

Endemic flowering plants of northern Western Ghats (Sahyadri Ranges) of India: A checklist

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ABSTRACT: A checklist of endemic flowering plant species of the northern Western Ghats (Sahyadri Ranges) of India is provided along with their IUCN threatened category. There are 159 flowering plant taxa belonging to 81 genera and 31 families found to be strictly endemic to the Sahyadri Ranges. The genus *Ceropegia* has the largest number (17) of endemic species. Five monotypic genera are restricted to the Sahyadri Ranges. Most of these endemic taxa are restricted to small biogeographical areas and are rare in occurrence. Field assessment has shown that 34 endemic taxa fall into IUCN category Critically Endangered, 18 into Endangered and 20 into Vulnerable. A large number of endemic taxa (34) are known only by their type collection, which could not be recollected even after repeated field explorations undertaken by several workers in their habitat of occurrence in last two decades. Hence, they are put in the category 'Data Deficient'.

DOI: 10.15560/10.3.461

INTRODUCTION

The concept of endemism has a long history in biology, dating back to Candolle (1820). In 1882, Engler gave a preliminary idea of endemism and provided one of the first classifications of endemics according to their evolutionary age. This classification has been greatly extended and widely used by many botanists (*e.g.*, Willis 1922; Cain 1944; Favarger and Contandriopoulos 1961; Stebbin and Major 1965; Hopper 1979). Early research on endemism pertained to vascular plants in temperate areas, for which several reviews have appeared in the past few decades (Prentice 1976; Krukeberg and Robinwitz 1985; Gentry 1986; Major 1988). In the tropics, where surveys of endemism began somewhat later, vascular plants, birds and butterflies have been studied. In India, several authors used the term endemic in their flora while giving the distributional data of different taxa. Cooke (1958) in his 'Flora of Bombay Presidency' used the term endemic for several taxa. There were some scattered publications on endemic plants of Western Ghats. Chatterjee (1940) listed 34 endemic dicotyledonous genera from Peninsular India. Rao (1972) stated 164 genera are endemic to Indian floristic region, of which nearly 60 genera are confined to Peninsular India and Sri Lanka. Subramanyam and Nayar (1974) enumerated endemic of Western Ghats. Nayar (1977) estimated that about 2,100 endemic flowering plant species occur in Peninsular India, which represent about 32% of its flora. However, Ahmedullah and Nayar (1986) did the first exhaustive work on the endemic Plants of Peninsular India. They have enumerated 1,940 endemic species including infraspecific taxa from Peninsular India. In the volumes of Red Data Books of Indian Plants (Nayar and Sastry 1987; 1988; 1990), some 90 endemic taxa were included from Northern Western Ghats. Nayar (1996) has enumerated 2,150 endemic plants of Peninsular India. Tetali *et al.* (2000) have reported 439 endemic taxa

for Maharashtra. Mishra and Singh (2001) have given detailed account of 215 endemic and threatened taxa from Maharashtra. Irwin and Narasimhan (2011) in a review of endemic genera have reported 49 endemic genera for India, of which 40 are from Peninsular India.

As far as endemic flowering plants of the Northern Western Ghats are concerned, no detailed inventory was undertaken in the past. Many new taxa have been described from Northern Western Ghats in the last two decades and several taxa, which were earlier considered as endemic to only Sahyadri Ranges, have been reported from other part of Peninsular India. Hence, it has become necessary to assess the current position of endemic plants of the Northern Western Ghats. The present study is also necessitated due to the fact that endemism is one of the most important factors for determining the status of threatened plants. Several workers have categorized threatened plants of Northern Western Ghats using old IUCN categories. However, the criteria for categorizing the threatened plants have been revised by IUCN (2001). It has become necessary to assess the status of endemic plants in light of the revised IUCN criteria and categories.

MATERIALS AND METHODS

Study site

Northern Western Ghats of India is popularly known as 'Sahyadri'. It is the northern half of the Western Ghats of India, which is a global biodiversity hotspot and mega-biodiversity center. Sahyadri is a chain of flat top mountains of about 750 km in length running parallel to the West Coast of Peninsular India from the river Tapi, South Gujarat (21°3'59.62" N, 73°39'8.44" E) to Goa (14°50'19.00" N, 74°14'44.10" E). The biogeographical province of Northern Western Ghats covers about 6,500 km² of mountainous terrain. It straddles the states of South

Gujarat, Maharashtra and Goa (Figure 1). The mountain chains of Northern Western Ghats are steep on the west windward side and slopping towards leeward side. The vegetation of the Northern Western Ghats in general can be differentiated into altitudinal zones. There are scrub and semi-deciduous type vegetation at elevations between 200–500 m. Dry deciduous forests are found at elevations between 500–1100 m. The windward side of Ghats, which receives the maximum rainfall, supports the moist deciduous forests having pockets of evergreen type in regions of higher rainfall.

Data collection

Information from taxonomic literature, specimens deposited in various herbaria and field explorations were utilized to prepare this checklist. Intensive and extensive field explorations were undertaken to different corners and pockets of Northern Western Ghats between 2001–2010. During field visits, data was gathered on distribution, area of occupancy, population size, number of mature individuals (if possible), and phenology and ecology. Three replicate plant specimens were collected. Collected plant materials were processed for preparation as herbarium specimens by usual techniques (Rao and Sharma 1990). Voucher specimens are deposited in the herbarium of Shivaji University, Kolhapur (Maharashtra) India and Walchand College Herbarium, Solapur. Field identifications were confirmed with the help of available literature (Cooke 1958; Bor 1960; Lakshminarasimhan 1996; Almeida 1996; 1998; 2001; 2003; 2009; Jagtap and Singh 1999; Singh and Karthikeyan 2000; 2001;

Ansari 2008; Ansari and Balakrishnan 2009; Binojkumar and Balakrishnan 2010). Author citation and binomial of collected species were verified with the International Plant Name Index (IPNI). Categorization of endemic taxa into IUCN red list categories (2001) was done mainly based on our own field observations after getting the preliminary information from literature and herbaria. During categorization mainly the criterion B of IUCN Criteria version 3.1 with their sub-criteria B1 (extent occurrence) and B2 (area of occupancy) have been followed. In some cases criteria C (population size estimated to number fewer than 250 mature individuals), D (population size estimated to number fewer than 50 mature individuals) and E (probability of extinction in the wild) have also been followed. The information for newly described taxa was collected by personnel communication with the original authors or with other experts in this field. All the families in the present work have been arranged according to Angiosperm Phylogeny Group Classification System (APG III, 2009). The genera, species and infraspecific taxa are arranged alphabetically. Additional information such as habit, IUCN category and voucher specimen number of each taxon is provided. Important endemic plants are featured in the Figures 2–6.

