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RAJ KUMAR*
MRIDUL CHAKRABORTI
NGURSANZUALA SAILO
TSHERING CHOMU BHUTIA
D. R. SINGH

ICAR-National Research Center for
Orchids, Pakyong,
Sikkim 737 106, India
*For correspondence.
e-mail: rajkumarrana10@gmail.com

Name confusions in Indian cycads

Species and issues

Linnaeus¹ described the genus *Cycas* with the lone species *C. circinalis* L. from India, which was based on Rheede's, *Hortus malabaricus*², tab. 13-21. Roxburgh³ included three species, viz. *C. circinalis* Willd., *C. revoluta* Thunb. and *C. sphaerica* Roxb. All three were reportedly introduced in the Botanical Garden, Howrah during 1798–99 from different countries (*C. circinalis*, Indonesia; *C. sphaerica*, Moluccas and *C. revoluta* cultivated in West Bengal gardens).

Dyer⁴ recognized five species: *C. circinalis* L. from the Malabar coast and west Madras; *C. rumphii* Miq. from the Andaman Islands; *C. pectinata* Ham. from North East India (Assam, East Bengal and Sikkim), *C. beddomei* Dyer from east Madras (Cuddapah Hills), and *C. revoluta* cultivated in Indian gardens. Dyer equated *C. sphaerica* Roxb. under *C. circinalis* L. (since Rheede's figures and description of *Todda Panna* (= *C. circinalis* L.) matched well with those of *C. sphaerica*), and *C. circinalis* under *C. rumphii*, as he cited tt. 22 and 23 of Rumphius's of *Herbarium amboinense*. Sahni⁵, after a century, attempted a revision of the Indian gymnosperms, but followed Dyer (l.c.) in synonymy. Hill⁶ presented diagnostic features and an identification key of different species of Indian cycads. Further, he elaborated how Roxburgh's description of *C. circinalis* applies to *C. rumphii* and of *C. sphaerica* to *C. circinalis*.

Much had happened in Indian *Cycas* after Lindstrom and Hill⁷ took up the re-

vision of cycads of Southeast Asia that included its members from India as well. Their study was based on a couple of field trips in India (2000–2002), and scrutiny of Indian collections in major herbaria (A (Cambridge), B (Berlin), BM (London), BO (Bogor), E (Edinburgh), G (Geneva), K (Kew), L (Leiden), LAE (Papua New Guinea), NY (New York) and P (Paris)). They recognized eight species from India, including the two relatively recently described *C. annaikalensis* R. Singh & P. Radha (2006) (type: India, Singh, Radha & Sharma (0491) 0144, IPUH) and *C. indica* A. Lindstr. & K.D. Hill (2007) (Type: India, Saldanha 15197, E) and one new record, *C. nathorstii* J. Schust. (type: Sri Lanka, Thwaites 3689, K). *C. sphaerica*, which was synonymized under *C. circinalis* by Dyer (l.c.) was revived. Further, the collections established in the name of *C. rumphii* Miq., from the Andaman and Nicobar Islands were recognized by them as *C. zeylanica* (J.Schust.) A. Lindstr. & K.D. Hill. (type: Sri Lanka, Thwaites 3862, BM). The identity and distribution of various species are discussed below.

C. rumphii – *C. zeylanica* – *C. edentata* (Figure 1 b and e)

The shoreline habitat, glossy leaves, large seeds and spongy endotesta are the features shared by *C. rumphii* and *C. zeylanica*. However, *C. zeylanica* can be recognized by the distinct terminal spine in the microsporophyll and seeds without a crest⁷. In contrast, the microsporophyll in *C. rumphii* has rudimentary terminal

spine and seeds with a crest. The mistaken identity of the Andaman and Nicobar Islands material (as *C. rumphii* and not as *C. zeylanica*) is possibly due to the proximity of these Islands to Indonesia where *C. rumphii* is more prevalent, than in Sri Lanka that has known distribution of *C. zeylanica*. There are no reports of the Burmese species, *C. edentata* de Laub. (type: Philippines, Kondo & Edaño 38877, L), from the Andaman Islands, and all the collections at PBL have been annotated as *C. rumphii*. It is difficult to establish the identity to these collections since only male/female specimens are present from different islands. The authors believe that these Islands might hold all three species, and not with distribution of *C. zeylanica* alone. A thorough exploration in the Andaman and Nicobar Islands might yield all three species since the Andaman Islands have a geographical affinity with Burma (*C. edentata*), and the Nicobar with Indonesia (*C. rumphii*) and Sri Lanka (*C. zeylanica*). This might even warrant a review on recent reported novelties, *C. andamanica* (type: India, Prasad & M.V. Ramana 1288, CAL) from North and Middle Andaman Islands⁸ and *C. dharmrajii* from the Andaman Islands⁹. The former was reportedly allied to *C. edentata* and *C. zeylanica*, and the differences cited are more quantitative than qualitative. The conservation concerns are so forceful for both *C. edentata* (near threatened) and *C. zeylanica* (critically endangered or possibly extinct in Sri Lanka)⁷, and may induce one to look for these species in newer possible localities

