaria & S.P. Chattopadhyaya, Fl. Hazaribagh 965. 2005.

Type: Java, *s.loc., s. die*, *Commerson s.n.* (P!)

Commelina salicifolia Roxb., Hort. Bengal. 4. 1814 (*nom. nud.*); C.B. Clarke in A. DC & C. DC., Monogr. Phan. 3: 157. 1881; Hook.f., Fl. Brit. India 6: 370. 1892; T. Cooke, Fl. Bombay 3: 290. 1906; Haines, Bot. Bihar Orissa 1124. 1961; Panigrahi & Kammathy, J. Indian Bot. Soc. 43: 301. 1962. **Plate 48, 49, 50c; Fig. 17**

A much branched decumbent annual herb, rooting at the nodes, lacking a definite base; roots long, thin, fibrous. Stem terete, green, basally reddish, internodes 6–10 cm long. Leaves distichous; sheath *ca.* 1 cm long, ciliate at margins, mottled with red striations; lamina lanceolate, 6–10 × 1–1.5 cm, acute at apex, obtuse at base, serrulate at margins, both surfaces glabrous. Spathe leaf opposed, cordate, 2.5–4 × 0.5–1 cm, conduplicate, acute or acuminate at apex, glabrous, green; peduncle 2–4.8 cm long, green; upper cincinnus *ca.* 1 cm long, exserted, densely ciliate, 1 male flowered; lower cincinnus 0.5–0.7 cm long, sparsely ciliate, 3–4 bisexual flowered. Sepals 3, white; medial boat shaped; laterals oblong, white tinged with blue. Petals blue; paired petals orbicular, claws *ca.* 2 mm long, odd petal deltoid. Stamens 3; lateral stamen filament white, slender, anthers yellow, medial stamen filament white basally and blue distally, anther yellow; curved. Staminodes 3; filaments slender, basally white and distally blue, antherodes yellow, 4 lobed with 2 lateral appendages; Ovary elliptic, green; style lilac, *ca.* 4 mm long; stigma trilobed. Capsules 1 or 2 per spathe, oblong, trilocular; dorsal locule 1(-) seeded; ventral

locules 2 seeded. Seeds 5, ovoid-elliptic, *ca.* 3 × 2 mm; testa brown, smooth with white farinose; whitish outgrowth at the rounded end, hilum linear; embryotega lateral.

Chromosome number: n = 45 (Kammathy & Rao, 1964); 2n = 75 (Sharma, 1955).

Flowering period: July–November.

Flowering time: 8.00–11.00 am.

Ecology: Waterlogged areas, near streams.

Distribution: Seychelles, Jawa and India to Southern China.

Specimens examined: **ANDAMAN AND NICOBAR ISLANDS**: South Andaman, Sippighat, 16/04/1964, *K. Thothathri 10280* (CAL). **ANDHRA PRADESH**: Barnset district, 24 Pergumah, 13/12/1883, *C.B. Clarke 34470* (MH). East Godavari district, Bangarappa, 13/03/1962, *s.coll. 280*; Biccanol, 25/12/1906, *Bourne 3205* (CAL); Maredumalli–Devarapalli, 20/02/1994, *M. Mohanan 101309*; Samalkota, 07/01/1917, *s.coll. 14163, 14015*; Samalkota Farm, 29/04/1913, *s.coll. s.n.* (MH). Krishna district, Guraja, 09/03/1985, *P. Venkanna 5539*; Kondapalli Village, 09/02/1985, *P. Venkanna 5941*; Nagarjunakonda Valley, 27/11/1961, *K. Thothathri 9806* (CAL); S.N. Collapalam, 04/08/1984, *P. Venkanna 5151* (MH). Nellore district, Butchi Reddypalam, 28/06/1994, *S. Satya 16314*; Kanigiri Reservoir, 25/12/1999, *M. Chenna Kesavalu 22893* (SKU). Visakhapatanam district, Araku Valley, 15/09/1961, *N.P. Balakrishnan 595*; Nilesweram, 22/02/1947, *V. Narayanaswamy 523* (CAL). Warangal district, Pakral, 02/03/1963, *A.N. Henry 15974* (CAL, MH). **ASSAM**: Dinjapur district, Raigunj, 01/11/1983, *R.N. Banerjee 16101* (CAL). Goalpara district, Fakiragram, 18/06/1974, *Satyendra & Das 51259* (CAL). Kamrup district, Guhawati plains, 09/1882, *s.coll. s.n.* (CAL); Matharguni, 12/07/1957, *R.S. Rao 9905* (ASSAM). Jalpaiguri district, Banks of Kultur, 10/1847, *C.B. Clarke*; Mahakalguni, Alipur, 25/08/1891, *E.A. Heawood 5*; Mayanapuri–Domohani, 28/08/1908, *I.H. Burkil 30840*; Herb. *G. Watt 12526*; Tigerpoint,

21/10/1878, J.*D. Hooker 12526* (CAL). 24 Pergumah district, Basudevapur, 09/08/1964, *M.N. Sanayal 137*; Budge Bridge, 26/10/1962, *M.K. Ghosh 994* (CAL). Murshidabad district, Giagmoga, 10/10/1965, *D.N. Guhabakshi 277* (CAL). District unknown, Ind. Orient. *s. die*, *Hooker & Thomson* (CAL). **BIHAR**: Champaran district, Bagava, 20/09/1965, *S.P. Banerjee 679* (CAL). **GOA**: North Goa district, Masanda, 02/05/1963, *s.coll. s.n.* (BSI). **KERALA**: Alappuzha district, Kuppappuram, 20/11/2010, *Sheba & Santhosh Nampy 4018* (DEV). Kannur district, Baveli, 22/06/1979, *V.S. Ramachandran 62734* (CAL). Palakkad district, Karapara, 20/12/1980, *N.C. Nair 69674*; Poovelippara, 01/05/1980, *V.J. Nair 67413* (CAL). Wayanad district, Muthanga, Kalloore, 20/06/2009, *Sheba & Santhosh Nampy 3204* (DEV). **MADHYA PRADESH**: Hoshangabad district, Churna, 27/07/1961, *J. Joseph 12875* (MH); Khajuraho, 08/1867, *G. King 123*; *Ibid.,* 11/1905, *A. Meebold 3038*; (CAL). **MAHARASHTRA**: Pune district, Nigdi, Old Bombay Highway, 03/09/2010, *Sheba & Santhosh Nampy 3264* **(**DEV); Pune (cultivated from Samalkot), 11/1962, *R.S. Rao 32787* **(**BSI). **MANIPUR**: District unknown, Jhirighal, 11/1907, *A. Meebold 5963*; *Ibid., s. die, G. Watt 7435* (CAL). **MEGHALAYA**: East Khasi Hills district, Maularnany, 09/06/1911, *I.H. Burkill 35271* (CAL). Jowai district, 09/09/2009, *Sheba & Santhosh Nampy 2272* (DEV). **ORISSA**: Kendrapara district, Rajnahar, 04/02/1961, *G. Panigrahi 23694* (ASSAM). **PUNJAB**: Hoshiarpur district, Mukerian, 16/10/1970, *O.P. Misra 41828* (CAL); *Ibid*., 16/09/1979, *P. Daniel 67451*; Tanda, 13/09/1979, *P. Daniel 67381* (BSD). **SIKKIM**: East Sikkim district, Sikkim, 03/08/1872, *G. King 52* (CAL). **TAMIL NADU**: Chennai district, Annamalai Nagar, 01/02/1958, *K.M. Sebastine 5260* (CAL, MH). Coimbatore district, Coimbatore, 05/1883, *s.coll. s.n.*; Kodabittu, 05/1883, *s.coll. s.n.*; Velliangiri Hills, 23/02/1932, *S.R. Raju & Rajnandan 259* (MH); Yerlagadda, 15/02/1947, *V. Narayanaswamy 327* (CAL). Cuddalore district, Bhuvanagiri, 11/02/1979, *K. Ramamurthy 58198* (CAL, MH); Chidambaram, 09/01/1978, *A. Mohan 11162* (RHT); *Ibid*., 05/04/1978, *K.M. Matthew 12783* (CAL); Kannerahalli, Kyathedeargidi, 23/04/1962, *A.S. Rao 80258* (BSI); Palaiman Canal, 03/04/1978, *K.M. Matthew 12675*; Veeranam Lake Exit, 05/04/1978, *K.M. Matthew 12783* (RHT). Dindigal district, Kodaikanal, Blackburne Shola, 10/08/1987, *K.M. Matthew & K.T. Mathew 50017*; Sirumalai, 21/01/1960, *J.*

Pallithanam 5774 ; Shombaganur, 19/11/1985, *K.M. Matthew 45711* (RHT). Salem district, Yerkadu, 23/11/1976, *K.M. Matthew & D.I. Arockiasamy 4947*; *Ibid*., 12/05/1978, *V. Alphonse Ambaj 13569* (CAL); Kaka Shola, 12/05/1978, *V.A. Amalraj 13659*; Shevaroy's Temple, 24/11/1976, *K.M. Matthew & D.I. Arockiasamy 5020* (RHT). **UTTAR PRADESH**: Allahabad district, Churk Rest House, 22/10/1964, *G. Panigrahi 3694* (CAL). Mala district, Pilibhit, 15/10/1970, *C.L. Malhotra 42795* (CAL, BSD); *Ibid*., 02/09/1972, *C.L. Malhotra 50670* (BSD). **WEST BENGAL**: Budwan district, Sainchigram, 12/09/1964, *A.K. Dutt 594* (CAL). Darjeeling district, Alabarie, 13/11/1898, *K. Biswas 8723* (CAL); Darjeeling, 29/08/2009, *Sheba & Santhosh Nampy 2233* **(**DEV); Haflong, 17/08/1908, *William G. Crath 291* (CAL). Hoogly district, Aiyana, 30/12/1962, *S.K. Mukherjee 5638*; Dhaniakhali, 25/11/1961, *Prabhat Hazra 179* (CAL). Howrah district, Amtha, 14/03/1964, *S.S.R. Bennet 640*; Kulgachia, 22/05/1963, *S.S.R. Bennet 292*; Mourigram, 25/04/1963, *S.S.R. Bennet 124*; Panpur, 04/05/1964, *S.S.R. Bennet 694*; Shalimar, 07/07/1879, *s.coll. s.n.* (CAL). North 24 Parganas district, 24 parganas, 12/08/1961, *G. Sengupta 75* (CAL). West Dinezpur district, Balurghat, 20/10/1961, *D.K. Banerjee 45* (CAL); Kheri Nuddi, Omela, 29/05/1900, *Inayat 23883*; Botanic. Garden. Kolkata (introduced), 07/07/1874, *s.coll. s.n.* (DD). District unknown, *s.loc*., 1880*, Fischer s.n.*, *s. die*, *Jenkins s.n. s. die, Masters s.n., s. die, Simsons s.n*. (CAL).

Notes: The nomenclature and typification of *Commelina longifolia* was discussed by Rao (1961). *C. salicifolia* Roxb. treated by various authors in Indian Floras is now considered conspecific to *C. longifolia*. It is easily distinguished by its long internodes (6–10cm long), narrower more acuminated glabrous leaves, glabrous spathes and smooth seeds.

17. *Commelina maculata* Edgew., Trans. Linn. Soc. London 20: 89. 1851; R.S. Rao, Blumea 14: 353. 1966; Karth. *et al*., Fl. Ind. Eum. Mon. 25. 1989, excl. syn. *C. obliqua* and *C. paludosa*

Type: India, Himalaya, 1800 m alt., 1844, *Edgeworth 155* (K!, holotype)

Commelina obliqua Buch.-Ham. var. *viscida* C. B. Clarke, Commelyn. Cyrtandr. Bengal t.10. 1874, in A. DC & C. DC., Monogr. Phan. 3: 178. 1881.

Commelina paludosa Blume var. *viscida* (C.B. Clarke) R.S. Rao & Kammathy, Bull. Bot. Surv. India 3: 168. 1961; R.S. Rao, Notes Roy. Bot. Gard. Edinburgh 25. 181. 1966, excl. syn. *C. obliqua* var. *mathewii* and *C. paludosa* var. *mathewii*.

Plate 51, 52, 50d; Fig. 18

A much branched sub–scandent, perennial herb, rooting at the nodes, with a definite base; roots, long, thick, tuberous. Stems terete, green–brown, with jointed hairs; internodes 7–13 cm long. Leaves distichous; sheath *ca.* 1.5 cm long, strigose, brown jointed cilia at apex; lamina ovate–lanceolate, 5–12 × 1–2 cm, acuminate at apex, rounded and oblique at base, entire at margins, both surfaces pilose or puberulous. Spathes terminal, single or clustered, basally fused, 0.2–1.5 cm, cucullate, acute, ciliate out, glabrous in, green; peduncle sessile; upper cincinnus absent; lower cincinnus *ca.* 0.5 cm long, 3 bisexual flowered. Sepals 3, white; medial boat shaped; laterals orbicular, basally fused. Petals blu;, paired petals deltoid-orbicular, claws *ca*. 5 mm long; odd petal obovate, white. Stamens 3; lateral stamen filament slender, 9 mm long, white-yellow, anthers yellow, medial stamen filament *ca.* 6 mm long, white-yellow, anthers yellow, curved. Staminodes 3; filaments slender, *ca*. 5 mm long, antherodes yellow, 4-lobed with 2 lateral

appendage. Ovary globose, green; style *ca*. 9 mm long; stigma capitate. Capsules 1–2 per spathe, ovoid, trilocular; locules 1-seeded. Seeds oblong–elliptic; testa reddish brown, farinose white, smooth; hilum linear; embryotega lateral.

Chromosome number: n = 30 (Kammathy & Rao, 1964; 1965; Panigrahi & Kammathy, 1964).

Flowering period: July–November.

Flowering time: 8.30–10.30 am.

Ecology: Forest edges and roadsides.

Distribution: Himalaya to Peninsular Malaysia and India.

Specimens examined: ANDHRA PRADESH: Krishna district, Kondapalli R.F., 04/08/1985, *P. Venkanna 5623* (MH). **ARUNACHEL PRADESH**: Dibang valley district, Mipi, *s. die*, *s.coll. 4272* (BSI). **ASSAM**: Phek district, Losami, 16/07/1942, *N.L. Borf 16016* (DD); Assam, s.*loc*., *s. die*, *Jenkins s.n*. (MEL). **HIMACHEL PRADESH**: Chamba district, Dalhousie, *s. die*, *C.B. Clarke 170*; *Ibid*., 26/09/1874, *C.B. Clarke 23148, 23159* (CAL); Palhidusi–Kaltidag, 12/09/1985, *Harinder 14026*; Trella, 26/07/1964, *N.C. Nair 32822* (BSD). Kalpa district, Khandrala Way, 09/1994, *Bipin Balodi 88865* (BSD). Mahesu district, Rohru, 30/07/1965, *N.C. Nair 36203* (BSD). Mandi district, Joginder Nagar, 20/08/1977, *S.K. Murti & R. Prasad 61893*; Urla–Drg, 25/08/1977, *S.K. Murthi & R. Prasad 62056* (BSD). Pauri district, Khirsu Road, 19/08/1978, *Panigrahi 65115*; *Ibid*., Pauri, 07/07/1976*, R.P. Srivastava 57063* (BSD). Shimla district, Chota Shimla, 20/07/1877*, J.S. Gamble 4591 B*; Shimla, 09/1975, *D. Brandis 1352* (MEL); Shimla*, s. die. M.B. Raizada 10002*; *Ibid.,* 08/07/1877, J.S. *Gamble 4548. B* (DD); Shimla Hill, 1884, Herb. *J.R. Drummond No. 719*; Sirmaur district, Momali, 29/07/1971, *U.C. Bhattacharya 44726* (BSD, CAL); Sarahan–Gohalpur, 26/007/1953, *S. P. Sethi & Raizada 20353* (DD); Sarahan, Bashahr, 27/08/1963*, N.C. Nair 29981, 29983* (BSD, CAL). **JAMMU & KASHMIR**: Kishtwar district, Mashadi, 12/08/1986, *P.K. Hajra 82528*

(BSD). **KARNATAKA**: Belgam district, Amboli Ghat, 27/11/1961, *M.Y. Ansari & R.V. Kammathy 78567* (BSI). **KERALA**: Kozhikode district, Devagiri Botanical Garden (introduced), 21/09/2011, *Santhosh Nampy & Sheba 3775* (DEV). Wayanad district, Muthanga Wild Life Sanctuary, 27/09/09, *Sheba & Santhosh Nampy 2277, 2278* (DEV). **MAHARASHTRA**: Amaravathi district, Rai Jungle, 09/10/1962, *Bhima Sankar 81770* (BSI). Mumbai district, Igatpuri, 13/09/1962, *R.S. Rao 81353* (BSI). Nasik district, Thari, 20/09/1967*, John Cherian 111541* (BSI). Pune district, Purandar, 19/07/1963, *R.S. Rao 88659* (BSI); Sinhaghad, *Ancy & Sheba 4546* (DEV). Raigad district, Matheran, 27/09/1960, *B.M. Wadhwa 67404* (BSI). Sindhdurg district, Malwar, Lingmala, 15/10/1961, *R.V. Kammathy 32830* (BSI); *Ibid*., 06/10/1957, *G.S. Puri 25628* (CAL). Satara district, Machutar Forest, 10/10/1960, *M.Y. Ansari 67523*; Mahabaleswar, 13/10/1957, *S.D. Mahajan 24641* (BSI); *Ibid*., 22/10/1957, *S.D. Mahajan 27160* (CAL); *Ibid*., 07/08/1962, *A.S. Rao 77939* (BSI); *Ibid*., 04/09/2010, *Sheba & Santhosh Nampy 3267* (DEV). Wai district, Panchguni, 29/10/1905, *W.A. Talbot 4474*, *Ibid*., 14/10/1961, *R.V. Kammathy 32801* (BSI); Table top land, 04/09/2010, *Sheba & Santhosh Nampy 3388* (DEV). **MANIPUR**: Imphal West district, Imphal*, s. die, D.B. Deb 164*; Mashing, 15/08/1957, *D.B. Deb 997* (CAL). Thimphu district, Kujiar, Champa, 02/10/1894, *C.B. Clarke 24059*; Makru, 11/1907, *A. Meebold 6211* (CAL). **MEGHALAYA**: East Khasi Hills district, Toroque, 17/11/1872, *C.B. Clarke 18416 A* (MEL); Barapani, 10/11/1960, *G. Panigrahi 57754* (ASSAM); Cherwa Plateau, 28/09/1867, *C.B. Clarke 5095* (CAL); E.B. Garden, 02/02/2005, *B.K. Sinha 112009*; K & J Hills, 10/09/1959, *G.K. Deka 57771* (ASSAM); Khasia, 06/1878, *Gustawmann 1169 A*; *Ibid*., 07/1878, *Gustawmann 1161*; Khasi Hills, 05/1920, *H.G. Carter 1158*; Mount Khasia, *s. die*, *Hooker & Thomson 48*; Nongthimai, 21/08/1956, *G. Panigrahi 2867*; *Ibid*., 19/09/1956, *G. Panigrahi 3279*; *Ibid*., 29/08/1959, *R.V. Kammathy 30*; *Ibid*., 20/11/1959, *R.V. Kammathy 28*; Nongstoin, 20/06/1958, *G. Panigrahi 16169*, 16469; Shillong, 25/07/1959, *G.K. Deka 18356* (CAL); *Ibid*., 08/09/2009, *Sheba & Santhosh Nampy 2263* (DEV); Woodland Com, 15/09/1960, *G.K. Deka 21754* (CAL); *Ibid*., 28/09/1964, *H. Dek 37036* (ASSAM); Jantia Hills district, Jowai, 21/07/1965, *N.P. Balakrishnan 42846*; Maolamang, 09/06/1911, *I.H. Burkill & S.C. Banerjee 35270, 35272* (CAL); Moplong,

08/09/2009, *Sheba & Santhosh Nampy 2266, 2267, 2269*; Pommoro, 01/09/2011, *Santhosh Nampy 4731*; Shillong–Jowai, 09/09/2009, *Sheba & Santhosh Nampy 2270, 2274* (DEV). West Khasi Hills district, Mairang, 15/06/1958, *G. Panigrahi 16160* (CAL). **NAGALAND**: Naga Hills district, Naga Hills, 07/1886, *D. Prain s.n.* (CAL); Nehu University Campus, 31/08/2011, *Santhosh Nampy 4704* (DEV). **ORISSA**: Nayagarh district, Brahmani, 05/11/1959, *s.coll. 2023*; Janabil, 16/02/1957, *s.coll. 2024* (ASSAM). **PUNJAB**: Dharmasala district, Dharmasala, 23/07/1963, *S.K. Malhotra 29015* (BSD). Kangra district, Bashahr, Manglad Khud, 13/10/1950, *M.B. Raizada 19961* (DD). **SIKKIM**: East Sikkim district, Sikkim, *S. Kurz s.n.* (CAL); *Ibid., s. die. J.D. Hooker s.n.* (MEL). Gangtok district, *s.loc.,* 14/07/1945, *N.L. Bor 900* (DD); Churangtang, 21/08/1909, *Smith & Cave 2803* (CAL). **TAMIL NADU**: Dindigal district, Kodaikanal–Palani Road, 21/10/2009, *Sheba & Santhosh Nampy 3300* **(**DEV). **UTTARAKHAND**: Almora district, Deorahat, 05/10/1975, *Wadhwa 57432*; Ranikhat Hill Slope, 02/10/1975, *B.M. Wadhwa 57337*; Ranikhat Valley, 30/09/1975, *B.M. Wadhwa 57221* (BSD). Bageswar district, Champawah, 27/01/1971, *C.M. Arora 38438* (BSD, CAL); Chropawat, 27/08/1971, *C.M. Arora 38438* (CAL); Daffia Dhoora, 27/08/1973, *C.M. Arora 50037* (BSD); Mevadabad, *s. die, T.J. Thomson s.n.* (CAL). Chakrata district, Chakrata, 28/07/1961, *Bhattacharya 16020* (BSD). Chamoli district, Ghat–Remn, 09/1980, *B.D. Naithani 53761* (BSD). Dehradun district, Missourie, 1897, *Duthie s.n.*; *Ibid*., 20/08/1897, *P.W. Mockinng s.n* Missourie, *s. die*, *Robson s.n.* (CAL), 09/1930, *M. B. Raizada 194*; 15/06/1945, *s.coll. 733; Ibid.,* 02/08/1960, *Hari Om Saxena 890*; Landom, 06/08/1942, *s.coll. 92692*; Ruttar Pir, 23/08/1891, *G.A. Grammie. s.n.*; Tons Nulah, 01/09/1772, *H.B. Naithani 3661* (DD); Kaempty Fall Road, Mussoorie, 04/08/1960, *C.L. Malhotra 12440* (BSD). Garhwal district, Bhyundar Valley, 15/08/1963, *Bhattacharya 29383, 29352* (BSD). Kumaon district, Loha Thal, *s. die*, *Strachey & Winterbottom 2* (CAL). Ninital district, *s.loc*. 08/1876, Davidson *s.n.* (DD). Pithogarh district, Chilkila Dam Site, 11/09/1985, *H.J. Chowdhari 78087*; Milankiti, 12/09/1983, *Bipin Balodi 75019* (BSD). Uttarkasi district, Hanumanchatti, 02/10/1995, *S.C. Majumdar & S. Singh 86354* (BSD). **UTTAR PRADESH**: Budaun district, Jabori, Hazara, 28/08/1999, *Inayat s.n.* (DD). Ghaziabad district, Tauri Valley, 28/08/1891, *G. A. Gamble s.n.* (DD). Sirmaur

district, West Simla, 18/08/1889, *Duthie 8830* (DD). Uttarkashi district, Naitwar, Tons F.D; *Ibid*., 20/09/1955*, K.C. Sahni 24142* (DD). **WEST BENGAL**: Burdwan district, Jegang, 12/05/1960*, A.K. Dutta 164* (CAL). Darjeeling district, Darjeeling, 27/08/1862, *T. Anderson 1316* (BSD, CAL); *Ibid*., 20/07/1870, *C.B. Clarke 12195* B, C (CAL); *Ibid*., 29/10/1975, *K.P. Radhakrishnan 11074* (CALI); Kurseong, 29/08/2009, *Sheba & Santhosh Nampy 2229*, *2235*; *Ibid.,* 08/09/2011, *Santhosh Nampy 4794* (DEV); Sanchal Lake, 31/10/1975, *E. Indira 11893*; *Ibid., s. die, Mary Cheriyan 12678* (CALI); St. Mary's Hill, 08/09/2011, *Santhosh Nampy 4796* (DEV); Runghee 13/08/1869, *C.B. Clarke 8603*; *Ibid*., 30/10/1870, *C.B. Clarke 13603 I* (MEL). Siliguri district, Siliguri, 08/09/2011, *Santhosh Nampy 4790*; North Bengal University Botanical Garden, 07/09/2011, *Santhosh Nampy 4807* (DEV). State and district unknown, *s.loc., s. die*, *Griffith 5514* (CAL).

Notes: *C. maculata* is rather common in North east India, but rare in South India. Some authors (Henry *et al*., 1989; Sasidharan & Sivarajan, 1996; Pullaiah, 1997) reported this species from South India, but no voucher specimens are found in the respective herbaria. However, in the present study, this species has been collected from two places in South India, *viz*., Muthanga (Wayanad district in Kerala) and Kodaikanal (Dindigul district in Tamil Nadu).

C. maculata is closely allied to *C. paludosa* but can be separated by its smaller (less than 1 m height) and more slender habit, hairy spathes and reddish brown seeds.

18. *Commelina paleata* Hassk. in Miq., Pl. Jungh. 139. 1852; Hook.f., Fl. Brit. India 6: 372. 1879; T. Cooke, Fl. Bombay 294. 1906; Engl., Bot. Jahrb. 59. 1913; R.S. Rao & R.V. Kammathy, J. Bombay Nat. Hist. Soc. 59: 61. 1962; B.D. Sharma *et al.,* Fl. Karnataka 289. 1984; A.N. Henry *et al.,* Fl. Tamil Nadu 3: 45. 1989; Karth. *et*

al., Fl. Ind. Enum. Mono. 25. 1989; Kesh. Murthy & Yogan., Fl. Coorg 480. 1990; Lakshmin. & B.D. Sharma, Fl. Nasik Dt. 482. 1991; M. Mohanan & A.N. Henry, Fl. Thiruvananthapuram 486. 1994; B.D. Sharma *et al.,* Fl. Maharashtra 158. 1996; K.M. Matthew, Fl. Palni Hills 1343. 1999; T.S. Nayar *et al*., Fl. Pl. Kerala. 660. 2006.

Type: From Java.

Trithyrocarpus oligospatha Hassk., Commel. Ind. 25. 1870.

Trithyrocarpus paleatus (Hassk.) Hassk., Commel. Ind. 25. 1870.

Plate 53, 50e; Fig. 19

Much branched, erect, perennial herb with a definite stout base; roots thick, 4–7 cm × 0.5–1 cm. Stems terete, green; internodes 8–9 cm long. Leaves distichous; sheath *ca*. 1–2 cm long, pilose, long ciliate near the mouth; lamina oblong–lanceolate to linear lanceolate, 6–13 × 2–4 cm, acuminate at apex, cuneate at base, upper surface puberulous, lower surface glabrous. Spathe terminal, solitary, broadly ovate, 1.5–2.7 × 0.4–0.7 cm, cucullate, acuminate–acute at apex, broadly rhomboid at base, ciliate at margins, scabridly pubescent out, glabrous in; peduncle 1–2 cm long, green; upper cincinnus lacking but sometimes present with 1 or 2 male flowers; lower cincinnus 1.5–2 cm long, 2 or 3 bisexual flowered. Sepals 3, transparent; medial lanceolate; laterals basally fused, oblong. Petals 3, blue; paired petals rounded-orbicular; odd petal lanceolate. Stamens 3; lateral stamen filament slender, *ca*. 8 mm long, anthers yellow; medial stamen anther large, curved. Staminodes 3; filaments slender, *ca.* 4 mm long, antherode 4-lobed with 2 lateral appendages. Ovary globose–oblong, green; style blue, *ca*. 8 mm long; stigma

capitate. Capsule 1 or 2 per spathe, oblong, trilocular; locules 1–seeded. Seeds 3, orbicular, *ca*. 3 × 1 mm; testa dark brown, smooth; hilum linear; embryotega lateral.

Chromosome number: n = 45 (Kammathy & Rao, 1961a; 1964).

Flowering period: March–September.

Flowering time: 8.00–11.00 am.

Ecology: In moist ground and rock crevices in forest areas.

Distribution: Bangladesh, Western Malesia and Peninsular India.

Specimens examined: **ANDHRA PRADESH**: Chingelpet district, Vandalur, 25/10/1914, *s.coll*. *11122* (MH). Chittoor district, Bakarapetta, 21/10/1990, *K.N. Ramakrishna 9842* (SKU). Guntur district, Bollapalla R.F., 30/08/1924, *s.coll*. *17404* (MH). **GOA**: South Goa district, Poinguinim, 12/10/1964, *R.S. Raghavan 103529*; Tudal, Ordofond, 11/10/1964, *R.S. Raghavan 103505* (CAL, BSI); Ordofond Forest, 24/08/1963, *K.C. Kanodia 89492* (BSI); Verna Village, 19/08/1963, *K.C. Kanodia 89340* (CAL). **KARNATAKA:** Bengaluru district, Pearl Valley, 27/06/1978, *N.S. Ravindra KFP 1431* (JCB). Hassan district, Bageshpur, 06/08/1969, *C.J. Saldanha 14387*; Nagpuri, 16/07/1969, *C.J. Saldanha 14114* (JCB). Mysore district, Hassanur, 06/09/1978, *C.J. Saldanha & S.R. Ramesh KFP 2522* (JCB). North Canara district, Carwar, 29/08/1885, *W.A. Talbot 1292* (DD, CAL). **KERALA**: Kollam district, Aryankav, 08/06/1977, *Sarada Amma 21888*; *Ibid., s. die, T.B. Prithi 22696*; Thenmala, 08/06/1977, *T. Uma 20919* (CALI). Kozhikode district, Devagiri, 11/12/1966, *K. Gopalan Nair s.n.* (CALI); Botanical Garden (cultivated) 12/02/2011, *Sheba & Santhosh Nampy 3759* (DEV). Malappuram district, Calicut University Campus, 12/08/1970, *V.V. Sivarajan 353* (CALI). Thrissur district, Parambikulam, 07/04/1963, *K. Ramamurthy 16129* (MH). Thiruvananthapuram district, Neyyar Dam, 16/04/1973*, J. Joseph 44173* (MH). **MAHARASHTRA**: Mumbai district, Borivali, 05/08/1952, *R. Fernandez 55*; *ibid*., 09/08/1953, *R. Fernandez 1392* (BLAT); *ibid*., 30/06/1961, *R.S. Rao 32720* (BSI); Goregaon, 02/07/1961, *R.S. Rao 32762*; Vicinity of C. Diary & Garrage,

07/07/1958, *S.C. Tavakari 1279, 1280*; Goregaon, Araey Milk Colony, 21/07/1958, *S.C. Tavakari T. 1383, T. 1384*; *ibid*., 11/09/1958, *S.C. Tavakari 1726* (BLAT); Kanheri Caves, 11/1962, *R.S. Rao 32737*; Kirlu, 21/07/1902, *L.D. Garade 557* (BSI); Khandala, 07/1919, *Santapau 27396*; *Ibid*., 04/09/1942, *Santapau 822*; *Ibid*., 06/08/1944, *Santapau 4656*; Neeral, Jummapatti, 29/08/1950, *N.A. Irani 5058*; *Ibid*., 13/07/1959, *N.A. Irani 4209*; *Ibid*., 03/09/1959, *N.A. Irani 4469*; *Ibid*., 13/10/1959, *N.A. Irani 4670*; *Ibid*., 09/08/1960, *N.A. Irani 5087*; *Ibid*., 17/09/1960, *N.A. Irani 5403*; Mumbai, Malad, 28/07/1953, *K.V. Shinoy 215*; *Ibid*., 22/07/1954, *G. Shah 99A*; *Ibid*., 18/09/1954, *G. Shah 634*; *Ibid*., 29/07/1955, *G. Shah 4710*; Sion Hill, 01/07/1941, *Santapau 219. 6. H* (BLAT). Nagar district, Panshat Forest, 09/10/1970, *B.M. Wadhwa 128327* (BSI). Nasik district, Brahmagiri, *s. die*, *P.L. Narasimhan 166875* (BSI). Pune district, Curti Village, 29/08/1963, *K.C. Kanodia 89643* (CAL, BSI); Karjat, 18/09/1962, *R.S. Rao 81576* (BSI); Khandala Ghat, 03/07/1961, *R.S. Rao 32772*; Matheran, 28/07/1966, *B.M. Wadhwa 109816*; Shivneri Hill, *s. die, M.Y. Ansari 88745*; Shivneri Hill, Junnar, 28/06/1964, *K. Hemandin, 94400* (BSI); Vanderodi, 19/09/1968, *K.V. Billore 116770* (BSI, CAL). Ratnagiri district, Anadval, Malwan, 07/08/1971, *R.S. Rao 131549*; Osargaon, Kankauli, 18/08/1991, *B.G. Kulkah 131744* (BSI). Thane district, Ajoba Parvat Slopes, 17/10/1967, *K.V. Billore 11934* (CAL, BSI); Kasara R.F., 26/08/1967, *K.V. Billore 110544*; Thungar, 22/07/1968, *K.V. Billore 116325*; Uttawada, 19/10/1967, *K.V. Billore 111990*; *Ibid*., 20/10/1967, *K.V. Billore 112957*; *Ibid*., 21/10/1967, *K.V. Billore 112990*; Vitarna Dam, 24/08/1967, *K.V. Billore 110480* (CAL); *110487* (BSI); *Ibid*., 24/08/1967, *K.V. Billore 110480* (CAL). **TAMIL NADU**: Coimbatore district, Hassanur, 21/08/1914, *s.coll. 10538* (MH); Kurudimalai, 13/12/1956, *K. Subramanyam 1771* (CAL). Dindigal district, Ammasathram, 30/01/1969, *K.M. Matthew 9862*; Dindigal, 01/11/1987, *K.M. Matthew 50929* (RHT); Kodaikanal Ghat, 18/12/1897, *Bourne 1235* (CAL); *Ibid*., 10/11/2011, *Shahina & Sheba 4553* (DEV); Pachalur Ghat Road, 13/05/1987, *K.M. Matthew & K.T. Mathew 49341*; Puthur–Kavelappatty Path, 02/05/1988, *K.M. Matthew 52861* (RHT). Salem district, Hoganaikal Forest, 12/07/1964, *E. Vajravelu 20580* (MH). Thirunelveli district, Agasthya falls, 13/11/2011, *Ancy & Sheba 5075* (DEV).

Notes: *Commelina paleata* is close to *C. ensifolia*, but differs by its peduncled spathe (1–2 cm long) without prominent veins and smooth orbicular seeds.

19.Commelina paludosa Blume, Enum. Pl. Javae 1: 2. 1827; Miq., Fl. Ned. Ind. 533. 1855; Panigrahi & Kammathy, J. Indian Bot. Soc. 43: 302. 1962; R.S. Rao & Kammathy, J. Bombay Nat. Hist. Soc. 59: 60. 1962; R.S. Rao, Notes Roy. Bot. Gard. Edinburgh. 25:1. 181. 1964; R.S. Rao & D.M. Verma, Bull. Bot. Surv. India 16: 11. 1974; C.J. Saldanha & Nicolson, Fl. Hassan Dt. 645. 1976; T.N. Srivast., Fl. Gorakhpurensis 322. 1976; K.M. Matthew, Indian J. Forest. 1: 117. 1981; N.P. Balakr., Fl. Jowai. 2: 548. 1983; H.J. Chowdhery & Wadhwa, Fl. Himachal Pradesh 3: 719. 1984; D.M. Verma *et al*., Fl. Raipur Durg & Rajnandgaon 389. 1985; V.S. Ramach. & V.J. Nair, Fl. Cannanore 482. 1988; Kesh. Murthy & Yogan., Fl. Coorg 480. 1990; Vajr., Fl. Palghat 517. 1990; B.V. Shetty & V. Singh, Fl. Rajasthan 2: 856. 1991; S.K. Malhotra & Moorthy, Fl. Taroba National Park 137. 1992; G.P. Roy *et al*., Fl. Madhya Pradesh, 442. 1992; Noltie, Fl. Bhutan 3: 235. 1994; Faden in Dassan., Rev. Handb. Fl. Ceylon 14: 194. 2000; Subba Rao & Kumari, Fl. Visakhapatanam 2: 292. 2008, non Vahl. 1805.

Type: Java, *s.loc*., *s.die*, *Blume 807* (L).

Commelina obliqua Buch–Ham. ex D. Don, Prodr. Fl. Nepal., 45. 1825; Hook.f., Fl. Brit. India 6: 372. 1892; T. Cooke, Fl. Bombay 3: 293. 1906; Rama Rao, Fl. Pl. Travancore 417. 1914; Bamber, Fl. Punjab 281. 564. 1916; Collett, Fl. Simlensis 532. 1921; Haines, Bot. Bihar Orissa 3: 1126. 1961. non Vahl, 1805.

Commelina polyspatha Wight, Ic. 29. t.2066. 1853. **Plate 54, 50f; Fig. 20**

An extensively scrambling or erect perennial herb, rooting at the nodes, with a definite base; roots long, thick, fibrous. Stems terete, 0.6–0.9 cm in diam., green with purple striations; internodes 6–16 cm long. Leaves spiral; sheath *ca.* 4 cm long, pubescent, ciliate at apex with red hairs that continue along the petiole adaxially; lamina lanceolate, 20–22 × 4–5 cm, acuminate at apex, cuneate and oblique at base, serrate at margins, upper surface scabrous, lower surface glabrous. Spathe clustered at the ends of shoots, sub sessile, 2–3 × 2–2.2 cm, cucullate, acuminate at apex, glabrous, green; peduncle *ca.* 0.5 cm long, green; upper cincinnus lacking; lower cincinnus *ca*. 1 cm long, glabrous, 5 or 6 bisexual flowered. Sepals 3, white; medial lanceolate; laterals oblong. Petals 3; paired petals pale blue or white, orbicular, claws *ca.* 10 × 5 mm, odd petal white, lanceolate, *ca.* 7 × 2 mm. Stamens 3; lateral stamen filament slender, *ca.* 8 mm long, anther white–yellow; medial stamen filament *ca.* 10 mm long, anthers large, yellow, curved, connective pale yellow. Staminodes 3; filaments slender; antherodes 4-lobed, lateral appendages yellow. Ovary ovoid, yellow; style white, *ca*. 10 mm long; stigma capitate. Capsules 1–3 per spathe, obovoid, trilocular; locules equal, 1-seeded. Seeds 3, ellipsoid, 3–4 × 2.5 mm; testa dark brown, smooth, minutely white farinose; hilum linear; embryotega lateral.

Chromosome number: n = 30 (Sharma & Sharma, 1958; Kammathy & Rao, 1961a, 1964; Panigrahi & Kammathy, 1964).

Flowering period: September–March.

Flowering time: 10.00–11.30 am.

Ecology: Along waysides, forest margins and stream sides; prefers exposed or partial shady habitats.

Distribution: Tropical and Subtropical Asia.

Specimens examined: **ANDHRA PRADESH**: Anantapur district, Buka Patanam, 18/10/1981, *N. Yesoda 603*; Kalasamudram R.F., 14/10/1984, *E. Chennaiah 2901*; Yadiki R.F., 13/11/1982, *Pullaiah & N. Yesoda 1112* (SKU). Chittoor district, Puttur–Kalisakona, 26/06/1969, *G.V. Subba Rao 32033* (MH). Cuddapah district, Balapalle, 21/07/1962, *J.L. Ellis 14309* (CAL, MH); Palakonda Hills, 14/10/1988, *C. Subharayendu & D. Alimoulalis 7721* (SKU). East Godavari district, Chinturu, 22/09/1980, *G.V. Subba Rao 68516* (MH); Ethakonda, 11/12/1947, *V. Narayanaswamy 97* (CAL); Muzumamidivalasa, 16/08/1995, *M. Mohanan 105014*; Velamuru, 19/02/1994, *M. Mohanan 101288* (MH). Guntur district, Ethipothila Falls, 14/01/1985, *V. Ramakrishnaiar 3295*; Macherla R.F., 21/01/1987, *V. Ramadrishnaiar 3873* (SKU). Kurnool district, Ahobilum, 28/10/1990, *T. Pullaiah & K.M. Ramakrishna 9853* (SKU); Chelamma, 16/10/1964, *J.L. Ellis 22039* (CAL, MH); Kambaginikond, 20/10/1997, *B. Raviprasad Rao 20015*; Nallamala Hills, 22/02/2009, *B. Raviprasad Rao 38879* (SKU). Rangareddi district, Kusumasamudram, 28/06/1990, *M.S. Muhammed & N. Venkattappa 10363* (SKU). Srikakulam district, Elwinpetta Block, 20/05/1979, *G.V. Subba Rao 62468*; Salur, 06/09/1962, *N.P. Balakrishnan 899* (CAL). Vishakapatanam district, Araku Valley, 17/09/1961, *N.P. Balakrishnan 660* (CAL); Chatilore Summit, *K.C. Jacob 454*; Padalammagudi, 14/10/1972, *G.V. Subba Rao 42577* (MH). Warangal district, Pakhal R.F., 27/11/1960, *K.M. Sebastine 11628* (CAL). **ARUNACHAL PRADESH**: Dibang Valley district, Ahango, 17/04/1999, *M. Bhaminik 2434* (CAL); Angolin Way Side, 27/08/2000, *M. Bhaminik 3297* **(**ASSAM). Dibang Valley district, Mipi, 16/11/1996, *M. Bhaminik 1290* (CAL). Lohit district, Chowkham & Kherem, 27/11/1969, *J. Joseph 48381*; Dalai River, 24/09/1969, *A.S. Rao 48057*; Dreyi–Shoeliang, 13/11/1957, *R.S. Rao 10499*; Lohitpur, 09/09/1969, *A.S. Rao 47964*; Namsai, 08/09/1969, *A.S. Rao 47711*; N.E.F.A, *s. die*, *R.S. Rao 1229, 1460*; K.F.D., Foot Hill Camp, 24/03/1957, *G. Panigrahi 5947*;

Parasuramkund, 03/12/1957, *R.S. Rao 10930*; Petepool, 26/09/1959, *G. Panigrahi 19639, 19647*; Shoeliang–Paya, 15/11/1959, *R.S. Rao 10623*; Tezu–Dehing Road, 20/06/1969, *A.S. Rao 47971*; Thewarygron, 18/08/2000, *M. Bhaminik 2860* (CAL). Subansiri district, Subansiri, 02/09/2009, *Sheba & Santhosh Nampy* 2246 (DEV); Way Side, 27/11/2000, *D.K. Singh 9353* (ASSAM). Tirap district, Jairampur, 11/10/1959, *R.S. Rao 19999*; Kobo, 04/12/1911, *I.H. Burkill 37019*; Longsek Hillock, 18/06/1961, *D.B. Deb 25753*; Niusa, 29/08/1958, *G. Panigrahi 14865*; Raho, 26/08/1958, *G. Panigrahi 14789*; Siang F.D., West of Tuting Political Colony, 06/11/1958, *R.S. Rao 17328*; Waka, 06/09/1958, *G. Panigrahi 17022*; Yambung, 07/01/1912, *I.H. Burkill 37714* (CAL). **ASSAM**: Kamrup district, Mauman forest, 24/06/1964, *A.S. Rao 39085* (CAL); Teesta, 17/07/1962, *R.V. Kammathy 81262* (BSI); Tura top, 12/12/1960, *G. Panigrahi 22362* (CAL). Nowgohg district, Kokai, 22/11/1957, *G. Panigrahi 11344*; Sonaikushi R.F., 20/08/1964, *N.P. Balakrishnan 39316*; Tengali Ram Garden, Jaboca, 10/1898, *Prain 71*; Upper Dibing, Digboi, 08/07/1959, *G. Panigrahi 18777*; Umitrue, 15/11/1956, *G. Panigrahi 16160* (CAL). District unknown, *s.loc., s. die, C.B. Clarke*, *1867*, *s.coll. 94* (MH); *s.loc., s. die,* Colonel *Jenkins s.n.*, *Masters s.n.*, *S.N. Bal 45* (CAL). *s.loc., s. die, Heyne s.n.* (K). **BIHAR**: District unknown, Gehwar, *s. die*, *Kurz s.n.*; Karampade, 07/01/1961, *G.V.S. Rao 23230* (CAL). **HIMACHAL PRADESH**: Kangra district, Khadiyar, 05/11/2000, *K. Srivastava 96153*; Renuka Lake, 05/11/2000, *S.K. Srivastava 96048* (BSD). Shimla district, Shimla, 1883, *Sehlich s.n.*; *Ibid.*, 10/1907, *A. Meebold 5103* (CAL). **KARNATAKA**: Bellary district, Sandur, 14/11/1978, *K.P. Sreenath & S.R. Ramesh 4316* (CAL). Coorg district, Gangadhareswaragudi, 06/09/1961, *R.S. Rao 73709*; Hejni Forest, Jog Falls, 30/11/1961, *M.Y. Ansari & R.V. Kammathy 78697*; Humnabad, 11/08/1976, *N.P. Singh 142854* (BSI); Malaikadu, Bill Hills, *s. die*, E. *Barnes s.n.* (DD); Sampaze Ghat, 25/08/1963, *A.S. Rao 95094* (BSI). Hassan district, Maranahalli, 22/08/1969, *C. Saldanha 14609;* Shiradi Ghat, 27/01/1971, *T.P. Ramamoorthy 1352*; *Ibid.*, 01/11/1976, *R.B. & A.J. Faden & C.J. Saldanha 76/206* (JCB). Mysore district, Shantaveri, 26/10/1964, *R.S. Raghavan 103980* (BSI). North Canara district, Devi Mave Ghat, 10/1919, *Hall & Mccann 35023*; Katlekau Evergreen Forest, 28/11/1950, *J. Fernandez JF s.n.* (BLAT); Nalalgaon, 08/11/1981, *B.R. Ramesh,*

Shivaprakash & S. Udayakumar 14110 (JCB). Raichur district, Gangavati, 10/09/1974, *s.coll. s.n*. (BSI). South Canara district, Charmadi, 24/11/1927, *S.R. Raju & Naganathan 18202* (MH); *Ibid*., 09/11/1962, *R.K. Arora 1026* (CAL); Jolpadi, 13/11/1900, *C.A. Barber 2367* (CAL, MH). District unknown, *s.loc.*, 28/09/1872, *s.coll. 54* (MH). **KERALA**: Ernakulam district, Kavelery, 11/1910, *A. Meebold 12294* (CAL). Idukki district, Chinnar, 21/01/2011, *Shahina & Sheba 4166* (DEV); Kulamavu, 14/12/1982, *C.N. Mohanan 76058* (MH); Neriyamangalam, 02/12/1993, *Anilkumar 19108* (TBGT). Kannur district, Ambayathode, 22/01/1979, *V.S. Ramachandran 59142* (CAL, MH); Aralam, Onnamthode, 11/03/2010, *Dantas 31301*; *Ibid*., 18/10/2010, *Dantas 31838* (KFRI); Chandanathode, 04/11/1965, *J.L. Ellis 26419* (MH); *Ibid*., 16/04/1966, *J.L. Ellis 27072* (CAL, MH); Kottiyoor Forest, 22/01/1979, *V.J. Nair 59791* (CAL, MH); *Ibid*., 01/10/2003, *Joby & Santhosh Nampy 998*; Pakramthalam, 20/07/2010, *Sheba & Santhosh Nampy 3243* (DEV); Panoth, 13/11/1978, *V.S. Ramachandran 58704* (MH). Kasargod district, Kottencherry, 26/01/2010*, Ancy & Sheba 4039* (DEV). Kollam district, Anathode, 10/11/1975, *K. Vivekananthan 46600* (CAL, MH); Kollam, 20/10/1952, *K. Rajappan s.n*. (SNC). Kozhikode district, Adivaram–Ghat Road, 13/12/2009, *Sheba & Santhosh Nampy 2297*; Ambumala, 12/12/2001, *Santhosh Nampy 186*; Devagiri Botanical Garden (introduced), 03/01/2011, *Sheba & Santhosh Nampy 4035*; Muthappanpuzha, 25/02/2001, *Santhosh Nampy 566*; Thamarassery Pass, 26/10/2002, *Joby & Santhosh Nampy 854*; Vellarimala, 16/01/2003, *Santhosh Nampy & Joby 5139* (DEV). Malappuram district, Manjeri, 24/02/1970, *J.L. Ellis 33543* (MH); Nadugani, 30/10/1986, *Jaisonlal 4250*; *Ibid*., *s. die*, *Philip Mathew 34412* (CALI); *Ibid*., 19/09/2004, *Joby & Binukuruvilla 1080*; *Ibid*., 23/02/2010, *Santhosh Nampy & Sheba 2758* (DEV). Palakkad district, Aruvampara, 08/12/1980, *N.C. Nair 69175*; Mangalam Dam, 12/01/2011, *Santhosh Nampy & Sheba 4304* (DEV); Panthanthode, 21/09/1977, *J. Joseph 51431*; Sholayar, 29/01/1990, *N. Sasidharan* 5579 (CALI); S.V. Dam Site, 18/01/1980, *P. Bhargavan 65560* (CAL, MH); *Ibid*., 04/12/1981, *Sathishkumar* 10138 (CALI); Teppakkulam, 17/05/1961*, K.N. Subramanian 71210* (BSI); Vattappara, Palakkayam, 07/08/2003, *Santhosh Nampy & Joby Paul 923* (DEV). Pathanamthitta district, Konni, 12/09/1988, *Anilkumar 1500* (SNC); Upper Moozhiyar, 25/11/1988, *N. Anilkumar 1154* (MH,

SNC). Wayanad district, 02/06/1990, *Sailaja 3803*; *Ibid*., 21/09/1990, *Shalima 3358*, *Praseena 4578*, *Bindu 2842*; *Ibid*., 22/09/1990, *Nazeemol 1045* (CALI); Meppadi, 26/01/2010, *Santhosh Nampy & Sheba 4036* (DEV); Pambra Estate, 27/10/1965, *J.L. Ellis 25723* (CAL, MH); Vythiri, Amba, 19/01/2010, *Santhosh Nampy & Sheba 3210* (DEV). District unknown, North Malabar, *s.loc.*, 19/10/1865*, T.A. Anderson. 53* (DD). **MADHYA PRADESH**: Pachmarhi district, Barthaghat, 19/07/1964, *G. Panigrahi 4287*; Dhup Garh, 16/07/1964, *G. Panigrahi 4516*; Saugor Ghat, Sonmuda, 05/11/1970, *G. Panigrahi 13334*; Tigorda, Hirapur R.F., 01/11/1960, *N.P. Balakrishnan 11450* (CAL). Surguja district, Ambikapur, Borwa Burdan Jungle, 28/11/1972, *G. Sengupta 15970* (CAL). **MAHARASHTRA**: Mumbai district, Bombay, *s. die*, *N.J. Dalzel 21* (DD). Thane district, Ajoba Parvat Slope, 16/10/1967, *K.V. Billore 111910* (CAL, BSI); Borivali, 22/07/1961, *G.L. Shah 10353, 10354*; Borivali National Park, 04/09/1957, *P.S. Herbert 2833*; Dhami Donger, 19/10/1967, *K.V. Billore 112940* (CAL); Dhob's Falls, 19/10/1951, *P.V. Bole 299* (BSI); Goregaon, Arayey Milk Colony, 15/07/1961, *G.L. Shah Shah 10327* (BLAT); Guden Vizag, 14/03/1926, *S.K. Wagh SKW 2117, SKW 2119*; Khandala, 22/09/1902, *G.A. Gammie 15461* (BSI); *Ibid*., 28/10/1949, *H. Santapau 10483*; Khandala Ecopoint, 10/1918*, H. Santapau 28345*; Lonawala, 10/1919, *R.K. Bhide s.n.*; Madhukosh, 16/08/1951, *H. Santapau 13072*; *Ibid*., 18/08/1951, *H. Santapau 13187*; *Ibid*., 14/09/1958, *H. Santapau 22714* (BLAT); Mahabeleswar, Babington Point, 14/10/1957, *S.D. Mahajan 24726* (BSI); Mandvi, 28/09/1961, *N.Y. Das NYD 4060*; Near Bus Stand, 29/08/1959, *P.V. Bole 2009*; Patil Road, 14/09/1958, *P.V. Bole 1739*; Pratap Singh Park, 13/09/1959, *P.V. Bole 2114* (BLAT). Pune district, Bhogav, 16/11/1960, *K.N. Subramanian 64939* (BSI); Purandhar, 01/09/1945*, H.Santapau 7150*; Talao–Petlet Road, 14/09/1958, *P.V. Bole 1740* (BLAT). **MANIPUR**: Imphal district, Imphal Valley, 17/06/1952, *D.B. Deb 350* (CAL); *Ibid*., 28/01/1960, *G. Panigrahi 13461* (ASSAM, CAL). **MEGHALAYA**: East Khasi Hills district, Jarain, 17/11/1969, *N.P. Balakrishnan 49945* (CAL); Moplongh, 08/09/2009, *Sheba & Santhosh Nampy 2275* (DEV); Mt. Khasia, *s. die*, *J.D. Hooker & Thomson s.n*. (CAL, MH); Near Daneshdas Hospital, 03/08/1963, *G.K. Deka 35773* (ASSAM); Nowrynkneg, 28/10/1956, *G. Panigrahi 4035*; *Ibid*., 26/09/1867, *C.B. Clarke 5060*; *Ibid*., *Stocks Law s.n.* (CAL); Shillong, 30/06/1962,

R.V. Kammathy 81232 (BSI); *Ibid*., 26/11/1962, *S. Chudurg 25262* (CAL); Shillong Peak, 22/09/1959, *G.K. Deka 19128*; Woodland, 15/09/1960, *G.K. Deka 21755* (CAL). Jaintia Hills district, Raliang R.F., 23/08/1968, *N.P. Balakrishnan 47012*; Jowai, 28/10/1956, *G. Panigrahi 4114*; *Ibid*., 23/01/1957, *G. Panigrahi*, *5063*, (CAL); Khalakri, 23/02/2007, *s.coll. 114245* (ASSAM). Ribhoi district, Nongpoh Forest, 27/06/1962*, R.V. Kammathy 81219* (BSI). **MIZORAM**: District unknown, Aizal Protected Area, 11/01/1963, *s.coll. s.n.* (ASSAM). Hangunumi, N. Hushai Hills, 10/09/1952, *B. Godfrey 473* (CAL). **NAGALAND**: Mokokchung district, Mokokchung Road, Lakhuni, 11/12/1933, *s.coll. 162* (CAL); Minkoba, 02/09/2011, *Santhosh Nampy 4742*; Naghutomi Village, 04/09/2011, *Santhosh Nampy 4747* (DEV); Tuensang, 13/10/1981, *s.coll. 12* (ASSAM); Vekuhomi Village, 04/09/2011, *Santhosh Nampy 4758* (DEV). **ORISSA**: Banji district, Gandhamardan Hill, 16/11/1959, *G. Panigrahi 21109*; Korandi River Valley, 09/12/1962, *G.V.S. Rao 30136* (CAL). Bhubaneswar district, Similipahar, Bhanjalosa–Barakonda, 13/11/1980, *Saxena & Brahmam 4281* (RRLB). Charata district, Balimala Project Area, 10/11/1963, *C.S. Raja 1050*; Sohia, 31/07/1961, *V.C. Bhattacharya 16083* (CAL). **PUNJAB**: Gurudaspur district, Pathoomld, 29/08/1969, *V.C. Bhattacharya 39358* (BSD, CAL). Hoshiarpur district, Bankhandi–Hoshiarpur Road, 21/08/1977, *Vohra & Daniel 60261* (BSD); Chohal, 28/08/1970, *O.P. Misra 41595*; Dholban, 22/09/1970, *O.P. Misra 41883* (BSD, CAL); Manguwal, 27/08/1970, O.P. Misra *44546* (BSD); Sikhor–Paroh, 16/07/1971, *O.P. Misra 44546* (BSD, CAL). **RAJASTHAN**: Jhalwar district, Sarhardi, 24/09/1964, *B.M. Wadhwa & D.M. Verma 3576* (CAL). Jodhpur district, Bansi, 15/12/1963, *D.M. Verma 1757*; Mandor Farden, 14/09/1973, *G.L. Tiwari 629* (BSJO); Puraniya, 18/08/1963, *D.M. Verma 762* (CAL). Kota district, Naka, 12/08/1963, *D.M. Verma 479, 480* (CAL). **SIKKIM**: East Sikkim district, Gangtok, Kolighora, 07/09/2011, *Santhosh Nampy 4773* (DEV); Labdah, 1901, *Prain 62* (CAL); Mungpoo, 02/07/1909, *K.E. Cooper 553* (CAL); Nilongpo, 01/10/1884, *C.B. Clarke 36045* (DD); Penlongla, 31/10/1961, *Sen Gupta 173*; *Ibid*., 06/09/1968, *N.C. Majumdar & R.N. Banerjee 225*; *s.loc.,* 28/07/1872, *G. King 54*; *s.loc*., 1873, *G. King 57 B*; Ranipool, 21/08/2004*, A.K. Pradeep 93028* (CALI); Rongu, 28/05/1951*, K. Biswas 9272*; Soodong, 15/11/1901, *D. Prain 466*; Surail, 22/09/1908, *W.W. Smith 40*; Vista, 30/11/1909, *Ribu &*

Rhomoo 3210 (CAL); *s.loc.,* 05/1862, *T. Anderson 1313*; *s.loc*., 28/09/1877, *G. King* 1881, *G. Watt s.n., J.D. Hooker 38*; Zero, Near BSI Campus, 23/08/2004, *A.K. Pradeep 93040* (CALI). **TAMIL NADU**: Coimbatore district, Shiruvani, 13/11/1956, *K. Subramanyam 1261* (CAL, MH); *Ibid*., 30/11/1956, *K. Subramanyam 1531* (CAL). Cudallore district, Ginja, 06/01/1927, *S.R. Raja & Naganathan 17937* (MH). Dindigul district, Palani, 27/11/1985, *K.M. Matthew & N. Rajendran 43290*; Sengattupatty, 28/07/1970, *K.M. Matthew 11756*; Sirumalai, *s. die*, *J. Pallithanam 2824* (RHT). Godavary East district, Chinturu, 22/09/1980, *G.V. Subba Rao 68516* (CAL). Namakkal district, Kolli hills, 29/03/2000*, K. Sampathkumar 23243* (SKU). Nilgiri district, Devala, 11/1884, *J.S. Gamble 15701*; Naduvattom, 04/10/1956**,** *N.P. Balakrishnan 254*; Sirur, 20/03/1972, *G.V. Subba Rao 40291* (MH). Salem district, Atthur, 28/08/1976, *D.I. Arockiasamy 3639* (RHT). Thiruchirappally district, Thuraiyur, 27/10/1987, *S.J. Britto 30594* (RHT). Tinnevelly district, Courtallum, 08/1835, *Wight 972* (CAL); *Ibid*., 23/07/1957, *K. Subramanyam 3755*; *Ibid*., 29/09/1975, *K.K.N. Nair 1239* (CALI), Kalakkad R.F., 08/11/1962, *J. Joseph 15169*; Kannikatti, 16/12/1957, *K. Subramanyam 4936*; *Ibid*., 10/07/1959, *K.M. Sebastine 8437* (CAL). Thiruchirappally district, Chengattupatti, 09/08/1958, *K.M. Sebastine 8437* (CAL). **TRIPURA**: District unknown, Shilachari, 27/12/1959, *D.B. Deb 2124, 2615* (CAL); Tibrubari, 14/09/1958, *D.B. Deb 1390*; Vasim–Maupi, 21/01/1962, *s.coll. s.n*. (ASSAM); Vizam–Monpur, 21/01/1962, *D.B. Deb 26944* (CAL). **UTTARAKHAND**: Bageswar district, Barum, 05/09/1971, *C.M. Arora 45525* (BSD, CAL); Kali Valley, 24/09/1884, *Duthie 3437* (DD). Dehradun district, Bhau Jani, 09/1941, *M.B. Raizada s.n.*; Bironi Neddi, 09/1882, *Duthie 2357*; Cambec Back Road, 09/09/1935, *M.B. Raizada 5525*; Dehradun, 18/10/1897, *Duthie s.n*.; Laduwala, 13/09/1928, *A.E. Osaeabton 1390* (DD); Makrand Swamp, 29/12/1961, *S.K. Malhotra 19124* (BSD, CAL); Mothranwala, 07/08/1958, *K.M.M. Dakshini 5570*; Mussoorie, Kaempty Fall, 10/08/1978, *G. Panigrahi 65085*; Rishikesh, 09/1968, *O.P. Misra 37910*; Rover's Cave, 19/08/1964, *C.R. Babu 33431*; Sahasradhara, 14/09/1962, *S.K. Malhotra 23782* (BSD); Thadiar, Tous F.D., 29/09/1950, *K.C. Shani 27055* (DD). Gahrwal district, Batwalchan–Narainkoti, 21/09/1958, *M.A. Rau 6444* (BSD); Corbet National Park, 22/11/1972, *K.P. Janardhanan 51170* (BSD, CAL). Haridwar district, Saharanpur,

10/1984, *V.S. Murty & A.K. Goel 1325* (BSD). Nainital district, Bhavali–Ratighat Forest, 26/10/1975, *Wadhwa 57772*; Hildwani, Tanda, 02/08/1989, *V. Singh & A.K. Sharma 888* (BSD); Nainital, 23/08/1923, *A. Champin s.n.* (DD). Pithoraghat district, Maitili, 06/10/2001, *M.S. Pundir 97079* (BSD). Tehri district, Garhwal, Gasefee Valley, 08/1881, *Duthie 2098* (DD); Ghuttu, 01/08/1978, *A.K. Goel 64217* (BSD). Uttarkasi district, Chakrata, 28/07/1961, *V.C. Bhattacharya 16020* (CAL); Sahia, 31/07/1961, *U.C. Bhattacharya 16083* (BSD). **UTTAR PRADESH**: Allahabad district, C.C. Compound, 31/08/1962, *C.M. Arora 3897*; Baredhaghat, 19/07/1964, *G. Panigrahi 4287*; Kotra R.F., 21/10/1964, *G. Panigrahi* 3087 (CAL). Hamirpur district, Mahoba, 28/09/1961, *Bhattacharya 17855*, *Ibid.*, 31/03/1962, *Bhattacharya 21000* (BSD). Mirzapur district, Banmohari, *G. Panigrahi 12619*; Ganga Valley, 09/1881, *Duthie 2098* (CAL); Pathri, 14/09/1980, *B.M. Wadhwa 62740* (BSD); Shimla, 1883, *Sehlich s.n.*; *Ibid*., 10/1907, *A. Meebold 5103* (CAL). **WEST BENGAL**: *s.loc., s. die., Thomson* (MH). Burdwan district, Bagila, 14/07/1964, *A.K. Dutta 455*; Jharghal R.F., 17/05/1963, *G. Sengupta 456* (CAL). Darjeeling district, Bardamanrag, 20/10/2008, *A.K. Ghosh 41560* (CAL); Kalimpongh, 07/1882, Thomson *10483* (MH); *Ibid*., 15/07/1962, *R.V. Kammathy 81257* (BSI); Kurseong, 08/09/2011, *Santhosh Nampy 4804, 4809* (DEV); Lebong, 11/07/1962, *R.V. Kammathy 81238* (BSI); Sanchal, 29/09/1907, *A.K. Ghosh 42852* (CAL); Simulbari, 08/09/2011, *Santhosh Nampy 4782* (DEV). Howrah district, Jhanamakha, 09/07/1965, *R.N. Banerjee 90* (CAL); Sibpore Botanical Garden, 08/03/1960, *s.coll. s.n.* (ASSAM). Hoogly district, Boiara, 26/11/1967, *Subir Sen 41* (CAL). Jalpaiguri district, Mendabari, Chilapatta R.F., 19/09/1975, *J.K. Sikdar 613*; Rajabhatkhwa, 08/01/1934, *C.E. Parkinson 3404* (DD); *Ibid*., 13/05/1949, *V. Narayanaswamy 2374* (CAL); Tung, Way to Darjeeling, 29/08/2009, *Sheba & Santhosh Nampy 2228* (DEV), State Unknown: Eastern Himalaya, Simulbarie, 16/11/1948, *K. Biswas 8705*; Rungbeu, 19/10/1940, *K. Biswas 4580* (CAL).

