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RHEEDE'S FERNS IN HORTUS MALABARICUS

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ABSTRACT

Rheede named nineteen species of ferns in Malayalam in his *Hortus Malabaricus* (Vol. 12, 1703). The botanical identity of these species made by eminent authors through ages has been studied. The study reveals that the names which were ascribed to these taxa earlier are mostly invalid now. The present work is devoted to establish their current botanical names through close examination of Rheedean plates and literature and current nomenclatural studies.

HISTORICAL ACCOUNT

Hendrik Adriaan van Rheede tot Drakenstein, Dutch Governor of Malabar (1669-1677) has been immortalised in the history of Indian botany by his classical work, *Hortus Malabaricus*, a *magnum opus* on the valuable plant wealth of Malabar. This pre-Linnaean monumental work was published in twelve folio volumes from Amsterdam from 1678 to 1703 and consisted of the description of 780 species with 794 illustrations (Fournier, 1980 ; Manilal, 1980 ; Suresh *et al.*, 1983 ; Vaczy, 1980) many of which form the types of species or genera described by later botanists (Mabberley, 1977 ; Ridsdale, 1980).

Following its publication, *Hortus Malabaricus* was extensively quoted to the botanical works dealing with Asiatic plants during the eighteenth and nineteenth century but the botanical identity of a number of plates remained obscure (Mitra and Jain, 1980) because the plates though reasonably good for the period were not supplemented by adequate description and technical information (Ridsdale, 1980 ; Manilal, 1980). Another reason for the obscurity in identification of some of the plates is that the plants they depicted were named in primitive Malayalam language using "Kolezuthu" script which became extinct and can not be deciphered now (Manilal, 1980). Moreover the polyglot nomenclature of the plant given on every plate in Latin, Nagri, Malayalam, Arabic, Dutch and Belgian are "severely distorted, presumably due to the influence of Portugese transliteration (Manilal, 1980). That is why during the centuries after the publication of *Hortus Malabaricus*, several of the ancient Malayalam plants names recorded by Rheede were modified to varying extents and therefore the old names often are not recognised by the presentday taxonomists (Suresh *et al.*, 1983). The Malayalam names of the plants were supplied in archaic "Kolezuthu" or in advanced "Aryaezuthu" by a body of appointed local physicians and pundits and were transliterated through Malayalam-Portuguese or Konkoni-Portuguese to Dutch (Manilal, 1980 ; Heniger, 1980). During this transliteration "due to the difficulty in expressing exact Malayalam phonetics with the use of alien Roman script, splitting of a single Malayalam word by mistake into two or more and then joining wrong segments of the words

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to coin new specific or generic names" usually led to obfuscate the originally intended meaning of the plant names which is required for their clear identity.

In spite of these defects, *Hortus Malabaricus* stands out unsurpassed even today as the most important source of original information on the plants of Malabar or west coast of India (Manilal, 1980) and remains referable to the annotation of relevant Malabarian species. In fact, in the past Rheede and his *Hortus* were extensively quoted by Roxburgh in *Flora Indica* (1820, 1832, 1874), J. D. Hooker in *Flora of British India* (1875-1897), Rumphius in *Herbarium Amboinense* (1750), J. Burman in *Flora Malabarica* (1759) and *Thesaurus Zeylanicus* (1737), N. L. Burman in *Flora Indica* (1768) and several other authors including Linnaeus (1747, 1753, 1754, 1763) and Willdenow (1810) in their classical works.

In recent times after the elapse of three centuries since the publication of the first volume of *Hortus Malabaricus* (1678), studies and critical commentaries have been made on the plants comprising many angiospermic families of Malabar that Rheede described and illustrated in 12 volumes of *Hortus Malabaricus* (Mabberley, 1977, 1980 ; Maheshwari, 1980 ; Ridsdale, 1980a, b ; Burtt, 1980 ; Mitra and Jain, 1980 ; Henry *et al.*, 1980 ; Kostermans, 1980 ; Moore and Dransfield, 1979 ; Nicolson, 1980 ; Suresh *et al.*, 1980, 1983 ; Sivarajan *et al.*, 1980 ; Thothathri and Nair, 1981 ; Trivengadum, 1983) but no critical studies have been made on the ferns which have been included by Rheede in the 12th volume of the work along with orchids, sedges and grasses. Of the seventynine entries made in the 12th volume Rheede has included nineteen ferns which are illustrated in plates numbering 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 29, 31, 32, 33, 34, 35, 39, 40 and 74.

Dennstedt (1818) and Dillwyn (1839) identified the fern specimens from the plates and references and accorded nomenclature to the taxa following contemporary literature on ferns. It is obvious that except a few Linnaean names, most of the names and a few identities do not stand out today. So it is the task of present day workers to undertake an intensive study and research to establish the correct identity and nomenclature of these taxa and thus to fulfil the historic mission of *Hortus Malabaricus*. With this view in mind the author has studied the Rheedean ferns in detail and has up-to-date nomenclature and commentary on identity as applicable to them.

TAXONOMIC ENUMERATION

1. PATITSJIVI MARAVARA (Rheede, Hort. Mal. 12 : 21 t. 10. 1703).

Hemionitis arifolia (Burm. f.) Moore, Index Fil., 114. 1859 ; Bedd. Handb. Ferns Brit. Ind. 413. t. 245. 1883. = *Asplenium arifolium* Burm. f., Fl. Ind., 231. 1768.