RESULTS

A total of 159 species (including infraspecific taxa) are endemic to northern Western Ghats of India. Many of them are restricted to small geographical area and facing high risk of extinction. Six endemic species have already been declared as extinct. A large number of endemic taxa are known by their type collection and nobody could relocate them even in their type localities. Hence, it seems that either these taxa are vanished from their natural localities or they are victim of misidentification. Thirty four endemic taxa fall into Critically Endangered category, are known from one or two localities with limited number of individuals and they are on verge of extinction. *Cryptocoryne cognata* Schott. has been collected during present work which was declared as extinct in Red Data of Indian Plants.

DISCUSSION

The present study has revealed that there are 144 flowering plant species and 15 infraspecific taxa strictly endemic to Northern Western Ghats (Sahyadri Mountain) of India (Table 1). Out of this diversity 70 species and 9 infraspecific taxa are dicotyledonous belonging to 45 genera and 21 families, and 74 species and 6 infraspecific taxa are monocotyledonous belonging to 36 genera and 10 families. Monospecific genera *Frerea indica* Dalzell (Apocynaceae), *Helicanthus elastica* (Desr.) Danser (Loranthaceae), *Pinda concanensis* (Dalz.) Mukherjee & Constance (Apiaceae), *Pogonachne racemosa* Bor and *Triplopogon ramosissimus* (Hack.) Bor (Poaceae) are restricted to the Sahyadri Ranges.

Most of these endemic species are restricted to small biogeographically areas and are rare in occurrence; their populations have been declining rapidly due to habitat modifications and anthropogenic pressures. They are facing various degrees of threat of extinction. Out of 159 endemic taxa, 34 falls into the Critically Endangered category, 18 are Endangered, 20 are Vulnerable, and

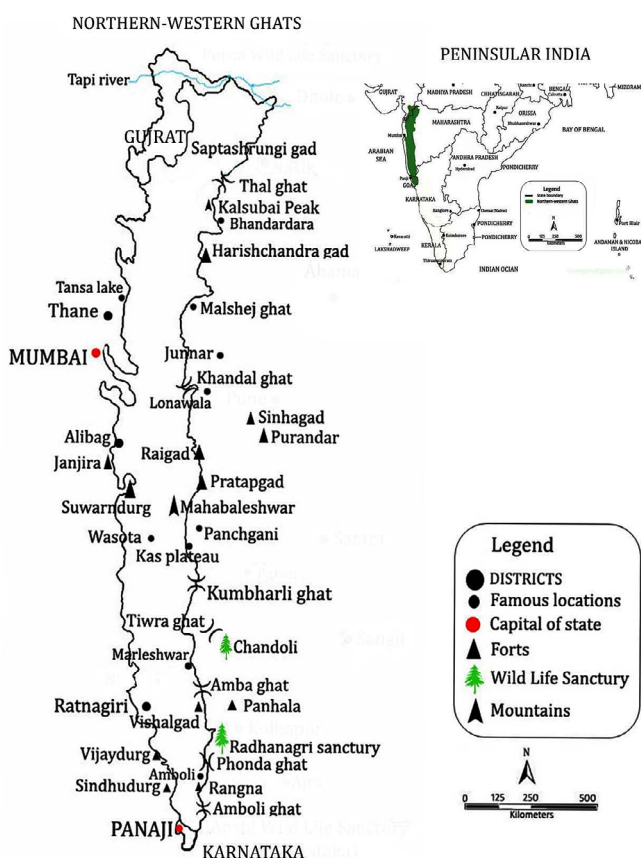


FIGURE 1. Location Map of Northern Western Ghats (Sahyadri Ranges) of India.

1 Near Threatened. Although, this categorization is at regional level, it may apply at global level also, since these taxa are strictly endemic to the study area. Most of the Critically Endangered taxa (e.g., *Arisaema sivasanii* Yadav, Patil & Janarthanam, *Brachystelma malwanense* Yadav & Singh, *Brachystelma naorojii* Tetali, Kulkarni, S. Tetali & Kumbhojkar, *Ceropegia anantii* Yadav, Sardesai & Gaikwad, *Ceropegia fantastica* Sedgwick, *Ceropegia huberi* Ansari, *Ceropegia mahabalei* Hemadri & Ansari, *Ceropegia panchganiensis* Blatter & McCann, *Ceropegia santapau* Wadhwa & Ansari, *Dicliptera nasikensis* Lakshminarasimhan & Sharma, *Scurrula stocksii* (Hook. f.) Danser and *Drimia razii* Ansari) are known from only a single locality (type locality) with limited number of individuals and less than 10 km² area of occupancy. We were not able to locate their 25 mature individuals in spite of several critical field explorations undertaken to various corners and pockets of Sahyadri Ranges. Hence, they seem to be on the verge of extinction.

Surprisingly, a large number of endemic taxa (34) are known only by their type collection, which could not be recollected even after repeated field explorations undertaken by several workers (e.g., Yadav 1997; Yadav et al. 1997; Tetali et al. 2000; Mishra and Singh 2001, Gaikwad and Yadav 2004; Yadav and Kamble 2008; Murthy et al. 2012; Gaikwad et al. 2013) in their habitat of occurrence in last two decades. Therefore, it seems that either these taxa are vanished from their localities or alternatively, that species misidentification has occurred. In the present work, these taxa are put in IUCN category 'Data Deficient' due to lack of adequate information on their distribution and/or

