

## MATERIALS AND METHODS

### Study area

The Western Ghats which run more or less parallel to the coast in Peninsular India are a chain of mountains along the Western border of the Deccan and overlooking the Arabian Sea on the west. They extend from the mouth of the Tapti River Valley (21°N) in Gujarat to Kanniyakumari (8°N) in Tamil Nadu. The Ghats are about 1600 km long in the north south direction and on an average 5 - 10 km broad (Venu, 2006). The Ghat passes through the states of Gujarat, Maharashtra, Goa, Karnataka, Kerala and Tamil Nadu from north to south.

The Northern Western Ghats extend from the mouth of the river Tapti up to Goa, about 750 km in length. They are popularly known as “Sahyadris” or “Konkan” and the altitudes range between 300 - 1500 m above msl excluding high crests. Along the Sahyadris, isolated conical, flat-topped hills occur with steep sides marked with distinct striations, in contrast the Ghats south of Amboli and Goa have rather gradual slopes without striations. Some of the major peaks in Sahyadris are Harishchandragad (1424 m), Mahabaleshwar peak (1438 m), Salhar (1567 m) and Kalsubai (1646 m) (Karthikyan, 1996).

In Karnataka, the Western Ghats rise sharply to form an unbroken though uneven rampart with an average altitude of about 900 m. Deep valleys plunging to less than 200 m and precipitous or rounded peaks rising to an altitude of over 1500 m make up this region of the Western Ghats (Saldanha, 1984). The western windward face of the Ghats descend steeply whereas the eastern leeward face has rolling hills and shallow valleys with mean elevation of about 800 m. The Sahyadri in this section runs southwards very close to the coast and at several places as in Karwar touches the sea shore and finally joins the Nilgiri Mountains. The Ghats at Kodachadri suddenly

rise to 1343 m and fall to about 600 m at Agumbe. From Kudremukh which is the highest peak (1892 m) up to Palghat Gap, the edge of the plateau is very often higher than 1000 m and the peaks are more numerous and higher too. Some of them are Pushpagiri (1713 m) in the north of Kodagu, Tadiandamol (1745 m), Banasuram (2060 m) and Vavul Mala (2339 m) at the edge of Wyanad plateau (Vajravelu & Vivekananthan, 1996). A major discontinuity known as Palghat (Palakkad) Gap in the more or less continuous hill ranges exists which separates the Nilgiris from the Anamalais.

The northern, southern and western boundaries of the Western Ghats are geographically distinct, while the eastern limit is not clear and merges with the eastern plateau and hills of Deccan (Vajravelu & Vivekananthan, 1996).

### **Rivers**

Except for the Narmada and the Tapti, the important rivers of Peninsular India that is the Godavari, Krishna, Cauvery (Kaveri) flow eastward into the Bay of Bengal, though they originate on the crest of Sahyadri which is about 50 - 80 km away from the Arabian Sea coast. The Tungabhadra, the important tributary of the river Krishna, is formed by the union of Tunga and Bhadra, both originating near the Gangamula peak (1199 m) which is about 5 km south west of Shringeri. The Cauvery too has its source on the Brahmagiri hill in Kodagu district. Of the west flowing rivers, the Sharavathi has been dammed to create an enormous lake and a spectacular waterfall, the Jog falls near Gersoppa on the west of the crest (Karthikeyan, 1996).

### **Climate**

India's climate is affected by two seasonal winds, the South-West monsoon and the South-East monsoon. The South-West monsoon commonly known as summer monsoon blows from the sea to land after crossing the Indian Ocean, whereas the

North-East monsoon known as the winter monsoon blows from the land to the sea (Karthikeyan, 1996).

The climate of the Western Ghats is mainly influenced by the South-West monsoon, even though the Western Ghats situated in the Karnataka, Tamil Nadu and Kerala, receive the North-East monsoon during October to January. The annual rainfall varies from 2350 mm in the north to 7450 mm in the south. The western slopes of the Ghats, exposed to the frontal attack of South -West monsoon, receive the maximum rain. In certain peaks like Agumbe (Karnataka), Kundah range, Nilgiris (Tamil Nadu) and Anaimudi (Kerala), the rainfall often exceeds 5000 mm; the rainfall figures of 2000 - 4000 mm in one single month July or August are not rare. Areas like Silent Valley which are shielded all around have developed a special micro climate (Vajravelu & Vivekananthan, 1996).