N. L. Burman in *Flora Indica* (1768) identified the plate with *Asplenium arifolium* Burm. f. Francis Hamilton described it as *Hemionitis trinervis* Ham. Dillwyn (1839) accepted Hamilton's identity but Dennstedt (1818) identified the species with *Polypodium tricuspe* Sw. But Swartz (1806) did not identify Rheede's plate 10 with it. It was the new name he gave to Thunberg's *Acrostichum hastatum*. One can imagine why Dennstedt chose this name for Rheede's plate 10. Because being truely a plant of *H. arifolia*, it has typical hastate fronds (*Frondibus hastatis*). Surprisingly, Swartz (1806) also did not ascribe this Rheedean plate to his *Polypodium hastatum*. Beddome, however, in his work on south Indian ferns (1863) identified it with *Hemionitis cordata* Roxb., but later (1883) established its correct identity as *Hemionitis arifolia* (Burm. f.) Moore. Clarke (1880) also referred Rheede's plate (t. 10) to this species.

Rheede had given on the plate the Sanskrit (Brahminic) name of the plant in Nagri script as "Souna Sjiba" ("Suna Sjiva") which in Malayalam is transcribed as "Patitjevi" and "Maravara" in Malayalam denotes an epiphyte (Suresh *et al.*, 1983). At the end of the description of the plate Rheede wrote, "Phillitidi affinis India, foliis ari." Burman apparently formed specific epithet of the species *arifolium* with the last two words. From Rheede's excellent illustration there is no reason for doubt of its being other than *Hemionitis arifolia* (Burm. f.) Moore.

2. PANNA-KELENGO-MARAVARA (Rheede, Hort. Mal. 12 : 22 t. 11. 1703)

Drynaria quercifolia (L.) J. Sm., Jour. Bot. 3 : 398. 1841 ; Bedd. Ferns South. Ind. 63. t. 187. 1863 ; Handb. Ferns Brit. Ind. 343. t. 191. 1883. = *Polypodium quercifolium* L., Sp. Pl. 2 : 1087. 1753.

The plant described and illustrated as Panna-kelengo-maravara by Rheede (l.c., t. 11) was first identified with *Polypodium indicum* by Rumphius (1750) in connection with the identification of his Moluccan (Amboina) plants. Rheede's description of the plate 11 probably helped him choose or rather pick up the name, where at the end, Rheede mentioned the following, "*Polypodium indicum* foliis latissimus." N. L. Burman (1768), Swartz (1806) and Roxburgh (1874), however, following Linnaeus, identified Rheede's plate 11 with *Polypodium quercifolium* L. and the latter referred it to Icon. Roxb., 14. t. 96 (ined.). Voigt (1845) also identified it with the same Linnaean species. Dennstedt (1818) and Dillwyn (1839) endorsed the same identity of the plate. Beddome (1863 ; 1883) correctly identified the species with *Drynaria quercifolia* (L.) J. Sm.

The plate is excellently drawn ; so its identity never became otherwise, but swung between its basionym and valid name.

3. WELLI-PANNA-KELENGU-MARAVARA (Rheede, Hort. Mal. 12 : 25 t. 12 & 13. 1703)

Microsorum scolopendria (Burm. f.) Copel., Univ. Calif. Publ. Bot. 16 : 112. 1929 or alternatively, **Phymatodes scolopendria** (Burm. f.) Ching, Contrib. Inst. Bot. Nat. Acad. Peiping 2 : 63. 1933. = *Polypodium scolopendria* Burm. f.. Fl. Ind. 232. 1768.

Rheede furnished a single description for plate 12 and 13 in *Hortus Malabaricus* (12 : 25) and gave for Malabarian name Welli-panna-kelengu-maravara as Groot-Wortel panna meaning plant with large root. Brahminical synonym of the plant was provided as Kadehou-maa giving probably the same meaning. So it seems plate 12 and 13 were the illustrations of the same plant. Dillwyn (1839), however, could not identify the plate 12 and referred to earlier authors' opinion and identity and about the plate 13 he supposed it to be the drawing of a fragment of a caudex of zalacca of calamus but not of fern. Dennstedt (1818) was doubtful about the identity of the plate 12 with *Phymatodes* L. and regarding the plate 13 he did not mention any name. It is true, however, that N. L. Burman did not refer Rheede's plates 12 and 13 to his *Polypodium scolopendrium* and that the plate 13 representing stem is shown to have spine or thorn like structure on its lateral sides. Rheede's description of the plant is also somewhat confusing. He wrote, "Flores nec fructus unquam visui objiciuntur sed vetustior facta planta, ex adverse foliorum lanuge quaedam ruffa inventitur, pulvese replata qui seminis locum supplet" which means grossly, flowers not fruits sometimes seen, wool of the leaves reddish, full powder in the place of seeds."