population status to make direct or indirect assessment of their extinction risk. However, *Barleria gibsonioides* Blatter *Crinum eleonora* Blatter & McCann var. *eleonora*, *Drimia polyphylla* (Hook.f.) Ansari & Raghavan, *Habenaria carangensis* Dalzell, *Hypoestis lanata* Dalzell and *Scilla viridis* Blatter & Hallb. have already been declared as extinct by earlier workers (Nayar 1996; Tetali et al. 2000; Mishra and Singh 2001). *Cryptocoryne cognata* Schott was declared as 'Extinct' in the Red Data Book of Indian Plants, volume 3 (Nayar and Sastry 1990) but during the present investigation, it has been observed in the many streams of the Ratnagiri and Sindhudurg districts of Maharashtra. Therefore, the status of this species has been changed from extinct to Endangered. *Arisaema sahyadricum* var. *ghaticum* Sardesai, Gaikwad & Yadav, *Ceropegia anantii* Yadav, Sardesai & Gaikwad, *Ceropegia anjanerica* Malpure, Kamble & Yadav, *Ceropegia mohanramii* Yadav, Gavade & Sardesai, *Chlorophytum gothanense* Malpure & Yadav, *Chlorophytum kolhapurensis* Sardesai, Gaikwad & Yadav, *Crypsopogon castaneus* Veldkamp & Salunkhe, *Eriocaulon apetalum* Puneekar, Malpure & Lakshminarasimhan, *Eriocaulon baramaticum* Shimpale, Bhagat, Deshmukh & Yadav, *Eriocaulon epedunculatum* Yadav, Potdar, Anil kumar and Otaghvari., *Eriocaulon kolhapurensis* Gaikwad, Sardesai & Yadav, *Eulalia shrirangii* Salunkhe & Patdar, *Mnesithea veldcampii* Potdar, Gaikwad, Salunkhe & Yadav, *Utricularia babui* Sardesai, Gaikwad & Yadav, *Utricularia janarthanamii* Yadav, Sardesai & Gaikwad and *Utricularia naikii* Yadav, Sardesai & Gaikwad are newly described taxa which remain known only from their type localities still today.

TABLE 1. Checklist of endemic flowering plants of Northern Western Ghats (Sahyadri Ranges) of India.

IUCN Old = IUCN category reported in earlier works; IUCN New = IUCN category as a result of present work. LC = Least Concern; NE = Not Evaluated; DD = Data Deficient; LR = Low Risk; NT = Near Threatened; VU = Vulnerable; EN = Endangered; CR = Critically Endangered; PE = Possibly Extinct.

SL	Botanical name	Habit	IUCN old	IUCN new	Field No.
Araceae					
1	<i>Amorphophalus konkanensis</i> Hett., Yadav & Patil	Tuberous herb	VU	VU	SPG-1328
2	<i>Arisaema caudatum</i> Engler	Tuberous herb	EN	VU	SPG-1527
3	<i>Arisaema sahyadricum</i> Yadav, Patil & Bachulkar	Tuberous herb	EN	CR	SPG-1389
4	<i>Arisaema sahyadricum</i> var. <i>ghaticum</i> Sardesai, Gaikwad & Yadav	Tuberous herb	----	CR	SPG-1716
5	<i>Arisaema sivasanii</i> Yadav, Patil & Janarthanam	Tuberous herb	CR	CR	SPG-1599
6	<i>Cryptocoryne cognata</i> Schott.	Rhizomatous herbs	PE	EN	SPG-1323
7	<i>Cryptocoryne cognatoides</i> (Blatter & McCann.	Rhizomatous herb	CR	VU	SPG-0968
Aponogetonaceae					
8	<i>Aponogeton bruggenii</i> Yadav & Govekar	Tuberous herb	CR	CR	SPG-2021
9	<i>Aponogeton satarensis</i> Sundararaghavan, Kulkarni & Yadav	Tuberous herb	EN	CR	SPG-1366
Colchicaceae					
10	<i>Camptorrhiza indica</i> Yadav, Singh & Mathew	Small herb	CR	CR	SPG-2411
11	<i>Iphigenia stellata</i> Blatter	Herb	VU	VU	SPG-1977
Orchidaceae					
12	<i>Habenaria carangensis</i> Dalzell	Herbs	PE	PE	SPG-0810
13	<i>Habenaria panchganiensis</i> Santapau & Kapadia	Herbs	EN	EN	SPG-1476
14	<i>Habenaria suaveolens</i> Dalzell	Herbs	CR	DD	----
Amaryllidaceae					
15	<i>Crinum brachynema</i> Herb.	Bulbous Herb	CR	CR	SPG-2567
16	<i>Crinum eleonora</i> Blatter & McCann. var. <i>eleonora</i>	Bulbous herbs	PE	DD	----
17	<i>Crinum eleonora</i> Blatter & McCann. var. <i>purpurea</i> Blatter & McCann.	Bulbous herb	PE	DD	----
18	<i>Crinum woodrowii</i> Baker	Bulbous herb	PE	CR	SPG-1418
19	<i>Pancreatium sanctae-mariae</i> Blatter & Hallberg	Bulbous herb	EN	EN	SPG-1298
Asparagaceae					
20	<i>Chlorophytum gothanense</i> Malpure & Yadav	Herb	----	CR	SPG-1072
21	<i>Chlorophytum glaucoides</i> Blatter	Herb	LR	LC	SPG-1301

TABLE 1. CONTINUED.

