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ACKNOWLEDGEMENTS. This work was carried out as a part of Department of Biotechnology (DBT), New Delhi, funded project at National Chemical Laboratory, Pune. R. S. thanks DBT for financial support and Dr C. K. John for useful suggestions and help with the preparation of photo plate.

Received 3 June 2005; revised accepted 4 October 2006

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Calamus – dwindling resources?

Calamus Linn. (Arecaceae), also known as cane is represented by 370 species¹ and peninsular India has 22 species². Regionally called 'Betha' in Karnataka, the genus is reported to have 21 species in the Western Ghats³. Karnataka has a rich assemblage encompassing 15 species⁴ with Kodagu district having 12 species (Tables 1 and 2). Members of the genus are of immense importance to the economy of local people both rural and tribal, as they provide raw material for the cottage industry.

Except for the preliminary survey made by Renuka⁵ and Lakshmana³ from some parts of the Western Ghats, there is no comprehensive account on the biodiversity and taxonomy of the genus from Karnataka. A floristic survey of the Western Ghats made by Renuka⁵, Lakshmana³ and the present authors revealed the presence of several new species and a wide range of variations in some of them.

The Western Ghats, one of the world's richest biodiversity hotspots⁶, forms the largest natural home for *Calamus* and its members are widely distributed in wet evergreen, semi-evergreen and moist deciduous forests.

In Karnataka, the Western Ghats and the Biligiri Rangana Hills form its natural habitats. *Calamus stoloniferus* Renuka is endemic to Karnataka region. While some species like *Calamus gamblei*, *C. thwaitesii* and *C. prasinus* are widely distributed and relatively easy to conserve, species such as *C. nagbettaii*, *C. stoloniferus*, *C. lacciferus*, *C. karnatakensis* and *C. travancoricus* are highly restricted in their distribution and more prone to eradication³.

The species of *Calamus* are dioecious and wind-pollinated, with their phenological behaviour being influenced by climatic, topographical and edaphic factors. The low frequency of male plants and wastage of pollen during rains have led to decreased pollination efficiency and low seed set. It was observed that during 2002 prolonged drought and delay in rainfall affected the phenology of *C. karnatakensis* and caused variations in time and space of maturity and receptivity of stigma as well as production of pollen grains. This resulted in comparatively low seed set in 2002.

Overexploitation and forest fire are further threats to the survival of *Calamus*

species. Major threats for eight different cane species are listed in Table 3. Some species like *C. huegelianus* Mart.^{7,8}, *C. metzianus* Schlecht³ reported earlier from Hassan and Uttara Kannada districts respectively, could not be relocated. *C. nagbettaii* Fernandez & Dey considered in the *Red Data Book* as vulnerable⁹ and *C. karnatakensis* Renuka & Lakshmana, *C. travancoricus* Bedd. ex Becc. & Hook. f. and *C. vattayila* Renuka which show restricted distribution are becoming rare in their natural habitats.

The conservation of *Calamus* is not only important for the preservation of the cane gene bank, but also for the protection of the existing species. The status of the *ex situ* germplasm stocks is also not satisfactory. For example, only five species of *Calamus* each with only one or two culms are maintained in the Lalbagh Botanical Garden, Bangalore. Further, the sex ratio is also found to be uneven with only male plants of *C. rotang* L. and only female plants of *C. delessertianus* Becc. being present in the same locality. Initiatives to enlarge the resource base are too meagre. A. C. Lakshmana has made considerable efforts to conserve