Notes: Some authors (see the citations) wrongly attributed the name *C. obliqua* Buch-Ham. ex D. Don (1825) for the Indian species, but this is a later homonym of *C. obliqua* Vahl (1805) and hence illegitimate. C.B. Clarke treated three varieties

under *C. obliqua*, *viz*., var. *genuina*, var. *viscida* and var. *mathewii*. *C. obliqua* var. *mathewii* is the synonym of *C. kurzii* and *C. obliqua* var. *viscida* is the synonym of *C. maculata*. But var. *genuina* is not so far reported from India

C. paludosa is one of the widespread species in India. It is a robust, perennial herb, with long red hairs at the sheath summit and terminal clustered, glabrous, cucullate spathes and dark brown seeds.

20. Commelina petersii Hassk., Fl. 46: 385. 1863; Faden in Dassan., Rev. Handb. Fl. Ceylon 14: 191. 2000; Sheba & Nampy, Indian Forester 138: 573. 2012.

Type: Mozambique, 06/1863, *Peters s.n.* (B!)

Commelina persicariaefolia Wight ex C.B. Clarke in A. DC & C. DC., Monogr. Phan. 3: 171.1881, as "persicariaefolia", *nom. illegit*., non Delile, 1815; Trimen, Cat. 95. 1885; Hook.f., Fl. Brit. India 6: 372. 1892, in Trimen, Handb. Fl. Ceylon 4: 302. 1898; C.E.C. Fisch. in Gamble, Fl. Madras 3: 1536. 1931.

Type: India, Tamil Nadu, Dindigal, *R. Wight* in Wall. *Cat. n. 8984* (K!)

Commelina jacobii C.E.C. Fisch., Bull. Misc. Inform. Kew 277. 1928 & in Gamble, Fl. Madras 3: 1536. 1931.

Type: India, Tamil Nadu, Coimbatore district, Agri. College Farm, 01/1921, *K.C. Jacob 15893* (MH!, K!).

Commelina alisagarensis Kumar & Deodikar, Proc. Indian Acad. Sci. 13: 168. 1941.

Type: India, Andhra Pradesh, Nizamabad district, Alisagar, 19/08/1939, *L.S.S. Kumar & S. Salman s.n.* (BSI!, lectotype designated here).

Commelina imberbis auct. R.S. Rao, Blumea 14: 352. 1966; Bennet, Name Ch. Fl. Pl. India & Adj. 140. 1987; Chandrab. & N.C. Nair, Fl. Coimbatore 298. 1987; Karth. *et al*., Fl. Ind. Enum. Mon. 25. 1989; T. Pullaiah, Fl. Andhra Pradesh 3: 1002. 1997; Sasidh., Biod. Doc. Kerala. 6: 498. 2004, non Ehrenb. ex Hassk., 1867.

Plate 55, 56, 61a; Fig. 21

Extensively branched, sub-scandent, annual or perennial herb with a definite base; roots thick, fibrous. Stems terete, green; internodes 5–9 cm long. Leaves distichous; sheath 1.5–2.5 cm long, puberulous, ciliate at apex, green, red on one side; lamina ovate–lanceolate, 5–10 × 1.5–3 cm; acute–acuminate at apex, rounded or cuneate at base, undulate and deeply serrate at margins, both surfaces scabrous. Spathe leaf opposed, cordate–truncate, 2–2.5 × 0.8–1 cm, cucullate, margins fused basally, acute at apex, sticky and densely hooked hairy out, glabrous in, green; peduncle 2–2.5 cm long, green, strigose; upper cincinnus *ca*. 0.5 cm long, vestigial, represented by a short stalk, enclosed within the spathe; lower cincinnus *ca*. 1 cm long, glabrous, 2 or 3 bisexual flowered. Sepals 3, transparent; medial boat shaped; laterals basally fused, ovate. Petals 3, blue; paired petals widely ovate-orbicular, claws *ca*. 3 mm long; odd petal obovate. Stamens 3; lateral stamen filament slender, white, *ca*. 4 mm long, anthers yellow, sagittate; medial stamen anther yellow, curved. Staminodes 3; filaments slender, 3–4 mm long; antherodes yellow, 4-lobed with 2 lateral appendages. Ovary ovate–elliptic, yellow; style white, *ca*. 4 mm long; stigma capitate. Capsules 1 or 2 per spathe, oblong–elliptic, compressed, trilocular

or bilocular; dorsal locule 1 seeded or rarely absent; ventral locules 2 seeded. Seeds 5, ovate-pyriform or elliptic, *ca*. 1.75 × 1 mm; testa dark brown, mottled with black, 3–6 transverse furrows, the intervening ridges with 2-many white-light brown tubercles; hilum linear; embryotega lateral.

Chromosome number: 2n = 30 (Kammathy & Rao, 1961a; Shetty & Subramanyam 1962).

Flowering period: December–January.

Flowering time: 8.00–11.00 am.

Ecology: Rocky areas, road sides, forest margins and exposed to partial shady habitats.

Distribution: Tropical & South Africa, Sri Lanka, Indo–China and India.

Specimens examined: **ANDHRA PRADESH**: Hyderabad district, Golconda Fort, 28/09/1962, *R.V. Kammathy 81268* (BSI). Kurnool district, Ayyalur, 21/01/1942, *J.S. Dhillon s.n*. (DD); Diguavametta, 01/03/1957, *S.K. Wagh 5304* (BLAT). Nellore district, Gudur, 02/02/1929, *K.C. Jacob 18513* (MH). Visakhapatanam district, Waltair University Campus, 21/10/1956, *Santapau 21343* (BLAT). **KARNATAKA**: North Canara district, Shivapura, 05/06/1982, *B. Gurudev Singh, Ajayakumar & S. Udayakumar KFP 14549* (JCB). **KERALA**: Kozhikode district, Devagiri Botanical Garden (introduced), 07/06/2009, *Santhosh Nampy & Sheba 3201* (DEV). Malappuram district, Calicut University Campus, 13/09/1981, *K. Susha 191*, 20/11/1981, *T. Paul 136* (CALI). Thiruvananthapuram district, Kovalam, 19/10/2009, *Sheba & Santhosh Nampy 2284* (DEV). **ORISSA**: Ganjam district, Gopalpura, 1889, *David Prain s.n.* (CAL). **TAMIL NADU**: Chennai district, Elagiris, *s. die*, *E. Barnes s.n.* (DD); Siruvani, 27/08/1961, *A.N. Henry ANH 1610* (BLAT). Coimbatore district, Agri. College Farm, 01/1921, *K.C. Jacob 15893*; *Ibid*., 06/08/1968, *M. Chandrabose 30635*; Anakkatti, 22/01/1931, *R. Raju & Naganathan*

4845 (MH); Anamalai, Vannathurai, 12/09/1961*, R.V. Kammathy 73939* (BSI); Central Farm, 10/1928, *K.C. Jacob s.n.*; *Ibid.*, 01/12/1928, *K.C. Jacob 16955* (MH); Coimbatore, *G.V. Narayana 1929* (DD); *Ibid*., 13/12/1982, *Kochuthressia 36140* (CALI); BSI Campus, 27/11/2010, *Sheba & Santhosh Nampy 3973* (DEV); Forest College Campus, 29/12/1962*, K.N. Subramanian 371* (DD); *Ibid*., 29/11/1964, *M. Chandrabose 28645* (MH); *Ibid*., 13/12/1983, *A.P. Vilasini 35651* (CALI); Kallar, 11/1962, *R.V. Kammathy 73929* (BSI); Karadimalai, 30/07/1929, *S.R. Raju & Rajnandan 18655* (MH); Maruthamalai, 28/11/2010, *Sheba & Santhosh Nampy 4029* (DEV); Mount Stoviert, 27/10/1961, *J. Joseph 13357*; Sathyamangalam, 27/11/1931, *S.R. Raju 6206*; Sewage Farm, 16/06/1957*, K. Subramanyam 5920*; Thalabetta, 29/11/1937, *K.C. Jacob 507* (MH). Dindigal district, Below Dam Site, 23/11/1985, *K.M. Matthew, A.Usha & N. Rajendran 43206* (RHT); Dindigal, 12/1826, *C.E.C. Fischer 8978, 8984* (K); Dindigal Rock, 20/12/1969, *K.M. Matthew 10627* (RHT); Lower Pulneys, *s. die*, *G. Rodriguez 1957* (CAL); *Ibid*., 09/11/2011, *Shahina & Sheba 4552* (DEV); Pachalur Ghat Road, 01/11/1987, *K.M. Matthew 50903*; Patchoi Malai, 12/1940, *s.coll. s.n.*; Periakulam, 23/11/1985, *K.M. Matthew, A. Usha & N. Rajendran 43177* (RHT); Sirumalai, 04/01/1963, *R.V. Kammathy 82656* (BSI); Uthamapalayam, 17/11/1987, *K.M. Matthew & M. Charles 51279*; Veerappan Kovil, 19/11/1987, *K.M. Matthew 51508* (RHT). Kanyakumari district, Kanyakumari, 23/04/2010, *Santhosh Nampy & Manudev 3215* (DEV); Tadikarankonam, 01/01/1963, *R.V. Kammathy 82624* (BSI). Nilgiri district, Gudulloor, 20/11/2002, *Santhosh Nampy 580* (DEV). Ramanathapuram district, Krusadi, 11/05/1949, *D. Daniel, Sundarraj & J. Subbaram Rao s.n.*, 30/12/1987*, V. Balasubramanian 1454* (MH); Malakkadu–Sivaganga, 13/09/1965, *K. Ramamurthy 25807* (CAL, MH); Malattaaru, Srierilliputhur R.F., 16/03/1970, *E. Vajravelu 33818*; Puligav, 30/01/1945, *D. Daniel & S.R. Raju s.n.* (MH); Periathusargam, 16/12/1979*, N.C. Nair 60896* (CAL, MH). Salem district, Buddireddipatti, 19/12/1913*, K.C. Jacob* 9661 (MH, K); Pudukkotta, 02/1886, *s.coll. s.n.* (MH); Wodappatti R.F., 18/07/1964, *E. Vajravelu 20696* (MH, K). Thirunelveli district, Palayamkottai, 16/11/1931, *G.V. Narayana & Naganathan 6094*, *6114* (MH). State unknown: Hillikal, 17/01/1942, s.*coll. s.n.* (DD).

Notes: The identity and distribution of *C. petersii* in India has been discussed by Sheba and Nampy (2012). Rao (1966b) assigned the name *C. imberbis* Hassk. for the Indian plants which were previously placed under *C. persicariaefolia* Wight ex C. B. Clarke, *C. jacobii* C.E.C. Fisch. and *C. alisagarensis* L.S.S. Kumar & Deodikar. Subsequently, many Indian authors (Bennet, 1987; Chandrabose & Nair, 1987; Karthikeyan *et al*., 1989; Sivarajan & Mathew, 1996; Daniel & Umamaheswari, 2001; Singh *et al*., 2001; Sasidharan, 2004; Nayar *et al*., 2006) followed Rao (1966b) and accepted the name *C. imberbis* Ehrenb. ex Hassk. for the Indian taxon. *C. imberbis* invariably have deeply transversely furrowed seeds with row of tubercles on the ridges and lack farinose granules, a character unique to *C. petersii*. This corroborates Faden's view (2000) that the Indian species named under *C. imberbis* auct. non Ehrenb. ex Hassk., 1867 belongs to *C. petersii* Hassk.

21. *Commelina sikkimensis* C.B. Clarke, Commelyn. Cyrtandr. Bengal 10. t.6. 1874, in A. DC & C. DC., Monogr. Phan. 3: 147. 1881, Hook.f., Fl. Brit. India 6: 369. 1892; Panigrahi & Kammathy, J. Indian Bot. Soc. 43: 300. 1962; R.S. Rao & D.M. Verma, Bull. Bot. Surv. India 16: 9. 1974; Karth. *et al.,* Fl. Ind. Enum. Mon. 25. 1989; Noltie, Fl. Bhutan 3: 236. 1994.

Type: India, Chura, 06/1850, *C.B. Clarke 956 A* (K!, lectotype designated here; CAL, DD, MEL!, paralectotypes). **Plate 57, 58, 61b; Fig. 22**

A much branched, extensively prostrate, probably perennial herb, rooting at the nodes, lacking a definite base; roots long, thin, fibrous. Stems terete, *ca.* 1 m long, green with red longitudinal striations; internodes 4–8 cm long. Leaves

distichous; sheath *ca*. 1.5 cm long, mottled with red striations, strigose, ciliate at the mouth; lamina lanceolate or ovate–lanceolate, 6–8 × 1–2 cm, acuminate at apex, unequally rounded or cuneate at base, serrulate at margins, upper surface puberulous, lower surface glabrous. Spathe leaf opposed, cordate, 2.5–4 × 0.5–0.9 cm, conduplicate, acuminate at apex, puberulent on both surfaces; peduncle *ca*. 2.5 cm long, green, strigose; upper cincinnus 1–1.2 cm long, exserted, sparsely ciliate, 2–6 male flowered; lower cincinnus 0.7–0.9 cm long, glabrous, 5–6 bisexual flowered. Sepals 3, white tinged with blue; medial sepal narrowed at apex; laterals orbicular, fused 1/3rd of its length. Petals bright blue; paired petals deltoid-orbicular, claws *ca*. 3 mm long, odd petal ovate. Stamens 3; filaments white–pale blue; lateral stamen anthers white, medial yellow, curved, connective white. Staminodes 3; filaments slender, blue; antherodes yellow, 4-lobed with 2 lateral appendages. Ovary ovate, light green; style white, 7 mm long; stigma capitate. Capsule 1 or 2 per spathe, oblong, trilocular; dorsal locule 1-seeded, indehiscent; ventral locule 2-seeded, dehiscent. Seeds 5, ovoid-elliptic, 3–4 × 2–3 mm; testa dark brown, reticulately pitted; hilum linear; embryotega lateral.

Chromosome number: n = 45 (Panigrahi & Kammathy, 1964; Kammathy & Rao, 1964).

Flowering period: July–March.

Flowering time: 8.00–12.00 pm.

Ecology: Near streams, roadside ditches and wet paddy fields.

Distribution: Bangladesh, Myanmar, Peninsular Malesia, North and North east India.

Specimens examined: **ARUNACHAL PRADESH**: Dibang Valley district, *s.loc*., 23/08/2000, *M. Bhaminik 3152* (CAL). Lohit district, Champa, 17/12/1969, *J. Joseph 48692*; N.E.F.A., 18/09/1969, *A.S. Rao 47911* (CAL). Subansiri district, Subansiri F.D., Petepool, 26/09/1959, *G. Panigrahi 19637*; Tirap F.D., 12/10/1959, *R.S. Rao 20073* (CAL). **ASSAM**: Golaghat district, Dergaon, *s. die*, *s.coll. 25892* (ASSAM); Haflong, 19/08/1908, *W.G. Crab 311*; Lohit Valley Road, 03/05/1916, *E. Alexander 19*; Mousmi, 19/09/1959, *G.K. Deka 19028*; Sissini, *s. die*, *G. Panigrahi 7025* (CAL). **KERALA**: Kozhikode district, Devagiri College Botanical Garden (introduced), 04/02/2011, *Sheba & Santhosh Nampy 4052* (DEV). Wayanad district, Sulthan Bathery (cultivated), 09/06/2011, *Sheba 3754* (DEV). **MANIPUR**: District unknown, Jhirighat, 11/1907, *A. Meebold 6191* (CAL). **MEGHALAYA**: East Khasi Hills district, Chirrapunji, 20/09/1959, *G. Panigrahi 3355* (ASSAM); Mamloo, 25/06/1962, *R.V. Kammathy 81208* (BSI); Relang, 27/05/1956, *R.S. Rao 2621* (CAL); *Ibid*., 19/09/1959, *R.S. Rao 2721* (ASSAM); Khasia, Kalimpong, 11/06/1850, *C.B. Clarke 522* (K); Shillong, Barapani Dam Site, 31/08/2011, *Santhosh Nampy 4709*; Moplong, 08/09/2009, *Sheba & Santhosh Nampy 2268* (DEV); Tripura Castle, 30/06/1962, *R.V. Kammathy 81230*; Umsaw, 01/07/1962, *R.V. Kammathy 81234* (BSI); Way to Elephant Fall, 09/09/2009, *Sheba & Santhosh Nampy 2276* (DEV). Jantia district, Jowai, Way to Jowai, 09/09/2009, *Sheba & Santhosh Nampy 2271* (DEV). **NAGALAND**: Mukokchung district, Charne Village, 05/09/2011, *Santhosh Nampy 4765*; Mukokchung, 02/09/2011, *Santhosh Nampy 4743*; Neghutom Village, 04/09/2011, *Santhosh Nampy 4749, 4751*; Vekuhomi Village, 04/09/2011, *Santhosh Nampy 4763* (DEV). Wokha district, Wokha 15/10/1981, *s.coll. 80647* (ASSAM). **SIKKIM**: Cheunglang district, Cheunglang, 21/08/1909, *Smith & Cave 2803* (CAL). North Sikkim district, Byangya, 08/08/1857, *Anderson s.n.*; *Ibid*., 05/1862, *Anderson 1317*, (DD). East Sikkim district, Gangtok, 06/09/1968, *M.C. Majumdar 229*; Lebdah, 07/06/1903, *D. Prain*, *186*; Mungpoo, 04/1905, *A. Meebold 3039*; *Ibid*., 01/06/1914, *C.W. Cousins 70* (CAL); Rungbee, 03/07/1870, *C.B. Clarke 12139* (K); Sonada, 05/07/1909, *R.E. Cooper 759* (CAL). West Sikkim district, Labong area, 13/07/1962, *R.V. Kammathy 81242* (BSI). **UTTARAKHAND**: Dehradun district, Dehradun, *s. die, s.coll. 15* (CAL). **UTTAR PRADESH**: Pilibhit district, Churra, 06/1850, *C.B. Clarke 956*

(K). **WEST BENGAL**: Darjeeling district, Kalimpong, 15/07/1962, *R.V. Kammathy* 81258 (BSI); Kurseong, St. Mary's Hill, 08/09/2011, *Santhosh Nampy 4798* (DEV); Kurseong, 27/09/1884, *C.B. Clarke 35941 A* (DD); Rishab, 18/08/1870, *C.B. Clarke 12379* P, F, H, M, N & P (CAL), *12379* G (MEL); *Ibid*., *12379*; *Ibid*., 26/06/1957, *C.B. Clarke s.n.*; *Ibid*., 28/07/1957, *C.B. Clarke s.n.*; *Ibid*., 14/09/1959, *C.B. Clarke s.n.*; Seroke Forest, 16/05/1966, *D. Das 44* (CAL). Jalpaiguri district, Bursa, 16/05/1949, *V. Narayanaswamy 2590*; Bursa–Chunabati, 17/05/1949, *V. Narayanaswamy 2640*; R.D. Jobgaon, 18/05/1949, *V. Narayanaswamy 2702* (CAL).

Notes: *Commelina sikkimensis* is restricted to North and Northeast India. It is close to *C. diffusa* but differs by its oblique leaves, more broad spathes, many flowered upper cincinni and pitted reticulate seeds.

22. ***Commelina subulata*** Roth*,* Nov. Pl. Sp. 23. 1821; C.B. Clarke in A. DC & C. DC., Monogr. Phan. 3: 148. 1881; Hook.f., Fl. Brit. India 6: 369. 1892; C.B. Clarke in Dyer, Fl. Trop. Africa 8: 38. 1901; T. Cooke, Fl. Bombay 3: 289. 1906; Rama Rao, Fl. Pl. Travancore 416. 1914; C.E.C. Fisch. in Gamble, Fl. Madras 1538. 1931; R.S. Rao & Kammathy, J. Bombay Nat. Hist. Soc. 59: 66. 1959; R.S. Rao, Blumea 14: 353. 1966; C.J. Saldanha & Nicolson, Fl. Hassan Dt. 645. 1976; K.M. Matthew & Britto in K.M. Matthew, Fl. Tamilnadu Carnatic 2: 1660. 1983; A.N. Henry *et al*., Fl. Tamil Nadu 3: 45. 1989; Karth. *et al*., Fl. Ind. Enum. Mono. 26. 1989; B.D. Sharma *et al*., Fl. Maharashtra 159. 1996; T. Pullaiah, Fl. Andhra Pradesh 3: 1004. 1997.

Type: India, *s.loc*., *s. die*, *Heyne s.n.* (holotype, B; isotype, K).

Commelina striata Hochst. ex A. Rich., Tent. Fl. Abyss. 2: 340. 1850.

Type: Prope Adoa, *s. die*, *Schimper 360* (K!).

Commelina subaurantiaca Hochst ex Kunth, Enum. Pl. 4: 658. 1843.

Type: Sudan, Cordofan, Abu Gerad, *s. die*, *Kotschy 59* (K!).

Commelina violacea C.B. Clarke in Dyer, Fl. Trop. Afr. 8: 39. 1901.

Syntypes: South Africa, Amboland, 18/10/ 1837, *Schinz 21933* (K!).

Plate 59, 60, 61c; Fig. 23

A much branched, erect annual herb with a definite base; roots long, thin, fibrous. Stems terete, green with red striations; internodes 5–8 cm long. Leaves distichous, cauline; sheath *ca.* 1 cm long, ciliate at margins, mottled with red striations; lamina subulate or linear–lanceolate, 2.5–4.5 × 0.3–0.5 cm acute at apex, cuneate at base, entire at margins, both surfaces glabrous. Spathes leaf opposed, cordate, *ca.* 1 × 0.5 cm long, conduplicate, acute at apex, ciliate towards margin, puberulent out, glabrous in, green; peduncle 0.2–0.3 cm long, green, strigose; upper cincinnus absent; lower cincinnus *ca.* 0. 3 cm long, glabrous, 2–3 bisexual flowered. Sepals 3, transparent; medial boat shaped; laterals fused 3/4th of its length. Petals 3, chrome-yellow; paired petals orbicular, claws long; odd petal with a pointed apex. Stamens 3; lateral stamen filaments slender, anthers yellow; medial stamen filament slender, anthers curved, large, yellow. Staminodes 3; filament slender; antherodes yellow, cruciform. Ovary oblong, green; style reddish, *ca.* 1.5 mm long; stigma capitate, red. Capsules 2 per spathe, oblong, trilocular; dorsal locule 1-seeded; ventral locules 2-seeded. Seeds 5, ovoid, compressed, *ca.* 2 mm long; testa black, transversely pitted, white farinose; hilum linear; embryotega lateral.

Chromosome number: n = 30 (Raghavan & Rao, 1961; Kammathy & Rao, 1961a).

Flowering period: September–December.

Flowering time: 8.00–11.00 am.

Ecology: Roadsides, paddy fields and open areas or on rocks.

Distribution: Tropical southern Africa, Arabian Peninsula and India.

Specimens examined: **ANDHRA PRADESH**: Anantapur district, Gundumala, 30/09/1982, *T. Pullaiah & N. Yesoda 737*; Mahabub Nagar, 15/10/1996, *K. Indira 18737* (SKU). Hyderabad district, Central University Campus, 11/09/1961, *R.V. Kammathy 73965* (BSI); *Ibid*., 03/09/2012, *Santhosh Nampy 4569* (DEV). Kurnool district, Horsely Hill, 19/10/2004, *Joby & Ratheesh 1152* (DEV). **KARNATAKA**: Belgam district, Belgam, 1958, *P.S. Chikkanaiah s.n.* (BLAT), Harilar Road, 24/08/1961, *R.S. Rao 73043*; *Ibid.,* 25/08/1961, *R.S. Rao 73048, 73075* (BSI). Bellary district, Ramadurg, 10/10/1919, *s.coll. 15945* (MH). Bengaluru district, Bengaluru, 09/1910, *A. Meebold 11382* (DD); Cubbon Park, 30/08/1980, *B. Gurudev Singh KFF 12154* (JCB); Lalbag Garden, 31/08/1961, *R.S. Rao 73488* (BSI). Coorg district, Maukal, 04/11/1963, *A.S. Rao 95539* (BSI). Hassan district, Gendakatta Forest, 08/09/1964*, C.J. Saldanha CS 8975*; Hassan, 21/09/1971, *K.N. Gandhi HFP 2094* (JCB). Mandya district, Bellur, 27/10/1981, *C.J. Saldanha, Sivaprakash & B. Gurudev Singh KFP 13825*; Nandi, 28/08/1966, *C.J. Saldanha 10365* (JCB). Mysore district, Bandipur, 10/1910, *A. Meebold 11554* (CAL). Tumkur district, Namadacheluma, Forest Rest House, 30/08/1961, *R.S. Rao 73994* (BSI); Devarayadurga, 15/08/1978, *C.J. Saldanha 2199* (CAL, JCB); Devarayadurga Temple, 29/08/1961, *R.S. Rao 73392* (BSI). KERALA: Kozhikode district, Devagiri Botanical Garden (introduced), 30/10/2011, *Manudev & Sheba 3783* (DEV). **MAHARASHTRA**: Kholapur district, Ghotonda, 26/11/1961, *M.Y. Ansari & R.V. Kammathy 78415* (BSI); Kholapur, Shivaji University Campus, 24/10/2011, *Manudev 5046* (DEV). Pune district, Ambavada, 04/11/1955, V.*D. Vartak 1886*; Arvi, 27/08/1964, *M.Y. Ansari 101504*; Bibi, 01/09/1962, *K.P. Janardhanan 76775*; Bhor Hill, 08/10/1955, *V.D. Vartak 1473* (BLAT). Dharwad district, Dharwad, 20/10/1889, *W.A. Talbot 2052*; Khanapur, 04/09/1963, *M.Y.*

Ansari 87903; *Ibid*., 13/08/1964, *M.Y. Ansari 99857*; Khed, Gargatwadi, 19/09/1960, *R.S. Rao 66273*; Vetala, 01/09/1962, *K.P. Janardhanan 76779* (BSI). Purandhar district, Purandhar, 14/10/1962*, M.K. Janardhanan & R.V. Kammathy 78308* (BSI). Satara district, Khandala, 19/10/1955*, V.D. Vartak 1683* (BLAT). **TAMIL NADU**: Dharmapuri district, Denkanikotta, 29/10/1981, *K.M. Matthew, Britto & N. Rani 28483*; Harur, 13/01/1979, *N. Venugopal 20925* (RHT). Salem district, Omallur, 20/09/1976, *D.I. Arockiasamy 4006*; Yercad, 27/11/1976, *D.I. Arockiasamy 5155*; *Ibid*., 12/12/1977, *D.I. Arockiasamy 9994* (RHT).

Notes: *Commelina subulata* is a short-lived annual characterized by its smaller size (upto 30 cm long), subulate leaves, falcate spathes (6–7 × 5–6 mm), chrome-yellow flowers and transversely pitted seeds.

23. Commelina suffruticosa Blume, Enum. Pl. Javae 3. 1827; Miq., Fl. Ned. Ind. 534. 1855; C.B. Clarke, Commelyn. Cyrtandr. Bengal t.12. 1874, Mon. Phan. 3: 188. 1881; Hook.f., Fl. Brit. India 6: 374. 1892; Panigrahi & Kammathy, J. Indian Bot. Soc. 43: 305. 1962; R.S. Rao & Kammathy, J. Bombay Nat. Hist. Soc. 59: 63. 1966; R.S. Rao & D.M. Verma, Bull. Bot. Surv. India 16: 12. 1974; J. Joseph, Fl. Nongpoh. 324. 1982; Kamble & S.G. Pradhan, Fl. Akola Maharashtra 230. 1988; Karth. *et al.,* Fl. Ind. Enum. Mon. 26. 1989; B.V. Shetty & V. Singh, Fl. Rajasthan 2: 850. 1993; Noltie, Fl. Bhutan 3: 228. 1994; B.D. Sharma *et al*., Fl. Maharashtra 161. 1996; T. Pullaiah, Fl. Andhra Pradesh 3: 1004. 1997; P.K. Bhatach. & K. Sarkar, Fl. West Champarani Dt. Bihar 408. 1998; Murti & Panigrahi, Fl. Bilaspur 2: 636. 1999; N.P. Singh *et al.,* Fl. Bihar 532. 2001; P.J. Bora & Y. Kumar, Floristic div. Assam 361. 2003. **Type**: Java, Mount Salak, 1826, *s.coll. s.n.*(P!, lectotype designated here).

Commelina rugulosa C.B. Clarke, J. Linn. Soc. Bot. 11. 446. 1871.

Commelina simsonii C.B. Clarke, J. Linn. Soc. Bot. 11. 446. 1871.

Commelina suffruticosa var. *rugulosa* C.B. Clake, Commelyn. Cyrtandr. Bengal 22. 1874.

Commelina suffruticosa var. *simsonii* C.B. Clarke, Commelyn. Cyrtandr. Bengal 22. 1874.

Spathodithyros suffruticosus (Blume) Hassk., Commelyn. Ind. 11. 1870.

Plate 62, 63, 61d; Fig. 24

Erect herbs with a definite base; roots long, thick. Stems terete, *ca.* 0.6 in diam., green, ciliate–puberulous with thick band of cilia; internodes 2–11 cm long. Leaves cauline, distichous; sheath 1.5–2 cm long, strigose, ciliate at apex, reddish; lamina lanceolate, 9–10 × 2–3 cm, acuminate at apex, oblique at base, entire at margins, pubescent on both surfaces. Spathes terminal, broadly cordate, 1.5–2 × 0.5–1.6 cm, conduplicate, triangular, acute at apex, pubescent out, glabrous in, green; peduncle *ca*. 1 cm long, pale green, puberulous, terminal and axillary; upper cincinnus absent; lower cincinnus *ca*. 5 mm long, puberulous, 6 or 7 bisexual flowered. Sepals 3, pale white; medial narrowed at apex; laterals ovate–orbicular, basally fused. Petals 3, white; paired petals orbicular, claws *ca.* 2 mm long; odd petal rounded at apex obovate, claw *ca*. 1 mm long. Stamens 3; lateral stamens filament slender, white, *ca*. 5 mm long, anthers yellow, medial stamen with large, yellow, curved anther, connective yellow. Staminodes 3; filaments slender, *ca.* 3 mm long; antherode pale yellow, shield shaped. Ovary ovate, green; style white, *ca*. 5 mm long; stigma trilobed, white. Capsules 5 or 6 per spathe, obovate-globose,

trilocular; dorsal locule aborted; ventral locules 1-seeded. Seeds 2, elliptic-rhomboid, *ca.* 3 × 2 mm; testa dark brown, reticulate-foveate, white farinose; hilum linear; embryotega lateral.

Chromosome number: n = 30 (Kammathy & Rao, 1961a; 1964; Panigrahi & Kammathy, 1964).

Flowering period: May–January.

Flowering time: 8.00–10.30 am.

Ecology: Forest margins, in partial shady and exposed habitats.

Distribution: Himalaya–Western Malesia and India.

Specimens examined: **ANDHRA PRADESH**: East Godavari district, Devarappalli, 02/10/1920, *V. Narayanaswamy 405*; Rampa Hills, 08/08/1914, *M.S. Ramaswamy 1518* (CAL). Nizamabad district, Ibrahimpet R.F., 27/09/1987, *T. Pullaiah & B. Raviprasad Rao 6133*; Mudhali R.F., 18/08/1988, *B. Raviprasad Rao 7126* (SKU). **ASSAM**: Kamrup district, Motarguri, 12/07/1957, *R.S. Rao 9975*, *10014* (ASSAM). **BIHAR**: Basia district, Lohardugga, 29/10/1883, *C.B. Clarke 33932* B (DD); Lokminleygu, 29/10/1883, *C.B. Clarke 33932* (CAL). Champaran district, Gobandhana, 15/11/1963, *B.V. Shetty 328* (CAL); Ladaburu, 28/12/1960, *G.V.S. Rao 22806* (ASSAM, CAL); Randue, 22/10/1873, *C.B. Clarke 20379* (CAL). **JHARKHAND**: Hazaribagh district, Chota Nagpur, Hundugagh, 12/09/1896, *D. Prain s.n.* (CAL). **KARNATAKA**: Kegalle district, Yellapur, 27/08/ 1883, *W.A. Talbot 678* (BSI). Mysore district, Gajanoor, 11/1962, *R.S. Raghavan 74035* A (BSI). North Canara district, North Canara, 25/10/1883, *W.A. Talbot 698* (CAL). **KERALA**: Kollam district, Thenmalai, 24/11/1961, *K.N. Subramanian 77135* (BSI). Kozhikode district, Devagiri Botanical Garden (cultivated), 03/03/2012, *Manudev & Sheba 4561* (DEV). Malappuram district, Adynpara waterfalls, Nilambur, 19/09/2004, *Joby & Binu 1081* (DEV); Karimpuzha, *s. die*, *Philip Mathew, 33238*; Vadapuram, *s. die, Philip Mathew 34550, 34552* (CALI);

Nedumkayam, Nilambur, 07/12/2002, *Joby & Santhosh Nampy 5107* (DEV). Pathanamthitta district, Elimullu–Thannithode, 31/05/2010, *Sheba & Santhosh Nampy 3232* (DEV). Thrissur district, Athirappally, 16/08/2003, *Aneesha & Joby 946*; Vazhani Forest, 15/08/2003, *Aneesha & Joby 937* (DEV). Kozhikode district, Adivaram, 29/10/2010, *Manudev & Sheba 3299*; Devagiri Botanical Garden, 27/01/2010, *Sheba & Santhosh Nampy 4042* (DEV). Wayanad district, Muthanga Wildlife Sanctuary, 25/08/2002, *Dineshraj & Santhosh Nampy 824*; *Ibid*., 19/07/2003, *Dineshraj & Santhosh Nampy 5158*; *Ibid*., 08/08/2010, *Sheba & Santhosh Nampy 3252* (DEV). **MADHYA PRADESH**: Bastar district, Bijaporeghat, 09/10/1987, *Anandkumar 16447* (CAL). Bilaspur district, Baretheghat, 19/07/1964, *G. Panigrahi 4277*; Biladila, 14/02/1963, *G. Panigrahi 6971*; Gandhigram, 22/10/1962, *G. Panigrahi 5547*; Khondra, 23/10/1970, *G. Panigrahi 12745, 12842*; Madai, 25/10/1970, *G. Panigrahi 12879*; Saitly, 30/09/1963, *M.Y. Ansari 93918* (CAL). Hoshangabad district, Dhain–Boxiroad, 04/10/1960, *J. Joseph 11226* (MH). Nagarhaveli district, Khanvel, 03/10/1963, *M.Y. Ansari 94081*; *Ibid*., 05/10/1963, *M.Y. Ansari 94208* (CAL, BSI). **MAHARASHTRA**: Mumbai district, Andheri, Makel Caves, 08/08/1942, *H. Santapau 6861*; Aray Milk Colony, 17/07/1958, *S.C. Tavakari T. 1339* (BSI); *Ibid*., 25/07/1958, *S.C. Tavakari T. 1423*; *Ibid*., 09/08/1959, *S.C. Tavakari T.2332*, (BLAT); Borivali, 30/06/1961, *S.R. Rolla 32738* (BSI); Bhaudup, Salsetta, 06/1917, *s.coll. 26267*, 07/1917, *s.coll. 26263* (BLAT); Borivali National Park, 30/09/1952, R. *Fernandez R.708*; *Ibid*., 14/10/1952, *R. Fernandez R.853, 854*; *Ibid*., 02/09/1953, *R. Fernandez R.1455*; *Ibid*., 21/09/1953 *R. Fernandez R627*; *Ibid*., 13/07/1956, *P.S. Herbert SH 1736*; *Ibid*., 19/09/1953*, R. Fernandez R.1562*, Borivali–Kanhery Caves, 06/07/1941, *H. Santapau 219.7H*, 25/08/1945, *H. Santapau 7067* (BLAT); Churakund, 26/08/1976, *M.Y. Ansari 144033* (BSI); Jummapatti, 22/06/1959, *N.A. Irani NI 4127*; Khandala, 29/08/1942, *H. Santapau 718*; Malad, 14/12/1957, *G.L. Shah Shah 9628*; Marol Cheknaka, 25/07/1958, *S.C. Tavakari 1419*; Mumbra, 07/07/1953, *K.V. Shinoy KVS 58*; *Ibid*., 22/06/1954, *K.V. Shinoy KVS 3573*; *Ibid*., 02/07/1954, *K.V. Shinoy KVS 3653*; *Ibid*., 13/07/1954, *K.V. Shinoy KVS 3783*, *Ibid*., 16/10/1953, *K.V. Shinoy KVS 836* (BLAT); Sahapur–Kare Road, 16/09/1962, *R.S. Rao 81491* (BSI); Salsetta,08/1925, *R.D. Acland ACK 1239*; Subir, Dangua,

10/09/1954, *H. Santapau 19508*; Thalkurwad Water Pipe, 02/07/1959, *N.A. Irani NI 4173*; Tongar, 13/07/1941, *H. Santapau 219.8 H*; Wagai, 03/09/1954, *H. Santapau 19190*; Vicinity of C. Diary, 17/07/1958, *S.C. Tavakari 1340, 1341* (BLAT). Thane district, Sadiyaghat, 15/11/1968, *K.V. Billore 115468* (CAL). **MEGHALAYA**: K & J district, Lumding, 19/06/1911, *I.H. Burkill & S.C. Banerjee 35308* (CAL); Balaibatilla, 17/09/1965, *J. Joseph 43613* (ASSAM). Ribhoi district, Nongpoh Forest, 27/06/1962, *R.V. Kammathy 81215* (BSI); *Ibid*., *s. die*, *H. Deka 18188* (CAL). Shillong district, Barapani Dam, 31/08/2011, *Santhosh Nampy 4705* (DEV). **ORISSA**: Balasore district, Balasore, 01/11/1959, *G. Panigrahi 20687* (ASSAM, CAL). Malkangiri district, Korukonda, 25/05/1959, *R.S. Rao 18575* (ASSAM). **SIKKIM**: East Sikkim district, Gangtok, Kolijhro, 07/09/2011, *Santhosh Nampy 4774* (DEV); Rangeet Valley Reserves, 17/07/1962, *R.V. Kammathy 81263* (BSI). **TRIPURA**: North Tripura district, Chandrapur, 29/08/1957, *R.S. Rao 8964* (ASSAM). Agarthala district, Tipperah Hill, Abhoynasa 27/12/1914, *P.M. Debbarmann 355* (CAL). **UTTARAKHAND**: Dehradun district, Chakrata, Saiya, 28/07/1968, *O.P. Misra 38232* (BSD, CAL); Kansro, 05/11/1957, *T.A. Rao 3453* (BSD); Mothranwala, 31/07/1959, *K.M.M. Dakshini 8056*; *Ibid*.,04/09/1961, *K.M.M. Dakshini 16392* (BSD, BSI); *Ibid*., (BSD). **UTTAR PRADESH**: Lakhimpur district, Mailani, 28/08/1962, *C.L. Malhotra 22878*; Gholkhand R.D., Rajaji Sanctuary, 18/10/1970, *G.V.S. Rao 40112* (BSD). **WEST BENGAL**: Darjeeling district, Selim, 08/09/1869, *C.B. Clarke 9053 B, C* (CAL). Durgapur district, Durgapur, 20/07/1973, *A.K. Mukherjee 18748* (CAL). Jalpaiguri district, Chilapetta, 07/09/1981, *B. Safni 10387* (CAL); Jeesta, 06/06/1870, *C.B. Clarke 11802 B, DD, FF, GG* (CAL), *11802 J, L* (MEL).

Notes: *Commelina suffruticosa* is rather common in India. It is easily distinguished by its oblique lanceolate leaves, white flowers, shield shaped antherodes, 2-seeded capsules and reticulate-foveate seeds.

24. ***Commelina tricolor*** E. Barnes, J. Bombay Nat. Hist. Soc. 46: 79. 1946; M. Ahmedulla & M.P. Nayar, End. Pl. Ind. 1: 209. 1987; M.P. Nayar & Sastry, Red Data Book Ind. Pl.1: 127. 1987.

Type: India, Tamil Nadu, Nilgiri, Gudalur Ghat, Karadimalai, 07/1940, *E. Barnes 2265* (CAL!, lectotype designated here). **Plate 64, 65, 61e; Fig. 25**

Tufted or sub-scandent, perennial herb with a definite base; roots thick, tuberous. Stems terete, dark red; internodes 4–7 cm long. Leaves distichous; sheath *ca.* 2 cm long, dark red, ciliate at apex with row of strigose hairs; lamina lanceolate, 5–8 × 1–1.5 cm, acuminate at apex, amplexicaul, cuneate at base, serrate at margins, upper surface scarcely puberulous, lower surface paler, glabrous. Spathes leaf opposed, conduplicate, cordate, 3–4 × 0.8–1.2 cm, acute at apex, puberulent out, glabrous in, finely ciliate at margins, green; peduncle 4–5 cm long, green or red with row of strigose hairs; upper cincinnus *ca.* 1.5 cm long, exserted, glabrous, 1 male flowered; lower cincinnus *ca.* 1 cm long, glabrous, 4–6 bisexual flowered. Sepals 3, white; medial boat shaped; laterals orbicular, fused 2/3rd of its length. Petals 3; paired petals orbicular, claws *ca.* 2 mm long, bright blue, odd petal widely ovate, claw *ca.* 1 mm long, light blue. Stamens 3; lateral stamen filament slender, anthers yellow, pollen white; medial stamen anther yellow, curved, connective yellow. Staminodes 3; filaments slender, lower portion white and upper lilac–blue; antherode yellow, 4-lobed with lateral appendages. Ovary elliptic, green; style *ca.* 6 mm long, lower mauve and upper yellow coloured; stigma capitate. Capsule 1or 2 per spathe, ovoid–oblong, compressed, bilocular; dorsal locule absent; ventral

locules 2-seeded. Seeds 4, oblong-elliptic, *ca.* 4 × 1.5 mm; testa pale brown, smooth with farinose granules; hilum linear; embryotega lateral.

Chromosome number: Not reported.

Flowering period: July–December.

Flowering time: 10.00–15.00 pm.

Ecology: Between rocks and amongst coarse grass.

Distribution: South India, endemic.

Specimens examined: **KARNATAKA**: Mangalore district, Mangalore, 27/10/1975, *Umesh & Akki 32* (JCB). **KERALA**: Wayanad district, Muthanga Wild Life Sanctuary, 29/11/2002, *Joby & Santhosh Nampy 891* (DEV). **TAMIL NADU**: Nilgiri district, Coonoor, 06/1883, *Gamble 12142* (DD); Gudalur, 07/1940, *E. Barnes* 2265 (DD, CAL); Karadimalai, 07/1940, *E. Barnes 2311*; *Ibid*., 08/1940, *E. Barnes 2310* (K); *Ibid*., 08/01/1963, *R.V. Kammathy 82663* (BSI); Needle Point, 06/10/2002, *Nisha & Dineshraj 847*; *Ibid*., 25/10/2003, *Joby & Santhosh Nampy DC 5178*; *Ibid*., 26/09/2010, *Sheba & Santhosh Nampy 3485*; *Ibid*., 04/12/2010, *Sheba & Manudev 4152*; *Ibid*., 21/07/2012, *Manudev 5272*; Ooty–Coimbatore Road Side, 17/10/2001, *Santhosh Nampy 151* (DEV).

Notes: Barnes (1946) described *Commelina tricolor* based on his collections from a few places at Nilgiris in South India. There is one sheet each at CAL and DD and 2 sheets at K. All have names in Barnes's own handwriting. Among them Barne's 2265 at CAL is designated here as the lectotype.

The epithet tricolor refers to the three colours of the floral whorls, the rather large whitish anterior sepals, the large bright yellow antherodes and the bright blue petals.

This species is rare and endemic to South India. It is a perennial species that

remains hidden in between stones during winter and summer and perennates soon after the rains. It is easily recognized by many, long peduncled (4–5 cm long) spathes usually borne at the terminal nodes of branches.

25. Commelina wightii R.S. Rao in Kammathy & Rao, Bull. Bot. Surv. India 3: 168. 1961, Notes Roy. Bot. Gard. Edinburgh 25: 181. 1964; S.S.R. Bennet, Name Ch. Fl. Pl. India & Adj. 141. 1986; M. Ahmedulla & M.P. Nayar, End. Pl. Ind. 1: 209. 1987; M.P. Nayar & Sastry, Red Data Book Ind. Pl. 1: 128. 1987; A.N. Henry *et al.*, Fl. Tamil Nadu 3: 45. 1989; Karth. *et.al*, Fl. Ind. Enum. Mon. 26. 1989; Vajr., Fl. Palghat 517. 1990; B.V. Shetty & V. Singh, Fl. Rajasthan 2: 853. 1993; T.S. Nayar *et al.*, Fl. Pl. Kerala. 660. 2006.

Commelina glabra C.B. Clarke in A. DC & C. DC., Monogr. Phan. 3: 163. 1881; Hook.f., Fl. Brit. India 6: 371. 1892; Rama Rao, Fl. Pl. Travancore 417. 1914; C.E.C. Fisch. in Gamble, Fl. Madras 1538. 1931, non G.F.W. Meyer, 1818.

Heterocarpus glaber Wight, Ic. Pl. Ind. Or. 29. t.2067. 1853.

Type: India, Paulghautcherry, 08/1844, *Wight s.n. A* (K!, lectotype designated here).

Plate 66, 67, 61f; Fig. 26

Profusely branched, decumbent annual herbs, rooting at the nodes, lacking a definite base; roots thin, fibrous. Stems terete, green, red longitudinal striations; internodes 4–6 cm long. Leaves distichous; sheath 0.5–0.7 cm long, strigose, ciliate at apex, mottled with red striations; lamina ovate–elliptic or lanceolate, 3–4 × 0.8–1 cm, acute at apex, obtuse at base, serrate at margins, both surfaces glabrous. Spathes leaf opposed, conduplicate, deeply cordate, 2–2.5 × 0.5–0.7 cm, acute at apex, ciliate

towards base and margins, glabrous on both surfaces, green; peduncle 2–4 cm long, green, strigose; upper cincinnus exserted, *ca*. 1 cm long, ciliate, 1 male flowered; lower cincinnus 0.5–0.7 cm long, glabrous, 2 bisexual flowered. Sepals 3, white; medial boat shaped; laterals orbicular. Petals 3, yellow; paired petals orbicular, claws *ca.* 1mm long, odd petal ovate with pointed apex. Stamens 3; lateral stamen filament slender, yellow, *ca.* 4 mm long, anthers brown; medial stamen filament *ca*. 3.5 mm long, anther curved, yellow, connective white. Staminodes 3; filaments slender, yellow; antherodes yellow, 4-lobed with lateral appendages. Ovary globose, yellow; style white, *ca.* 4 mm long; stigma capitate. Capsules 1 per spathe, globose, dorsal and 1 ventral locule aborted, and 1 ventral locule 1-seeded. Seed 1, oblong-globose, *ca.* 2 × 2 mm; testa brown, smooth; hilum linear; embryotega lateral.

Chromosome number: Not reported.

Flowering period: August–October.

Flowering time: 9.00–11.30 am.

Ecology: Sandy soil and paddy fields in exposed areas.

Distribution: South India, Endemic.

Specimens examined: **KERALA**: Kozhikode district, Devagiri Botanical Garden (introduced), 27/10/2010, *Sheba & Santhosh Nampy 3292* (DEV). Palakkad district, Olavakkot, *s.loc*., 26/12/1916, *s.coll. s.n.*; *Ibid*., 16/10/1963, *J. Joseph 17720* (CAL, MH); Palakkad Railway Station, 10/1983, *s.coll. s.n.* (MH); Walayar, 10/1884, *J.S. Gamble 14890* (CAL). Thrissur district, Brahmakulam, 09/08/2010, *Alfred & Shahina 3253* (DEV); Guruvayoor, 18/08/1997, *Surayya Beegum 13659* (CALI); Kandassankadavu, 10/11/1989, *N.K. Mini 2492* (CALI); Kaveedu, 09/08/2010, *Shahina & Sheba 3254*; Peruvallur, 20/09/2001, *Aneesha & Sajini 554*; *Ibid.,* 29/08/2002, *Sajini & Santhosh Nampy 811* (DEV); Shornur, 11/1900, *s.coll. s.n.*;

s.loc., 1884, *s.coll. s.n.*; Malabar, *s.loc.,* 20/02/1951, *C. Rajasekhara Mudaliyr 195* (MH). **TAMIL NADU**: Coimbatore district, Anamalai, *J.S. Gamble 14655*; *Ibid., s. die*, *s.coll. 1868*; *Ibid*., 1889, *Beddome 119* (CAL); *s. die*, *s.coll*. *s.n.*; Tekkadiamufo, 25/10/1914, *Fischer 11428* (MH). Ramanathapuram district, Vellantharavai, 07/02/1987, *V. Balasubramanian 1182* (MH). Trichinappalli district, Trichinappaly, 10/1984, *s.coll. s.n.* (MH). District unknown, Bolampatty Hills, *Wight* 2905 (MH); *Ibid*., 11/1852, *C.B. Clarke s.n.* (K).

Notes: Robert Wight (1853) in *Icones Plantarum Indiae Orientalis* described and illustrated *Commelina wightii* as *Heterocarpus glabe*r based on specimens from Bolampatty hills and Palghat jungles in South India. There is a single sheet at MH and according to Noltie (2005) 3 sheets at K and no specimens at E. In the present study all the above sheets were seen, but all lacking the name in Wight's own handwriting. The material at MH, agreeing in all respects with the protologue; is designated here as the lectotype.

Clarke (1881) placed this species under *Commelina* as *C. glabra*. Since it is a later homonym of *C. glabra* G. Mey. (1818), this name is illegitimate. Subsequently, it was named as *C. wightii* by Kammathy and Rao (1961). Some authors (Govaerts & Faden, 2012) ascribe the name to Raizada (1958). However the name *C. wightii* was first used by Rao in 1958 and published in the proceedings of the Indian Science Congress. According to Art. 30A of Vienna Code (McNeill, 2006) this does not constitute an effective publication. Raizada (1958) also published the same name but without any reference to (*l.c.)* publication and hence illegitimate (Art. 33.4, Vienna Code 2006). Thus the name *C. wightii* is considered as validly published by R.S. Rao in 1961, with a direct reference to Wight's (*l.c.*) description.

Commelina wightii is rare and endemic to South India. It is the only Indian species having yellow flowers and is also distinguished by its 1-seeded capsules and smooth seeds.

SHEBA M. JOSEPH. “TAXONOMIC REVISION OF THE GENUS COMMELINA L. (COMMELINACEAE) IN INDIA” THESIS. DEPARTMENT OF BOTANY PLANT SYSTEMATICS AND FLORISTICS LABST. JOSEPH’S COLLEGE, DEVAGIRI, KOZHIKODE-8, UNIVERSITY OF CALICUT, 2012.

CHAPTER 6
DISCUSSION AND SUMMARY

DISCUSSION

Habitat

Commelina thrives in moist, wet-humid, shady or partially shady regions in the tropics and subtropics as well as the temperate regions. Most of them are perennials found in a wide variety of habitats such as sea shores, edges of paddy fields, way sides, railway tracks, forest margins, evergreen forests, sholas, montane grasslands, as well as rock crevices of higher altitudes. Annual species are usually found in exposed conditions. *C. benghalensis* and *C. diffusa* are widespread and survive in almost all environments. A few species like *C. clavata*, *C. clavatoides*, *C. kurzii* and *C. tricolor* prefer higher altitudes, usually found in regions 1000-1500 m above sea level, while most others are found in lower plains. *C. albescens* grows in extreme conditions of desert regions while *C. attenuata* prefers open sandy soils and sea shores. However, all the species prefer moisture and partial or complete shade regardless of the habitat.

Habit

The plants are erect, sub-scandent, scandent or diffusely spreading. They are erect in *C. coelestis, C. paleata*, *C. subulata* and *C. suffruticosa*, sub-scandent with a definite base in *C. albescens, C. benghalensis, C.ekabeeja, C. ensifolia, C. maculata, C. petersii, C. tricolor* and *C. kurzii*, scandent with a definite base in *C. appendiculata, C. attenuata, C. clavata, C. clavatoides, C. forskalaei* and erect or

scandent in *C. paludosa*. They are diffusely spreading without a definite base in *C. andamanica*, *C. caroliniana, C. diffusa, C. indehiscens, C. longifolia, C. sikkimensis* and *C. wightii.*

Roots

Roots are adventitious. They are usually long, thin or thick or tuberous. They arise from the base of the plant or from basal nodes or from nodes where the stems are in contact with soil. The roots are thin in *C. andamanica*, *C. attenuata, C. benghalensis, C. caroliniana, C. diffusa, C. forskalaei, C. indehiscens, C. longifolia, C. sikkimensis, C. subulata* and *C. wightii*, tuberous in *C. albescens, C. coelestis, C. maculata* and *C. tricolor* but thick in all other Indian species.

Shoots

In *Commelina*, there is neither a distinct main shoot nor a single, clear, sympodial axis, but rather have diffuse branches. The shoots may be monomorphic or dimorphic. In monomorphic type, the flowering shoots differ from the vegetative shoots only in being erect or ascending while the latter are spreading. The shoots are monomorphic in *C. coelestis, C. ensifolia, C. kurzii, C. paleata, C. paludosa*, *C. subulata* and *C. suffruticosa* while dimorphic in *C. andamanica, C. appendiculata, C. attenuata, C. benghalensis, C. caroliniana, C. clavata, C. clavatoides, C. diffusa, C. forskalaei, C. indehiscens, C. longifolia, C. maculata, C. petersii, C. sikkimensis*, *C. tricolor* and *C. wightii*. Long shoots are produced in *C. andamanica*, *C. indehiscens* and *C. maculata*. The flowering shoots of *C. andamanica, C. indehiscens* and *C. maculata* are short and have reduced leaves, while the vegetative

shoots, which are often produced in the off season, are considerably long, stout and have distinctly larger leaves.

Lateral shoots arise from the axillary buds within the sheaths. Such shoots may emerge from the top of the sheaths or they may perforate them. A lateral shoot always has a bladeless sheath or prophyll at its base.

Internodes

The internodes are terete and their length varies from 2-16 cm in Indian *Commelina*s. The middle internodes are generally the longest. The upper ones are often very strongly reduced. Internodes are red in *C. tricolor*, basally red and apically green in *C. longifolia*, green or brown in *C. andamanica*, *C. benghalensis, C. caroliniana* and *C. maculata*, green with red striations in *C. clavata*, *C. indehiscens, C. paludosa, C. sikkimensis, C. subulata* and *C. wightii*. In all others they are green throughout. It may be glabrous or variously pubescent. A fine line of strigose hairs can be seen in *C. kurzii* and *C. wightii* or it may be completely pubescent or puberulent.

Leaves

The leaves are alternate and distichous. They are simple, entire and parallel veined. Their sheaths are slightly to completely fused. The length of the sheath varies from 0.4–4 cm, green or mottled with red striations. It is pubescent or puberulous in *C. coelestis*, *C. ensifolia*, *C. indehiscens*, *C. paleata*, *C. paludosa* and *C. petersii*, dense ciliate in *C. forskalaei* hirsute in *C.ekabeeja* but with a band of strigose hairs in other species. The hairs at the summit of the sheath may be red in *C.*

benghalensis, red but forming a ligule like structure in *C. paludosa* and hyaline in others.

The lamina is green but rarely paler abaxially. The shape and size of the lamina vary in different species. It is usually lanceolate, but may be linear-lanceolate, ovate-lanceolate, oblong-lanceolate, oblong or elliptic. It is ovate–oblong in *C. forskalaei* but ovate–elliptic in *C. wightii* and ovate in *C. andamanica*.

The size of the lamina varies from 0.2–22 × 0.4–5 cm. The largest leaf range is seen in *C. clavatoides* and *C. paludosa*. The base of the lamina is cuneate in most species, but it is rounded and oblique in *C. andamanica*, *C. indehiscens, C. kurzii*, *C. maculata, C. paludosa, C. sikkimensis* and *C. suffruticosa* obtuse in *C. benghalensis*, *C. longifolia*, *C. subulata*, and *C. wightii*, broad in *C. coelestis* and amplexicaul in *C. tricolor*. The apex of the lamina is acute or acuminate. The margin is serrate–serrulate, undulate in *C. albescens, C. benghalensis, C. coelestis, C. forskalaei, C. kurzii and C. petersii*.

The surfaces are glabrous or pubescent. Both surfaces are glabrous in *C. appendiculata, C. caroliniana, C. diffusa, C. longifolia, C. subulata* and *C. wightii* but pubescent or pilose on both surfaces in *C. andamanica, C. albescens, C. benghalensis, C. ensifolia, C. forskalaei, C. indehiscens, C. paleata, C. petersii* and *C. suffruticosa.* In the remaining species, the lamina is scabrous adaxially and glabrous abaxially.

Spathe **Plate 68-70**

While considering the shape, position, number, size, hairiness, length of peduncle and nature of cincinni, the spathes provide many taxonomically useful characters that help in distinguishing species of *Commelina*.

The spathes are of two kinds: cucullate and conduplicate. The cucullate spathes are funnel shaped due to the fusion at the basal region. Their apex is acute or acuminate but strongly falcate in *C. albescens*. In conduplicate spathes, the margins are free to the base but they are folded. Among the 24 Indian species, 11 come under cucullate type, including *C. petersii* and *C. paleata* though they resemble conduplicate type in appearance. All the cucullate species possess mucilaginous secretions within the spathe.

The cucullate spathes are terminal except in *C. petersii* where it is leaf opposed. The conduplicate spathes, though they are terminal initially later become leaf opposed. But in *C. suffruticosa* and *C. coelestis*, they are terminal.

The number of spathe within a sheath is solitary or a cluster of 2-6. Among the cucullate type *C. andamanica, C. ensifolia, C. forskalaei, C. paleata* and *C. petersii* bear solitary spathe while *C. albescens*, *C. benghalensis*, *C. kurzii, C. maculata* and *C. paludosa* have 2–6 spathes. All species of conduplicate group bear solitary spathe.

The length of the spathes vary from 1–9 cm. The smallest size (*ca*. 1cm long) is found in *C. subulata* and the longest spathe (*ca.* 9 cm long) in *C. appendiculata*.

The spathes are ciliate, pubescent, puberulent or glabrous. Among cucullate type, except *C. paludosa* which have glabrous spathes, all others have ciliate or glandular hairy spathes. In conduplicate type, *C. appendiculata, C. diffusa* and *C. longifolia* have glabrous spathes but in others, they are ciliate or puberulent. In *C. subulata* and *C. wightii,* the spathe margin is ciliate throughout and in *C ekabeeja* it is hirsute. In *C. caroliniana, C. clavata* and *C. clavatoides* the cilia is found only at the base.

The spathe is pedunculate or sessile. Among cucullate type, the peduncle is long (2–2.5 cm) in *C. petersii* and short (0.6 cm) in *C. forskalaei* and in others, the spathes are sessile or sub sessile. Among conduplicate type, *C. subulata* is always sessile while in others the length of peduncle varies from 2–10 cm.

The number of cincinnus is usually 2, but in some species the outer cincinnus is aborted or not exserted. Among cucullate type, *C. benghalensis* and *C. forskalaei* have exserted upper cincinnus while in others they are lacking or vestigial. Among conduplicate type, upper cininnus is lacking in *C. suffruticosa* but in others they are exserted or vestigial.

Flower **Plate 71 & 72**

Flowers are borne on the cincinni. They are pedicellate, pentacyclic, trimerous and zygomorphic. The flowers are generally unscented and remain open for a few hours at the end of which they fade.

The flower size vary from 4–40 mm wide. The smallest flower is found in *C. subulata* and the largest in *C. paleata*. The zygomorphic symmetry of flowers is

primarily due to the one sided arrangement of the stamens and staminodes. More striking is the differentiation of the corolla into two larger clawed petals and smaller odd petal. A less obvious zygomorphy is also present in the calyx, the medial sepal is morphologically distinct from the laterals. The horizontal flowers characteristically have the medial sepal, paried petals and staminodes on the upper side and the lateral sepals, odd petals and stamens on the lowe side.

Commelina produces staminate flowers on the upper cincinus and bisexual flowers on the lower cincinnus and very rarely bisexual flowers are also seen in the upper cincinnus. The flowers are usually blue coloured. The blue varies from lilac, pale blue to deep blue. But in *C. suffruticosa* produces white flowers, *C. paludosa* produce white or lilac or light blue. *C. kurzii* with white, lilac, blue or mauve *C. wightii* with yellow and *C. subulata* with chrome-yellow flowers. The variation seen in the flower colour can be seen in the plate 71 & plate 72.

Calyx

The calyx consists of three, free or variously fused, persistent sepals. They are hyaline or white but, sometimes tinged with lilac or blue. The medial sepal differs from the laterals in being more deeply ovate with a narrow apex and is comparatively smaller in size. The lateral sepals are ovate, oblong or orbicular.

The sepals are free in *C. caroliniana, C. clavatoides C. forskalaei, C. indehiscens,* and *C. paludosa* but in others the two lateral sepals are variously fused basally or $2/3^{rd}$ or $3/4^{th}$ of its length.

Corolla **Plates 73 & 74**

The corolla is composed of two equal, clawed paired petals, usually oriented upwards and a medial petal oriented downwards. They are free and deliquescent.

The odd petal differs from the paired petals in size, shape, colour and lack of claw. It is small (*ca*. 2 mm broad), lanceolate, acute-obtuse in *C. paludosa, C. maculata, C. kurzii, C. forskalaei*, *C. petersii, C. paleata*, *C. benghalensis, C. albescens, C. andamanica* and *C. ensifolia*, but extremely small (*ca.* 1 mm broad) in *C. andamanica, C. ensifolia* and *C. paleata*. In others the odd petal is similar to the lateral petals except in the absence of claw.

The paired petals have a basal claw and an upper limb. The limb varies from orbicular to deltoid. Most commonly it is orbicular. The limb apex is normally rounded to obtuse but the base varies from symmetric to asymmetric and from cuneate to cordate.

The petals are blue commonly lilac but white, yellow or chrome-yellow in some species. It is white in *C. suffruticosa*, chrome-yellow in *C. subulata*, yellow in *C. wightii* and white, lilac, violet or mauve in *C. kurzii*. The claws are either concolorous with the limbs or paler than them. The degree of difference between the odd petal and paired petals as well as details in size, shape, colour and other are taxonomically useful.

Androecium

Androecium consists of three stamens (two antisepalous and one antipetalous) and three staminodes (one antisepalous, two antipetalous) borne on both sides of the flower.

Stamens **Plate 75**

The three stamens in a flower are more or less equal or the lateral stamens have longer filaments. The filaments are always glabrous, but variously coloured. They are usually slender, filiform except in *C. forskalaei*, where they are flat or winged. The filament of the medial stamen is much varied in their size and is always straight with its tip mostly curved inwards. Colour of the filament varies from blue, lilac, white-yellow. The filaments are yellow in *C. wightii* and *C. petersii*, white in *C. indehiscens* and *C. suffruticosa,* white-yellow in *C. paludosa* and *C. maculata,* lilac in *C. benghalensis,* lilac or yellow in *C. kurzii, C. tricolor* and *C. ensifolia*, blue in *C. attenuata, C. caroliniana, C. clavata, C. diffusa, C. longifolia* and *C. appendiculata* and basally white and distally lilac in lateral filaments of *C. benghalensis* and *C. tricolor*, basally white and distally blue in *C. forskalaei*. The size of the filaments of medians and laterals are almost equal and vary from 3–9 mm. They are equal in *C. diffusa, C. sikkimensis, C. suffruticosa, C. subulata* and *C. wightii*. Median stamen is little longer in *C. forskalaei* and *C. paludosa,* but it is shorter in others.