SL	Botanical name	Habit	IUCN old	IUCN new	Field No.
22	<i>Chlorophytum kolhapurense</i> Sardesai, Gaikwad & Yadav	Scapigerous herb	----	CR	MMS-1578
23	<i>Dipcadi concanense</i> (Dalzell) Baker	Perennial herb	CR	EN	SPG-2666
24	<i>Dipcadi maharashtrensis</i> Deb & Dasgupta	Perennial herb	CR	CR	SPG-1379
25	<i>Dipcadi minor</i> Hook. f.	Perennial herb	CR	DD	Dalzell-s.n.
26	<i>Dipcadi saxorum</i> Blatter	Perennial herb	CR	EN	SPG-2785
27	<i>Dipcadi ursulae</i> Blatter var. <i>ursulae</i>	Herb	EN	LC	SPG-2830
28	<i>Drimia polyphylla</i> (Hook.f.) Ansari & Raghavan	Herb	PE	PE	----
29	<i>Drimia razii</i> Ansari	Herb	CR	CR	SPG-2157
30	<i>Protasparagus karthikeyanii</i> Kamble	Small Shrub	DD	DD	Vasavada-17349 (BSI)
31	<i>Scilla viridis</i> Blatter & Hallberg	Herb	PE	PE	----
Zingiberaceae					
32	<i>Curcuma inodora</i> Blatter	Rhizomatous herb	LR	LC	SPG-1880
33	<i>Curcuma purpurea</i> Blatter	Rhizomatous herb	DD	DD	----
34	<i>Hitchenia caulina</i> (Grah.) Baker	Rhizomatous herb	VU	NT	SPG-1979
Eriocaulaceae					
35	<i>Eriocaulon apetalum</i> Punekar, Malpure & Lakshminarasimhan	Herb	----	EN	SPG-0887
36	<i>Eriocaulon baramaticum</i> Shimpale, Bhagat, Deshmukh & Yadav	Herb	----	CR	SPG-2998
37	<i>Eriocaulon bolei</i> Bole & Almeida	Herb	CR	DD	Bole-2230 (BLAT)
38	<i>Eriocaulon epedunculatum</i> Yadav, Potdar, Anil kumar and Otaghvari	Herb	----	EN	SPG-1073
39	<i>Eriocaulon kolhapurense</i> Gaikwad, Sardesai & Yadav	Herb	----	VU	MMS-5350
40	<i>Eriocaulon ratnagiricus</i> Yadav, Gaikwad & Sardesai	Herb	CR	CR	SPG-1E
41	<i>Eriocaulon rouxianum</i> Steud.	Herb	CR	DD	Patel-s.n. (BLAT)
42	<i>Eriocaulon santapau</i> Moldenke	Herb	CR	DD	Santapau & McCann-1290 (BLAT)
43	<i>Eriocaulon sharmae</i> Ansari & Balakrishnan	Herb	DD	CR	SPG-0956
44	<i>Eriocaulon tuberiferum</i> Kulkarni & Desai	Herb	EN	LC	SPG-2910
Cyperaceae					
45	<i>Cyperus decumbens</i> Govind	Herb	DD	DD	Sedgwick-4792A (BSI)
46	<i>Cyperus pentabracteatus</i> Govind & Hemadri	Herb	CR	NE	Hemadri-107562B (BSI)
47	<i>Eleocharis lankana</i> Koyama subsp. <i>mohamadii</i> Wadood Khan	Herb	CR	NE	M.A. Khan-4254b-d (BSI)
48	<i>Eleocharis wadoodii</i> Yadav, Lekhak & Chandore	Herb	----	NE	Chandore-131 (SUK)
49	<i>Fimbristylis ambavanensis</i> Prasad & Singh	Herb	DD	DD	Venkatta Reddi 99049A&B (BSI)
50	<i>Fimbristylis ratnagirica</i> Prasad & Singh	Herb	DD	DD	Kulkarni-131758 (BSI)
51	<i>Fimbristylis unispicularis</i> Govind & Hemadri	Herb	CR	NE	Hemadri-107528B-D (BSI)
52	<i>Mariscus blatteri</i> McCann.	Herb	CR	NE	Nana-7646 (BLAT)
53	<i>Mariscus konkanensis</i> (T. Cooke) Sedgwick	Herb	LR	LC	McCann-2974-8 & 3410 (BLAT)
54	<i>Pycerus bolei</i> Almeida	Herb	CR	DD	SMA-3438 (BLAT)
55	<i>Pycerus lanceolotii</i> S.M. Almeida	Herb	CR	DD	SMA- 0162 (BLAT)
Poaceae					
56	<i>Coelachne minuta</i> Bor	Herb	EN	VU	SPG-1324
57	<i>Crysopogon castaneus</i> Veldkamp & Salunke	Herb	----	NE	SPG-0951
58	<i>Dichanthium armatum</i> (Hook. f.) Blatter & McCann	Herb	VU	NE	Almeida-2319 (BLAT)
59	<i>Dichanthium compressum</i> (Hook. f.) Jain & Deshpande	Herb	EN	NE	Janardhanam-81850 (BSI)
60	<i>Dichanthium jainii</i> (Deshpande & Hemadri) Deshpande	Herb	EN	NE	Patwardhan-1114 (BSI)
61	<i>Dichanthium maccannii</i> Blatter	Herb	DD	DD	McCann-s.n. (BLAT)
62	<i>Dichanthium panchganiensis</i> Blatter & McCann	Herb	EN	NE	McCann-s.n. (BLAT)
63	<i>Dichanthium woodrowii</i> (Hook. f.) Jain & Deshpande	Herb	EN	NE	Woodrow-27 (BSI)
64	<i>Dimeria blatteri</i> Bor	Herb	VU	NE	Blat. & McCann-9918 (BLAT)
65	<i>Dimeria woodrowii</i> Stapf.	Herb	EN	NE	Kulkarni-120259 (BSI)
66	<i>Eulalia shrirangii</i> Salunke & Potdar	Herb	-----	EN	SPG-2724
67	<i>Glyphochloa ratnagirica</i> (Kulkarni & Hemadri) Clayton	Herb	EN	NE	Kulkarni-119190 (BSI)
68	<i>Glyphochloa santapau</i> (Jain & Deshpande) Clayton	Herb	EN	NE	Mishra- 176968 (BSI)
69	<i>Isachne borii</i> Hemadri	Herb	EN	NE	Woodrow-s.n. (BLAT)
70	<i>Isachne swaminathanii</i> Ved Prakash & Jain	Herb	VU	NE	Wadhwa-127804 (BSI)
71	<i>Ischaemum bolei</i> M.R. Almeida	Herb	EN	DD	SMA-913 (BLAT)

TABLE 1. CONTINUED.