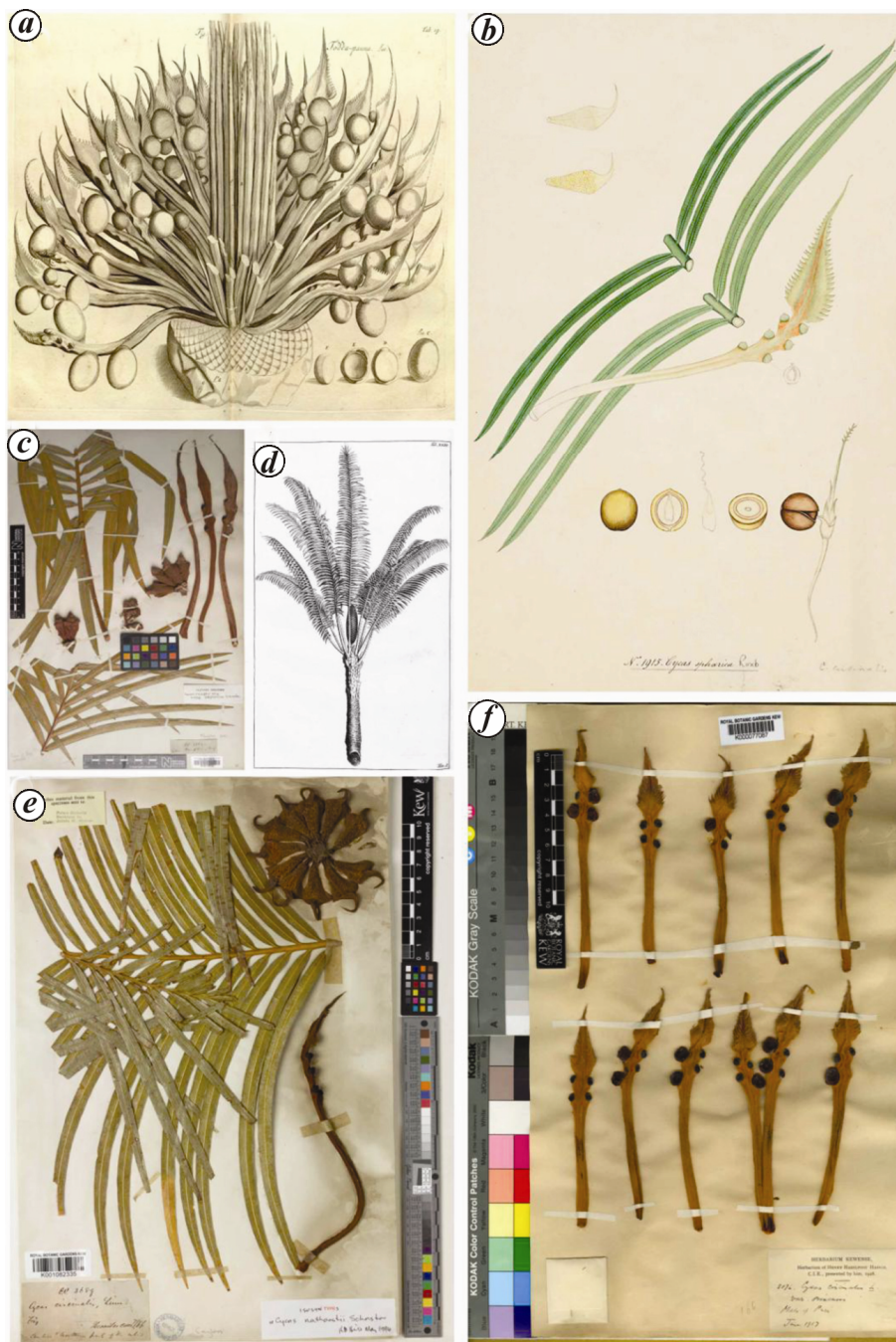


Figure 1. *a*, *Cycas circinalis* (image of t.19, Rheede: lectotype). *b*, *Cycas rumphii* (image of pl. 23, Rumphius: lectotype). *c*, *Cycas sphaerica* (image of t.1915, Roxburgh). *d*, *Cycas circinalis* var. *orixensis* (image: K000077087: syntype). *e*, *Cycas rumphii* ssp. *zeylanica* (image of BM001047702: isotype). *f*, *Cycas nathorstii* (image of K001082335: isosyntype).

such as these Islands. There shall be a boost in the conservation effort if newer habitats are reported for these species from these Islands.