The anthers are four celled and dehiscing longitudinally. The medial and lateral anthers vary in size, shape, colour, curvature and pollen colour. The medial anther is always larger than the laterals, yellow in colour and with a short curvature at the lower side or on the upperside or on both the sides. The curvature may be seen on both sides in *C. tricolor, C. caroliniana*, *C. kurzii, C. suffruticosa* and in *C. longifolia*. In *C. forskalaei* the medial anther has a yellowish globular outgrowth at the base. In all other cases the curvature is only on the lowerside. The shape of

lateral anthers are sagittate, linear or spherical and white, blue or yellow in colour, white anthers are found in *C.ensifolia* and *C. sikkimensis*; blue in *C. benghalensis* and *C. forskalaei* and yellow in others. In *C. caroliniana, C. clavata, C. clavatoides, C. indehiscens, C. longifolia*, *C. paludosa* and *C. undulata* the dehiscing area have a black or brown band and all the other cases it is white. The colour of the connective varies from white to yellow; mostly white but yellow in *C. tricolor* and *C. suffruticosa*.

The colour of pollengrains vary from pale to deep yellow and white. The medial stamen produces yellow pollen while the lateral stamens produce white pollen in *C. benghalensis, C. ensifolia*, *C. forskalaei* and *C. tricolor* while in all others the pollens are yellow.

Staminodes **Plate 76**

The staminodes are usually 3, but 3 or 2 in *C. forskalaei*, *C. petersii*, *C. diffusa* and *C. indehiscens*. A third one with a slender filament lacking an antherode can sometimes present in *C. diffusa* and *C. indehiscens*.

The staminode filaments are usually filiform and slender than those of the staminal filaments but they are flat in *C. forskalaei*. The colour may be light–deep blue, yellow, white or red. The filament is yellow in *C. wightii*, white in *C. suffruticosa* and *C. paludosa* and red in *C. subulata*.

The antherodes are typically 4 lobed with 2 lateral appendages. The appendages are globular with a stalk. The lobes show much vaiation in their shape and may be sessile or stalked. They are stalked in *C. attenuata*, *C. caroliniana*, *C.*

clavata, *C. clavatoides*, *C. indehiscens*, *C. longifolia*, *C. tricolor* and *C. wightii*. The lobes are unequal in *C. diffusa* and *C. sikkimensis*. The lobes are sessile in *C. andamanica*, *C. benghalensis*, *C. ensifolia*, *C. forskalaei*, *C. kurzii*, *C. maculata*, *C. paleata*, *C. paludosa* and *C. petersii*. The lobes are poorly developed in *C. subulata* and *C. suffruticosa*. The characters of staminodes are taxonomically useful, but it is not much reliable being inconsistent in their arrangement in male and bisexual flowers.

The function of the staminodes seem to attract pollinators. The colour of the antherode is usually yellow, varies from deep to pale. In *C. clavata*, *C. clavatoides* and in *C. longifolia*, the antherode is maroon or cream spotted medially.

Gynoecium

The gynoecium consists of a tricarpellary, trilocular ovary with 1 dorsal and 2 ventral locules, a slender style and stigma. The ovary is globose–elliptic, green or yellow. In most of the *Commelina* species the dorsal locule is one ovuled. In *C. clavata, C. clavatoides, C. suffruticosa, C. tricolor* and *C. wightii*, the ovule in the dorsal locule is aborted or become vestigial. The ventral locules are one or two ovuled. In *C. indehiscens*, the dorsal locule contain 1 ovule and the ventral locules are aborted.

The style is slender, glabrous and usually white. It is lilac–white in *C. benghalensis, C. caroliniana* and *C. longifolia,* blue in *C. paleata*, basally mauve and distally yellow in *C. tricolor* and red in *C. subulata.* The style is coiled after pollination.

The stigma is terminal and sometimes brightly coloured. It is trilobed in C. *andamanica, C. attenuata, C. ensifolia, C. longifolia* and *C. suffruticosa* but capitate in others.

Capsule

The capsules are usually 1 or 2 within a spathe, but always 1 in *C. attenuata, C. benghalensis, C. forskalaei* and *C. wightii*, always 2 in *C. subulata*, 3 or 4 in *C. coelestis* and 5 or 6 in *C. suffruticosa*. The size varies from 4–10 × 2–6 mm. The longest capsule (10 mm) is found in *C. appendiculata* and *C. indehiscens* and the smallest (4 mm) in *C. subulata*. The tip of the capsule is long and pointed in *C. indehiscens* and cuspidate in others.

The shape of the capsules vary from globose, ovoid, obovoid, oblong to elliptic. They are globose in *C. appendiculata, C. kurzii, C. suffruticosa* and *C. wightii,* ovoid in *C. albescens, C. attenuata* and *C. maculata*, obovoid in *C. forskalaei* and *C. paludosa,* ovate–elliptic in *C. caroliniana* and *C. petersii,* oblong–elliptic in *C. clavata*; obovoid–elliptic in *C. ensifolia*, ovoid–oblong in *C. tricolor* but oblong in others.

The capsule is trilocular in most species, but bilocular in *C. attenuata, C. clavata*, *C. suffruticosa,* and *C. tricolor*. One locule is functional in *C. wightii* due to the abortion of the dorsal and one of the ventral locule. In *C. albescens, C. ensifolia, C. kurzii,* and *C. petersii* the second flower produces bilocular instead of a trilocular capsule.

The ventral locules are 2 seeded generally, but they are aborted completely in *C. indehiscens*. In *C. wightii* one of the ventral locule is aborted while the other is 1 seeded. The ventral locules are one seeded in *C. appendiculata, C. ensifolia, C. kurzii, C. maculata, C. paleata, C. paludosa* and *C. suffruticosa*.

Seed

The seeds show variation in size, shape, number, colour of the testa and ornamentation. The size of the seeds varies from 2–6 × 1–3 mm. Largest seed (*ca.* 5 mm) is seen in *C. appendiculata* and *C. indehiscens* and the smallest seed (*ca.* 1.5 mm) is found in *C. subulata*. The seed is triangular in *C. coelestis*, ovoid–oblong in *C. sikkimensis* and *C. tricolor*, globose –orbicular in *C. albescens, C. forskalaei, C. kurzii, C. paleata* and *C. wightii*, elliptic in *C. attenuata, C. paludosa* and *C. suffruticosa*, ovoid-oblong to elliptic in *C. benghalensis, C. clavata, C. clavatoides, C. longifolia, C. maculata* and *C. subulata*;, oblong in *C. diffusa* and ovate-pyriform or elliptic in *C. caroliniana* and *C. petersii*.

The ornamentation of the testa under LM is smooth, reticulate, pitted or ridged, but under SEM, the surface is granulate, rugulate, reticulate or perforate with or without farinose granules. The testa is irregularly pitted in *C. coelestis,* transversely pitted in *C. subulata*, reticulately pitted in *C. sikkimensis* and shallowly pitted in *C. clavatoides*. In *C. petersii* the surface testa has tubercles on ridges whereas *C. benghalensis* has furrowed reticulations. The seed is foveate reticulate in *C. suffruticosa*, shallowly reticulate in *C. clavata*, doubly reticulate *in C. diffusa* and smooth in others.

Farinose granules are present in most species. It may be thickly arranged or irregularly scattered. Comparatively larger farinose outgrowths are seen in *C. ensifolia, C. maculata C. paludosa* and *C. suffruticosa* which can also be seen under LM.

The seeds are appendaged at both ends in *C. appendiculata* and *C. attenuata* and appendaged at one end in *C. longifolia.* The appendages are honey comb like in *C. attenuata*. In all Indian species studied, the hilum is linear and the embryotega is lateral.

Morphometric analysis in Indian *Commelina*

A cluster analysis is used to classify all the species, as it is better in representing distances among similar species (Newmaster *et al.*, 2008), performed with NTSYS software. Twenty five species of *Commelina* are selected as Operational Taxonomic Units (OUT's) and a total of 52 characters are selected for the cluster analysis. All data inferred during the current study- either from the field or herbaria as well as the experimental garden at St. Joseph's College Botanical Garden, are used for the analysis. A data matrix of 52 morphological characters of 25 species is prepared (Table 7, Appendix VIII). All the computations are done using NTSYS (Rohlf, 2000) software and a cluster analysis for the qualitative morphological data is performed using Simple matching coefficient. A dendrogram (Figure 27) was plotted from a distance matrix generated using an arithmetic average (UPGMA) clustering algorithm and standardized data based on the average taxonomic distance subjected to the unweighted pair-group clustering method The

similarity studies using morphological characters indicated that there are considerable variations among the twenty five species of *Commelina* studied.

The dendrogram obtained through the analysis clearly revealed that 25 species used in the morphometric analysis falls under 6 distinct clusters in 2 sections. *C. subulata* Roth, a small sized grasy species, distinguishable by its chrome yellow flowers stands separate and constitute a separate section (section 1) while the other section consists of 24 species grouped into 5 distinct clusters under 2 groups. The species in each cluster revealed close inter specific relationships.

Species with a single cincinnus (lower cincinnus only) exhibited 69% similarity and falls under group I where as those species with 2 cincinni (both upper and lower) showed 66% similarity and constitute the group II. All the species with cucullate spathes with the exception of *C. benghalensis* and *C. forskalaei* forms a separate cluster under group I. However, *C. andamanica* stands separate in this cluster with a similarity coefficient of 73%. Similarly, *C. coelestis* and *C. suffruticosa* shared 71% affinity, clustered with *C. ekabeeja* that shared 70% relationship represents another cluster in group I which can be distinguished by their erect habit with a definite base and thick roots. Group II represents those species with 2 cincinni (both upper and lower) which constitute 14 species under 4 clusters. *C. benghalensis* and *C. forkalaei* distinguished by their cucullate spathes and cleistogamous flowers forms a separate cluster under this group. *C. wightii*, characterized by their yellow flowers represents the lone species of a third cluster.

Table 7. Characters used for Cluster Analysis

1. Plants erect (0) Plants not erect (1)	14. Spathe usually solitary (0) Spathe usually clustered (1)	27. Flowers chrome yellow/orange (0) Flowers other than chrome yellow/orange (1)	40. Ventral locules aborted (0) Ventral locules Fertile (1)
2. Plants with a definite base (0) Plants lacking a definite base (1)	15. Spathe pedunculate > 2 cm (0) Spathe sessile / subsessile < 1 cm (1)	28. Flowers Yellow (0) Flowers other than yellow (1)	41. Ventral locules 2-seeded (0) Ventral Locules 1-seeded (1)
3. Plants rooting at nodes(0) Plants not rooting at nodes (1)	16. Spathe conduplicate (0) Spathe cucullate (1)	29. Odd petal large, showy (0) Odd petal much reduced/lanceolate (1)	42. Seeds longer than broad (0) Seeds globose or spherical (1)
4. Roots thick/tuberous (0) Roots not thick/tuberous (1)	17. Spathe green veined (0) Spathe with out green veins (1)	30. Staminal filaments terete (0) Staminal filaments flattened (1)	43. Seeds smooth (0) Seeds not smooth (1)
5. Plants annual (0) Plants perennial (1)	18. Spathe base hastate (0) Spathe base not hastate (1)	31. Antherodes 4-lobed (0) Antherodes not 4-lobed (1)	44. Seeds ridged (0) Seeds not ridged (1)
6. Cleistogamous flowers present (0) Cleistogamous flowers absent (1)	19. Spathe distally falcate (0) Spathe distally not falcate (1)	32. Pistil pilose/hirsute/puberulous (0) Pistil glabrous (1)	45. Seeds reticulate (0) Seeds not reticulate (1)
7. Internodes < 7 cm long (0) Internodes > 8 cm long (1)	20. Spathe variously pubescent (0) Spathe glabrous (1)	33. Stigma trilobed (0) Stigma capitate (1)	46. Seeds doubly reticulate (0) Seeds not doubly reticulate (1)
8. Sheath summit with red hairs (0) Sheath summit without red hairs (1)	21. Spathe margin ciliate (0) Spathe margin not ciliate (1)	34. Capsule strictly 1 per spathe (0) Capsule more than 1 per spathe (1)	47. Seeds with a torus on the testa (0) Seeds without a torus on the testa (1)
9. Sheath summit with white hairs (0) Sheath summit without white hairs (1)	22. Upper cincinnus present (0) Upper cincinnus absent / vestigial (1)	35. Capsules 1-3 per spathe (0) Capsule 5 / 6 per spathe (1)	48. Seeds with farinose granules (0) Seeds without farinose granules (1)
10. Leaf base oblique (0) Leaf base not oblique (1)	23. Upper cincinnus 2-6 flowered (0) Upper cincinnus ≤ 2 flowered (1)	36. Capsules apiculate (0) Capsules not apiculate (1)	49. Seeds with tubercles on ridge (0) Seeds without tubercles (1)
11. Lamina usually ovate-lanceolate (0) Lamina usually linear (1)	24. Lower cincinnus 2-6 flowered (0) Lower cincinnus ≤ 2 flowered (1)	37. Capsule 1-seeded (0) Capsule 2-5 seeded (1)	50. Seeds appendaged (0) Seeds not appendaged (1)
12. Lamina variously pubescent (0) Lamina glabrous (1)	25. Flowers blue (0) Flowers other than blue (1)	38. Dorsal locules aborted (0) Dorsal locules fertile (1)	51. Seeds pitted (0) Seeds not pitted (1)
13. Spathe axillary/leaf opposed (0) Spathe terminal (1)	26. Flowers white (0) Flowers other than white (1)	39. Dorsal locules deshiscent (0) Dorsal locules indehiscent (1)	52. Testa reddish brown (0) Testa dark brown/black (1)

Those species with smooth seeds *viz*. *C. appendiculata*, *C. attenuata*, *C. caroliniana* and *C. longifolia* falls under cluster I of group II while the rest of the species having reticulate or pitted seeds falls under cluster II constituting seven species *viz*. *C. clavata*, *C. clavatoides, C. tricolor, C. petersii, C. diffusa, C. sikkimensis and C. indehiscens*. *C. clavata* and *C. clavatoides* shows the highest affinity with a similarity coefficient of 92% which forms a separate sub-cluster with *C. tricolor* sharing 89% of their characters. *C. diffusa* and *C. sikkimensis* represents another closely related group with a coefficient of 87% of affinity. All the taxa under this cluster are characterized by conduplicate and puberulous spathes.

The present numerical analysis has yielded a good clustering pattern that reflects the natural relationship among the 25 species of *Commelina* in India.

SUMMARY

Commelina L. is the largest genus of Commelinaceae and comprises about 206 species in the world. It is the second largest genus in India with 25 species. The genus is taxonomically neglected with the absence of modern floristic treatments

and monographs. Subsequent to Hooker's (1892) treatment of the genus in *Flora of British India*, there has been no revision of *Commelina* in India. The only other work, after Hooker (*l.c.*) that covers the genus for the whole of India is the mere enumeration by Karthikeyan *et al*. (1989). In the present investigation, the genus is revised for India based on extensive field exploration and in consultation with major Indian herbaria.

Field studies are conducted in different parts of India during 2008-2012, spending 150 days in the field. All, except *Commelina albescens*, *C. appendiculata* *C. coelestis* and *C. ekabeeja* are collected live. In addition to the personal collections of the author, materials housed at ASSAM, BLAT, BSD, BSI, BSJO, CAL, CALI, DD, DEV, JCB, MH, PBL, RRLB, RHT, SKU, TBGT, MEL, NBU, SNC are also consulted to understand the variation and distribution of each species. Two thousand eight hundred and eighty six herbarium specimens are examined and four hundred and twenty three populations are observed in the field.

In the present study 25 species of *Commelina* are treated, which includes 2 new species and one new name, C. *ekabeeja* Sheba & Nampy. *C. clavatoides* Nampy & Sheba, recently described from South India, is close to *C. clavata* but differs by its long internodes, leaf and peduncle, antherode with a cream or purple spot at the centre, free sepals, 5-6 capsules per spathe and shallow pitted, ovoid to oblong seeds. The other species described from South Andaman, *C. andamanica* Sheba & Nampy is closely allied to *C. suffruticosa* and *C. benghalensis* but differs from them in its trailing habit without a definite base, solitary and terminal cucullate spathe with a single cincinnus and two smooth seeds within the capsule. A new

name C. *ekabeeja* Sheba & Nampy is proposed in this treatment to replace *C. hirsuta* (Wight) C.B. Clarke. The latter name is a later homonym of *C. hirsuta* R. Br. (1814) or Willd. ex Spreng. (1820) or Kunth. (1843) or Hochst. ex A. Rich. (1850) and is illegitimate under Article 58.3 of ICBN.

The nomenclature of all species is updated with latest literature and in consultation with types and protologues. Type specimens or cibachromes/ microfisches/ images of types from K, US, BM, BR, C, G, L, P have been consulted. There are several changes in the Indian names, which include *C. kurzii* for *C. erecta* sensu Karthikeyan *et al*., *C. caroliniana* Walter for *C. hasskarlii*, *C. petersii* for *C. imberbis* sensu R.S. Rao and *C. paludosa* for *C. maculata* sensu Karthikeyan *et al*. The three taxa included by Karthikeyan *et al*. (1989) *viz*., *C. avenaefolia* J. Graham, *C. clavata* var. *hohenanackeri* C.B. Clarke and *C. kotschyi* Hassk. in Schweinf. are excluded in the current treatment. In the present work, the following names *viz*., *C. appendiculata* C.B. Clarke, *C. clavata* C.B. Clarke, *C. ekabeeja* Sheba & Nampy, *C. indehiscens* E. Barnes, *C. kurzii* C.B. Clarke, *C. sikkimensis* C.B. Clarke, *C. tricolor* E. Barnes and *C. wightii* R.S. Rao are lectotypified.

A study on the foliar epidermal features and their taxonomic significance is conducted on 21 species. The epidermal pattern and distribution of hairs on the lamina show a close relationship between the species. Similarly, the significance of testa ornamentation in the taxonomy of 21 species of *Commelina* is also studied using Scanning Electron Microscopy.

The phytogeographic pattern of *Commelina* in India is mapped based on field and herbarium studies. Among the 25 species, 5 (20%) are endemic, 10 (40%)

are widely distributed occurring in almost all states and the remaining 10 (40%) have localized distribution. Peninsular India with 20 species (80%), has highest number of species followed by 14 species (56%) in North Eastern India. State wise, Tamil Nadu have maximum diversity with 20 species (80%) followed by Kerala with 18 species (72%). From the Andaman and Nicobar islands, 7 species (28%) are reported including one new species, *C. andamanica*.

Morphometric analysis of 25 Indian species are also performed with NTSYS software. A total of 52 characters are selected for the cluster analysis from each species. The present numerical analysis has yielded a good clustering pattern that reflects the natural relationship among the 25 species of *Commelina* in India.

APPENDIX I

TAXA NOT INCLUDED IN THE PRESENT STUDY

1. *Commelina avenaefolia* J. Graham, Cat. Pl. Bombay 224. 1839; Hook.f., Fl. Brit. India 374. 1982 (as doubtful species); T. Cook, Fl. Bombay 204. 1906 (as doubtful and indeterminable species); R.S. Rao, Blumea 14(2): 354. 1966; Karthikeyan *et al*., Fl. Indicae Enum. Mon. 24. 1989; B.D. Sharma *et al*., Fl. Maharashtra 161. 1996 (as doubtful and indeterminable species).

Graham (1839) in his catalogue of plants of Bombay described *C. avenaefolia* as "leaves sprinkled with hairs, sheaths hairy; involucre truncate" from the forests of Kandalla in Satara district, Maharashtra. From the very scanty diagnosis given above, which can be equally applied to many species, I cannot determine Graham's species exactly. I made extensive search in many Indian herbaria, and couldn't find Graham's specimens of *C. avenaefolia*. Further, Rao (1966a) reported that Graham's collections have been sent to B.van Hugel who deposited them in the Natural History Museum Herbarium, Wien and Dr. Rao made a thorough search for this specimen and unable to trace the sheet. He assumes that Graham's material of this species might have destroyed during IInd World War along with other monocot specimens and it is suggested that this name must be rejected. However, it is treated as a valid species by Karthikeyan *et al*. (1989) and Govaerts & Faden (2012, as *C. avenifolia*).

2. *Commelina gelatinosa* Edgew., J. Asiat. Soc. Bengal 21: 177. 1853.
Trithyrocarpus gelatinosus (Edgew.) Hassk., Flora 49: 211. 1866.

This species was described by Edgeworth (1851) from Banda in Uttar Pradesh, but it is not available in any Indian herbaria. No mention of this species is found in any Indian floras except Duthie (1915) who treated it as a synonym of *C. obliqua* Buch-Ham., but Govaerts and Faden (2012) recognized it as a valid species. According to Edgeworth (*l.c*.) it comes nearest to *C. donii* A. Dietr. (= *C. paludosa* Blume), but is immediately distinguishable by the scabrous upper surface of the leaves and other characters.

APPENDIX I

TAXA NOT INCLUDED IN THE PRESENT STUDY

1. *Commelina avenaefolia* J. Graham, Cat. Pl. Bombay 224. 1839; Hook.f., Fl. Brit. India 374. 1982 (as doubtful species); T. Cook, Fl. Bombay 204. 1906 (as doubtful and indeterminable species); R.S. Rao, Blumea 14(2): 354. 1966; Karthikeyan *et al*., Fl. Indicae Enum. Mon. 24. 1989; B.D. Sharma *et al*., Fl. Maharashtra 161. 1996 (as doubtful and indeterminable species).

Graham (1839) in his catalogue of plants of Bombay described *C. avenaefolia* as "leaves sprinkled with hairs, sheaths hairy; involucre truncate" from the forests of Kandalla in Satara district, Maharashtra. From the very scanty diagnosis given above, which can be equally applied to many species, I cannot determine Graham's species exactly. I made extensive search in many Indian herbaria, and couldn't find Graham's specimens of *C. avenaefolia*. Further, Rao (1966a) reported that Graham's collections have been sent to B.van Hugel who deposited them in the Natural History Museum Herbarium, Wien and Dr. Rao made a thorough search for this specimen and unable to trace the sheet. He assumes that Graham's material of this species might have destroyed during IInd World War along with other monocot specimens and it is suggested that this name must be rejected. However, it is treated as a valid species by Karthikeyan *et al*. (1989) and Govaerts & Faden (2012, as *C. avenifolia*).

2. *Commelina gelatinosa* Edgew., J. Asiat. Soc. Bengal 21: 177. 1853.
Trithyrocarpus gelatinosus (Edgew.) Hassk., Flora 49: 211. 1866.

This species was described by Edgeworth (1851) from Banda in Uttar Pradesh, but it is not available in any Indian herbaria. No mention of this species is found in any Indian floras except Duthie (1915) who treated it as a synonym of *C. obliqua* Buch-Ham., but Govaerts and Faden (2012) recognized it as a valid species. According to Edgeworth (*l.c*.) it comes nearest to *C. donii* A. Dietr. (= *C. paludosa* Blume), but is immediately distinguishable by the scabrous upper surface of the leaves and other characters.

3. *Commelina heterosperma* Blatt. & Hallb., J. Indian Bot. 2: 54. 1921.

Blatter and Hallberg (1921) described this species based on collections of McCann from Igatpuri ghats in Nasik District of Maharashtra. Though the type is recorded as St. Xavier's College No. 12786, it is not available at BLAT or in any other Indian herbaria. No mention of this species is found in any Indian Floras. Rao (1966b) treated it as a synonym of *C. kotschyi* Hassk. and this was followed by Karthikeyan *et al*. (1989), but Govaerts and Faden (2012) recognized it as a valid species.

Rao's (*l.c.*) assumption that *C. heterosperma* (= *C. kotschyi*) has entered in to the Western Ghats area of India from East Africa rather recently is also not acceptable.

4. *Commelina kotschyi* Hassk. in G.Schweinfurth, Beitr. Fl. Aethiop. 207. 1867.

It is currently treated under the synonym of *C. imberbis* Ehrenb ex Hassk. The report of its earlier occurrence in India is doubtful (see above).

5. *C. clavata* var. *hohenanackeri* C.B. Clarke

This variety is reported from Nilgiris, but no data available on this in any Indian herbaria.

APPENDIX II

LIST OF PAPERS PUBLISHED/ COMMUNICATED

Sheba M. Joseph and Santhosh Nampy**. 2012.** Capsule and seed morphology of *Commelina* L. (Commelinaceae) in relation to taxonomy. *International J. Bot*. **8**(**1**): 1-12.

Sheba M. Joseph and Santhosh Nampy**. 2012.** Present status of *Commelina petersii* ex. Hassk. (Commelinaceae). *Indian Forester* **138**(**6**): 573

Sheba M. Joseph, A. Anna Ancy Antony and Santhosh Nampy. **2012.** *Commelina clavatoides* (Commelinaceae), a new species of from Kerala, India. *J. Bot. Res. Inst. Texas* **6**(**1**):119-122.

Papers communicated

Santhosh Nampy, **Sheba M. Joseph** and K.M. Manudev. **2012.** The genus Commelina L. (Commelinaceae) in Andaman & Nicobar Islands, India with one new species and three species records. *Phytotaxa*.

Sheba M. Joseph and SanthoshNampy. **2012.** Taxonomic significance of spathe characters in Indian Commelinas. *Botanica Orientalis*.

APPENDIX III

LIST OF HERBARIA CONSULTED

1. Blatter Herbarium, St. Xaviers College, Mumbai (BLAT).
2. Botanic Garden and Botanical Museum, Berlin-Dahlem Herbarium, Berlin, Germany (B*).
3. Botanical Survey of India, Andaman & Nicobar Circle, Port Blair (PBL).
4. Botanical Survey of India, Eastern Circle, Shillong, Meghalaya, India (ASSAM).
5. Botanical Survey of India, Northern Circle, Dehradun, Uttarakhand, India (BSD).
6. Botanical Survey of India, Southern Circle, Coimbatore, Tamil Nadu, India (MH).
7. Botanical Survey of India, Western Circle, Pune, Maharashtra, India (BSI).
8. Calicut University Herbarium, Department of Botany, University of Calicut, Kerala, India (CALI).
9. Central National Herbarium, Kolkata, West Bengal, India (CAL).
10. Forest Research Institute, Indian Council of Forestry Research and Education, Dehradun, Uttarakhand, India (DD).
11. Institute of Minerals and Materials Research Institute Herbarium, Bubhaneswar, Orissa, India (RRLB).
12. Museum National d'Histoire Naturelle, Paris, France (P*).
13. National Botanic Garden, Belgium (BR*).
14. National Herbarium, Leiden University Branch, Nederlands (L*).
15. National History Museum, London, England (BM*).
16. National Museum of Natural History, Smithsonian Institution, Washington, USA (US*).
17. Natural History Museum of Denmark, Copenhagen, Denmark (C*).
18. North Bengal University Herbarium, Siliguri, West Bengal.
19. Rapinat Herbarium, St. Joseph's College, Trichy (RHT).
20. Royal Botanic Gardens, Melbourne, Australia (MEL).

21. Royal Botanical Gardens, Kew (K*).
22. Sree Narayana College Herbarium, Kollam, Kerala.
23. Srikrishna Devaraya University Herbarium, Anantapur (SKU).
24. St. Joseph's College Herbarium, Bengaluru (JCB).
25. St. Joseph's College Herbarium, Devagiri, Kozhikode (DEV).
26. The Conservatory and Botanical Garden, Geneva (G*).
27. Tropical Botanical Garden Herbarium, Thriuvananthapuram (TBGT).

* consulted virtual database available online.

APPENDIX IV

COMMELINA MODEL DATA SHEET

Name:		Flowering time:		Locality:		Photo ☐	
Common name:		Flowering season:		District:			
Collection date:		Altitude:		State:		Collection No:	
Habitat	Forest	☐	Cultivating land	☐	Exposed	☐	
	Road side	☐	Riverside	☐	Shade	☐	
	Sea shore	☐	Rocky area	☐	Partial shade	☐	
	Waste land	☐	Garden	☐	Special notes:		
Habit	Annual	☐	Ascending	☐	Decumbent	☐	
	Biennial	☐	Scrambling	☐	Procumbent	☐	
	Perennial	☐	Erect	☐	Floating	☐	
	Height:		Creeping	☐	Epiphytic	☐	
	Special notes:						
Root	Fibrous	☐	From base	☐	Tuber length:		
	Tuberous	☐	From lower nodes	☐	Tuber thickness:		
	From all nodes	☐	Special notes:				
Stem	Node purple	☐	Inter node glabrous	☐	Velutinous	☐	
	Green	☐	One line of cilia	☐	Pubescent	☐	
	Inter node purple	☐	Woolly	☐	Scabrous	☐	
	Green	☐	Villose	☐	Setose	☐	
	Inter node length:		Pilose	☐	Strigose	☐	
	Special notes:		Hispid	☐	Tomentose	☐	
			Hirsute	☐			
Leaf	Radicale	☐	Radicale leaf spiral	☐	Cauline leaf spiral	☐	
	Cauline	☐	Distichous	☐	Distichous	☐	
			Alternate	☐	Alternate	☐	
	Sheath		Green	☐	Green	☐	Length :
			Purple	☐	Purple	☐	
			Glabrous	☐	Glabrous	☐	
			Hirsute	☐	Hirsute	☐	
			Villose	☐	Villose	☐	
			Hispid	☐	Hispid	☐	
			Tomentose	☐	Tomentose	☐	
	Mouth		Ciliate	☐	Ciliate	☐	
			Glabrous	☐	Glabrous	☐	
			Red rufus hairs	☐	Red rufus hairs	☐	
	Petiole		Length:		Length:		
			Green	☐	Green	☐	
			Purple	☐	Purple	☐	
			Hairy	☐	Hairy	☐	
			Glabrous	☐	Glabrous	☐	

	Radicale leaf		Cauline leaf		
Leaf base	Attenuate	□	Attenuate	□	
	Cuneate	□	Cuneate	□	
	Oblique	□	Oblique	□	
	Obtuse	□	Obtuse	□	
	Cordate	□	Cordate	□	
	Amplexicaul	□	Amplexicaul	□	
Lamina	Linear	□	Linear	□	Length :
	Lanceolate	□	Lanceolate	□	
	Ovate	□	Ovate	□	Breadth:
	Elliptic	□	Elliptic	□	
	Oblong	□	Oblong	□	
	Obovate	□	Obovate	□	
Margin	Entire	□	Entire	□	
	Undulate	□	Undulate	□	
	Ciliate	□	Ciliate	□	
	Scabrous	□	Scabrous	□	
	Smooth	□	Smooth	□	
	Hyaline	□	Hyaline	□	
Apex	Acute	□	Acute	□	
	Acuminate	□	Acuminate	□	
	Apiculate	□	Apiculate	□	
	Scabrous	□	Scabrous	□	
	Smooth	□	Smooth	□	
	Obtuse	□	Obtuse	□	
Upper surface	Woolly	□	Woolly	□	
Special notes:	Strigose	□	Strigose	□	
	Tomentose	□	Tomentose	□	
	Pubescent	□	Pubescent	□	
	Puberulous	□	Puberulous	□	
	Pilose	□	Pilose	□	
	Villose	□	Villose	□	
	Scabrous	□	Scabrous	□	
	Glabrous	□	Glabrous	□	
	Hirsute	□	Hirsute	□	
	Hispid	□	Hispid	□	
Lower surface	Glabrous	□	Glabrous	□	
Special notes:	Pubescent	□	Pubescent	□	
	Puberulous	□	Puberulous	□	
	Pilose	□	Pilose	□	
	Villose	□	Villose	□	
	Scabrous	□	Scabrous	□	
	Hirsute	□	Hirsute	□	
	Hispid	□	Hispid	□	
	Woolly	□	Woolly	□	
	Strigose	□	Strigose	□	
	Tomentose	□	Tomentose	□	

Inflorescence	Terminal	☐	Panicle	☐	Peduncle glabrous	☐	Length :		
	Axillary	☐	Corymb	☐	Ciliate	☐	Breadth:		
	Axillary&terminal	☐	Raceme	☐	One line of cilia	☐	Special notes:		
	Solitary	☐	Cincinnus	☐	Green	☐			
			Cyme	☐	Purple	☐			
			Thyrse	☐					
	Bract foliaceous	☐	Bract ovate	☐	**Bract lower surface**		**Bract base**		
			Cordate	☐	Villose	☐	Oblique	☐	
	Spathaceous	☐	Obtuse	☐	Cordate	☐	Margin entire	☐	
	Special notes:		Linear	☐	Glabrous	☐	Ciliate	☐	
			Falcate	☐	Pubescent	☐	Hairy	☐	
			Lanceolate	☐	Hispid	☐	Acuminate	☐	
	Length :		Ciliate	☐	Hirsute	☐	Apiculate	☐	
	Breadth:				Apex acute	☐			
					Woolly	☐			
					Pilose	☐			
	Bracteole ovate	☐	Bracteole apex acute	☐	Margin entire	☐	Outer surface		
	Falcate	☐	Apiculate	☐	Ciliate	☐	Hispid	☐	
	Linear	☐	Acuminate	☐	Hairy	☐	Ciliate	☐	
	Lanceolate	☐	Special notes:		Length :		Villous	☐	
	Base amplexicaul	☐			Breadth:		Pilose	☐	
	Obtuse	☐					Woolly	☐	
							Glabrous	☐	
Flower	Sessile	☐	Zygomorphic	☐	Male	☐	Length :		Special notes:
	Pedicellate	☐	Actinomorphic	☐	Female	☐	Breadth:		
	Pedicel length:		No. of flowers:		Bisexual	☐			
	Ciliate	☐							
	Glabrous	☐							
	One line of cilia	☐							
	Sepal no:		Shape ovate	☐	Length:		Glabrous	☐	
	Green	☐	Lanceolate	☐	Breadth:		Pubescent	☐	
	Pale white	☐	Oblong	☐	Sepal united	☐	Ciliate	☐	
	Special notes:		Elliptic	☐	Free	☐	Villose	☐	
			Margin entire	☐	Base connate	☐	Pilose	☐	
			Ciliate	☐	Lateral fusion	☐	Hirsute	☐	
			Serrate	☐			Hispid	☐	
			Hyaline	☐			Tomentose	☐	
	Petal no:		Shape ovate	☐	Length :		Glabrous	☐	
	Green	☐	Lanceolate	☐	Breadth:		Pubescent	☐	
	Blue	☐	Elliptic	☐	Petal united	☐	Margin entire	☐	
	Purple	☐	Reniform	☐	Petal free	☐	Hairy	☐	
	Violet	☐	Oblong	☐	Base connate	☐	Ciliate	☐	
	Yellow	☐	Special notes:						
	Red	☐							
	Cream	☐							
	White	☐							

	Fertile stamen no:		Hair blue	☐	Anther lobe yellow	☐	Pollen white	☐
	Bearded	☐	Violet	☐	White	☐	Yellow	☐
	Glabrous	☐	Yellow	☐	Violet	☐	Smooth	☐
	Filament length:		White	☐	Blue	☐	Spiny	☐
	Violet	☐	Purple	☐	Black	☐	Pollen ovate	☐
	Blue	☐	Basifixed	☐	Purple	☐	Elliptic	☐
	White	☐	Dorsifixed	☐	Yellow	☐	Triangular	☐
	Yellow	☐			Connective		Special notes:	
	Purple	☐			Purple	☐		
	Filament free	☐	Dehiscence		White	☐		
	Connate	☐	Porisidal	☐	Yellow	☐		
	Epipetalous	☐	Valvular	☐	Blue	☐		
	Antipetalous	☐			Violet	☐		
	Sterile stamen no:		Hair blue	☐	Bilobed	☐	Yellow	☐
	Bearded	☐	Violet	☐	Trilobed	☐	Violet	☐
	Glabrous	☐	White	☐	Crusiform	☐	Blue	☐
	Filament length:		Yellow	☐	Unilobed	☐	Purple	☐
	Epipetalous	☐	Filament violet	☐	Filament base connate	☐		
	Antipetalous	☐	Blue	☐	Free	☐		
			White	☐	special notes:			
	Gynoecium ovate	☐	Glabrous	☐	Style white	☐	Length:	
	Globose	☐	Apex ciliate	☐	Blue	☐	Bearded	☐
	Obovate	☐	Valves ciliate	☐	Violet	☐	Glabrous	☐
	No. of locules:		Base ciliate	☐	Stigma simple	☐	Stigma blue	☐
			Hairy	☐	Capitate	☐	Violet	☐
	Green	☐	Breadth:		Bilobed	☐	Purple	☐
	Pale green	☐	Length:		Trilobed	☐	White	☐
	White	☐	No. of ovule/locule:				Special notes:	
Capsule	Globose	☐	Glabrous	☐	Bilocular	☐	Bivalvate	☐
	Ovate	☐	Apex ciliate	☐	Trilocular	☐	Trivalvate	☐
	Elliptic	☐	Valves ciliate	☐	Unilocular	☐	Length:	
	Green	☐	Valves hairy	☐	Middle		Breadth:	
	Yellow	☐	Pubescent	☐	constricted	☐	Special notes:	
Seed	Biseriate	☐	White	☐	Alveolate	☐	Hilum linear	☐ Length :
	Uniseriate	☐	Brown	☐	Foveolate	☐	Punctiform	☐ Breadth:
	No. per locule:		Gray	☐	Smooth	☐	Rounded	☐
	Pyriform	☐	Pale brown	☐	Papillate	☐	Dotted	☐
	Ovate	☐	Yellow	☐	Tuberculate	☐	Dorsal	☐
	Rectangular	☐	Reddish brown	☐	Reticulate	☐	Ventral	☐
	Globose	☐	Dark brown	☐	Verrucose	☐	Embryotega	
	Elliptic	☐	Black	☐	Rugose	☐	Lateral	☐
	Triangular	☐			Pitted	☐	Semilateral	☐
	Special notes:				Striate	☐	Terminal	☐

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APPENDIX V

LIST OF FLORAS CONSULTED

The following floras were referred for the present work, but only those regional /state/district floras whose voucher materials studied/consulted are included in the citations.

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APPENDIX VI

DISTRIBUTION OF INDIAN SPECIES OF *COMMELINA*

Name	Distribution in India	World Distribution
C. albescens Hassk.	Rajasthan, Gujarat.	Eritrea to Malawi, Arabian Peninsula, Pakistan to Western India.
C. andamanica Sheba & Nampy	Andaman & Nicobar Islands.	India.
C. appendiculata C.B.Clarke	Arunachel Pradesh, Assam, Meghalaya, Orissa, Sikkim, West Bengal.	Eastern Himalaya to Northern Vietnam, Sri Lanka.
C. attenuata Vahl	Andaman & Nicobar islands, Andhra Pradesh, Bihar, Chattisgarh, Goa, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Orissa, Tamil Nadu, Uttar Pradesh.	India, Sri Lanka
C. benghalensis L.	Andaman & Nicobar islands, Andhra Pradesh, Arunachel Pradesh, Assam, Bihar, Chattisgarh, Daman, Goa, Gujarat, Hariyana, Himachal Pradesh, Jammu & Kashmir, Jharkhand, Karnataka, Kerala, Lakshadweep, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Orissa, Pondicherry, Punjab, Rajasthan, Sikkim, Tamil Nadu, Tripura, Uttarakhand, Uttar Pradesh, West Bengal.	Tropics & Subtropics.
C. caroliniana Walter	Andaman & Nicobar islands, Andhra Pradesh, Assam, Bihar, Chattisgarh, Daman, Delhi, Gujarat, Himachal Pradesh, Jharkhand, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Meghalaya, Orissa, Punjab, Rajasthan, Tamil Nadu, Uttarakhand, Uttar Pradesh, West Bengal.	Himalaya to India.
C. clavata C.B. Clarke	Andaman & Nicobar islands, Andhra Pradesh, Karnataka, Kerala, Maharashtra, Tamil Nadu.	South india, Sri Lanka, Indochina, West Malesia.

Name	Distribution in India	World Distribution
C. clavatoides Nampy & Sheba	Kerala.	South India.
C. coelestis Willd.	Himachal Pradesh, Sikkim, Tamil Nadu, Uttarakhand, West Bengal.	Mexico to Central America.
C. diffusa Burm.f	Andaman & Nicobar islands, Andhra Pradesh, Arunachel Pradesh, Assam, Bihar, Goa, Gujarat, Himachal Pradesh, Jammu & Kashmir, Jharkhand, Karnataka, Kerala, Lakshadweep, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Nagaland, Orissa, Punjab, Rajasthan, Sikkim, Tamil Nadu, Tripura, Uttarakhand, Uttar Pradesh, West Bengal.	Tropics & Subtropics.
C.ekabeeja Sheba & Nampy *nom.nov.*	Tamil Nadu.	India.
C. ensifolia R. Br.	Andhra Pradesh, Bihar, Karnataka, Kerala, Pondicherry, Tamil Nadu.	India, Sri Lanka, Australia.
C. forskalaei Vahl	Andhra Pradesh, Daman, Diu, Gujarat, Goa, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Punjab, Rajasthan.	Africa, Arabian Peninsula, South India, Indochina.
C. indehiscens E. Barnes	Karnataka, Kerala, Tamil Nadu.	South India, Sri Lanka.
C. kurzii C.B. Clarke	Andhra Pradesh, Arunachel Pradesh, Bihar, Daman, Goa, Gujarat, Himachal Pradesh, Jammu & Kashmir, Karnataka, Kerala, Lakshadweep, Madhya Pradesh, Maharashtra, Orissa, Punjab, Rajasthan, Tamil Nadu, Uttarakhand, Uttar Pradesh, West Bengal.	Tropics & Subtropics Asia to Northern Australia.
C.longifolia Lam.	Andaman & Nicobar islands, Andhra Pradesh, Assam, Bihar, Goa, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Orissa, Punjab, Sikkim, Tamil Nadu, Uttar Pradesh, West Bengal.	Seychelles, India to South China & Java.
C. maculata Edgew.	Andhra Pradesh, Arunachel Pradesh, Assam, Himachal Pradesh, Jammu &	Himalaya to Peninsular Malesia.

Name	Distribution in India	World Distribution
	Kashmir, Karnataka, Kerala, Maharashtra, Manipur, Meghalaya, Nagaland, Orissa, Punjab, Sikkim, Tamil Nadu, Uttarakhand, Uttar Pradesh, West Bengal.	
C. paleata Hassk.	Andhra Pradesh, Goa, Karnataka, Kerala, Maharashtra, Tamil Nadu.	Bangladesh, South India, West Malesia.
C. paludosa Blume	Andhra Pradesh, Arunachel Pradesh, Assam, Bihar,Himachal Pradesh, Karnataka, Kerala, Maharashtra, Manipur, Meghalaya, Mizoram,Nagaland,Orissa, Punjab, Rajasthan,Sikkim,Tamil Nadu, Tripura, Uttarakhand, Uttar Pradesh, West Bengal.	Tropics & Subtropics Asia
C.petersii Hassk.	Andhra Pradesh, Karnataka, Kerala, Orissa,Tamil Nadu.	Tropics & Southern Africa, India, Sri Lanka, Indochina.
C. sikkimensis C.B. Clarke	Arunachel Pradesh, Assam, Kerala, Manipur, Meghalaya, Nagaland, Sikkim, Uttarakhand, West Bengal.	India, Bangladesh, Myanmar, Peninsular Malesia, North and North east.
C. subulata Roth	Andhra Pradesh, Karnataka, Maharashtra.	Tropical & Southern Africa, Arabian Peninsula, South India.
C.suffruticosa Blume	Andhra Pradesh, Assam, Bihar, Jharkhand, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Meghalaya, Orissa, Sikkim, Tripura, Uttaranchal, Utter Pradesh, West Bengal.	Himalaya to West Malesia.
C. tricolor E. Barnes	Karnataka, Kerala, Tamil Nadu.	South India.
C. wightii R.S. Rao	Kerala, Tamil Nadu.	South India.

APPENDIX VII

CHROMOSOME NUMBERS OF INDIAN SPECIES OF *COMMELINA*

No.	Name	Chromosome numbers		References
		n	2n	
1	***C. albescens* Hassk.**	30	-	Lewis & Tadesse (1964)
2	***C. attenuata* Vahl**	24	48	Kammathy & Rao (1961a)
3	***C. benghalensis* L.**	11	22	Ganguly (1946)
		-	22	Sharma (1955) Kammathy & Rao (1961a) Shetty & Subramanyam (1962) Panigrahi & Kammathy (1964)
			28	Morton (1956a)
4	*C.hasskarlii* C.B. Clarke **= *C.caroliniana* Walter**	45	-	Raghavan & Rao (1961) Kammathy & Rao (1964, 1965)
5.	***C. coelestis* Willd.**	-	90	Anderson & Sax (1936)
6.	***C. diffusa* Burm. f**	-	56	Darlington (1929)
		-	30	Simmonds (1954)
		15	30	Sharma (1955) Kammathy & Rao (1961a)
		15	-	Raghavan & Rao (1961) Panigrahi & Kammathy (1964) Kammathy & Rao (1964)
		-	28	Morton (1956)
		35	42	Sharma (1955)
7.	***C. ensifolia* R. Br.**	45	-	Kammathy & Rao (1961a, 1964, 1965)
8.	***C. forskalaei* Vahl**	-	28	Morton (1956)
		14	-	Malik (1961)
		15	-	Raghavan & Rao (1961) Kammathy & Rao (1961a)
		15	30	Shetty & Subramanyam (1962)

No.	Name	Chromosome numbers		References
		n	2n	
9	***C. indehiscens* E. Barnes**	75	-	Kammathy & Rao (1964, 1965)
10	*C. undulata* R.Br. **= *C.kurzii* C.B. Clarke**	60	-	Malik (1961) Raghavan & Rao (1961)
		45	60	Kammathy & Rao (1961a)
11	***C. longifolia* Lam.**	-	75	Sharma (1955)
		45	-	Kammathy & Rao (1964)
12	***C. maculata* Edgew.**	30	-	Kammathy & Rao (1964, 1965)
		15	30	Panigrahi & Kammathy (1964)
13	***C. paleata* Hassk.**	45	-	Kammathy & Rao (1961a, 1964)
14	***C. paludosa* Blume**	-	100, 150	Sharma (1955)
		-	45	Sharma & Sharma (1958)
		30	60	Sharma & Sharma (1958)
		30	-	Kammathy & Rao (1961a, 1964) Panigrahi & Kammathy (1964)
15	*C. jacobii* C.E.C. Fisch. **= *C. petersii* Hassk.**	15	30	Kammathy & Rao (1961a)
		15	-	Shetty & Subramanyam (1962)
16	***C. sikkimensis* C.B. Clarke**	30	60	Sharma & Sharma (1958)
		45	-	Panigrahi & Kammathy (1962) Kammathy & Rao(1964)
17	***C. subulata* Edgew.**	30	-	Raghavan & Rao (1961) Kammathy & Rao (1961a)
18	***C. suffruticosa* Blume**	30	-	Kammathy & Rao (1961a, 1964) Panigrahi & Kammathy (1964)

APPENDIX VIII

DATA MATRIX USED FOR MORPHOMETRIC ANALYSIS

Species / Characters	*C. albescens*	*C. andamanica*	*C. appendiculata*	*C. attenuata*	*C. benghalensis*	*C. carolliniana*	*C. clavata*	*C. clavatoides*	*C. coelestis*	*C. diffusa*	*C. ekabeeja*	*C. ensifolia*	*C. forskalaei*	*C. indehiscens*	*C. kurzii*	*C. longifolia*	*C. maculata*	*C. paleata*	*C. paludosa*	*C. petersii*	*C. sikkimensis*	*C. subulata*	*C. suffruticosa*	*C. tricolor*	*C. wightii*
Plants erect (0) Plants not erect (1)	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**0**	**1**	**0**	**1**	**1**	**1**	**1**	**1**	**1**	**0**	**0**	**1**	**1**	**0**	**0**	**1**	**1**
Plants with a definite base (0) Plants lacking a definite base (1)	**0**	**1**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**1**	**0**	**1**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**1**
Plants rooting at nodes(0) Plants not rooting at nodes (1)	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**1**	**0**	**1**	**1**	**0**	**0**	**1**	**0**	**0**	**1**	**0**	**1**	**0**	**1**	**1**	**1**	**0**
Roots thick/tuberous (0) Roots not thick/tuberous (1)	**0**	**1**	**0**	**1**	**1**	**1**	**0**	**0**	**0**	**1**	**0**	**0**	**1**	**1**	**0**	**1**	**0**	**0**	**0**	**0**	**1**	**1**	**0**	**0**	**1**
Plants annual (0) Plants perennial (1)	**1**	**1**	**1**	**0**	**0**	**1**	**1**	**1**	**1**	**0**	**1**	**1**	**0**	**1**	**1**	**0**	**1**	**1**	**1**	**1**	**1**	**0**	**1**	**1**	**0**
Cleistogamous flowers present (0) Cleistogamous flowers absent (1)	**1**	**1**	**1**	**1**	**0**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**0**	**0**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
Internodes < 7 cm long (0) Internodes > 8 cm long (1)	**0**	**0**	**0**	**1**	**1**	**0**	**1**	**1**	**1**	**0**	**0**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**0**	**0**	**1**	**0**	**0**
Sheath summit with red hairs (0) Sheath summit without red hairs (1)	**1**	**1**	**1**	**1**	**0**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**0**	**1**	**1**	**1**	**1**	**1**	**1**
Sheath summit with white hairs (0) Sheath summit without white hairs (1)	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**
Leaf base oblique (0) Leaf base not oblique (1)	**1**	**0**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**0**	**1**	**0**	**1**	**0**	**1**	**0**	**1**	**0**	**1**	**1**
Lamina usually ovate-lanceolate (0) Lamina usually linear (1)	**1**	**0**	**1**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**1**	**0**	**0**	**0**
Lamina variously pubescent (0) Lamina glabrous (1)	**0**	**0**	**1**	**0**	**0**	**1**	**0**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**1**

Characters \ Species	*C. albescens*	*C. andamanica*	*C. appendiculata*	*C. attenuata*	*C. benghalensis*	*C. caroliniana*	*C. clavata*	*C. clavatoides*	*C. coelestis*	*C. diffusa*	*C. ekabeeja*	*C. ensifolia*	*C. forskalaei*	*C. indehiscens*	*C. kurzii*	*C. longifolia*	*C. maculata*	*C. paleata*	*C. paludosa*	*C. petersii*	*C. sikkimensis*	*C. subulata*	*C. suffruticosa*	*C. tricolor*	*C. wightii*
Spathe axillary/leaf opposed (0) Spathe terminal (1)	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**1**	**0**	**0**	**1**	**0**	**1**	**1**	**0**	**1**	**1**	**1**	**0**	**0**	**0**	**1**	**0**	**0**
Spathe usually solitary (0) Spathe usually clustered (1)	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**1**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**0**
Spathe pedunculate > 2 cm (0) Spathe sessile/subsessile < 1cm (1)	**1**	**1**	**0**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**1**	**1**	**0**	**1**	**0**	**1**	**0**	**1**	**0**	**0**	**1**	**1**	**0**	**0**
Spathe conduplicate (0) Spathe cucullate (1)	**1**	**1**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**1**	**1**	**1**	**0**	**1**	**1**	**1**	**1**	**0**	**0**	**0**	**0**	**0**
Spathe green veined (0) Spathe with out green veins (1)	**0**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**0**	**1**	**1**	**0**	**1**	**1**	**0**	**1**	**1**	**0**	**1**	**1**	**1**	**1**	**0**	**1**	**1**
Spathe base hastate (0) Spathe base not hastate (1)	**1**	**1**	**1**	**0**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
Spathe distally falcate (0) Spathe distally not falcate (1)	**0**	**1**	**0**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**0**	**1**	**1**	**1**
Spathe variously pubescent (0) Spathe glabrous (1)	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**1**
Spathe margin ciliate (0) Spathe margin not ciliate (1)	**0**	**0**	**0**	**0**	**1**	**0**	**1**	**1**	**0**	**1**	**0**	**1**	**1**	**1**	**1**	**1**	**0**	**0**	**1**	**1**	**0**	**0**	**1**	**0**	**0**
Upper cincinnus present (0) Upper cincinnus absent / vestigial (1)	**0**	**1**	**0**	**0**	**0**	**1**	**0**	**0**	**1**	**0**	**1**	**1**	**0**	**0**	**1**	**0**	**1**	**0**	**0**	**1**	**0**	**1**	**1**	**0**	**0**
Upper cincinnus 2-6 flowered (0) Upper cincinnus ≤ 2 flowered (1)	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**0**	**1**	**1**	**1**	**1**
Lower cincinnus 2-6 flowered (0) Lower cincinnus ≤ 2 flowered (1)	**0**	**1**	**1**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**
Flowers blue (0) Flowers other than blue (1)	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**1**	**0**	**1**
Flowers white (0) Flowers other than white (1)	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**0**	**1**	**1**

Characters \ Species	*C. albescens*	*C. andamanica*	*C. appendiculata*	*C. attenuata*	*C. benghalensis*	*C. caroliniana*	*C. clavata*	*C. clavatoides*	*C. coelestis*	*C. diffusa*	*C. ekabeeja*	*C. ensifolia*	*C. forskalaei*	*C. indehiscens*	*C. kurzii*	*C. longifolia*	*C. maculata*	*C. paleata*	*C. paludosa*	*C. petersii*	*C. sikkimensis*	*C. subulata*	*C. suffruticosa*	*C. tricolor*	*C. wightii*
Flowers chrome yellow/orange (0) Flowers other than chrome yellow/orange (1)	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**0**	**1**	**1**	**1**
Flowers Yellow (0) Flowers other than yellow (1)	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**0**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**0**
Odd petal large, showy (0) Odd petal much reduced/ lanceolate (1)	**1**	**1**	**0**	**0**	**1**	**0**	**0**	**0**	**1**	**0**	**1**	**1**	**1**	**0**	**1**	**0**	**1**	**1**	**1**	**1**	**0**	**0**	**1**	**0**	**0**
Staminal filaments terete (0) Staminal filaments flattened (1)	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**0**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
Antherodes 4-lobed (0) Antherodes not 4-lobed (1)	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**1**	**0**	**0**
Pistil pilose/hirsute/puberulous (0) Pistil glabrous (1)	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**0**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
Stigma trilobed (0) Stigma capitate (1)	**1**	**0**	**1**	**0**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**0**	**1**	**1**	**1**	**0**	**1**	**1**	**1**	**1**	**1**	**1**	**0**	**1**	**1**
Capsule strictly 1 per spathe (0) Capsule more than 1 per spathe (1)	**1**	**0**	**1**	**1**	**0**	**1**	**1**	**1**	**1**	**1**	**0**	**1**	**0**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**0**
Capsules 1-3 per spathe (0) Capsule 5 / 6 per spathe (1)	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**
Capsules apiculate (0) Capsules not apiculate (1)	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**0**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
Capsule 1-seeded (0) Capsule 2-5 seeded (1)	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**0**	**1**	**0**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**0**
Dorsal locules aborted (0) Dorsal locules fertile (1)	**0**	**0**	**1**	**0**	**1**	**1**	**0**	**0**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**0**	**0**	**0**
Dorsal locules deshiscent (0) Dorsal locules indehiscent (1)	**0**	**1**	**1**	**1**	**0**	**0**	**1**	**1**	**0**	**1**	**1**	**0**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**1**	**1**	**0**	**1**	**1**	**1**

Species / Characters	*C. albescens*	*C. andamanica*	*C. appendiculata*	*C. attenuata*	*C. benghalensis*	*C. caroliniana*	*C. clavata*	*C. clavatoides*	*C. coelestis*	*C. diffusa*	*C. ekabeeja*	*C. ensifolia*	*C. forskalaei*	*C. indehiscens*	*C. kurzii*	*C. longifolia*	*C. maculata*	*C. paleata*	*C. paludosa*	*C. petersii*	*C. sikkimensis*	*C. subulata*	*C. suffruticosa*	*C. tricolor*	*C. wightii*
Ventral locules aborted (0) Ventral locules Fertile (1)	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**0**	**1**	**1**	**0**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
Ventral locules 2-seeded (0) Ventral Locules 1-seeded (1)	**0**	**1**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**1**	**0**	**1**	**1**	**0**	**1**	**1**	**1**	**0**	**0**	**0**	**1**	**0**	**1**
Seeds longer than broad (0) Seeds globose or spherical (1)	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**1**
Seeds smooth (0) Seeds not smooth (1)	**0**	**0**	**0**	**0**	**1**	**0**	**1**	**1**	**1**	**1**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**1**	**1**	**1**	**1**	**1**	**0**
Seeds ridged (0) Seeds not ridged (1)	**1**	**1**	**1**	**1**	**0**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**0**	**1**	**1**	**1**	**1**	**1**
Seeds reticulate (0) Seeds not reticulate (1)	**1**	**1**	**1**	**1**	**0**	**1**	**0**	**0**	**1**	**0**	**1**	**1**	**1**	**0**	**1**	**1**	**1**	**1**	**1**	**1**	**0**	**1**	**0**	**1**	**1**
Seeds doubly reticulate (0) Seeds not doubly reticulate (1)	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**0**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
Seeds with a torus on the testa (0) Seeds without a torus on the testa (1)	**1**	**0**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**0**	**1**	**1**	**0**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
Seeds with farinose granules (0) Seeds without farinose granules (1)	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**1**	**1**	**1**	**0**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**1**	**1**	**0**	**0**	**0**	**1**
Seeds with tubercles on ridge (0) Seeds without tubercles (1)	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**0**	**1**	**1**	**1**	**1**	**1**
Seeds appendaged (0) Seeds not appendaged (1)	**1**	**1**	**0**	**0**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**0**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**0**
Seeds pitted (0) Seeds not pitted (1)	**1**	**1**	**1**	**1**	**0**	**1**	**1**	**0**	**0**	**1**	**1**	**1**	**1**	**0**	**1**	**1**	**1**	**1**	**1**	**1**	**0**	**0**	**1**	**1**	**1**
Testa reddish brown (0) Testa dark brown/black (1)	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**0**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**

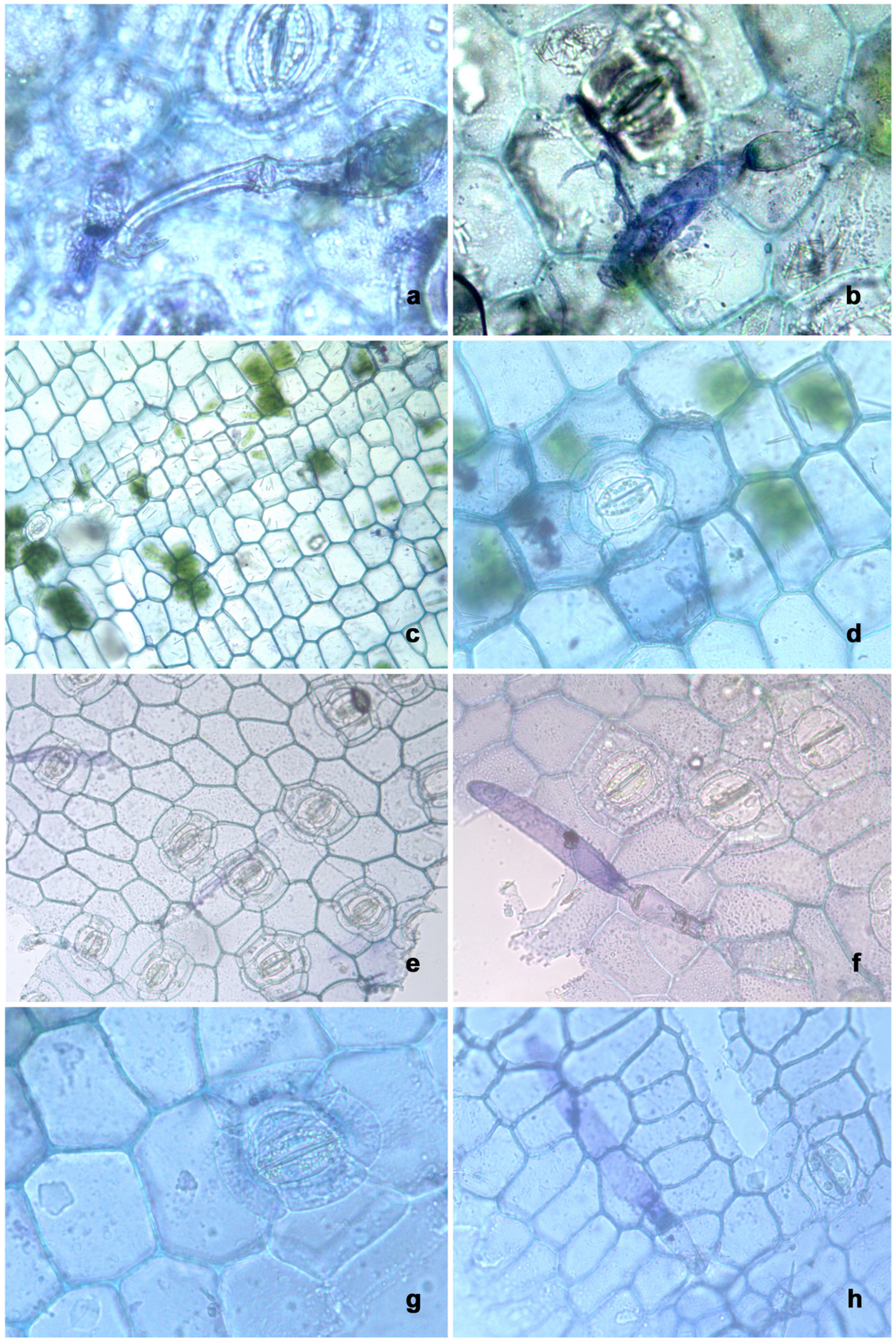


Plate 11. Foliar epidermis of *Commelina* species. (**a-d**) *C. paleata* Hassk.: **a-b.** Abaxial epidermis; **c-d**. Adaxial epidermis. (**e-h**) *C. paludosa* Blume: **e-f.** Abaxial epidermis; **g-h.** Adaxial epidermis.