SL	Botanical name	Habit	IUCN old	IUCN new	Field No.
72	<i>Ischaemum bombaiense</i> Bor	Herb	CR	NE	Snatapau-10473 (BLAT)
73	<i>Ischaemum huegelii</i> Hack.	Herb	CR	DD	-----
74	<i>Juncenella neglecta</i> Yadav, Chivalkar & Gosavi	Herb	-----	LC	SPG-2991
75	<i>Mnesithea veldcampii</i> Potdar, Gaikwad, Salunkhe & Yadav	Herb	-----	CR	SPG-0889
76	<i>Panicum deccanense</i> Naik & Patunkar	Herb	VU	VU	RDG-1706 (WCAS)
77	<i>Panicum johnii</i> Almeida	Herb	EN	NE	SMA-2597 (BLAT)
78	<i>Pogonachne racemosa</i> Bor	Herb	VU	NE	Woodrow-s.n. (BSI)
79	<i>Sacciolepis indica</i> (L.) Chase var. <i>intermedia</i> Almeida	Herb	EN	NE	SMA-1393 (BLAT)
80	<i>Triplopogon ramosissimus</i> (Hack.) Bor	Herb	-----	CR	SPG-1002
Ranunculaceae					
81	<i>Delphinium malabarium</i> (Huth) Munz var. <i>malabarium</i>	Perennial herb	VU	VU	SPG-0811
82	<i>Delphinium malabarium</i> (Huth) Munz var. <i>ghaticum</i> Billore	Perennial herb	CR	DD	Ryan-1425A & B (BSI)
83	<i>Thalictrum obovatum</i> Blatter	Herb	CR	DD	Ankadi- P-26A (BLAT)
Fabaceae					
84	<i>Alysicarpus narimanii</i> S.M. Almeida & M.R. Almeida	Erect herb	DD	DD	Shah-10593 (BLAT)
85	<i>Alysicarpus salim-alii</i> S.M. Almeida & M.R. Almeida	Erect herb	DD	DD	Blatter-9376 (BLAT)
86	<i>Alysicarpus tetragonolobus</i> Edgew. var. <i>pashanensis</i> S.M. Almeida & M.R. Almeida	Erect herb	DD	DD	Panthaki-2009 (BLAT)
87	<i>Flemingia rollae</i> (Billore & Hemadri) A. Kumar	Herb	EN	CR	SPG-2723
88	<i>Galactia tenuiflora</i> (Klein ex Willd.) Wight & Arn. var. <i>minor</i> Baker	Twiner	DD	DD	-----
89	<i>Indigofera deccanensis</i> Sanjappa	Shrub	VU	CR	RDG-999 (WCAS)
90	<i>Indigofera santapau</i> Sanjappa	Herb	CR	DD	Santapau-7174 (BLAT)
91	<i>Indigofera trita</i> L. var. <i>purandharensis</i> Sanjappa	Shrub	CR	DD	Shah-9259-60 (BLAT)
92	<i>Smithia agharkarii</i> Hemadri	Herb	VU	LC	SPG-1077
93	<i>Smithia oligantha</i> Blatt.	Herb	DD	DD	-----
94	<i>Sphenostylis bracteata</i> (Baker) Gillett	Climbing Shrub	VU	VU	SPG-2988
Caesalpiniaceae					
95	<i>Cassia kolabensis</i> Kothari, Moorthy & Nayar	Herb	EN	NE	Kothari-147643A (BSI)
Rhamnaceae					
96	<i>Ventilago maderaspatana</i> Gaertn. var. <i>fructifida</i> Santapau	Scandent shrub	CR	NE	Irani-4972 (BLAT)
97	<i>Ziziphus rugosa</i> Lamark var. <i>glabra</i> Bhandari & Bhansali	Small tree	DD	DD	Irani-2891 (BLAT)
Begoniaceae					
98	<i>Begonia phrixophylla</i> Blatter & McCann.	Perennial herb	CR	NE	McCann-2916 (BSI)
Celastraceae					
99	<i>Salacia brunoniana</i> Wight & Arn.	Scandent shrub	CR	VU	SPG-0809
Euphorbiaceae					
100	<i>Euphorbia katrajensis</i> Gage	Herb	VU	VU	SPG-1327
101	<i>Euphorbia khandalensis</i> Blatter & Hallberg	Perennial herb	EN	EN	SPG-1001
102	<i>Euphorbia panchganiensis</i> Blatter & McCann.	Succulent herb	EN	LC	Kulkarni-120257 (BSI)
103	<i>Jatropha nana</i> Dalzell	Under shrub	EN	EN	SPG-2997
Lythraceae					
104	<i>Rotala belgaumensis</i> Yadav, Malpure & Chandore	Herb	-----	NE	SPG-2726
105	<i>Rotala floribunda</i> (Wight) Koehne	Tiny herb	EN	EN	SPG-1076
106	<i>Rotala ritchiei</i> (Clarke) Koehne	Submerged aquatic herb	CR	DD	Janardhanan-68579 (BSI)
107	<i>Rotala sahyadrica</i> Gaikwad, Sardesai & Yadav	Submerged aquatic herb	-----	CR	SPG-399C
Malvaceae					
108	<i>Abutilon ranadei</i> Woodr. & Stapf.	Shrub	CR	CR	SPG-1325
Loranthaceae					
109	<i>Helicanthes elastica</i> (Desr.) Danser	Parasitic herb	-----	VU	SPG-2827
110	<i>Scurrula stocksii</i> (Hook. f.) Danser	Parasitic herb	CR	CR	SPG-2992
Amaranthaceae					
111	<i>Achyranthes coynei</i> Santapau	Small Shrub	EN	VU	SPG-2001
Rubiaceae					
112	<i>Neanotis sahyadrica</i> Billore & Mudaliar	Erect herb	CR	NE	Billore-111944 (BSI)
Gentianaceae					
113	<i>Canscora khandalensis</i> Santapau	Erect herb	VU	NE	Santapau-2663 (BLAT)
Apocynaceae					
114	<i>Bidaria khandalense</i> (Santapau) Jagtap & Singh	Woody climber	CR	VU	SPG-1048

TABLE 1. CONTINUED.