The Northern Western Ghats receive heavy rainfall during the South West monsoon which starts in early June and trails off during September. The heaviest rains are recorded in the month of July and August. Along the west coast it is 2500 mm but diminishes eastward. The top regions in Northern Western Ghats such as Mahabaleshwar and Amboli that are to the windward side of the Sahyadris get a rainfall of 6200 mm and 7477 mm, respectively.

### **Temperature and Humidity**

The mean annual temperature varies from 20 - 24°C. The mean daily temperature in the coldest months of December to January ranges between 18 - 24°C, the absolute minimum temperature being in the range of 6 - 14.8°C in different places of Sahyadris.

The humidity during monsoon months ranges between 70 - 90% and during dry periods it is 10 - 30% (Karthikeyan, 1996).

## Soils

The main groups of soils found along the North Western Ghats are high and low level laterites, red loam, medium black soils, red gravelly soils and mixed red and black soils. Usually medium black soils are found on flat hilltops while the valleys have deep red, gravelly soils with good humus content. Most of the soils in North West coast are leached lateritic and reddish (Mahabale, 1987). They are originally derived from Deccan traps. Along the river banks and near estuaries the soils are alluvial and fertile whereas along the sea coast and on top of hills, the soils are poor (Karthikeyan, 1996).

## Vegetation

The vegetation types of Sahyadris in the Northern Western Ghats can be classified into Scrub, Dry deciduous, Tropical moist deciduous and Montane subtropical evergreen forests (Karthikeyan, 1996). Whereas the main vegetation types of Central Western Ghats in the Shimoga-Kanara region are the Wet evergreen forest, Wet semi-evergreen forest, Moist deciduous forest, Dry deciduous forest and Shola forest and Grasslands (Keshava Murthy and Yoganarasimhan, 1990; Nayar, 1996; Vajravelu & Vivekananthan, 1996).

1. **Scrub forests:** This type of forests are found in both the Northern and central Western Ghats and occur along foot hills at lower elevations and along the eastern slopes, from 200 - 500 m altitudes in the rain shadow region. Here the soil is usually lateritic and gravelly soil. The vegetation here is mainly thorny, where it consists of usually thorny species with a few stunted, crooked and malformed trees. Among the herbaceous species, genera belonging to Acanthaceae are *Andrographis serpyllifolia* Wight, *Barleria buxifolia* L., *Barleria prionitis* L., *Cynarospermum asperrima* (Nees) Vollesen, *Dicliptera zeylanica* Nees, *Eranthemum roseum* (Vahl)

R. Br., *Hemigraphis latebrosa* Nees, *Justicia diffusa* Willd., *Lepidagathis cuspidata* (Wall.) Nees, *Rungia pectinata* (L.) Nees and *Rungia repens* (L.) Nees are found. Some climbers and scandant shrubs, epiphytes and parasites are found here. Some of the herbaceous members form the screen vegetation (Keshava Murthy and Yoganarasimhan, 1990).

2. **Dry and tropical moist deciduous forests:** These types are present in the Northern Western Ghats. A little higher above the scrub, the vegetation changes into dry deciduous and trees start appearing. At higher elevations with better soil and improved climatic conditions, the vegetation changes to the tropical moist deciduous forests. *Strobilanthes ixiocephalus* Benth. and *Strobilanthes integrifolius* (Dalzell) Kuntze are common here.
3. **Dry and moist deciduous forests:** In the Central Western Ghats, the dry deciduous forests occur on the eastern part of the Ghats and around hills of lower elevations between 300 to 900 m and in several protected areas, which receive moderate rainfall. The canopy is open and the trees are leafless during the summer months. Flowering and fruiting are generally, far advanced before the first flush of new leaves. *Strobilanthes callosa* Nees is one of the undergrowths.

The moist deciduous type occurs having a brief leaf fall, between 500 and 1200 m depending upon the rainfall, which is from 160 to 250 cm annually. They are found in certain pockets of Murkal, Nagarhole, Ponnampet, Somavarpet, Shanivarasanthe and lower parts of Karike and Sampaje ghats. *Hygrophila auriculata* (K. Schum.) Heine and *Phaulopsis imbricata* (Forsk.) Sweet. are among the Acanthaceae present.