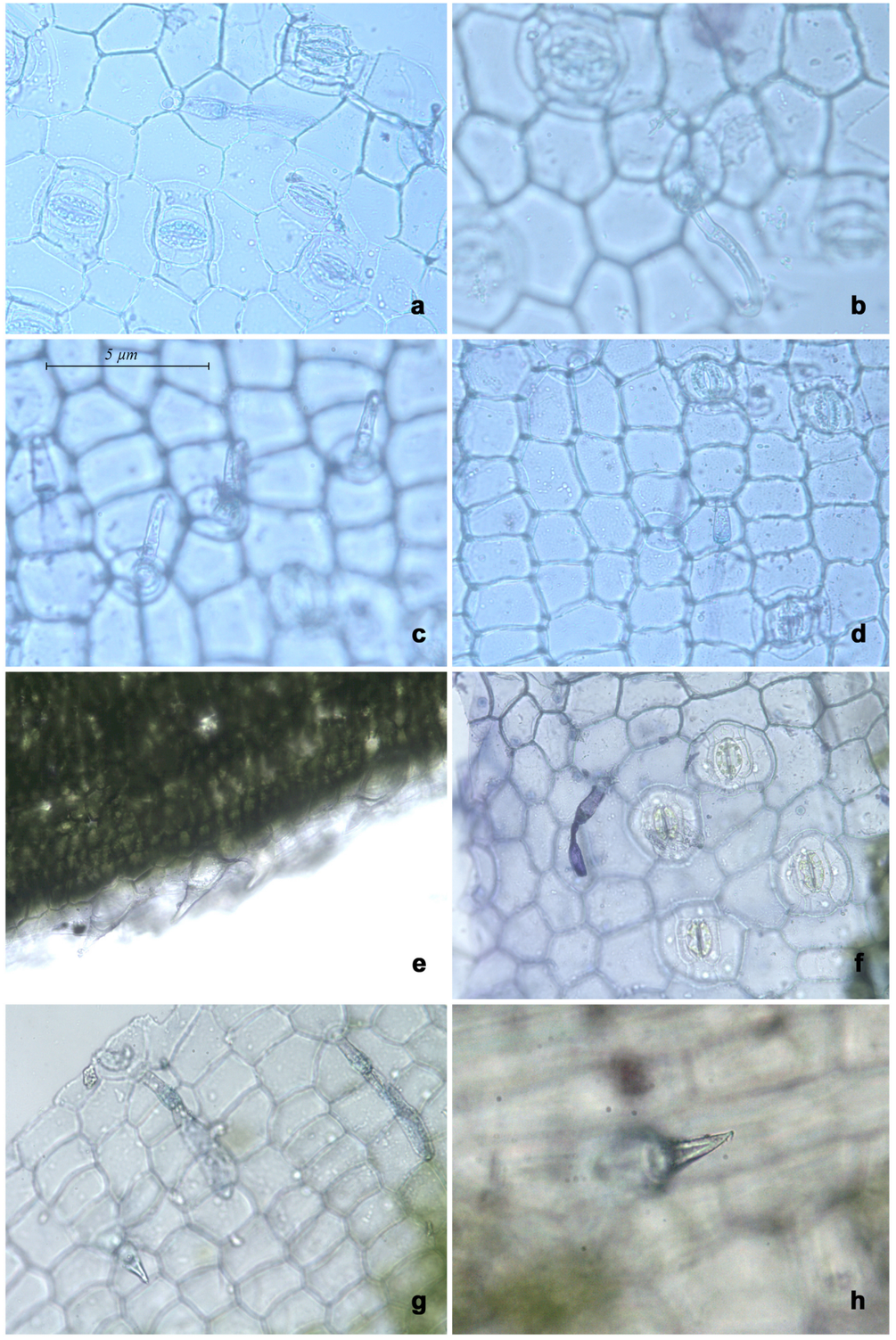


Plate 12. Foliar epidermis of *Commelina* species. (**a-d**) *C. petersii* Hassk.: **a-b.** Abaxial epidermis; **c-d**. Adaxial epidermis. (**e-h**) *C. sikkimensis* C.B. Clarke: **e-f.** Abaxial epidermis; **g-h.** Adaxial epidermis.

Plate 1. Area of study



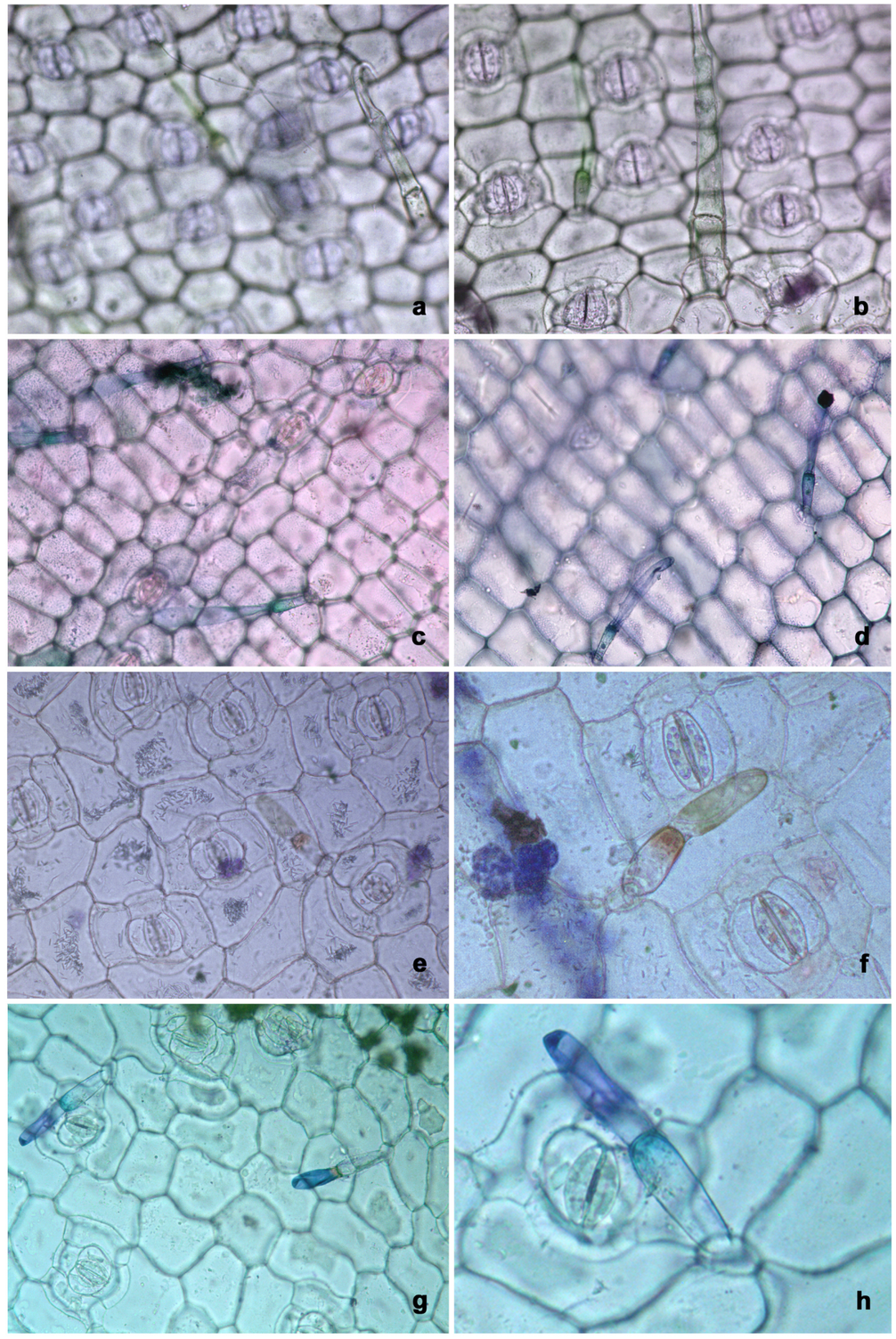


Plate 2. Foliar epidermis of *Commelina* species. (**a-d**) *C. andamanica* Sheba & Nampy: **a-b.** Abaxial epidermis; **c-d.** Adaxial epidermis. (**e-h**) *C. attenuata* Vahl: **e-f.** Abaxial epidermis**; g-h.** Adaxial epidermis.

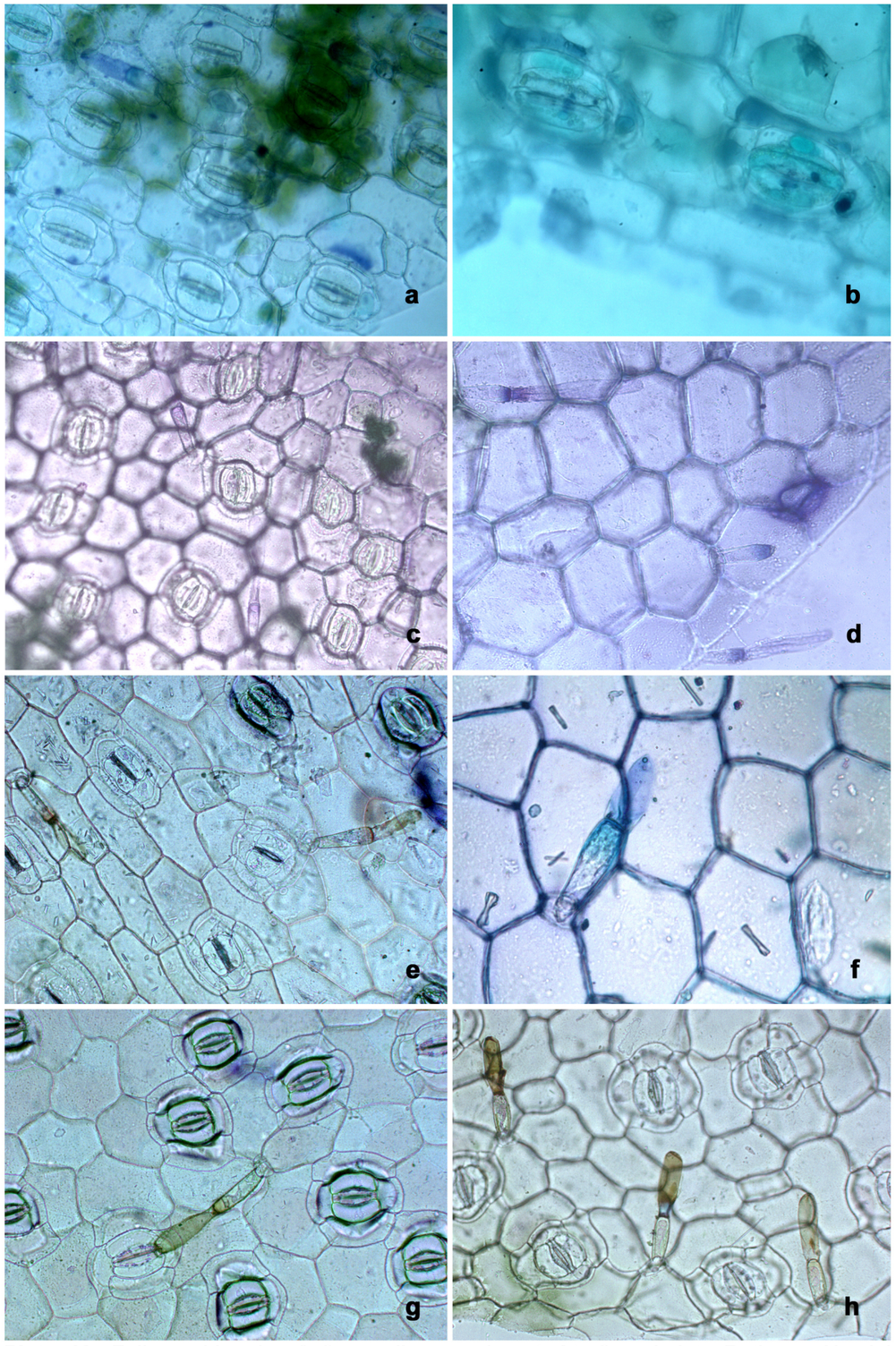
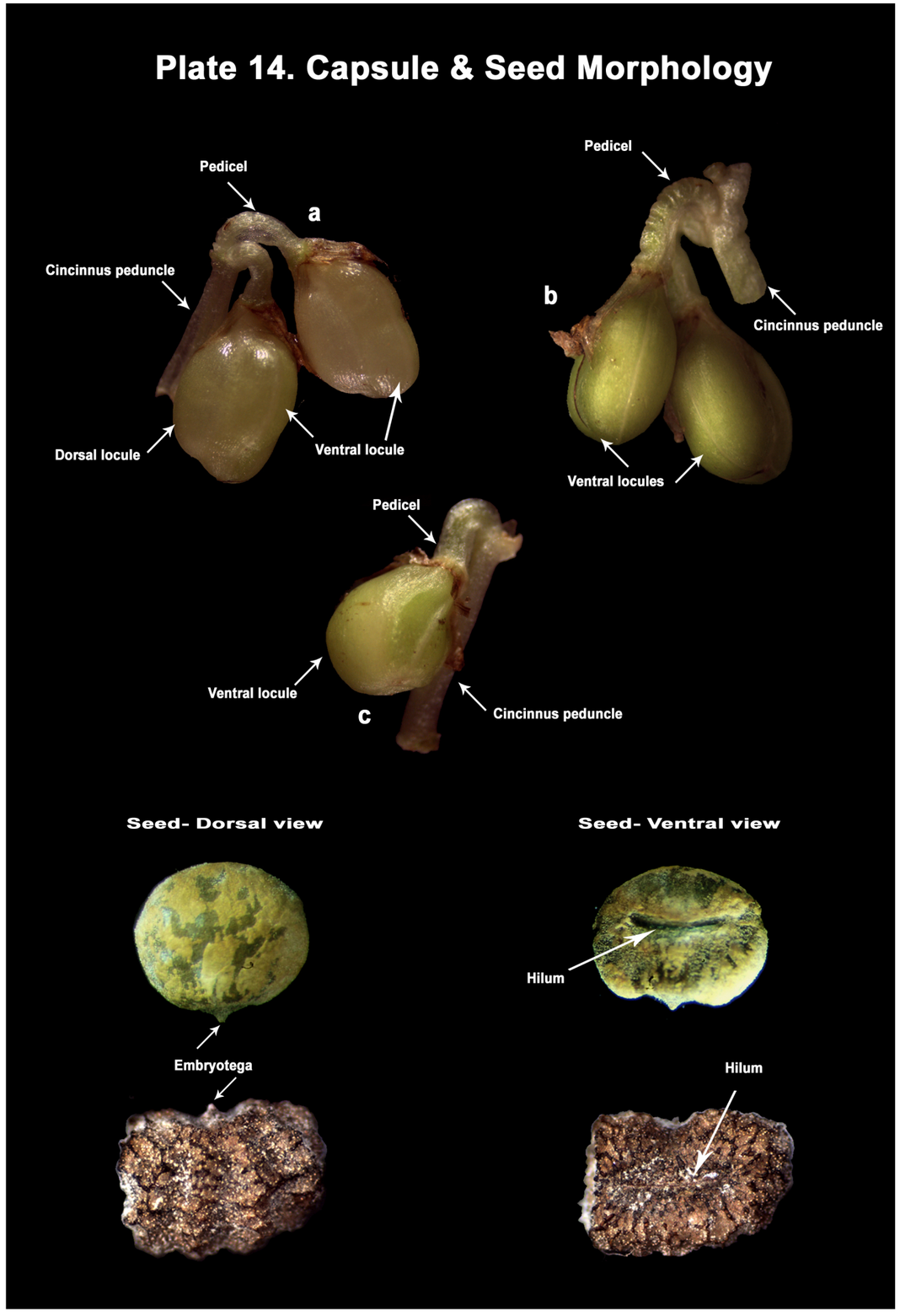


Plate 13. Foliar epidermis of *Commelina* species. (**a-b**) *C. subulata* Roth: **a.** Abaxial epidermis; **b**. Adaxial epidermis. (**c-d**) *C. suffruticosa* Blume: **c.** Abaxial epidermis; **d.** Adaxial epidermis. (**e-f**) *C. tricolor* E. Barnes: **e.** Abaxial epidermis; **f.** Adaxial epidermis. (**g-h**) *C. wightii* R.S. Rao: **g.** Abaxial epidermis; **h.** Adaxial epidermis.



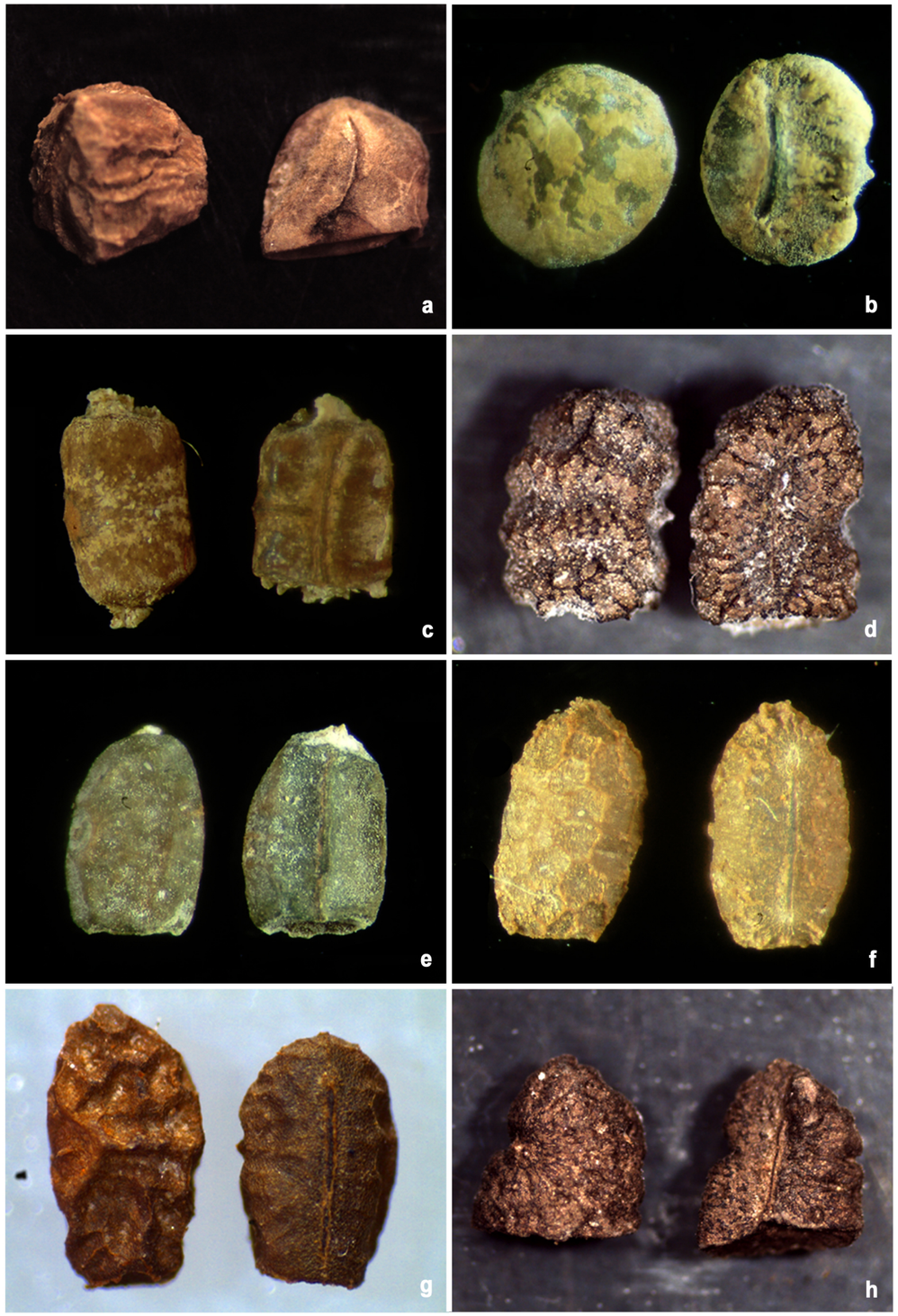


Plate 15. Seeds of *Commelina* species. **a.** *Commelina albescens* Hassk. (from *B.V. Shetty 1784*); **b.** *Commelina andamanica* Sheba & Nampy (from *Santhosh Nampy & Manudev 3131*); **c.** *C. attenuata* Vahl (from *Aneesha T.H. 5150*); **d.** *C. benghalensis* L. (from *Santhosh Nampy 141*); **e**. *C. caroliniana* Walter (from *Joby & Santhosh Nampy 5103*); **f.** *C. clavata* C.B. Clarke (from *Joby & Santhosh Nampy 874*); **g.** *C. clavatoides* Nampy& Sheba (from *Sheba & Santhosh Nampy 4016*); **h.** *C. coelestis* Willd. (from *s. coll. 2239*).



Plate 16. Seeds of *Commelina* species. **a.** *C. diffusa* Burm.f. (from *Joby & Santhosh Nampy*); **b.** *C. ensifolia* R. Br. (from *Sheba & Santhosh Nampy 4006*); **c & d.** *C. forskalaei* Vahl (from *Santhosh Nampy 138*); **e.** *C. indehiscens* E. Barnes (from *Sheba & Santhosh Nampy 4015*); **f.** *C. kurzii* C.B. Clarke (from *Joby & Santhosh Nampy 969*); **g**. *C. longifolia* Lam. (from *Sheba & Santhosh Nampy 3264*); **h.** *C. maculata* Edgew. (from *Sheba & Santhosh Nampy 2267*).

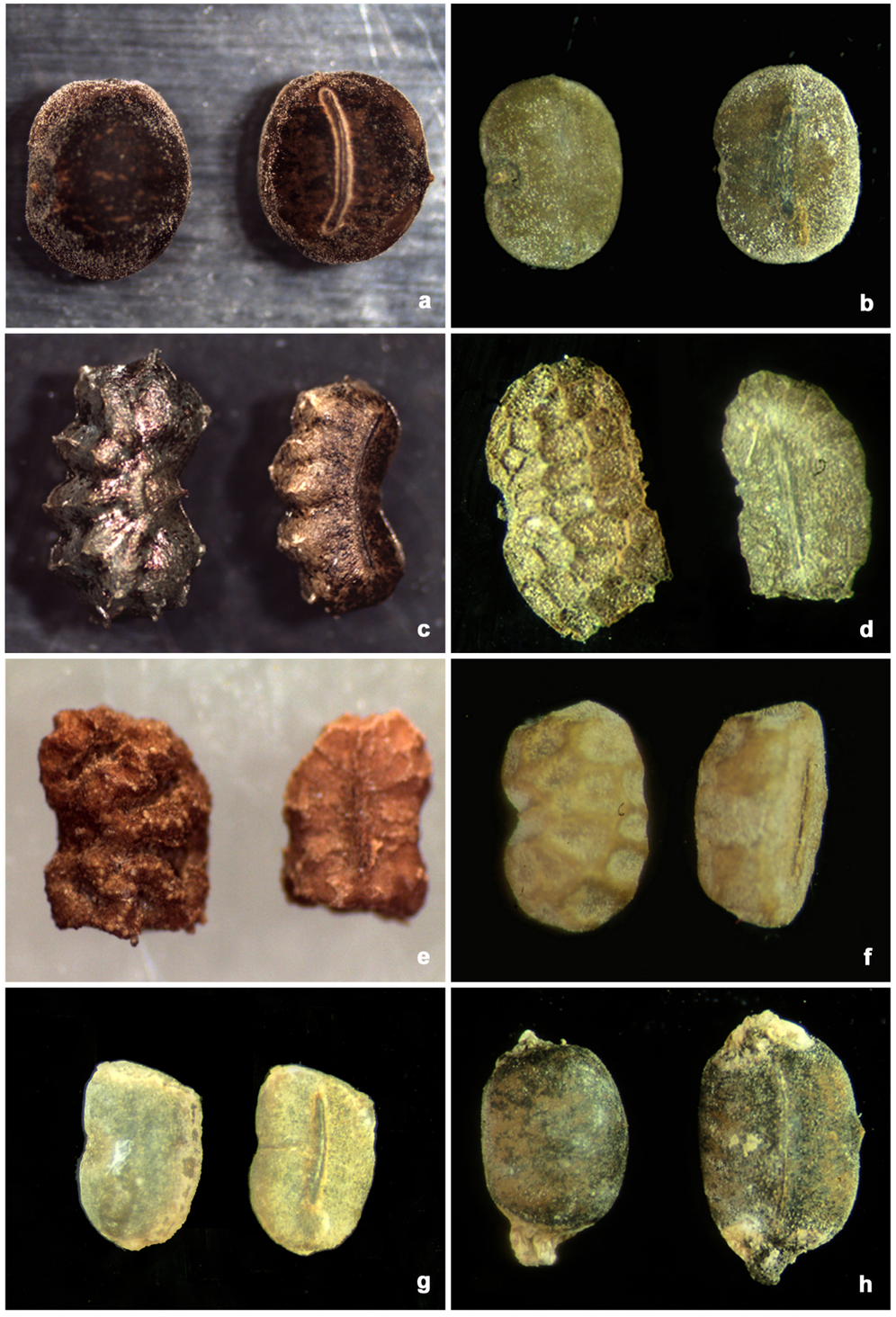


Plate 17. Seeds of *Commelina* species. **a.** *C. paleata* Hassk. (from *K.V. Billore 116770*); **b.** *C. paludosa* Blume (from *Santhosh Nampy 566*); **c.** *C. petersii* Hassk. (from *Sheba & Santhosh Nampy 3973*); **d.** *C. sikkimensis* C.B. Clarke (from *Sheba & Santhosh Nampy 2271*); **e.** *C. subulata* Roth (from *Joby & Ratheesh 1152*); **f.** *C. suffruticosa* Blume (from *Dineshraj & Santhosh Nampy 824*); **g**. *C. tricolor* E. Barnes (from *Joby & Santhosh Nampy 891*); **h.** *C. wightii* R.S. Rao (from *Sheba & Santhosh Nampy 3292*).

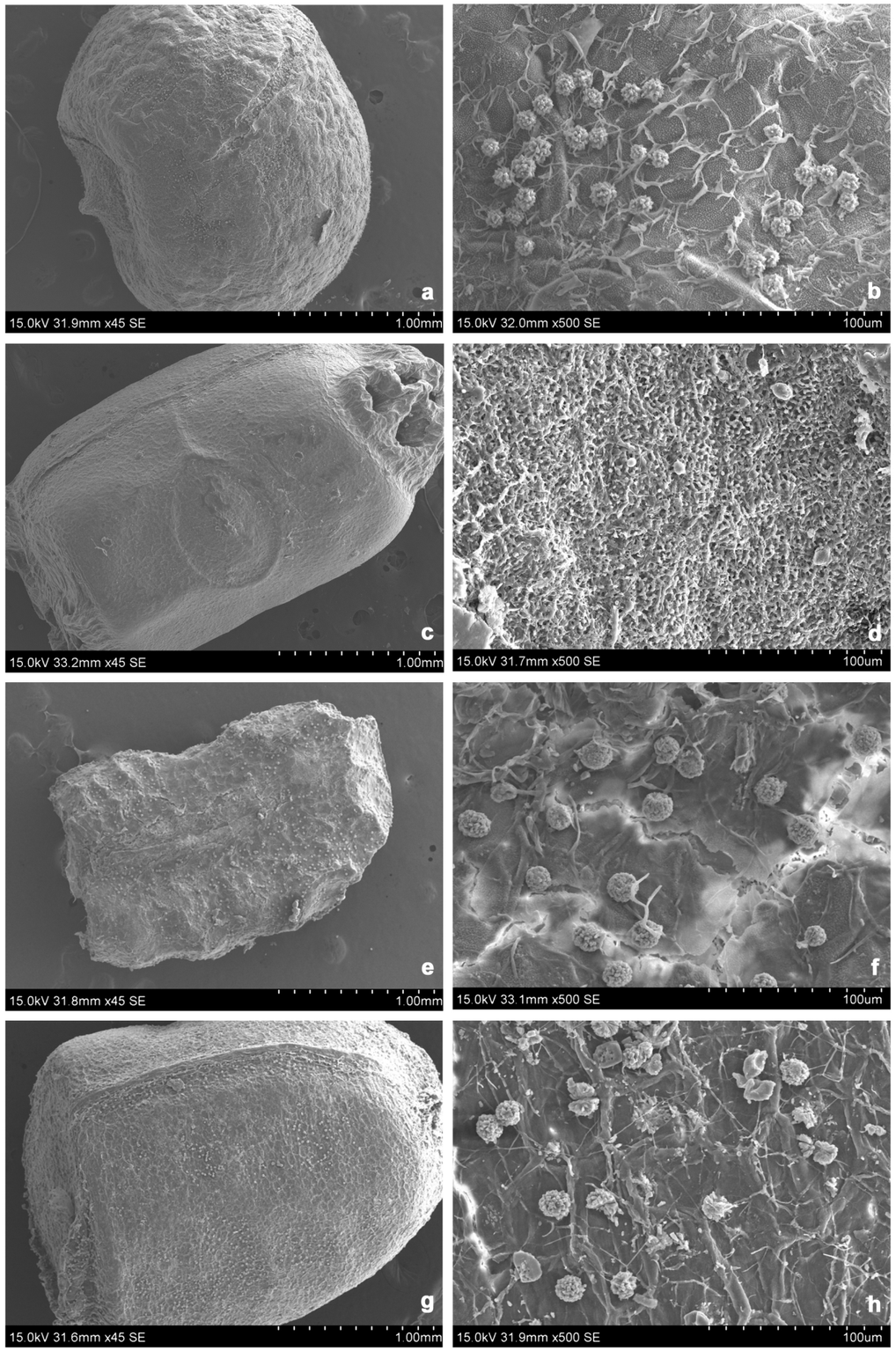
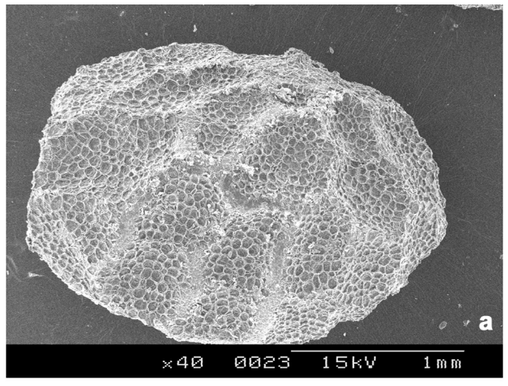
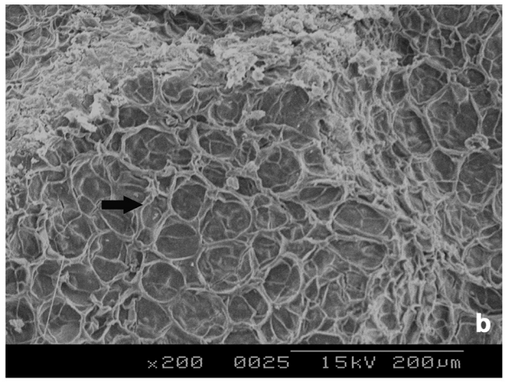
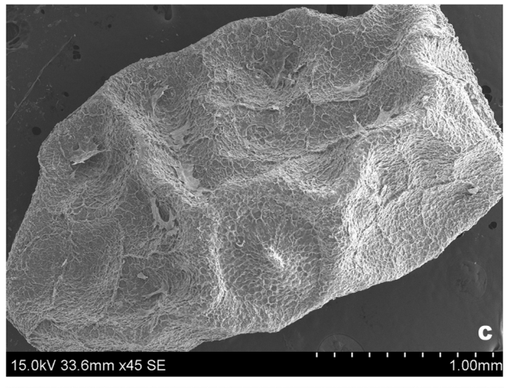
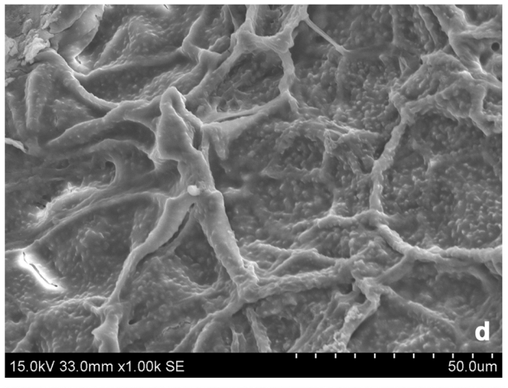


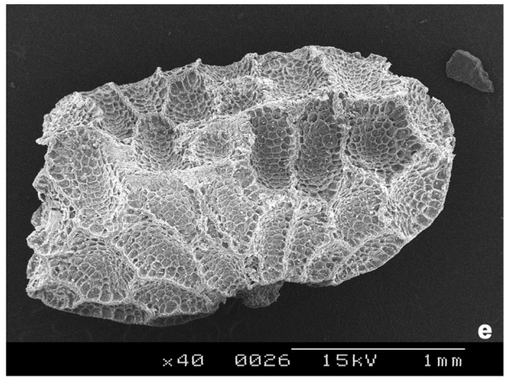
Plate 18. Scanning electron micrographs of *Commelina* species. **a & b.** *C. andamanica* Sheba & Nampy; **c & d.** *C. attenuata* Vahl; **e & f.** *C. benghalensis* L., **g & h.** *C. caroliniana* Walter.

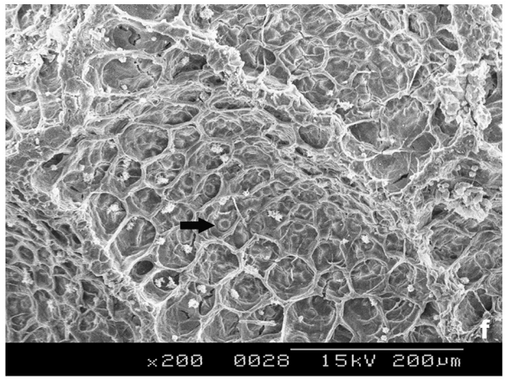


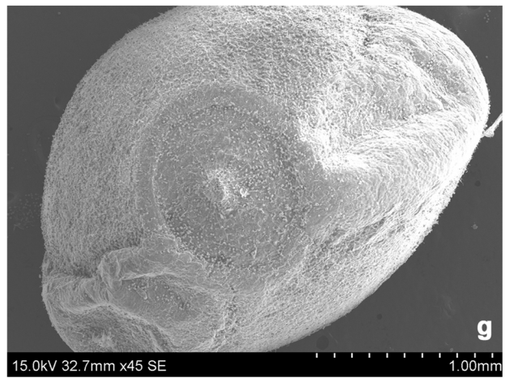












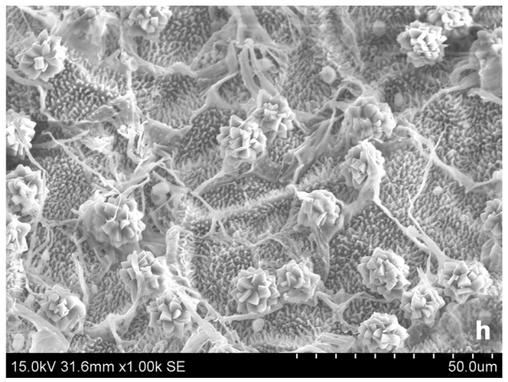
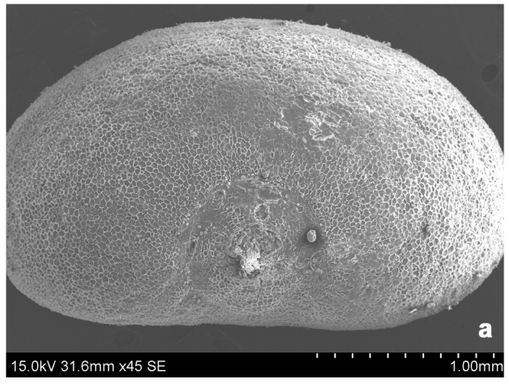
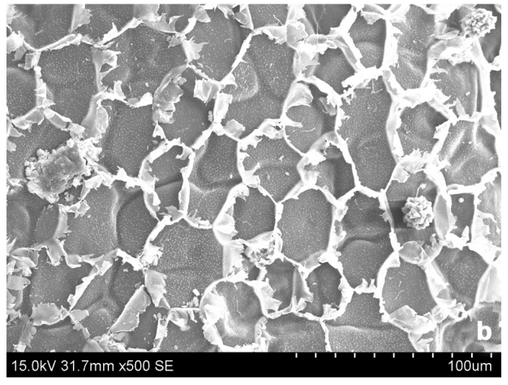
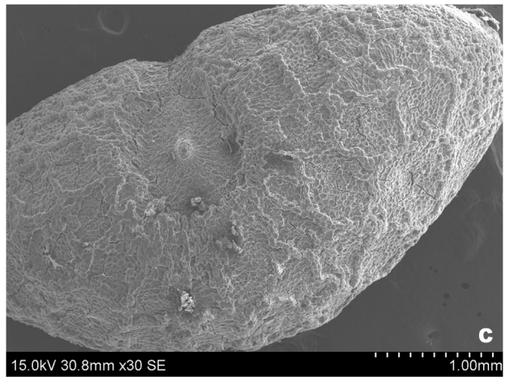
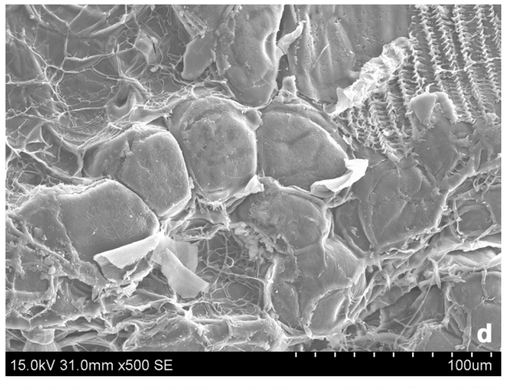


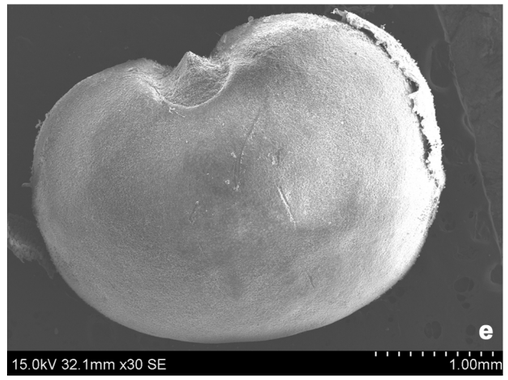
Plate 19. Scanning electron micrographs of *Commelina* species. **a & b.** *C. clavata* C.B. Clarke; **c & d.** *C. clavatoides* Nampy & Sheba; **e & f.** *C. diffusa* Burm.f.; **g & h.** *C. ensifolia* R. Br.

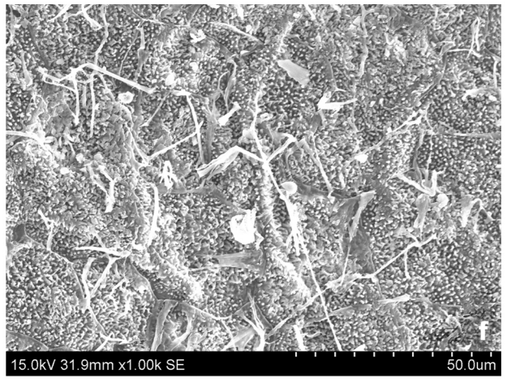


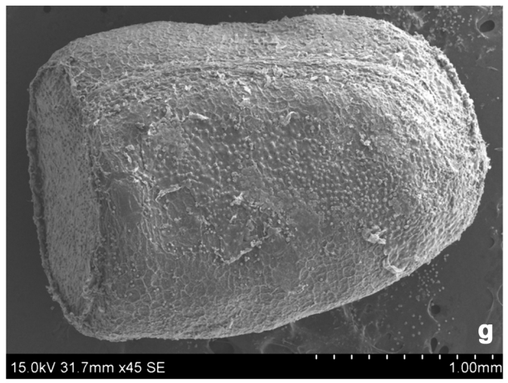












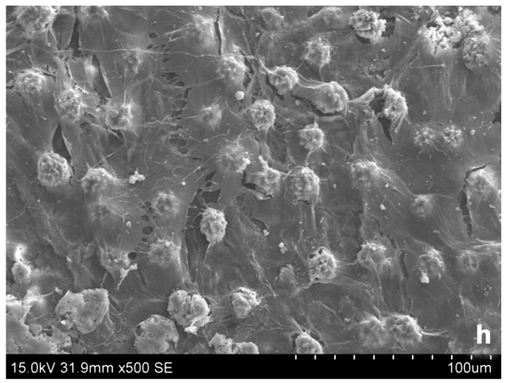
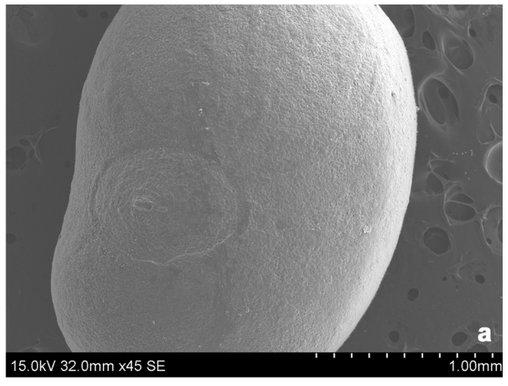
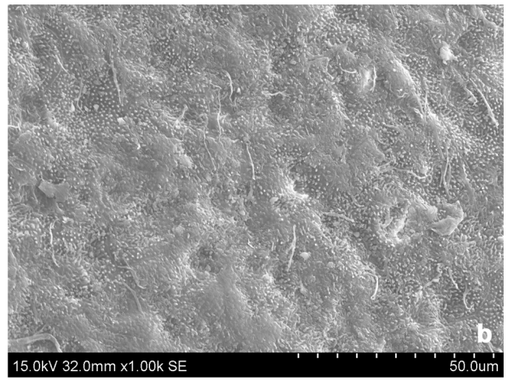
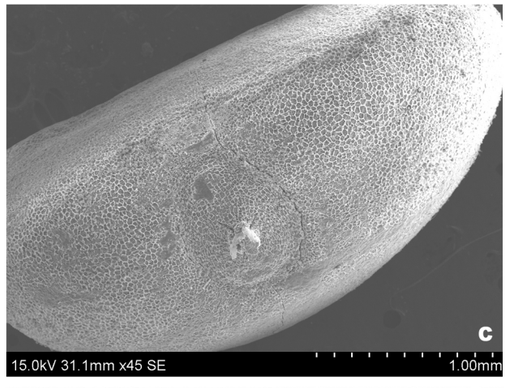
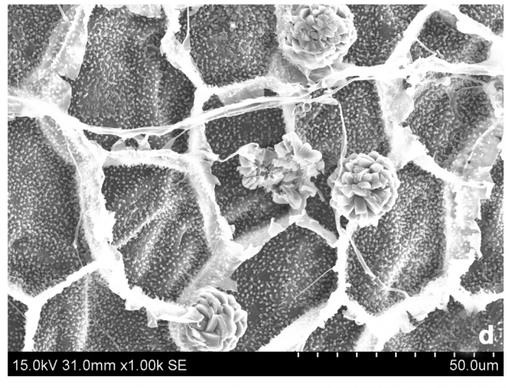


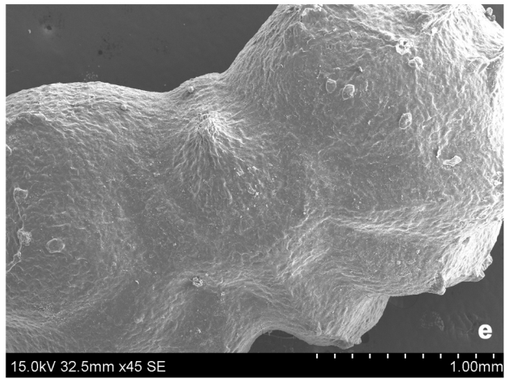
Plate 20. Scanning electron micrographs of *Commelina* species. **a & b.** *C. forskalaei* Vahl; **c & d.** *C. indehiscens* E. Barnes; **e & f.** *C. kurzii* C.B. Clarke; **g & h.** *C. longifolia* Lam.

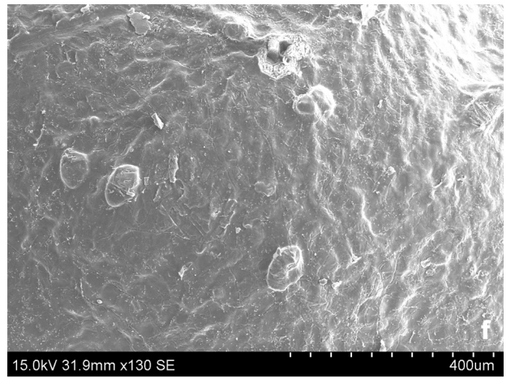


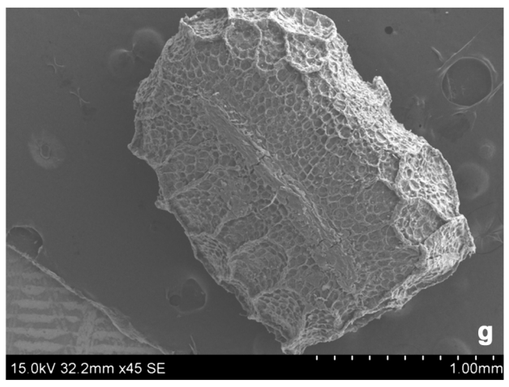












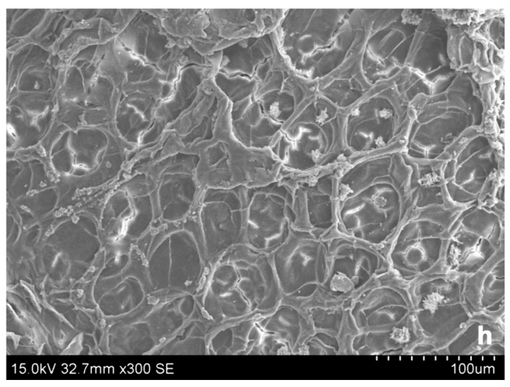
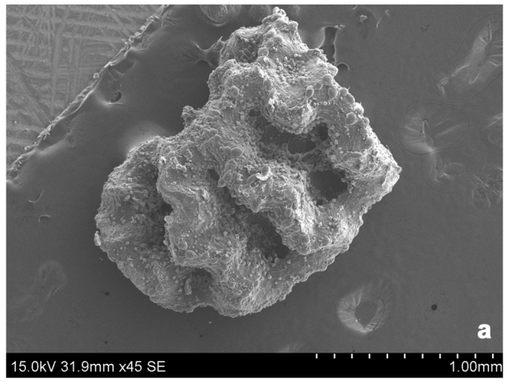
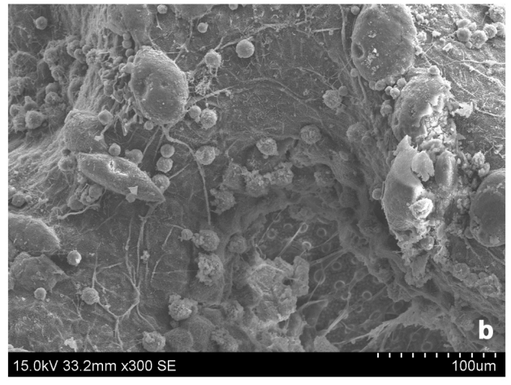
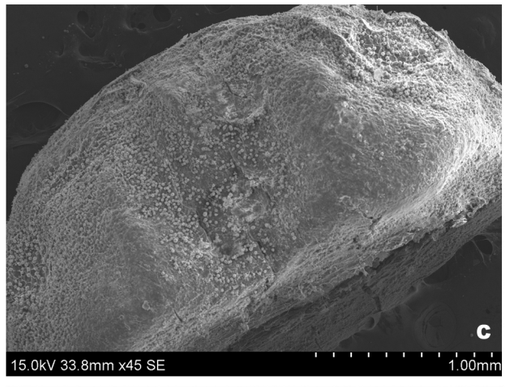
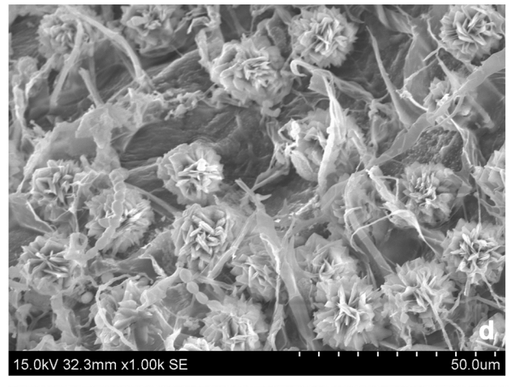


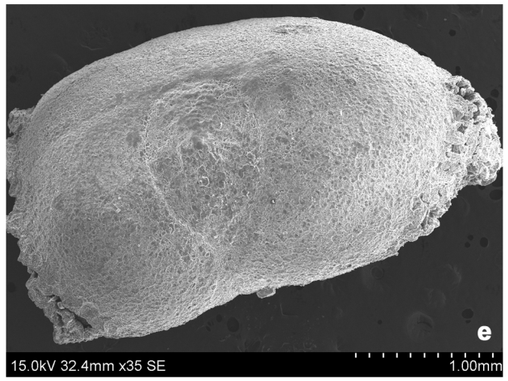
Plate 21. Scanning electron micrographs of *Commelina* species. **a & b.** *C. maculata* Edgew.; **c & d.** *C. paludosa* Blume; **e & f.** *C. petersii* Hassk.; **g & h.** *C. sikkimensis* C.B. Clarke.

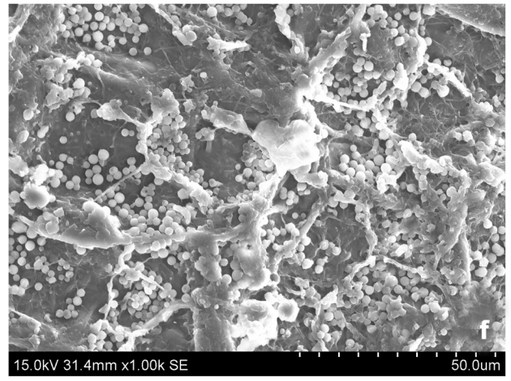


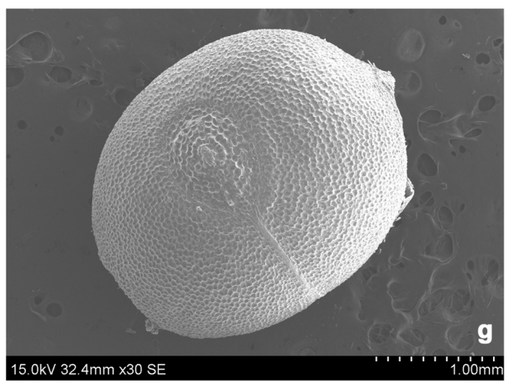












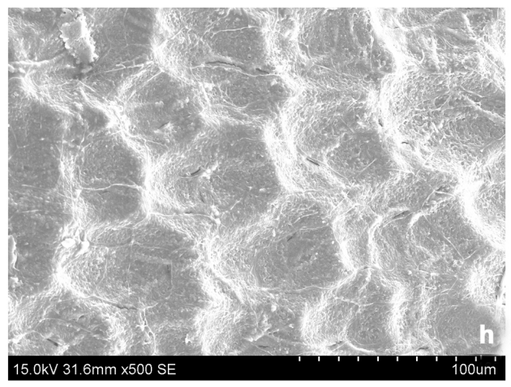
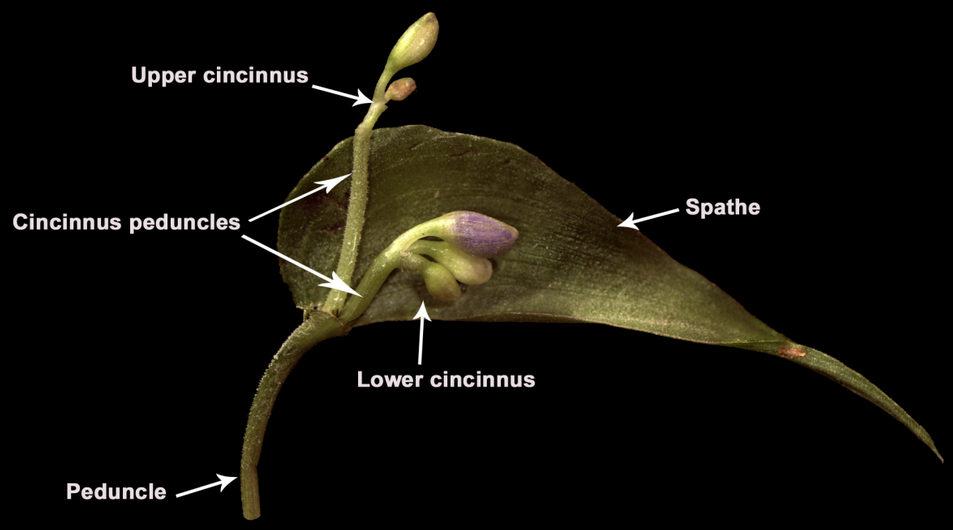


Plate 22. Scanning electron micrographs of *Commelina* species. a & b. *C. subulata* Roth; **c & d.** *C. suffruticosa* Blume; **e & f.** *Commelina tricolor* E. Barnes; **g & h.** *C. wightii* R.S. Rao

Plate 23. Structure of Inflorescence



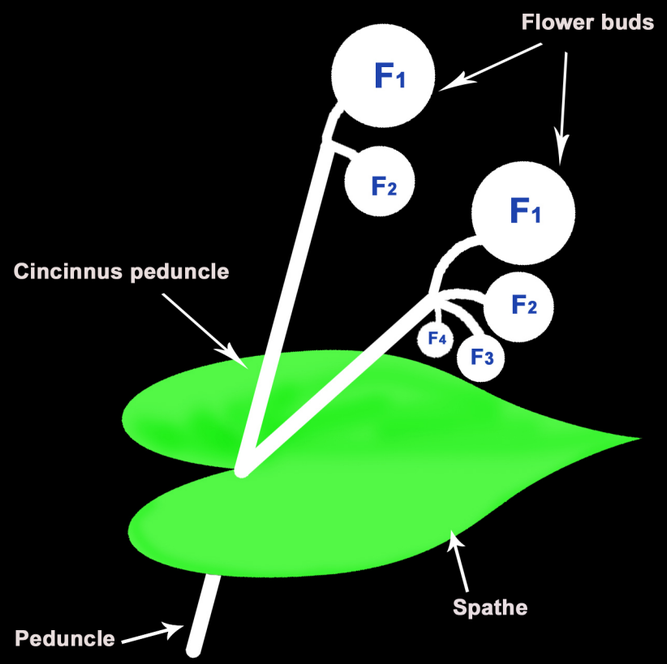


Plate 24. Floral Morphology

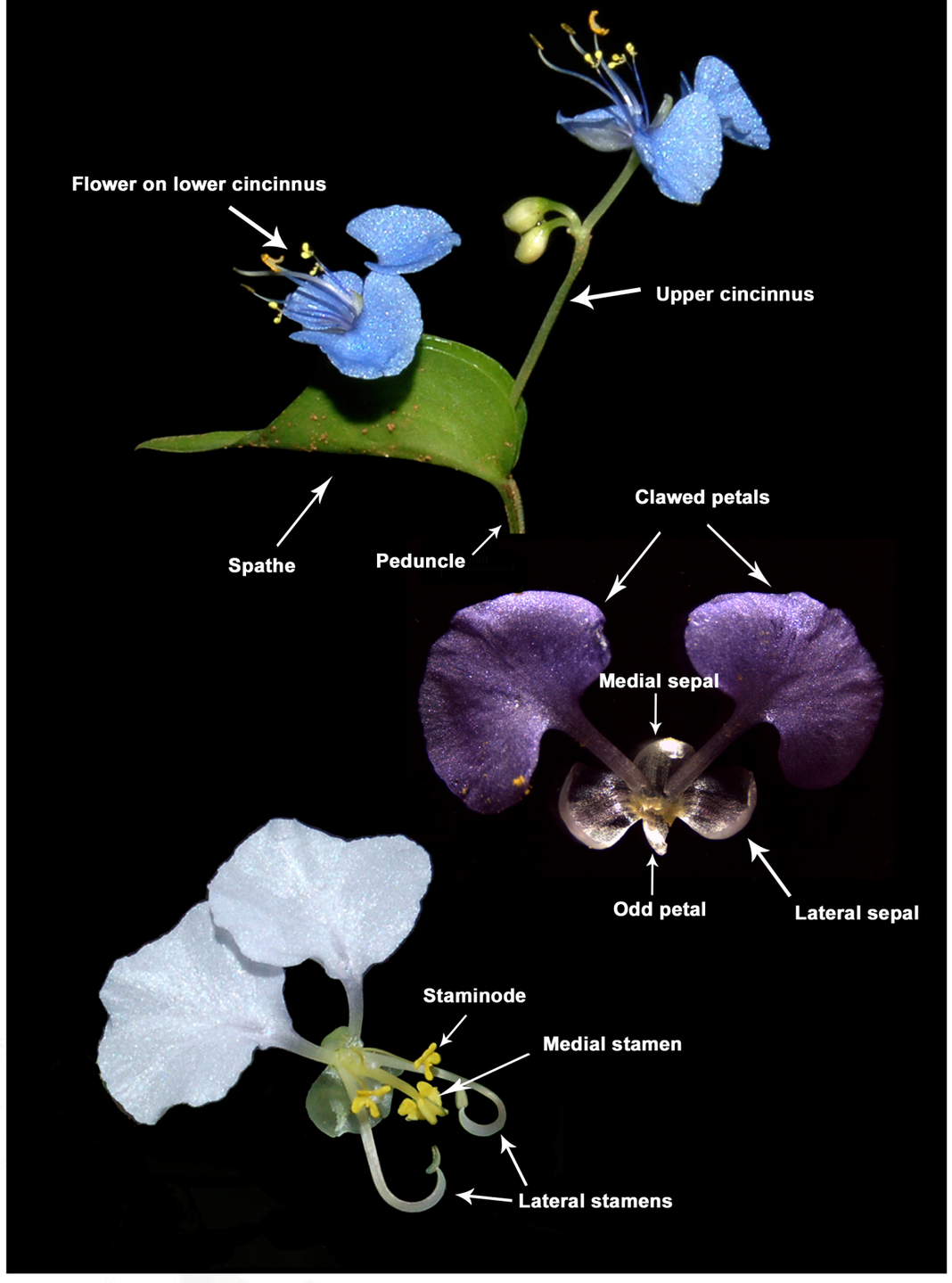




Plate 25. Type of *Commelina albescens* Hassk.



Plate 26. *Commelina andamanica* Sheba & Nampy *sp. nov.*: **a.** Habit; **b.** Cincinnus- front view; **c.** Spathe- side view; **d**. Leaf sheath with white hairs; **e.** Flower; **f.** Flower showing details of calyx and corolla; **g.** Sepals; **h.** Lateral stamen; **i.** Medial stamen; **j.** Staminode; **k.** Gynoecium; **l.** Seed- dorsal & ventral views (**a-k** from *Santhosh Nampy & Manudev 3751*; **l** from *Santhosh Nampy & Manudev 3131*)



Plate 27. Type of *Commelina andamanica* Sheba & Nampy *sp. nov.*



Plate 28. Lectotype of *Commelina appendiculata* C.B. Clarke

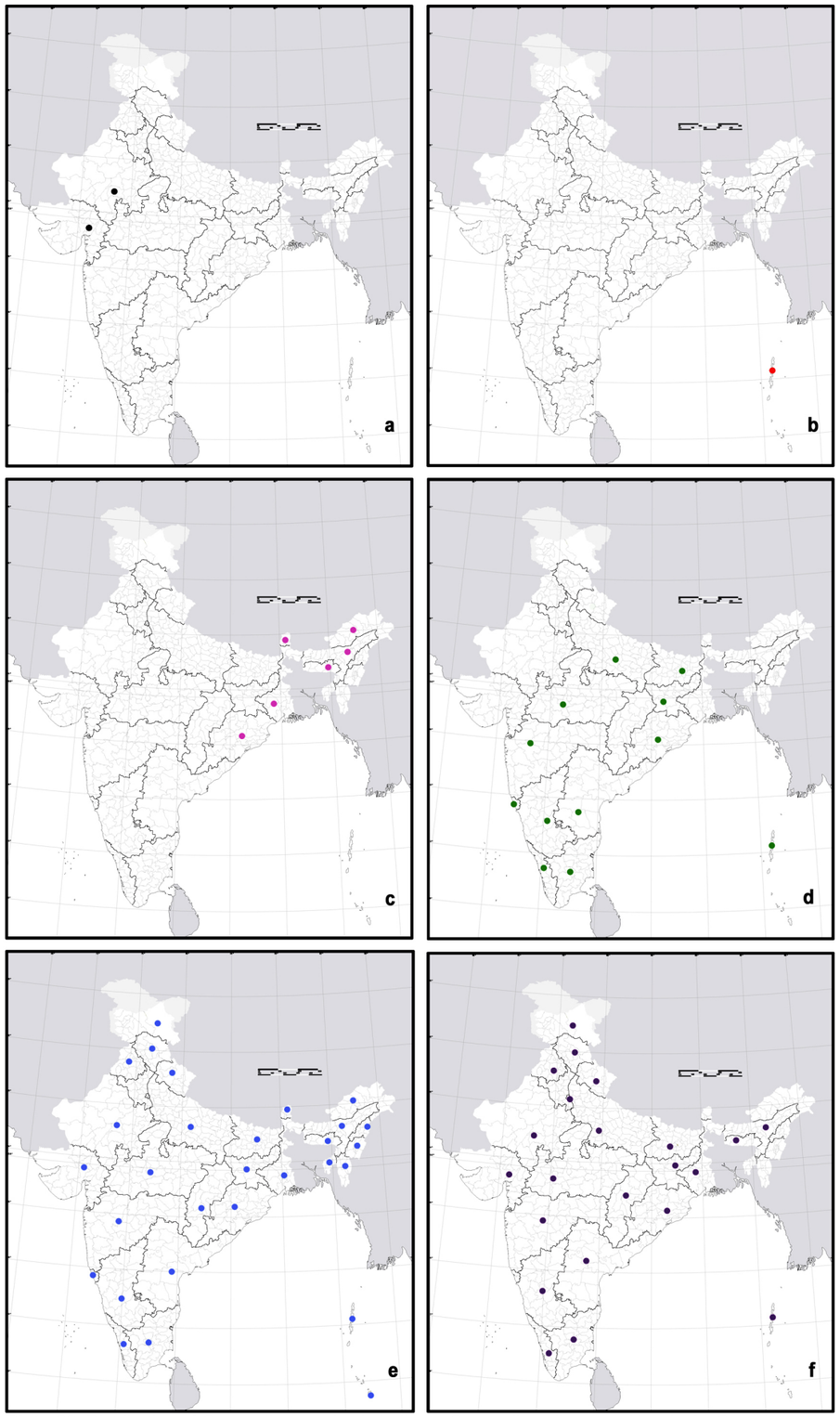


Plate 29. Distribution of *Commelina* species in India. **a**. *Commelina albescens* Hassk.; **b**. *C. andamanica* Sheba & Nampy; **c**. *C. appendiculata* C.B. Clarke; **d**. *C. attenuata* Vahl; **e**. *C. benghalensis L.*; **f**. *C. caroliniana* Walter.

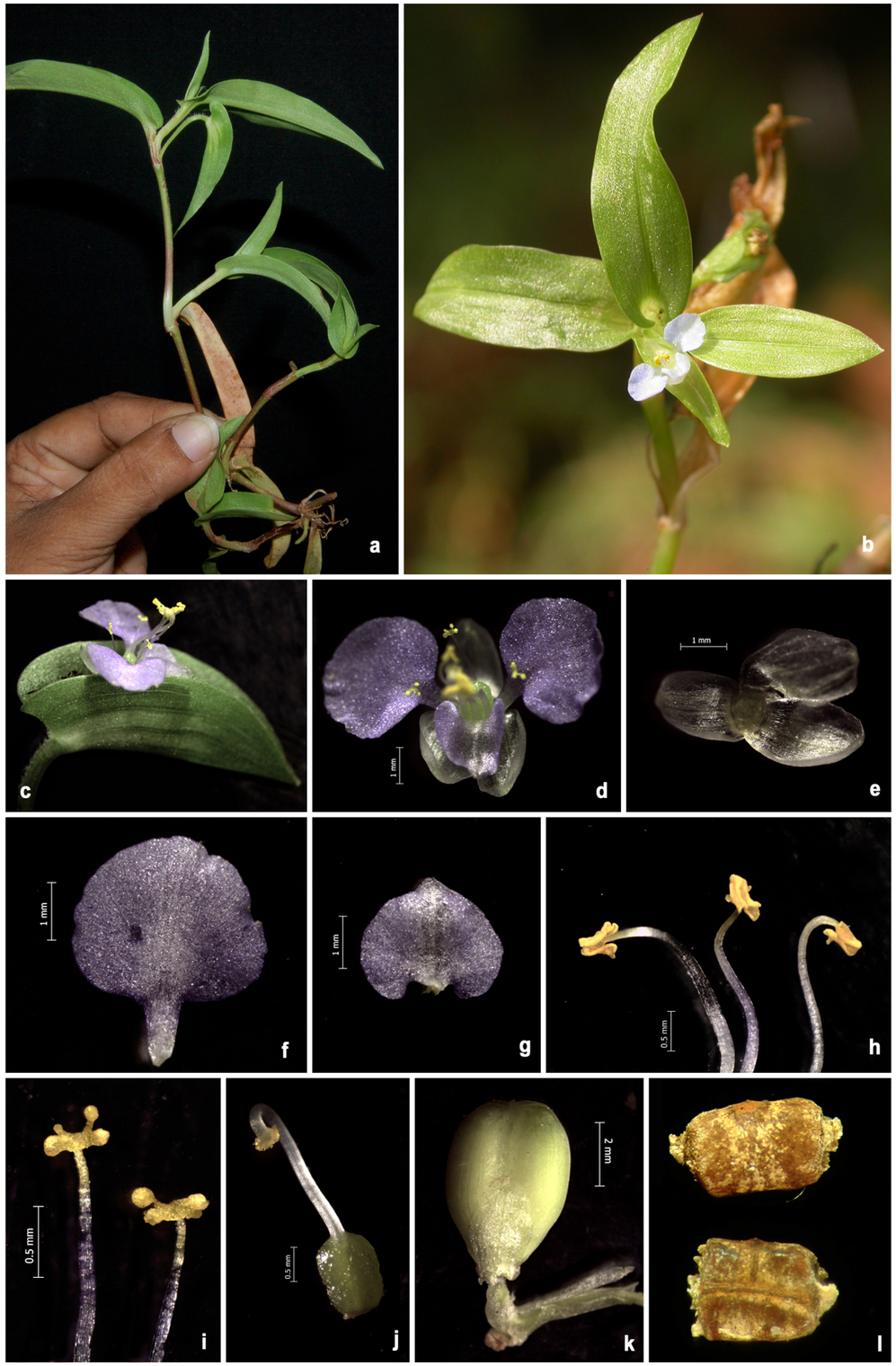


Plate 30. *Commelina attenuata* Vahl: **a.** Habit; **b.** Flowering twig; **c.** Cincinnus- side view; **d.** Flower- front view; **e**. Sepals; **f.** Clawed petal; **g.** Odd petal; **h.** Stamens; **i.** Staminodes; **j.** Gynoecium; **k.** Capsule; **l.** Seed- dorsal & ventral views (**a-k** from *Manudev 5057*; **l** from *Aneesha T.H. 5150*).

