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A Summary of the Status of Threatened Pteridophytes of India

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ABSTRACT: An assessment of rare and threatened Pteridophytes of political India, classifying species into different categories, has been made based on our own field-observations, data from herbarium-collections, and published literature. Their general range in political India has been given, though only limited details of extra-Indian range are provided. Modern taxonomic concepts and nomenclature have been adopted. Our survey has revealed that 414 species of Pteridophytes (219 At risk, of which 160 Critically endangered, 82 Near-threatened and 113 Rare), constituting *c*. 41-43 % of the total number of *c*. 950-1000 Pteridophytes of political India, are threatened or rare there. 84 species included in earlier works are excluded as they are not considered to be of threatened status. One new combination and two *nomina nova* have been validated (*Leptochilus pothifolius* (D.Don) Fras.-Jenk., *Asplenium rivulare* Fras.-Jenk. and *Thelypteris chandrae* Fras.-Jenk.).

KEY WORDS: **Pteridophytes, ferns, India, threatened, At risk, rare, taxonomy, endemics, new names.**

INTRODUCTION

India has a rich and varied pteridophytic flora due to its diversified topography, variable climatic conditions and its geographical position with several migration-flows of species of different phytogeographical elements meeting in different parts of the Country. Pteridophytes are an important component of the flora of this major region of species-diversity, next to Angiopsperms in number. More than 1200 species of ferns and fern allies have reported from India (Dixit, 1984; Chandra, 2000), but recent revision of doubtful new species is showing this to be an overestimate by perhaps 20%, even though genuine new findings are made from time to time. Nevertheless, it is likely that the actual number may be in the region of 900 to 1000 species.

Despite the large number of indigenous species a considerable percentage of them are rare and threatened. With increasing utilization of land and natural resources, it is feared that many of these threatened taxa will become yet rarer, more vulnerable and endangered, and in several cases may finally become extinct, as any disturbance or imbalance in their narrowly confined ecosystems is liable to lead to their extermination. The paramount example adjacent to India is the fate of the fern-flora of Bangladesh, which has been decimated to such an extent by land-use that perhaps only half its known species still survive there and the last fragment of natural forest left in the whole Country was destroyed approximately 3 years ago. Although the forest-cover of adjacent Bhutan and Myanmar remains in good state, most regions of India have suffered and continue to suffer evident degradation on a very large scale, which is increasing relentlessly. In many regions it is now difficult to find any extensive area of natural forest and the effective strict protection of small token-areas selected for their species-diversity is now of increasingly urgent import.

The World Conservation Union (IUCN), or International Union for the Conservation of Nature and Natural Resources, has played a major rôle in focussing international concern on the loss or extinction of species and is now the accepted authority on such matters. IUCN's original Red Data Book (IUCN, 1966), now revised annually and called the IUCN Red List (e.g. IUCN, 1978, 1998), which became only electronic since 2000, is to be found at the website: http://www.iucnredlist.org, or www.iucn.org. It was the first international study of this sort and several nations have published their own Red Data Books since then (e.g. Perring and Farwell 1977; Takhtajan, 1978; Ayensu, 1981; Jain, 1984; Nayar and Sastry, 1987, 1988, 1990; and see Jain and Rao, 1984). The main focus of the Red List is on species, though infra-specific categories, particularly of subspecies, are now also covered. IUCN's

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important and detailed overview of the status of the Indian flora (among others), with special studies of a number of key-areas of biodiversity in India and adjacent Countries has been presented by Davis, Heywood and Hamilton (1995). Subsequently the International Association of Pteridologists (IAP) appointed a committee for fern-conservation when it was first established in 1981. This became the Species Survival Commission (SSC) specialist group for Pteridophytes, which, using criteria established by the IUCN, developed a list of threatened ferns world-wide. Their World Conservation Monitoring Centre at Cambridge, England, listed 1650 threatened species of Pteridophytes world-wide (Jermy, 1990), under the following categories: Presumed Extinct - 20, Endangered - 67, Vulnerable - 91, Rare - 354, Candidate species for conservation - 1318. IUCN undertook a major revision of its recommendations in 1994 and 2001 in order to formulate a new conservation strategy of natural resources, and based on their new criteria for species to be included in the Red List, IUCN (1998) listed 770 threatened species of Pteridophytes world-wide. But of the 44 species listed from the Indian subcontinent, half (23) were either synonyms of other, non-threatened species or mistaken in other ways, such as being listed twice under different genera, or not being rare, due to reliance on erroneous data published on them locally. Sharpe (2001) also accepted the 770 threatened fern-allies and ferns world-wide.

Much study has been carried out in India on threatened species of Flowering Plants and their conservation, but ferns and fern-allies, which constitute a sizeable and valuable part of the national flora, have attracted less notice. Jain and Sastry (1980) made a first attempt by listing nearly 17 rare and endangered Pteridophytes from India along with Angiosperms. Dixit (1983) and Datta (1983) listed 25 "rare and interesting" and 5 rare pteridophytes, respectively. Bir (1987) identified 104 rare and endangered species of Pteridophytes from various regions of India, but later Bir (1988) listed 49 endangered species. Nayar and Sastry (1987, 1988, 1990) included 31 threatened pteridophytes in the volumes of the Botanical Survey of India's Red Data Book of Indian Plants. However, there has been little agreement between authors on the species listed and many of them are known to be taxonomic synonyms of well known species, or are commoner species which are not under threat.

Some local studies of threatened taxa of a particular region have also been made, with a few listed by IUCN (1998). Thus Bir's (1987) study listed endangered species by region and Bhardwaja, Gena and Verma (1987) enumerated 36 endangered species belonging to 21 genera of ferns and fern-allies from Rajasthan. Pangtey and Samant (1988) listed some Pteridophytes of the Kumaun Himalaya, Uttarakhand, they considered to be rare or endangered. Pande and Bir (1994) and Pande and Pande (2003) assessed rare and threatened pteridophytes of the Kumaun Himalaya, where first 22 and then 30 taxa were reported as endemic (but only 1 may be doubtfully correct, see Fraser-Jenkins (2008b)), and first 135 and then 123 taxa were considered as rare and endangered. Madhusoodanan (1991) listed rare and endangered ferns of the Western Ghats of Kerala and subsequently Manickam (1995) reported 44 rare and endangered species from the Western Ghats of South India. Singh and Panigrahi (2005) reported some 48 supposedly new and rare taxa mainly from single collections from a small district of eastern Arunachal Pradesh and listed 16 endemics to N.E. India, but all 48 have been synonymised by Fraser-Jenkins (2008b) and only one of their reported endemics is considered to be correct.

Unfortunately, due to taxonomic misunderstandings and lack of knowledge of the distribution of species outside India, most authors' assessments of endemics and threatened species were considerably misleading. Important changes have been made recently in our taxonomic understanding of species and in assessment of their frequency of occurrence. As a result the previous lists of threatened Pteridophytes are now understood to be insufficiently accurate and much in need of revision. We have therefore attempted to update the inventory of threatened Pteridophytes of India in the present paper based on a new assessment.

CATEGORIES OF THREATENED PTERIDOPHYTES

The present study is based partially on a wide-based survey of publications in scientific journals, monographs and Floras of both India and adjacent Countries. We have assessed these reports utilising wide field-experience gained during many years of collection and study-excursions throughout India and (CRFJ) in all the adjacent Countries, except Tibet. Detailed herbarium-study has also been carried out by the second author (CRFJ) in all the main national and international herbaria with Indian holdings, including checking the original specimens of many published reports. In certain cases further information has been obtained through personal consultation with other pteridologists in India and

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abroad. In assessing the category of threat to species, the following three sources of information have been given particular attention:

(1) Herbaria. Detailed scrutiny of collections in a large number of herbaria can provide valuable information as to the status of a species. The data on present distribution and on their past distribution along with the trends of shrinkage of population are very important in categorisation of the status of a species. Follow-up work, visiting the locality concerned, which the second author has done in a number of cases, provides very useful information as to the occurrence of the species in the area.

(2) Review of Literature. Floras, checklists, monographs and taxonomic accounts giving reports of species may provide much further information about their distribution-status. Comparison of old floras and recent ones may also give important information about the present status of species, particularly where a species is found by renewed search to be absent from an area where it once occurred. However an important caveat is that modern workers must ascertain that the report and identification of the species were genuinely correct for both older and newer reports by taking the trouble to examine the original herbarium-specimens supporting the reports.

(3) Extensive and Specific Field-Surveys. a) To find out the present distribution; b) To estimate the past distribution and changes in population-size; c) To measure the threat to the species through accurate field-observation of the population over a period of time. In practice we have hardly been able to carry out such investigation, but have been able to make useful observations of the present distribution and rarity or commonness of species. Taxonomic exactitude is obviously a prerequisite of any such work and may require checking the identity of specimens with an experienced expert specialist either in India or internationally, despite the increasing rarity of extant fern-taxonomists, like the ferns themselves.

In order to understand the species properly we have incorporated modern taxonomic and nomenclatural revision from various unpublished works of one of us (Fraser-Jenkins, 2008a, 2008b, in press), in accordance with the current International Code of Botanical Nomenclature and also bearing in mind modern taxonomic revision of genera and species. In this study we are concerned only with species or subspecies and have ignored the ranks of variety or forma, which have often been over-recognised as most such taxa require syonymising as merely part of the normal range of variation within species. We have also omitted spontaneous, sterile hybrids not reproducing or behaving as species as irrelevant to the concept of endemism and have also ignored adventive and introduced species, which have sometimes been redescribed as new species in error.

The Red List (IUCN, 1978) recognised five categories of threatened plants (including Rare and Indeterminate, now no longer utilised), subsequently revised (IUCN, 1994) into six categories. Since 2001 any submissions to the current Red List (IUCN, 2006) require use of the most recently updated nine categories (based on the Red List of IUCN, 2001), detailed documentation, maps, details of threat and changes and a written case for inclusion. The current categories (see the website: http://www.iucnredlist.org/) are:

1) 'Extinct' (EX) - with no reasonable doubt after exhaustive surveys.
2) 'Extinct in the wild' (EW) - only known in cultivation after exhaustive surveys.
3) 'Critically endangered' (CR) - extremely high risk of extinction in the wild.
4) 'Endangered' (EN) - very high risk of extinction in the wild.
5) 'Vulnerable' (VU) - high risk of extinction in the wild.
6) 'Near threatened' (NT) - close or likely to qualify as threatened in the near future.
7) 'Least concern' (LC) - widespread and abundant.
8) 'Data deficient' (DD) - inadequate information on abundance and distribution to assess risk.
9) 'Not evaluated' (NE) - not evaluated against the criteria.

These categories are appropriate to Countries where the local occurrence of species is known in great detail and their former occurrence is also known from reliable data. However, in a number of tropical and developing Countries such precise information is hardly available except in very rudimentary form. The highly sophisticated and detailed system of local recorders feeding data into a Central data-base simply does not exist in most Countries, including India, where many pteridologists do not know the species well enough and field-work is considerably limited so they inevitably fail to visit the majority of localities, even those well known from the past. In addition, due to the inacessibility of many areas the number of localities known in India from herbarium-collections probably represents only a random fraction of the actual extant populations of species. In most cases there is almost no historical information and even today estimates of population-size *etc*. are almost entirely missing. For

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this reason the IUCN categories are somewhat impractical outside of advanced, often Western Countries and a handful of others. Therefore partly instead of the IUCN categories mentioned above, the overall term "threatened status" is used here in a conservation-context for any indigenous species of taxonomic significance, which falls into one of three categories of threat, defined below, namely:

1. 'At risk',
2. 'Near-threatened',
3. 'Rare'.

Apart from 'Near-threatened' our categories are not the same and are not as strict as those of IUCN. Our highest category, "At risk" is equivalent to a combination of three of the IUCN categories, 'Critically endangered' (CR), 'Endangered' (EN) and 'Vulnerable' (VU). But we have placed an asterisk by those species we consider to be in the IUCN 'Critically endangered' category. Our next category, 'Near-threatened', is as near as we can make it, the same as the IUCN category so named, while our last category, 'Rare', is not directly related to the current IUCN categories. We have formulated these categories as we wish to draw attention to the decline and rarity of many species in India, which may not yet be at "very high risk", but will soon become so if their status is not made known and steps are not taken for local conservation-measures. Our listing is therefore to be taken as a first warning of perceived threat to many species. Even so, we must caution that assessment is bound to be considerably subjective and will depend much on the field-experience of authors, which can seldom be considered as sufficient to obtain a really accurate view of species, though we have attempted to gain a more accurate view by means of extensive field-visits over several decades. We hope that later studies may be able to focus on listing known localities nationally and documenting the categories more precisely.

(1) 'At risk' – These species are recognized by any one of the following criteria: 1) the decline is thought to be rapid and their number and habitat have been drastically reduced to a critical level; 2) the reproductive capacity appears to have fallen considerably below its rate of elimination from the habitat, leading to decline in number and size of population; 3) species with 3 or fewer known localities; 4) known only from one population - although covered under the previous category, we add this fourth sub-category mainly to draw attention to the existence of such a situation. Such species are in danger of extinction if the causal factor continues to operate. Although assessment has had to be made subjectively, we conclude that there are 219 species of pteridophytes to be considered as 'At risk' in India. Of these, 160 are starred to indicate that they come into the IUCN category of '**Critically endangered**'. These starred species are of particular concern and should be understood as species requiring active focus and efforts for the conservation of the limited localities where they occur in order to preserve both them and the associated species of plants and animals, which are also likely to be of special interest.

(2) 'Near-threatened' – This includes species which are declining because of over-exploitation, extensive habitat-destruction or other environmental disturbances. In this category the decline has started and is apparently slow, but the threat could push the species into the 'At risk' category in the near future. These species are likely to be in danger if modification to their habitat does not stop, or if their reproductive spread is affected.

Gureyeva (2002), however, suggested rather different, more general biological criteria to determine whether a fern species was becoming threatened or not, the main cause of vulnerability being associated with the success-rate of their reproductive biology. According to her, 1) ferns having effective ways of reproduction in their environment, either vegetatively, through buds or rhizome-branching, or through regularly producing viable spores would be the least vulnerable; 2) ferns which do not branch at all but which easily produce sporelings in their environment would be considered slightly vulnerable; 3) species which have sporophytes without effective vegetative reproduction, and also require a combination of many favourable factors for producing gametophytes from the spores, are the most vulnerable and have the least chance for continued survival during environmental change. Her categories key in an environmental factor since if the degradation of the environment, or destruction of plants, causes a drop in effective reproduction the status of the fern will change accordingly. Although we do not follow her categories as such here, it can be understood that our description of the current state of species, based on external factors is intimately related to the factors of vulnerability she categorized and the two sets of categories are different sides of the same coin. However it is clear that the anthropogenic causes of rarity she also recognised play a far larger part in India, with its more obvious and widespread environmental destruction, compared to Russia. In our analysis there are 82 species to be considered as 'Near-threatened' in India.

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(3) 'Rare' – These species occur in widely separated small sub-populations (so that interbreeding is seriously reduced or is restricted to a single population) with narrow localised or specialised habitats, often with low climatic tolerance and specialised adaptations; or are thinly scattered over a more extensive range. The rarest are usually ancient species adapted to uncommon habitats, with both hampered spore and vegetative renewal, especially if they inhabit zones of intensive human economic activity. Anthropogenic factors create imbalances in the ecosystem leading to the rarity of many species today. They need not be threatened *per se*, but are at risk of falling into the 'Near-threatened' category if no attention is paid to their plight. Rarity as such is not mutually exclusive and 'At risk' and 'Near-threatened' species may or may not be rare, though the more threatened species are usually also rare. But species we have listed simply under the category of 'Rare' are not sufficiently so as to fall into the threatened categories. However we have also mentioned under any species of all three categories when they are very rare. We estimate that there are 113 species to be considered under the category of 'Rare', but not 'At risk' or 'Near-threatened'.

ESTABLISHING WHICH SPECIES ARE THREATENED

It is difficult to make an accurate inventory of threatened species in India, with its vast size, remote and varied areas, often difficult of access, and rich flora. An accurate complete inventory of the known fern-flora does not exist yet though it is under preparation at an advanced stage (Fraser-Jenkins, in prep.), and the rate of deforestation and destruction of habitat is very high. One of the richest and less spoilt areas of India, northern Arunachal Pradesh, remains very poorly known as no pteridologists who know the bulk of the species they see have collected there, apart from some very brief visits. In addition few workers throughout India are competent to identify species and there are no local recorders who could record the species growing in fern-localities. Nevertheless extensive and specifically targeted field-visits and herbarium-study can reveal a considerable amount of the real status of our threatened species.

The species which are included in the threatened list are mainly those which are:

1. Endemics with restricted distribution (the total number of Indian endemics has been revised by Fraser-Jenkins (2008b, in press) to *c.* 45 species, not the *c.* 510 previously reported). We recognise 27 endemics or possible endemics as threatened in India.
2. Local species with their range restricted to isolated localities, yet they occur in considerable numbers in each locality (many plants but only at one or a few places);
3. Species occurring in small numbers or as few plants but in many separate or distant localities;
4. Species occurring as a few individuals in few localities, or in a single locality;
5. Species overexploited and becoming extirpated in many former areas by man, particularly for commercial purposes;
6. Rare species, though safe from human expansion;
7. Uncommon species very seldom collected as located in areas extremely difficult to reach;
8. Species suspected to be threatened but for which no or very little information exists.

At present a large number of Pteridophytes in India are threatened mainly due to human activities, such as:

- ♦ Environmental degradation of preferred habitat for species, such as uncontrolled tree-felling and destruction for fuel, timber, crop-plantations or grazing, building over sites near to cities or coastal resort areas, or draining of wetlands for agriculture.
- ♦ Pollution of the environment, such as stream-banks, lakes and road-sides.
- ♦ Unregulated commercial collection, such as of tree-fern trunks for orchid-growing.
- ♦ Immoderate collection of species known to be rare by students; however we consider that constructive small-scale collection by scientific research-botanists generally represents no threat, even though it is often unnecessarily obstructed and prohibited by authorities under the provisions of the International Convention on Biodiversity. Without such collection further advances in botanical research are severely set back and excessive restriction amounts to a misuse of the Convention, for which purpose it was not intended.

The current situation throughout much of India has serious implications for the future. With ever-increasing encroachment upon natural vegetation, huge areas are being denuded annually and continue to be damaged with little or no control. The continued decrease in forest-cover is not conducive to achieving a healthy environment for the country's development and resulting climatic change, such as decreased rainfall and increased temperature, is already creating problems for agriculture,

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increasing storms, floods and droughts *etc*. A crucial factor thought to be causative in the current problem of Global Warming is the destruction of forests and the climatic alteration it causes. The inevitable result is that with increasing destruction of the vegetation there is an accompanying loss of species of the country's valuable pteridophytic flora from the ever-expanding areas affected.