The description apparently means that the plates depict of an angiospermic plant, preferably of an orchid, where seeds are powdery, but overall morphological features including spiny stem do not conform of this idea. What is important is the name pro-

vided that includes "panna" and "maravara" meaning "polypodiaceous fern" and "epiphyte" in Malayalam respectively. So Dennstedt's assumption of its being a zalacca or calamus or as per Rheede's description, an orchid does not stand out altogether. On the other hand, by the term "all or full powder in place of seeds" Rheede wanted to mean mature sori breaking into powder all over the fertile frond.

It is pertinent to mention that Beddome could not identify the species correctly. In his earlier work (1863) he named the species as *Polypodium phymatodes* L. and later work (1883) as *Pleopeltis phymatodes* L.

4. TAMA-POUL-PAATSJA-MARAVARA (Rheede, Hort. Mal. 12 : 27-29. t. 14. 1703)

Lycopodium phlegmaria L., Sp. Pl. 2 : 1101. 1753.

The illustration of the plant 14 is so natural that its correct identity has been made by almost all the later authors following Linnaeus (Roxb., 1814, 1874 ; Grah., 1839 ; Voigt, 1845 ; Clarke, 1880). Roxburgh, however, remarked on Rheede's plate 14 in *Flora Indica* as follows : "Rheede's figure Tama-ponel-paatsja-maravara (vol. 12 : 27, t. 14) differs from my plant in the number of the rows of leaves and in the spikes being much longer, yet I have no doubt of their being the same." Icone Roxb. 14 t. 84 in this regard is quoted. N. L. Burman in his *Flora Indica* (1768), Dennstedt (1818) and Dillwyn (1839) identified the plate with the Linnaean species. Only Rumphius (1750) was wrong in referring Rheede's plate 14 to *Equisetum Amboinicum*. Buchanon-Hamilton (later Sir Francis Hamilton who was Superintendent, Royal Botanic Garden, Shibpur, 1814-1816), however, wrote the correct name *Lycopodium phlegmaria* L., on the back of the plate 41 of Rumphius (1750) which has been examined by the author in Herb. CAL.

Beddome did not include fern-allies in his works. So his opinion about the plate remains unknown. But one can assume that if he did so, he would have made the correct identity in view of the naturalness of the illustration.

5. PARA-PANNA-MARAVARA (Rheede, Hort. Mal. 12 : 31, t. 15. 1703)

Diplazium esculentum (Retz.) Sw., Schrad. Jour. Bot. 1801 : i. 312. t. 31. f. 19. 1803. =*Hemionitis esculenta* Retz. Obs. 6 : 38. 1791.

Rumphius (1750) while identifying his Moluccan plants with Filix esculenta 'seu femina' (*Sajor paccu* in Moluccan language) quoted Rheede's Para-panna-maravara. Buchanon-Hamilton, on the other hand, identified Rumphius' plate with *Asplenium filix-femina* and recorded the name on the back of the plate in the volume which is in the Calcutta Herbarium. Dillwyn (1839) identified the plate with *Diplazium malabaricum* Bl. and gave three alternative names of which Swartz's *Asplenium ambiguum* was one. Dennstedt (1818), however, determined the latter species for the plate 15. On the other hand, Beddome identified earlier the same species with *Callipteris esculenta* (Retz.) J. Sm. (1863) and later with *Anisogonium esculentum* (Retz.) C. Presl (1883). Both the plates in two publications, however, were the same. Swartz (1806) in his genus *Aspidium* included the species of *Polypodium* L., *Polystichum* and *Athyrium* Roth, *Tectaria* Cav. and *Nephrodium* Michaux and re-named *Polypodium filix-mas* L. and *P. filix-femina* with *Aspidium filix-mas* and *A. filix-femina* respectively. He kept aside Michaux's *Nephrodium filix-femina* as a doubtful species. He never mentioned these two species under *Asplenium* L., on the contrary he described some of the *Asplenium* species of Linnaeus under his genus *Diplazium*.

Rheede in the description of the plate 15 compared it with Kari welli-panna [*Christella parasitica* (L.) Lév.] and stated that in general morphology, form and figure of the plant and leaves it looked similar to Kari-welli-panna excepting that the plant was not so tall and pinnules were not so deeply lobed or incised and round like those of Kari-welli-panna (...formae & figurae ut illi Kari-welli-pannae, sed non tam alte exsurgentes ; ...Folia etiam ut illa Kari-welli-panna, excepto quod non tam profunde sint incisa, neque etiam rotundo...).

The apparent similarity between these two species of *Diplazium* and *Christella* in general habit and frond characteristics did not slip off the notice of Rheede though there are some critical differences and the two belong to two separate families. Michaux's *Nephrodium filix-femina,* in this regard may be referred to and reason may be sought as to why Swartz did not include Michaux's species in his *Aspidium* genus as *Nephrodium* is basically close to or rather synonymous to *Christella* Lév. and other thelypteridiaceous genera. But strangely enough is that Swartz ascribed Rheede's Para-panna-maravara to his *Asplenium ambiguum* but never to his *Diplazium esculentum*. This may be due to the reason that Swartz could not think of putting it in the genus other than *Asplenium* but at the same time was ambiguous about its placement in that genus for its seemingly un-*Asplenium* characters as revealed in the plate. His ambiguity is reflected in the selection of the specific epithet, "ambiguum"

Asplenium filix-femina (L.) Bernh., is actually *Athyrium filix-femina* (L.) Roth which does not match with the Rheedean plate 15. On the other hand, the plate equates exactly with *Diplazium esculentum* having fronds spirally arranged, crowded, long petioled, obliquely erect, bipinnate, pinnae of large size, robust smooth, hairy at base. Pinnules sub-sessile, oblong or linear with a broad base and narrowed acuminate-serrate apex, margin crenate or shallowly lobed, thinly coriaceous, veins pinnate, anastomosing ; sori placed along veins on the under-surface of the leaflets.