This type gradually merges with the evergreen type through the semievergreen type. Many dry deciduous trees of lower elevations and evergreen trees of higher

elevation intrude into this zone. Due to the high yield of valuable timber, these forests have been extensively exploited and consequently greatly disturbed. Semievergreen forests occur as transitional zones between the evergreen and moist deciduous vegetation.

4. **Montane sub-tropical evergreen forests:** The evergreen forests that occur in the Northern Western Ghats are not typical evergreen forests. As the trees tend to be dwarf, without any tiers or canopies of tropical elements they are classified as montane evergreen forests. *Eranthemum roseum* (Vahl) R. Br. is found as a member of the rich herbaceous flora.
5. **Semi-evergreen and evergreen forests:** These types of forests are found in the Central Western Ghats. Tropical Evergreen forests occur in the lower slopes and valleys of the Ghat. Giant tree with buttressed bases and trunks that are unbranched over 30 m with closed canopy and several strata are characteristic of these forests.

In Uttara Kannada the evergreen forests are found in Central, Southern and Western parts of the district in places like Jog, Katgal and Yellapur. Both the sides of the Sharavathi River between Jog falls and Gersoppa are having dense evergreen vegetation.

The evergreen belt in Agumbe-Hulical ranges in Shimoga district extends all along the Ghat region facing Dakshina Kannada. The altitudinal and horizontal distribution of the forests vary depending on elevation. The forests have trees between 100 to 400 m whereas climax type of evergreen forests occurs between 400 to 750 m.

In Chikmaglur District, the evergreen forests are common around the hills and valleys of Bhagavathi, Bhyrapura, Charmadi Ghats, Kemmangundi and Samse where the altitude ranges from 500 to 1500 m. These forests are on the windward

side of the Western Ghats. *Asystasia chelonoides* Nees is present in the undergrowth whereas *Thunbergia alata* Boj. ex Sims. is frequent among the climbers and lianas.

In Kodagu District the occurrence of tall trees in the top layer of evergreen forests was reported by Keshava Murthy and Yoganarasimhan (1990). *Asystasia crispata* Benth. is among the ground layer plants. The similarity of the evergreen forests in Kodagu District to the wetter forests of Kerala is indicated by presence of *Cullenia exarillata* Wight. This type is found where the altitude ranges from 600 to 1500 m and rainfall from 270 to 650 cm. Some areas like Irpu, Virajpet, Wotekolli, Sollekolli, Bhagamandala, Talacauvery, Mercara, upper ghats of Sampaje, Kakkabe, Tadiandamol, Heggademane, Shanthalli, Kundalli, parts of Pushpagiri abound in this type of forests. A clear demarcation between the two types is not possible since the elements intrude into one another.

- 6. Sholas and grassland type:** The Shola type of vegetation comprises of both tropical and subtemperate genera mixed together. The Sholas may be considered to be a climax type. They are isolated, compact and usually small woods composed of evergreen trees. The Shola type of vegetation is seen along elevations of 1200 m and above, mainly around Gangamula, Kemmanagundi, Kudremukh, patches of Charmadi Ghats and in areas like the ranges of Brahmagiri, Mercara, Pushpagiri, Tadiandamol and Talacauvery. The undergrowth is represented by species of *Strobilanthes*, a large number of ferns and ground orchids. They are normally bordered by a narrow but dense belt of *Strobilanthes heyneanus* Nees. Trees and shrubs are present. Shola type of vegetation with genera of tropical and subtemperate regions are seen in higher elevations.

The last 300 m of the mountains are steep and are dominantly covered with grasses. They are also termed as “Savanas” due to the dense growth of grasses. The trees in these grassy slopes are stunted with smaller-sized leaves compared with those occurring in semi-evergreen and evergreen forests. Along the hill tops *Phoenix humilis* Royle is found scattered. The grasses grow in tufts and are found scattered irregularly on the rocky ground. Interspersed with grasses herbs are also found.



## **Methodology**

The “Systematic Studies on the Endemic Species of the Family Acanthaceae from the Northern and parts of Central Western Ghats” was undertaken and started in June 2004.