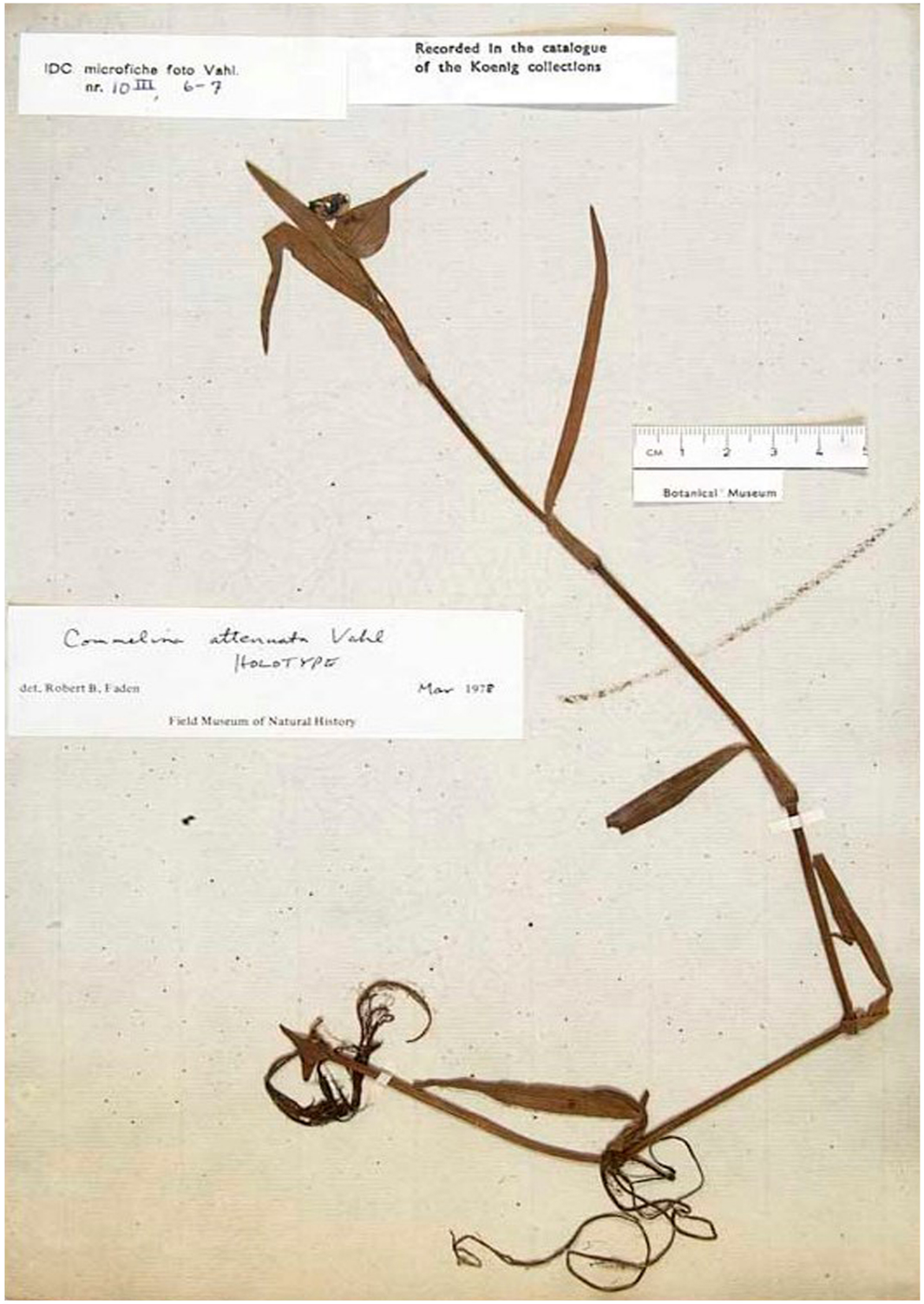


Plate 31. Type of *Commelina attenuata* Vahl

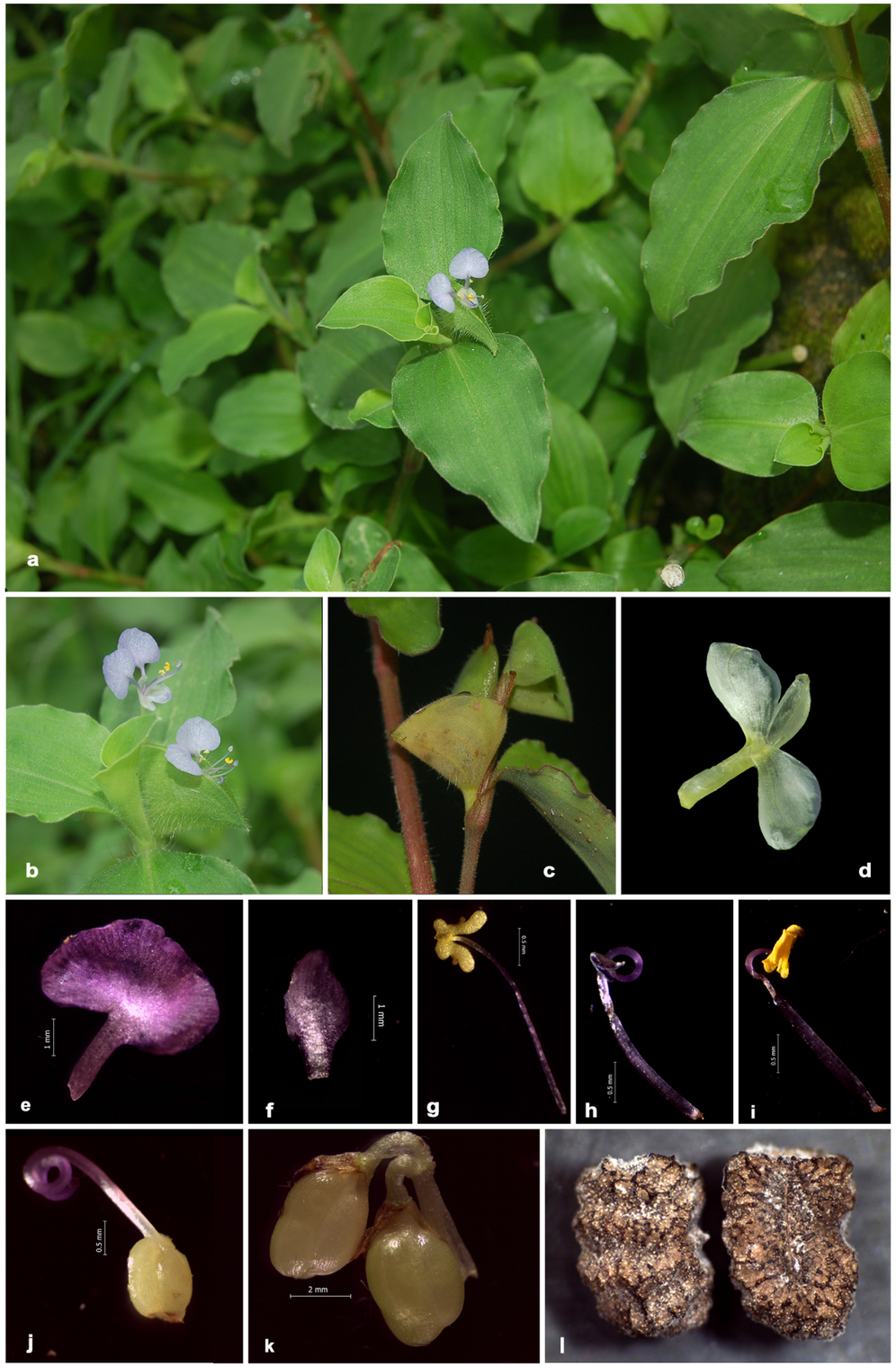


Plate 32. *Commelina benghalensis* L.: **a.** Habit; **b.** Cincinnus; **c.** Spathe; **d.** Sepals; **e**. Clawed petal; **f.** Odd petal; **g.** Staminode; **h.** Lateral stamen; **i.** Medial stamen; **j.** Gynoecium; **k.** Capsule; **l.** Seed- dorsal & ventral views (**a-k** from *Sheba & Santhosh Nampy 4047*; **l** from *Santhosh Nampy 141*).



Plate 33. Type of *Commelina benghalensis* L.

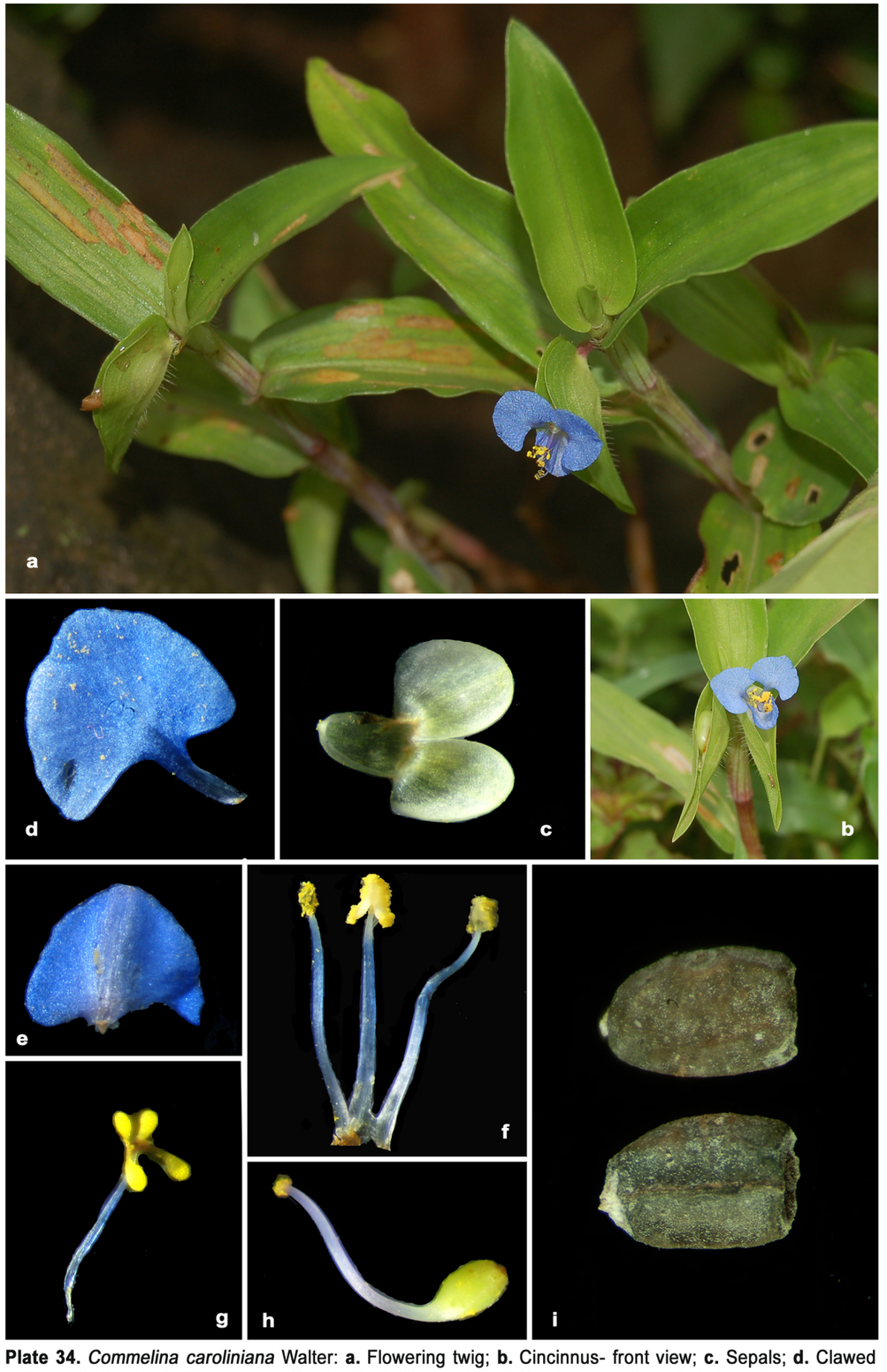


Plate 34. *Commelina caroliniana* Walter: **a.** Flowering twig; **b.** Cincinnus- front view; **c.** Sepals; **d.** Clawed petal; **e.** Odd petal; **f.** Stamens; **g.** Staminode; **h.** Gynoecium; **i.** Seed- dorsal & ventral views (from *Sheba & Santhosh Nampy 3763*; from *Joby & Santhosh Nampy 5103*).

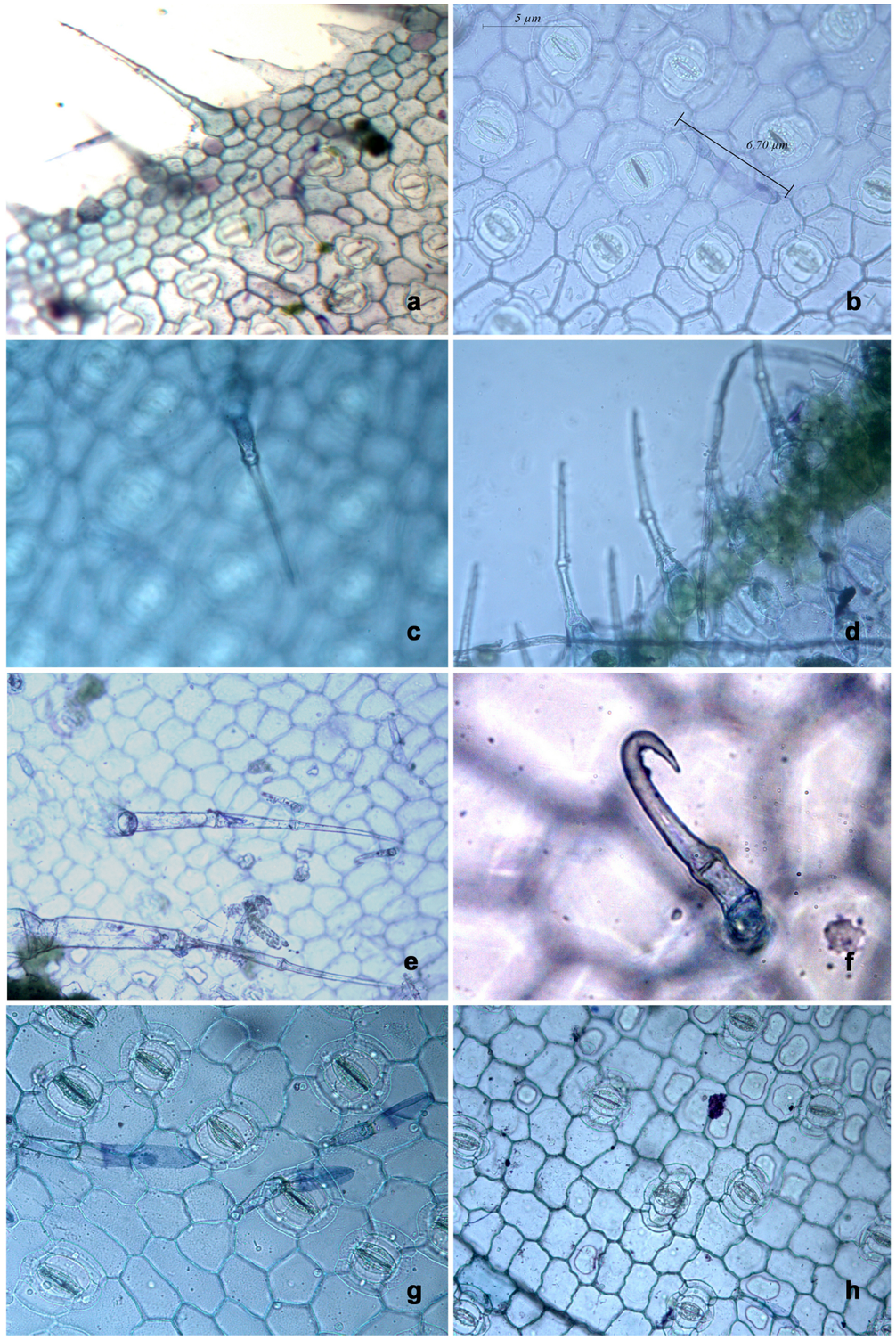


Plate 3. Foliar epidermis of *Commelina* species. (**a-f**) *C. benghalensis* L.: **a-c.** Abaxial epidermis; **d-f.** Adaxial epidermis. (**g-h**) *C. caroliniana* Walter: **g.** Abaxial epidermis**;** **h.** Adaxial epidermis.

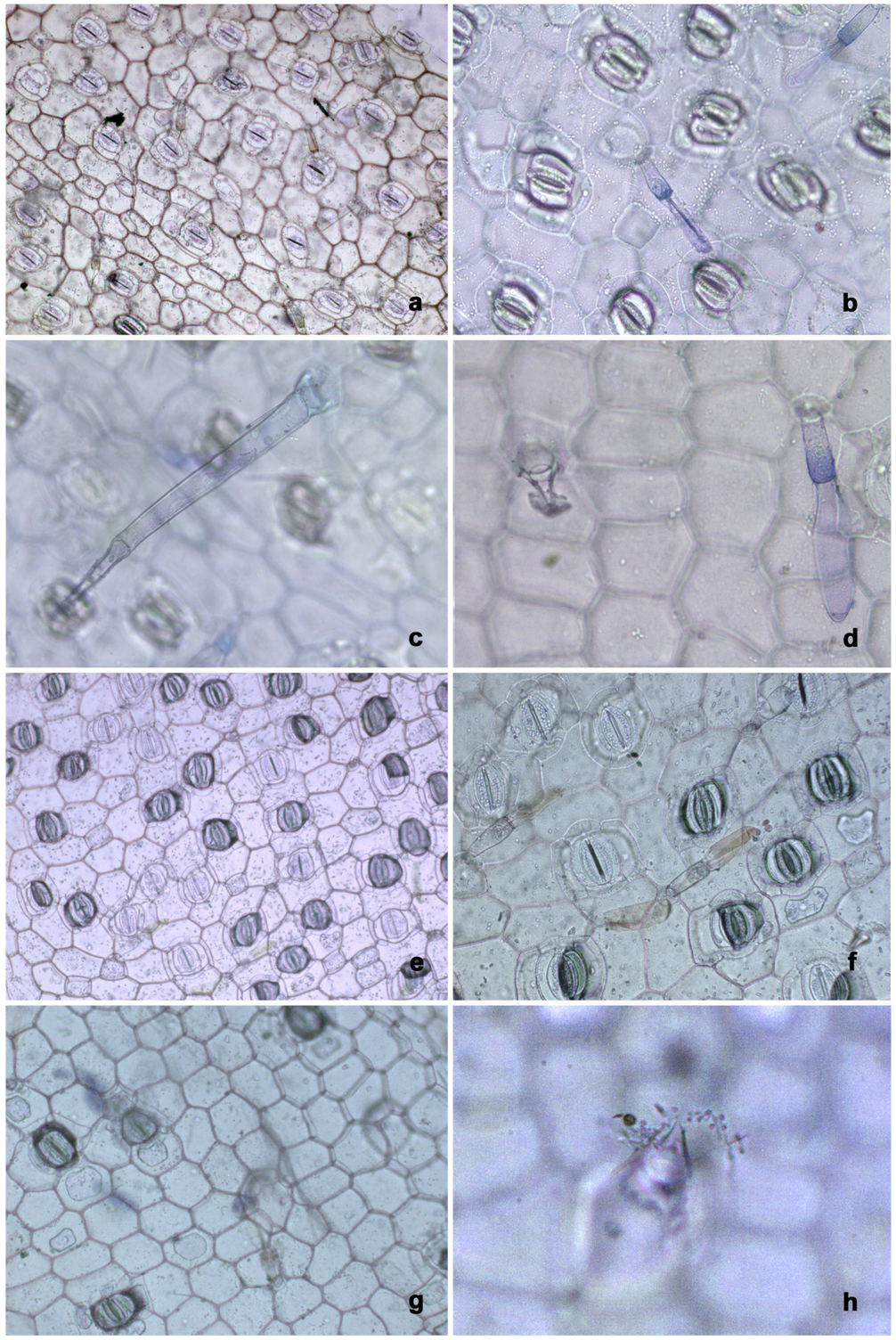


Plate 4. Foliar epidermis of *Commelina* species. (**a-d**) *C. clavata* C.B. Clarke (from Idukki): **a-c.** Abaxial epidermis; **d.** Adaxial epidermis. (**e-h**) *C. clavata* C.B. Clarke (from Nilgiris): **e-f.** Abaxial epidermis; **g-h.** Adaxial epidermis.

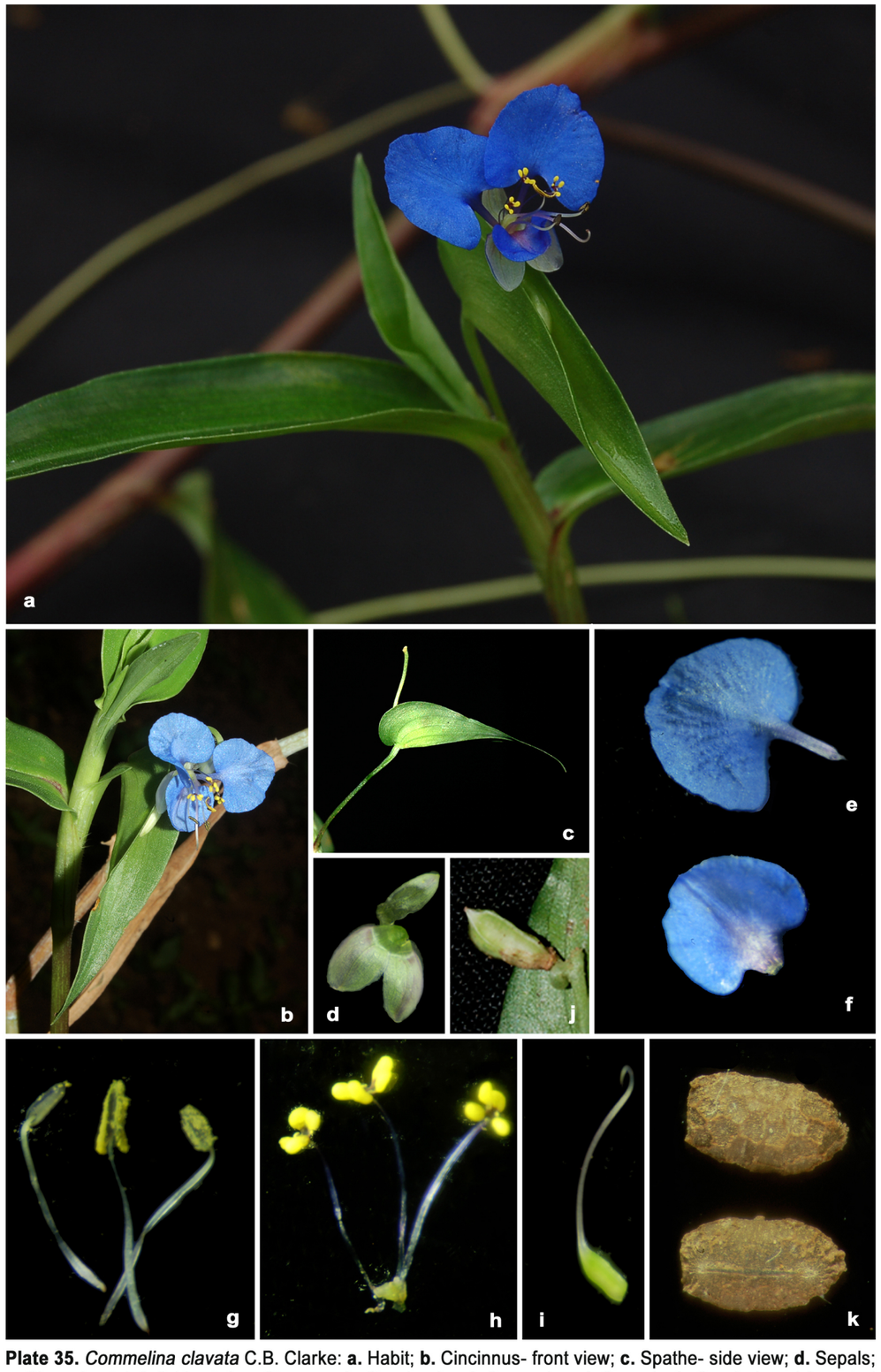


Plate 35. *Commelina clavata* C.B. Clarke: **a.** Habit; **b.** Cincinnus- front view; **c.** Spathe- side view; **d.** Sepals; **e**. Clawed petal; **f.** Odd petal; **g.** Stamens; **h.** Staminodes; **i.** Gynoecium; **j.** Capsule; **k.** Seed- dorsal & ventral views (**a-j** from *Manudev & Santhosh Nampy 3714*; **k** from *Joby & Santhosh Nampy 874*).



Plate 36. *Commelina clavatoides* Nampy & Sheba: **a.** Plant under cultivation; **b.** Sheath; **c.** Spathe with upper and lower cincinni bearing opened flowers- side view; **d.** Flower- side view; **e & f**. Spathe with cincinni showing flower buds; **g.** Spathe with mature capsules; **h.** Seeds- dorsal & ventral views (from *Sheba & Santhosh Nampy 4016*).



Plate 37. Type of *Commelina clavatoides* Nampy & Sheba



Plate 38. Type of *Commelina coelestis* Willd.

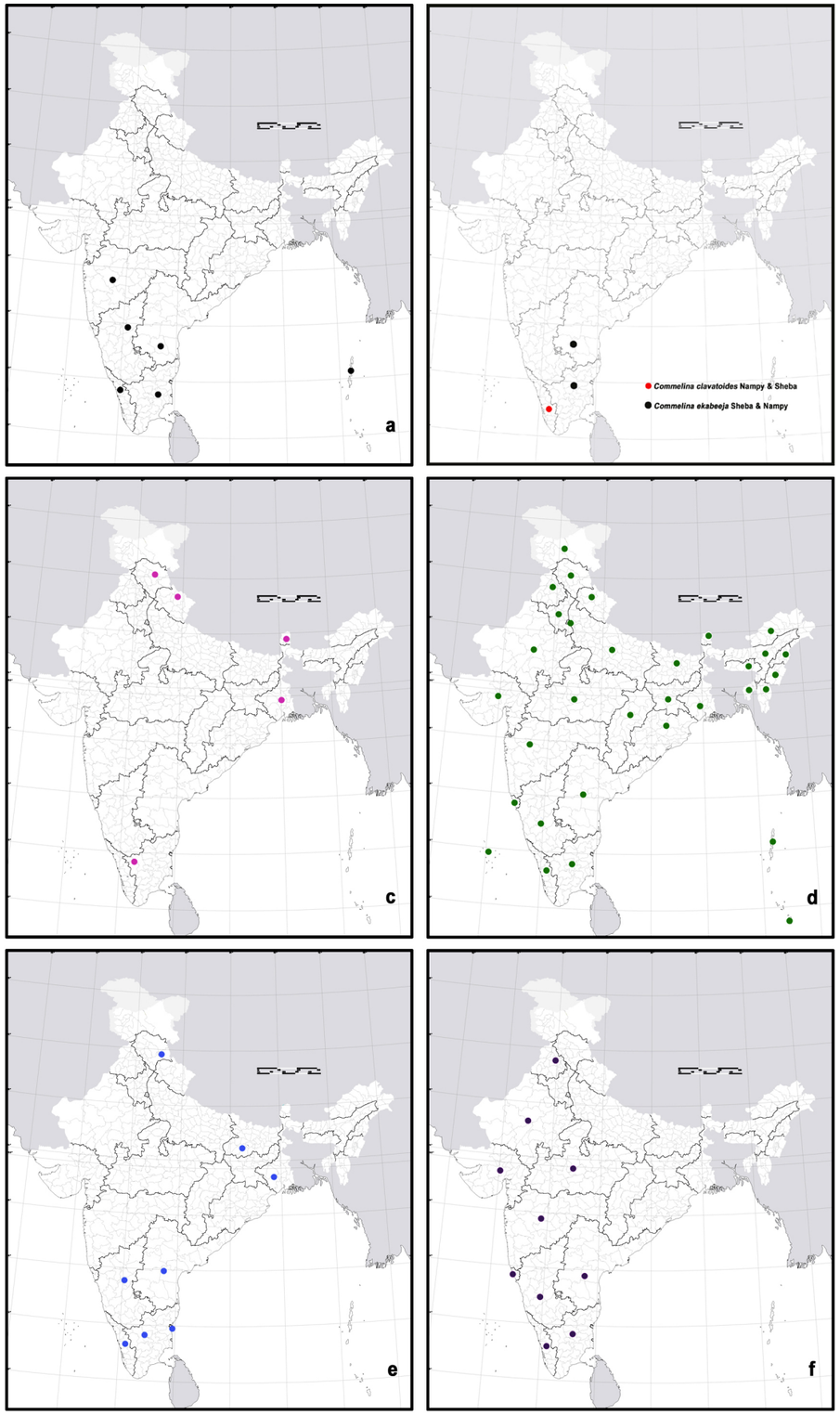


Plate 39. Distribution of *Commelina* species in India. **a**. *Commelina clavata* C.B.Clarke; **b**. *C. clavatoides* Nampy & Sheba and *C. ekabeeja* Sheba & Nampy; **c**. *C. coelestis* Willd.; **d**. *C. diffusa* Burm.f.; **e**. *C. ensifolia* R. Br.; **f**. *C. forskalaei* Vahl

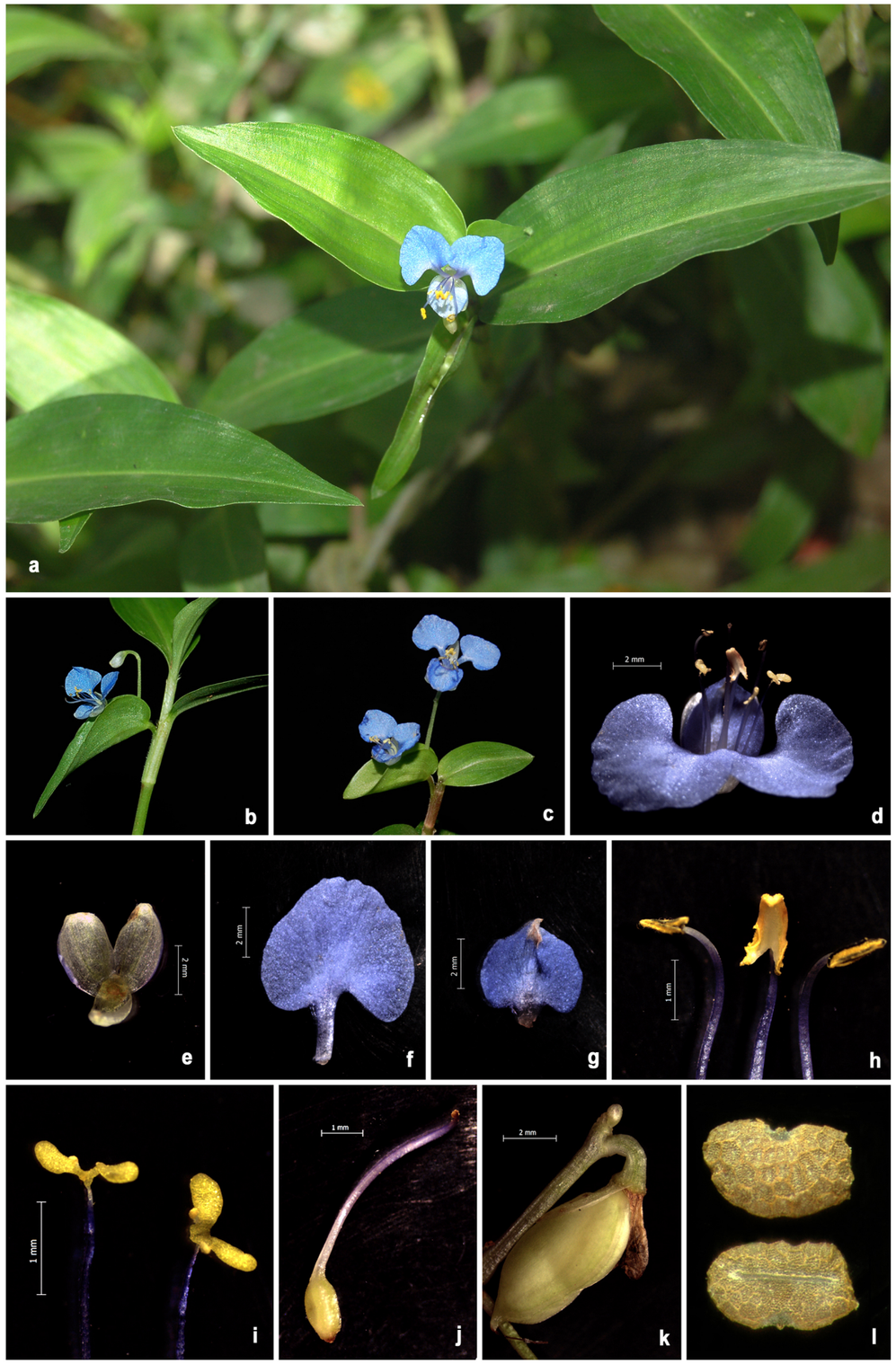


Plate 40. *Commelina diffusa* Burm.f.: **a.** Habit; **b & c.** Spathe with upper and lower cincinni bearing opened flowers- side view; **d.** Flower; **e.** Sepals; **f**. Clawed petal; **g.** Odd petal; **h.** Stamens; **i.** Staminodes; **j.** Gynoecium; **k.** Capsule; **l.** Seed- dorsal & ventral views (**a-k** from *Sheba & Santhosh Nampy 4047*; **l** from *Joby& Aneesha 95*).



Plate 41. Lectoype (**A**) of *Commelina ekabeeja* Sheba & Nampy *nom. nov.*

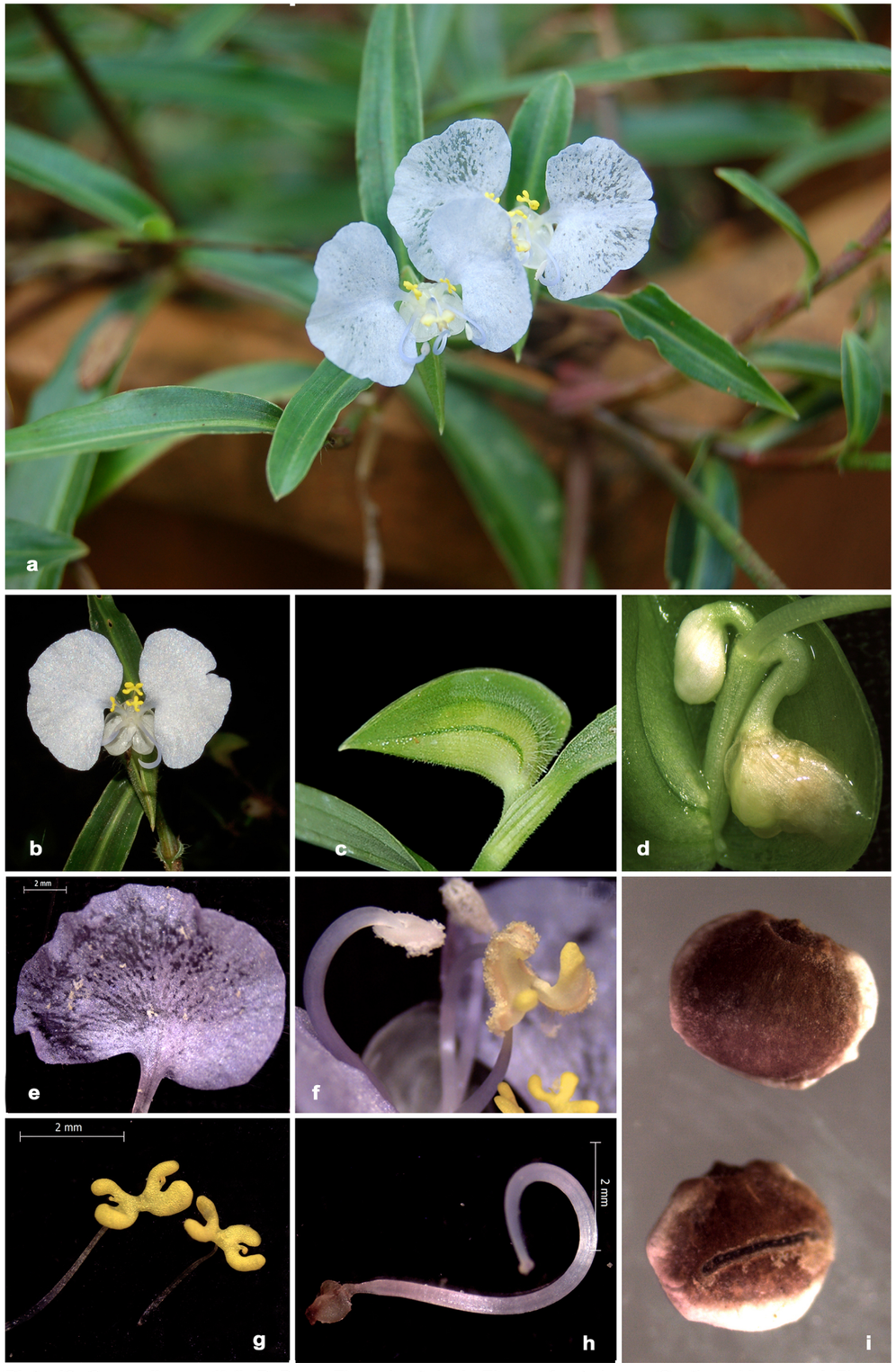


Plate 42. *Commelina ensifolia* R. Br.: **a.** Flowering twig; **b.** Flower- front view; **c.** Spathe- side view; **d.** Flower buds; **e.** Clawed petal; **f**. Stamens; **g.** Staminodes; **h.** Gynoecium; **i.** Seed- dorsal & ventral view (**a-h** from *Sheba & Santhosh Nampy 3234*; **i** from *Sheba & Santhosh Nampy 4006*).



Plate 43. Type of *Commelina ensifolia* R. Br.

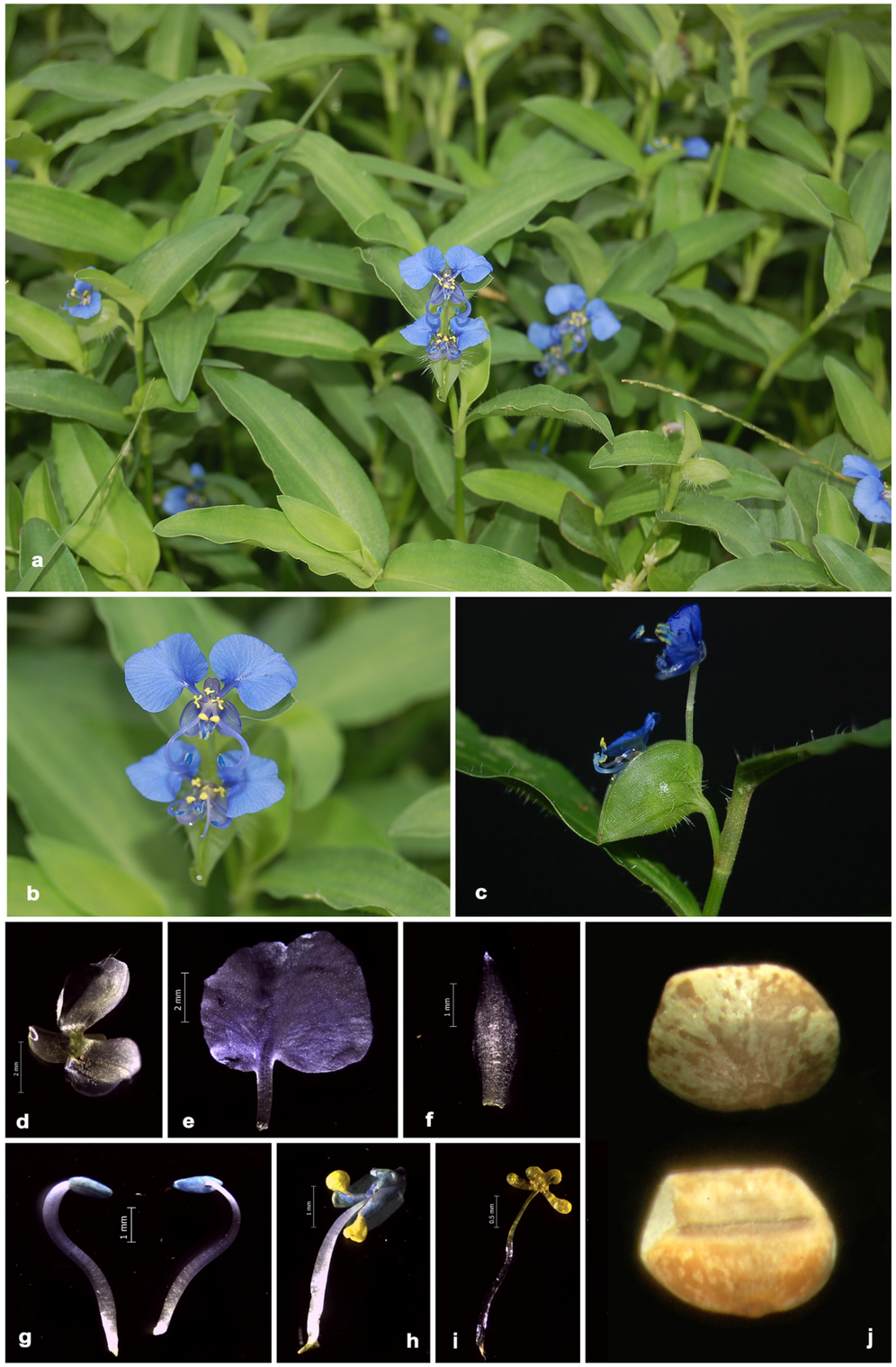


Plate 44. *Commelina forskalaei* Vahl: **a.** Habit; **b & c.** Spathe with upper and lower cincinni bearing opened flowers; **d.** Sepals; **e.** Clawed petal; **f.** Odd petal; **g.** Lateral stamens; **h.** Medial stamen; **i.** Staminode; **j.** Seed-dorsal & ventral view (from *Manudev & Sheba 5050*).

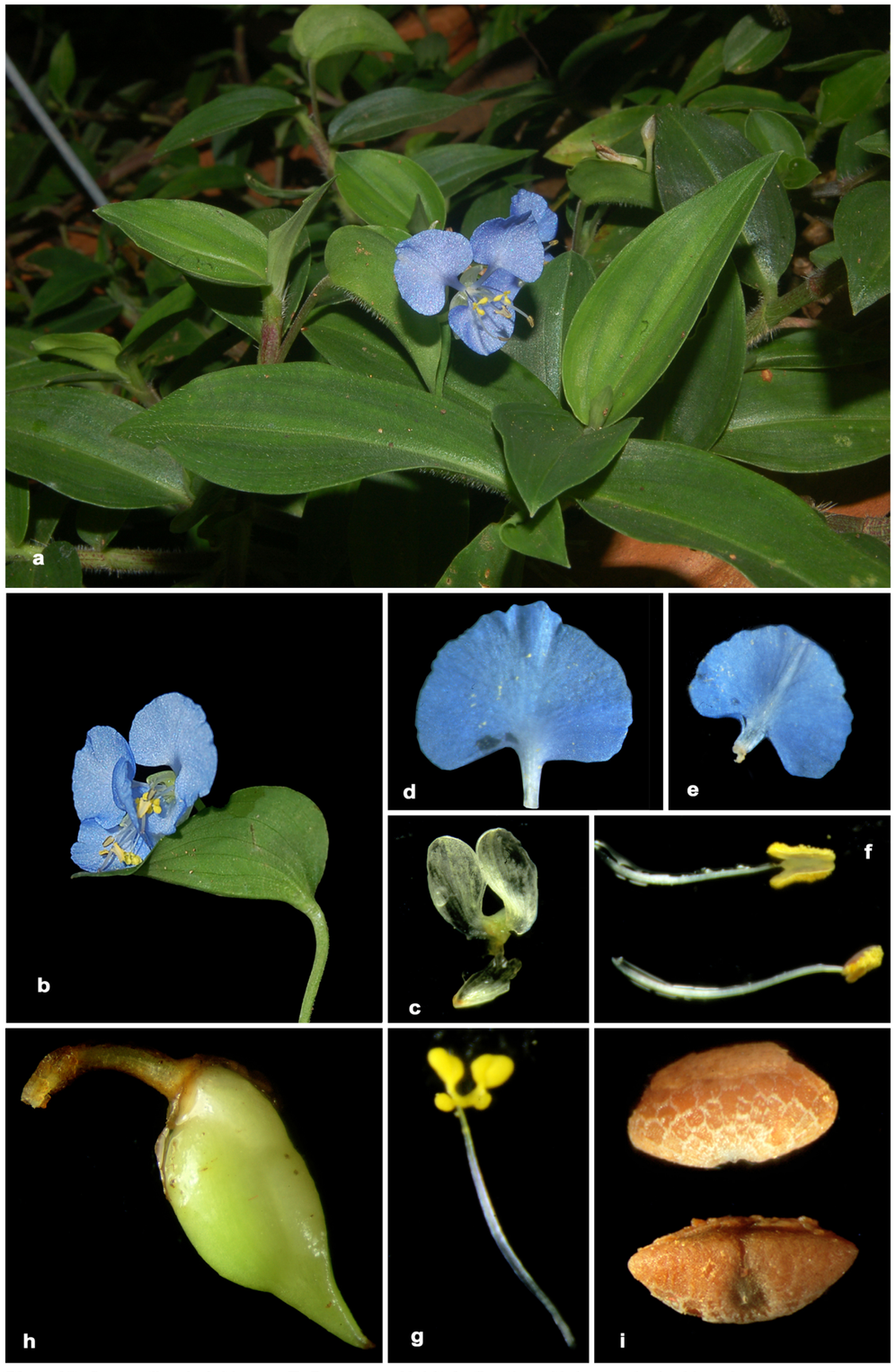


Plate 45. *Commelina indehiscens* E. Barnes: **a.** Habit; **b.** Spathe with lower cincinni bearing opened flowers; **c.** Sepals; **d.** Clawed petal; **e.** Odd petal; **f.** Stamens; **g.** Staminode; **h.** Capsule; **i.** Seed- dorsal & ventral view (**a-h** from *Manudev & Sheba 3295*; **i** from *Sheba & Santhosh Nampy 4015*).



Plate 46. Paralectotype of *Commelina indehiscens* E. Barnes

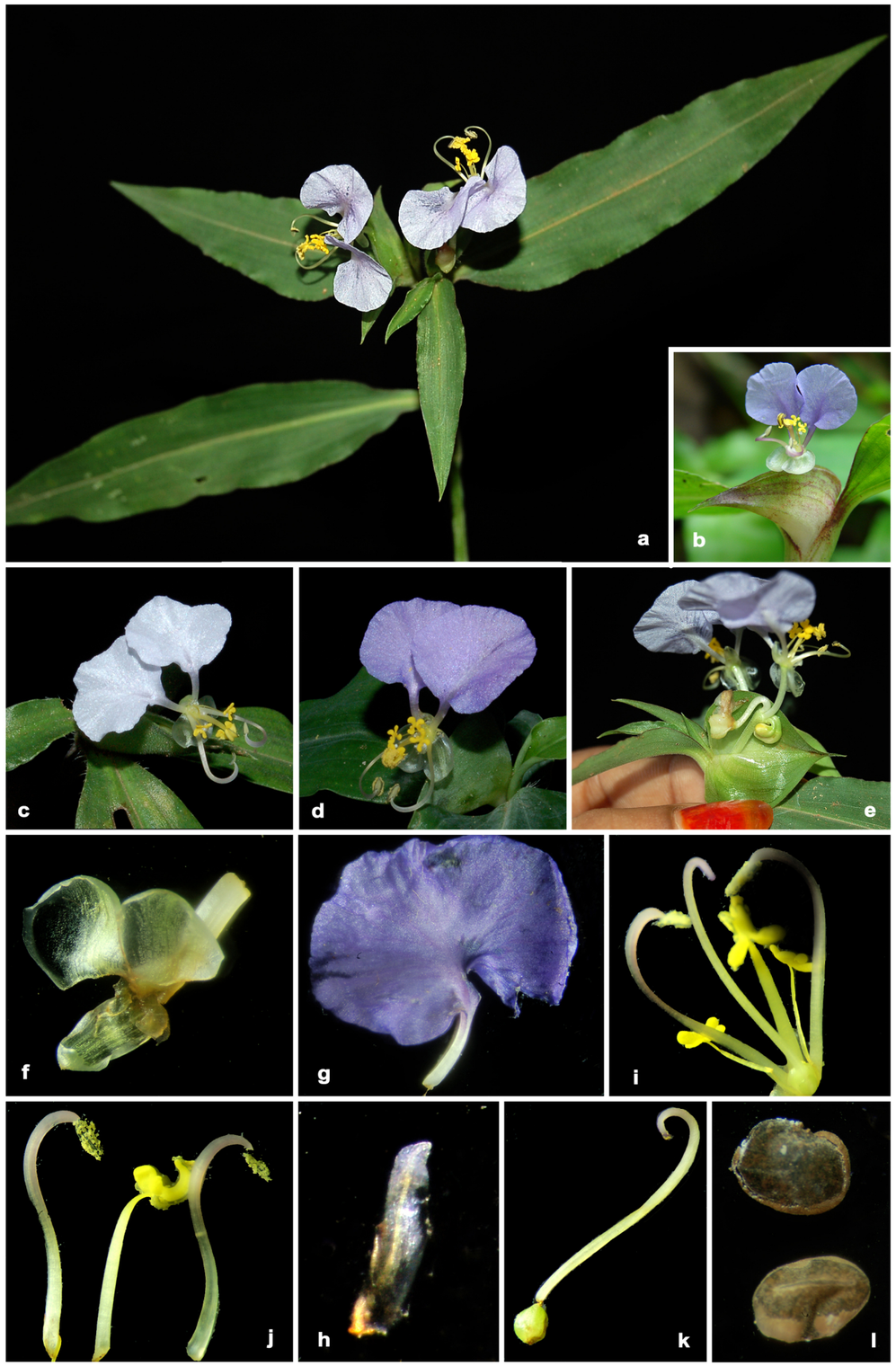


Plate 47. *Commelina kurzii* C.B. Clarke: **a.** Flowering twig; **b-e.** Spathe with lower cincinni bearing opened flowers; **f.** Sepals; **g.** Clawed petal; **h.** Odd petal; **i.** Stamens & staminodes; **j.** Stamens; **k.** Gynoecium; **l.** Seed- dorsal & ventral views (**a** from *Joby & Santhosh Nampy 1235*; **b** from *Sheba & Santhosh Nampy 4030*; **c** from *Sheba & Santhosh Nampy 3231*;**d & f-k** from *Sheba & Santhosh Nampy 4051*; **l** from *Joby & Santhosh Nampy 969*).

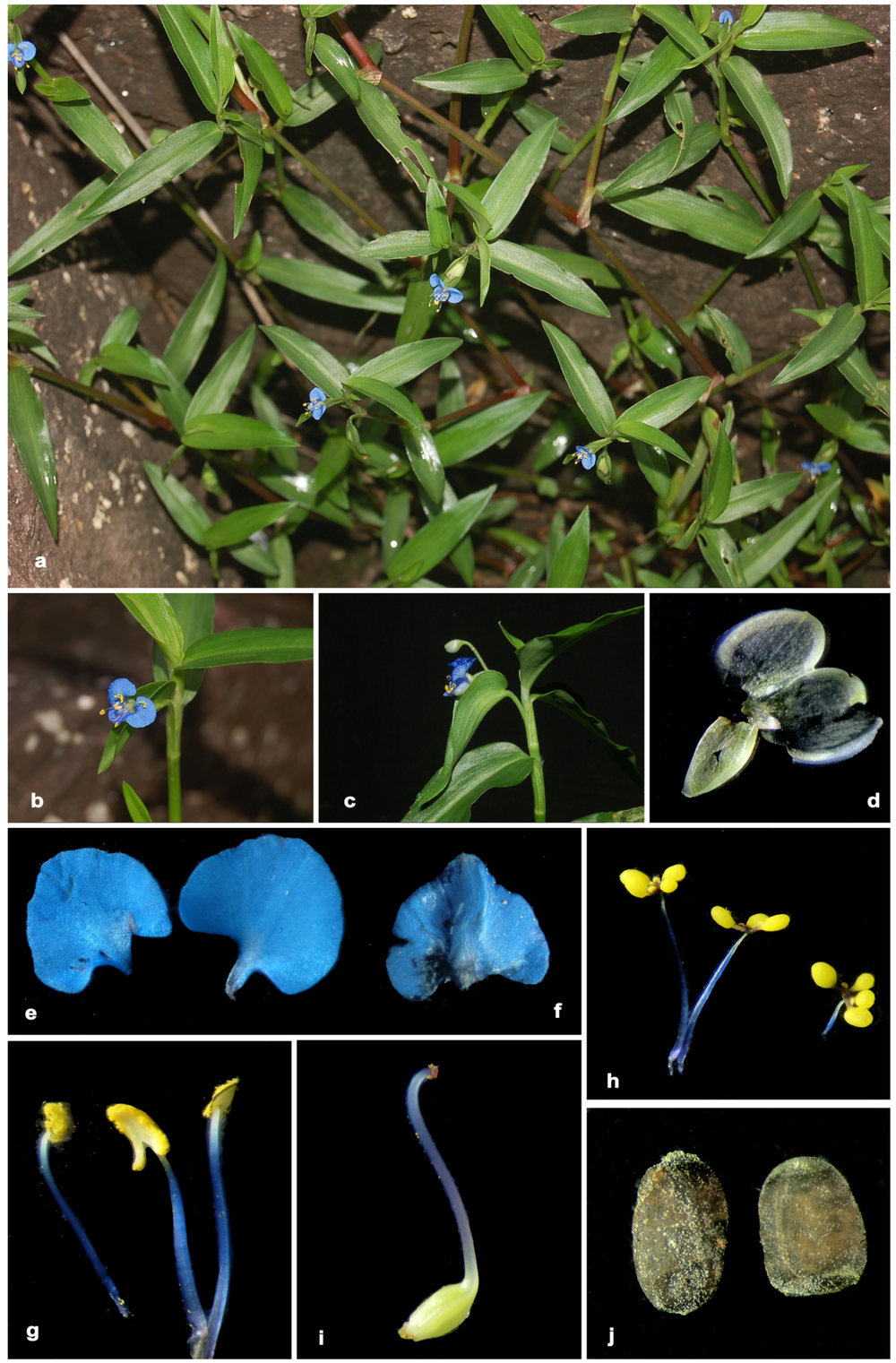


Plate 48. *Commelina longifolia* Lam.: **a.** Habit; **b & c.** Spathe with upper & lower cincinni bearing opened flowers; **d.** Sepals; **e.** Clawed petals; **f.** Odd petal; **g.** Stamens; **h.** Staminodes; **i.** Gynoecium; **j.** Seed- dorsal & ventral view (all from *Sheba & Santhosh Nampy 4051*).

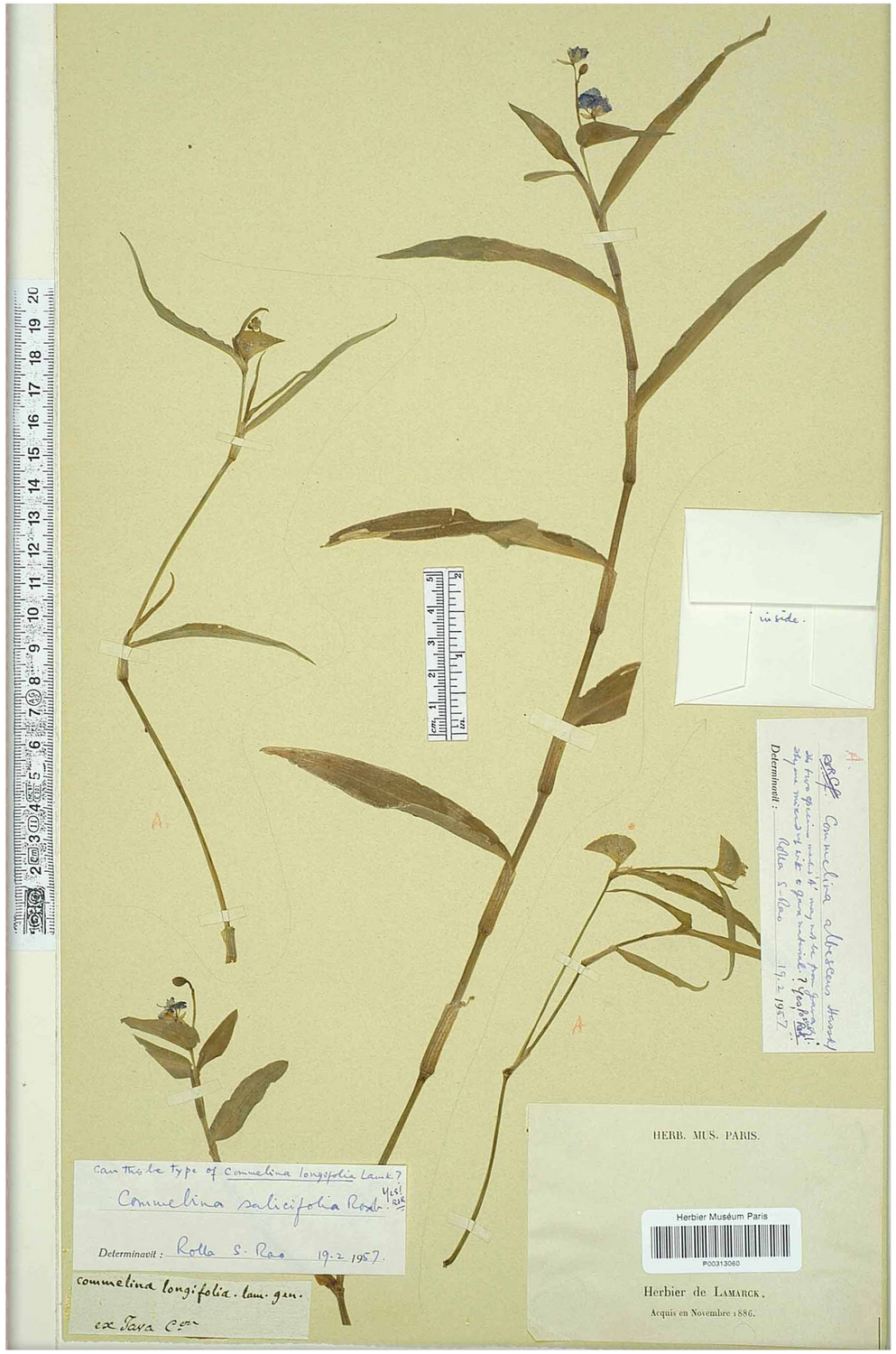


Plate 49. Type of *Commelina longifolia* Lam.