The Rheedean plate is excellently drawn and there is no difficulty in identifying it with the said *Diplazium* species.

6. KAL-PANNA-MARAVARA (Rheede, Hort. Mal. 12 : 33. t. 16, 1703)

Asplenium adiantum-nigrum L., Sp. Pl. 2 : 1081. 1753 ; Bedd. Ferns Brit. Ind. 62. t. 62. 1866 ; Handb. Ferns Brit. Ind. 157. 1883.

Swartz (1806) identified Rheede's plate 16 with the Linnaean species *Asplenium adiantum-nigrum*. But strangely enough, Linnaeus in describing the species in *Species Plantarum* never equated the Rheedean plate with this species, nor did Willdenow (1810). There may be one reason. As the habitat of this species is mainly in southern Europe (Europa australiore) as mentioned by Linnaeus, he and Willdenow could not imagine of its collection by Rheede from Malabar and therefore ignored the identity of the plate with the species. It is also strange to note that Beddome did not mention this plant in his *Ferns of Southern India* (1863). He, however, mentioned its occurrence from north-west India (Kashmir, Dalhousie, Chamba) in his *Ferns of British India* with a plate (t. 62. 1866) and subsequently in the *Handbook* (1883).

However, Rheede's plate 16 has been compared in Herb. CAL with the herbarium specimen of *Asplenium adiantum-nigrum* collected from north-west India and by illustration and description the Rheedean plate exactly matches with the plant of this species.

In this context, this is to mention that Dennstedt (1818) identified this Rheedean plate with a new species, *Aspidium alterni-*

frons and following him Dillwyn (1839) after changing the generic epithet, re-named it as *Asplenium alternifrons* (Dennst.) Dillw. Mabberley (1977) quoting Hermann Manitz's review (1968) of Dennstedt's identity of ninety Malabarian specimens based on the plates of Rheede's *Hortus Malabaricus* of which forty-eight were *nomina nuda* and forty-one validly published, states that plate 16 of the 12th volume belonging to the latter group is only of a fern specimen to which Dennstedt applied this "new name." However, Dennstedt's identity of the plate as belonging to a new species namely *Aspidium alternifrons* Dennst. and its subsequent recent identity as a *Dryopteris* species (*see* Mabberley, 1977) is all wrong. The idea of ascribing it to a *Dryopteris* species perhaps reminds one of the inclusion of Rembert Dodoens' *Dryopteris nigra* (Stir. hist. pempt. sex, 466. 1583) by Linnaeus as a synonym of *Asplenium adiantum-nigrum.*

7. KARI-WELLI-PANNA-MARAVARA (Rheede, Hort. Mal. 12 : 35 t. 17. 1703)

Christella parasitica (L.) Lév., Fl. Kouytécheou., 475. 1915. = *Polypodium parasiticum* L., Sp. Pl. 2 : 1090. 1753.

Dennstedt (1818) determined the identity of the plate with *Aspidium parasiticum* Sw. Dillwyn (1839), however, identified it with Hamilton's *Polypodium obtusum* ignoring its identification with *Polypodium parasiticum* L. or *Aspidium parasiticum* Sw., by Linnaeus, Willdenow and N. L. Burman, because Blume (1828) and Hamilton did not recognise these identities (Dillwyn, 1839).

Linnaeus (1753) mentioned that the habitat of *P. parasiticum* was in India and that it was a big tree like fern. He referred to Osbeck's collection (*Osbeck* 41) of the species from India. The Indian Pteridologists, however, identified the species with various other nomenclatures, but not with *Christella* Lév. Beddome (1866) first identified the species with *Nephrodium didymosorum* Parish ex Bedd., then redesignated it as *Nephrodium molle* Desv. var. *didymosorum* (Parish ex Bedd.) Bedd. (1883). Two other species, Beddome (1892) named as *Nephrodium procurrens* (Mett.) Bak. and *N. tectum* Bedd. are the synonyms of *C. parasitica* (L.) Lév.

Clarke (1880), however, named it as *Nephrodium parasiticum* (L.) Desv. Recently Nayar and Kaur (Comp. to Beddome, 68, 1974) identified it with *Cyclosorus didymosorus* (Parish ex Bedd.) Nayar and Kaur. They are also likewise synonyms of the species.

The correct identity and current name of the plant, illustrated in plate 17 by Rheede is *Christella parasitica* (L.) Lév.

8. NELLA-PANNA-MARAVARA (Rheede, Hort. Mal. 12 : 39 t. 18. 1703)

Asplenium falcatum Lamk., Encycl. Méth., Bot. 2 : 306. 1786 ; Bedd. Handb. Ferns Brit. Ind. 156. 1883.