ENUMERATION

The following enumeration lists 29 fern-allies and 385 ferns as threatened taxa of Pteridophytes. The species are arranged alphabetically under each category within families. Some brief taxonomic details are given where important, along with their revised distribution in India and occasional details of some parts of their extra-Indian range. Several modern authors have given highly inaccurate ranges outside India due to lack of taxonomic knowledge while reading old literature. Some recent lists have also given many mistaken ranges within India, for similar reasons, or arising due to misapplication of old British terms, such as "Sikkim" and particularly "Assam", which have largely been revised here. The classification followed for the families and genera is mainly that of Kramer and Green (1990) with some minor modifications, though in a few cases certain genera they did not accept are accepted here due to their practical distinctness. Many works in India still follow the more splitting treatment of Pichi Sermolli (1977), utilising the thelypteroid genera of Holttum (1971), more appropriate as sections, and some of the excessively split genera and families of Ching (1978), which are permanently used in isolation in China. In keeping with most modern workers we have synonymised these more minor entities and take a generally broader and more practical approach. 28 of the species listed have been given with a query, often those from the Andaman and Nicobar Islands whose identity requires confirmation, but also because of taxonomic doubt or in a few cases, uncertain occurrence in India.

Critically endangered species are marked with an asterisk (*).

FERN ALLIES

Lycopodiaceae

At risk

*1. *Huperzia cancellata* (Spring.) Trevis. - Bhutan; far N.E. India (Arunachal Pradesh).

*2. *Huperzia carinata* (Desv.) Trevis. - Nicobar Islands (Dixit and Sinha, 2001); ?S. India. Reports from S. India by Dixit (1984, 1987), following Baker, were probably in error.

*3. *Huperzia quasipolytrichoides* (Hayata) Ching (see Fraser-Jenkins, 2008a, in press) (misapplied name: *H. cryptomerina sensu* Dixit, *non* (Maxim.) R.D.Dixit) - very rare. Far N.E. India (Arunachal Pradesh); Myanmar; S.China; Taiwan.

*4. *Huperzia nummulariifolia* (Blume) Jermy - Nicobar Islands (given *sub Lycopodium* by Dixit and Sinha, 2001).

5. *Huperzia phyllantha* (Hook. & Arn.) Holub - Sri Lanka; Nicobar Islands; S. India. Reported from N.W. and N.E. India in error by Dixit (1984).

*6. *Huperzia vernicosa* (Hook. & Grev.) Trevis. - very rare. S. India.

*7. *Lycopodium annotinum* L. subsp. *alpestre* (Hartm.) Å. Löve & D. Löve (syn.: *L. zonatum* Ching, *L. alticola* Ching) - N.W. India (Uttarakhand); N.E. India (Sikkim; Arunachal Pradesh). Reports from S. India (Shevaroy Hills) and Meghalaya were in error.

8. *Lycopodium complanatum* L. - N.E. India (Meghalaya). Reports from Sri Lanka and S. India refer to *L. wightianum* Spring. The N.E. Indian and S.W. Chinese populations may perhaps be partly *L. multispicatum* Wilce (S.E. Asia to the Philippines), which requires comparison with and careful delineation in relation to *L. complanatum*.

*9. *Lycopodium dendroideum* Michx. ("*L. obscurum*" *sensu* Dixit) - very rare. Bhutan; ?far N.E. India (?Arunachal Pradesh). See Fraser-Jenkins (2008a, in press). Reported from S. India (Shevaroy Hills) in error.

Near-threatened

10. *Lycopodium wightianum* (Wall. *ex* Hook. & Grev.) Holub - S. India.

Rare

11. *Huperzia ceylanica* (Spring) Trevis. - Sri Lanka; S. India (rare) and far N.E. India (Meghalaya). IUCN (1998) listed it (*sub Lycopodium ceylanicum* Spring) as Indeterminate.

12. *Huperzia nilagirica* (Spring) R.D.Dixit (syn.: *H. hilliana* (Nessel) Holub) (**endemic**) - S. India.

13. *Huperzia selago* (L.) Bernh. *ex* Schrank & Mart. subsp. *arctica* (Grossh. *ex* Tolm.) Å.Löve & D.Löve (syn.: *H. dixitiana* P.Mondal & S.R.Ghosh (type only), *L. selago* L. var. *appressum* Desv.) - Pakistan; N.W. India (Indian Kashmir; Uttarakhand, Hemkund); N.E. India (N. Sikkim). Reported in error from Sri Lanka and S. India.

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14. *Huperzia phlegmaria* (L.) Rothm. (syn.: *Phlegmariurus phlegmaria* (L.) T. Sen & U.Sen) - Sri Lanka; Andaman Islands; Nicobar Islands (Dixit and Sinha 2001); S. India; Nepal; N.E. India (W. Bengal, Darjeeling; Sikkim; Assam; Arunachal Pradesh; Meghalaya; Tripura); Bhutan; Myanmar.
15. *Lycopodium veitchii* Christ (*L. alpinum sensu auct. Ind*., *non* L.) - Nepal, N.E. India (Sikkim; Arunachal Pradesh).
16. *Lycopodium casuarinoides* Spring - far N.E. India (Assam; Meghalaya).

Selaginellaceae

At risk

*17. *Selaginella aitchisonii* Hieron. - very rare. N.W. India (Indian Kashmir); N.W. Nepal. Treated by Alston (1945) as a growth form of the boreal Asian species, *S. sanguinolenta* (L.) Spring, which can exist in a similarly narrow, homophyllous form. But Fraser-Jenkins (1992, 1997) reasoned that *S. aitchisonii*, *S. sanguinolenta* and the heterophyllous *S. jacquemontii* Spring (syn.: *S. kashmiriana* R.D.Dixit) are three distinct species.
*18. *Selaginella cataractarum* Alston (**endemic**) - S. India. IUCN (1998) listed it as Endangered "Endangered in Kerala; Extinct in Tamil Nadu (Silver Cascade, Kodaikanal)", though its partial extinction probably requires confirmation.
19. *Selaginella megaphylla* Baker - N. E. India (Assam, Kamrup; Arunachal Pradesh); Bhutan.
*20. ?*Selaginella ornithopodioides* (L.) Spring (syn.: *S. integerrima* (Hook. & Grev.) Spring) - Sri Lanka; ?S. India. Alston (1945) definitively and correctly lectotypified *S. ornithopodioides* on the basis of Hermann's Sri Lankan plant cited by Linnaeus, who had based his description on that of *Flora Zeylanica*, which he cited as the first reference. But Panigrahi (1976) reverted to misapplying the name *S. ornithopodioides* (L.) Spring to an unidentified Chinese plant also cited by Linnaeus, following Spring's partial and Baker's total misapplication of the name to the Chinese plant, even though their treatments had been emended by both Trimen and Alston. Panigrahi therefore used the name *S. integerrima*, given as its synonym by Alston, for the Sri Lankan species, instead of the earlier *S. ornithopodioides*. However neither Spring nor Baker lectotypified *S. ornithopodioides* in any way, as contended by Panigrahi, whose attempted new lectotypification must therefore be set aside. Spring did not exclude Linnaeus' original Sri Lankan type as he included Linnaeus' description (while emphasising its ambiguity) and also the *Flora Zeylanica* reference and Ceylon locality. But Baker definitely excluded the Sri Lankan plant and must therefore be considered to have published a new name for the Chinese species, *S. ornithopodioides* Baker, *non* (L.) Spring, but which was not only a later homonym, but was anyway superfluous as he also included *Lycopodium hispidum* Willd. in its synonymy.

Spring also mentioned Malabar for the species, and the type of the synonym, *S. integerrima*, was given as Courtallam (S. India), *Wight* (E). But Alston suggested that the latter was in error as Wight's material at Kew is all labelled Colombo (Sri Lanka), and gave the range as confined to Sri Lanka. The occurrence of *S. ornithopodioides* in India is therefore not fully established, though it may be present in S. India, but no further material was cited by Dixit (1992).

*21. *Selaginella pulvinata* (Hook. & Grev.) Maxim. - very locally common in N.W. India (Uttarakhand, Pithoragarh, inc. by *CRFJ*); N.W. Nepal. Reported from S.E. Myanmar in error for *S. involvens* (Sw.) Spring.
*22. *Selaginella wattii* Baker - far N.E. India (Manipur - single, type-collection), ?Myanmar (Dixit, 1984, 1992, without cited specimen). Reports from Myanmar require confirmation, though its presence there is to be expected. Ghosh et al. (2004) also reported it from Mizoram, Nagaland and Bangladesh, which requires confirmation. This taxon is very little known and is close to the S. Indian *S. proniflora* (Lam.) Baker, with long cilia on the sporophylls.

Rare

23. *Selaginella adunca* A.Braun *ex* Hieron. [subsp. *adunca*] (**endemic**) - very locally abundant in N.W. India (Himachal Pradesh; Uttarakhand); replaced in Tibet and China by the closely similar subsp. *albocincta* (Ching) Fras.-Jenk. (2008a, in press). Alston (1945) erroneously gave Madden's collection from Srinagar, Garhwal (Kumaon), as if from Srinagar, Kashmir. IUCN (1998) listed *S. adunca* as Endangered.
24. *Selaginella miniatospora* (Dalz.) Bak. (**endemic**) - S. and W.C. India.
25. *Selaginella picta* A.Braun *ex* Baker (syn.: *S. picta* f. *viridis* Alston) - far N.E. India (Assam; Arunachal Pradesh; Manipur; Nagaland).
26. *Selaginella tenuifolia* Spring - N.E. India (W. Bengal, Darjeeling; Sikkim; Arunachal Pradesh; Meghalaya).

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Isoetaceae

Many species have been reported or described recently from India as if endemic, often from single collections and possibly reflecting more the place of work of the workers concerned than the actual taxonomy and distribution. Their status as species is doubtful and perhaps most of them appear to represent no more than infraspecific variation in spore-surface morphology, of unsure taxonomic significance. There are probably two good species present in India, doubtfully more (Fraser-Jenkins, 1997). Further study is required into separation of species, and their correct nomenclature and synonymy. It is hardly meaningful to list the published taxa as threatened species until their taxonomic status is clarified. The following taxa have been reported:

Isoetes bilaspurensis Panigrahi - C. India (Madhya Pradesh). Synonym of *I. coromandelina*. IUCN (1998) listed it as Rare.

Isoetes brachyglossa A.Braun (*I. coromandelina* L.f. subsp. *brachyglossa* (A.Braun) Panigrahi) - N.E. India (W. Bengal). A synonym of *I. coromandelina*.

Isoetes coromandelina L.f. subsp. *coromandelina* (as opposed to subsp. *macrotuberculata* C.R.Marsden, from Australia) - Throughout most India, except the Himalaya: W.C. India (Rajasthan; Gujarat); C. India (Uttar Pradesh; Bihar; W. Bengal; Orissa; Madhya Pradesh; Maharashtra; Goa); S. India (Karnataka; Kerala; Tamil Nadu); Nepal; Myanmar; China; Thailand and Vietnam.

Isoetes coromandelina var. *raipurensis* Unni - C. India (Madhya Pradesh).

Isoetes debii S.C. Sinha - far N.E. India (Manipur).

Isoetes divyadarshanii P.K.Shukla, G.K.Srivast. & S.K.Shukla - C. India (Maharashtra).

Isoetes dixitii Shende [*sub* "*dixitei*"] - C. India (Madhya Pradesh; Maharashtra; Karnataka). Synonym of *I. coromandelina*. IUCN (1998) listed it as Extinct.

Isoetes fuchsii Goswami & U.S. Sharma - C. India (Madhya Pradesh).

Isoetes indica D.D. Pant & G.K.Srivast., *non* Koenig - C. and S. India (Uttar Pradesh; Madhya Pradesh; Tamil Nadu). Synonym of *I. coromandelina*.

Isoetes indica var. *harotiensis* Bhardwaja & Gena - W.C. India (Rajasthan).

Isoetes mahadevensis G.K.Srivast., D.D.Pant & P.K.Shukla - C. India (Madhya Pradesh).

Isoetes mirzapurensis Panigrahi & R.D.Dixit - C. India (Uttar Pradesh). Synonym of *I. coromandelina*; placed in the synonymy of *I. indica* by Dixit (1984).

Isoetes muricata Bhu & Goswami - C. India (Madhya Pradesh).

Isoetes panchananii D.D.Pant & G.K.Srivast. [var. *panchananii*] - C. and W.C. India (Madhya Pradesh; Maharashtra).

Isoetes panchananii D.D. Pant & G.K. Srivast. var. *pachmarhiensis* G.K.Srivast., M.Srivast., D.D. Pant & P.K. Shukla - C. India (Madhya Pradesh).

Isoetes panchganiensis G.K.Srivast., D.D. Pant & P.K. Shukla [var. *panchganiensis*] - C. India (Maharashtra).

Isoetes panchganiensis G.K. Srivast. *et al*. var. *kemangundiensis* G.K. Srivast., D.D. Pant & P.K. Shukla - S. India (Karnataka).

Isoetes pantii Goswami & B.S. Arya - C. India (Madhya Pradesh). Synonym of *I. coromandelina*.

Isoetes pantii var. *hybrida* Goswami, *nom. inval*. (*sin. typ*.) - C. India (Madhya Pradesh). This taxon demonstrates the variability in spore-surface ornamentation suspected to be prevalent in Indian *Isoetes*.

Isoetes rajasthanensis Gena & Bhardwaja - W.C. India (Rajasthan). One of three dubious new species described from the same pond.

Isoetes reticulata Gena & Bhardwaja - W.C. India (Rajasthan).

Isoetes sahyadriensis Mahab. - S. India (Maharashtra; Karnataka). Synonym of *I. coromandelina*.

Isoetes sampathkumaranii L.N. Rao - C. India (Madhya Pradesh); S. India (Karnataka; Andhra Pradesh). Synonym of *I. coromandelina*. IUCN (1998) listed it as Extinct.

Isoetes tuberculata Gena & Bhardwaja (*sub* "*I. tuberosa* Gena & Bhattacharyya" (Dixit and Balkrishna, 1989 et al.) - W.C. India (Rajasthan). Synonym of *I. coromandelina*.

Isoetes udupiensis P.K. Shukla, G.K. Srivast. & S.K.Shukla - S. India (Karnataka).

Isoetes unilocularis D.D. Pant & G.K. Srivast. - C. India (Uttar Pradesh); S. India (Tamil Nadu). Synonym of *I. indica* and thus of *I. coromandelina*.

Equisetaceae

At risk

*27. *Equisetum palustre* L. - very rare. Pakistan; far N.W. India (Northern Indian Kashmir).

Psilotaceae

Near-threatened

28. *Psilotum nudum* (L.) P. Beauv. (syn.: *P. triquetrum* Sw., *P. nudum* var. *molesworthiae* Iranzo, Prada & Salvo, which was listed from Spain by IUCN (1998) with its world-status as Endangered) - Sri Lanka; Andaman Islands; Nicobar Islands (Dixit and Sinha, 2001); S. India; C. India and N.W. India (Himachal Pradesh; Uttarakhand; Punjab); Nepal; N.E. India (W. Bengal, Darjeeling; Assam; Arunachal Pradesh; Nagaland; Meghalaya; Mizoram).

29. *Psilotum complanatum* Sw. - Nicobar Islands (Dixit and Sinha, 2001).

FERNS

Ophioglossaceae

At risk

30. *Botrychium virginianum* (L.) Sw. - very rare. Pakistan; N.W. India (Indian Kashmir; Himachal Pradesh; Uttarakhand) and N.E. India (Meghalaya). Most reports of this species are in error for *B. lanuginosum* Wall. *ex* Hook. & Grev. (syn.: *B. lanuginosum* var. *nepalense* Nishida). The report from C. Nepal by Fraser-Jenkins in Thapa (2002) was in error for small to medium-sized plants of *B. lanuginosum*, with the fertile branch arising from the junction-point of the rachis and lowest pinna as in *B. virginianum*,

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but the lowest basiscopic pinnule of the frond clearly the longest, unlike in that species.

31. *Helminthostachys zeylanica* (L.) Hook. (syn.: *H. laciniata* Voigt) - S. India; C. India; N.W. India (Uttarakhand, inc. Banbasa near Tanakpur, *CRFJ*); Nepal; N.E. India (W. Bengal; Assam; Meghalaya).

*32. *Ophioglossum gramineum* Willd. - S. India; W.C. and C. India; N.W. India (Uttarakhand); far N.E. India (W. Bengal).

*33. *Ophioglossum lusitanicum* L. - S. India; C. India.

*34. *Ophioglossum pendulum* L. - Nicobar Islands (Dixit and Sinha, 2001); far N.E. India (Assam; Arunachal Pradesh).

Rare

35. *Botrychium daucifolium* Wall. *ex* Hook. & Grev. - S. India; C. India; Nepal; N.E. India (W. Bengal; Sikkim; Arunachal Pradesh; Meghalaya). Reported from Uttarakhand in error for *B. multifidum* (S.G.Gmel.) Rupr.

36. *Botrychium lunaria* (L.) Sw. - Pakistan; N.W. India (Indian Kashmir; Himachal Pradesh; Uttarakhand); Nepal; N.E. India (Sikkim). A report from S. India (Shevaroy Hills) was in error.

37. *Botrychium ternatum* (Thunb.) Sw. - N.W. India (Himachal Pradesh; Uttarakhand); Nepal; N.E. India (W. Bengal, Darjeeling; Sikkim; Arunachal Pradesh). Reported from Rajasthan (Mt. Abu) in error for *B. lanuginosum* Wall. *ex* Hook. & Grev.

38. *Ophioglossum nudicaule* L. - C. India; S. India. Reported from the Himalayan region in error for *O. parvifolium* Grev. & Hook. *O. eliminatum* Khand. & Goswami, described from C. India, may belong to this group, but requires further comparison with other Asian species.

39. *Ophioglossum parvifolium* Grev. & Hook. (syn.: *O. macrorrhizum* Kunze) - S. India; C. India; N.W. India (Himachal Pradesh; Uttarakhand); Nepal; N.E. India (Arunachal Pradesh; Meghalaya; Tripura).

40. *Ophioglossum polyphyllum* A.Braun *ex* Seub. (syn.: *O. aitchisonii* (C.B. Clarke) d'Almeida) - C. India; Pakistan; N.W. India (Indian Kashmir; Himachal Pradesh; Uttarakhand; Panjab).