Using Ahmedullah & Nayar (1986), Nayar (1996) and Mishra & Singh (2001), a checklist of endemic taxa of Acanthaceae from the study area was prepared and data pertaining to distribution of these taxa was obtained from Floras of the study area. Taxa showing extended distribution beyond the Western Ghats as determined from herbarium data and Floras of surrounding regions were excluded from the present study.

The endemic species were collected by undertaking field trips to the different parts of study area spanning the three states of Maharashtra, Goa and Karnataka from August 2004 to February 2008. Since no endemic Acanthaceae were either found listed in the Floras of Gujarat, nor collections observed in any of the local herbaria visited, field trips were not conducted to Gujarat.

The flowering specimens collected were given collection numbers. The field data such as habit, habitat, inflorescence details, phenology, flower colour, etc. were noted down in the field. Some flowering twigs of the specimens collected were preserved in FAA solution (Formaldehyde: Acetic acid: Ethyl Alcohol:: 9: 0.5: 0.5) for dissection in the laboratory.

The altitude, longitude and latitude readings were noted down with the help of the Garmin GPS12 hand held receiver to note the exact locations. Photographs in the field were taken using Nikon Coolpix 4500 camera.

The collected Acanthaceae specimens were processed for herbarium using standard herbarium techniques. The ethyl alcohol saturated with mercuric chloride

was used to poison specimens. Specimens were mounted on standard herbarium sheets. Labels with the specimen details were pasted and the herbaria deposited at the Goa University Herbarium (GUH, it is not an acronym, but abbreviated for convenience and used in the text throughout).

The morphological details were studied by dissecting specimens under WILD M3Z Leica stereo microscope. Detailed descriptions were written incorporating all the variations and illustrations of floral parts were drawn using the drawing tube attached to M3Z Leica stereo microscope.

Standard revisionary methods were used for evaluating the taxa. Names were applied using type method. Nomenclature updated in accordance with the ICBN (International Code of Botanical Nomenclature) (Mc Neil *et al.* 2006, Vienna Code) and other publications on Acanthaceae viz. Santapau (1952), Malhotra & Moorthy (1981), Wood (1994), Carine *et al.* (2004), Venu & Daniel (2006). Author abbreviations were updated according to Brummit & Powell (1992).

The identifications were confirmed by comparing with Type and/or authentic herbarium specimens available at major herbaria such as BSI (Botanical Survey of India, Western Circle Herbarium, Pune), MH (Madras Herbarium of Botanical Survey of India, Southern Circle, Coimbatore) and CAL (Central National Herbarium of the Indian Botanic Garden, Botanical Survey of India, Kolkata) and photographs of type specimens as well as other specimens from K (Royal Botanic Garden, Kew), CALI (Herbarium, University of Calicut) and FRLH (Foundation for Revitalisation of Local Health Traditions Herbarium). The other important herbaria visited were JCB (Joseph College Herbarium, housed at Indian Institute of Science, Bangalore), BLAT (Blatter Herbarium at St. Xavier's College, Bombay), AHMA (Agarkar Research Institute Herbarium, Pune), SUK (Shivaji University, Kolhapur), GUH (Goa University

Herbarium) and JPH (Fr. Joseph Pallithanam Herbarium at St. Xavier's College, Goa. It is not an acronym, but abbreviated for convenience and used in the text throughout). Specimens available in these herbaria were also studied for their morphological details using hand lens and details on the herbarium labels were noted. Some of the specimens that could not be collected were described from the *Type* as well as general collections from the above mentioned herbaria.

### **Pollen study**

Pollen for the study was obtained from the following sources:

- Fresh anthers collected from specimens brought from the field.
- Flowers preserved in FAA.
- Dried specimens prepared for Herbarium.

Pollen grains were examined using light microscopy. Pollen samples were acetolysed following the technique of Erdtman (1960). The slides for light microscopy were prepared by mounting pollen in glycerin jelly, sealed with DPX and observed under the compound microscope. Pollen size measured by micrometry under the compound microscope Olympus CH30 based on an average of 20 pollens. The photographs were taken using Olympus SZ51 compound microscope attached with DP12 camera. Description terminology used by Carine & Scotland (1998) and Chaubal (1966) was followed in the present study.