Table 1. Distribution of *Calamus* in Karnataka

Species	Regional name	Occurrence
<i>Calamus dransfieldii</i> Renuka	Meese betha	Bhagamandala, Talacauvery (Kodagu district); Balur S F (Chickmagalur district); Kumrahalli (Hassan district)
<i>Calamus gamblei</i> Becc. ex Becc. & Hook. f.	Hasiru betha	Pushpagiri, Talacauvery (Kodagu district); Doddasampige, B.R. Hills (Chamarajanagar district)
<i>Calamus huegelianus</i> Mart.	Sooji betha	Reported from Kagenari S F (Hassan district ⁷) and Chickmagalur district ⁸ ; could not be relocated
<i>Calamus karnatakensis</i> Renuka & Lakshmana	Sukku betha	Bhagamandala, Talacauvery (Kodagu district); Agumbe (Shimoga district)
<i>Calamus lacciferus</i> Lakshmana & Renuka	Neeru betha	Agumbe (Shimoga district); Bhagamandala, Talacauvery, Makut, Pushpagiri (Kodagu district)
<i>Calamus lakshmana</i> Renuka	Halu betha	Bhagamandala, Pushpagiri (Kodagu district); Vanagur, Bisale Ghat, Hanbal (Hassan district) Londa and Kanakumbi (Belgaum district); Gersoppa (Uttara Kannada district)
<i>Calamus metzianus</i> Schlecht	–	Reported from Uttara Kannada district could not be relocated
<i>Calamus nagbetta</i> Fernandez & Dey	Nag betha	Subrahmanya, Gundya (Dakshina Kannada district), adjacent parts of Hassan and Kodagu districts
<i>Calamus prasinus</i> Lakshmana & Renuka	Onti betha	Sampaje, Anegundi (Dakshina Kannada district); Talacauvery, Bhagamandala (Kodagu district); Kumrahalli (Hassan district); Agumbe (Shimoga district); Mookambika Reserve Forests, Kollur (Udupi district)
<i>Calamus pseudotenuis</i> Becc. ex Becc. & Hook. f.	–	Kumrahalli, Hanbal (Hassan district); Arabbithittu (Kodagu district)
* <i>Calamus stoloniferus</i> Renuka	Jedu betha	Makut (Kodagu district)
<i>Calamus thwaitesii</i> Becc. & Hook.f.	Handi betha	Sampaje, Anegundi (Dakshina Kannada district); Doddasampige, B. R. Hills (Chamarajanagar district); Belgaum (Belgaum district); Bhagamandala, Pushpagiri (Kodagu district); Mookambika Reserve Forest, Kollur (Udupi district); Honnavar, Sirsi, Janmanae (Uttara Kannada district); Agumbe (Shimoga district)
<i>Calamus travancoricus</i> Bedd. ex Becc. & Hook. f.	Kiri betha	Pushpagiri, Makut (Kodagu district)
<i>Calamus vattayila</i> Renuka	Devaru betha	Makut (Kodagu district)
<i>Calamus hookerianus</i> Becc.	–	Agumbe (Shimoga district)

*Endemic to Karnataka region.

Table 2. Major cane-growing areas in Karnataka

District	Land area (sq. km)*	Forest area (sq. km)*	Percentage of forest area	No. of <i>Calamus</i> species present
Belgaum	13,415	2,246	16.74	2
Chickmagalur	7,201	2,179	30.26	2
Dakshina Kannada	4,843	5,182	61.39	3
Udupi	3,598			2
Hassan	6,814	541	7.94	6
Kodagu	4,102	1,260	30.71	12
Mysore	6,269	4,130	34.55	0
Chamarajanagar	5,685			2
Shimoga	8,465	3,270	38.63	5
Uttara Kannada	10,291	8,292	80.57	3

*Source: Annual Report of Karnataka Forest Department 2005–06 (based on Forest Survey of India, 1999).

Note: Though land area in some districts is clearly demarcated, the forest area is not indicated.

some of the *Calamus* species from the Western Ghats by growing them in his nursery ‘Shyamala Nandanavana’. There has been no such systematic and sustained

effort, as practised in the countries of Southeast Asia. Although several authors^{10–12} from India as early as the 1950s, emphasized the need for undertak-

ing plantation programmes for enhancing cane resources, for several reasons it was not implemented. Though Karnataka Forest Department has made considerable conservation efforts by raising 7062 cane plantations in different districts (Forest Department Annual Report 2005–06) it is not satisfactory, as only species which bear large number of seeds and those which are easily accessible are given priority, e.g. *C. nagbetta* and *C. thwaitesii*. The other species do not get the required attention. Unabated exploitation of the forests of the Western Ghats coupled with large-scale conversion of forests into agricultural land has led to a severe scarcity of cane, affecting the supply of raw material to the craftsmen, as well as the gene diversity of cane. The State Government initiated active measures to get raw material by importing cane from northeastern States and the Andamans. This may lead to fast depletion of