Marattiaceae

At risk

*41. *Christensenia aesculifolia* (Blume) Maxon (syn.: *C. assamica* (Griff.) Ching) - far N.E. India (Assam; Arunachal Pradesh; Meghalaya). IUCN (1998) listed *C. assamica* from China and N.E. India as Vulnerable.

42. *Marattia fraxinea* Sw. - Sri Lanka; S. India.

Osmundaceae

At risk

*43. *Osmunda cinnamomea* L. subsp. *asiatica* (Fernald) Fras.-Jenk. - very rare. Bhutan; far N.E. India (Arunachal Pradesh).

*44. *Osmunda javanica* Blume - very rare. Far N.E. India (Arunachal Pradesh). Chandra (2000) listed it from Tamil Nadu and Kerala, but Sledge (1982) made clear that Panigrahi and Dixit's (1969) report from S. India was in error for a Sri Lankan plant and Beddome's doubtful report was for the next species.

*45. ?*Osmunda angustifolia* Ching (syn.: *O. collina* Sledge) - very rare or perhaps only cultivated in S. India (Kerala, *Gen. Johnston*, cited by Beddome with doubt as to its wild origin); Thailand; S.E. China.

Near-threatened

46. *Osmunda huegeliana* C.Presl. (syn.: *O. regalis* var. *panigrahiana* R.D.Dixit) - C. and S. India. Reported from Arunachal Pradesh in error for *O. regalis* L.

Rare

47. *Osmunda regalis* L. - far N.E. India (Arunachal Pradesh; Meghalaya). Reports from the W. Himalaya are in error for abnormal or sterile *O. japonica* Thunb. and from C. and S. India for *O. huegeliana* C.Presl.

Plagiogyriaceae

The several species described by Ching and also Dixit and Das and commonly reported from India are synonyms (see Fraser-Jenkins, 1997; Zhang and Nooteboom, 1998).

At risk

48. *Plagiogyria glauca* (Blume) Mett. (syn.: *P. glaucescens* Ching) - far N.E. India ("Assam"; Manipur; Meghalaya).

Near-threatened

49. *Plagiogyria adnata* (Blume) Bedd. (syn.: *P. rankanensis* Hayata) - far N.E. India ("Assam"; Meghalaya).

Schizaeaceae

At risk

50. *Lygodium circinnatum* (Burm.f.) Sw. - Andaman Islands; Nicobar Islands (Dixit and Sinha, 2001); far N.E. India (Assam). Reported from N.W. India by Chandra (2000) in error for the radiate first leaf of *L. flexuosum* (L.) Sw.

*51. *Lygodium polystachyum* Wall. *ex* T.Moore - very rare. Far N.E. India (Assam).

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*52. *Schizaea dichotoma* (L.) Sm. - very rare. Nicobar Islands (Dixit and Sinha, 2001); S. India.
*53. *Schizaea digitata* (L.) Sw. - very rare. Andaman Islands; Nicobar Islands (Dixit and Sinha, 2001); S. India; N.E. India (Assam; Meghalaya).

Near threatened

54. *Lygodium longifolium* (Willd.) Sw. - very rare. S. India.

Gleicheniaceae

At risk

55. *Dicranopteris* ?*curranii* Copel. (syn.: *D. linearis* (Burm.f.) Underw. var. *wattii* Panigrahi & R.D.Dixit) - Nicobar Islands (Dixit and Sinha, 2001); N.E. India (Manipur).
56. ?*Dicranopteris subpectinata* (Christ) C.M. Kuo - ?Andaman Islands (Dixit and Sinha, 2001). Close to *D. linearis* (Burm.f.) Underw. and both *D. subpectinata* itself and its occurrence in the Andamans may require further study.

Dipteridaceae

At risk

*57. *Dipteris wallichii* (R.Br.) T.Moore - E. Nepal; N.E. India (Sikkim; Arunachal Pradesh; Assam; Meghalaya); Bhutan; Bangladesh.

Polypodiaceae

At risk

*58. *Arthromeris notholaenoides* V.K.Rawat & Fras.-Jenk. (Fraser-Jenkins, 2008a, in press) (apparently endemic) - very rare. A single collection of this very distinctive species covered in dense hair, with small rounded-apexed pinnae, from far N.E. India (Arunachal Pradesh, Lower Debang Valley, Mehao, *V.K. Rawat*). Probably to be expected in Tibet.
59. *Arthromeris wardii* (C.B.Clarke) Ching - Bhutan; far N.E. India (W. Bengal, Kalimpong; Arunachal Pradesh; Nagaland); Tibet.
*60. *Drymotaenium miyoshianum* (Makino) Makino - very rare. Far N.E. India (Arunachal Pradesh).
*61. *Drynaria bonii* Christ (syn.: *D. meeboldii* Rosenst.) - very rare. Far N.E. India (Manipur; "Assam", given by Roos, 1985). IUCN (1998) listed *D. meeboldii* from Manipur only, as Vulnerable.
*62. *Drynaria parishii* (Bedd.) Bedd. - very rare. Far N.E. India ("Assam?", given by Roos, 1985).
*63. *Goniophlebium persicifolium* (Desv.) Bedd. - very rare. Far N.E. India ("Assam", [probably *King* 6321, 6384?], given by Rödl-Linder, 1990).
*64. *Lemmaphyllum microphyllum* C.Presl - very rare. Far N.E. India (E. Arunachal Pradesh).
*65. *Leptochilus minor* Fée (syn.: *L. minutulus* Fée, *Dendroglossa minutula* (Fée) Copel.) - far N.E. India (Meghalaya). IUCN (1998) listed *Dendroglossa minutula* (Fée) Copel. from N.E. India only, as Endangered. Nooteboom (1997) mistakenly placed *Nistarika bahupunctika* B.K.Nayar, Madhus. & Molly (syn.: *Leptochilus bahupunctika* (B.K.Nayar *et al*.) Nampy) in its synonymy, which is a synonym of the very different species, *Leptochilus axillaris* (Cav.) Kaulf.
*66. *Leptochilus subhemionitideus* (Christ) Bosman (syn.: *Neocheiropteris subhemionitidea* (Christ) Fras.-Jenk. (1997); misapplied name: *Microsorum hymenodes sensu auct. Ind*., *non* (Kunze) Ching [= *Microsorum membranaceum* (D.Don) Ching]) - very rare. E. Nepal; Bhutan; far N.E. India (Arunachal Pradesh).
67. *Leptochilus thwaitesianus* Fée - S. India. Reports from far N.E. and C. and C.W. India are in error for *L. lanceolatus* Fée. Nooteboom (1997) mistakenly placed this species in the synonymy of the very distinct species *Leptochilus decurrens* Blume.
*68. *Loxogramme grammitoides* (Baker) C.Chr. (syn.: *L. yigongensis* Ching & S.K.Wu; misapplied name: *L. lankokiensis sensu* Singh and Panigrahi (1987, 2005), *non* (Rosenst.) C.Chr. [= *L. acroscopa* (Christ) C.Chr. from S.E. Asia]) - very rare. N.E. India (W. Bengal, Gairibas, nr. Manebhanjyang, Darjeeling; Arunachal Pradesh, Namdapha, *CRFJ etc*.). Dr. Michael G. Price of Michigan has kindly informed the author of the identity of *L. lankokiensis* and that *L. acroscopa* is not present in India. Singh and Panigrahi's report of *L. lankokiensis* from India was in error for small plants of *L. grammitoides*.
*69. *Microgramma lycopodioides* (L.) Copel. - very rare or ?extinct. Sri Lanka; S. India.
70. *Microsorum chinense* (Mett. *ex* Kuhn) Fras.-Jenk. (2008a, in press) (syn.: *M. henryi* (Christ) C.M.Kuo; *Microsorum excelsum* Ching & SKWu) - very rare. Bhutan; far N.E. India (Arunachal Pradesh). Confused with *M. fortunei* (T.Moore) Ching, but with larger, wider fronds and more rows of sori.
*71. *Neocheiropteris ensata* (Thunb.) Ching - very rare. Far N.E. India (Manipur; Meghalaya).
*72. *Phymatopteris connexa* (Ching) Pic.Serm. - very rare. Far N.E. India (Manipur, Sirhoi, *F. Kingdon Ward* 17833, BM!) (Fraser-Jenkins, 2008a, in press).

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73. *Phymatopteris nigrovenia* (Christ) Pic. Serm. - very rare. Nepal; N.E. India (W. Bengal, Darjeeling; Sikkim). This species is closely related to *P. veitchii* (Baker) Pic. Serm. from Japan and to *P. shensiense* (Christ) Pic. Serm. from China.

*74. *Phymatopteris tibetana* (Ching & S.K. Wu) W.M.Chu - very rare. Nepal; N.E. India (Sikkim) (Fraser-Jenkins, 2008a, in press).

75. *Phymatosorus longissimus* (Blume) Pic.Serm. (syn.: *Microsorum rubidum* (Kunze) Copel.) - S. India; Nicobar Islands (Dixit and Sinha, 2001); far N.E. India (Assam); Bangladesh.

*76. *Platycerium wallichii* Hook. - very rare. Far N.E. India (Manipur); Myanmar. Reported from the Andaman and Nicobar Islands in error (Dixit and Sinha, 2001) and confused with the African species *P. alcicorne* Desv., which is widely known in cultivation.

*77. *Polypodiodes dielsiana* (C.Chr.) Fras.-Jenk. (1997) - very rare. Far N.E. India ("Assam", *Hooker* (K), given by Rödl-Linder, 1990).

*78. *Polypodiodes manmeiense* (Christ) Fras.-Jenk. (1997) - very rare. Far N.E. India (Meghalaya; "Assam" only, given by Rodl-Linder (1990), but referring to Meghalaya). Reports from the W. Himalaya (Uttarakhand) and Sikkim were in error for *Polypodioides microrhizoma* (C.B.Clarke *ex* Baker) Ching.

79. *Polypodiodes wattii* (Bedd.) Ching (syn.: *Goniophlebium niponicum* (Mett.) Bedd. var. *wattii* Bedd.) - far N.E. India (Arunachal Pradesh; Manipur; Meghalaya).

*80. *Pyrrosia boothii* (Hook.) Ching - very rare. N.E. India (?W. Bengal, Darjeeling; Sikkim); Bhutan.

*81. *Pyrrosia drakeana* (Franch.) Ching - very rare. Far N.E. India (Arunachal Pradesh).

82. *Pyrrosia laevis* (J.Sm.) Ching (syn.: *Pyrrosia jaintensis* (C.B.Clarke) Ching) - far N.E. India (Meghalaya); Myanmar.

*83. *Pyrrosia longifolia* (Burm.f.) C.V.Morton - very rare. Far N.E. India (Arunachal Pradesh).

*84. *Pyrrosia rasamalae* (Racib.) K.H.Shing (syn.: *Pyrrosia arunachalensis* Sarn.Singh & Panigrahi) - very rare. Far N.E. India (Arunachal Pradesh) (Fraser-Jenkins, 2008a, in press).

85. *Pyrrosia subfurfuracea* (Hook.) Ching - [Bhutan], far N.E. India (Arunachal Pradesh; Mizoram). Reports from the W. Himalaya and Sikkim were in error for *Pyrrosia flocculosa* (D.Don) Ching and *P. costata* (Wall. *ex* C.Presl) Tagawa & K. Iwats.

*86. *Selliguea chrysotricha* (C. Chr.) Fras.-Jenk. (2008a, in press) - very rare. Far N.E. India (Arunachal Pradesh).

87. *Selliguea majoensis* (C.Chr.) Fras.-Jenk. (2008a, in press) (misapplied name: *Phymatopteris griffithiana sensu* Ching *et auct. Ind.*, *non* (Hook.) Pic.Serm. [syn.: *P. integerrima* (Ching) Bir, from E. Nepal and N.E. India]) - far N.E. India (Nagaland; Meghalaya); Tibet (Fraser-Jenkins, 2008a, in press).

*88. *Selliguea subsparsa* (Baker) Hovenkamp ("*Holcosorus bisulcatus* (Hook.) Ching" *sensu* Dixit and Nair, 1977) - very rare. Far N.E. India (Arunachal Pradesh). *S. bisulcata* (Hooker) Hovenkamp is confined to Borneo and has a quadrangular leaf with elongated, fusing, sunken sori, not a narrow, deflexed lamina with a midrib, and separate, easily visible sori as in Rao's collection from Siang, Arunachal Pradesh, reported by Dixit and Nair. Two widespread species can exist in gramineous forms as well as their normal, wider-fronded forms, *S. enervis* (Cav.) Ching, from Thailand and Malaya south-eastwards, and *S. subsparsa* (Baker) Hovenkamp (syn.: *Crypsinus wrayi* (Baker) Holttum) from Malaya south-eastward. Both vary in scale-denticulation. The collection from Arunachal Pradesh appears to belong to the gramineous form of *S. subsparsa*, as illustrated from Malaya by Piggott and Pigott (1988) and mentioned by Holttum (1954), but *S. enervis* and *S. subsparsa* may not be entirely separate species (Hovenkamp, 1998). IUCN (1998) listed *Holcosorus bisulcatus* from Arunachal Pradesh only, as Endangered.

*89. *Selliguea tricuspis* (Hook.) Fras.-Jenk. (2008a, in press) (syn.: *Christiopteris tricuspis* (Hook.) Christ) - very rare. N.E. India (Darjeeling [?extinct]; S. Sikkim).

*90. *Thylacopteris papillosa* (Blume) Kunze *ex* J.Sm. - very rare. Far N.E. India (Arunachal Pradesh).

Near-threatened

91. *Belvisia henryi* (Hieron. *ex* C.Chr.) Raymond - Nepal; N.E. India (Sikkim; Meghalaya); S. India. *B. spicata* (L.f.) Mirb. *ex* Copel. and its synonym, *B. revoluta* (Blume) Copel., and *B. mucronata* (Fée) Copel. and its synonym, *B. callifolia* (Christ) Copel., have also been reported from India, especially N. India, in error for *B. henryi* by various authors, including Satija and Bir (1985). Hovenkamp and Franken (1993) recognize only *B. henryi* from India, though the other two species are present in Sri Lanka. Beddome also reported *B. spicata* from S. India, but perhaps rather dubiously.

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92. *Goniophlebium mengtzeense* (Christ) Rödl-Linder (syn.: *Polypodium argutum* forma *khasianum* C.B.Clarke; misapplied name: *G. subauriculatum sensu* Satija and Bir (1985), *non* (Blume) C. Presl - Far N.E. India (Meghalaya). Distinguishable from *G. subauriculatum*, which does not occur in India, by its sori not being sunken, the rhizome-scales dimorphic, with round, adpressed ones at the base of deltate and filiform ones; branched laminar hairs absent and only simple.
93. *Lepisorus oligolepidus* (Baker) Ching - N.E. India only (Arunachal Pradesh). Reports from the W. Himalaya and S. India were in error, mainly for *L. scolopendria* (Ching) Mehra & Bir (Fraser-Jenkins, 2008a, in press). Several other Chinese species have been reported in error from the W. and E. Indo-Himalaya.
94. *Lepisorus sordidus* (C.Chr.) Ching - far N.E. India only (Arunachal Pradesh).
95. *Leptochilus superficialis* (Blume) Fras.-Jenk. (2008a, in press) (syn.: *Neocheiropteris superficialis* (Blume) Bosman) - E. Nepal; Bhutan; far N.E. India (?Sikkim; Arunachal Pradesh; Manipur; Nagaland; Meghalaya). Reported from S. India by Satija and Bir (1985) in error.
96. *Microsorum fortunei* (T.Moore) Ching (syn.: *Lepisorus fortunei* (T. Moore) C.M. Kuo, error due to study of incorrect type, see Fraser-Jenkins (2008a, in press)) - Bhutan; far N.E. India (Arunachal Pradesh).
97. *Microsorum zippelii* (Blume) Ching (syn.: *Neocheiropteris zippelii* (Blume) Bosman, *Microsorum indicum* Ching) - S. India; W. Himalaya (Uttarakhand, rare); N.E. India (W. Bengal; Sikkim; Manipur; Meghalaya); Bhutan; Myanmar.
98. *Pleopeltis macrocarpa* (Bory *ex* Willd.) Kaulf. - S. India; C. India; ?N.E. India (Meghalaya). N.E. Indian records were probably in error for *Lepisorus macrosphaerus* (Baker) Ching.
99. *Polypodiodes niponicum* (Mett.) Ching - far N.E. India (Meghalaya).
100. *Polypodiodes subamoena* (C.B.Clarke) Ching - N.W. India (Uttarakhand, rare); Nepal; N.E. India (W. Bengal, Darjeeling; Sikkim); Bhutan.
101. *Pyrrosia ceylanica* (Giesenh.) Sledge - very rare. Sri Lanka; S. India.

Rare

102. *Arthromeris tenuicauda* (Hook.) Ching - Bhutan; far N.E. India (Arunachal Pradesh; Manipur; Meghalaya). Reported from Uttarakhand in error. Very similar to the common *A. tatsienensis* (Franch. & Bureau *ex* Christ) Ching, but the pinnae are stalked.
103. *Leptochilus pothifolius* (D. Don) Fras.-Jenk., *comb. nov*., basionym: *Hemionitis pothifolia* D.Don, *Prodr. Flor. Nepal*.: 13 (1824) (syn.: *Colysis pothifolia* (D. Don) C. Presl; *Colysis latiloba* Ching) - Nepal; N.E. India (W. Bengal; Sikkim; Arunachal Pradesh; Manipur; Meghalaya). The name *C. pothifolia* has usually been misapplied in India to *L. ellipticus* (Thunb.) Noot., which is a common and widespread species.
104. *Leptochilus pedunculatus* (Hook. & Grev.) Fras.-Jenk. (syn.: *Leptochilus macrophyllus* (Blume) Noot. var. *pedunculatus* (Hook. & Grev.) Noot.) - E. Nepal; N.E. India (W. Bengal; Arunachal Pradesh; Meghalaya); Bangladesh.
105. *Neocheiropteris ovata* (Fée) Fras.-Jenk. (1997) (syn.: *Neolepisorus ovata* (Fée) Ching; *Microsorum phyllomanes* (Christ) Koidz.) - Nepal; N.E. India (W. Bengal, Darjeeling; Sikkim; Manipur; Meghalaya).
106. *Phymatopteris crenatopinnata* (C.B.Clarke) Pic.Serm. (syn.: *Phymatopsis decurrentiadnata* (Rosent.) S.R.Ghosh, see Fraser-Jenkins (2008a, in press)) - Bhutan; far N.E. India (Arunachal Pradesh; Manipur; Meghalaya).
107. *Phymatopteris erythrocarpa* (Mett. *ex* Kuhn) Pic.Serm. - N.W. India (rare, Himachal Pradesh); Nepal; N.E. India (W. Bengal, Darjeeling; Sikkim); Bhutan. Reported in error from Kashmir by Beddome in a lapse of memory.
108. *Polypodiodes hendersonii* (Bedd.) Fras.-Jenk. (1997) (syn.: *Goniophlebium hendersonii* Bedd., *Polypodiodes atkinsonii* (C.Chr.) Ching) - Nepal; N.E. India (W. Bengal, Darjeeling; Sikkim; Manipur; Meghalaya). Reports from the W. Himalaya were in error for *P. lachnopus* (Wall. *ex* Hook.) Ching (Pangtey, Khullar and Fraser-Jenkins, 2008, in press).
109. *Pyrrosia nummulariifolia* (Sw.) Ching (syn.: *P. obovata* (Blume) Ching) - Bhutan; far N.E. India (Assam; Arunachal Pradesh; Manipur; Meghalaya; Mizoram).
110. *Pyrrosia stenophylla* (Bedd.) Ching (syn.: *P. nayariana* Ching & P.Chandra; *P. porosa* (C.Presl) Hovenkamp var. *stenophylla* (Bedd.) Hovenkamp) - Nepal; N.E. India (Sikkim; Arunachal Pradesh; Manipur; Meghalaya); Bhutan; Myanmar. This is a good species distinct from, though closely related to the common *P. porosa* (C.Presl) Hovenkamp.