### **Scanning Electron Microscopy (SEM) for seeds**

Seeds were mounted onto glass slides using double sided sticky tape and then mounted onto SEM stubs; sputter coated with Platinum and examined using a JOEL JSM6360 scanning electron microscope at 5 and 10 KV. Whole surface of each seed examined under SEM and photographs taken at three different magnifications.

## **Anatomy**

Hand sections were taken of the stems for some of the species of the genus *Strobilanthes* Blume, stained with safranin, mounted in glycerine and observed under the compound microscope Olympus CH30. The photographs were taken using Olympus SZ51 microscope attached with DP12 camera.

## **Phylogeny**

Phylogenetic analysis using PHYLIP 3.67 (Felsenstein, 2006) was carried out using parsimony. The morphological characters and character states are given in Table 1 and the character scoring is given in Table 2.

## **Phytogeographical distribution**

Phytogeographical distribution was studied from the data obtained from collections made during the present study, distribution data collected from herbaria and from literature. It is presented in the form of maps.

## **Threat Status**

The threat status for the endemic species was worked out according to IUCN (International Union of Conservation and Nomenclature) 2001 Categories & Criteria (Version 3.1).

Table 1: Characters used in phylogenetic analysis

Sr. no.	Character	0	1	2	3	4	5
1	Explosive fruits	absent	present				
2	Retinacula	absent	papillate	soft	hooked		
3	Cystoliths	absent	present				
4	Corolla aestivation	left contorted	descending cochlear	ascending cochlear	quincuncial	open	plicate
5	Stamens	four	two	one			
6	Staminodes	absent	present				
7	Pollen pores	spiranthes	equatorial	panthoporate			
8	Pseudocolpi	absent	present	?			
9	Corolla	5-lobed	bi-lipped	no upper lip	obscurely bi-lipped		
10	Seeds	four	more than four	two	?		
11	Bracts	large	small	minute	absent		
12	Bracteoles	absent	present				
13	Long filament	glabrous	hairy	glandular hairy	hairy at base	?	
14	Anthers	bithecos	monotheous	one cell obsolete	?		
15	Anthers	parallel	divergent/ sagittate	superposed	connivent	?	
16	Anthers	spurred /muticous	muticose	spurred	bearded/glandular hairy/ciliate back	glabrous	
17	Ovary	glabrous	pubescent	glandular hairy	hairy/gland hairy at apex	woolly tomentose	?
18	Style	hairy on 1 line	glabrous	pubescent	hairy at base	gland hairy	?
19	Stigma	funnel shape and 2 lobed	bi-lipped	protrusion present	1 lobe suppressed	?	
20	Areole	absent	present	?			
21	Flowers	pedicellate	sessile	shortly pedicellate	sub-sessile		
22	Seed surface	hairy/ appendaged	glabrous	?			
23	Seed hairs	absent	uniformly hairy	hairy along margins	in groups	trigonous hairy	?
24	Appendages	scaly plates	granular	absent	rugouse/verrucose	papillate/ bullate	tuberculate/ glochidiate