SL	Botanical name	Habit	IUCN old	IUCN new	Field No.
115	<i>Brachystelma malwanense</i> Yadav & Singh	Small perennial herb	CR	CR	SPG-1718
116	<i>Brachystelma naorajii</i> Tetali, Kulkarni, S. Tetali & Kumbhojkar	Small perennial herb	CR	CR	SPG-2020
117	<i>Ceropegia anantii</i> Yadav, Sardesai & Gaikwad	Erect herb	CR	CR	SPG-1713
118	<i>Ceropegia anjanerica</i> Malpure, Kamble & Yadav	Erect herb	----	NE	SPG-2057
119	<i>Ceropegia evansii</i> McCann.	Herbaceous climber	CR	CR	SPG-1213
120	<i>Ceropegia fantastica</i> Sedgwick	Climbing herb	CR	CR	SPG-1399
121	<i>Ceropegia huberi</i> Ansari	Herbaceous climber	EN	CR	SPG-2857
122	<i>Ceropegia jainii</i> Ansari & Kulkarni	Perennial herb	CR	EN	SPG-2323
123	<i>Ceropegia lawii</i> Hook. f.	Perennial herb	EN	EN	SPG-0990
124	<i>Ceropegia maccannii</i> Ansari	Perennial herb	EN	EN	SPG-2690
125	<i>Ceropegia mahabalei</i> Hemadri & Ansari	Perennial herb	CR	CR	SPG-1818
126	<i>Ceropegia media</i> (Huber) Ansari	Herbaceous climber	VU	VU	SPG-1133
127	<i>Ceropegia mohanramii</i> Yadav, Gavade & Sardesai	Erect herb	CR	NE	SPG-1663
128	<i>Ceropegia noorjahaniae</i> Ansari	Perennial herb	EN	EN	SPG-2314
129	<i>Ceropegia panchganiensis</i> Blatter & McCann.	Perennial herb	CR	CR	SPG-2471
130	<i>Ceropegia rollae</i> Hemadri	Perennial herb	CR	CR	SPG-2955
131	<i>Ceropegia sahyadrica</i> Ansari & Kulkarni	Perennial herb	VU	VU	SPG-1996
132	<i>Ceropegia santapau</i> Wadhwa & Ansari	Herbaceous climber	EN	CR	SPG-1319
133	<i>Ceropegia vincaefolia</i> Hook. f.	Herbaceous climber	EN	VU	SPG-1722
134	<i>Frerea indica</i> Dalzell.	Succulent herb	CR	CR	SPG-2994 (WCAS)
Convolvulaceae					
135	<i>Argyria boseana</i> Santapau & Patel	Climbing shrub	EN	NE	Kapadia-2084-5 (BLAT)
136	<i>Ipomoea salsettensis</i> Santapau & Patel	Twining shrub	EN	DD	Santapau-23353 (BLAT)
137	<i>Operculina tansaensis</i> Santapau & Patel	Climbing shrub	CR	DD	Patel-1613-5 (BLAT)
Scrophulariaceae					
138	<i>Bonnayodes limnophiloides</i> Blatter & Hallberg	Herb	CR	DD	Blatter & Hallberg-9450 (BLAT)
139	<i>Lindernia quinqueloba</i> (Blatter & Hallberg) Mukharjii	Small herb	VU	DD	Blatter-1518 (BLAT)
Lamiaceae					
140	<i>Leucas deodikarii</i> Billore & Hemadri	Under-shrub	EN	NE	Mishra-176985 (BSI)
Lentibulariaceae					
141	<i>Utricularia babui</i> Sardesai, Gaikwad & Yadav	Small herb	----	EN	MMS-3045 (SUK)
142	<i>Utricularia janarthanamii</i> Yadav, Sardesai & Gaikwad	Small herb	----	VU	RDG-990 (WCAS)
143	<i>Utricularia naikii</i> Yadav, Sardesai & Gaikwad	Small herb	----	EN	MMS-1911 (SUK)
Acanthaceae					
144	<i>Barleria gibsonioides</i> Blatter	Small shrub	PE	PE	Blatter-2-7 (BLAT)
145	<i>Barleria grandiflora</i> Dalzell	Small shrub	CR	VU	SPG-1326
146	<i>Dicliptera ghatica</i> Santapau	Erect herb	CR	DD	Santapau-1915 (BLAT)
147	<i>Dicliptera nasikensis</i> Lakshminarasimhan & Sharma	Prostrate herb	CR	CR	SPG-2993
148	<i>Hypoestis lanata</i> Dalzell	Undershrub	PE	PE	Acland-0916 (BLAT)
149	<i>Lepidagathis bandraensis</i> Blatter	Herb	CR	VU	RDG-812 (WCAS)
150	<i>Nilgiranthus reticulatus</i> (Stapf.) Bremek.	Shrub	LR	NE	Billore-115514 (BSI)
151	<i>Synnema anomalum</i> (Blatter) Santapau	Prostrate herb	PE	PE	----
Asteraceae					
152	<i>Blumea venkataramanii</i> RollaRao & Hemadri	Erect herb	EN	NE	Hemadri-68988 (BSI)
153	<i>Cyathocline purpurea</i> (Buch.-Ham. ex D. Don) O. Ktze. var. <i>alba</i> Santapau	Herb	VU	NE	Santapau-8863 (BLAT)
154	<i>Cyathocline purpurea</i> (Buch.-Ham. ex D. Don) O. Ktze. var. <i>bicolor</i> Santapau	Herb	CR	NE	Santapau-3422 (BLAT)
155	<i>Phyllocephalum hookeri</i> (Clarke) Uniyal	Erect herb	DD	DD	----
Apiaceae					
156	<i>Heracleum dalgadianum</i> Almeida	Perennial herb	CR	NE	SPG-1075
157	<i>Pimpinella rollae</i> Billore & Hemadri	Perennial herb	CR	CR	SPG-1302
158	<i>Pimpinella tomentosa</i> (Dalzell & Gibson) Clarke	Perennial herb	LR	LC	SPG-2989
159	<i>Pinda</i> "= " <i>concanensis</i> (Dalzell) Mukherjee & Constance	Perennial herb	LR	LC	SPG-2725



FIGURE 2. A. *Abutilon ranadei*; B. *Bidaria khandalensis*; C. *Delphinium malabaricum* var. *malabaricum*; D. *Sphenostylis bracteata*; Photos by S.P. Gaikwad.