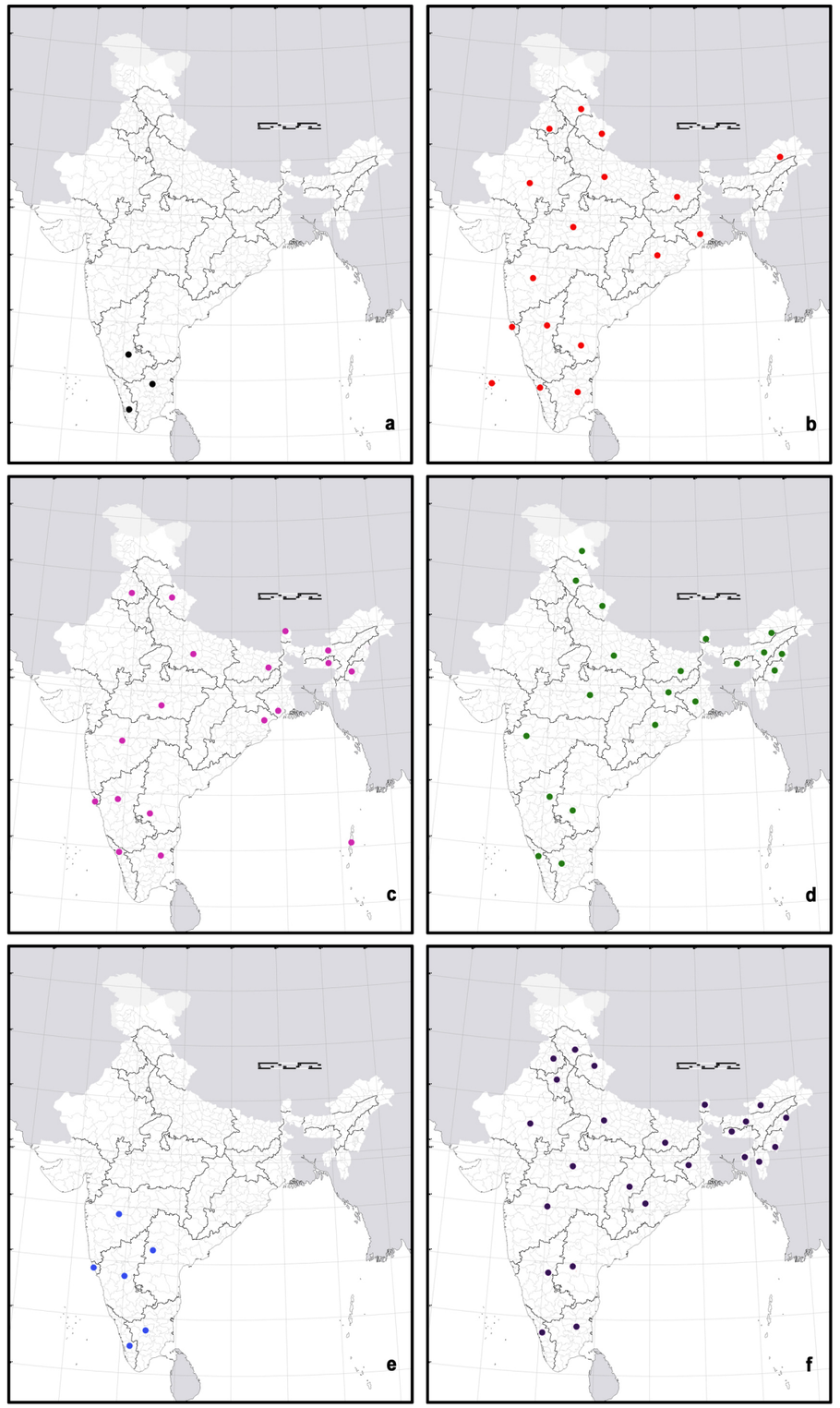


Plate 50. Distribution of *Commelina* species in India. **a**. *Commelina indehiscens* E. Barnes; **b.** *C. kurzii* C.B. Clarke; **c**. *C. longifolia* Lam.; **d**. *C. maculata* Edgew.; **e**. *C. paleata* Hassk.; **f**. *C. paludosa* Blume

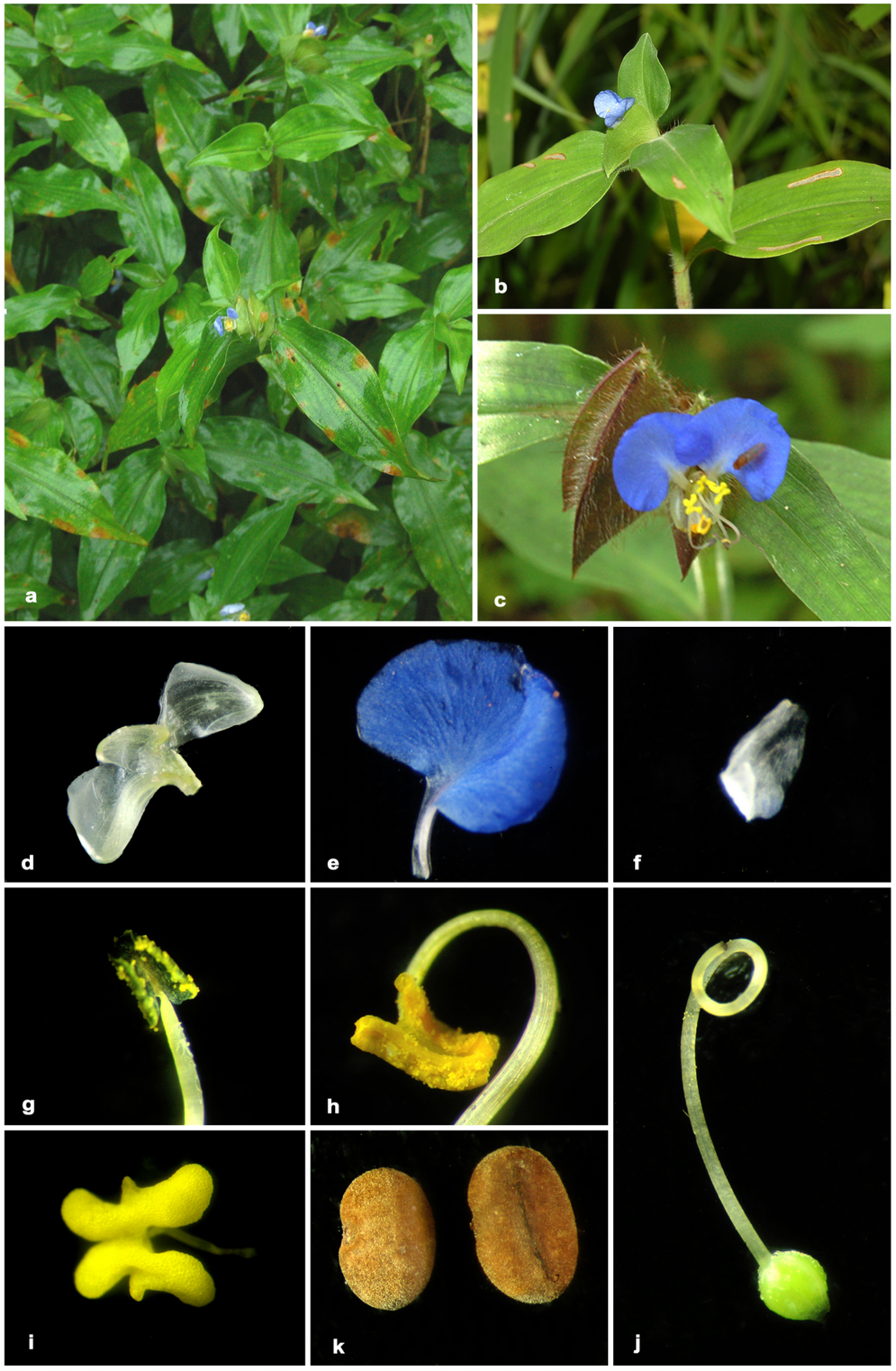


Plate 51. *Commelina maculata* Edgew.: **a.** Habit; **b & c.** Spathe with lower cincinni bearing opened flowers; **d.** Sepals; **e.** Clawed petal; **f.** Odd petal; **g.** Lateral stamen; **h.** Medial stamen; **i.** Antherode; **j.** Gynoecium; **k.** Seed- dorsal & ventral views (**a** from *Santhosh Nampy 4796*; **b** from *Sheba & Santhosh Nampy 3267*; **c** from *Santhosh Nampy 4704;* **d-j** from *Santhosh Nampy & Sheba 3775*; **c** from *Sheba & Santhosh Nampy 2267*).



Plate 52. Type of *Commelina maculata* Edgew.



Plate 53. *Commelina paleata* Hassk.: **a.** Habit; **b.** Spathe- side view; **c.** Sepals; **d.** Clawed petal; **e.** Odd petal; **f.** Stamens; **g.** Staminodes; **h.** Gynoecium; **i.** Seed- dorsal & ventral views (**a-h** from *Santhosh Nampy & Sheba 3775*; **i** from *K.V. Billore 116770*).

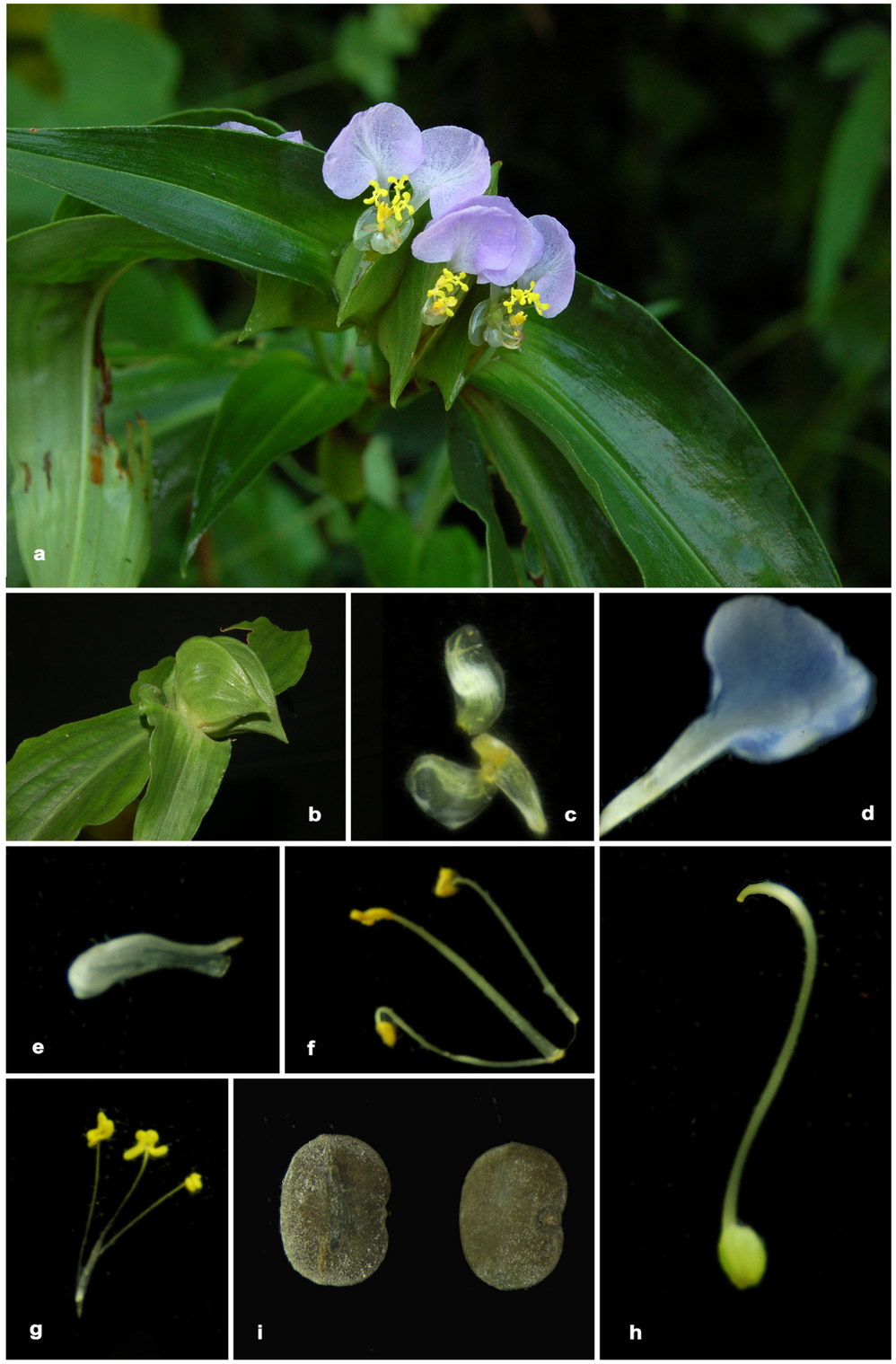


Plate 54. *Commelina paludosa* Blume: **a.** Flowering twig; **b.** Spathe- side view; **c.** Sepals; **d.** Clawed petal; **e.** Odd petal; **f.** Stamens; **g.** Staminodes; **h.** Gynoecium; **i.** Seed- dorsal & ventral views (**a-h** from *Sheba & Santhosh Nampy 4035*; **i** from *Santhosh Nampy 566*).

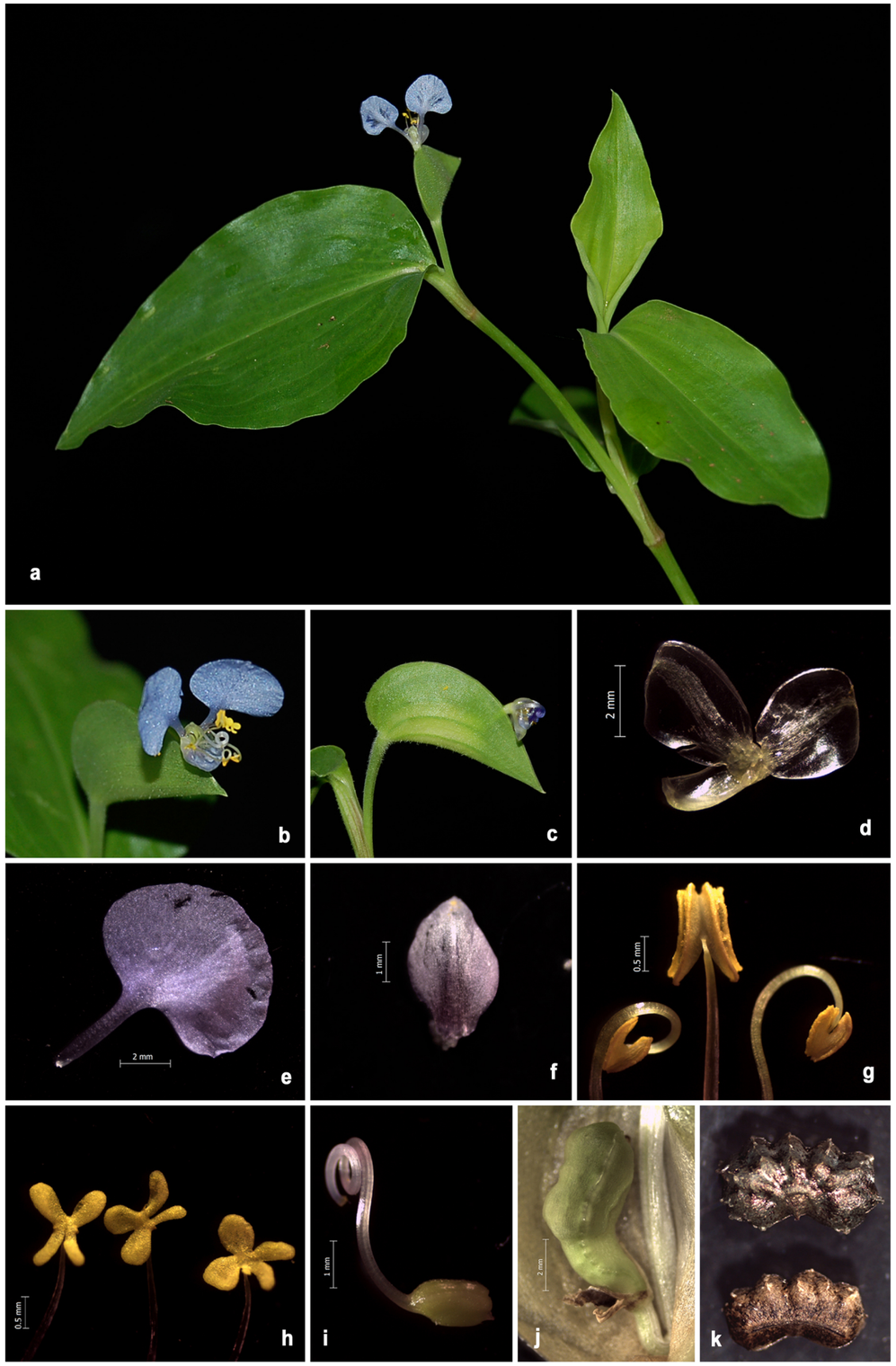


Plate 55. *Commelina petersii* Hassk.: **a.** Flowering twig; **b & c.** Spathe with lower cincinni bearing opened flowers- side view; **d.** Sepals; **e.** Clawed petal; **f.** Odd petal; **g.** Stamens; **h.** Staminodes; **i.** Gynoecium; **j.** Capsule; **k.** Seed- dorsal & ventral views (**a-j** from *Santhosh Nampy & Sheba 3201;* **k** from *Santhosh Nampy & Sheba 3973*).



Plate 56. Type of *Commelina petersii* Hassk.

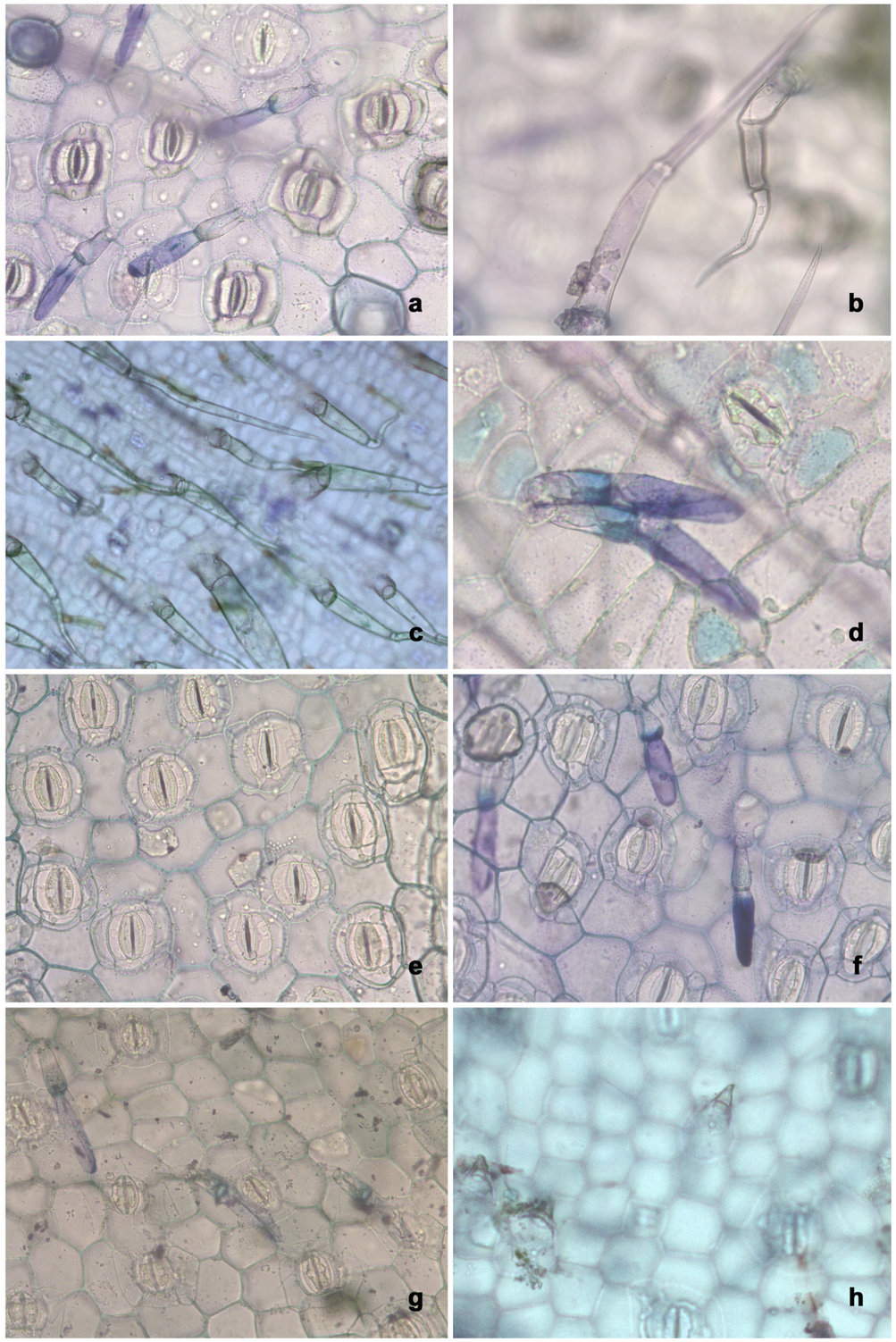


Plate 5. Foliar epidermis of *Commelina* species. (**a-d**) *C. clavata* C.B. Clarke (from Vythiri): **a-b.** Abaxial epidermis; **c-d.** Adaxial epidermis. (**e-h**) *C. clavatoides* Nampy & Sheba: **e-f.** Abaxial epidermis**; g-h.** Adaxial epidermis.

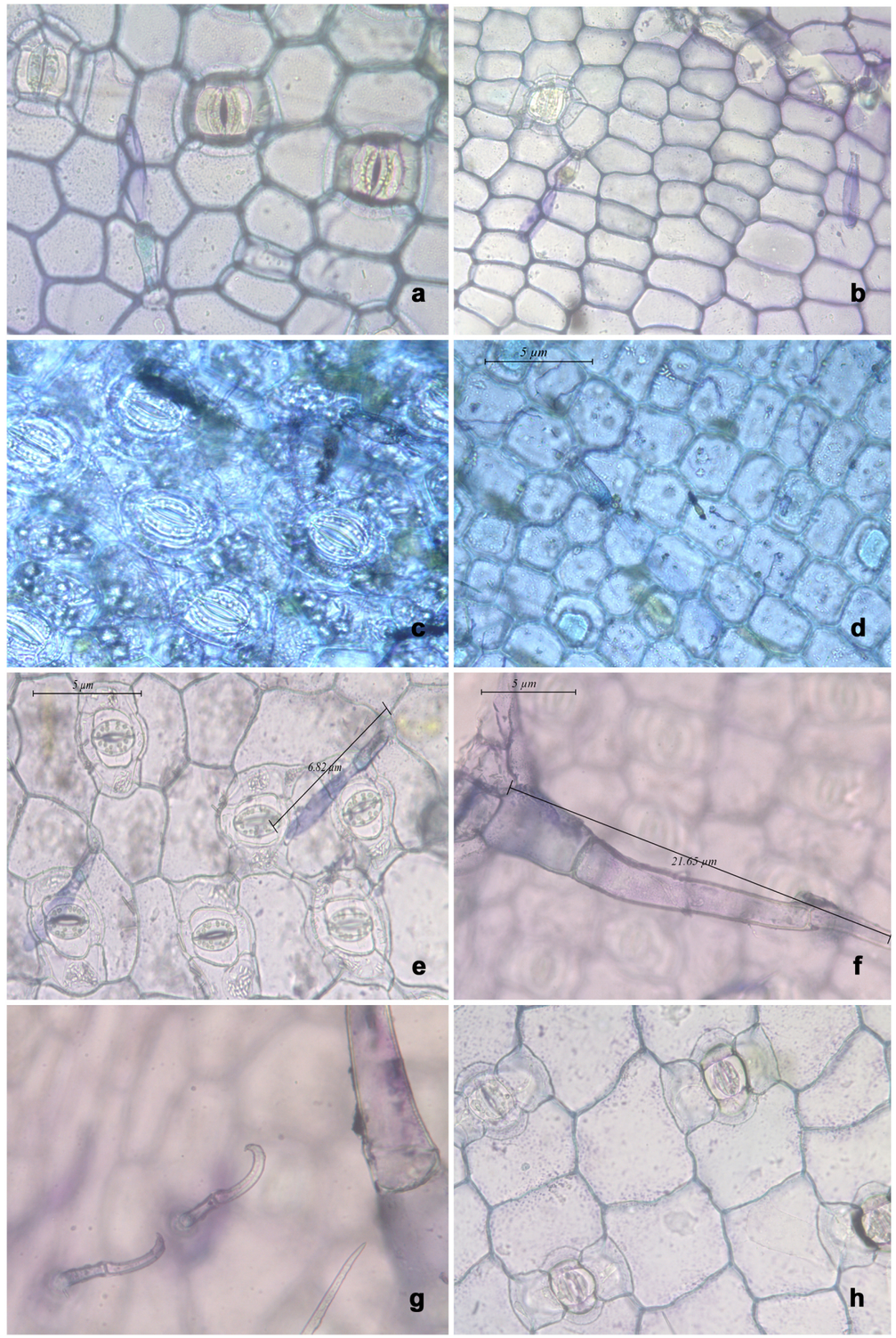


Plate 6. Foliar epidermis of *Commelina* species. (**a-b**) *Commelina diffusa* Burm.f.: **a.** Abaxial epidermis; **b.** Adaxial epidermis. (**c-d**) *C. ensifolia* R. Br.: **c.** Abaxial epidermis; **d.** Adaxial epidermis. (**e-h**) *C. forskalaei* Vahl: **e-g.** Abaxial epidermis; **h.** Adaxial epidermis.

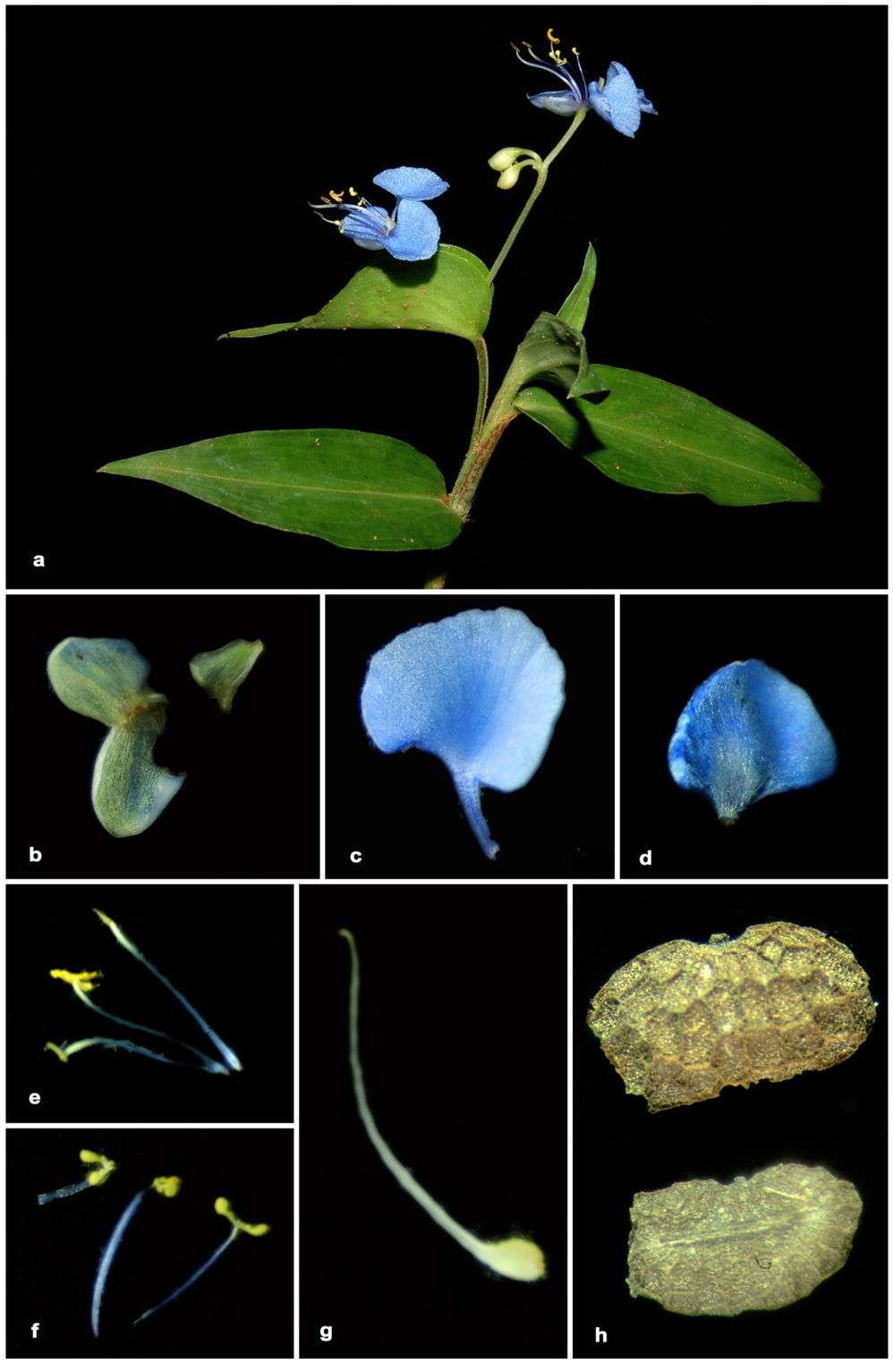


Plate 57. *Commelina sikkimensis* C.B. Clarke: **a.** Flowering twig; **b.** Sepals; **c.** Clawed petal; **d.** Odd petal; **e.** Stamens; **f.** Staminodes; **g.** Gynoecium; **h.** Seed- dorsal & ventral views (**a-g** from *Sheba & Santhosh Nampy 4052*; **h** from *Sheba & Santhosh Nampy 2271*).



Plate 58. Lectotype (**A**) of *Commelina sikkimensis* C.B. Clarke

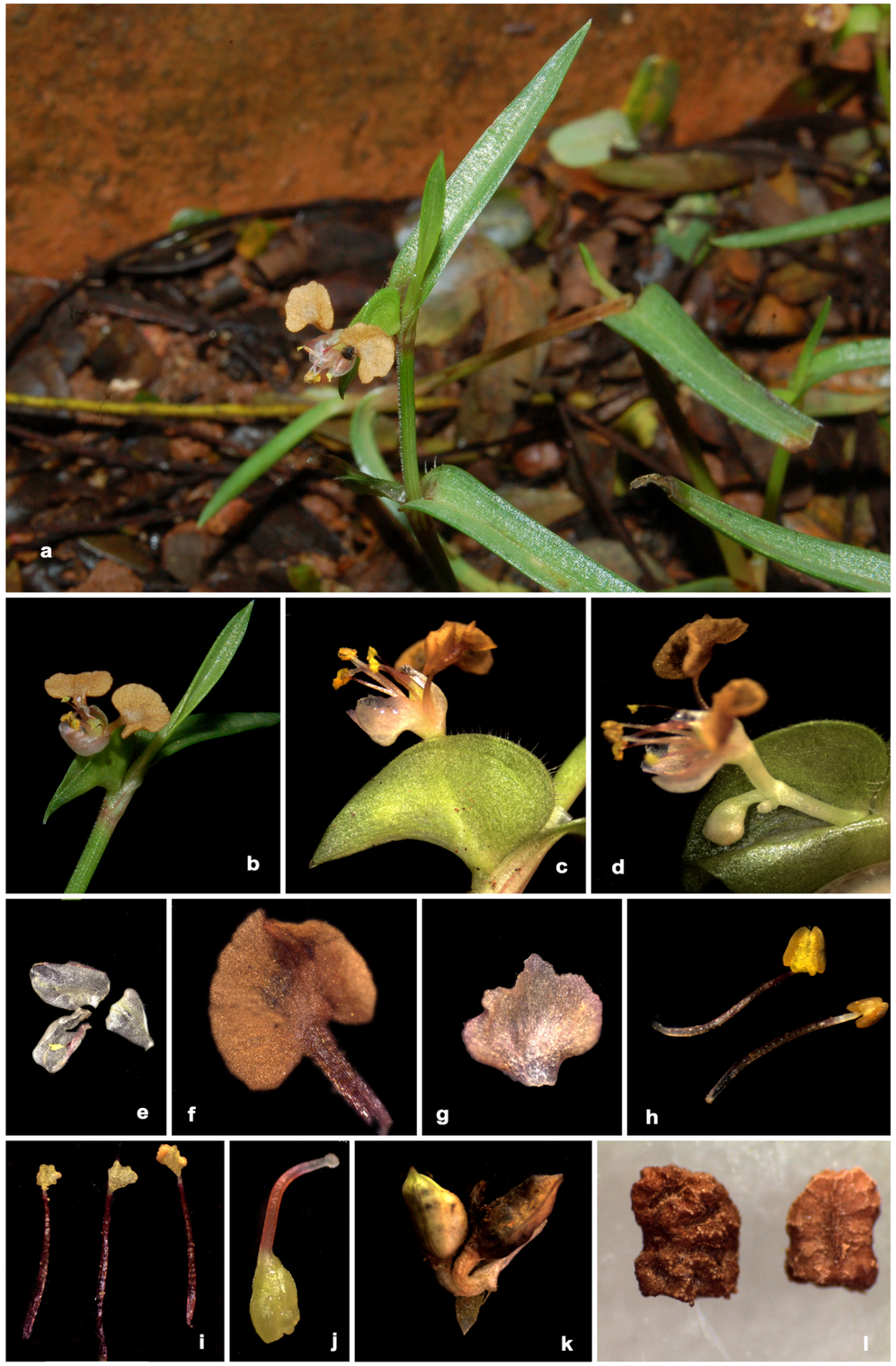


Plate 59. *Commelina subulata* Roth: **a.** Habit; **b-d.** Spathe with cincinni bearing opened flowers- side view; **e.** Sepals; **f.** Clawed petal; **g.** Odd petal; **h.** Stamens; **i.** Staminodes; **j.** Gynoecium; **k.** Capsule; **l.** Seed- dorsal & ventral views (**a-k** from *Manudev & Sheba 3783;* **l** from *Joby & Ratheesh 1152*).

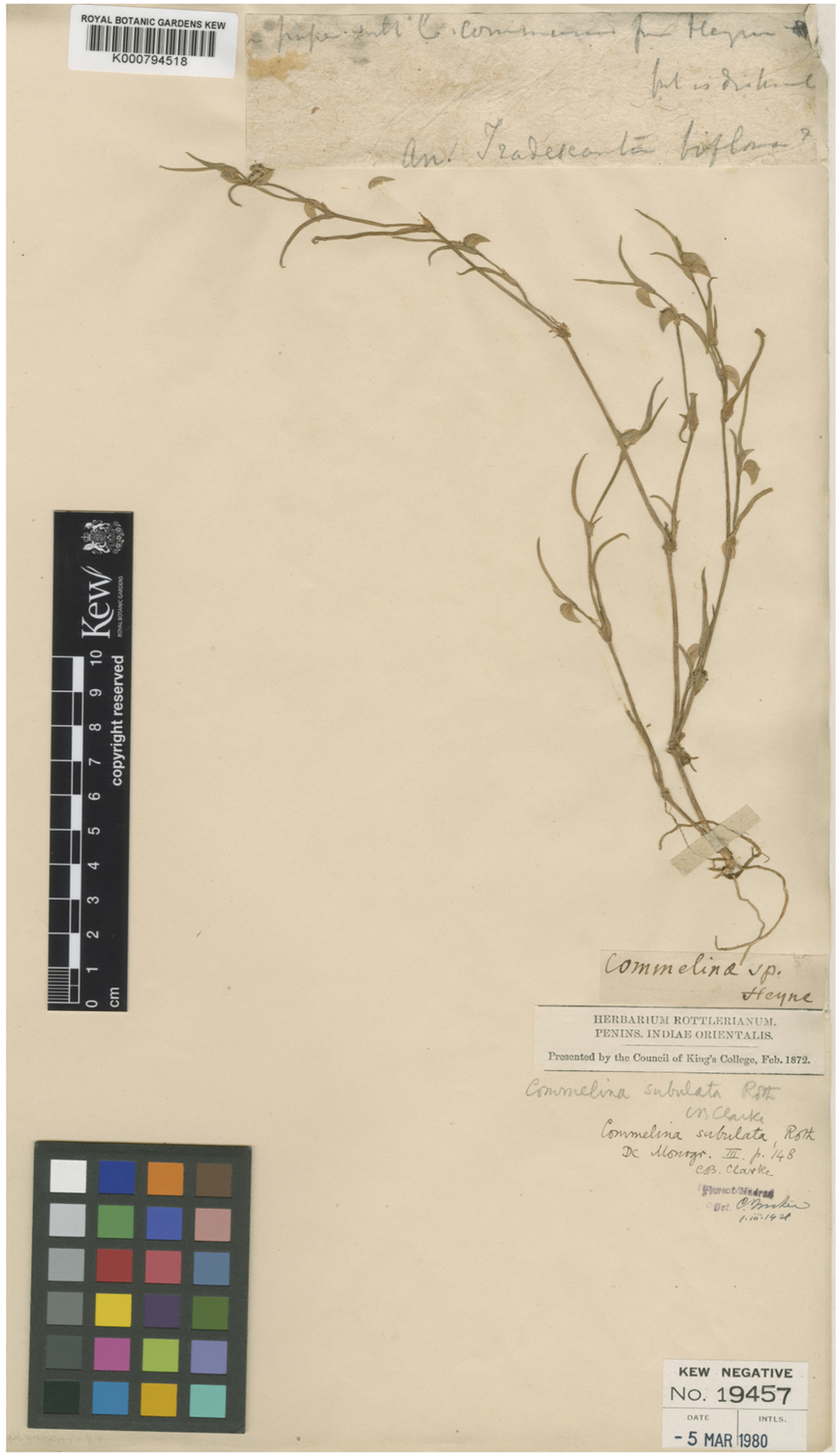


Plate 60. Type of *Commelina subulata* Roth

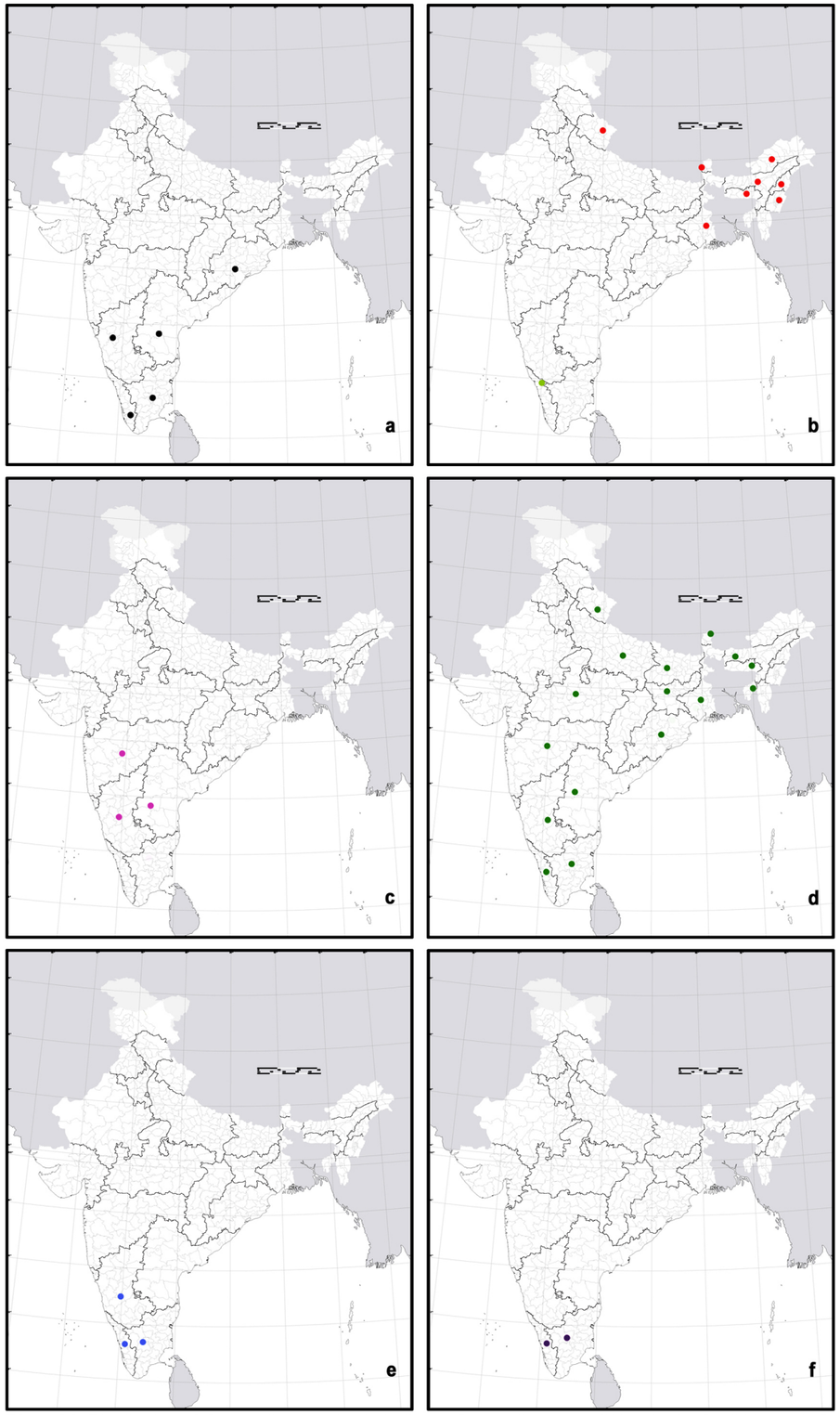


Plate 61. Distribution of *Commelina* species in India. **a**. *Commelina petersii* Hassk.; **b**. *C. sikkimensis* C. B.Clarke; **c**. *C. subulata* Roth; **d**. *C. suffruticosa* Blume; **e**. *C. tricolor* E. Barnes; **f**. *C. wightii* R.S. Rao.



Plate 62. *Commelina suffruticosa* Blume: **a.** Flowering twig; **b.** Spathe with opened flowers- front view; **c.** Spathe- side view; **d.** Lower cincinnus bearing flower buds; **e.** Flower- front view; **f.** Sepals; **g.** Clawed petal; **h.** Odd petal; **i.** Stamens; **j.** Staminodes; **k.** Gynoecium; **l.** Capsules; **m.** Seed- dorsal & ventral views (**a-l** from *Sheba & Santhosh Nampy 4042*; **m** from *Dineshraj & Santhosh Nampy 824*).



Plate 63. Lectotype of *Commelina suffruticosa* Blume

Plate 64. *Commelina tricolor* E. Barnes: **a.** Habit; **b.** Spathe with upper & lower cincinni bearing opened flowers- side view; **c.** Seed- dorsal & ventral views (**a** from *Manudev 5272*; **b** from *Sheba & Manudev 4152*; **c** from *Joby & Santhosh Nampy 891*).



Plate 65. Lectotype of *Commelina tricolor* E.Barnes



Plate 66. *Commelina wightii* R.S. Rao: **a.** Habit; **b.** Spathe with cincinni bearing opened flowers- side view; **c.** Spathe enlarged; **d.** Flower- side view; **e.** Sepals; **f.** Clawed petal; **g.** Odd petal; **h.** Stamens & staminodes; **i.** Stamens; **j.** Staminode; **k.** Gynoecium; **l.** Seed- dorsal & ventral views (all from *Seba & Santhosh Nampy 3292*).



Plate 67. Lectotype (**A**) of *Commelina wightii* R.S. Rao

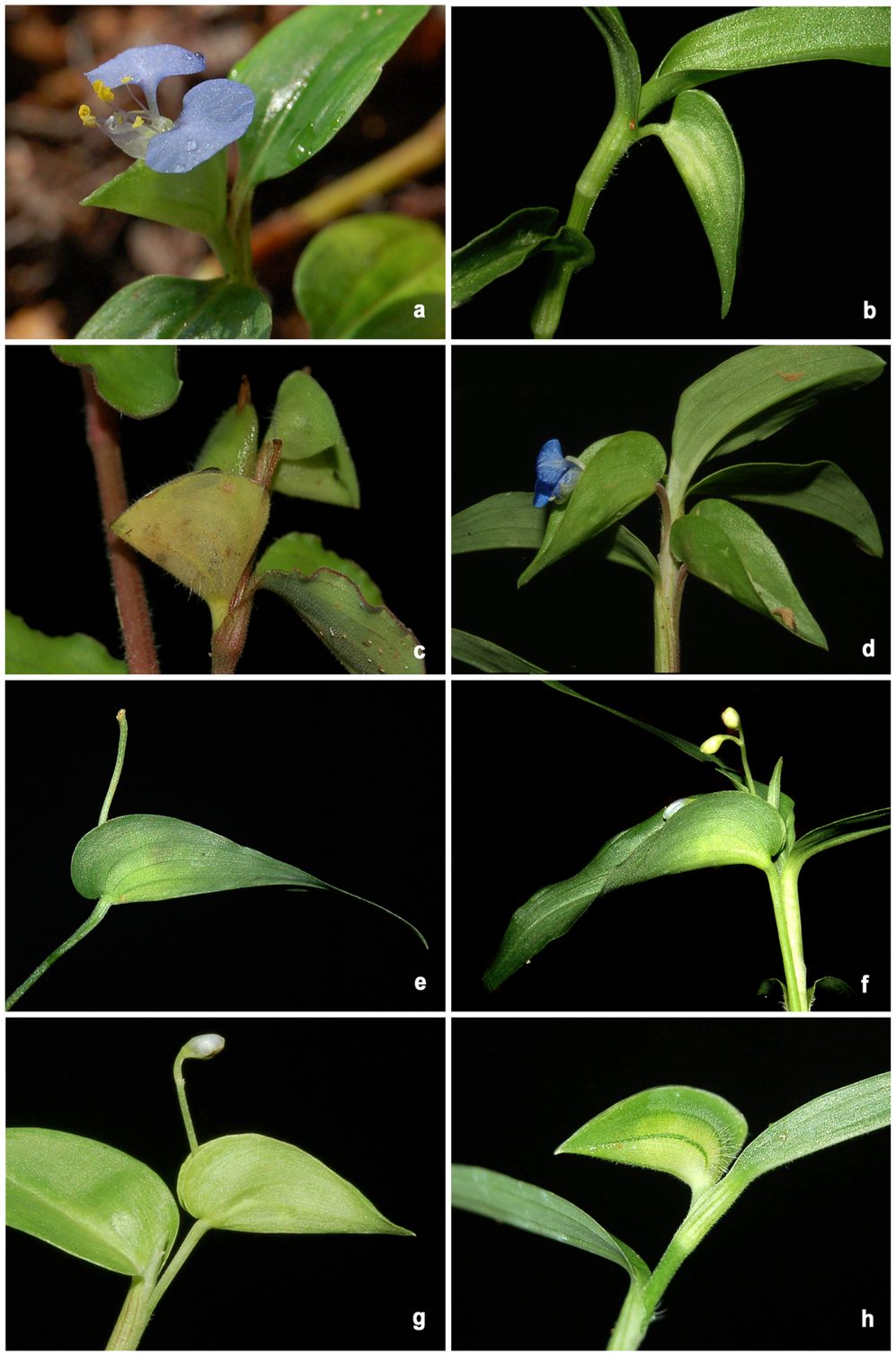


Plate 68. Spathes of *Commelina* species. **a.** *C. andamanica* Sheba & Nampy; **b.** *C. attenuata* Vahl; **c.** *C. benghalensis* L.; **d**. *C. caroliniana* Walter; **e.** *C. clavata* C.B. Clarke; **f.** *C. clavatoides* Nampy & Sheba; **g.** *C. diffusa* Burm.f.; **h.** *C. ensifolia* R. Br.

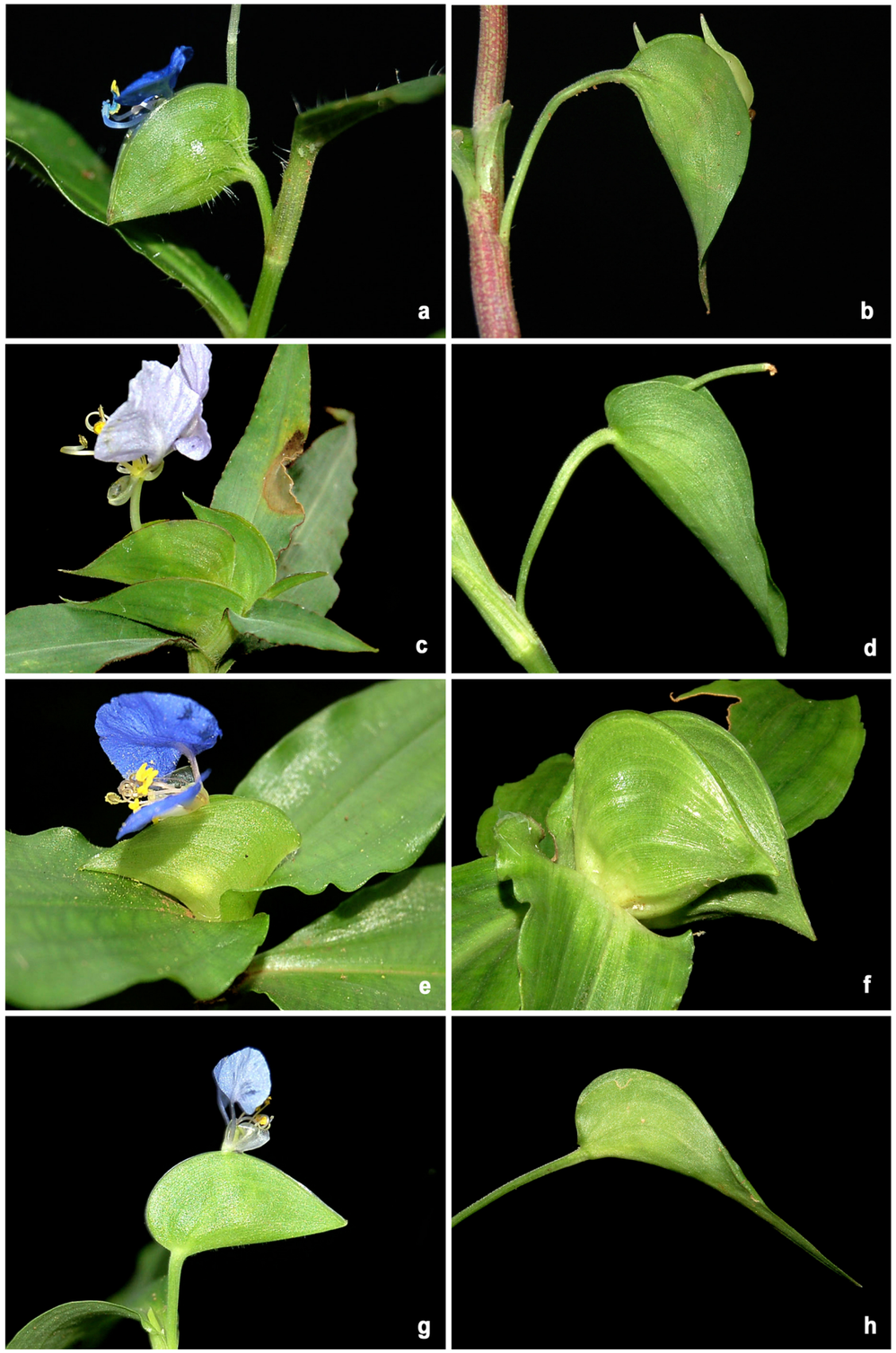


Plate 69. Spathes of *Commelina* species. **a.** *C. forskalaei* Vahl; **b.** *C. indehiscens* E. Barnes; **c.** *C. kurzii* C.B. Clarke; **d**. *C. longifolia* Lam.; **e.** *C. maculata* Edgew.; **f.** *C. paludosa* Blume; **g.** *C. petersii* Hassk.; **h.** *C. sikkimensis* C.B. Clarke.

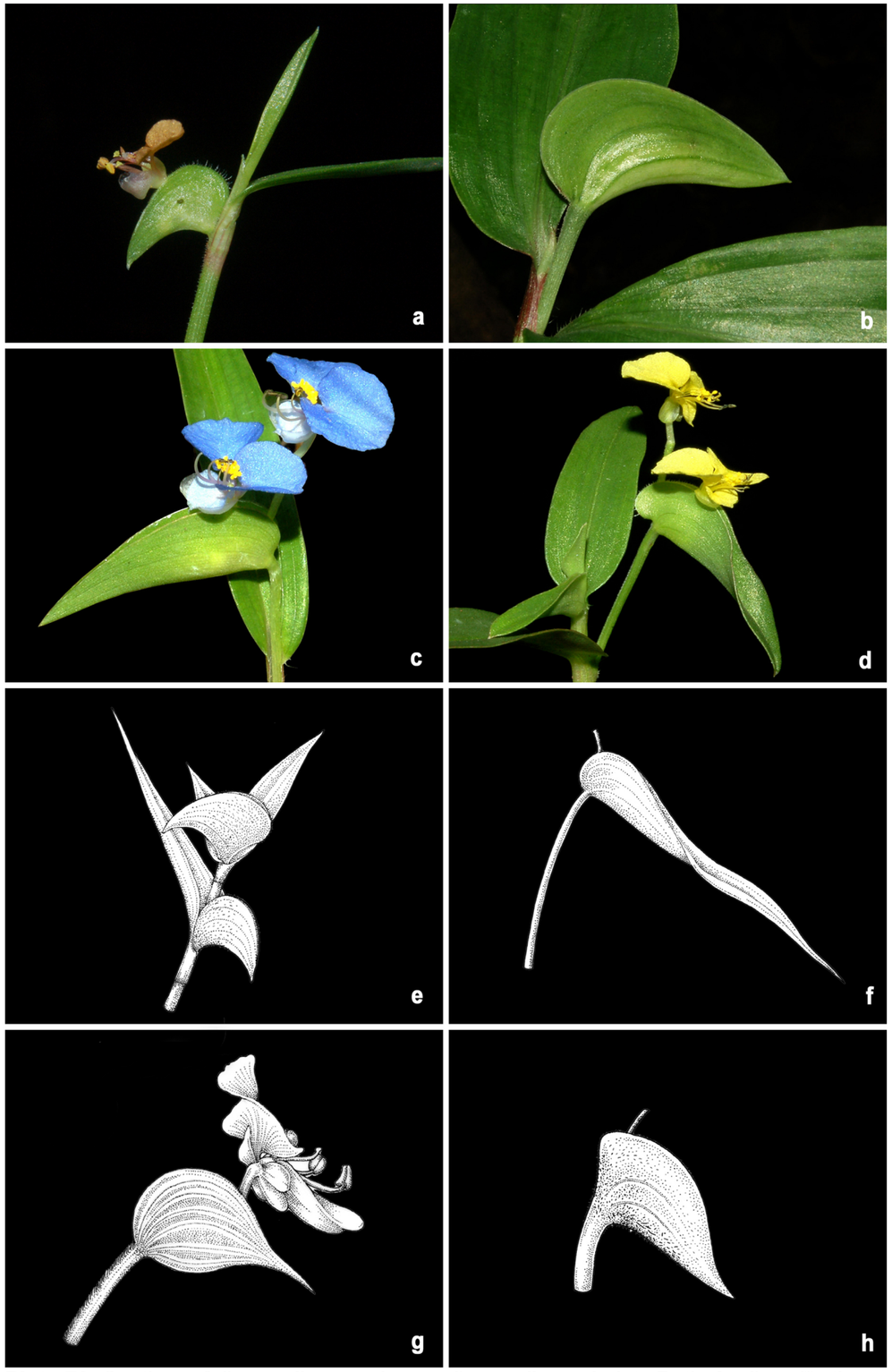


Plate 70. Spathes of *Commelina* species. **a.** *Commelina subulata* Roth; **b.** *C. suffruticosa* Blume; **c.** *C. tricolor* E. Barnes; **d**. *C. wightii* R.S. Rao.; **e.** *Commelina albescens* Hassk.; **f.** *C. appendiculata* C.B. Clarke; **g.** *C. coelestis* Wild.; **h**. *C. paleata* Hassk. (**e-h** drawn from herbarium specimens)

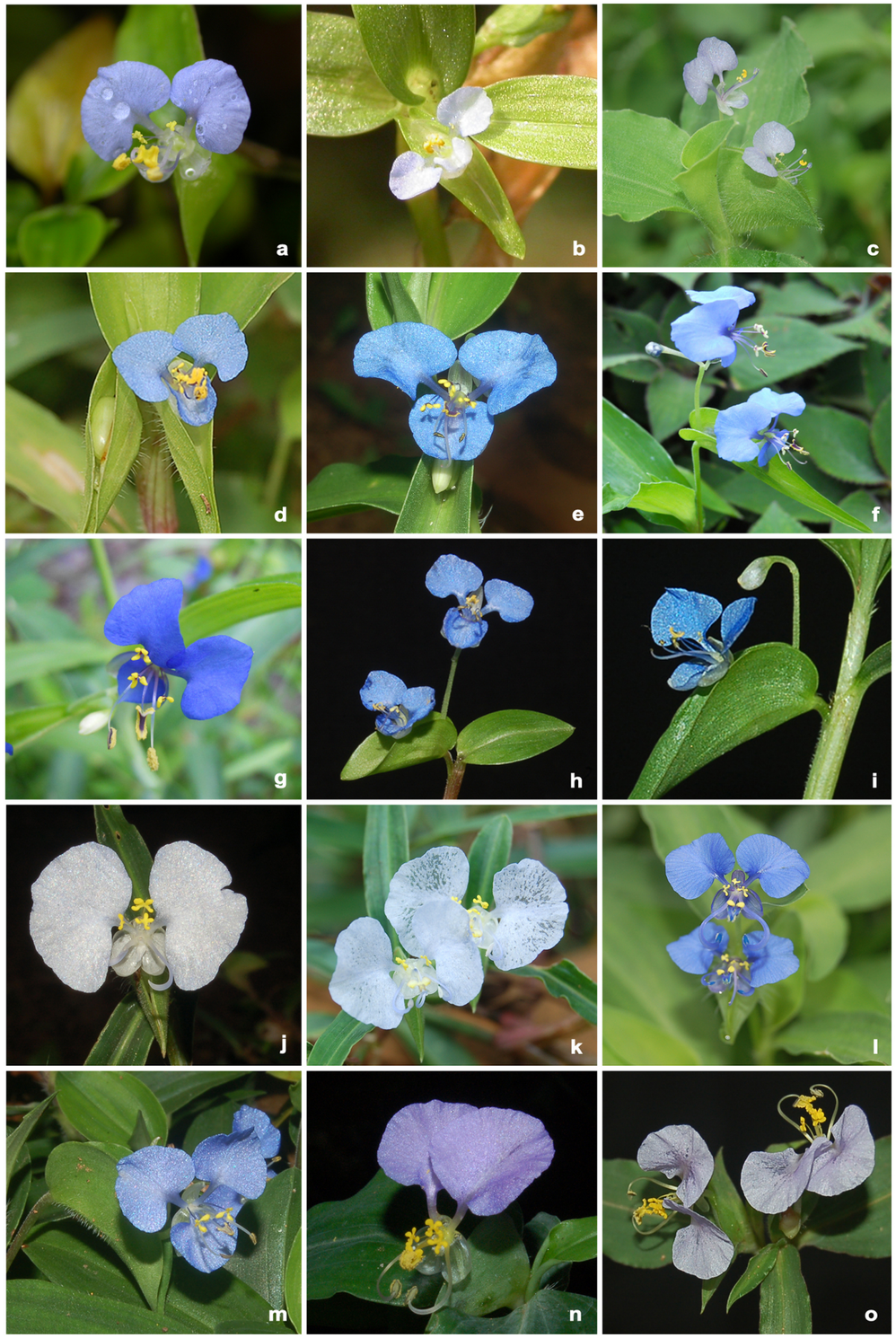


Plate 71. Flowers of *Commelina* species. **a.** *C. andamanica* Sheba & Nampy; **b.** *C. attenuata* Vahl; **c.** *C. benghalensis* L.; **d**. *C. caroliniana* Walter; **e.** *C. clavata* C.B. Clarke; **f & g.** *C. clavatoides* Nampy & Sheba; **h & i.** *C. diffusa* Burm.f.; **j & k.** *C. ensifolia* R. Br.; **l.** *C. forskalaei* Vahl.; **m.** *C. indehiscens* E. Barnes; **n & o.** *C. kurzii* C.B. Clarke.



Plate 72. Flowers of *Commelina* species. **a & b.** *C. kurzii* C.B. Clarke; **c**. *C. longifolia* Lam.; **d.** *C. maculata* Edgew.; **e.** *C. paleata* Hassk.; **f & g.** *C. paludosa* Blume; **h.** *C. petersii* Hassk.; **i & j.** *C. sikkimensis* C.B. Clarke; **k.** *C. subulata* Roth; **l.** *C. suffruticosa* Blume; **m**. *C. tricolor* E. Barnes; **n & o**. *C. wightii* R.S. Rao.

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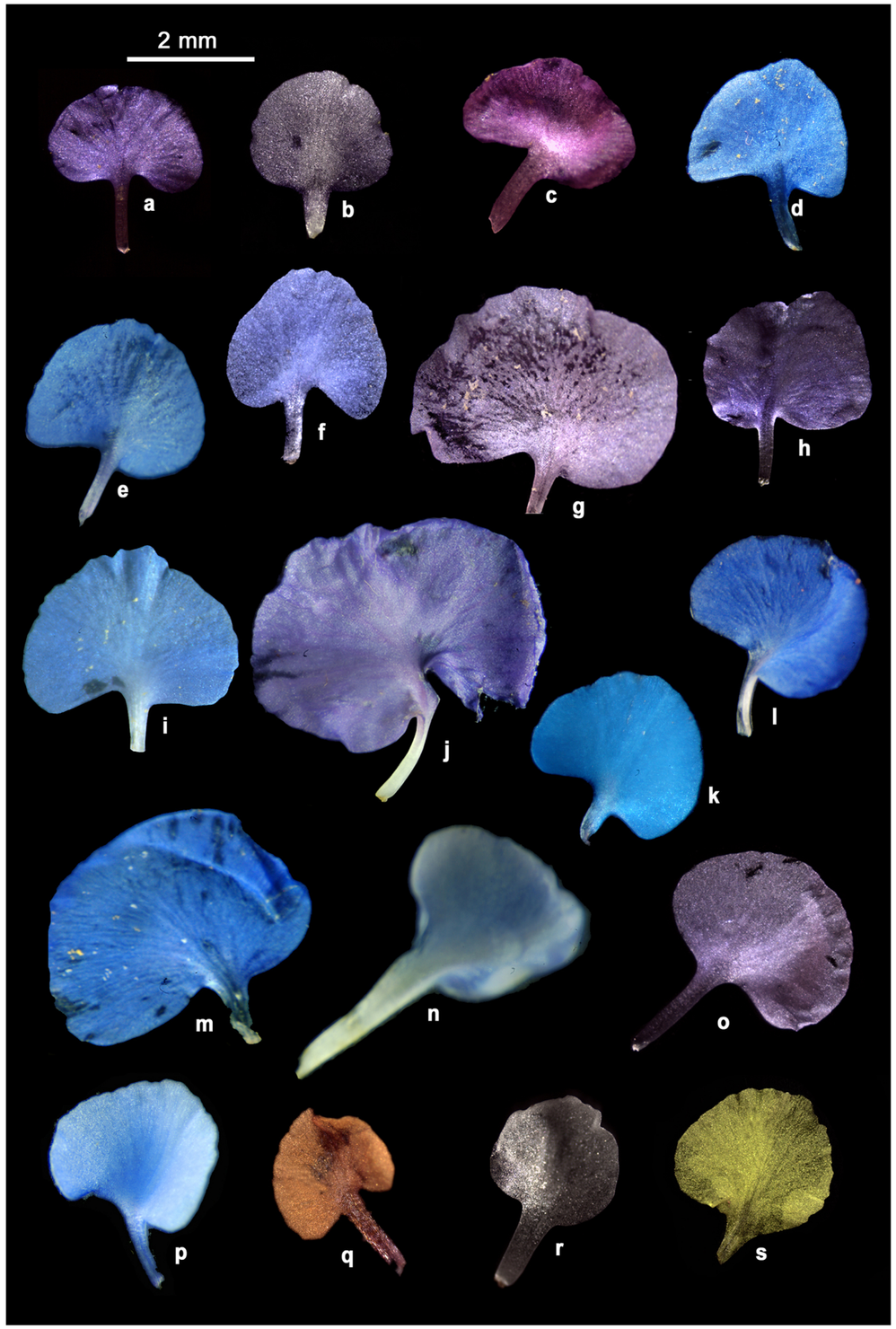


Plate 73. Clawed petals of *Commelina* species. **a.** *C. andamanica* Sheba & Nampy; **b.** *C. attenuata* Vahl; **c.** *C. benghalensis* L.; **d**. *C. caroliniana* Walter; **e.** *C. clavata* C.B. Clarke; **f.** *C. diffusa* Burm.f.; **g.** *C. ensifolia* R. Br.; **h.** *C. forskalaei* Vahl; **i.** *C. indehiscens* E. Barnes; **j.** *C. kurzii* C.B. Clarke; **k**. *C. longifolia* Lam.; **l.** *C. maculata* Edgew.; **m.** *C. paleata* Hassk.; **n.** *C. paludosa* Blume; **o.** *C. petersii* Hassk.; **p.** *C. sikkimensis* C.B. Clarke; **q.** *C. subulata* Roth; **r.** *C. suffruticosa* Blume; **s**. *C. wightii* R.S. Rao.



Plate 74. Odd petals of *Commelina* species. **a.** *C. andamanica* Sheba & Nampy; **b.** *C. attenuata* Vahl; **c.** *C. benghalensis* L.; **d**. *C. caroliniana* Walter; **e.** *C. clavata* C.B. Clarke; **f.** *C. diffusa* Burm. f.; **g.** *C. ensifolia* R. Br.; **h.** *C. forskalaei* Vahl; **i.** *C. indehiscens* E. Barnes; **j.** *C. kurzii* C.B. Clarke; **k**. *C. longifolia* Lam.; **l.** *C. maculata* Edgew.; **m.** *C. paleata* Hassk.; **n.** *C. paludosa* Blume; **o.** *C. petersii* Hassk.; **p.** *C. sikkimensis* C.B. Clarke; **q.** *C. subulata* Roth; **r.** *C. suffruticosa* Blume; **s**. *C. wightii* R.S. Rao.



Plate 75. Stamens of *Commelina* species (**a1-s1**. Lateral stamen; **a2-s2**. Medial stamen). **a.** *C. andamanica* Sheba & Nampy; **b.** *C. attenuata* Vahl; **c.** *C. benghalensis* L.; **d**. *C. caroliniana* Walter; **e.** *C. clavata* C.B. Clarke; **f.** *C. diffusa* Burm.f.; **g.** *C. ensifolia* R. Br.; **h.** *C. forskalaei* Vahl; **i.** *C. indehiscens* E. Barnes; **j.** *C. kurzii* C.B. Clarke; **k**. *C. longifolia* Lam.; **l.** *C. maculata* Edgew.; **m.** *C. paleata* Hassk.; **n.** *C. paludosa* Blume; **o.** *C. petersii* Hassk.; **p.** *C. sikkimensis* C.B. Clarke; **q.** *C. subulata* Roth; **r.** *C. suffruticosa* Blume; **s**. *C. wightii* R. S. Rao.