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111. *Selliguea rhynchophylla* (Hook.) Fras.-Jenk. (2008a, in press) (syn.: *Phymatopteris rhynchophylla* (Hook.) Pic.Serm.) - N.E. India (Sikkim; Arunachal Pradesh; Meghalaya); Bhutan.

Grammitidaceae

The five genera usually recognised in the Indian subcontinent (see Parris, 1990), *Scleroglossum*, *Grammitis*, *Xiphopteris*, *Ctenopteris* and *Prosaptia* were based on obviously visible frond-form as regards degree of dissection and the number of sori per lobe. But Parris (2007, 2006-2007) has found that this family actually contains a larger number of highly separately evolved genera based on major features of a radial versus dorsivental rhizome, quite different types of scales and hairs, stipe-articulation and venation, which cannot be considered of mere infra generic significance in the *Grammitidaceae*. Various degrees of frond-form development occur in some of the genera, as in the genera in most other families. Parris' generic scheme is adopted here along with her revision of species. *Ctenopteris* is no longer recognised as its type-species belongs in *Prosaptia*.

At risk

*112. *Ctenopterella blechnoides* (Grev.) Parris (syn.: *Grammitis blechnoides* Grev., *Ctenopteris moultonii* (Copel.) C. Chr. & Tardieu) - very rare, or extinct. Sri Lanka; S. India.

113. *Oreogrammitis attenuata* (Kunze) Parris - very rare. Sri Lanka; S. India.

*114. *Oreogrammitis austroindica* (Parris) Parris (**endemic**) - very rare or extinct. S. India (Nilgiri Hills). Not seen since the later-mid 19th. Century and known only from a single collection by Beddome, which was first noticed as distinct by Sledge (1960); potentially extinct.

115. *Oreogrammitis pilifera* (Ravi & J.Joseph) Parris (**endemic**) (*G. medialis sensu auct. Ind*., *non* (Baker) Sledge) - very rare, Parris has shown that it is endemic to S. India, while *Oreogrammitis medialis* (Baker) Parris is confined to Sri Lanka and has been widely reported from S. India in error. This species was originally named by its authors by accident as the number of hairs on the sporangia is variable and of no significance and they separated it thereby from what they took as "*G. medialis*" from S. India (actually other plants of *G. pilifera*) on an erroneous basis.

*116. *Prosaptia alata* (Blume) Christ - very rare, if not potentially extinct. Sri Lanka; S. India.

117. *Prosaptia contigua* (G.Forst.) C.Presl - very rare. Sri Lanka; S. India.

*118. *Prosaptia khasyana* (Hook.) C.Chr. & Tardieu - very rare. Far N.E. India; Myanmar. Sledge's report of *P. khasyana* from Sri Lanka referred to the endemic *P. ceylanica* Parris (Parris, 2006-2007).

119. *Prosaptia obliquata* (Blume) Mett. - very rare. Sri Lanka; S. India.

*120. *Scleroglossum sulcatum* (Kuhn) Alderw. - very rare. Sri Lanka; far N.E. India (Meghalaya).

*121. *Tomophyllum perplexum* (Parris) Parris - very rare. Sri Lanka and S. India only. This species is distinct from *T. subfalcatum* (Blume) Parris, confined to S.E. Asia, *T. epaleatum* (Parris) Parris, from Sri Lanka and the common and widespread Himalayan *Tomophyllum donianum* (Spreng.) Fras.-Jenk. & Parris, in Fraser-Jenkins (2008a, in press) (syn.: *Tomophyllum sinicum* (Ching) Parris). But all four had previously been reported from India or Sri Lanka under the name *Ctenopteris subfalcata* (Blume) Kunze), until revised by Parris. Fraser-Jenkins (2008a, in press) found that the Himalayan plant is distinct from the S.E. Asian and utilised the name *Polypodium donianum* Spreng. as the basionym for it, a *nom. nov*. for Don's *Polypodium tenellum* D.Don; this was then confirmed by Parris and the necessary combination made in *Tomophyllum* instead of *Grammitis*.

Hymenophyllaceae

At risk

*122. *Hymenophyllum acanthoides* (Bosch) Rosenst. (syn.: *Meringium acanthoides* (Bosch) Copel.) - very rare. S. India. Reports from N.E. India may have been in error for *H. denticulatum* Sw.

*123. *Hymenophyllum barbatum* (Bosch) Baker - very rare. Far N.E. India (Meghalaya).

124. *Trichomanes agasthianum* (Madhus. & C.A.Hameed) C.A.Hameed, K.P.Rajesh & Madhus. (2003) (syn.: *Crepidomanes agasthianum* Madhus. & C.A.Hameed; *Trichomanes lunulatum* (Madhus. & C.A.Hameed) C.A.Hameed, K.P.Rajesh & Madhus. (2003)) - very rare. S. India. This species, described as if endemic, needs to be checked in comparison to Malesian species as its separate identity has not yet been properly investigated and established.

*125. *Trichomanes apiifolium* C.Presl (syn.: *Callistopteris apiifolia* (C.Presl) Copel.) - very rare. Nicobar Islands. Reported by Tagawa and

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Iwatsuki (1979) and Kuo (1985) from the Nicobar Islands, but not by Dixit (1984), Dixit and Sinha (2001) or Chandra (2000).

*126. *Trichomanes exiguum* (Bedd.) Baker (syn.: *Didymoglossum exiguum* (Bedd.) Copel.) - very rare. Sri Lanka; S. India.

*127. *Trichomanes grande* Copel. (syn.: *Nesopteris grandis* (Copel.) Copel.) - Nicobar Islands (Dixit and Sinha, 2001).

128. ?*Trichomanes griffithii* (Bosch) Alston *ex* Panigrahi (syn.: *Crepidomanes griffithii* (Bosch) R.D. Dixit & S.R. Ghosh) - Andaman Islands (Dixit and Sinha, 2001); Myanmar. Panigrahi published this combination written in the herbarium by Alston, as he acknowledged. Hameed, Rajesh and Madhusoodanan (2003) synonymised this species within the S. and N.E. Indian *etc*. species *T. bipunctatum* Poir., but possibly in error.

129. *Trichomanes henzaianum* Parish *ex* Hook. (syn.: *Microgonium henzaianum* (Parish *ex* Hook.) Copel, ?*Trichomanes vamana* C.A.Hameed & Madhus., *nom. nud*.) - very rare. S. India.

130. *Trichomanes javanicum* Blume (syn.: *Cephalomanes javanicum* (Blume) Bosch) - Nicobar Islands (Dixit and Sinha, 2001); far N.E. India (Assam; Arunachal Pradesh; Manipur; Mizoram); Bangladesh; Myanmar.

*131. *Trichomanes maximum* Blume (syn.: *Vandenboschia maxima* (Blume) Copel., *Trichomanes indicum* S.R.Ghosh) - Very rare. ?Nicobar Islands (Dixit and Sinha, 2001); far N.E. India (Arunachal Pradesh); Myanmar.

*132. ?*Trichomanes mindorense* Christ (syn.: *Microgonium mindorense* (Christ) Copel.) - very rare. S. India (Hameed, Rajesh and Madhusoodanan, 2003). Its presence in India perhaps requires confirmation.

133. *Trichomanes motleyi* Bosch (syn.: *Microgonium motleyi* (Bosch) Bosch) - very rare. Andaman Islands (Dixit, 1984; Chandra, 2000, but omitted by Dixit and Sinha, 2001).

*134. *Trichomanes parvifolium* (Baker) Copel. (syn.: *Trichomanes minutifolium* Tagawa & K. Iwats., *Microgonium parvifolium* (Baker) Tagawa & K.Iwats.) - very rare W.C. Nepal (cave by waterfall at Komale, below and on S.W. side of Hattiya Deurali, above and W. of Anbu Khaireni, Gorkha District, *CRFJ* 28500 (FN 4475), 19 April 2000); N.E. India (Sikkim); Myanmar; Thailand.

*135. *Trichomanes sublimbatum* Müll.Hal. (syn.: *Microgonium sublimbatum* (Müll. Hal.) Bosch; misapplied name: *Trichomanes muscoides sensu auct. Ind. bor.*, *non* Sw. [= *T. hymenoides* (Hedw.) Copel., from C. and S. America], *Didymoglossum hymenoides sensu* Chandra (2000), *non* (Hedw.) Copel.) - very rare. ?S. India (Hameed, Rajesh and Madhusoodanan, 2003); far N.E. India (Meghalaya, inc. Sohrarim, Mawmitheid, *CRFJ*). The identity of the S. Indian plant perhaps requires further confirmation.

Near-threatened

136. *Hymenophyllum denticulatum* Sw. (syn.: *Meringium denticulatum* (Sw.) Copel.) - S. India; far N.E. India (Assam; Arunachal Pradesh; Manipur; Nagaland; Meghalaya and Mizoram); Myanmar.

137. *Hymenophyllum edentulum* (Bosch) C.Chr. (syn.: *Meringium edentulum* (Bosch) Copel.) - far N.E. India (Meghalaya).

138. *Hymenophyllum khasianum* Baker (syn.: *Hymenophyllum flaccidum* (Bosch) Baker, *non* Bosch, *Meringium flaccidum* (Bosch) N.C.Nair; misapplied name: *Mecodium undulatum sensu* Dixit (1984), *non* (Sw.) Copel. [= *Hymenophyllum undulatum* Sw., from C. and S. America]) - far N.E. India (Meghalaya).

139. *Hymenophyllum levingei* C.B.Clarke (syn.: *Mecodium levingei* (C.B.Clarke) Copel.; misapplied name: *Sphaerocionium ciliatum* sensu Dixit (1984) and Chandra (2000), *non* (Sw.) Copel. [= *Hymenophyllum ciliatum* (Sw.) Sw. from C. and S. America]) - N.E. India (Sikkim); Bhutan. Very locally abundant.

140. *Hymenophyllum simonsianum* Hook. - N.E. India (W. Bengal, Darjeeling; Sikkim; Arunachal Pradesh; Manipur; Meghalaya); Bhutan.

141. *Trichomanes christii* Copel., syn.: *Trichomanes barnardianum* F.M.Bailey subsp. *christii* (Copel.) Croxall; *Crepidomanes christii* (Copel.) Copel.) - S. India. Although this species has been placed as a subspecies of the Australian species, *T. barnardianum*, it is maintained as a distinct species here. The S. Indian plant has longer frond-axes than the common form in the Philippines, which has a shorter, more radiate frond with the sori borne more towards the apical area. However, an isotype of *T. christii* at US shows the more elongated frond form similar to that of the S. Indian plant, which is therefore accepted here as being conspecific and is a S.E. Asian species present in S. India.

142. *Trichomanes humile* G.Forst. (syn.: *Reediella humilis* (G. Forst.) Pic. Serm.) - Andaman

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Islands, Nicobar Islands (Dixit and Sinha, 2001).

143. *Trichomanes latemarginale* D.C.Eaton (syn.: *Crepidomanes latemarginale* (D.C.Eaton) Copel.) - N.E. India (Meghalaya). Sledge (1968) showed that this species is different from *T. intramarginale* Hook. & Grev., from Sri Lanka and S. India, and *T. kurzii* Bedd. (syn.: *T. malabaricum* (C.A.Hameed & Madhus.) C.A.Hameed, K.P.Rajesh & Madhus.), from Sri Lanka; S. India; the Andaman Islands and N.E. India, though Chandra (2000) synonymised all three under *T. intramarginale*, which is a separate species confined to Sri Lanka and S. India. The S. Indian reports of *T. latemarginale* refer to *T. kurzii*.
144. *Trichomanes nitidulum* Bosch (syn.: *Microtrichomanes nitidulum* (Bosch) Copel.; misapplied name: *Microtrichomanes digitatum sensu auct. Ind.*, *non* (Sw.) Copel. [= *Trichomanes digitatum* Sw. from Mauritius, S.E. Asia and Australia]) - far N.E. India (Meghalaya).

Rare

145. *Hymenophyllum gardneri* Bosch - Sri Lanka and S. India. Closely related to the common N. Indian *etc*. *H. exsertum* Wall. *ex* Hook., but with consistently more compact fronds. It was carefully distinguished by Sledge (1968), though Hameed, Rajesh and Madhusoodanan (2003) have subsequently synonymised it within *H. exsertum*.
146. *Trichomanes bilabiatum* Nees & Blume - Sri Lanka; Nicobar Islands; S. India. Reported from N.E. India in error for *T. bipunctatum* Poir. and from the W. Himalaya in error for the common species, *T. latealatum* Bosch.
147. *Trichomanes bimarginatum* (Bosch) Bosch (syn.: *Microgonium bimarginatum* Bosch; *Trichomanes neilgherrense* Bedd.; misapplied name: *Trichomanes muscoides sensu* Bedd., *non* Sw. [= *T. hymenoides* (Hedw.) Copel., from C. and S. America]) - Sri Lanka; S. India; far N.E. India (Meghalaya).
148. *Trichomanes bipunctatum* Poir. (syn.: *Crepidomanes bipunctatum* (Poir.) Copel.) - S. India; N.E. India (Sikkim; Nagaland; Meghalaya). Shown by Sledge (1968) to be distinct from *T. bilabiatum* Nees & Blume, though Chandra (2000) placed *T. bilabiatum* in the synonymy of *T. bipunctatum* in error. Reported from N.W. India in error for the common *T. campanulatum* Roxb.
149. *Trichomanes intramarginale* Hook. & Grev. (syn.: *Crepidomanes intramarginale* (Hook. & Grev.) C.Presl) - S. India. Reported from N. India in error for *T. latemarginale* (see above under that name).
150. *Trichomanes obscurum* Blume (syn.: *Selenodesmium obscurum* (Blume) Copel., *Cephalomanes obscurum* (Blume) K.Iwats.) - Sri Lanka; S. India. Reported from "N. India," probably in error for *T. maximum* Blume from far N.E. India.
151. *Trichomanes saxifragoides* C.Presl (syn.: *Crepidomanes saxifragoides* (C.Presl) P.S.Green) - Sri Lanka; S. India; C. Nepal (near Dam, Phewa Tal, Pokhara, *CRFJ* 26100, 9 March 1998, H); N.E. India (Assam; Arunachal Pradesh; Nagaland). Sledge (1968) definitively showed that this species is distinct from *T. proliferum* Blume (syn.: *T. minutum* Blume), which has a more pinnate, less radiating lamina and frequently bears adventive fronds from the stipes (proliferous). But the two have unfortunately again been united recently by Japanese botanists with a less precise species-concept into an aggregate-species including both distinct species.

Cyatheaceae

As shown by Holttum, Tryon's arguments for the splitting of Cyathea into several splinter-genera are somewhat arbitrary, hardly practical and his genera not well defined. The genus *Cyathea* has therefore been retained here.

At risk

152. *Cibotium barometz* (L.) J.Sm. (syn.: *C. assamicum* Hook.) - far N.E. India (Assam; Arunachal Pradesh).
*153. *Cyathea albosetacea* (Scott *ex* Bedd.) Copel. (syn.: *Sphaeropteris albosetacea* (Bedd.) R.Tryon) - Nicobar Islands; IUCN (1998) listed it as Vulnerable.
154. *Cyathea andersonii* (J.Scott *ex* Bedd.) Copel. (syn.: *Gymnosphaera andersonii* (J. Scott *ex* Bedd.) Ching & S.K.Wu) - N.E. India (Sikkim; Arunachal Pradesh (inc. Daphla Hills); Meghalaya); Bhutan.
155. *Cyathea brunoniana* (Wall. *ex* Hook.) C.B.Clarke & Baker (syn.: *Sphaeropteris brunoniana* (Wall. *ex* Hook.) R.Tryon) - E. Nepal; N.E. India (West Bengal, Darjeeling; Sikkim; Arunachal Pradesh; Manipur; Nagaland; Meghalaya). Reported from the W. Himalaya and S. India in error.

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156. *Cyathea chinensis* Copel. (syn.: *Alsophila costularis* Baker) - E. Nepal; N.E. India (W. Bengal, Darjeeling; Sikkim; Arunachal Pradesh; Manipur; Nagaland; Meghalaya).
157. *Cyathea contaminans* (Wall. *ex* Hook.) Copel. (syn.: *Sphaeropteris glauca* (Blume) R.Tryon, *non Cyathea glauca* Bory) - N.E. India (W. Bengal, Darjeeling; Sikkim; Arunachal Pradesh; Manipur; Meghalaya).

*158. *Cyathea crinita* (Hook.) Copel. (syn.: *Sphaeropteris crinita* (Hook.) R.Tryon) - Sri Lanka and S. India. Chandra (2000) cited the authorities and reference for *Sphaeropteris crinita* as Tryon in Fraser-Jenkins (1997); but where this type of citation was given it was not intended to be the author citation and reference, which is given in *Index Filicum*.

Near-threatened

159. *Cyathea khasyana* (Moore *ex* Kuhn) Domin (syn.: *Gymnosphaera khasyana* (T.Moore *ex* Kuhn) Ching) - N.E. India (W. Bengal, Darjeeling; Sikkim; Arunachal Pradesh; Nagaland; Meghalaya; Mizoram). Beddome mistakenly referred this species partly to *A. comosa* Hook., a synonym of the Malesian *C. squamulata* (Blume) Copel., which latter was thus reported from India by Chandra (2000), but *C. squamulata* is a distinct and non-Indian species.
160. *Cyathea nilgirensis* Holttum (syn.: *Alsophila nilgirensis* (Holttum) R.Tryon) (**Endemic**) - S. India (Kerala; Tamil Nadu; Andhra Pradesh). IUCN (1998) listed it as Endangered. Nayar and Geevarghese (1993) erroneously referred this species to *C. walkerae* Hook, endemic to Sri Lanka, which was thence listed by Chandra (2000).