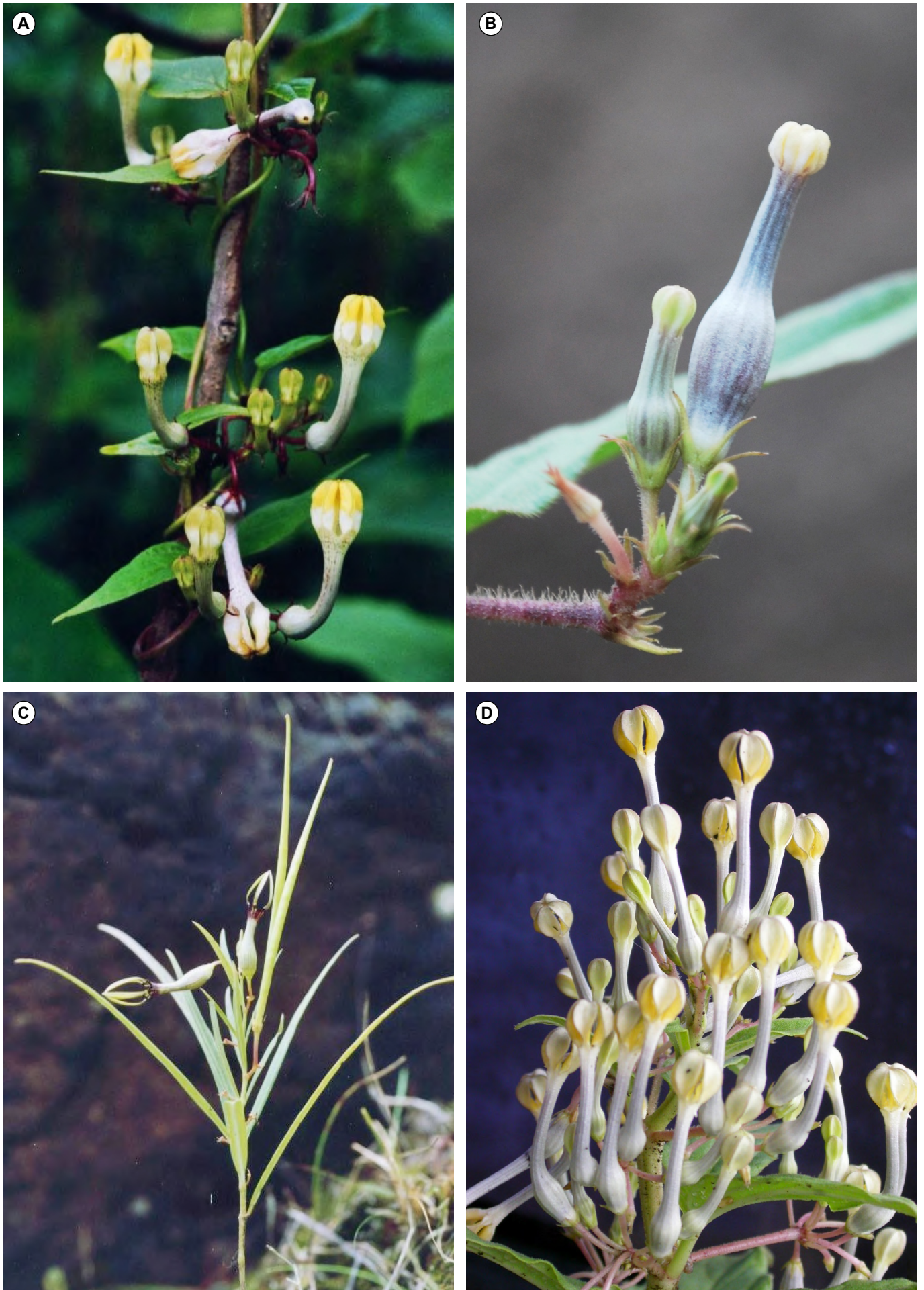


FIGURE 3. A. *Ceropegia evansii*; B. *Ceropegia maccannii*; C. *Ceropegia noorjahaniae*; D. *Ceropegia panchganiensis*; Photos by S.P. Gaikwad.



FIGURE 4. A. *Ceropogia fantastica*; B. *Frerea indica*; C. *Helicanthes elastica*; D. *Pinda concanensis*; E. *Rotala sahyadrica*; F. *Rotala floribunda*; G. *Aponogeton bruggenii*; H. *Scurrula stocksii*; Photos by S.P. Gaikwad.