Plate 76. Staminodes of *Commelina* species. **a.** *C. andamanica* Sheba & Nampy; **b.** *C. attenuata* Vahl; **c.** *C. benghalensis* L.; **d**. *C. caroliniana* Walter; **e.** *C. clavata* C.B. Clarke; **f.** *C. diffusa* Burm. f.; **g.** *C. ensifolia* R. Br.; **h.** *C. forskalaei* Vahl; **i.** *C. indehiscens* E. Barnes; **j.** *C. kurzii* C.B. Clarke; **k**. *C. longifolia* Lam.; **l.** *C. maculata* Edgew.; **m.** *C. paleata* Hassk.; **n.** *C. paludosa* Blume; **o.** *C. petersii* Hassk.; **p.** *C. sikkimensis* C.B. Clarke; **q.** *C. subulata* Roth; **r.** *C. suffruticosa* Blume; **s**. *C. wightii* R.S. Rao.

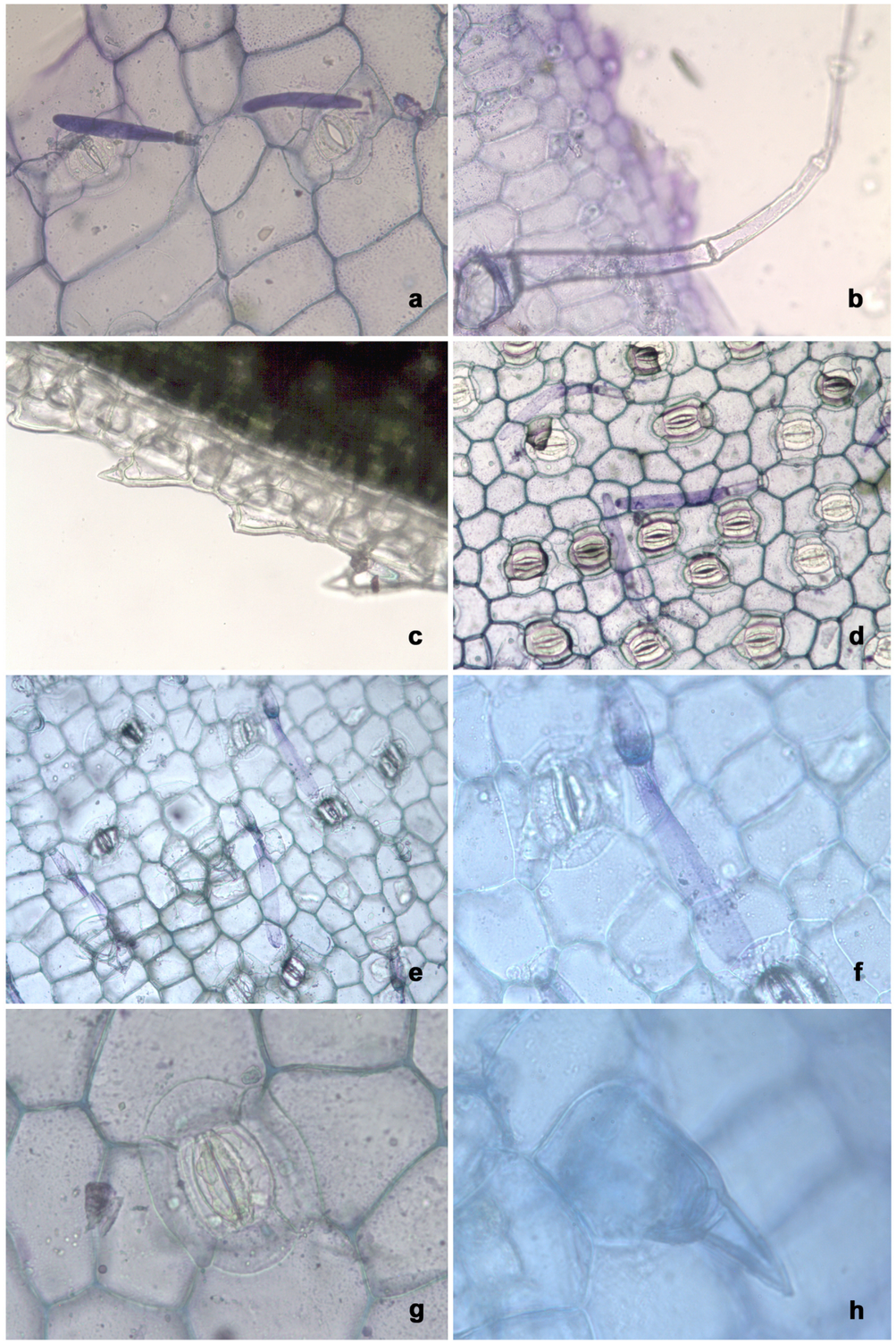


Plate 7. Foliar epidermis of *Commelina* species. (**a-b**) *C. forskalaei* Vahl: **a-b.** Adaxial epidermis. (**c-h**) *C. indehiscens* E. Barnes: **c-d.** Abaxial epidermis; **e-h.** Adaxial epidermis.

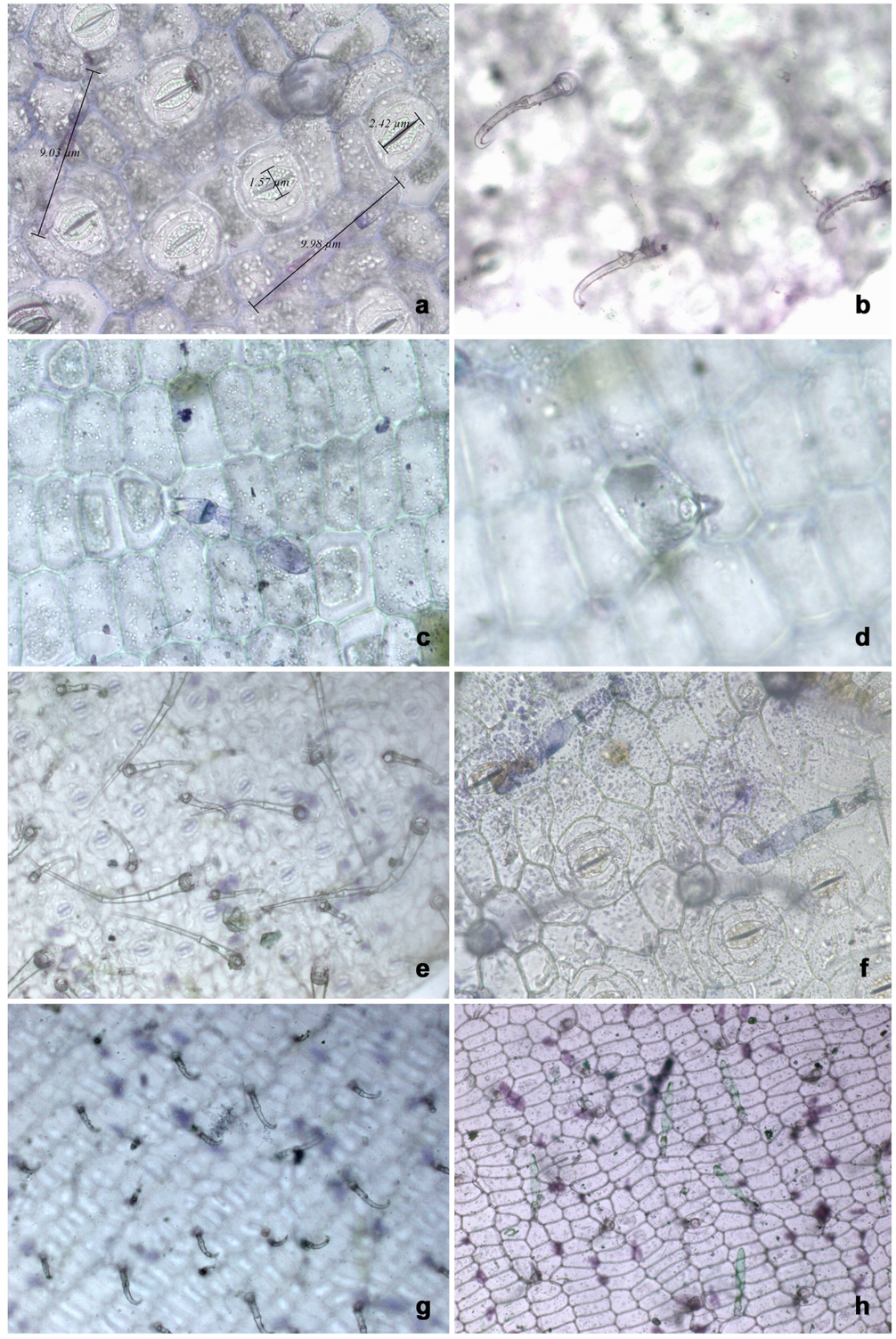


Plate 8. Foliar epidermis of *Commelina* species. (**a-d**) *C. kurzii* C.B. Clarke (Gudalore): **a-b.** Abaxial epidermis; **c-d**. Adaxial epidermis. (**e-h**) *C. kurzii* C.B. Clarke (Kodaikanal): **e-f.** Abaxial epidermis; **g-h.** Adaxial epidermis.

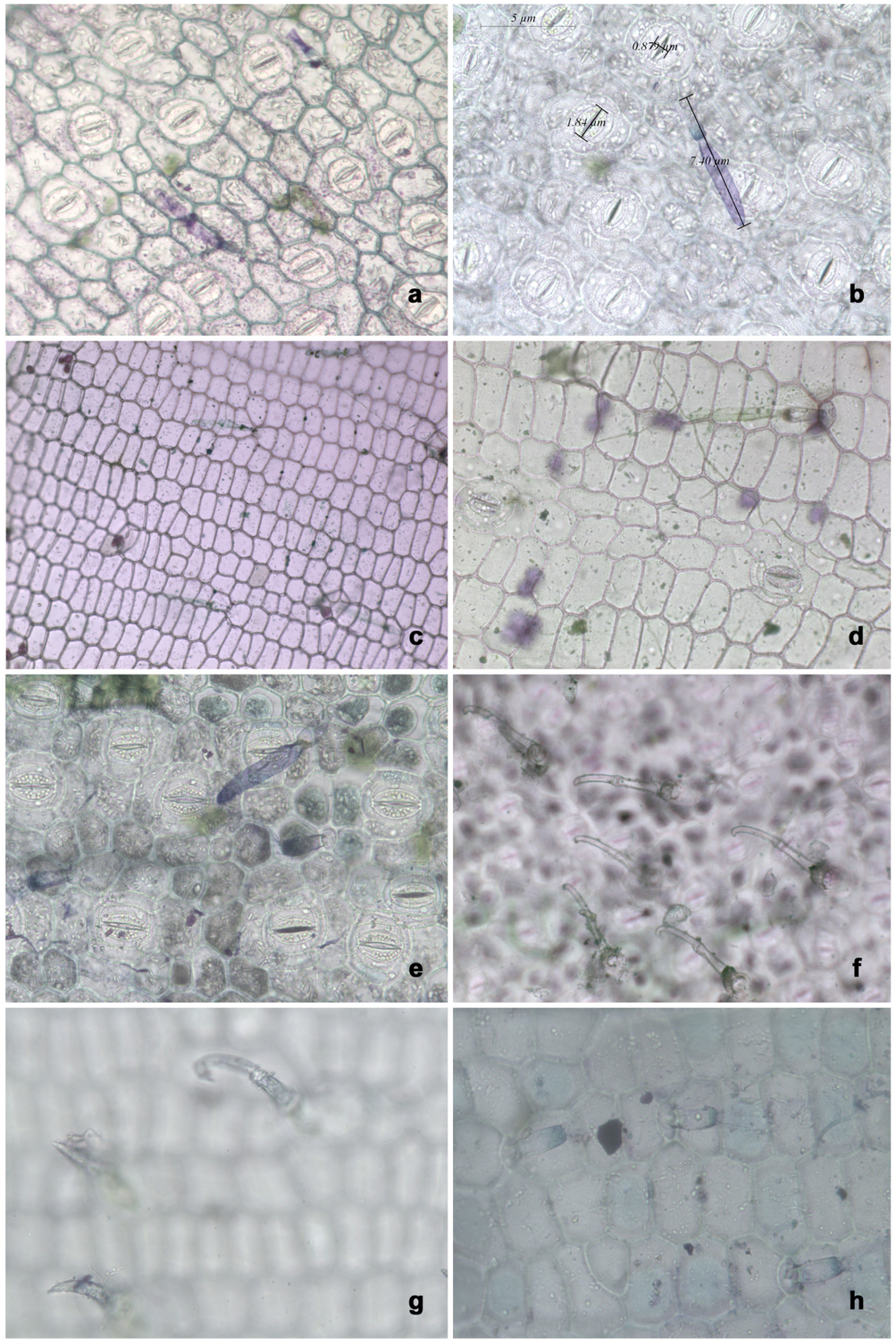


Plate 9. Foliar epidermis of *Commelina* species. (**a-d**) *C. kurzii* C.B. Clarke (Maruthamalai): **a-b.** Abaxial epidermis; **c-d**. Adaxial epidermis. (**e-h**) *C. kurzii* C.B. Clarke (Thannithode): **e-f.** Abaxial epidermis; **g-h.** Adaxial epidermis.

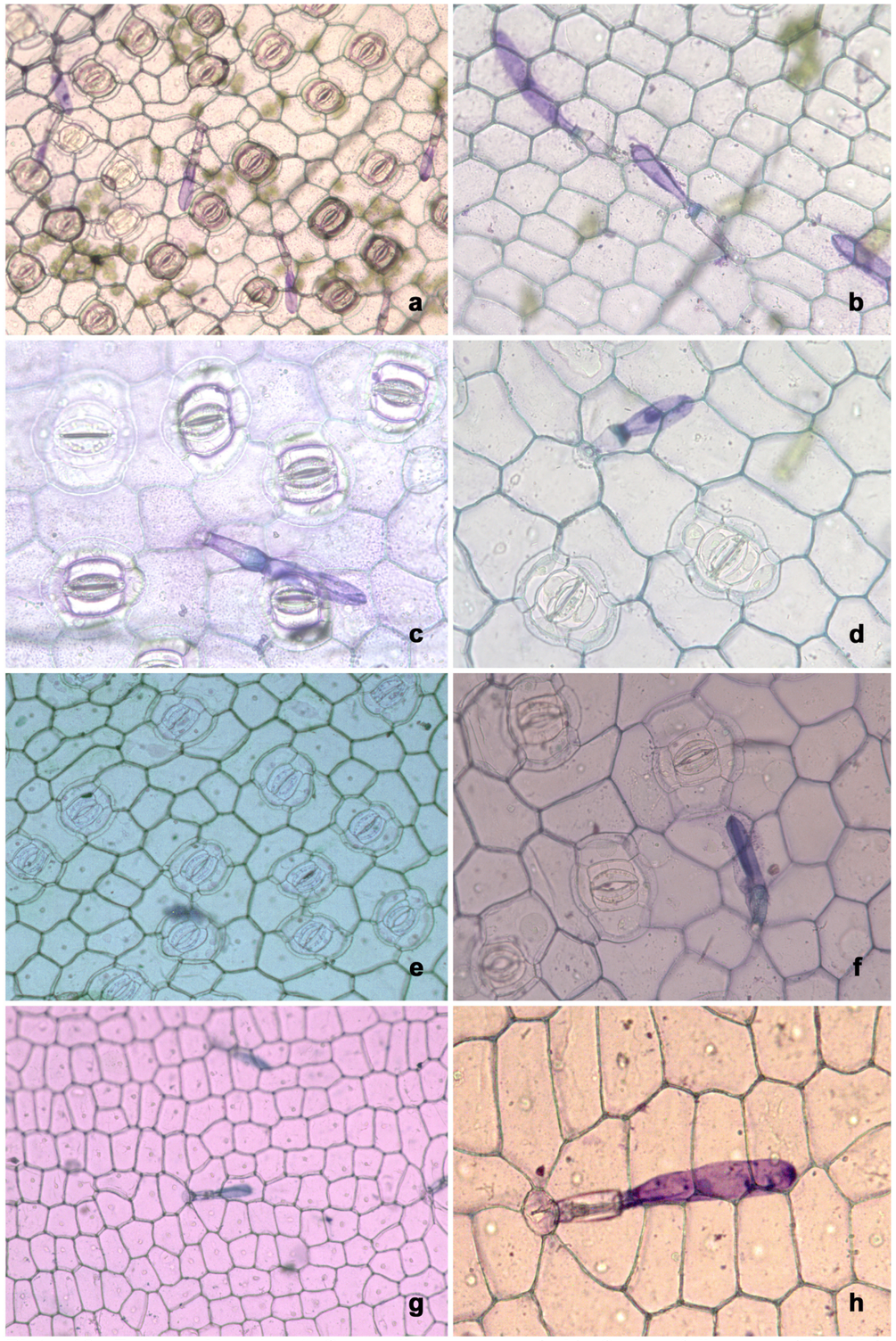


Plate 10. Foliar epidermis of *Commelina* species. (**a-b**) *C. longifolia* Lam. (Pulpally): **a.** Abaxial epidermis; **b**. Adaxial epidermis. (**c-d**) *C. longifolia* Lam. (Pune): **c.** Abaxial epidermis; **d**. Adaxial epidermis. (**e-h**) *C. maculata* Edgew: **e-f.** Abaxial epidermis; **g-h.** Adaxial epidermis.

Introduction 1

Materials & Methods 2

3 Foliar Epidermal Studies

4 Capsule & Seed Morphology

5 Systematic treatment

6 Discussion & Summary

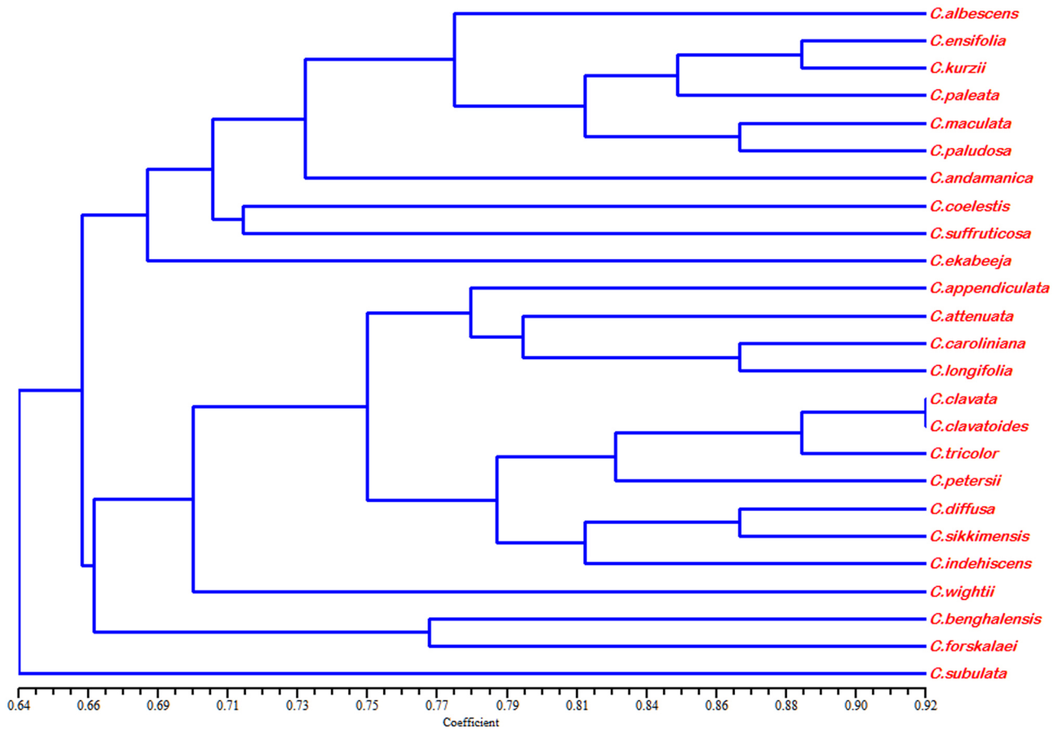
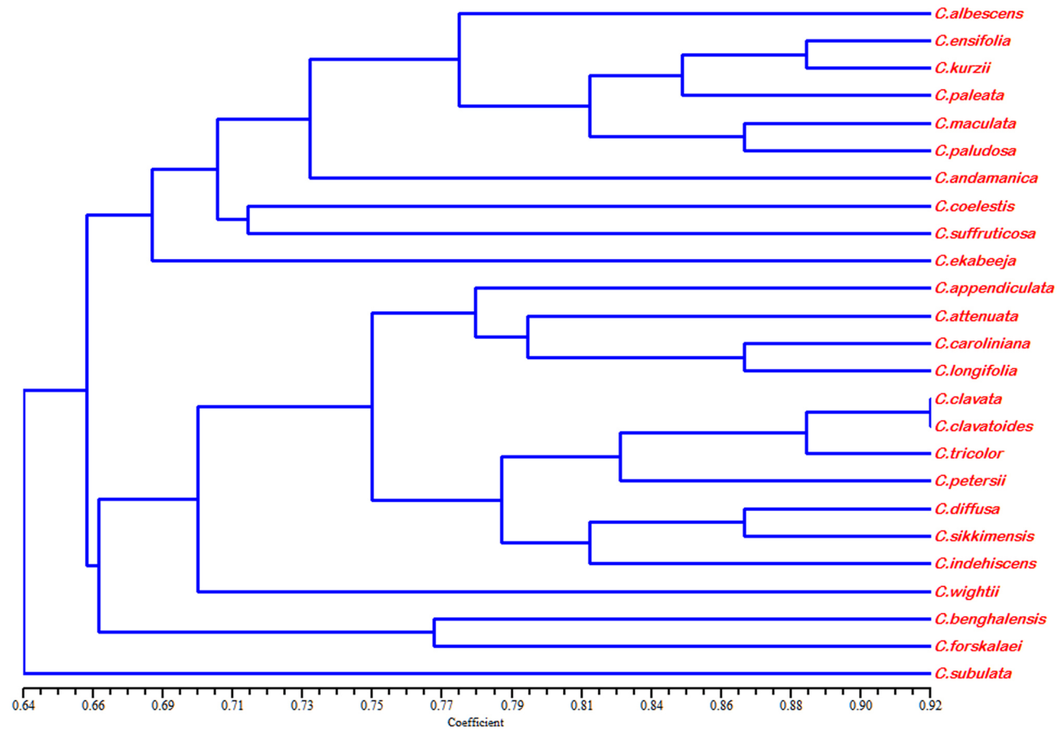


Figure 27. Dendrogram of divergence between the species of *Commelina* in India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C.ensifolia
C.kurzii
C.paleata
C.maculata
C.paludosa
C.andamanica
C.coelestis
C.suffruticosa
C.ekabeeja
C.appendiculata
C.attenuata
C.caroliniana
C.longifolia
C.clavata
C.clavatoides
C.tricolor
C.petersii
C.diffusa
C.sikkimensis
C.indehiscens
C.wightii
C.benghalensis
C.forskalaei
C.subulata
0.64 0.66 0.69 0.71 0.73 0.75 0.77 0.79 0.81 0.84 0.86 0.88 0.90 0.92
Coefficient

Figure 27. Dendrogram of divergence between the species of *Commelina* in India

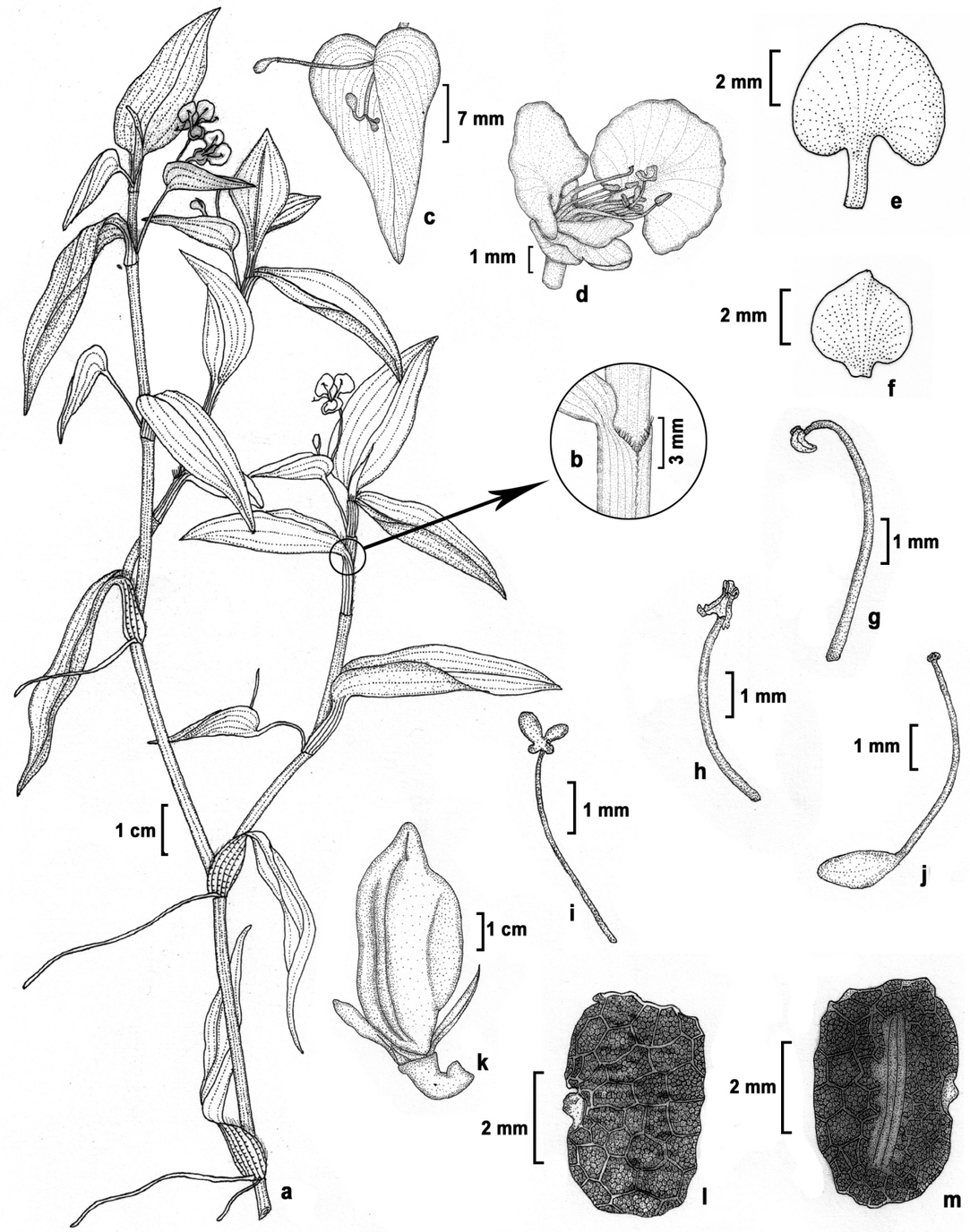

Figure 11. *Commelina diffusa* Burm.f.: **a.** Flowering twig; **b.** Summit of leaf sheath; **c.** Spathe; **d.** Flower; **e.** Clawed petal; **f.** Odd petal; **g.** Lateral stamen; **h.** Medial stamen; **i.** Staminode; **j.** Gynoecium; **k.** Capsule; **l.** Seed- dorsal view; **m.** Seed- ventral view (**a-d & g-m** from *Santhosh Nampy 140*; **e & f** from *Sheba & Manudev 3766*).

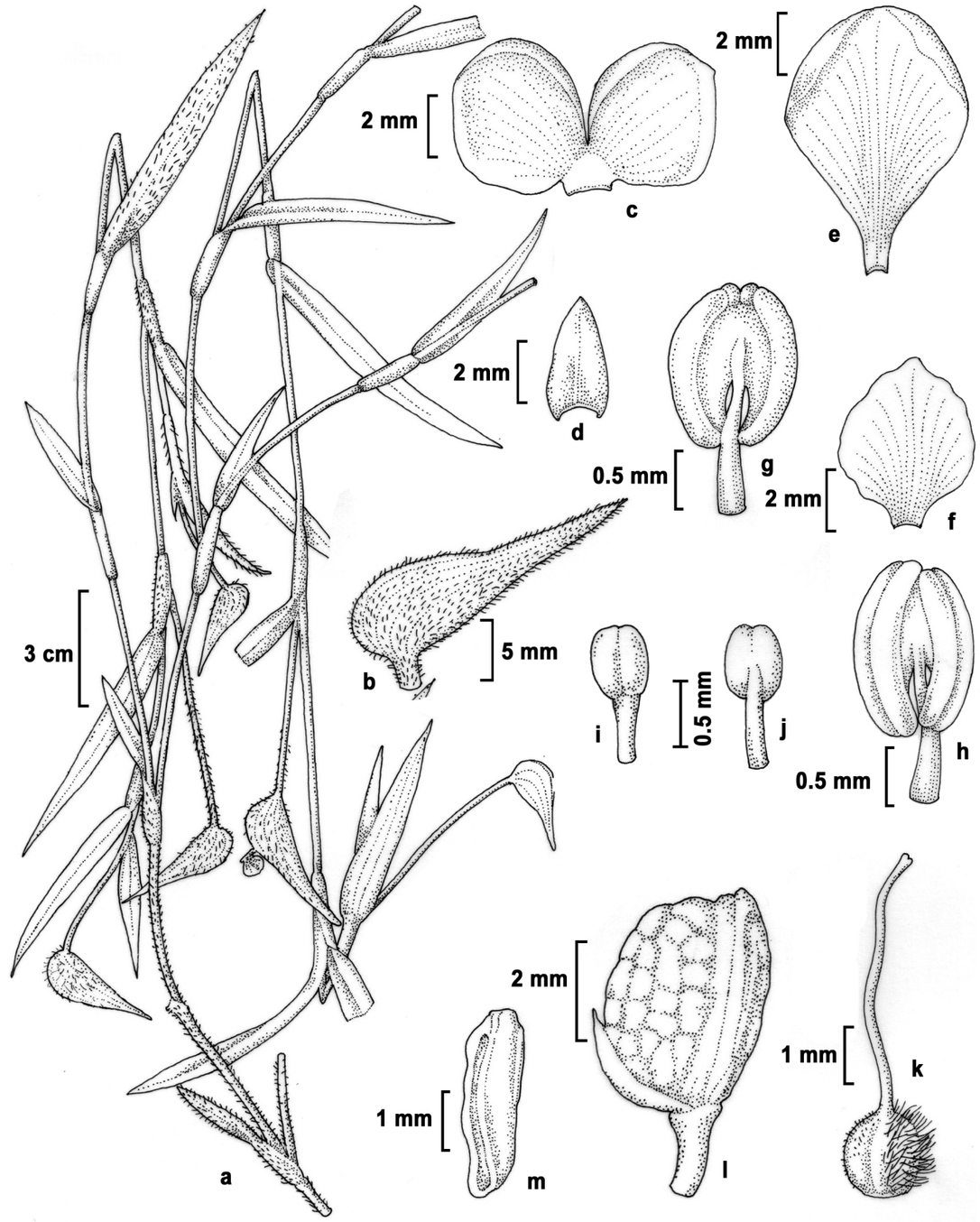

Figure 12. *Commelina ekabeeja* Sheba & Nampy *nom. nov.*: **a.** Flowering twig; **b.** Spathe; **c & d.** Sepals; **e.** Clawed petal; **f.** Odd petal; **g & h.** Stamens; **I & j.** Staminodes; **k.** Gynoecium; **l.** Capsule; **m.** Seed(redrawn from Matthew, 1998).

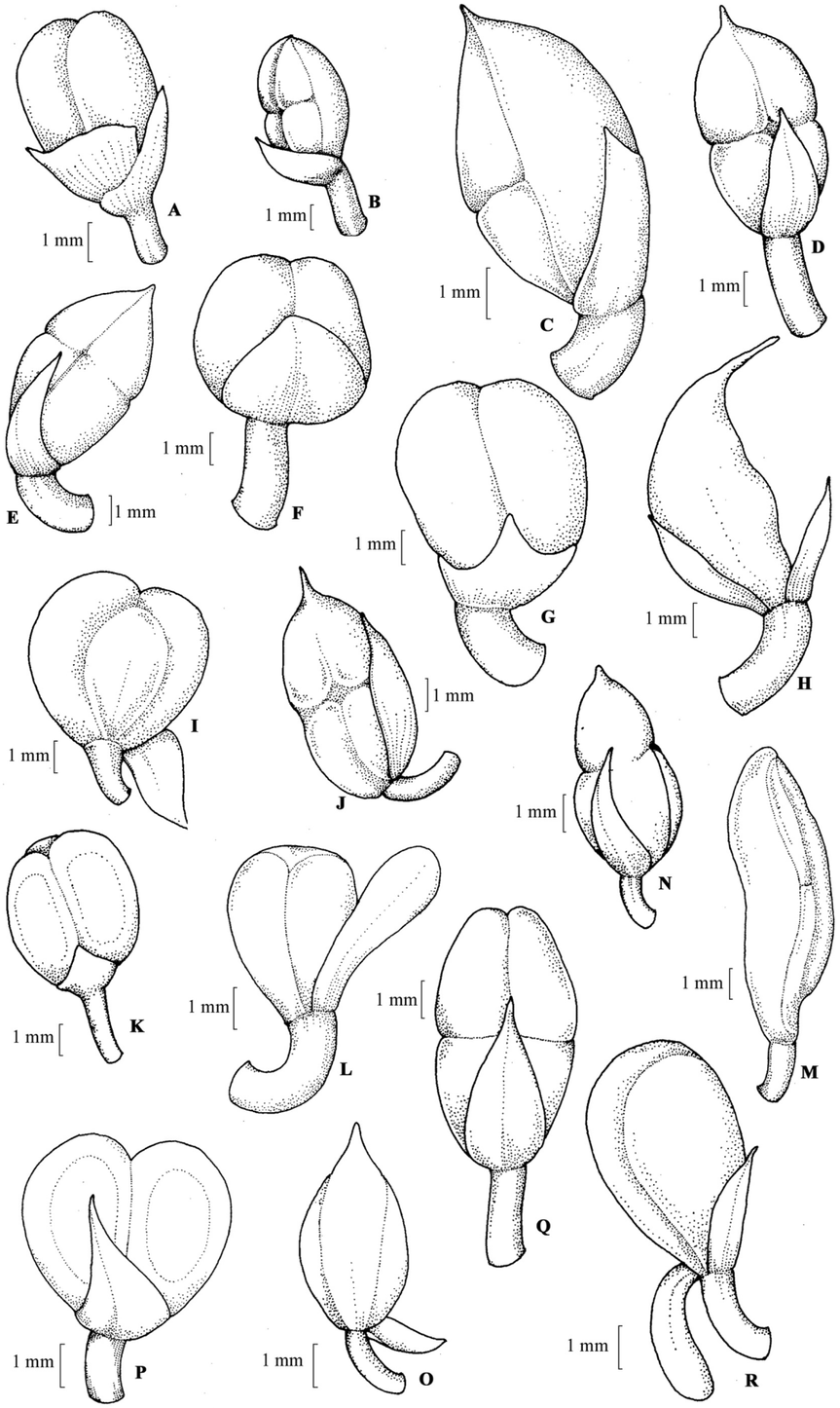

Figure 1. Capsules of *Commelina* species: **A.** *Commelina attenuata* Vahl; **b.** *C. benghalensis* L.; **b.** *C. caroliniana* Walter**; b.** *C. clavata* C.B. Clarke; **e.** *C. diffusa* Burm.f.; **f.** *C. ensifolia* R. Br.; **g.** *C. forskalaei* Vahl; **g.** *C. indehiscens* E. Barnes; **i.** *C. kurzii* C.B. Clarke; **j.** *C. longifolia* Lam.; **k.** *C. maculata* Edgew.; **l.** *C. plaudosa* Blume**; m.** *C. petersii* Hassk.; **n.** *C. sikkimensis* C.B. Clarke; **o.** *C. subulata* Roth; **p.** *C. suffruticosa* Blume; **q.** *C. tricolor* E. Barnes; **r.** *C. wightii* R.S. Rao

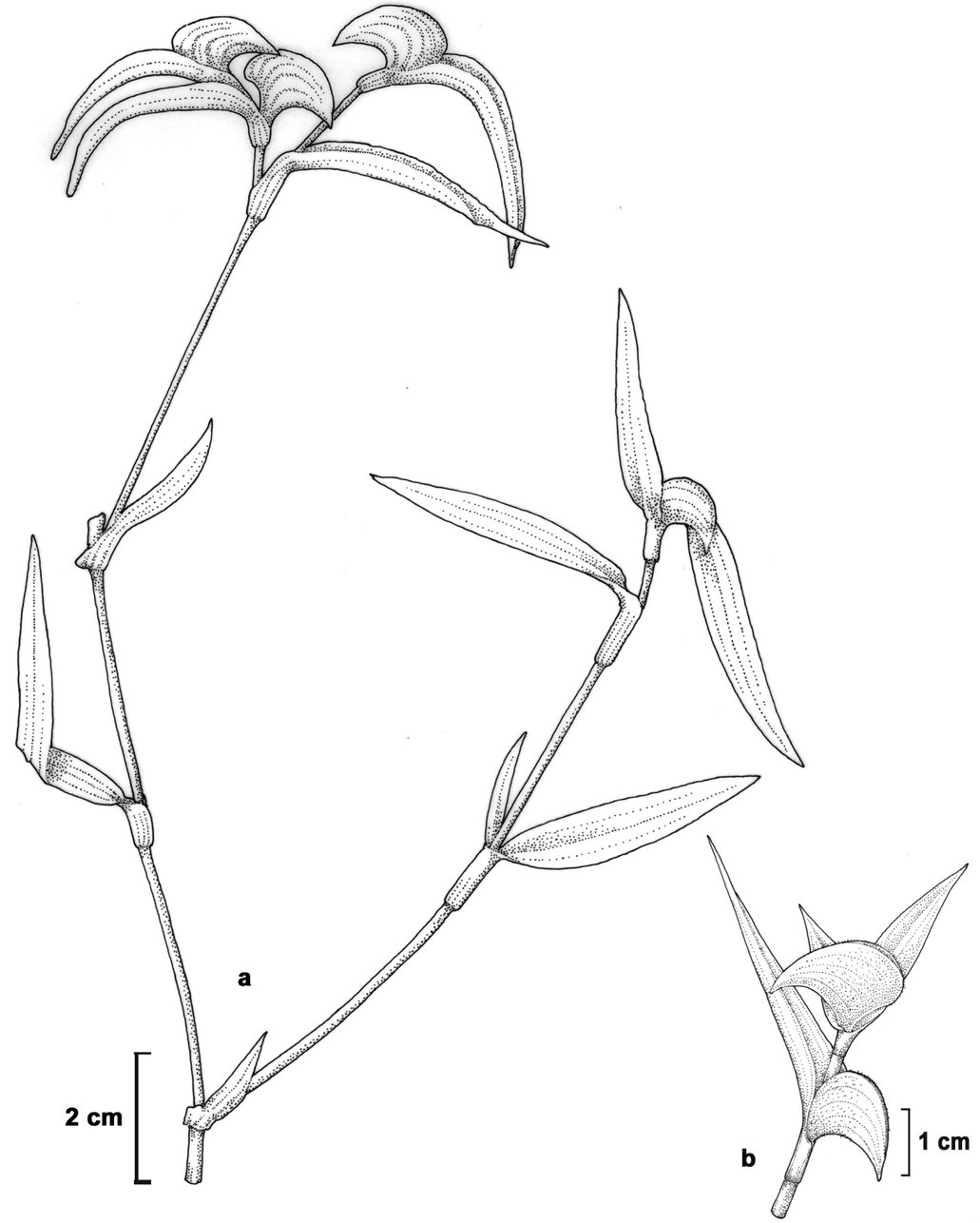

Figure 2. *Commelina albescens* Hassk. **a.** Flowering twig; **b.** Spathe.

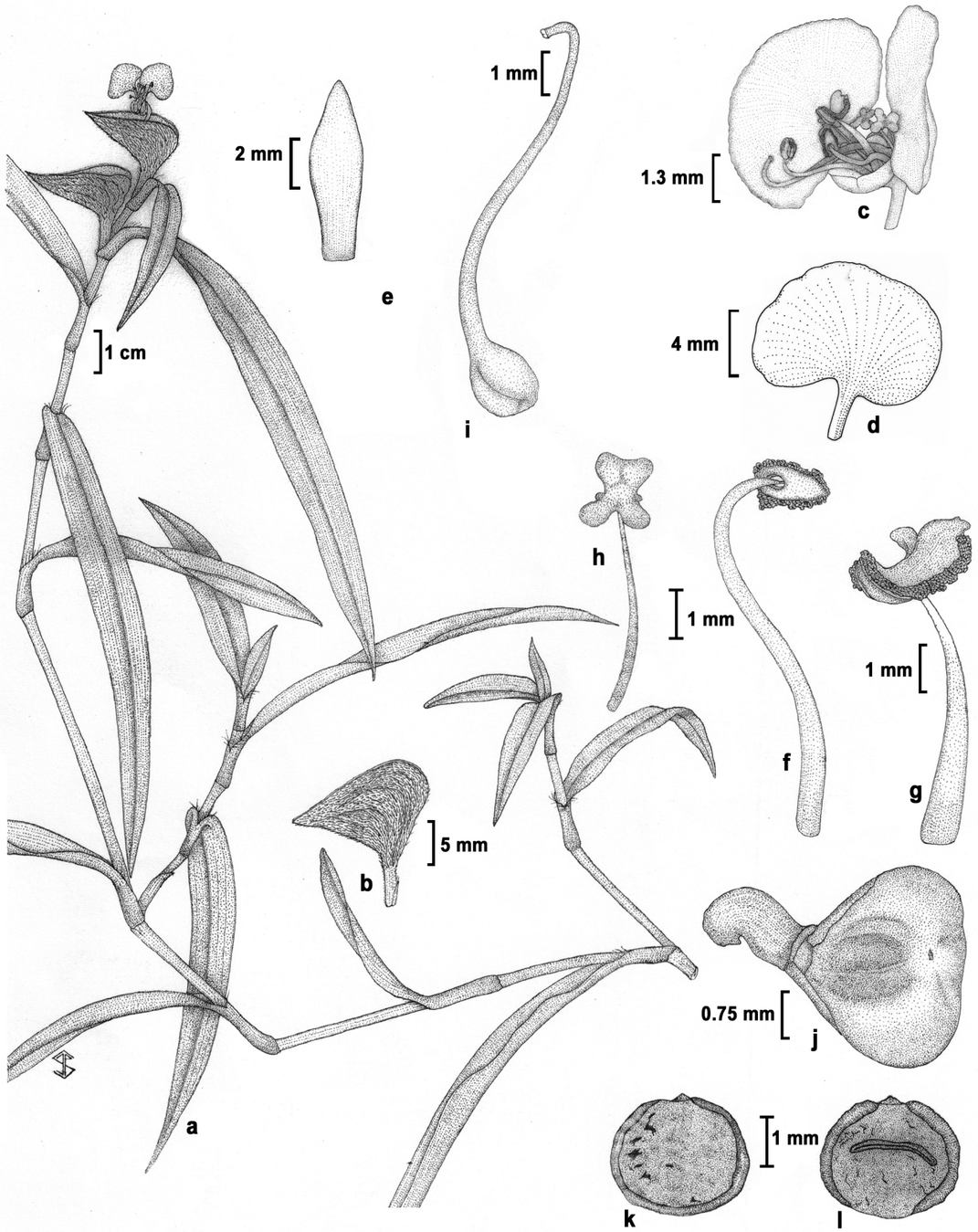

Figure 13. *Commelina ensifolia* R. Br.: **a.** Flowering twig; **b.** Spathe; **c.** Flower; **d.** Clawed petal; **e.** Odd petal; **f.** Lateral stamen; **g.** Medial stamen; **h.** Staminode; **i.** Gynoecium; **j.** Capsule; **k.** Seed- dorsal view; **l.** Seed- ventral view (**a-c & g-l** from *Santhosh Nampy & Joby 954*; **d & e** from Sheba & *Santhosh Nampy 3234*; **f** from *Sheba & Manudev 3766*).

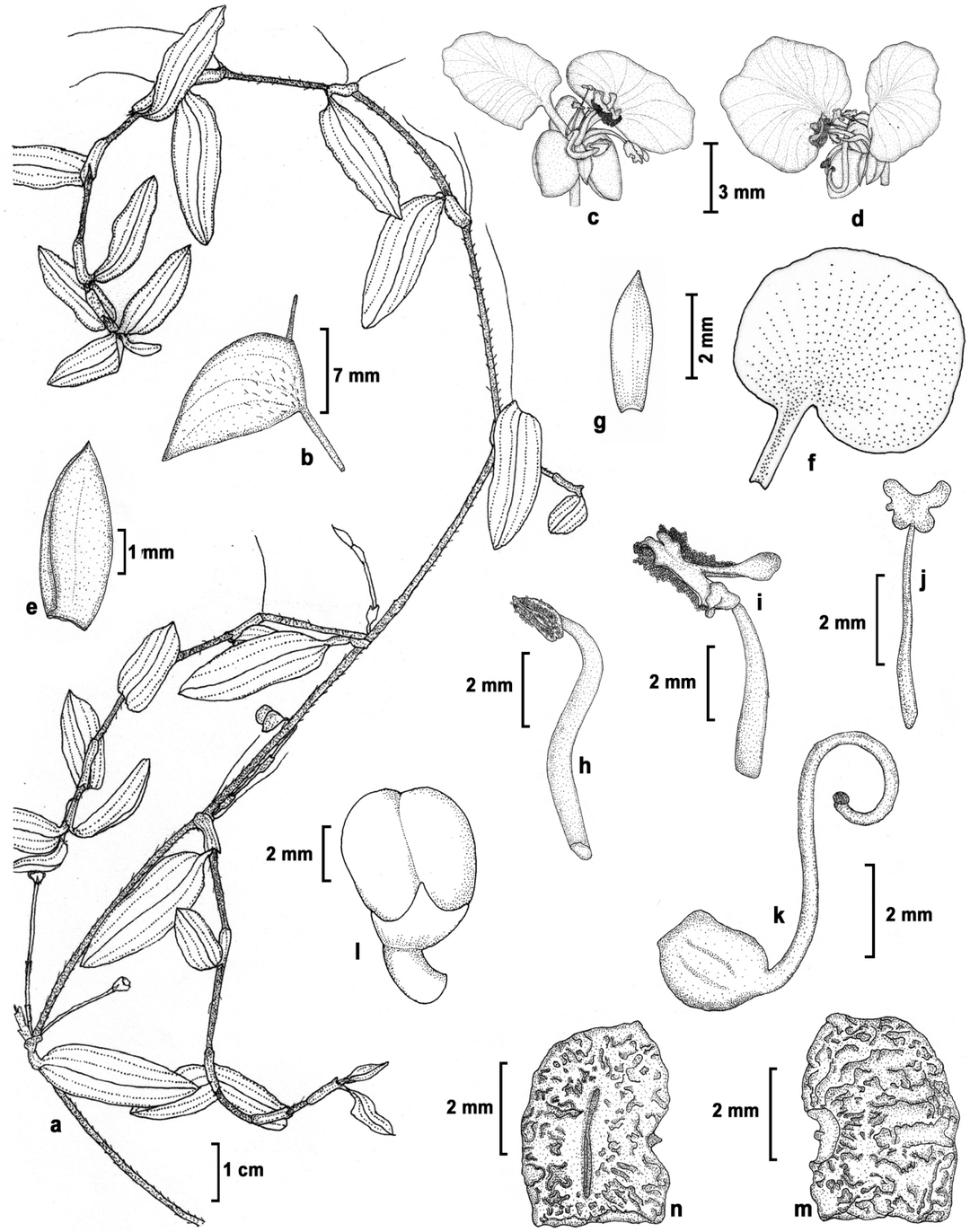

Figure 14. *Commelina forskalaei* Vahl: **a.** Flowering twig; **b.** Spathe; **c.** Male flower; **d.** Bisexual flower; **e.** Sepal; **f.** Clawed petal; **g.** Odd petal ; **h.** Lateral stamen; **i.** Medial stamen; **j.** Staminode; **k.** Gynoecium; **l.** Capsule; **m.** Seed- dorsal view; **n.** Seed- ventral view (**a** from *Joby 480*; **b-e, h-k & m-n** from *Joby & Santhosh Nampy 839*; **f, g & l** from *Manudev & Sheba 5050*).

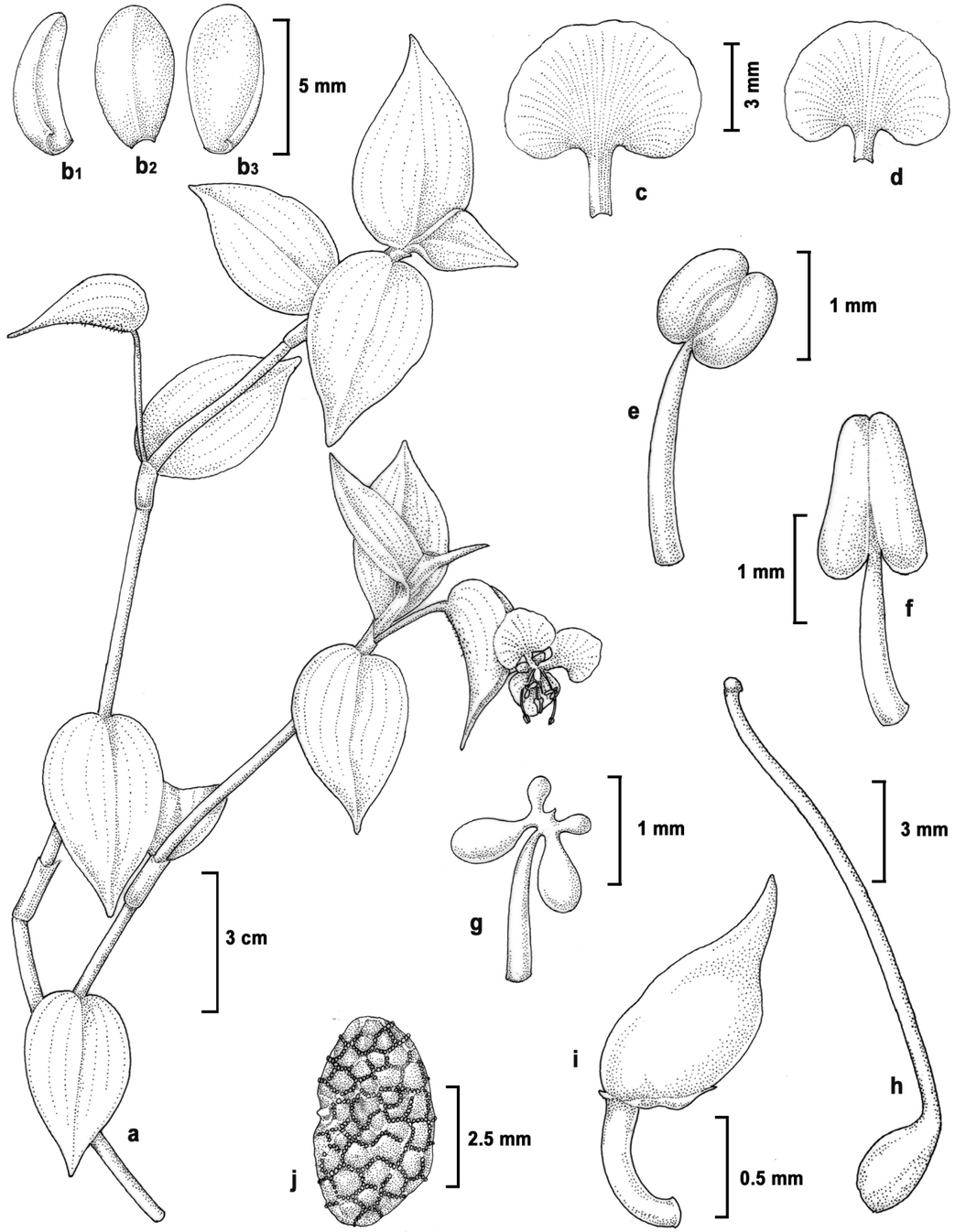

Figure 15. *Commelina indehiscens* E. Barnes: **a.** Flowering twig; **b.** Sepals; **c.** Clawed petal; **d.** Odd petal; **e.** Lateral stamen; **f.** Medial stamen; **g.** Staminode; **h.** Gynoecium; **i.**Capsule; **j.** Seed- dorsal view (all from *Manudev & Sheba 3295*).

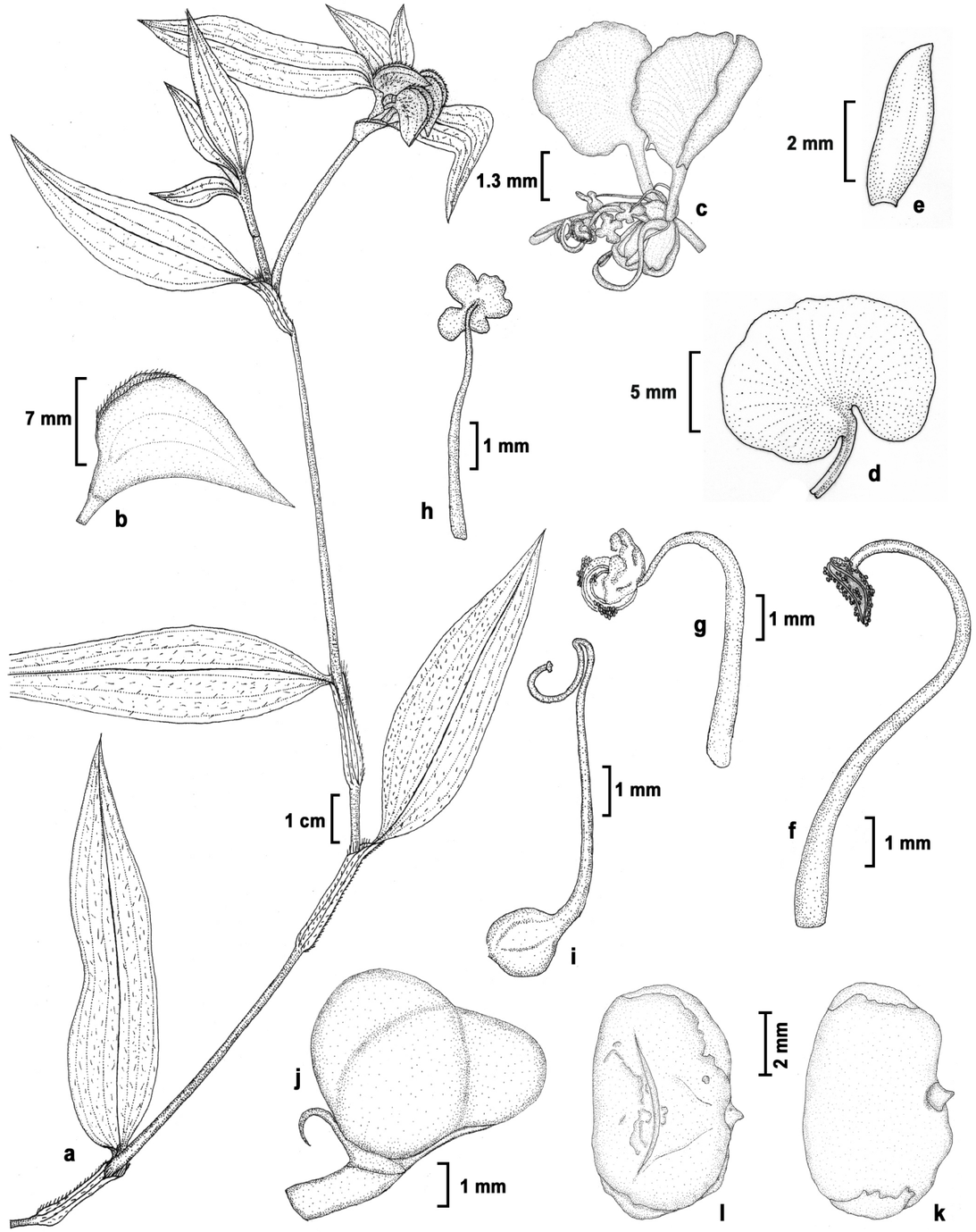

Figure 16. *Commelina kurzii* C.B. Clarke: **a.** Flowering twig; **b.** Spathe; **c.** Flower; **d.** Clawed petal; **e.** Odd petal; **f.** Lateral stamen; **g.** Medial stamen; **h.** Staminode; **i.** Gynoecium; **j.** Capsule; **k.** Seed- dorsal view; **l.** Seed- ventral view (**a-c & f-l** from *Joby 5115*; **d & e** from Sheba & *Santhosh Nampy 4051*).

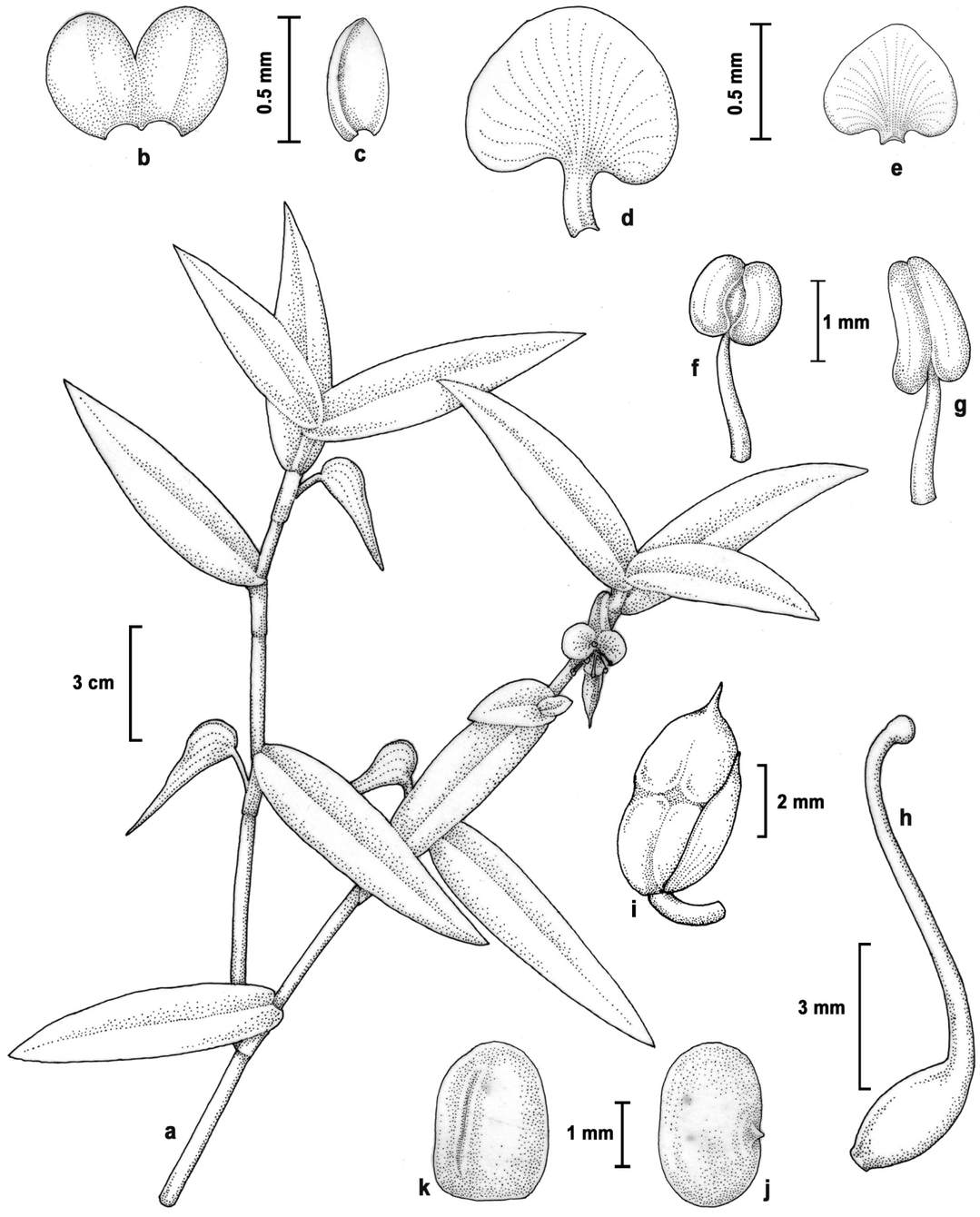

Figure 17. *Commelina longifolia* Lam.: **a.** Flowering twig; **b & c.** Sepals; **d.** Clawed petal; **e.** Odd petal; **f.** Lateral stamen; **g.** Medial stamen; **h.** Gynoecium; **i.** Capsule; **j.** Seed- dorsal view; **k.** Seed- ventral view (**a-k** from *Sheba & Santhosh Nampy 3264*).

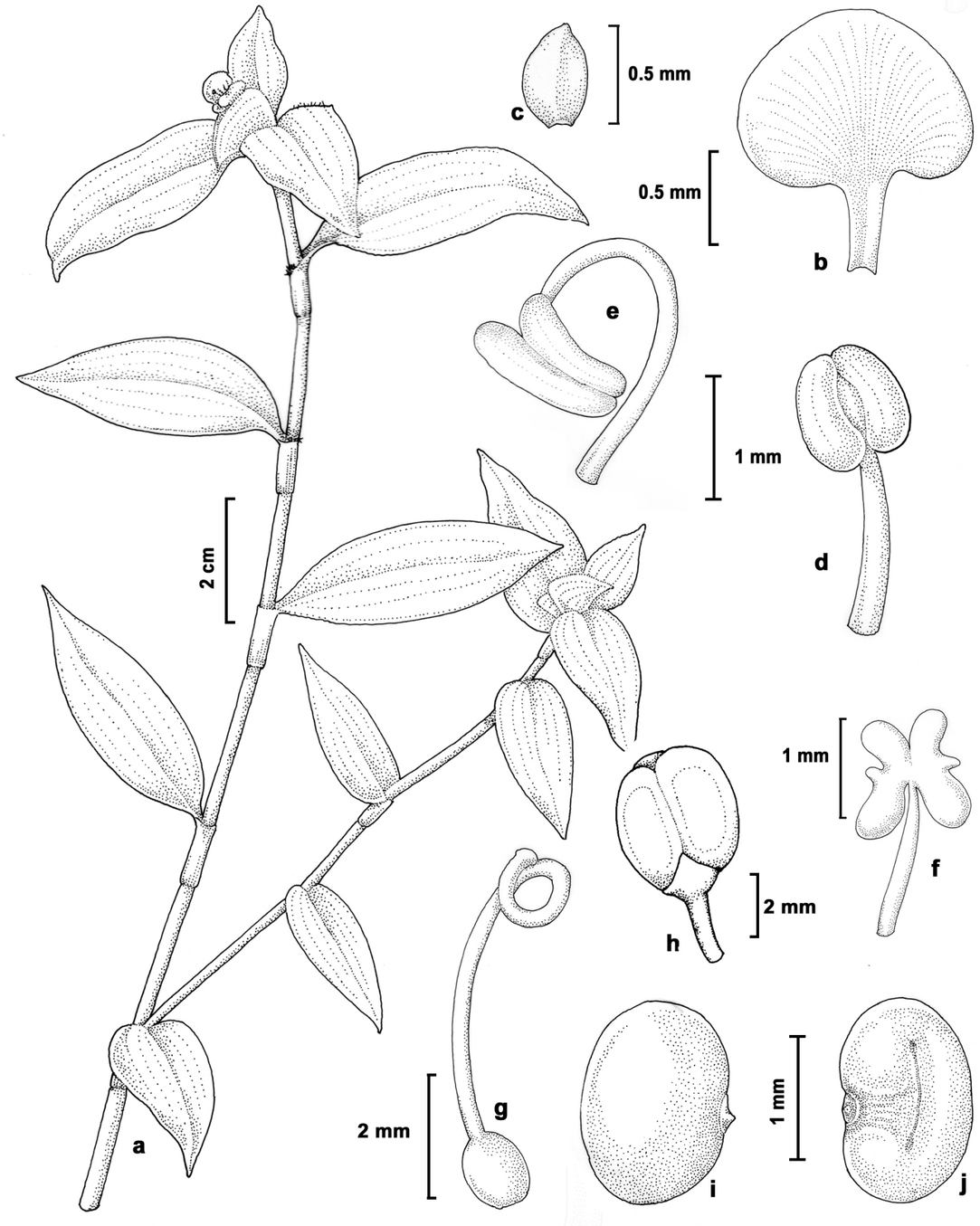

Figure 18. *Commelina maculata* Edgew.: **a.** Flowering twig; **b.** Clawed petal; **c.** Odd petal; **d.** Lateral stamen; **e.** Medial stamen; **f.** Staminode; **g.** Gynoecium; **h.** Capsule; **i.** Seed- dorsal view; **j.** Seed- ventral view (**a-j** from *Santhosh Nampy & Sheba 3775*).