Rare

161. ?*Cyathea holttumiana* R.R.Rao & Jamir - N.E. India (Nagaland). A doubtful species requiring reidentification and probably merely a synonym of *C. brunoniana* (Wall. *ex* Hook.) C.B. Clarke & Baker.
162. ?*Cyathea nicobarica* N.P. Balakr. & R.D. Dixit (syn.: *Sphaeropteris nicobarica* (N.P. Balakr. & R.D. Dixit) R.D. Dixit) - Nicobar Islands. A doubtful species requiring comparison with Malesian species.

The following three names, said to be endemic, even to their local village in the case of the two latter, are taxonomically doubtful and require further study in relation to other species:

• *Cyathea gamblei* R.D. Dixit. N.E. India (W. Bengal; Assam; Sikkim). Because Holttum had expressed some doubt over his identification of *C. henryi* (Baker) Copel. from India in the absence of any stipe material, Dixit then described a new species for it, though still without having seen the stipe or providing any information about it. He also did not investigate how *C. gamblei* differed from *C. henryi* and gave no comparative differences from that species. It therefore remains a dubious taxon requiring investigation.

• *Cyathea nayarii* Bandyopadhyay, T.Sen & U.Sen. Far N.E. India (Arunachal Pradesh).

• *Cyathea sharmae* Bandyopadhyay, T.Sen & U.Sen. Far N.E. India (Arunachal Pradesh).

Dennstaedtiaceae

At risk

*163. *Dennstaedtia wilfordii* (T.Moore) Christ *ex* Ching - very rare. Pakistan; far N.W. India (Indian Kashmir).
*164. *Microlepia calvescens* (Hook.) C.Presl - N.E. India (Assam; Manipur; Meghalaya). Reported by Chandra (2000) from Uttarakhand in error.
*165. *Microlepia majuscula* (E.J.Lowe) T.Moore - very rare. S. India. IUCN (1998) listed it from Sri Lanka only, as Indeterminate.

Near-threatened

166. *Microlepia trichocarpa* Hayata (syn.: *M. brevistrigosa* A.Biswas) - Nepal (Bajrabarahi, Kathmandu, *CRFJ*); N.E. India (W. Bengal, Damsong, E. of Kalimpong, *CRFJ* 30428, 25 May 2004); China. Related to *M. strigosa* (Thunb.) C.Presl, but with much more densely and longer-hairy axes (see Fraser-Jenkins, 2008a, in press).

Rare

167. *Microlepia hallbergii* (d'Almeida) C.Chr. - S. India; N.W. India (Uttarakhand); Nepal; N.E. India (Arunachal Pradesh; Meghalaya); China.

Lindsaeaceae

At risk

168. *Lindsaea commixta* Tagawa (syn.: *L. orbiculata* (Lam.) Mett *ex* Kuhn var. *commixta* (Tagawa) K.U.Kramer) - ?Andaman Islands (Dixit and Sinha, 2001), but specimen not seen by them); C. Nepal (Andheri Khola, Syangja, *R.L. Fleming* 864, partly labelled as Mussoorie, W. Himalaya in error, and thence reported by Chandra (2000)); far N.E. India (Meghalaya); Myanmar; Malesia *etc*.
169. *Lindsaea malabarica* (Bedd.) Baker (endemic) - S. India; C. India. IUCN (1998) listed it as Rare.
170. *Lindsaea venusta* Kaulf. *ex* Kuhn (misapplied name: *Lindsaea lobata sensu* Beddome, *non*

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Poir. [from S.E. Asia]) - very rare. Sri Lanka; S. India. Reported by Chandra (2000) under both *L. venusta* and *L. lobata*.

*171. *Taenitis blechnoides* (Willd.) Sw. - very rare. Sri Lanka; Nicobar Islands (Dixit and Sinha, 2001); S. India; far N.E. India (Arunachal Pradesh; ?Meghalaya).

*172. *Tapeindium pinnatum* (Cav.) C. Chr - very rare. S. India. Dixit (1984) reported it from the E. Himalaya in error.

Near-threatened

173. *Lindsaea parasitica* (Roxb.) Hieron.- Nicobar Islands (Dixit and Sinha, 2001).

174. *Lindsaea repens* (Bory) Bedd. (inc. syn.: *L. pectinata* Blume; misapplied name: L. *glandulifera* auct. N. Ind., *non* Blume) - C. India; N.E. India (W. Bengal, Dulkajhar, N.E. side of Naxal Bari, "Sikkim" terai, W. of Siliguri, *C.B. Clarke*; probably extinct due to drainage and cultivation); far N.E. India (Assam; Arunachal Pradesh; Meghalaya). *L. repens* was reported from Sikkim in error for Dulkhajar (W. Bengal) and *L. repens* was also reported *sub L. glandulifera* Alderw. in error, true *L. glandulifera* being a more deeply lobed-pinna'd species confined to Sri Lanka and S.E. Asia. The Indian plants represent var. *pectinata* (Blume) Mett. *ex* Kuhn, a part of the common range of variation of *L. repens* with shallowly to slightly deeply lobed fertile pinnae and elongated sori.

175. *Lindsaea walkerae* Hook. (syn.: *L. rutlandica* "*rutlandia*" R.D.Dixit & S.R.Ghosh) - Sri Lanka; Andaman Islands (Dixit and Sinha, 2001); S.E. Asia.

Rare

176. *Lindsaea bouillodii* Christ - S. India.

177. *Lindsaea chienii* Ching - Nicobar Islands (Dixit and Sinha, 2001); N.E. India (Manipur, Dilong, *B.Ghosh* 16439, CAL, det. R.D. Dixit).

178. *Lindsaea gueriniana* (Gaudich.) Desv. - Andaman Islands. Dixit (1984) reported it from the Nicobar Islands only, but Dixit and Sinha (2001) reported it from the Andaman Islands only.

179. *Lindsaea javanensis* Blume - far N.E. India (Assam; Arunachal Pradesh; Meghalaya).

180. *Lindsaea malayensis* Holttum - Nicobar Islands (Dixit and Sinha, 2001). Chandra's (2000) and many of Dixit and Sinha's (2001) records, "Andaman and Nicobar Islands," refer to the name of the Indian state and do not necessarily mean both groups of islands, which can cause inaccuracies.

181. *Lindsaea oblanceolata* Alderw. - Nicobar Islands (Dixit and Sinha, 2001).

182. ?*Lindsaea obtusa* J.Sm. *ex* Hook. (syn.: *L. andamanica* R.D.Dixit & S.R.Ghosh) - Andaman Islands; China; S.E. Asia. Kramer identified the Andaman material as minor local variation within *L. obtusa*, explaining that it is smaller and thus slightly less deeply lobed than usual, but is hardly a separate form as such variation occurs widely and is not unusual in the variable species *L. obtusa*. Chandra (2000) listed the species separately under both names, *L. anadamanica* and *L. obtusa*, but only the one taxon occurs in the Andamans.

183. *Lindsaea tenera* Dryand. (**endemic**) - Andaman Islands and Nicobar Islands (Dixit and Sinha, 2001). IUCN (1998) listed it as Rare. Kramer (1972) discussed this species in detail and retained it as a doubtful possible endemic taxon related to *L. bouillodii* Christ. This was then separated by Dixit as a species, probably correctly.

184. *Lindsaea tetragona* K.U.Kramer - Nicobar Islands (Dixit and Sinha, 2001).

Pteridaceae

At risk

185. *Acrostichum speciosum* Willd. - Andaman Islands and Nicobar Islands (Dixit and Sinha, 2001); S.E. Asia; Australia.

*186. *Aleuritopteris argentea* (S.G.Gmel.) Fée - very rare, far N.E. India (Meghalaya, *Hooker*); Bhutan. Not seen again in 150 years in India and possibly requiring reaffirmation in case it was collected later during Hooker's onward journey in Sikkim.

*187. *Aleuritopteris thwaitesii* (Mett. *ex* Kuhn) Saiki (syn.: *Cheilanthes keralensis* N.C.Nair & S.R.Ghosh) - very rare. Sri Lanka; S. India.

188. *Cheilanthes nitidula* Hook. subsp. *henryi* (Christ) Fras.-Jenk. (Fraser-Jenkins and Dulwat, 2008, in press) (syn.: *Pellaea henryi* Christ; *Mildella henryi* (Christ) C.C.Hall & Lellinger; *non C. henryi* Christ [= *C. hancockii* Baker]) - Bhutan (nr. Thimphu, *CRFJ*); far N.E. India (Arunachal Pradesh, Di Chu and Dirang Dzong, *F. Kingdon Ward*; Namdapha); Tibet; S.W. and S. China; Taiwan; Vietnam. *C. nitidula* subsp. *nitidula*, extends in range from Pakistan to N.W. Nepal, while the vicariant subsp. *henryi* replaces it in N.E. India. *Pellaea* has been restricted to imparipinnate species, but the present species and its group, which Fraser-Jenkins (1997) erroneously treated under *Pellaea*, belong to *Cheilanthes* (syn.: *Cheilosoria*; *Mildella*).

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*189. *Negripteris scioana* (Chiov.) Pic.Serm. - very rare in India. Africa; Arabia; W.C. India (Rajasthan, Sitamata Sanctuary, Aravalli Hills, *Chamansingh Dulawat*, 2006, det. CRFJ) (Fraser-Jenkins and Dulawat, 2008, in press).

*190. *Notholanea delavayi* (Baker) C. Chr. - N.W. India (Uttarakhand); N.W. Nepal; Bhutan. Reported from Himachal Pradesh in error.

*191. *Notholaena lanuginosa* (Desf.) Desv. *ex* Poir. subsp. *bivalens* Reichst. (syn.: *Cosentinea vellea* (Aiton) Tod. subsp. *bivalens* (Reichst.) Rivas Mart. & Salvo) - very rare. Pakistan (5 miles S. of Malakand, *CRFJ* 16702-16705, 6 Oct. 1990, NMW [temporarily loaned to GENT]); N.W. India (Himachal Pradesh).

**Notholaena dipinnata* Fras.-Jenk. (Fras.-Jenk. & Dulawat, 2008, in press), syn.: *Gymnopteris bipinnata* Christ, has been collected from Lohit, N.E. Arunachal Pradesh, and is a Critically endangered species.

*192. *Pellaea calomelanos* (Sw.) Link (syn.: *P. hastata* (Thunb.) Prantl) - very rare. Pakistan; N.W. India (Himachal Pradesh; Uttarakhand); W. Nepal.

*193. *Pellaea longipilosa* Bonap. (syn.: *P. malabarica* B.K.Nayar & Geev.) - very rare. E. Africa; S. India (Fraser-Jenkins, 2008a, in press; Fraser-Jenkins and Dulawat, 2008, in press).

*194. *Pteris amoena* Blume - very rare. Far N.E. India (Assam, N. Cachar Hills; Meghalaya).

*195. *Pteris barbigera* Ching - very rare. N.E. India (W. Bengal, nullah near Rungbi [below Mongpo], *J.S. Gamble*); China. Not seen in India for *c*. 130 years.

*196. *Pteris geminata* Wall. *ex* J.Agardh (syn.: *Campteria kleiniana* C.Presl, *nom. nud.*, *Pteris kleiniana* Christ) - S. India.

*197. *Pteris griffithii* Hook.- far N.E. India (Arunachal Pradesh); Myanmar and ?S.W. China. Not re-collected for many years. Reported from the Andaman Islands by Dixit and Sinha (2001) in error, but it is unclear which species their report referred to.

198. ?*Pteris* sp. (*sub P. griffithii sensu* Dixit and Sinha (2001), *non* Hook.) - Andaman Islands (see above).

*199. *Pteris mertensioides* Willd. - Sri Lanka; Andaman Islands (Dixit and Sinha, 2001); S. India; ?Bhutan; Myanmar; Thailand; S.E. Asia and Oceania.

200. ?*Pteris* sp. *indet*. (*sub P. pluricaudata sensu* Dixit and Sinha (2001), *non* Copel. [= *P. armata* C.Presl]) - Andaman Islands. Copeland described *P. pluricaudata* from the Philippines, but later correctly sank it as a synonym of the Philippine endemic *P. armata* C.Presl (M.G. Price, pers. comm. 2007). The identity of the Andaman collection (*Dixit* 62045, CAL) is considerably doubtful and unlikely to be this species.

*201. *Pteris tripartita* Sw. - very rare. Sri Lanka; S. India; Andaman and Nicobar Islands (Dixit and Sinha, 2001). Recently refound in S. India and reported by Benniamin *et al.* as the Himalayan species, *P. wallichiana* J.Agardh, but his material was reidentified by the present author at XCH as *P. tripartita*.

*202. *Pteris venulosa* Blume - very rare. Far N.E. India (Manipur; Mizoram); Myanmar; S.E. Asia. Reported from S. India in error, referring to *P. venusta* Kunze, which has sometimes been mistakenly given in its synonymy, though that is a species very close to and in the group of *P. pellucida* C.Presl, distinguished by the entirely untoothed laminar margins.

*203. *Syngramma alismifolia* (C. Presl) J. Sm. - Nicobar Islands (Dixit and Sinha, 2001).

Near-threatened

204. *Aleuritopteris duthiei* (Baker) Ching - very rare. N.W. India (Uttarakhand); Nepal; Bhutan; Tibet.

205. *Aleuritopteris wollenweberi* Fras.-Jenk. (2008a, in press) - Sri Lanka; S. India (Shevaroy Hills).

206. *Anogramma leptophylla* (L.) Link - Afghanistan; N.W. Pakistan; S. India. Replaced in the W. Himalaya, and possibly as far east as C. Nepal (Chapagaon, *R.L. Fleming*, ?confused label), by *A. reichsteinii* Fras.-Jenk. (1997).

207. *Pellaea boivinii* Hook. - Sri Lanka; S. India. IUCN (1998) listed it from Sri Lanka only, as Indeterminate.

208. *Pellaea falcata* R.Br. (syn.: *P. seticaulis* (Hook.) S.R.Ghosh) - Sri Lanka; S. India; Australasia.

209. *Pteris cadieri* Christ - far N.E. India (Assam; Arunachal Pradesh).

210. *Pteris subindivisa* C.B.Clarke - N.E. India (W. Bengal, Darjeeling; ?Sikkim; Arunachal Pradesh); Bhutan. Reported from N.W. India (Uttarakhand) in error.

211. *Pteris tricolor* Linden - very rare. Far N.E. India (Manipur); China. Reported from Sikkim in error for a white-variegated form of *P. subquinata* Wall. *ex* J.Agardh, which still occurs today on the road-cliff shortly before Chungtang, Sikkim.

Rare

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212. *Anogramma reichsteinii* Fras.-Jenk. - W. C. India (Mahabaleshwar); N.W. India (Himachal Pradesh; Uttarakhand); perhaps as far east as C. Nepal, though the specimen from Chapagaon, *R.L. Fleming*, is perhaps doubtfully located and might have been from Mussoorie, where Fleming was based.
213. *Cerosora microphylla* (Hook.) R.Tryon (syn.: *Anogramma microphylla* (Hook.) Diels; *Idiotgramma microphylla* (Hook.) S.R.Ghosh) - Nepal; N.E. India (W. Bengal, Darjeeling; Sikkim; Meghalaya); Bhutan; Myanmar.
214. *Cheilanthes persica* (Bory) Mett. *ex* Kuhn (syn.: *C. szovitzii* Fisch. & C.A.Mey.) - Afghanistan; Pakistan; N.W. India (Indian Kashmir; ?Himachal Pradesh).
215. *Doryopteris ludens* (Wall. *ex* Hook.) J.Sm. - far N.E. India (Assam; Manipur; Nagaland; Tripura; Mizoram), E.C. India (Orissa). Early reports of this species from S. India based on Wight's and Wallich's specimens, cited by Chandra (2000), but with the wrong hill-ranges given, were in error for *D. concolor* (Langsd. & Fisch.) Kuhn (syn.: *D. kirkii* (Hook.) Alston).
216. *Onychium tenuifrons* Ching (syn.: *O. fragile* S.C.Verma & Khullar) - N.W. India (Uttarakhand); Nepal; China.
217. *Pteris grevilleana* Wall. *ex* J.Agardh - far N.E. India (Assam; Arunachal Pradesh; Meghalaya); Myanmar.
218. *Pteris heteromorpha* Fée - Sri Lanka; S. India; W.C. India; E.C. India (Orissa); far N.E. India (Arunachal Pradesh).
219. *Pteris multiaurita* J.Agardh - Sri Lanka; S. India.
220. *Pteris quadriaurita* Retz. - Sri Lanka; S. India; ?Andaman Islands (Dixit and Sinha, 2001). Widely overrecorded in India for other members of the complex *P. aspericaulis* Wall. *ex* J.Agardh aggregate. The identity of the sterile collection (*Bhargava* 6352, PBL) cited from the Andamans is very dubious. *P. aspericaulis* itself does not occur in S. India and *P. quadriaurita* not in the north.
221. *Pteris roseolilacina* Hieron. - N.W. India (Uttarakhand, Pithoragarh, Kukrouli near Thal, *Y.P.S.Pangtey*, det. CRFJ); Nepal; Sikkim; China.
222. *Pteris vittata* L. subsp. *vermae* Fras.-Jenk. - very rare. N.W. India (Uttarakhand, apparently from Bhujia Ghat, below Nainital, *S.C. Verma*); ?far N.E. India (?Arunachal Pradesh; ?Meghalaya *etc.*); ?Nepal; ?Bhutan; Tibet; China.

Adiantaceae

At risk

*223. *Adiantum soboliferum* Wall. *ex* Hook. - very rare. S. India; far N.E. India (Assam; Nagaland).
224. *Adiantum stenochlamys* Baker - Andaman Islands (Dixit and Sinha, 2001).

Near-threatened

225. *Adiantum poiretii* Wickstr. (syn.: *A. thalictroides* Willd. *ex* Schltdl.; *A. aethiopicum sensu auct. Ind.*, *non* L. [from Africa]) - Sri Lanka; S. India.