The identity of the plate with *Asplenium falcatum* Lamk. has been made by Dillwyn (1839) but Dennstedt (1818) was doubtful whether the plate represented *Asplenium falcatum* Sw. non-Lamk. N. L. Burman (1768), however, identified the plate with *Trichomanes adiantoides* L. which is a synonym of the species. But Linnaeus did not identify Rheede's plate 18 with his *Trichomanes adiantoides.* On the other hand, J. Burman's Filix non ramosa, zeylanica foliis Adianthi in modum serratis (1737), however, matched with Rheede's plate 18.

Beddome in his earlier work (1863) described an *Asplenium* species with *A. caudatum* Forst which exactly matched with Rheede's plate of Nella-panna-maravara. Later in *Handbook* (1883) he made the species synonymous to *A. falcatum* Lamk. His description in the two works and the plate excellently matched with Rheede's description and

plate of the fern. So Rheede's Nella-panna-maravara is none other than Lamarck's *Asplenium falcatum.*

9. PANNA-MARA-MARAVARA (Rheede, Hort. Mal. 12 : 39 t. 19. 1703)

Bolbitis subcrenata (Hook. et Grev.) Ching, in C. Chr. Index Fil. Suppl. 3 : 50. 1934. = *Gymnopteris subcrenata* Hook. et Grev., Ic. Fil. 110. 1828 ; Bedd. Ferns Brit. Ind. 437. 1883.

Dillwyn (1839), Voigt (1845) and Clarke (1880) noted the identity of the plate with *Acrostichum flagelliferum* Wall. Blume (1828) described *A. flagelliferum* Wall. and mentioned Rheede's Panna-mara-maravara (l.c., t. 19) as the identical species, though erroneously he cited t. 11 instead of t. 19. The examination of Blume's plate of *A. flagelliferum,* however, reveals that the illustration comes near Rheede's plant but differs in some respect. Beddome (1863) first named this species as *Poecilopteris terminans* Wall. and then (1866) as *Poecilopteris flagellifera* Wall. and cited Rheede's plate 11 but in *Handbook* (1883) he identified it with *Gymnopteris subcrenata* Hook. et Grev. and referred to Rheede's Panna-mara-maravara as a synonym of this species. After citing Rheede's plate 19 to *Gymnopteris subcrenata,* Beddome made a note that Hooker in *Species filicum* wrongly cited Rheede's plate 11 to *Gymnopteris flagellifera* Wall. which he also committed earlier as shown above. This relay-mistake about citing the plate is significant, for it lets anybody guess that these authors did not examine this Rheedean plate themselves and the mistake once committed by a previous author had been bluntly followed and relayed by later authors.

The illustration in Rheede especially in this plate is so excellent and vividly natural that one should not make any mistake in identifying the species.

ELETTADI-MARAVARA (Rheede, Hort. Mal. 12 : 41 t. 20 & 21. 1703)

Raphidophora pertusa (Roxb.) Schott, Bonplandia 5 : 45. 1857 (an aroid).

Rheede's plates of Elettadi-maravara long remained misidentified as an element of a fern species since J. Burman (1759) while describing a Javanese element namely *Polypodium laciniatum* made reference of Rheede's plates but mentioned that the Javanese element lacked perforations on the leaf blade while Indian element contained them. N. L. Burman (1768) and subsequently Dennstedt (1818) followed the same identity of the Rheedean plates. But Roxburgh (1820) identified Rheede's element with *Pothos pertusa* Roxb. Then in 1921, Merrill transferred *Polypodium laciniatum* into the aroidean genus *Raphidophora* and named it *R. laciniata.* But following the rule of priority its name is established as *R. pertusa* (Roxb.) Schott.

Details of this history is given by Suresh *et al.* in their study of Rheede's aroids (1983).

10. MARETLA-MALA-MARAVARA (Rheede, Hort. Mal. 12 : 57 t. 29. 1703)

Pyrrosia nummularifolia (Sw.) Ching, Bull. Chin. Bot. Soc. 1 : 47. 1935. = *Acrostichum nummularifolium* Sw., Syn. Fil. 191. 419. t. 2 f. 1. 1806.

Rheede's Maretla-mala-maravara* (t. 29) has been mentioned by Linnaeus (1763) as a synonym of his *Acrostichum heterophyllum.* But Blume (1828) made it a synonym of his *Niphobolus carnosus.* The specific epithet *carnosus* had been probably chosen by Blume as Rheede described the plant having "folia carnosa" (fronds succulent). Blume, however, in his treatment of *Acrostichum nummularifolium* Sw. in the same work (p. 33) had not referred to plate 29 of Rheede nor did Swartz himself. Elsewhere

*In description however Rheede used the name Marettamala-marvara.

in the same work (p. 67) in the annotation of *Nothochlaena piloselloides* Kaulf., Blume wrote, "excl. fig. Rheed. Hort. Mal. 12 t. 29." Dennstedt (1818), however, following Linnaeus identified Rheede's plate 29 with *Acrostichum heterophyllum* L., synonymous to *Nothochlaena piloselloides* as depicted by Blume (1828). Burman f. (1768) also followed Linnaeus in the identity of the plate but Voigt (1845) identified it with *Nothochlaena piloselloides* Kaulf.