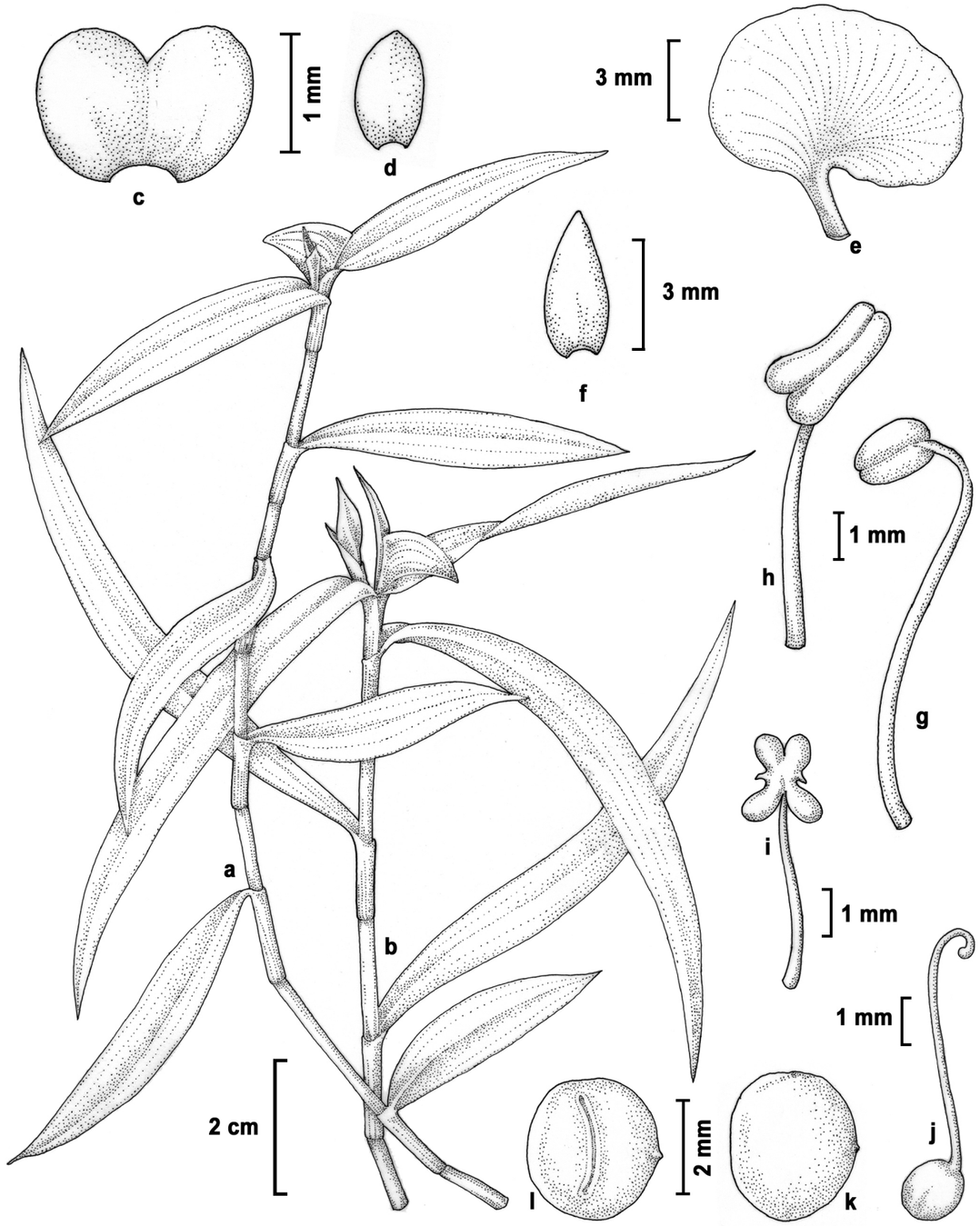

Figure 19. *Commelina paleata* Hassk.: **a & b.** Flowering Twig; **c & d.** Sepals; **e.** Clawed petal; **f.** Odd petal; **g.** Lateral stamen; **h.** Medial stamen; **i.** Staminode; **j.** Gynoecium; **k.** Seed- dorsal view; **l.** Seed- ventral view (**a & c-l** from *Santhosh Nampy & sheba 3775;* **b** from *Sheba & Manudev 4562*).

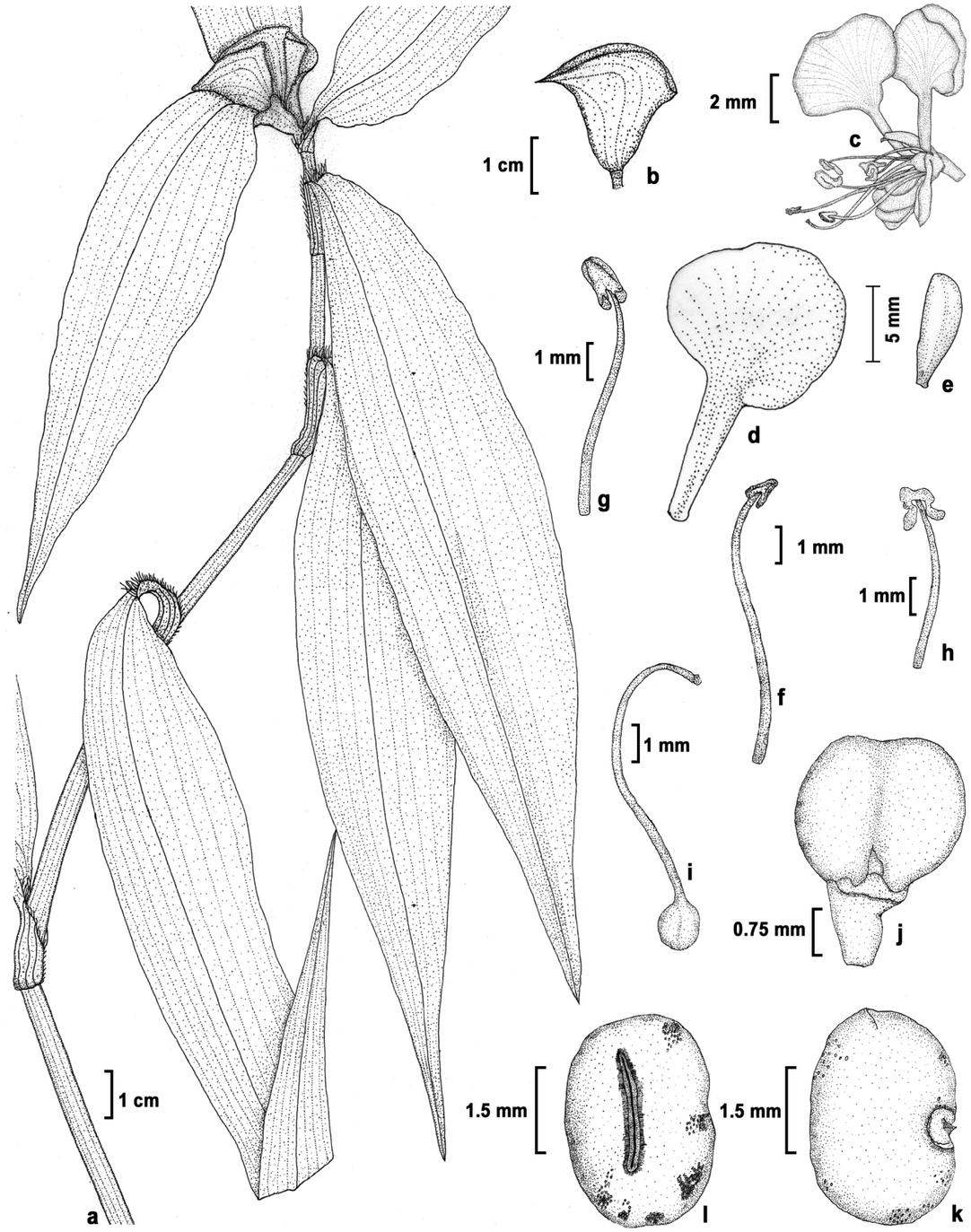

Figure 20. *Commelina paludosa* Blume: **a.** Flowering twig; **b.** Spathe- side view; **c.** Flower; **d.** Clawed petal; **e.** Odd petal; **f.** Lateral stamen; **g.** Medial stamen; **h.** Staminode; **i.** Gynoecium; **j.** Capsule; **k.** Seed- dorsal view; **l.** Seed- ventral view (**a-c & f-i** from *Joby & Anisha 854*; **d & e** from *Sheba & Santhosh Nampy 4035*; **j-l** from *Santhosh Nampy 566*).

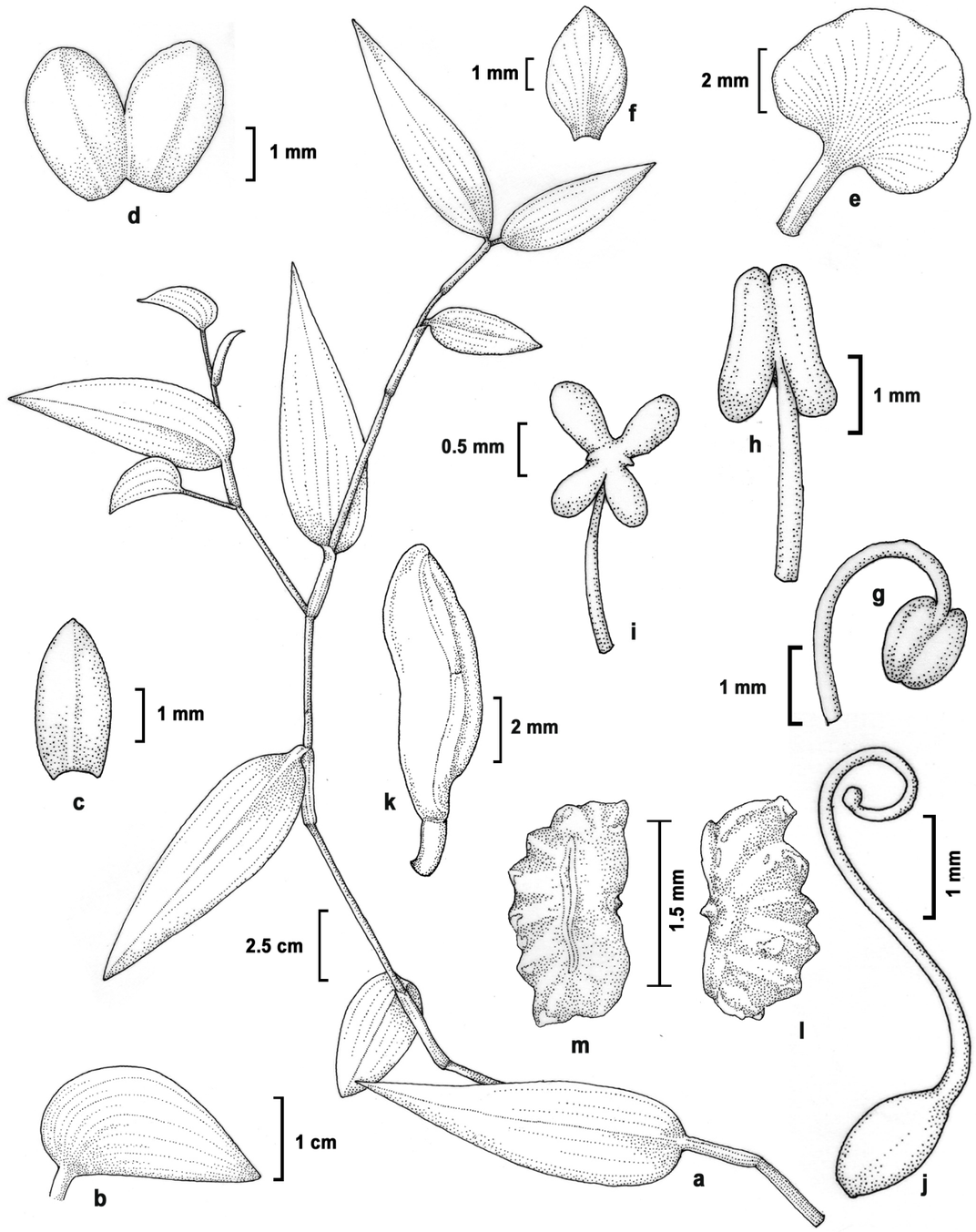

Figure 21. *Commelina petersii* Hassk.: **a.** Flowering twig; **b.** Spathe; **c & d.** Sepals; **e.** Clawed petal; **f.** Odd petal; **g.** Lateral stamen; **h.** Medial stamen; **i.** Staminode; **j.** Gynoecium; **k.** Capsule; **l.** Seed- dorsal view; **m.** Seed- ventral view (**a-m** from *Santhosh Nampy & Sheba 3201).*

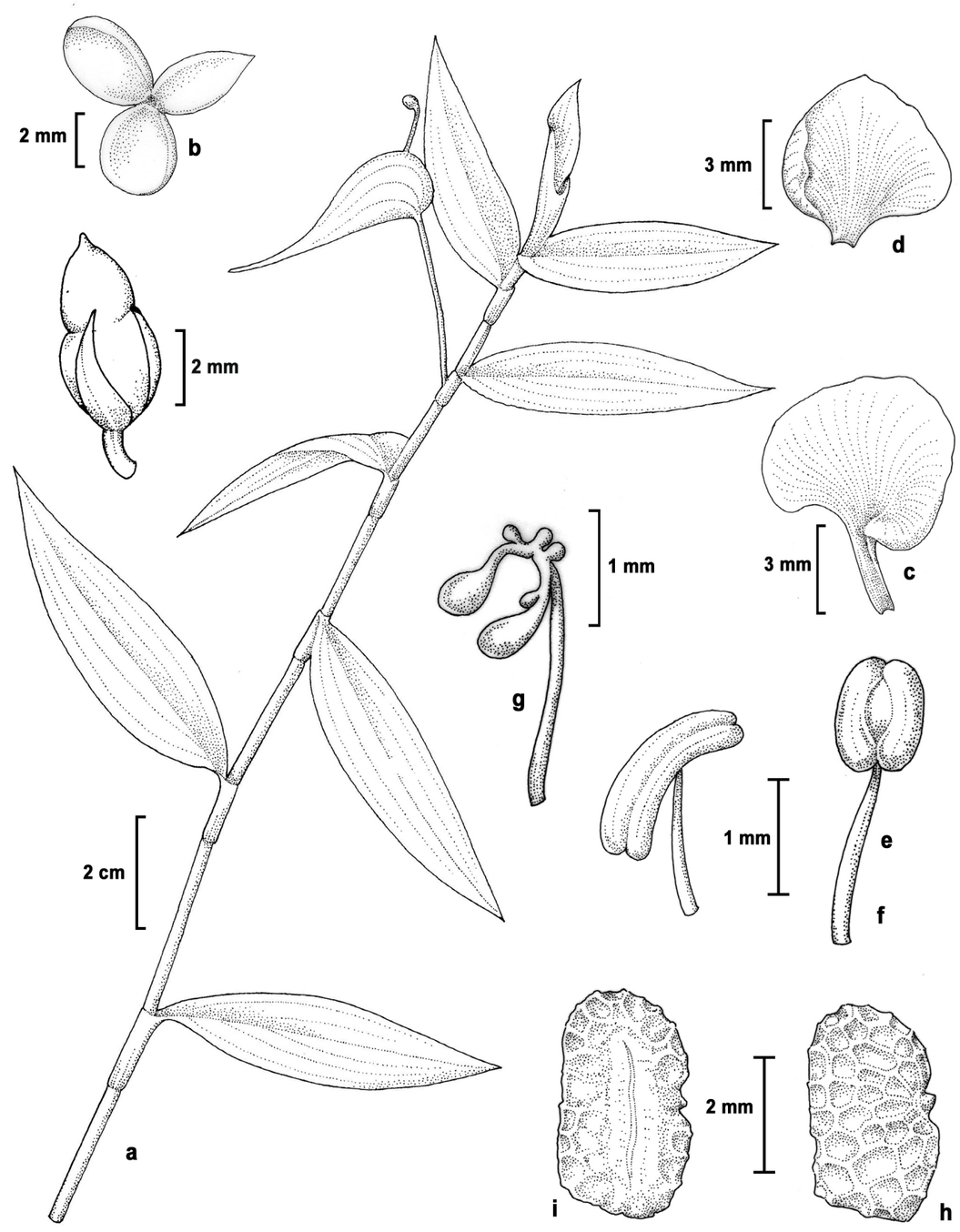

Figure 22. *Commelina sikkimensis* C. B. Clarke: **a.** Flowering twig; **b.** Sepals; **c.** Clawed petal; **d.** Odd petal; **e.** Lateral stamen; **f.** Medial stamen; **g.** Staminode; **h.** Seed- dorsal view; **i.** Seed- ventral view (all from Sheba & *Santhosh Nampy 4052*).

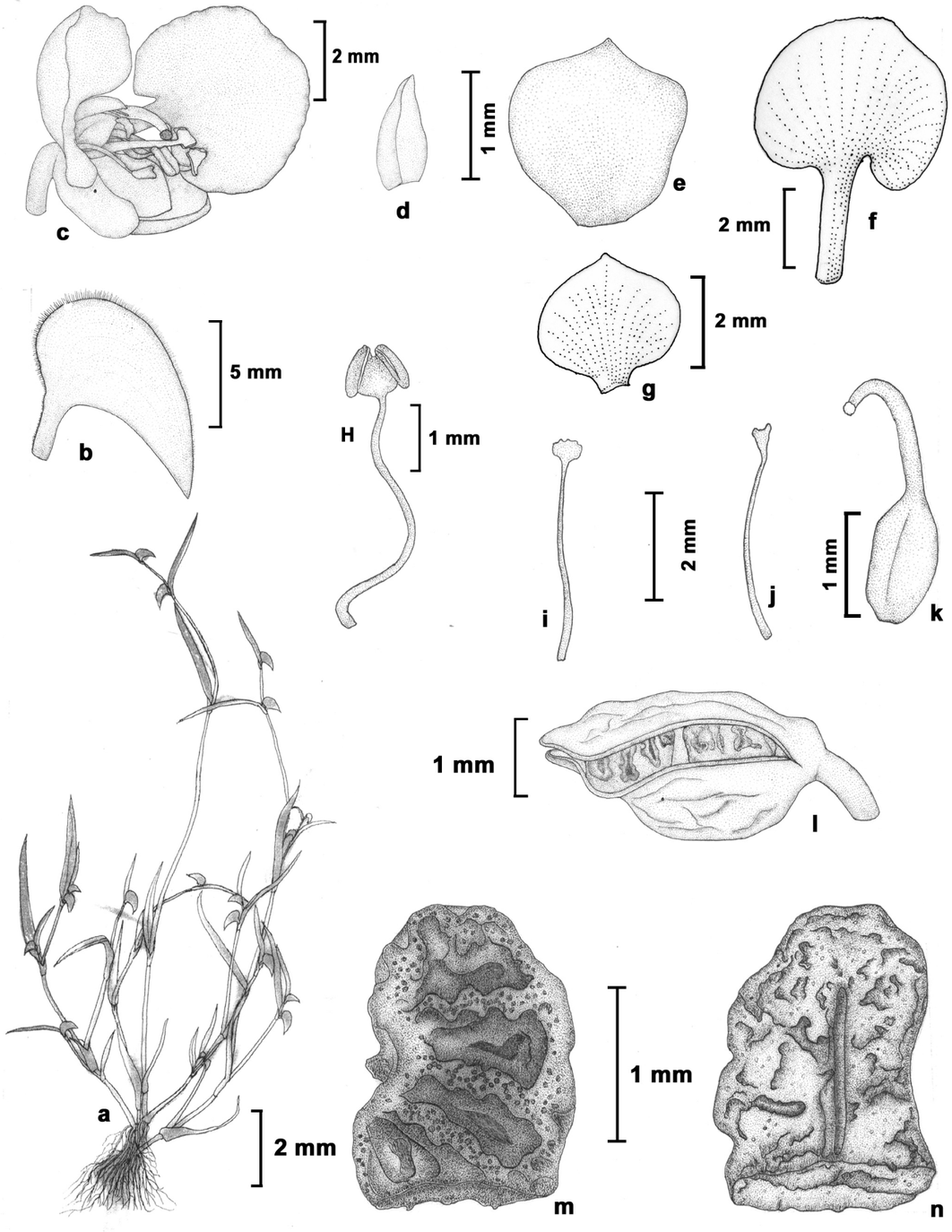

Figure 23. *Commelina subulata* Roth: **a.** Habit; **b.** Spathe; **c.** Flower; **d & e.** Sepals; **f.** Clawed petal; **g.** Odd petal; **h.** Stamen; **i & j.** Staminode; **k.** Gynoecium; **l.** Capsule; **m.** Seed- dorsal view; **n.** Seed- ventral view (**a-e & h-n** from *Joby & Ratheesh 1152*; **f & g** from *Manudev & Sheba 3783*).

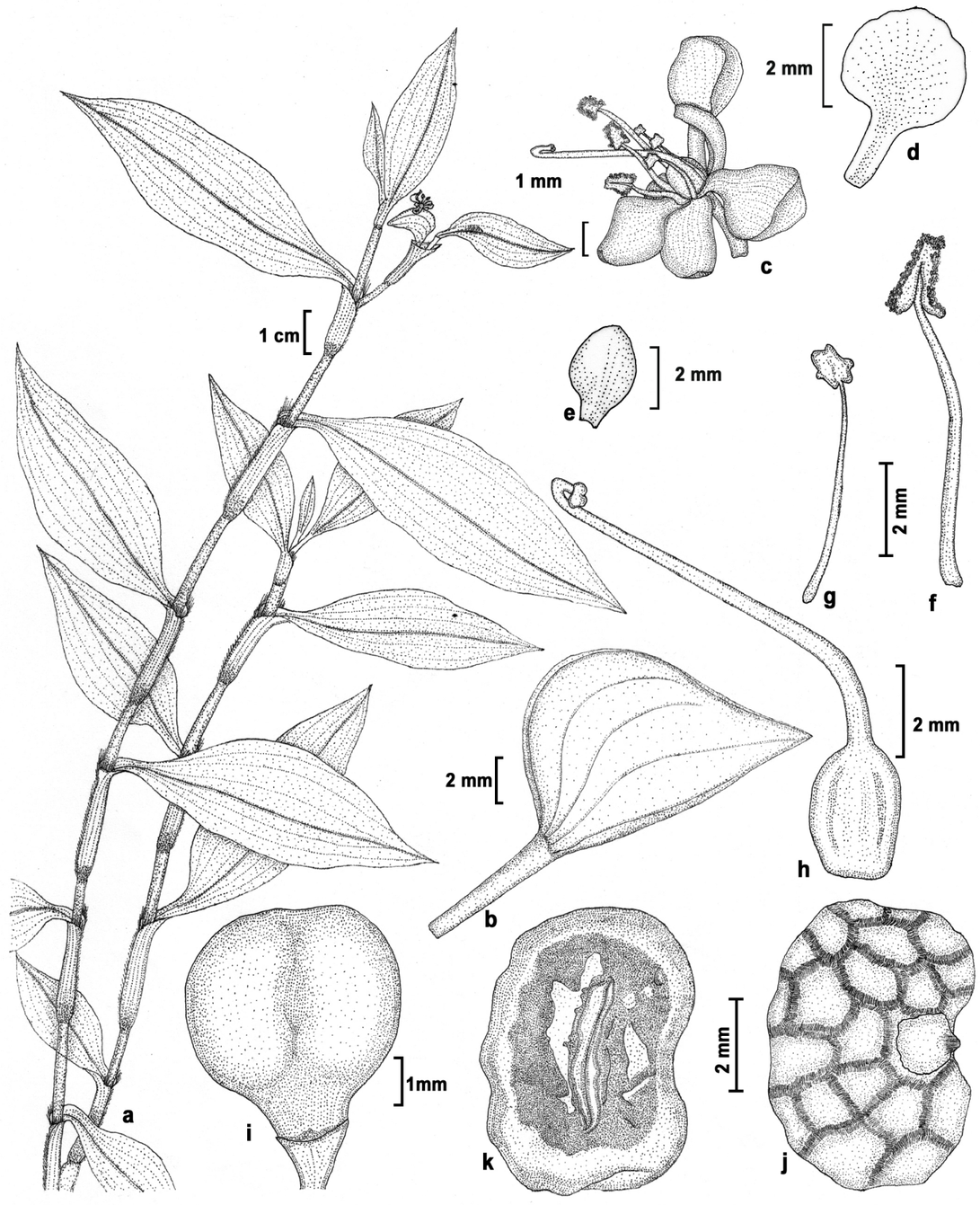

Figure 24. *Commelina suffruticosa* Blume: **a.** Flowering twig; **b.** Spathe; **c.** Flower; **d.** Clawed petal; **e.** Odd petal; **f.** Stamen; **g.** Staminode; **h.** Gynoecium; **i.** Capsule; **j.** Seed- dorsal view; **k.** Seed- ventral view (**a-c & f-k** from *Joby 5107*; **d & e** from *Manudev & Sheba 4561*).

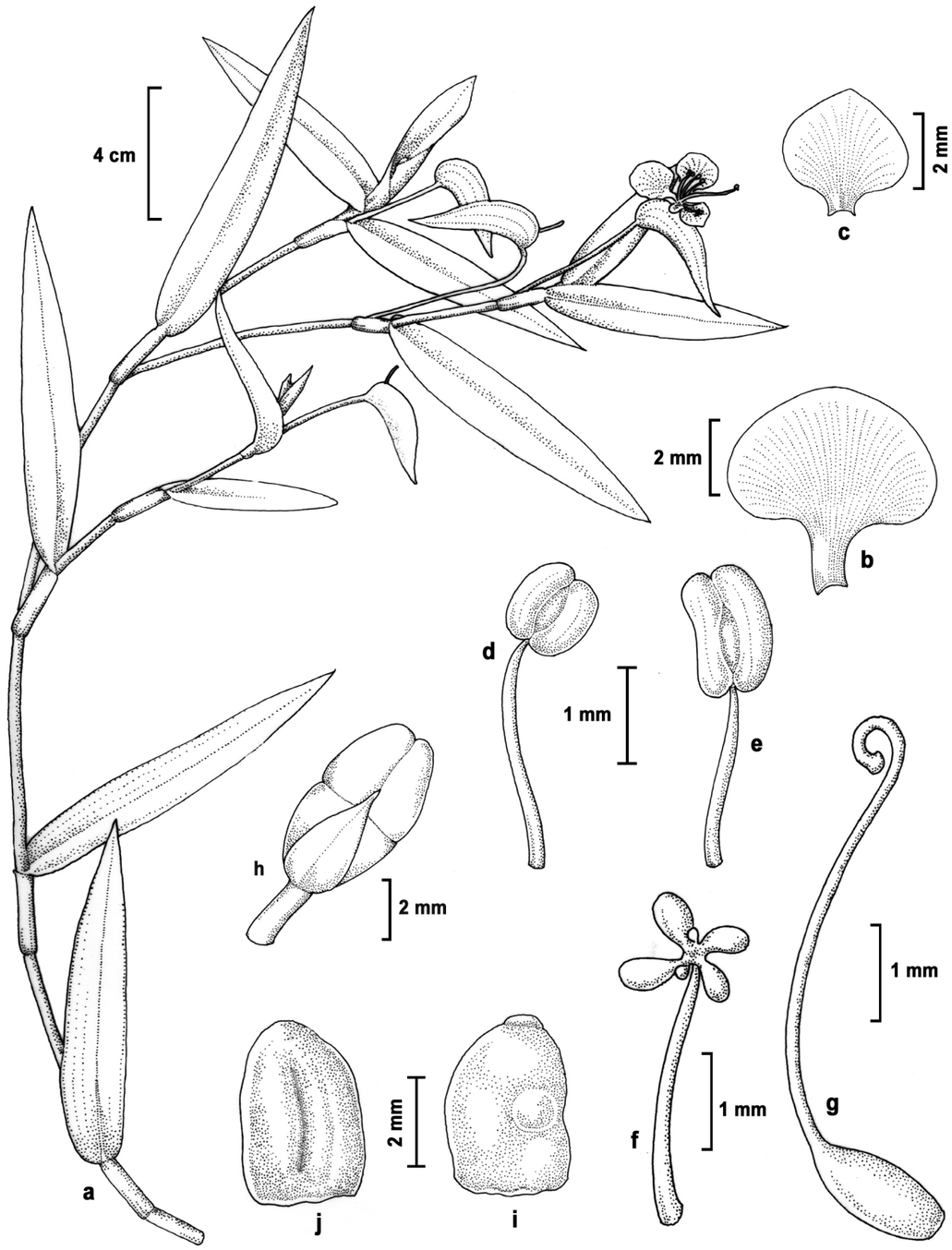

Figure 25. *Commelina tricolor* E. Barnes: **a.** Flowering twig; **b.** Clawed petal; **c.** Odd petal; **d.** Lateral stamen; **e.** Medial stamen; **f.** Staminode; **g.** Gynoecium; **h.** Capsule; **i.** Seed-dorsal view; **j.** Seed- ventral view (all from *Sheba & Manudev 4152*).

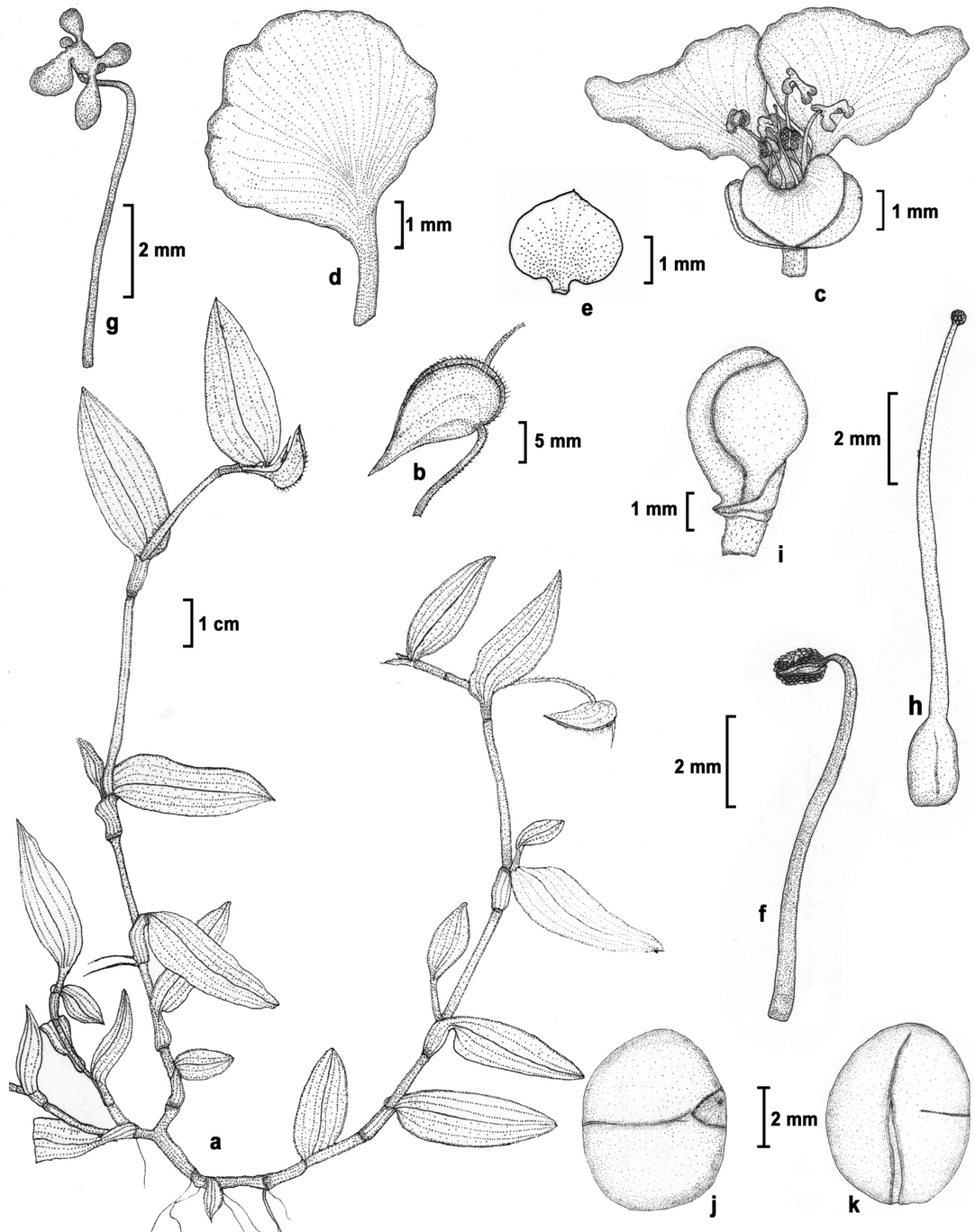

Figure 26. *Commelina wightii* R.S. Rao: **a.** Flowering twig; **b.** Spathe; **c.** Flower; **d.** Clawed petal; **e.** Odd petal; **f.** Lateral stamen; **g.** Staminode; **h.** Gynoecium; **i.** Capsule; **j.** Seed- dorsal view; **k.** Seed- ventral view (**a-b & i-k** from *Sajini & Anisha 554*; **c-d & f-h** from *Sajini 811*; **e** from *Sheba & Santhosh Nampy 3292*).

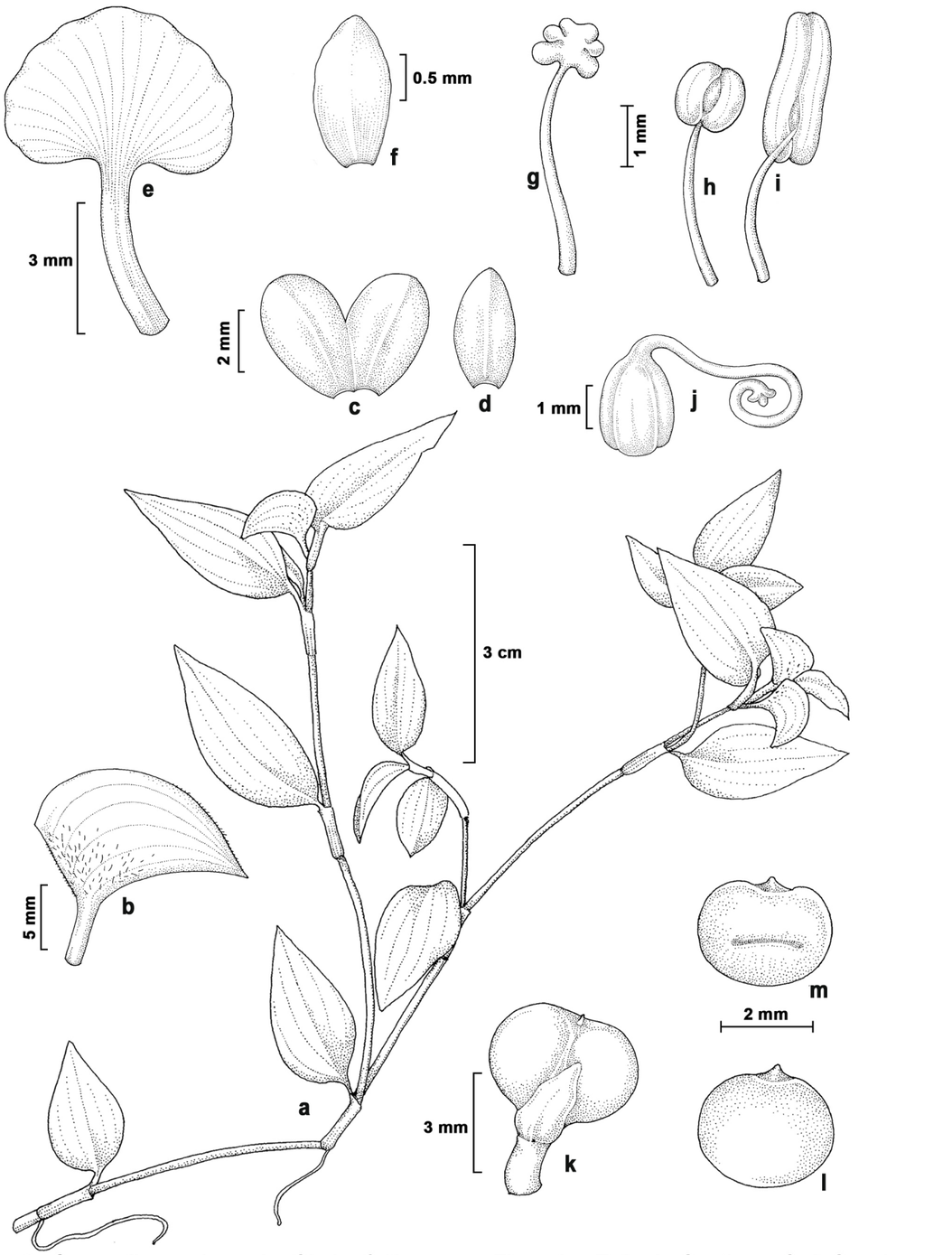

Figure 3. *Commelina andamanica* Sheba & Nampy: **a.** Flowering Twig; **b.** Spathe; **c & d.** Sepals; **e.** Clawed petal; **f.** Odd petal; **g.** Staminode; **h.** Lateral stamen; **i.** Medial stamen; **j.** Gynoecium; **k.** Capsule; **l.** Seed- Dorsal view; **m.** Seed- Ventral view. (all from *Santhosh Nampy & Manudev 3131*)



Figure 4. *Commelina appendiculata* C.B. Clarke: **a.** Flowering twig; **b.** Spathe (from *C.B. Carke 12065R*).

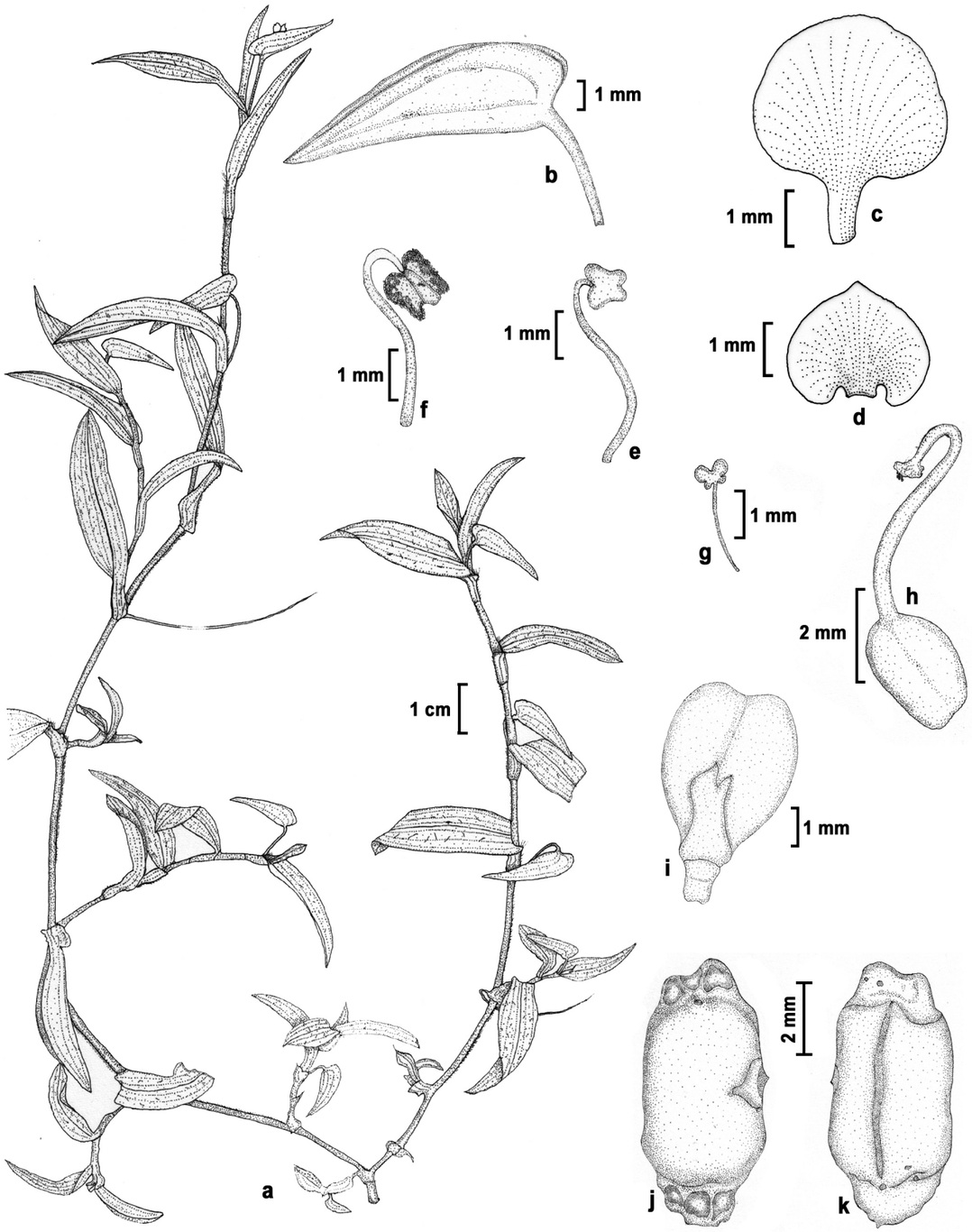

Figure 5. *Commelina attenuata* Vahl: **a.** Flowering twig; **b.** Spathe; **c.** Clawed petal; **d.** Odd petal; **e.** Lateral stamen; **f.** Medial stamen; **g.** Staminode; **h.** Gynoecium; **i.**Capsule; **j.** Seed- dorsal view; **k.** Seed- ventral view. (**a-b & e-k** from *Joby & Santhosh Nampy 478;* **c & d** from *Manudev 5057*).

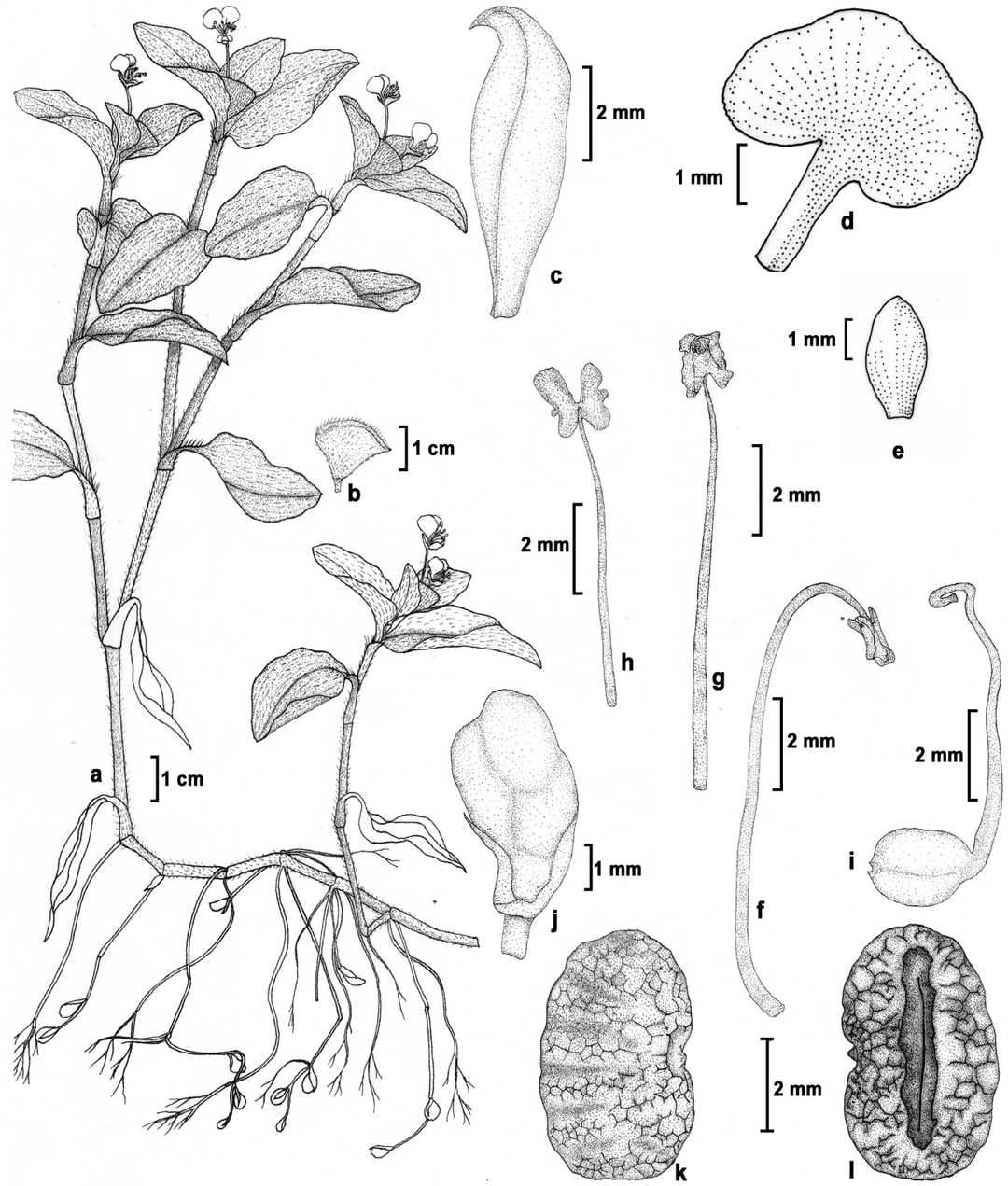

Figure 6. *Commelina benghalensis* L. **a.** Flowering twig; **b.** Spathe; **c.** Sepal; **d.** Clawed Petal; **e.** Odd petal; **f.** Lateral stamen; **g.** Medial stamen; **h.** Staminode; **i.** Gynoecium; **j.** Capsule; **k.** Seed- Dorsal view; **l.** Seed- Ventral view (**a-c & f-l** from *Santhosh Nampy 141*; **d & e** from *Sheba & Santhosh Nampy 4047*).

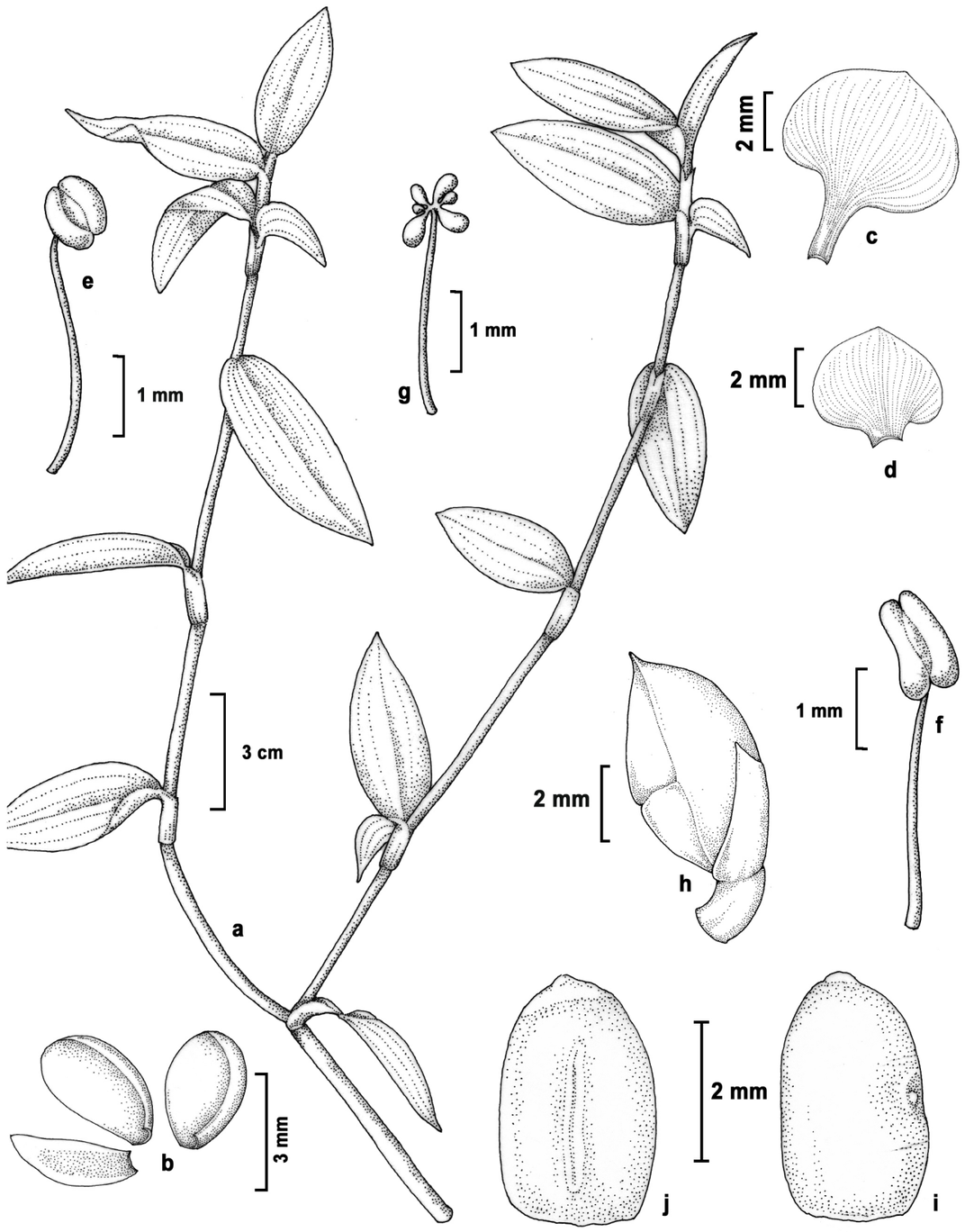

Figure 7. *Commelina caroliniana* Walter: **a.** Flowering twig; **b.** Sepals; **c.** Clawed petal; **d.** Odd petal; **e.** Lateral stamen; **f.** Medial stamen; **g.** Staminode; **h.** Capsule; **i.** Seed- dorsal view; **j.** Seed- ventral view. (**a-j** from *Sheba & Santhosh Nampy 3763*).

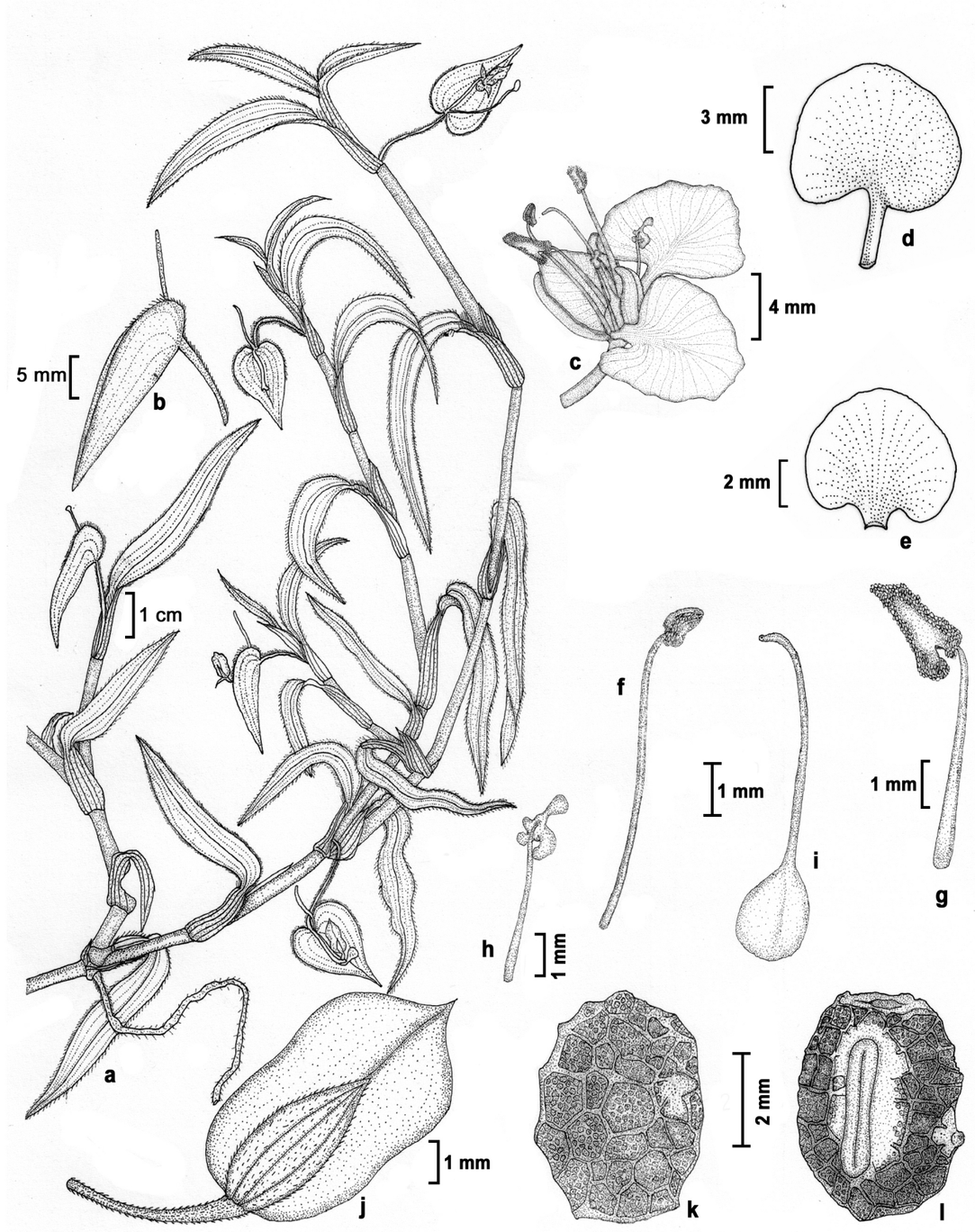

Figure 8. *Commelina clavata* C.B. Clarke: **a.** Flowering twig; **b.** Spathe; **c.** Flower ; **d.** Clawed petal; **e.** Odd petal; **f.** Lateral stamen; **g.** Medial stamen; **h.** Staminode; **i.** Gynoecium; **j.** Capsule; **k.** Seed- dorsal view; **l.** Seed- Ventral view (**a-c & f-l** from *Santhosh Nampy & Joby 082;* **d & e** from ***Manudev &*** *Santhosh Nampy 3714*)

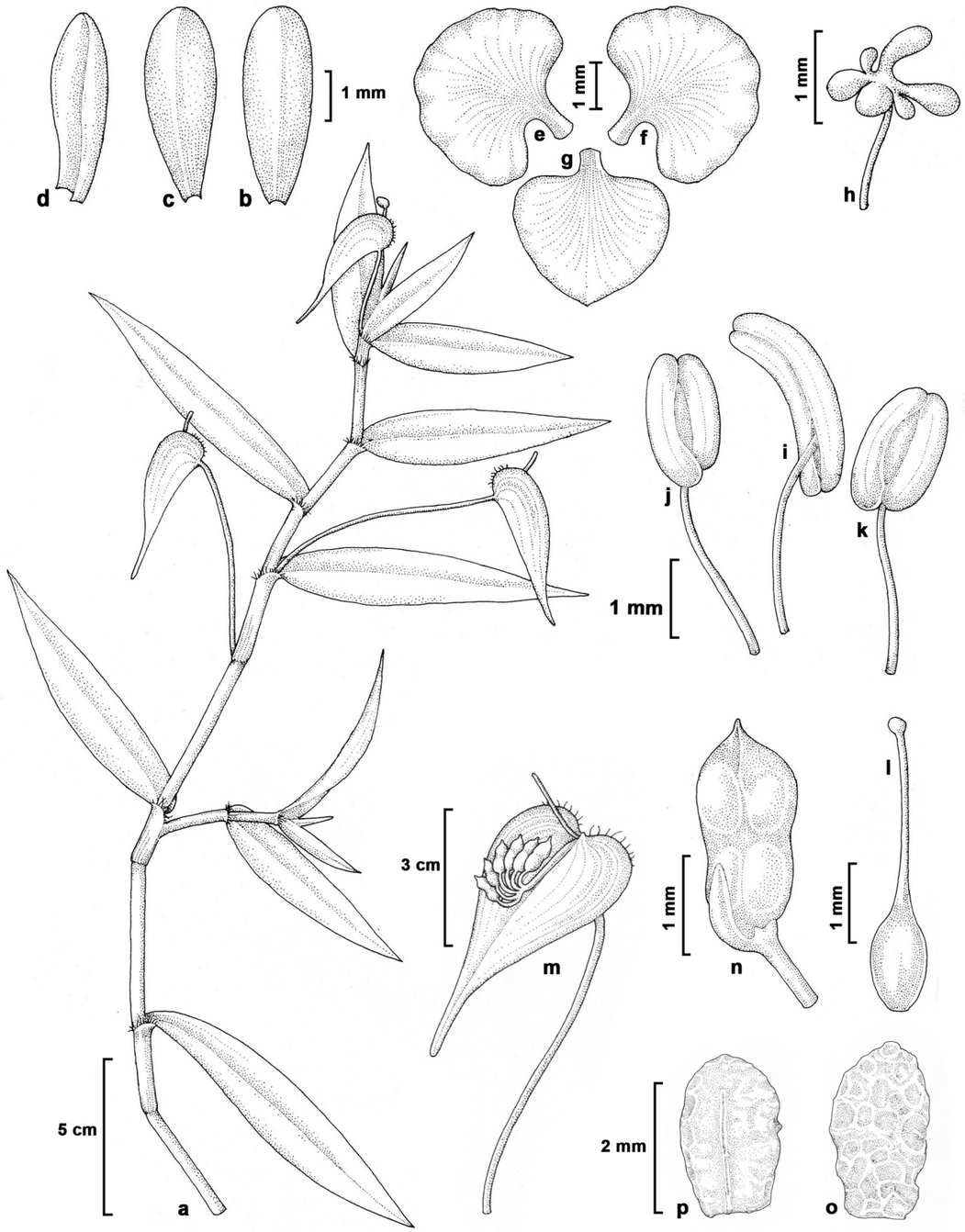

Figure 8. *Commelina clavatoides* Nampy & Sheba: **a.** Flowering twig; **b & c.** Lateral sepals; **d.** Medial sepal; **e & f.** Clawed petals; **g.** Odd petal; **h.** Staminode; **i.** Central stamen; **j & k**. Lateral stamens; **l.** Gynoecium; **m.** Spathe with capsules; **n.** Capsule; **o.** Seed- dorsal view; **p.** Seed- ventral view (from *Sheba M. Joseph & Santhosh Nampy 4016*).

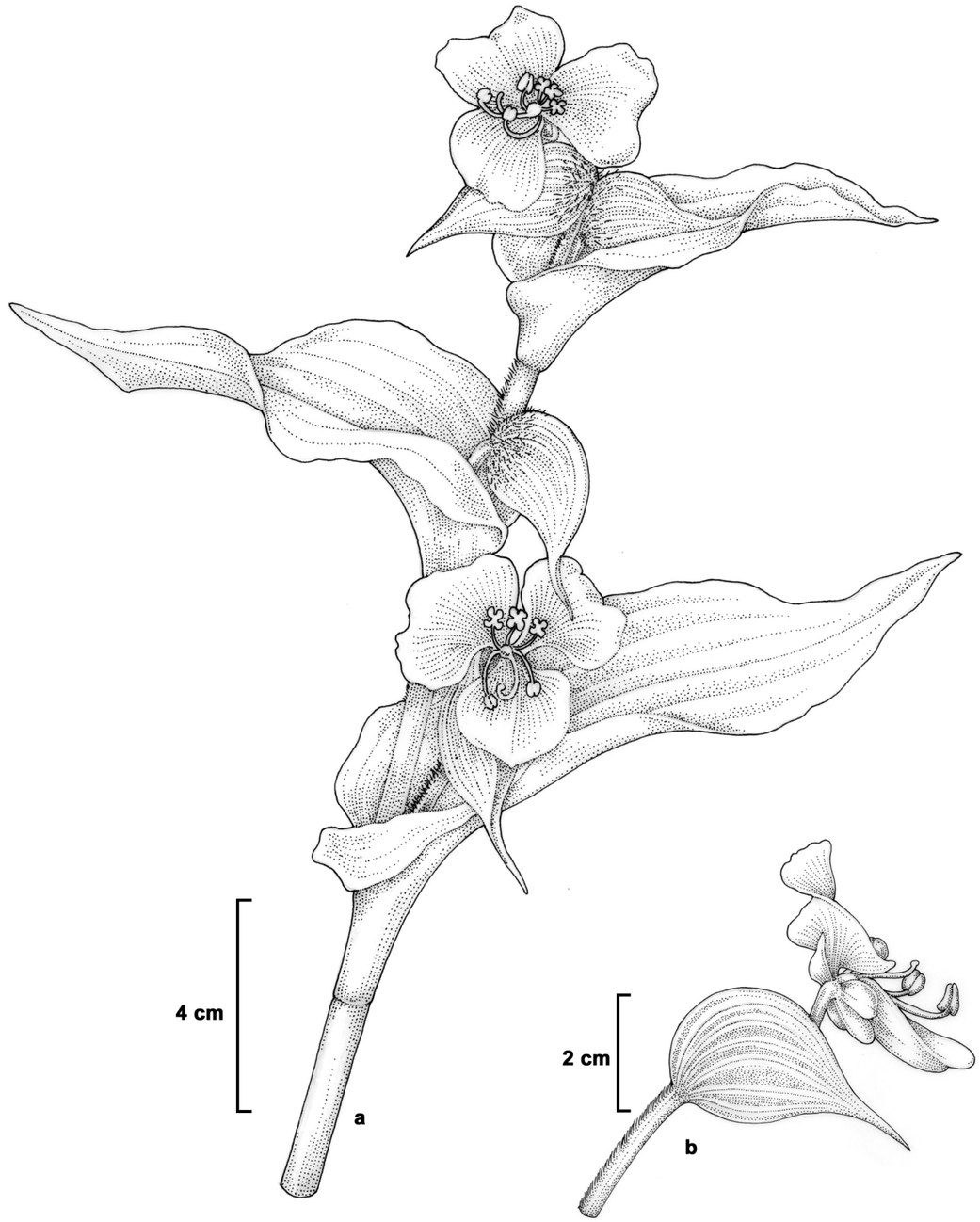

Figure 10. *Commelina coelestis* Willd.: **a.** Flowering twig; **b.** Spathe (redrawn from from Fyson, 1932).

SHEBA M. JOSEPH. “TAXONOMIC REVISION OF THE GENUS COMMELINA L. (COMMELINACEAE) IN INDIA” THESIS. DEPARTMENT OF BOTANY PLANT SYSTEMATICS AND FLORISTICS LABST. JOSEPH’S COLLEGE, DEVAGIRI, KOZHIKODE-8, UNIVERSITY OF CALICUT, 2012.

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