Rare

226. *Adiantum flabellulatum* L. - far N.E. India (Assam, Kamrup; Manipur; Meghalaya).
227. *Adiantum wattii* Baker (syn.: *A. levingei* Baker; *A. refractum* Christ; *A. edentulum* Christ; *A. delavayi* Christ; *A. muticum* Ching) - N.W. India (Himachal Pradesh; Uttarakhand); Nepal; N.E. India (Sikkim; Arunachal Pradesh). A high-Himalayan species, reported from Kashmir, S. India and Bangladesh in error.

Vittariaceae

The genus *Haplopteris*, though separated by a few authors due to preliminary molecular findings of uncertain taxonomic significance, is not utilised here, being of little practical value, with no significant morphological differences from *Vittaria*.

Rare

*228. *Vittaria microlepis* Hieron. - very rare. Sri Lanka and S. India.

Near-threatened

229. ?*Antrophyum henryi* Hieron. - reported as very rare from N.E. India (?Sikkim; Arunachal Pradesh) by Dixit and Nair (1974), probably requires confirmation.

Rare

230. ?*Antrophyum callifolium* Blume - Andaman Islands; Nicobar Islands (Dixit and Sinha, 2001). Its presence probably requires confirmation in comparison to *A. reticulatum* (G.Forst.) Kaulf.
231. *Antrophyum parvulum* Blume - Nicobar Islands (Dixit and Sinha, 2001); N.E. India (Sikkim; Meghalaya).
232. *Vittaria ensiformis* Sw. (syn.: *V. montana* Manickam) - Mascarene Islands; Sri Lanka; S. India. Reported in error from the Nicobar Islands; N.E. India and S.E. Asia.
233. ?*Vittaria zosterifolia* Willd. - Mascarene Islands; ?Andaman Islands; ?Nicobar Islands (Dixit and Sinha, 2001); ?N.E. India (Sikkim;

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Arunachal Pradesh; Manipur); ?Malesia. Reported in error from the W. Himalaya. Many, perhaps all records from Asia are in error for collections of *V. elongata* Sw. and it is possible that the status and separate identity of *V. zosterifolia* itself might be worth further investigation.

Aspleniaceae

The subsidiary genera, *Hymenasplenium* and *Thamnopteris* are not recognised here as they clearly belong within *Asplenium* on morphological grounds and the cytological difference in base-number for the former is now known to be inconstant.

At risk

*234. *Asplenium affine* Sw. - very rare. S. India.

*235. ?*Asplenium anogrammoides* Christ (*A. sarellii sensu* Bir) - very rare, but of doubtful occurrence. Most or perhaps all records are in error for large specimens of *A. laciniatum* D.Don and/or *A. tenuicaule* Hayata ?N.W. India (Himachal Pradesh; Uttarakhand); China.

*236. *Asplenium batuense* Alderw. - Nicobar Islands; S.E. Asia. Although Dixit and Sinha (2001) described the lamina as merely tapering to the base, instead of ending truncately as in this species, they mentioned the distinct stipe and winged rachis and were thus presumably referring correctly to the present species.

*237. *Asplenium delavayi* (Franch.) Copel. (syn.: *Sinephropteris delavayi* (Franch.) Mickel) - very rare. W. Nepal (Rijal 2008, in press); Bhutan (*S. Matsumoto*); N.E. India (?Sikkim; Manipur). It has also been reported from Sikkim.

*238. *Asplenium exiguum* Bedd. (**endemic**) - very rare. S. India only. Replaced by the fairly common *A. yunnanense* Franch. in the north, which is responsible for records of *A. exiguum* from the Himalayan region. *A. lushanense* C.Chr., given by Chandra (2000) in its synonymy, is a separate species with narrower fronds, from Bhutan (Thimphu, Taba, *CRFJ*) and presumably to be expected in further N.E. India.

*239. *Asplenium hymenophylloides* Fée (syn.: *A. pumilum* Sw. subsp. *hymenophylloides* (Fée) Schelpe) - very rare. [W. and E. Africa], W.C. India (Rajasthan, Mt. Abu).

240. *Asplenium khasianum* Sledge (misapplied name: *A. gardneri sensu* Clarke, from the Khasi Hills, *non* Baker) (**apparently endemic**) - far N.E. India (Assam, Meghalaya, E. Arunachal Pradesh); presumably likely to turn up in Myanmar, and, perhaps under a different name, in China. Listed by Dixit (1984) and Chandra (2000) under both *A. gardneri* and *A. khasianum*, from Khasia *etc*.

*241. *Asplenium pellucidum* Lam. (syn.: *A. hirtum* Kaulf.; *A. borneense sensu* Singh and Bir (1989) and Vasudeva, Bir and Kachroo (1990), *non* Hook. [from S.E. Asia]) - very rare. N.E. India (S. Sikkim, "Lingtam", presumably Singtam, below and N. of Darjeeling (Beddome)); far N.E. India (Sikkim); S. India (Kerala, Silent Valley).

*242. ?*Asplenium scalare* Rosenst. - very rare. S. India (Kerala, Kovilthery Forest, Bonaccord, below Ponmudi, Kerala, *J.Joseph* 46516, 24 Aug. 1975, MH!). The Kerala specimen tapers to the lamina-base, and has a raised and slightly winged costa (beneath) and the apical proliferations of this species, unlike the similar *A. phyllitidis* D.Don, which is common in S. India (where *A. nidus* L. does not occur except in cultivation). It differs from *A. batuense* Alderw. in not having a clearly separate, short stipe or an abrupt base to the lamina.

*243. *Asplenium serricula* Fée - very rare. S. India.

244. ?*Asplenium sublaserpitiifolium* Ching - ?Nicobar Islands (Dixit and Sinha, 2001); China; Malaya. Although this species, if correctly reported, is a distinct member of the group, the taxonomy of the *A. nitidum* Sw. group requires further study. Recent material from S. India (CALI!) suggests that *A. nitidum* may cover a range of morphology not realised by Ching and Tardieu-Blot when they separated several species. Dixit and Sinha reported both *A. nitidum* and the present species, differing in size of the specimens cited.

*245. *Asplenium thunbergii* Kunze (syn.: *A. belangeri* (Bory) Kunze, *non* Bory; *A. decorum* Kunze) - very rare. Far N.E. India (Manipur, Kufra, *G. Watt*). The specimen at Kew was genuinely collected in the wild by George Watt, as he remarked on the sheet, though overlooked by Hooker.

Near-threatened

246. *Asplenium caudatum* G.Forst agg. - W. Bengal (Darjeeling terai, Sukna, *CRFJ*); Assam; Myanmar. Similar to and probably the same as, *A. crinicaule* Hance, but with a longer frond and more pointed pinnae, approaching somewhat towards those of *A. yoshinagae* Makino subsp. *indicum* (Sledge) Fras-Jenk., but more robust and less lobed.

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Probably largely overlooked elsewhere in N.E. India. Not the same as *A. caudatum* itself, but in the same group.

247. *Asplenium grevillei* Wall. *ex* Hook. & Grev. - very rare. S. India; far N.E. India (Arunachal Pradesh; Meghalaya).
248. *Asplenium magnificum* (Ching) Bir, Fras.-Jenk. & Lovis (syn.: *A. birii* (Å.Löve & D.Löve) Bir) - N.E. India (W. Bengal, Darjeeling; Sikkim; Arunachal Pradesh; Manipur).
249. *Asplenium nidus* L. - very rare. ?Nicobar Islands (Dixit and Sinha, 2001), otherwise confined to far N.E. India (Assam; Manipur; Meghalaya) and S.E. Asia. All other N. and S. Indian and Nepalese *etc*. records are in error for *A. phyllitidis* D.Don.
250. ***Asplenium rivulare*** Fras.-Jenk., ***nom. nov***. for *Asplenium unilaterale* Lam. var. *rivale* Bedd., *Handb. Ferns Brit. India Ceylon and Malay Peninsula*: 153 (1883) (syn.: *A. hindusthanense* [*sub* "*hindusthanensis*"] Bir, *nom. inval*., replaced name reference not cited) (**apparently endemic** to S. India). Further study is needed to see if any N. Indian and Chinese *etc*. plants match it.
251. *Asplenium simonsianum* Hook. - very rare. S.E. India (Andhra Pradesh, Vizakhapatnam); far N.E. India (Meghalaya; Tripura).
252. *Asplenium tenerum* G.Forst. - Nicobar Islands (Dixit and Sinha, 2001).

Rare

253. *Asplenium aitchisonii* Fras.-Jenk. & Reichst. - Pakistan; N.W. India (Indian Kashmir; Himachal Pradesh; Uttarakhand).
254. *Asplenium apogamum* N.Murak. & Hatan. (syn.: *Asplenium unilaterale* Lam. var. *birii* B.K.Nayar & Geev.) - S. India (Fraser-Jenkins, 2008a, in press).
255. *Asplenium auritum* Sw. - S. India.
256. *Asplenium nesii* Christ - Pakistan; N.W. India (?Himachal Pradesh; Uttarakhand); Nepal.
257. *Asplenium pekinense* Hance - Pakistan; N.W. India (Indian Kashmir; Himachal Pradesh; Uttarakhand); Nepal.
258. *Asplenium prolongatum* Hook. (*A. achilleifolium sensu* Bir, *non* (Lam.) C.Chr. [from the Mascarenes, not present in India]) - S. India; ?E. Nepal; far N.E. India (Arunachal Pradesh; Meghalaya). Nepal was listed by Dixit (1984), but probably in error as no specimens have been seen by CRFJ and Thapa during the preparation of Thapa (2002).
259. *Asplenium rockii* C.Chr. - S.E. India (Andhra Pradesh); far N.E. India (Meghalaya; Mizoram); Myanmar.
260. *Asplenium viride* Huds., *nom. cons*. (syn.: *A. trichomanes-ramosum* L.) - N.W. India (Indian Kashmir; Himachal Pradesh; Uttarakhand); Nepal.

Thelypteridaceae

Athough Holttum separated many genera, a number of authors now use a 4-5 generic system (*Thelypteris*, *Cyclosorus*, *Pseudophegopteris* and *Phegopteris*), but Holttum himself stated that the most logical alternative to utilising all his genera would be to recognize only one genus. This is a practical alternative with a characteristic and recognisable genus and we prefer here to use the single genus, *Thelypteris*.

At risk

*261. *Thelypteris beddomei* (Baker) Ching (syn.: *Parathelypteris beddomei* (Baker) Ching) - very rare. Sri Lanka; S. India.
*262. *Thelypteris confluens* (Thunb.) C.V.Morton (syn.: *Thelypteris squamigera* (Schlecht.) Ching) - very rare. Sri Lanka; S. India.
*263. *Thelypteris cuspidata* (Blume) K.Iwats. (syn.: *Pronephrium cuspidatum* (Blume) Holttum) - very rare. Nicobar Islands (Dixit and Sinha, 2001); Malesia.
*264. *Thelypteris didymochlaenoides* (C.B.Clarke) Holttum) (**apparently endemic** to N.E. India) - very rare. Far N.E. India (Meghalaya, Sohra [= Cherrapunji], inc. by *CRFJ*). Probably to be expected in Myanmar and ?S.W. China, perhaps under some other name in the latter. IUCN (1998) listed it as Rare.
*265. *Thelypteris kurzii* (Holttum) Fras.-Jenk. (1997) (syn.: *Sphaerostephanos kurzii* Holtt.) - very rare. Nicobar Islands (not given in their text by Dixit and Sinha (2001), though listed by them as an endemic).
266. ?*Thelypteris latebrosa* (Kunze *ex* Mett.) C.F.Reed (syn.: *Sphaerostephanos latebrosus* (Kunze *ex* Mett.) Holttum) - ?N.E. India. A single specimen of this S.E. Asian species was reported by Holttum from W. Bengal (Duars, Haldibari, *J.S. Gamble* 6652 c, K (!)), but may perhaps be a poor specimen of *T. dentata* (Forssk.) E.P.St. John, with unusually reduced lower pinnae. Its presence in India requires confirmation, but is probably incorrect as its nearest known locality is in Malaya, though considering the above specimen Holttum suggested that more collections could perhaps turn up in Assam and Myanmar if searched for in CAL. The area concerned has been badly damaged by human settlement and cultivation so that almost no natural forest is left there, and

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if the specimen is actually *T. latebrosa*, it is unlikely to survive there today. It has alternatively been reported from Assam, but actually referring to the specimen from W. Bengal.

267. ?*Thelypteris menisciicarpa* (Blume) K.Iwats. (syn.: *Pronephrium menisciicarpon* (Blume) Holttum) - ?Nicobar Islands (Dixit and Sinha, 2001). Reported from Arunachal Pradesh by Singh and Panigrahi (2005) in error for *T. lakhimpurensis* (Rosenst.) K.Iwats.

*268. *Thelypteris namburensis* (Bedd.) C.F.Reed (syn.: *Christella namburensis* (Bedd.) Holttum) (**apparently endemic**) - very rare. Far N.E. India (Assam, Nambor forest, Jorhat, inc. by *CRFJ*; E. Arunachal Pradesh); probably to be expected from Myanmar and also China, perhaps under some other name in the latter. Holttum reported it from Thailand, though it was not listed from there subsequently by Tagawa and Iwatsuki (1988).

269. *Thelypteris paludosa* (Blume) K.Iwats. (syn.: *Pseudophegopteris paludosa* (Blume) Ching) - very rare. S. India; S.E. Asia. Reported from the Himalaya by Iwatsuki (1975) and thence other Indian authors in error for *T. pyrrhorhachis* (Kunze) C.M.Kuo. Although Fraser-Jenkins (1997) only accepted the presence of *T. pyrrhorhachis* and its subspecies in India, he has recently identified typical *T. paludosa* from a few localities in the Palni and Nilgiri Hills, S. India (Shembaganaur and Uthamapalayam, Top Station, *V.S. Manickam* 31813 and 31510, in RHT herbarium) (Fraser-Jenkins 2008a, in press).

*270. *Thelypteris palustris* Schott subsp. *palustris* (misapplied name: *Thelypteris thelypteroides sensu* Chandra (2000), *non* (Michx.) Holub [= *T. novoeboracensis* (L.) Nieuwl., from N. America]) - Pakistan; far N.W. India (Indian Kashmir; Himachal Pradesh); Europe; Northern Asia. Replaced in N. America by subsp. *pubescens* (Lawson) Fras.-Jenk. (1997). Reports by Khullar (2000) from Uttarakhand (Pithoragarh: Deochula and Sandeo) were in error for *T. appendiculoides* Fras.-Jenk. (syn.: *Christella appendiculata* (C.Presl) Holttum), and by various authors from S. India for *T. confluens* (Thunb.) C.V.Morton, while an erroneous report from Meghalaya has not yet been re-identified by us. *T. palustris* is confined to three lakes in the N.W. part of the Indian subcontinent.

271. *Thelypteris opulenta* (Kaulf.) Fosberg (syn.: *Amphineuron opulentum* (Kaulf.) Holttum) - very rare. Sri Lanka; Nicobar Islands (Dixit and Sinha, 2001); S. India. Reports from Sikkim; Assam and Meghalaya were in error, partly for *T. immersa* (Blume) Ching and other species.

272. ?*Thelypteris srilankensis* Panigrahi (syn.: *Christella zeylanica* (Fée) Holttum) - Sri Lanka; ??Nicobar Islands (reported as doubtful and not accepted by Dixit and Sinha, 2001).

Near-threatened

273. *Thelypteris chandrae* Fras.-Jenk., *nom. nov.* for *Dryopteris stegnogramme* var. *asplenioides* C.Chr., *Act. Hort. Gothob*. **1**: 56 (1924), *non Thelypteris asplenioides* (Sw.) Proctor. This species has often been known in error as *Stegnogramme aspidioides* Blume which is a distinct species from Java, separated by Ching (1936) - far N.E. India (Meghalaya). Named after the present co-author, Dr. Subhash Chandra.

274. *Thelypteris elwesii* (Baker) Ching (syn.: *Oreopteris elwesii* (Baker) Holttum) - very rare. Very locally abundant in N.E. India (Sikkim); S.W. China. IUCN (1998) listed it from Sikkim only, as Rare.

275. ?*Thelypteris heterocarpa* (Blume) C.V.Morton (syn.: *Sphaerostephanos heterocarpus* (Blume) Holttum) - ?Andaman Islands and ?Nicobar Islands (reported *sub Cyclosorus heterocarpus* (Blume) Ching by Dixit and Sinha (2001), but probably requiring confirmation).

276. *Thelypteris hirsutipes* (C.B.Clarke) Ching (syn.: *Coryphopteris hirsutipes* (C.B.Clarke) Holttum) - far N.E. India (Meghalaya).

277. *Thelypteris immersa* (Blume) Ching (syn.: *Amphineuron immersum* (Blume) Holttum) - ?Nicobar Islands (Dixit and Sinha, 2001); far N.E. India ("Assam", *teste* Holttum).

278. *Thelypteris parishii* (Bedd.) Panigrahi (syn.: *Pronephrium parishii* (Bedd.) Holttum) - far N.E. India (Assam, inc. Nambor Forest, Golaghat, *CRFJ*; Arunachal Pradesh; Meghalaya). Reported by Dixit and Sinha (2001) from the Nicobar Islands in error for a small plant of *Thelypteris* ?*menisciicarpa* (Blume) K.Iwats.

279. *Thelypteris subelata* (Baker) C.F.Reed (syn.: *Christella subelata* (Baker) Holttum; *Thelypteris assamica* (Bedd.) C.F.Reed) - far N.E. India ("Assam", *G. Mann*); Myanmar; Thailand.

280. *Thelypteris thwaitesii* (Hook.) C.F.Reed (syn.: *Pronephrium thwaitesii* (Hook.) Holttum) - S. India; far N.E. India (Assam, Nambor Forest, *CRFJ*).

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Rare 281. *Thelypteris griffithii* (T.Moore) C.F. Reed (syn.: *Dictyocline griffithii* T.Moore; *Stegnogramme griffithii* (T.Moore) K.Iwats.) - far N.E. India (Meghalaya); Myanmar.

282. ?*Thelypteris himalaica* (Ching) C.F.Reed (syn.: *Stegnogramme himalaica* (Ching) K.Iwats.) - N.W. India (Himachal Pradesh; Uttarakhand); Nepal; N.E. India (Sikkim) and China. *Stegnogramme himalaica* (Ching) K.Iwats., was listed from the "N.W." Himalaya (where it does not occur, only in the W. and C. Himalaya) by IUCN (1998) as Vulnerable; this was probably from Dixit, who communicated information on Indian species and often referred to the W. Himalaya as within the N.W. Himalaya. This is a very doubtful species taxonomically, which appears to belong to, or is at least very close to the common Himalayan *T. mollissima* (Fisch. *ex* Kunze) N.Thapa (2002), as concluded by Fraser-Jenkins (1997), though some plants have rather more anastomosing veins than might be expected in *T. mollissima*.