? : Not known

Table 2: Character scores for phylogeny

Sr. no.	Taxa	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1	<i>Thunbergia grandiflora</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	<i>Acanthopale jogensis</i>	1	3	1	0	0	0	2	0	0	2	0	1	1	0	0	4	3	1	3	0	1	0	0	0	2
3	<i>Barleria gibsonioides</i>	1	3	1	3	1	1	1	0	3	0	0	1	2	0	0	4	0	1	3	0	3	1	0	0	2
4	<i>B. grandiflora</i>	1	3	1	3	1	1	1	0	3	0	0	1	1	0	0	4	0	1	3	0	3	1	0	0	2
5	<i>B. involucreta</i> var. <i>elata</i>	1	3	1	3	1	1	1	0	3	0	0	1	1	0	0	4	3	1	3	0	3	0	1	0	2
6	<i>B. terminalis</i>	1	3	1	3	1	1	1	0	3	0	0	1	1	0	0	4	3	1	3	0	3	0	1	0	2
7	<i>B. sepalosa</i>	1	3	1	3	1	1	1	0	3	0	0	1	?	0	0	4	0	1	3	0	3	0	1	0	2
8	<i>Calacanthus grandiflorus</i>	1	3	1	0	0	0	1	1	1	2	0	1	0	0	1	1	1	2	1	2	3	0	1	0	2
9	<i>Cynaropsermum asperrimum</i>	1	3	0	4	0	0	1	0	2	0	0	1	0	2	2	3	3	3	1	0	1	0	4	0	2
10	<i>Dicliptera ghatica</i>	1	3	1	2	1	0	1	1	1	0	0	1	1	0	2	4	1	2	1	0	1	0	0	0	5
11	<i>D. nasikensis</i>	1	3	1	2	1	0	1	1	1	0	0	1	1	0	2	4	2	2	1	0	1	0	0	0	5
12	<i>Dyschoriste dalzellii</i>	1	3	1	0	0	0	1	1	1	0	3	1	1	0	0	2	0	2	3	0	2	0	1	0	2
13	<i>Eran. cap.</i> var. <i>concanensis</i>	1	3	1	0	1	1	1	0	0	0	1	1	0	0	0	2	1	2	3	1	1	0	0	2	2
14	<i>Gymnostachyum febrifugum</i>	1	3	1	2	1	0	1	0	1	1	2	0	0	0	1	3	0	2	3	0	2	0	3	0	2
15	<i>G. glabrum</i>	1	3	1	2	1	0	1	0	1	1	2	1	3	0	0	3	1	2	3	0	2	0	3	0	2
16	<i>G. latifolium</i> var. <i>latifolium</i>	1	3	1	2	1	0	1	0	1	1	2	1	1	0	0	3	0	2	3	0	3	0	3	0	2
17	<i>G. latifolium</i> var. <i>decurrens</i>	1	3	1	2	1	0	1	0	1	1	2	1	1	0	1	3	0	2	3	0	3	0	3	0	2
18	<i>G. polyanthum</i>	1	3	1	2	1	0	1	0	1	1	2	1	0	0	1	3	2	2	3	0	3	0	3	0	2
19	<i>Haplanthodes neilgherryensis</i>	1	3	1	2	1	0	1	0	3	1	2	1	0	0	3	3	1	2	3	0	1	0	0	0	3
20	<i>H. plumosa</i>	1	3	1	2	1	0	1	0	3	1	2	1	0	0	3	3	2	2	3	0	1	0	0	0	3
21	<i>Hem. latebrosa</i> v. <i>heyneana</i>	1	3	1	0	0	0	1	1	3	1	0	0	1	0	0	1	1	2	2	0	3	0	1	0	2
22	<i>Hygrophila anomala</i>	1	2	1	0	2	1	1	1	1	1	0	1	0	0	0	1	1	2	2	0	3	0	2	0	0
23	<i>H. pinntifida</i>	1	2	1	0	0	0	1	1	1	1	0	1	0	0	1	3	1	1	3	0	3	0	4	0	0
24	<i>Hypoestes lanata</i>	1	3	1	2	1	0	1	0	1	1	0	1	1	1	4	1	?	1	1	0	3	0	0	0	3
25	<i>Justicia santapau</i>	1	3	1	2	1	0	1	0	1	0	1	1	3	0	2	2	1	3	1	0	3	0	0	0	3
26	<i>J. wynaadensis</i>	1	3	1	2	1	0	1	0	1	0	1	1	3	0	2	2	1	3	1	0	3	0	0	0	3
27	<i>Lepidagathis bandraensis</i>	1	3	1	3	0	0	1	0	1	2	1	1	0	0	2	3	1	3	1	0	1	0	1	0	2
28	<i>L. cristata</i>	1	3	1	3	0	0	1	0	1	2	1	1	0	0	2	1	1	3	1	0	1	0	1	0	2
29	<i>Neuracanthus trinervius</i>	1	3	1	5	0	0	1	0	0	0	0	0	1	0	0	1	0	1	3	0	1	0	1	0	2