On the other hand, Swartz (l.c. p. 94, 286) and Schukuhr (t. 67. 1809) identified Rheede's plate with *Pteris piloselloides* L. Linnaeus himself, however, did not ascribe the Rheedean plate to his *Pteris piloselloides*. His *Pteris piloselloides* was later re-named as *Nothochlaena (Notholaena) piloselloides* by Kaulfuss, as *Taenitis piloselloides* by R. Brown and lastly as *Drymoglossum piloselloides* by Presl. These were all new taxonomic identities of *Acrostichum heterophyllum* L. Beddome (1863) and Clarke (1880) identified the Linnaean species with *Drymoglossum piloselloides*. Beddome (1866, 1883), however, re-assessed his early identity and stated that his early identification of Indian fern with *Niphobolus nummularifolius* Mett. would be actually a form of *Drymoglossum piloselloides* Presl.

Actually *Pyrrosia nummularifolia* and *Drymoglossum piloselloides* are morphologically quite alike to each other excepting the shape of the fertile frond and the arrangement of sori on its surface. In that respect, Rheede's plate t. 29 does not match with that of Blume's *Niphobolus carnosus* (t. 19, 1828) nor with that of Schukuhr's *Pteris piloselloides* (t. 67, 1809) and those of others of the same species.

In *Pyrrosia nummularifolia* the basal part of the elongated fertile frond is narrower and the terminal part wider and blunt and the sori are arranged all over its surface densely while in *Drymoglossum piloselloides*, basal part of the fertile frond is as wide as the terminal part and the sori are arranged marginally on the terminal part like a crescent or occasionally throughout the entire lateral margins, keeping the middle portion empty. In Rheede's plate 29 the basal part of the fertile frond are narrower and the sori as revealed by dots are arranged all over the surface.

These differences escaped the notice of all the previous authors, which swept Beddome also to a land of dilemma and confusion regarding the taxonomic identity of the two species as discussed above.

So Rheede's Maretla-mala-maravara is *Pyrrosia nummularifolia* (Sw.) Ching.

11. ARANA-PANNA (Rheede, Hort. Mal. 12 : 61 t. 31. 1703)

Nephrolepis biserrata (Sw.) Schott, Gen. Fil. ad t. 3. 1834. = *Aspidium biserratum* Sw., Schrad. Jour. Bot. 1800 : 32. 1801.

Willdenow (1810) identified Rheede's Arana-panna with *Aspidium splendens* Willd. The identity was followed both by Dennstedt (1818) and Dillwyn (1839) in their works. Beddome (t. 94, 1863) identified Rheede's plant with *Nephrolepis acuta* Presl. He, however, quoted *Nephrolepis biserrata* J. Sm. non (Sw.) Schott as its synonym. Clarke (1880) in his studies of north Indian ferns described *N. acuta* Presl but did not refer to Rheede's Arana-panna as synonymous to it. Swartz (1806) did not mention this plate under his *Aspidium biserratum* but under his *Polypodium punctulatum*, a dubious species thought to be belonging either to *Aspidium* or to *Polypodium* (Species dubiae : generis Polypodii vel Aspidii).

However, the illustration of the plant in Rheede t. 31 is excellent and there is no difficulty in identifying the correct species as *Nephrolepis biserrata* (Sw.) Schott.

12. VALLI-PANNA (Rheede, Hort. Mal. 12 : 63 t. 32. 1703)

Lygodium flexuosum (L.) Sw., Schrad. Jour. Bot. 1800/2 : 106. 1801 ; Syn. Fil., 153. 1806. Bedd., Ferns South Ind. 21. t. 63. 1863 ; Handb. Ferns Brit. Ind. 457. t. 283. 1883. = *Ophioglossum flexuosum* L., Sp. Pl. 2 : 1063. 1753.

Rheede's Valli-panna (t. 32) had been referred by Linnaeus (1753, 1763) to *Ophioglossum flexuosum* and by Rumphius (t. 32, 1750) to his *Adian volubile majus. Ophioglossum flexuosum* L., however, was redescribed by Swartz as *Lygodium flexuosum* (L.) Sw. Swartz's identity has been correct and so Rheede's Valli-panna is surely *Lygodium flexuosum* (L.) Sw. The illustration is excellent and so all the later authors (Voigt, 1845 ; Roxb., 1874 ; Beddome, 1863 ; Clarke, 1880) who studied Rheede's ferns correctly identified the plate. Clarke's keen observation of the Rheedean plate made him realise that not only plate 32 but also plate 33 was the illustration of the same plant. The Malayalam name, Valli-panna for *Lygodium flexuosum* (L.) Sw., appears to be well-known as Lushington (1915) recorded it in his book.

13. TSJERU-VALLI-PANNA-WARAPOLY (Rheede, Hort. Mal. 12 : 65. t. 33. 1703)

Lygodium flexuosum (L.) Sw., Schrad. Jour. Bot. 1800/2 : 106. 1801. Bedd., Ferns South. Ind. 21. t. 63. 1863 ; Handb. Ferns Brit. Ind. 457. t. 283. 1883. = *Ophioglossum flexuosum* L., Sp. Pl. 2 : 1063. 1753.