283. *Thelypteris hirtisora* (C.Chr.) K.Iwats. (syn.: *Sphaerostephanos hirtisorus* (C.Chr.) Holttum) - far N.E. India (Nagaland; Mizoram); Myanmar; Thailand.

284. *Thelypteris phegopteris* (L.) Sloss. (syn.: *Phegopteris connectilis* (Michx.) Watt; misapplied name: *Phegopteris hexagonoptera sensu* Chandra (2000), *non* (Michx.) Fée [from N. America], see Fraser-Jenkins, 1992) - N.W. India (Indian Kashmir; Himachal Pradesh; Uttarakhand); Nepal.

285. *Thelypteris rectangularis* (Zoll.) K.Iwats. (syn.: *Pseudophegopteris rectangularis* (Zoll.) Holttum) - C. and E. Nepal, inadvertently omitted by Thapa (2003); N.E. India (W. Bengal, Darjeeling; Sikkim). The report of this species from the W. Himalaya (Kinnaur, *S.P. Khullar* (!)) was in error for *T. pyrrhorhachis* (Kunze) C.M.Kuo (Fraser-Jenkins, 1997), which, as the second author has seen and collected in many such more desolate inner-Himalayan areas, even if beside streams, often becomes less lobed and with ±entire pinna-lobes when in the more extreme, inner-Himalayan climatic region. But although the rhizome may be short, it does not have the strongly erect, tallish crown-rhizome of *T. rectangularis* and the segments are more deeply separate and longer in comparison with true *T. rectangularis*, as studied in the field by the author. *T. rectangularis* has also been reported from Uttarakhand (Pauri), in error.

286. *Thelypteris siamensis* Tagawa & K.Iwats. (syn.: *Christella siamensis* (Tagawa & K.Iwats.) Holttum) - N.E. India (W. Bengal, Darjeeling terai, Sevoke, Mongpong, *CRFJ*; Assam; E. Arunachal Pradesh); China; Thailand. Very close to *T. hispidula* (Decne.) C.F.Reed, but less hairy and the lowest few pinnae deflexed and slightly dimidate at their basiscopic bases, with an entire basal area there.

287. *Thelypteris subpubescens* (Blume) K.Iwats. - ?Andaman and ?Nicobar Islands (Dixit and Sinha, 2001); ?far N.E. India (Assam; Arunachal Pradesh; ?Meghalaya). Panigrahi (1960, 1975a, 1975b) confused this and other related species of its group (see Holttum, 1976) and its identification and range in India require further study. A report from Uttaranchal (Pithoragarh) was in error and reports from W. Bengal and Sikkim require verification, as also from C. and S. India. It appears to be related to *T. meeboldii* (Rosenst.) Holttum, from S. India and their precise delineation requires study.

Woodsiaceae

At risk

*288. *Athyrium atratum* Bedd. (syn.: *A. gedeanum* (Racib.) Christ) - very rare. Far N.E. India (Manipur; N. Arunachal Pradesh); Vietnam; Sumatra and Java. IUCN (1998) listed it from Manipur only, as Endangered.

289. *Athryium cumingianum* (C.Presl) Ching (syn.: *Anisocampium cumingianum* C.Presl) - Sri Lanka; S. India; far N.E. India (Meghalaya).

*290. *Athyrium niponicum* (Mett.) Hance (syn.: *A. brevisorum* Bedd.) - very rare. Far N.E. India (Arunachal Pradesh; Manipur; Tripura). See Fraser-Jenkins, Rush and Ching (1982).

291. *Athyrium repens* (Ching) Fras.-Jenk. (2008a, in press) (misapplied name: *A. subtriangulare sensu* Bir, *non* (Hook.) Bedd. [= *A. spinulosum* (Maxim.) Milde]) - very rare. Nepal; N.E. India (Sikkim); Bhutan; S.W. China.

*292. *Athyrium roseum* Christ (syn.: *A. mengtzeense* Hieron.) - very rare. C. Nepal (way to Annapurna Base Camp, *CRFJ*); N.E. India (W. Bengal, Darjeeling, Palmajua, *CRFJ*); Tibet; China. Previously unrecorded from the Indian subcontinent.

*293. *Deparia macdonellii* (Bedd.) M.Kato - very rare. Endemic to the far W. (*i.e.* N.W.) Himalaya only: Pakistan; N.W. India (Indian Kashmir; Himachal Pradesh).

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*294. *Diplazium crenatoserratum* (Blume) T.Moore - very rare. Andaman Islands (Dixit and Sinha, 2001); S.E. Asia.

*295. *Diplazium cordifolium* Bl. (syn.: *D. integrifolium* Bl.; *Anisogonium cordifolium* (Bl.) Bedd.; *D. cordifolium* var. *listeri* ?Baker ms. *ined.*) - very rare. Far N.E. India (Arunachal Pradesh, *J.L. Lister* (!), collector for Calcutta, with Col. H. Godwin-Austen, as scientists on the Duphla Hills military expedition of 1874); ?Manipur); S.E. Asia; Australia etc. Dixit (1984) reported it from Manipur.

*296. *Diplazium griffithii* T.Moore (syn.: *D. petrii* Tardieu) - very rare. Far N.E. India (Meghalaya, inc. Sohrarim, Mawmihtied, *CRFJ*); S.E. Asia. Widely confused by Baker, followed by Beddome and Clarke, with the common tripinnate species, *D. spectabile* (Wall. *ex* Mett.) Ching, though corrected by him later, but often continuing to be misapplied thus in India to this day. Moore's original, true *D. griffithii*, which he validated with a full description, has been overlooked by several Indian authors and is a quite different, small, bipinnatifid species with simply lobed pinnae, which are pinnatifid or just become pinnate, and black stipe-scales.

297. *Diplazium heterophlebium* (Mett. *ex* Baker) Diels (syn.: *Dictyodroma heterophlebia* (Mett. *ex* Baker) Ching) - E. Nepal (Ilam, Pashupatinagar, *CRFJ*); N.E. India (W. Bengal, very rare or perhaps extinct in the Darjeeling area; Sikkim; Arunachal Pradesh; Meghalaya). It was stated by Clarke to be common around Darjeeling, though perhaps a slight exaggeration. Reported from the W. Himalaya in error.

*298. *Diplazium pinfaense* Ching - very rare. Far N.E. India (Manipur).

*299. *Diplazium pinnatifidopinnatum* (Hook.) T.Moore - far N.E. India (Assam; E. Arunachal Pradesh).

*300. ?*Diplazium tomentosum* Blume - very rare, if present. Far N.E. India; a specimen was labelled as from Khasia, *W. Griffith* (K!), though it has never been found since then in India and may perhaps be doubtfully localised. It otherwise occurs in Myanmar; Thailand; Vietnam and Malesia. It may be noted that a number of Griffith's unique collections suspected previously to have been mislocalised have subsequently turned out to be correct following further exploration in N.E. India.

*301. *Diplazium virescens* Kunze - very rare. Far N.E. India (Meghalaya, Shillong Peak, below old Peak Lodge, *CRFJ*, in 1998, not previously reported from India).

*302. *Diplazium* sp. - very rare. S. India. This species is generally close to the simply pinnate *D. sylvaticum* (Bory) Sw., but with a shortish horizontal rhizome and black, muricate stipe-bases bearing entire, black stipe-base scales. It has stalked, more nearly entire pinnae with cartilaginous margins and narrowly rounded-cuneate bases, without the very shallow, rectangular lobes of *D. sylvaticum*, and no teeth even towards the pinna-apices. The frond-apex is obviously imparipinnate and unlobed, unlike the gradually decreasing to lobed apex of *D. sylvaticum*. The second author found two unidentified specimens of this species in the *D. sylvaticum* cover at RHT herbarium in 2007, collected by the remarkable and energetic pteridologist, Father (Dr.) V.S. Manickam, and identified it as a distinct species apparently previously unrecorded from India (Tirunelvelli Distr., Kannikatty Hills, on the way to Agasthiar Hills, Ambasamudram taluk, 1200 m. *V.S. Manickam* 32366 and 32384, 9 April 1985). A rather similar species was found by the author near Kyaikto in Mon, S.E. Myanmar, though with more teeth, and further study is being undertaken by CRFJ to identify the two taxa. They are of S.E. Asian affinity, near to the Malayan *D. montanum* Alderw. or *D. subintegrum* Holttum, but less toothed.

*303. *Gymnocarpium oyamense* (Baker) Ching (syn.: *Currania oyamense* (Baker) Copel.) - very rare. Nepal; ?far N.E. India (Arunachal Pradesh).

*304. *Matteuccia orientalis* (Hook.) Trevis. - very rare. Far N.E. India (Meghalaya). Not collected for many years. Replaced in the W., C. and E. Indo-Himalaya, including Sikkim, by the uncommon (though not very rare) *M. intermedia* C.Chr., which has strongly narrowed frond-bases, especially noticeable in sterile fronds. Nearly all reports of *M. orientalis* from India refer to *M. intermedia*, which was omitted by both Dixit (1984) and Chandra (2000).

*305. *Woodsia cycloloba* Hand.-Mazz. - very rare. N.W. India (Uttarakhand); N.E. India (Sikkim); Nepal; China.

*306. *Woodsia glabella* R.Br. *ex* Richardson - very rare. Far W. (*i.e.* N.W.) and W. Himalaya; N.W. India (Ladakh, *Leos Klimes*, Trebon, Czech Republic, det. CRFJ; Uttarakhand, Kumaon in DD, det. CRFJ). These two specimens are the first collections of the N. American; European

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and Siberian species, *W. glabella* from the Himalayan region. They have straw-coloured stipes, glabrous upper stipe, rachis and lamina (except indusial hairs) and small, less lobed pinnae, rather like a short-pinna'd and unlobed *W. hancockii* Baker, and with similarly few scales. They differ from the generally similar *W. alpina* (Bolton) Gray in their smaller, less rounded pinna-lobes, the lowest pinnae being very small, and in that *W. alpina* has hairs and small scales up the whole stipe, rachis and on the lamina. *W. glabella* was not previously known from Indian subcontinent.

Near-threatened

307. *Athyrium nakanoi* C.Chr. - very rare. Bhutan; far N.E. India (Arunchal Pradesh, *A.K. Baishya*, det CRFJ). Reported from Assam and Meghalaya in error for *A. puncticaule* (Blume) T.Moore.
308. *Athyrium kumaonicum* Punetha (**apparently endemic**) - range improperly known. N.W. India (Uttarakhand: Nainital, *CRFJ*; Pithoragarh, *N. Punetha*, holotype (!)), may possibly also be found extending further east and perhaps rather doubtfully genuinely endemic unless it is a neoendemic allopolyploid of relatively recent origin.
309. *Diplazium beddomei* C.Chr. - Sri Lanka; S. India. The scarce, but locally common *D. chattagrammica* (C.B.Clarke) Ching, from far N.E. India (Assam; Arunachal Pradesh); Bangladesh and Myanmar, is closely related to *D. beddomei* and may perhaps be conspecific, though it sometimes has slightly more lobed pinnules.
310. ?*Diplazium cognatum* (Hieron.) Sledge - Sri Lanka; S. India. Apparently closely related and very similar to *D. leptophyllum* Christ (below) and may perhaps be synonymous, pending further study. *D. cognatum* was listed by IUCN (1998) from Sri Lanka only, as Indeterminate.
311. *Diplazium crinitum* (Baker) C.Chr. - very rare. Far N.E. India (Assam, Digboi, *CRFJ*; E. Arunachal Pradesh, Namdapha, *CRFJ*); S.E. Asia (Fraser-Jenkins, 1997).
312. *Diplazium leptophyllum* Christ (possible syn.: *D. cognatum* (Hieron.) Sledge, described from Sri Lanka) - very rare, ?Sri Lanka; S. India; far N.E. India (Mizoram, Lushai Hills, *Rev. Wenger*); China *etc*.
313. *Diplazium muricatum* (Mett.) Alderw. - Sri Lanka and S. India only [also ?Java, its perhaps erroneous type-locality]. Replaced by *D. kawakamii* Hayata in the Himalaya; China; S. Japan *etc*. (see Fraser-Jenkins, 2008a, in press).
314. *Diplazium travancoricum* Bedd. - Sri Lanka and S. India only.
315. *Woodsia alpina* (Bolton) Gray (syn.: *W. himalaica* Ching & S.K.Wu) - Pakistan; N.W. India (Indian Kashmir; Himachal Pradesh; Uttarakhand); W. Nepal; Tibet.
316. *Woodsia lanosa* Hook. - N.W. India (Uttarakhand); N.E. India (Sikkim).
317. *Woodsia hancockii* Baker - N.W. India (Himachal Pradesh; Uttarakhand); W. Nepal.
318. *Woodsia rosthorniana* Diels - N.E. India (N.E. Arunachal Pradesh); Bhutan.

Rare

319. *Athyrium davidii* (Franch.) Christ (syn.: *A. duthiei* (Bedd.) Bedd.) - N.W. India (Uttarakhand); Nepal; N.E. India (Sikkim; Arunachal Pradesh). *A. duthiei* was listed by IUCN (1998) from Sikkim and Kumaon only, as Rare.
320. *Athyrium gymnogrammoides* (Klotzsch *ex* Mett.) Bedd. (syn.: *A. solenopteris* (Kunze) T.Moore var. *pusillum* (Kunze) T.Moore) - Sri Lanka and S. India.
321. *Athyrium puncticaule* (Blume) T.Moore - far N.E. India (Meghalaya); Myanmar; Thailand; Vietnam; S. China; Taiwan (Liu and Fraser-Jenkins, 2006) and S.E. Asia. Widely mistaken for the closely related and common species, *A. foliolosum* T.Moore *ex* R.Sim, in the W., C. and E. Himalaya *etc*.
322. *Athyrium praetermissum* Sledge - Sri Lanka and S. India only. Reported from the Himalaya in error for the more finely dissect and highly setose (above the pinnules) common species, *A. distans* (D.Don) T.Moore, and the less dissect, but setose species *A. xichouense* Y.T.Hsieh & Z.R.Wang. *A. praetermissum* does not have setae above the pinnule-midribs. Manickam and Irudayaraj's (2003) report of *A. drepanopterum* (Kunze) A.Braun *ex* Milde from the Nilgiri Hills (XCH 611), tentatively so identified in 1992 by CRFJ, was actually a semi-sterile specimen of *A. praetermissum* (XCH! redet. CRFJ in 2007).
323. *Athyrium rubricaule* (C.B.Clarke) Bir - N.W. India (Indian Kashmir; Himachal Pradesh; Uttarakhand); Nepal; N.E. India (W. Bengal; Sikkim); Bhutan; Tibet; China. From Nepal eastwards this species is gradually replaced by the closely similar *A. dubium* Ching, which has a more delicate frond and thinner stipe, and usually more horizontal rhizome, it also has smallish, but obvious setae above the pinnules.

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whereas *A. rubricaule* does not have them. The two species have been much confused, especially in China, where they have been combined in error.

324. *Diplazium bellum* (C.B.Clarke) Bir - Nepal; N.E. India (W. Bengal; Sikkim; Nagaland); Bhutan; Myanmar; China. Often confused, including by Clarke, with the common and widespread, *D. laxifrons* Rosenst. of the W. and E. Himalaya (the intermediate *Diplazium* no. 105 of Fraser-Jenkins, 1992: 113), which is not, as Fraser-Jenkins (1997) later thought, *D. torrentium* (C.B.Clarke) Tardieu (the latter name being a synonym of *D. sikkimense* (C.B.Clarke) C.Chr.). *D. bellum* is not present in S. India; Australia; or Africa, as reported by Chandra (2000).
325. *Diplazium sibiricum* (Turcz. *ex* Kunze) Sa.Kurata - Pakistan; N.W. India (Indian Kashmir; Himachal Pradesh; Uttarakhand). Closely related to *D. squamigerum* (Mett.) Matsum. (below), but with a thin, long-creeping rhizome and rather more finely dissect fronds with more remote lobes.
326. *Diplazium squamigerum* (Mett.) Matsum. - N.W. India (Himachal Pradesh; Uttarakhand); Nepal; N.E. India (N. Sikkim; Arunachal Pradesh); Tibet; China; Taiwan and Japan. Reported from Kashmir in error for *D. sibiricum* (above).
327. *Diplazium sylvaticum* ["*silvaticum*" auct.] (Bory) Sw. (syn.: *D. firmum* Fée) - Mascarene Islands; Sri Lanka; S. India; far N.E. India (Assam, inc. Golaghat, Nambor Forest, *CRFJ*; Meghalaya). *D. mixtum* (Roxb.) C.V.Morton is not this species, but an earlier name for *D. prescottianum* (Wall. *ex* Hook.) T.Moore *ex* C.Chr., from S.E. Asia, while *D. pseudosylvaticum* Panigrahi (*D. allantoideum* M.G.Price) is a distinct tripinnatifid species from Java, requiring further nomenclatural research.

Dryopteridaceae

At risk

*328. *Acrorumohra diffracta* (Baker) Ching - very rare. Far N.E. India (N. Arunachal Pradesh); China; Taiwan. Fraser-Jenkins (1989, 1997) doubted his earlier placement of this species within *Dryopteris* near to the *D. sparsa* (D.Don) Kuntze group. The genus *Acrorumohra* (but excluding the other Indian subcontinental species sometimes placed within it) is now maintained as distinct here. It is presumably more closely related to *Leptorumohra* and thus in Subfam. *Polystichoideae*, not Subfam. *Dryopteridoideae* (see Fraser-Jenkins, 1997), though the *D. sparsa* group in *Dryopteris* shows distant connections to the polystichoid ferns.
329. *Ctenitis mannii* (C.Hope) Ching - far N.E. India (Assam; Arunachal Pradesh; Meghalaya).
*330. *Cyrtomium fortunei* J.Sm. - very rare. Far N.E. India (Manipur).
*331. *Cyrtomium micropterum* (Kunze) Ching - very rare. Africa; S. India. Related to and might perhaps even be synonymous with *C. clivicola* (Makino) Tagawa from China and Japan.
*332. *Dryopsis ferruginea* (Baker) Holttum & P.J.Edwards (syn.: *Ctenitis ferruginea* (Baker) Ching) - very rare. S. India.
*333. *Dryopsis manipurensis* (Bedd.) Holttum & P.J.Edwards (syn.: *Ctenitis manipurensis* (Bedd.) Ching) - very rare. Far N.E. India (Manipur; Meghalaya; ?Assam); S.E. Asia.
*334. *Dryopteris alpestris* Tagawa - very rare. Nepal; N.E. India (Sikkim); Tibet.
*335. *Dryopteris angustifrons* (T.Moore) Kuntze - very rare. Probably extinct in Nepal and India; Nepal (*Wallich*); N.E. India (Sikkim); S.W. China (S. Yunnan).
*336. *Dryopteris assamensis* (C.Hope) C.Chr. & Ching - very rare. N.E. India (W. Bengal: Darjeeling terai, Dulkajhar, near Naxal Bari, *C.B. Clarke*; Assam; Arunachal Pradesh; Meghalaya). Very probably extinct in W. Bengal due to the draining and cultivation of Dulkajhar, which was formerly a marshy grass-land.
*337. *Dryopteris austroindica* Fras.-Jenk. (**endemic**) - very rare. S. India (probably extinct in the Shevaroy Hills, searched for in detail by the second author in 1978 and 2007, but area now largely destroyed by fire and rubber plantations; Nilgiri Hills).
338. *Dryopteris basisora* Christ - very rare. N.W. India (Uttarakhand). To be expected further east. Tibet; S.W. China.
*339. *Dryopteris costalisora* Tagawa (*D. bonatiana sensu* Fraser-Jenkins (1989), *p.p. Ind.*, *non* (Brause) Fras.-Jenk. [= *D. panda* (C.B.Clarke) Christ]) - very rare. E. Nepal (Ilam, Mekma, Tonglo Mountain, *CRFJ*); N.E. India (W. Bengal, Darjeeling, Tonglo Mountain); China; Taiwan. Levinge's old collection labelled Sikkim (*i.e.* "British Sikkim", now Darjeeling Distr.) almost certainly referred to the same population on Tonglo. It may be expected

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further east in N.E. India, but has not so far been collected elsewhere in the area.