Table 3. Species of *Calamus* under threat in Karnataka

Species	Cause of threat
<i>Calamus nagbetta</i>	An endemic species. The cause of its decline in nature is due to overexploitation. For the last few years conservation measures have been adopted to increase the population of this species.
<i>C. hookerianus</i>	An endemic species of the southern part of the Western Ghats. Vulnerable due to destruction of habitats.
<i>C. metzianus</i>	An endemic species with limited population. The cane is soft and has no commercial value. Vulnerable due to its restricted distribution.
<i>C. dransfieldii</i>	An endemic species of the southern part of the Western Ghats. A newly described rattan of limited population. Its identity needs a check with <i>C. delessertianus</i> .
<i>C. gamblei</i>	An endemic species of the Western Ghats. One of the most exploited canes of the Peninsular India. Vulnerable due to the small population and excessive exploitation.
<i>C. huegelianus</i>	An endemic species with limited population in the Nilgiris, Chickmagalur. Vulnerable due to destruction of habitat.
<i>C. brandisii</i>	An endemic species with limited population in the lower Western Ghats. Now restricted in small pockets. Cane is soft and has limited local use. It is likely to become vulnerable due to destruction of habitat.
<i>C. vattayila</i>	An endemic species of the southern part of the Western Ghats – in the Makut range. It has limited population in four localities of Kerala ^{13,14} .

cane in those States, where there are no regeneration programmes being undertaken. For increased natural regeneration, there should be an optimum distribution of male and female plants. However, the sex ratio in most of the habitats studied is found to be uneven. With the incessant destruction of wet evergreen forests locally and globally, there is great threat to the existence of cane. If immediate attention is not paid in the next ten years many species of cane may disappear from the forests, leaving only a few specimens in the cane germplasm plots of a few research stations in the country. Conserving the genetic resources of cane and making them available to meet the livelihood requirements of forest-fringe communities is an onerous task. It is necessary to take up biodiversity conservation and development of canes on a war footing.

Some strategies for conservation of cane are as follows:

- Cultivation of cane by suckers and seeds by tribals should be encouraged, especially in the areas where utilization of cane is popular, as it would reduce the destruction of wild reserves.
- Due care must be taken to protect the solitary cane species and those of high commercial value.
- Extension of cane cultivation through social forestry and promotion in corporate plantations as commercial species should be seriously explored.
- Establishment of Canetum with representation of commercially important, lesser known, rare and threatened species and development of more cane plantations as has been done around Dharmastala, Sampaje, etc. This would augment raw material supply, and at

the same time decrease the pressure on wild populations.

- Collection of seeds from wild, especially of the rare and endangered species and growing them in nurseries and transplantation back into the forest.
- Extraction of cane before flowering drastically affects the seed source. Hence, some of the natural stands should be preserved to ensure a steady supply of seeds for the future plantation programme.
- Modern propagation technologies through tissue culture, etc. are to be adopted for their multiplication.
- Studies should be initiated to provide more information on cane agronomy, nursery, etc. to the farming community to boost their productivity.
- Research to be initiated on reproductive biology using isoenzyme studies for identifying male and female cane plants in seedling stage.

By adopting the above strategies we can save *Calamus*. Further it would provide an added impetus for the growth and development of the cane industry.

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ACKNOWLEDGEMENTS. We thank Shri A. C. Lakshmana (IFS), former Conservator of Forests, Govt of Karnataka and Shri. K. B. Sadanand, former Deputy Editor (Science), Kannada Encyclopaedia, Manasagangotri, Mysore for constructive suggestions, and the Ministry of Environment and Forests, Govt of India, for financial assistance.

Received 7 December 2005; revised accepted 7 October 2006

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