Dillwyn (1839) identified the plate with *Lygodium pinnatifidum* Sw., a synonym of *Lygodium flexuosum* (L.) Sw. Willdenow (1810) however put it under *Hydroglossum pinnatifidum* Willd. Dennstedt (1818), on the other hand, identified the plate with *Lygodium adnascens* which appears to be a confusing nomenclature. A confusion on the identity of Rheede's ferns drawn in plate 33 and 34 is also envisaged. This was due to the confusion Linnaeus made in his *Species Plantarum* (vide, 2, 2 : 1519. 1763) where under *Ophioglossum scandens* L., he quoted Tsjeru-valli-panna, Rheed. Mal. 12. 65. t. 33 and under *Ophioglossum flexuosum* mentioned Valli-panna, Rheed. Mal. 12. t. 32 and 33. Following Linnaeus N. L. Burman (1768) and Lushington (1915) identified Tsjeru-valli-panna-warapoly (t. 33) and Tsjeria-valli-panna (t. 34) with *Lygodium scandens* Sw. which is synonymous to *Lygodium microphyllum* (Cav.) R. Br.

The identity is wrong. The plate 33 is the clear illustration of *Lygodium flexuosum* (L.) Sw.

14. TSJERIA-VALLI-PANNA (Rheede, Hort. Mal. 12 : 67. t. 34. 1703)

Lygodium microphyllum (Cav.) R. Br., Fl. Novae Holl. 1 : 162. 1810. Bedd., Handb. Ferns Brit. Ind. 455. t. 282. 1883. = *Ugena microphylla* Cav., Ic. Descr. Pl. 6 : 76. t. 595. 1801.

The plate depicts the *Lygodium* species with fronds having lamina small, entire, base broad and apex narrow. The illustration and description clearly indicates the species *Lygodium microphyllum*. Dillwyn (1839), however, identified the plate with *Lygodium scandens* Sw. and mentioned about the identity of earlier authors such as of Roxburgh's *Ophioglossum filiforme*, Gmelin's *Osmunda scandens*, Willdenow's *Hydroglossum scandens* etc. Roxburgh in both *Hortus Bengalensis* (1814) and in *Flora Indica* (C. B. Clarke ed., 1874) and in *Icone Roxburghianae* (14, t. 86) identified Rheede's plate 34 with *Ophioglossum filiforme*. What is interesting is that in his latter work Roxburgh put *Lygodium microphyllum* R. Br. as the synonym of *O. filiforme*. Dennstedt (1818) followed Roxburgh's identity of the plate but revealed his doubt with a note of interrogation. Beddome (1863, 1883), however, opted for *Lygodium scandens* Sw. and made *L. microphyllum* R. Br. a synonym of

it. Clarke (1880) unerringly indicated Rheede's plate 34 as belonging to *L. microphyllum* R. Br.

15. PANNA-VALLI (Rheede, Hort. Mal. 12 : 69. t. 35. 1703)

Stenochlaena palustris (Burm. f.) Bedd., Ferns Brit. Ind., Suppl. 26. 1876. = *Polypodium palustre* Burm. f., Fl. Indica, 234. 1768.

The plate provides the illustration of only sterile pinnae of the species. Fertile pinnae are not shown. However, from the drawings, it is clear that the sterile pinnae are *ca.* 15 × 3 cm, very shortly stalked, base broadly cuneate, apex acuminate, edges sharply and irregularly serrate which are the morphological characteristics of the sterile pinnae of the species, *Stenochlaena palustris* (Burm. f.) Bedd. N. L. Burman (1768) identified Rheede's Panna-valli with *Polypodium palustre* Burm. f. which is the basionym of the species, *S. palustris* (Burm. f.) Bedd. Dennstedt (1818) and Dillwyn (1839), however, following Willdenow, identified Rheede's Panna-valli with *Lomaria scandens* Willd. Willdenow (1810) described *Lomaria scandens* having, "sterile frond pinnate, pinnae lanceolate, costate, petiolate, base round, spinulose, serrate, fertile frond pinnate, linear, caudex scandent." Mettenius (1856) put *Lomaria scandens* into a separate genus *Lomariopsis* on margin and apex characters of the frond which he thought were more closely similar to *Taeniopteris* Hook. (synonymous to *Vittaria* Sm.) with "leaves pinnate, margin of the pinnae sterile, generally distinctly revolute." On the other hand, Swartz (1806) identified Rheede's plate 35 with *Onoclea scandens.*

The identities of the plate made by all these authors were wrong. Because Willdenow's *Lomaria* is synonymous to *Blechnum,* Mettenius's *Lomariopsis* is a special subgroup of Asplenioid ferns and *Onoclea* is under onocleoid group of ferns which have different morphological characteristics of sterile and fertile fronds from those of *Stenochlaena* with which Rheede's plate is identified, though the species is a blechnoid fern.

Seeing the morphological difference of Willdenow's *Lomaria scandens* from the other blechnoid group of ferns, John Smith (1841, 1875) created a new genus *Stenochlaena* with the characteristics of having "in the pinnae of sterile frond a transverse anastomose vein continuous with and close to the midrib but which on account of the narrowness of the fertile pinnae is not evident..."

Beddome in his works (1863, 1883) has given description and excellent plates of the species which exactly match with Rheede's plate. So there is little doubt of its being other than *Stenochlaena palustris* (Burm. f.) Bedd.