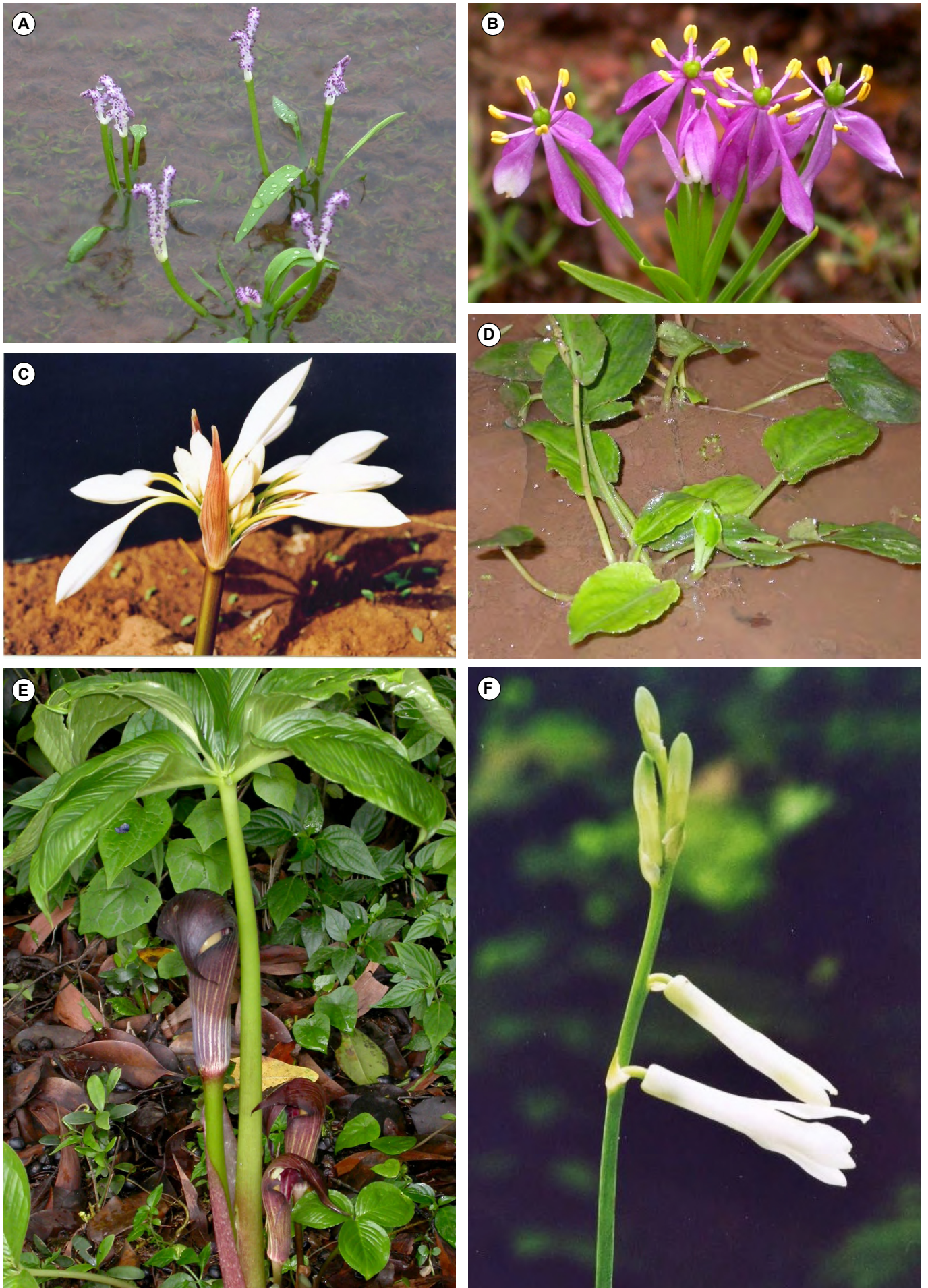


FIGURE 5. A. *Aponogeton satarensis*; B. *Camptorrhiza indica*; C. *Crinum brachynema*; D. *Cryptocoryne cognata*; E. *Arisaema sahyadricum*; F. *Dipcadi concanense*; Photos by S.P. Gaikwad.

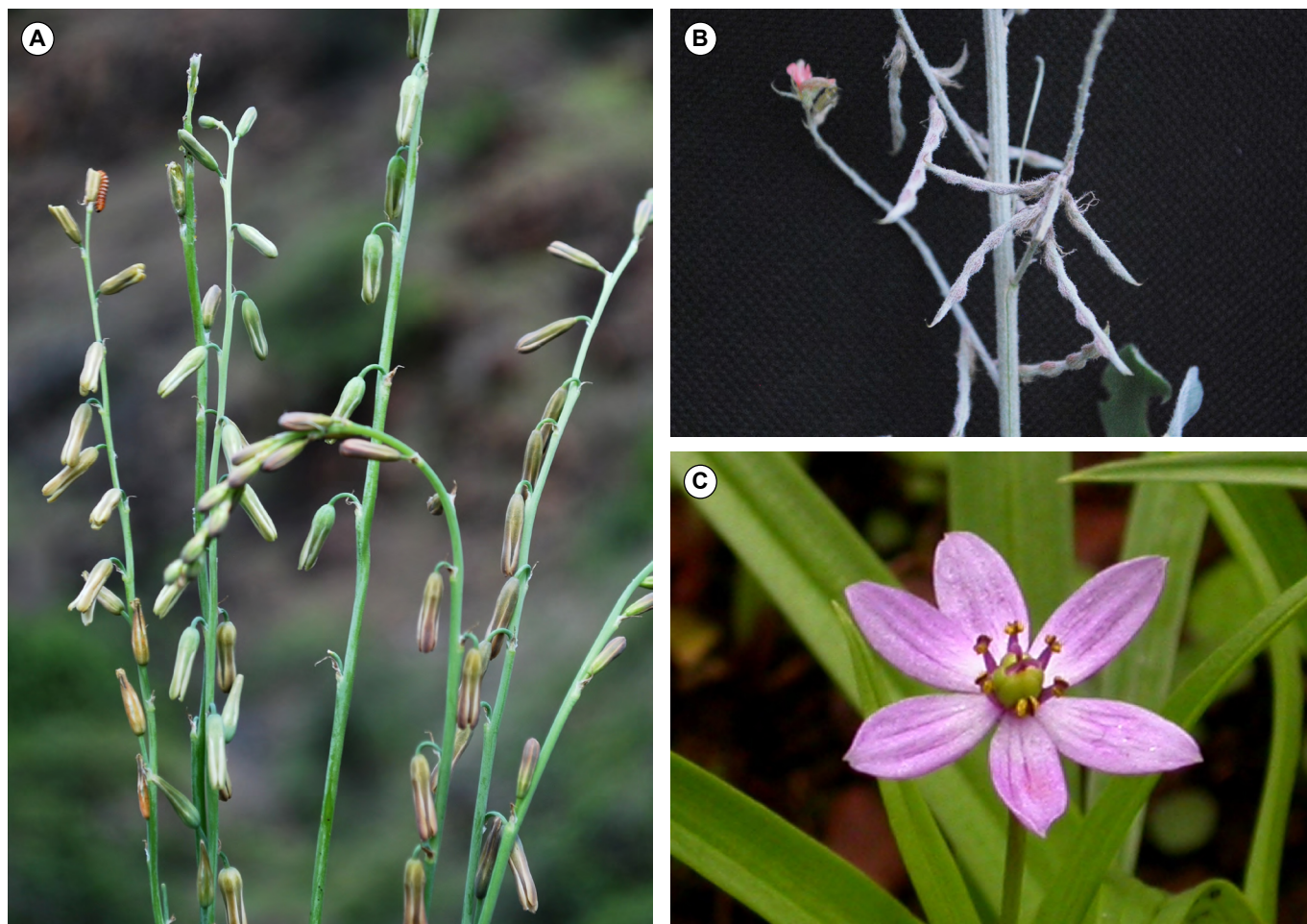


FIGURE 6. A. *Dipcadi saxorum*; B. *Indigofera deccanensis*; C. *Iphiginia stellata*; D. *Triplopogon ramosissimus*; Photos by S.P. Gaikwad.

ACKNOWLEDGMENTS: The authors are grateful to the Principal, Walchand College of Arts & Science, Solapur for providing available research facilities; Director, Botanical Survey of India, Western Circle, Pune and Curator, Blatter Herbarium, Mumbai for confirmation of identifications and to Department of Science and Technology (DST), Government of India for financial assistance.

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RECEIVED: May 2012

ACCEPTED: April 2014

PUBLISHED ONLINE: July 2014

EDITORIAL RESPONSIBILITY: Paul Egan