C. circinalis – *C. circinalis* var. *swamyi* – *C. indica* – *C. swamyi* (Figure 1 a)

Pant¹⁰ suggested that a few populations from Mysore and Hassan districts of

Karnataka with stunted growth, dichotomous branching and smaller narrow leaflets represent a variety of *C. circinalis*, var. *swamyi* (*nom. nud.*). Lindstorm and Hill (l.c.) described it as a new species, *C. indica* and referred to *C. circinalis* var. *swamyi* under notes emphasizing in diagnostics its abnormal branching. Singh and Radha¹¹ who also included *C. circinalis* var. *swamyi*, made fresh col-

lections in adjacent Nagmangala (Mandya district, Karnataka) and described it as a new species of *Cycas*, *C. swamyi* Rita Singh & P. Radha (type: India, Rita Singh, (080)182, IPUH). They had not made any comments while describing it on *C. indica* published earlier. Thus, both the names were published for the same species in a gap of one year. To add to the confusion, Ranjay *et al.*¹²

synonymized *C. swamyi* with *C. circinalis* without offering any explanation.

C. circinalis var. *orixensis* – *C. sphaerica* – *C. orixensis* – *C. nayagarhensis* (Figure 1 c and d)

Haines¹³ described *C. circinalis* L. var. *orixensis* (type: Haines 5876, 5877 K), from Mals of Puri, Odisha. Lindstrom and Hill (l.c.), based on collections at BM, appropriately synonymized it with *C. sphaerica* Roxb. Roxburgh's description of megasporophyll of *C. sphaerica* is elaborate and without any ambiguity, particularly with reference to the moderately serrate margins and erasable ferruginous downy tomentum. These are reflected in his drawing (Roxb., tab. no. 1915) and match well with the type of *C. circinalis* var. *orixensis* (Haines 5877). Further, Roxburgh's description of the microsporophyll goes well with the description and images of *C. orixensis*¹⁴. However, there is some confusion in the illustration of the microsporophyll that has no serrated margins and appears to belong to var. *circinalis*. Many plant databases have accepted this treatment. Singh *et al.*¹⁴ unduly elevated *C. circinalis* var. *orixensis* to the status of species, *C. orixensis* (epitype: India, Singh & Khuraijam, 67636 (♂), USEM).

Singh *et al.* (l.c.) described another new species *C. nayagarhensis* (type: India, Singh & Khuraijam, 67409, USEM) based on material collected from a small population in the hills adjoining Nayagarh district, Odisha. The characters are well within the range of *C. sphaerica*/*C. orixensis*. The megasporophylls described in this species match well with the drawing and description of *C. sphaerica* of Roxburgh. The shape of the seed and its anatomy are again similar with Roxburgh's description and illustration. They stated that the apical spines of the microsporophylls are stout, upturned, entire and occasionally forked. This description appears to apply to young cones as the mature ones have forked apical spines. Since the plant is described from the hills, variations might be attributed to the dry habitat. Molecular studies on all four species (*C. sphaerica*/*C. circinalis* var. *orixensis*/*C. orixensis*/*C. nayagarhensis*) are required to resolve identities.

C. annaikalensis versus others (*C. circinalis* – *C. indica* – *C. nathorstii*)

Singh and Radha¹⁵ described *C. annaikalensis* based on material from the Malabar coast (type: Rita Singh, P. Radha and Prabha Sharma, 0491, IPUH). Lindstrom and Hill (l.c.) commented that the new species was described from a small population in the Annaikal hills near Palghat, Kerala, which lies within the range of *C. circinalis*. Further, they contended that it was compared only with *C. circinalis* from Kerala and not from its entire range of distribution, nor with *C. indica* or *C. nathorstii*. This makes a compelling case for a review of *C. annaikalensis*, which could happen only with more collections from known distribution of its entire range. The changes in climatic and edaphic conditions may bring in variations in the habit, branching pattern, and height and width of the vegetative and reproductive organs. Further, *C. nathorstii* requires new collections as its addition to Indian cycads is based on a single old collection (Figure 1 f). These can be well understood with adequate collections from different places and also possibly through molecular studies.