16. BELLAN-PATSJA (Rheede, Hort. Mal. 12 : 73. t. 39. 1703)

Lycopodium cernuum L., Sp. Pl. 2 : 1103. 1753.

The illustration is clear for the identity of the species and all previous identifications of the plate made by earlier authors (Willdenow, 1810 ; Dennstedt, 1818 ; Dillwyn, 1839 ; Roxburgh, 1874 ; Clarke, 1880) are correct. Rumphius (1750), however, referred to Rheede's plate of Bellan-patsja with his 'Cingulum terrae' (Ruttu ruttu papuwa, in Moluccan language). Both are synonymous to *L. cernuum* L. and are quoted by Linnaeus under the species.

Note : Regarding Bellan-patsja, Rheede in *Hortus Malabaricus* referred wrongly to plate 40 which is not in conformity with the description but with Avenka treated next by Rheede in volume 12 that represents *Adiantum philippense* L.

17. AVENKA (Rheede, Hort. Mal. 12 : t. 40. 1703)

Adiantum philippense L., Sp. Pl. 2 : 1094. 1753.

Rheede has not given any description of the species. The description which he furnished with reference to plate 40 is actually of plate 39 of which mention has already been made above. N. L. Burman (1768) first described *Adiantum lunulatum* Burm. f. and cited Rheede's plate 40 under this species. Thereafter Willdenow (1810) mentioned this Rheedean plate under *A. lunulatum* Burm. f. Roxburgh (1874), however, quoted Avenka under *Pteris lunulata* Retz. and reduced *A. lunulatum* Burm. f. to its synonym. Voigt (1845) ascribed Rheede's plate 40 to *A. lunulatum* Burm. f. and kept Retzius' *P. lunulata* its synonym. So did Beddome in citation of this Rheedean plate. But strangely enough, Linnaeus (1753, 1763) missed Rheede's Avenka (t. 40) under his *Adiantum philippense* L. It is now known that *Adiantum lunulatum* Burm. f. is a taxonomical synonym of *Adiantum philippense* L. For details see Pichi Sermolli (1957). Thus Rheede's Avenka (t. 40) is *Adiantum philippense* L.

18. TIRI-PANNA (Rheede, Hort. Mal. 12 : 141. t. 74. 1703)

Pyrrosia lanceolata (L.) Farwell, Amer. Midl. Nat. 12 : 245. 1931. = *Acrostichum lanceolatum* L., Sp. Pl. 2 : 1067. 1753.

Linnaeus (1753, 1763) quoted Rheede's Tiri-panna (t. 74) under *Acrostichum lanceolatum* L. Obviously in citing the plant under the genus *Acrostichum*, he was mistaken. Because from the illustration and description of Rheede, it appeared that it should not belong to *Acrostichum* which is a Pteridioid group. The mistake was also realised by Forst. (1786), Swartz (1806) and Willdenow (1810). So they put Rheede's Tiri-panna under the species, *Polypodium acrostichoides*, using specific epithet *acrostichoides* derived from the generic epithet *Acrostichum* to commemorate the Linnaean mistake. *Polypodium sensu lato* was later divided into several generic groups on the basis of varying morphological characteristics, including sporophytic gametophytic and cytological characteristics. Thus many species described by Linnaeus in the genus *Acrostichum* were later transferred into the *Polypodium* group which were again sorted out and grouped by Desvaux in the genus *Cyclophorus*, by Giesenhagen in the genus *Niphobolus* and by Mirbel in the genus *Pyrrosia*, the last being valid and currently used, the former two being generic synonyms of the latter.

From the study of the illustration t. 74 and its description given by Rheede, it is found that of the 13 *Pyrrosia* species occurring in India (Nayar and Chandra, 1965, 1967) none is matching with it excepting *P. lanceolata*.

The species excepting *P. adnascens*, *P. lanceolata* and *P. longifolia* are morphologically different from the Rheedean species in respect of their longer stipe, broader frond blade, hairless margin, texture of leaf lamina etc. as evident from the comparison of the Rheedean plant with these species. And of those 3 species mentioned, which come closer to the plate, *P. longifolia* is supposed to have not been seen by Rheede, as this species does not occur in India (Nayar and Chandra, *l.c.*). Of the remaining 2 species, *P. adnascens* has dimorphic fronds, sterile being smaller, fertile larger. But in *P. lanceolata* there is no leaf dimorphism, sterile and fertile fronds being of same size. In Rheede's plate the fronds are drawn almost all alike and elongated. In addition, Rheede's description of the plate can be examined. Regarding frond he wrote : Folia sola ex radice exsurgunt, pedibus rigidis acfuscis, oblongo angusta, in

cuspidem stricta, crassiola, carnosa, plana, virosis fusci, interius in medio striata, in oris rufforubra pulverulenta lanugine obducta. The description grossly narrated the common morphological characters of the species such as frond simple arising from root, foot or basal portion (stipe) rigid, brown in colour, lamina oblong-narrow (lanceolate), cuspidate straight (apical part), texture thick, fleshy, plane, brown inner portion striate in middle, mouth (upper part) red, powdery, covered by wool (fertile with sori and stellate hairs).

The description and the plate clearly points out to *Pyrrosia lanceolata*. So Rheede's Tiri-panna is determined to be the said species without any doubt.

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