30	<i>Rungia linifolia</i> var. <i>linifolia</i>	1	3	1	2	1	0	1	0	1	0	2	1	2	0	2	2	1	3	1	0	1	0	0	4
31	<i>R. linifolia</i> var. <i>saldanhae</i>	1	3	1	2	1	0	1	0	1	0	2	1	2	0	2	2	0	3	1	0	1	0	0	4
32	<i>Strobilanthes anamallaica</i>	1	3	1	0	0	0	1	1	0	2	1	1	1	0	0	4	0	1	3	0	1	1	0	2
33	<i>S. aurita</i>	1	3	1	0	0	1	1	1	0	0	0	1	0	0	0	4	3	4	2	1	1	0	1	2
34	<i>S. barbatus</i>	1	3	1	0	0	0	1	1	0	2	0	1	1	0	0	4	3	1	3	0	1	1	0	2
35	<i>S. callosus</i>	1	3	1	0	0	0	1	1	0	2	0	0	1	0	0	4	3	2	1	1	1	0	1	2
36	<i>S. canaricas</i>	1	3	1	0	1	0	1	1	0	?	1	1	1	0	0	4	0	2	3	?	1	?	?	2
37	<i>S. ciliatus</i>	1	3	1	0	0	1	1	1	0	0	1	1	0	0	0	4	0	1	3	0	1	1	0	2
38	<i>S. foliosus</i>	1	3	1	0	1	1	1	1	0	0	0	1	1	0	0	4	3	1	2	0	1	1	0	2
39	<i>S. gamblei</i>	1	3	1	0	1	0	1	1	3	0	1	1	1	0	0	4	3	2	3	1	1	0	1	2
40	<i>S. heteromallus</i>	1	3	1	0	0	0	1	1	0	0	0	1	0	0	0	4	3	2	3	0	1	0	2	2
41	<i>S. heyneanus</i>	1	3	1	0	0	0	1	1	0	0	0	0	1	0	0	4	0	1	3	0	1	1	0	2
42	<i>S. integrifolius</i>	1	3	1	0	0	1	1	1	0	2	0	1	1	0	0	4	3	4	2	1	1	0	1	2
43	<i>S. ixiocephalus</i>	1	3	1	0	0	0	1	0	0	2	0	1	1	0	0	4	0	0	3	1	1	0	1	2
44	<i>S. meeboldii</i>	1	3	1	0	0	0	1	?	0	?	1	1	1	0	0	4	0	0	3	?	1	?	?	2
45	<i>S. microstachya</i>	1	3	1	0	0	0	1	1	0	0	0	1	0	0	0	1	2	1	3	0	1	1	0	2
46	<i>S. minor</i>	1	3	1	0	0	0	1	0	0	?	1	1	1	0	0	4	0	2	3	?	1	?	?	2
47	<i>S. neilgherrensis</i>	1	3	1	0	0	1	1	1	0	0	0	1	1	0	0	4	3	4	3	0	1	1	0	2
48	<i>S. neosper</i>	1	3	1	0	0	0	1	1	0	0	0	1	1	0	0	4	3	2	3	1	1	0	1	2
49	<i>S. newii</i>	1	3	1	0	0	1	1	1	0	0	1	1	0	0	0	4	3	3	3	1	1	0	1	2
50	<i>S. reticulatus</i> var. <i>reticulatus</i>	1	3	1	0	1	1	1	1	0	0	0	0	1	0	0	4	3	2	3	1	1	0	1	2
51	<i>S. reticulatus</i> var. <i>l. var. nov.</i>	1	3	1	0	1	1	1	1	0	0	0	0	1	0	0	4	3	2	3	1	1	0	1	2
52	<i>S. scrobiculata</i>	1	3	1	0	0	0	1	1	0	0	0	1	0	0	0	4	0	4	2	1	1	0	1	2
53	<i>S. sessilis</i> var. <i>sessilis</i>	1	3	1	0	0	1	1	1	0	0	0	0	1	0	0	4	3	2	3	1	1	0	1	2
54	<i>S. sessilis</i> var. <i>ritchiei</i>	1	3	1	0	0	0	1	1	0	0	0	0	1	0	0	4	3	2	3	1	1	0	1	2
55	<i>S. sessilis</i> var. <i>sessilioides</i>	1	3	1	0	0	0	1	1	0	0	0	0	1	0	0	4	3	2	3	1	1	0	1	2
56	<i>S. tristis</i>	1	3	1	0	0	1	1	1	0	0	0	0	1	0	0	4	1	2	2	1	1	0	1	2

? : Not known