C. sainathii – *C. darshii* – *C. pschannae*

The other confusion relates to new species described from the Indian Botanic Garden, Howrah and claimed to be introduced from the Andaman Islands¹⁶. These are *C. sainathii* R.C. Srivastava¹⁶ (allied to *C. zeylanica*), *C. darshii* R.C. Srivastava & B. Jana¹⁷ (allied to *C. rumphii*), and *C. pschannae* R.C. Srivastava & Lalji Singh¹⁸ (allied to *C. zeylanica* and *C. sainathii*). All three were described based on female plants and incomplete collections (a portion of leaf and a mega-sporophyll). The author/authors gave neither a detailed account of taxonomy/diagnostics nor stated by whom/when these species were introduced into the garden from the Andaman and Nicobar Islands. Such information adds authenticity to the claim of their introduction from the Andaman Islands.

Some suggestions

What has been happening in India against all accepted norms of taxonomy is the publication of new species without

studying adequate material or checking the population of the new species reported. The number of *Cycas* species has gone up from 8 to 17 (three from Calcutta Botanic Garden, two from the Eastern and two from Western Ghats, and two from the Andaman Islands) between 2004 and 2016. Moreover, the type specimens of many names were retained with the authors without due depositions in designated herbaria. A singular case is presented to prove the point. Singh *et al.*¹⁴ while reporting the new species stated in their article that they would deposit the types in CAL in due course, which they never did. The Melbourne Code¹⁹ (Rec. Code 7a) strongly recommends 'that the material on which the name of a taxon is based, especially the holotype, be deposited in a public herbarium or other public collection with a policy of giving researchers access to deposited material'. Moreover, the National Biodiversity Authority under the Biodiversity Act (2002) and Rules (2004) mandates deposition of collections in notified national herbarium repositories. With such failings in holotype deposition, reviewing names in Indian cycads might become difficult. Few names published recently in the Indian literature have fragmentary material as types and do not serve the purpose of application of the name. These include *C. sainathii* (type: India, R.C. Srivastava 201, CAL), *C. darshii* (Type: R.C. Srivastava 202, CAL) and *C. pschannae* (Type: India, R.C. Srivastava, 19, CAL). Cycads being unisexual plants, the designation of types is to be done in complementarity. The International Code of Nomenclature of Algae, Fungi and Plants does not give any provision to include both male and female specimens as holo, since the collections do not come under a single gathering. This might prove to be a visible inadequacy of designated holotype specimen/material in confirming the name on other materials that belong to the same taxon but to a different sex other than that of the holotype, or when the name itself requires a review in future. The authors of the names (unisexual taxa) can designate one as holo and the other as para while publishing new species. Fresh collections and focused explorations in different phyto-geographic zones reduce noise these names have brought into the documentation of Indian cycads. Further, one should apply

molecular studies/DNA barcoding to resolve taxonomic issues which go beyond morphological appraisal in Indian cycads.

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M. VENKAT RAMANA¹
P. VENU^{2,*}
M. SANJAPPA³

¹Department of Botany,
University College of Science,
Saifabad,

Hyderabad 500 004, India

²Environment Protection Training
and Research Institute,
Gachibowli,

Hyderabad 500 048, India

³Mahatma Gandhi Botanical Garden,
University of Agricultural Sciences,
GKVK,

Bengaluru 560 065, India

*For correspondence.

e-mail: pvenu.bsi@gmail.com

Citrus macroptera Montrouz var. *annamensis* Tanaka: a potential nutraceutical for ethno-fishery

In the northern part of Tripura, various aspects of ethno-fishery have been documented. Fruit peels of *Citrus macroptera* Montrouz var. *annamensis* Tanaka are often used as nutraceuticals for indigenous fishery along with various botanicals, viz. leafy vegetables, fronds of ferns, fruits and seeds (Figure 1). During documentation of ethno-fishery practices, some garland-like structures were found floating on the aquatic bodies (Figure 2). This was a practice against rot diseases of fishes. The observation and documentation persisted for 0–60 days after the botanicals were applied as garland-like structures. Two different seasons were chosen when maximum disease outbreak was reported.

After a time-interval of 60 days, the garland-like structures had almost vanished, indicating that they were totally consumed by the fishes. This practice is useful and beneficial for major and mi-

nor Indian carps; it is also cost-effective. The plants used were *Alternanthera philoxeroides* Griseb., *Monochoria hastata* (L.) Solms, *Bryophyllum pinnatum* (Lam.) Oken, along with the major part of the garland-like structure containing

fruit peels of *C. macroptera* Montrouz var. *annamensis* Tanaka. Ethnic people sliced them and picked up with fine bamboo needle to sew them together into a garland-like structure. The sewing was done perfectly using fine jute rope



Figure 1. Fresh fruits of *Citrus macroptera* Montrouz var. *annamensis* Tanaka.