*340. *Dryopteris deparioides* (T. Moore) Kuntze subsp. *deparioides* - very rare. Sri Lanka, rare; S. India (Anamalai Hills, very rare). Not collected again in India for 150 years. Conservation of this species with its almost unique sori borne on stalks beyond the segment-margins is highly desirable but will need to be based in Sri Lanka.

*341. *Dryopteris dickinsii* (Franch. & Sav.) C. Chr. - very rare. Pakistan; N.W. India (Indian Kashmir; Himachal Pradesh); China; Japan.

*342. *Dryopteris hasseltii* (Blume) C.Chr. (syn.: *Arachniodes hasseltii* (Blume) Ching, given by Chandra, 2000) - very rare. Far N.E. India (Assam, Dibrugarh, Makum Forest, *G. Mann*), not collected for over 100 years. This typical member of the *D. sparsa* (D.Don) Kuntze group has been persistently misplaced in *Acrorumohra* by Ching and present-day Chinese botanists, obscuring the identity of that genus. Listed *sub Arachniodes hasseltii* by IUCN (2004) from China as Endangered.

*343. *Dryopteris himachalensis* Fras.-Jenk. - very rare. N.W. India (Himachal Pradesh); China.

*344. *Dryopteris nobilis* Ching - very rare. N.E. India (W. Bengal, Darjeeling, Kurseong, *H.C. Levinge*, perhaps now extinct in Kurseang area due to building-development; Sikkim, Bridge B2, N. of Gangtok, *CRFJ*; Assam; Meghalaya).

*345. *Dryopteris camusiae* Fras.-Jenk. (1997) (syn.: "*D. kunmingensis* Fras.-Jenk.", *nom. nud.*, erroneously left in the script, but should have been changed to *D. camusiae*; misapplied name: *D.* x *pteridiiformis* Christ, *pro sp.* [a sterile hybrid between *D. caroli-hopei* Fras.-Jenk. x *D. camusiae* Fras.-Jenk., from China]) - very rare. Far N.E. India (Naga Hills). Known only from a single collection from India, though common in Yunnan.

*346. *Dryopteris varia* (L.) Kuntze - very rare. Possibly extinct or nearly so in India. Far N.E. India (Assam, Cachar Hills, Kapili hot springs; Meghalaya, Garampani hot springs, probably extinguished at that locality due to tourism-construction and disturbance).

*347. *Heterogonium pinnatum* (Copel.) Holttum - very rare. Andaman Islands (Dixit and Sinha, 2001).

*348. *Lastreopsis tenera* (R.Br.) Tindale - very rare. Sri Lanka; S. India.

*349. *Polystichum anomalum* (Hook. & Arn.) J.Sm. [forma *travancoricum* (Bedd.) Fras.-Jenk.] (syn.: *P. anomalum var. travancoricum* (Bedd.) Sledge; *P. travancoricum* (Bedd.) B.K. Nayar & S. Kaur; *P. eximium* (Mett. ex Kuhn) C. Chr.) - very rare. Sri Lanka and S. India. IUCN (1998) listed it from Sri Lanka only, as Indeterminate. Some populations in Sri Lanka, where it is less threatened, have a unique feature of having the sori on the top surface of the leaf [forma *anomalum*]. Endemic to Sri Lanka and S. India, though Chandra (2000) gave its range as throughout S.E. Asia in error as its synonym, *P. eximium*, has been widely misapplied in Asia in error for *P. scariosum* (Roxb.) C.V.Morton (syn.: *P. birii* Jamir & R.Rao) (see Fraser-Jenkins, 1991).

*350. *Polystichum duthiei* (C.Hope) C.Chr. - very rare. N.W. India (Uttarakhand); Nepal; China; Taiwan.

*351. *Polystichum glaciale* Christ (syn.: *Sorolepidium glaciale* (Christ) Ching) - very rare. N.E. India (Sikkim); Bhutan; Tibet; China.

*352. *Polystichum grandifrons* C.Chr. (syn.: *P. kiusiuense* Tagawa) - very rare. Far N.E. India (Manipur). The type-collection of *P. grandifrons* is partly a gigantic specimen with fusing segments and "coarse morphology", but is otherwise similar to *P. kiusiuense* and other material connects the two.

*353. *Polystichum manickamianum* Benniamin, Fras.-Jenk. & Irud. (2008, in press) (endemic) - very rare. S. India (S.W. Tamil Nadu, Agasthiar Hills, *V.S. Manickam*, det. CRFJ). Only known from one locality, but a quite distinct species related to *P. scariosum* (Roxb.) C.V.Morton, but with a shorter frond, more stalked, obtuse and larger segments and nearly marginal sori. Initially mistakenly identified by the second author in 1992 as *P. subinerme* (Kunze) Fras.-Jenk., but on seeing a photograph and then the specimens again in 2007 (XCH!) it was immediately obvious that it is a very distinct species, not matching other African, Indian, S.E. Asian or Chinese species. He therefore gave it the name *P. manickamianum*. It was investigated cytologically by Irudayaraj.

*354. *Polystichum polyodon* Wall. *ex* Ching (apparently endemic) - very rare. Far N.E. India (Meghalaya only), though perhaps to be expected in Myanmar and/or S.W. China. Its "mixed morphology" probably suggests it may be an allopolyploid neo-endemic, though as yet it has not been investigated cytologically and the second author has himself only collected it once.

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*355. *Polystichum subinerme* (Kunze) Fras.-Jenk. (syn.: *P. kunthianum* B.K.Nayar & Geev.) (**endemic**) - very rare. S. India (Tamil Nadu: Shevaroy Hills and Nilgiris; and Kerala: Silent Valley). This proliferous-apexed species was formerly observed by the second author to be reasonably common in the Shevaroy Hills (in 1978), but is now almost extinct in places where it was formerly to be seen there. It is perhaps nearly confined now to the Orchid Garden of the Botanical Survey of India, Yercaud, where it could easily be destroyed by the continual fires that ravage the Shevaroy Hills every year without control. Fraser-Jenkins (1991) misapplied the name *P. kunthianum* to the common S. Indian species, *P. palniense* Fras.-Jenk. (Fraser-Jenkins, 2008a, in press), due to the semi-sterile and difficult type-specimen of *P. kunthianum* (CALI!), seen again in 2007.

*356. *Polystichum wattii* (Bedd.) C.Chr. (syn.: *Lastreopsis wattii* (Bedd.) Tagawa) - very rare. Far N.E. India (?Arunachal Pradesh, *Rao & Hajra*, specimen not seen for verification; Manipur). IUCN (1998) listed it *sub* both *Lastreopsis* and *Polystichum* from Manipur only, as Extinct and as Extinct or Endangered, respectively.

*357. *Polystichum* sp. *indet*. - very rare. Far N.E. India (Manipur, Ukhrul, CAL!; and Nagaland, Poltsero, NEHU!). Reported by Fraser-Jenkins (1991: 274), but widely mistakenly *sub P. makinoi* (Tagawa) Tagawa. The present species is a brown-scaled species in the *P. yunnanense* Christ agg., close to *P. tangmeiense* Ching and *P. microphyllum* (Blume) C.Presl. Currently under study by CRFJ.

*358. *Pteridrys cnemidaria* (Christ) C.Chr. & Ching (misapplied name: *P. syrmatica* (Willd.) C.Chr. & Ching - very rare. N.E. India (W. Bengal, Darjeeling, not collected for many years; ?Sikkim; Assam; Meghalaya).

*359. *Pteridrys syrmatica* (Willd.) C.Chr. & Ching - very rare. Sri Lanka; S. India. IUCN (1998) listed it from Sri Lanka only, as Indeterminate.

360. *Pteridrys zeylanica* Ching - very rare. Sri Lanka; S. India (Kerala; Andhra Pradesh). IUCN (1998) listed it from Sri Lanka only, as Indeterminate.

361. *Tectaria kehdingiana* (Kuhn) M.G.Price (syn.: *Luerssenia kehdingiana* Kuhn) - Nicobar Islands (Dixit and Sinha, 2001); Sumatra.

*362. *Tectaria subconfluens* (Bedd.) Ching (apparently endemic) - far N.E. India (Meghalaya); probably also to be expected in Myanmar and/or S.W. China. Dixit (1984) and thence Chandra (2000) also listed it for Bangladesh and China, though the basis for those Countries was not given as it was not listed for Bangladesh by Beddome or Clarke. It was also not given for China by Wu and Wang (1999) in the *Flora Reipublicae Popularis Sinicae*, nor by Gias Uddin (2001, *ined*.), nor in the lists of Bangladesh Pteridophytes in British and Indian herbaria prepared by the present second author (*ined*.).

363. *Tectaria zeilanica* (Houtt.) Sledge (syn.: *Quercifilix zeylanica* (Houtt.) Copel.) - Sri Lanka; S. India; China.

Near-threatened

364. *Arachniodes superba* Fras.-Jenk. (1997) (syn.: *Lithostegia foeniculacea* (Hook.) Ching) - E. Nepal; N.E. India (Sikkim; ?Arunachal Pradesh); Bhutan; Tibet.

365. *Dryopsis scabrosa* (Kunze) Holttum & P.J.Edwards (syn.: *Ctenitis scabrosa* (Kunze) Ching) - S. India. Reported from Meghalaya in error.

366. *Dryopteris khullarii* Fras.-Jenk. (endemic) - N.W. India (Himachal Pradesh; Uttarakhand). A presumed neoendemic which may have arisen through hybridisation.

367. *Dryopteris sledgei* Fras.-Jenk. - Sri Lanka and S. India.

368. *Dryopteris yoroii* Seriz. (syn.: *D. sparsa* (D.Don) Kuntze var. *nitidula* (Bedd.) Ching) - N.W. India (Himachal Pradesh; Uttarakhand); Nepal; N.E. India (W. Bengal, Darjeeling; Sikkim; ?Arunachal Pradesh); Myanmar; Tibet.

369. *Tectaria chattagramica* (C.B.Clarke) Ching - very rare. Far N.E. India (Assam; Meghalaya); Bangladesh; Myanmar; Thailand. IUCN (1998) listed it from Bangladesh only, as Vulnerable.

370. *Tectaria dubia* (C.B.Clarke & Baker) Ching - ?Nepal (Kaski Distr., above Birethanti, two days on way to Annapurna Base Camp, *CRFJ*); far N.E. India (N. Arunachal Pradesh); S.W. China. Reported from Pithoragarh by Pangtey and Punetha (1987), and thence others, in error for *T. coadunata* (Wall. *ex* Hook. & Grev.) C.Chr. (corrected by Pangtey in Khullar, 2000).

371. *Tectaria ingens* (Atk. *ex* C.B.Clarke) Holttum - N.E. India (W. Bengal; Sikkim; Meghalaya); ?Bhutan.

372. *Tectaria melanocaulos* (Blume) Copel. - very rare. Andaman Islands. Reported by Dixit & Sinha (2001), though not by Holttum (1991).

373. ?*Tectaria siifolia* (Willd.) Copel. (syn.: *T. ternifolia* (Alderw.) C.Chr.) -?Andaman Islands

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(Dixit and Sinha, 2001, *sub T. ternifolia*), but Holttum (1991) gave it as confined to Malesia.

Rare

374. *Ctenitis subglandulosa* (Hance) Ching (syn.: *Ctenitis rhodolepis* (C.B.Clarke) Ching) - N.E. India (W. Bengal; Sikkim; Assam; Nagaland; Meghalaya).
375. *Dryopteris filix-mas* (L.) Schott - N. America (also including subsp. *brittonii* Fras.-Jenk. & Widén); N.W. Africa; Europe east to the Tien Shan; W. Asia; N.E. Afghanistan; N. Pakistan; N.W. India (Indian Kashmir). A European element confined to the far West Himalaya in the Indian subcontinent.
376. *Dryopteris odontoloma* (Bedd.) C.Chr. (**endemic**) - S. India only. Confused in the 19th Century with *D. nigropaleacea* (Fras.-Jenk.) Fras.-Jenk. and *D. juxtaposita* Christ of the Himalayan region, which were both referred to *D. odontoloma* (Fraser-Jenkins, 1989).
377. *Dryopteris sikkimensis* (Bedd.) Kuntze - N.E. India (Sikkim); Tibet. The range of this high-altitude Himalayan species was correctly given by Fraser-Jenkins (1989) as Sikkim and Tibet. Subsequent inexplicable reports from Nepal; Bangladesh; Myanmar and many low-altitude areas of N., C. and S. India; Sri Lanka and tropical S.E. Asia, where it does not occur, were in error.
378. *Dryopteris subtriangularis* (C.Hope) C.Chr. (syn.: *D. uropinna* M.G.Price) - far N.E. India (Assam; Arunachal Pradesh; Meghalaya).
379. *Pleocnemia submembranacea* (Hayata) Tagawa & K.Iwats. (syn.: *P. winitii* Holttum) - Nepal (Fraser-Jenkins, 1997; Thapa, 2002); N.E. India (W. Bengal; Sikkim; Assam; Meghalaya); Bangladesh; S.E. Asia. Chandra (2000) also gave it from Madhya Pradesh.
380. *Polystichum acutidens* Christ - N.E. India (W. Bengal; Arunachal Pradesh; Nagaland; Manipur; Meghalaya); Bhutan.
381. *Polystichum luctuosum* (Kunze) T.Moore - Pakistan; N.W. India (Indian Kashmir; Himachal Pradesh; Uttarakhand); W. Nepal; far N.E. India (Arunachal Pradesh).
382. *Polystichum mannii* C.Hope *ex* Fras.-Jenk. - N.E. India (Sikkim: Bridge B2, N. of Gangtok, CRFJ; Assam; Arunachal Pradesh; Meghalaya); Bhutan.
383. *Polystichum woodsioides* Christ (misapplied name: *P. moupinense* (Franch.) Bedd., see Fraser-Jenkins, 1997) - Nepal; N.E. India (Sikkim); Bhutan.
384. ?*Tectaria fissa* (Kunze) Holttum (syn.: *T. oligophylla* (Rosenst.) C. Chr.; *T. polymorpha* (Wall. *ex* Hook.) Copel. var. *cuneifolia* Bonap.; *T. cuneifolia* (Bonap.) Å.Löve & D.Löve) - ?Andaman Islands (Dixit and Sinha, 2001); S.E. Asia. *T. polymorpha* var. *cuneifolia* was reported by Dixit and Sinha (2001) from the Andaman Islands. It was previously reported by Dixit (1984) from the Andamans; Myanmar and China. *T. oligophylla* has thence been reported from the Andaman Islands; Myanmar and China (Chandra, 2000), the two latter in error. But Holttum (1991) gave it as confined to Malesia and it is not given from China in *Flora Reipublicae Popularis Sinicae*, nor from Myanmar by Fraser-Jenkins (in prep.).
385. *Tectaria griffithii* (Baker) C.Chr. (syn.: *T. multicaudata* (C.B.Clarke) Ching) - far N.E. India (Assam; Meghalaya).
386. *Tectaria simonsii* (Baker) Ching - N.E. India (?Sikkim; Assam; Nagaland; Meghalaya); Bangladesh; S.W. China; Taiwan; Myanmar; Thailand; S.E. Asia.

Oleandraceae

At risk

387. *Arthropteris palisotii* (Desv.) Alston (syn.: *Nephrolepis ramosa* (Pal.Beauv.) T.Moore) - very rare. Sri Lanka and S. India.
388. *Oleandra undulata* (Willd.) Ching (misapplied name: *O. cumingii sensu* Clarke and Beddome, *non* J.Sm. *ex* C.Presl) - very rare. Far N.E. India: ("Assam"; Manipur).

Rare

389. *Nephrolepis radicans* (Burm.f.) Kuhn (syn.: *N. volubilis* J.Sm. *ex* C.Presl; misapplied name: *N. falcata sensu auct. Ind. p.p., non* (Cav.) C.Chr.) - N.C. India; S.E. Nepal (Belbari, *N. Thapa*; *CRFJ*); far N.E. India (Assam; Manipur); Bangladesh; Myanmar; Thailand; S.E. Asia. Reported from S. India in error; and from Nainital, by Hope, in error for *N. cordifolia* (L.) C.Presl, *nom. et typ. cons.* (syn.: *N. auriculata* (L.) Trimen).
390. *Oleandra musaefolia* (Blume) C.Presl - Sri Lanka; S. India.

Lomariopsidaceae

At risk

*391. *Bolbitis nodiflora* (Bory) Fras.-Jenk. (1997) (syn.: *B. appendiculata* (Willd.) K.Iwats. subsp. *vivipara* (Hook.) Hennipman, vars. *vivipara* and *neglecta* Hennipman) - Andaman Islands; Nicobar Islands (Hennipman, 1977, not given by Dixit and Sinha, 2001); far N.E. India (Manipur; Nagaland); Bangladesh; Myanmar; Thailand and S.E. Asia. Although Bir (2002)

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mentioned the name *B. nodiflora* (Willd.) K.Iwats. this was a *lapsus mentis* for *B. appendiculata* (Willd.) K. Iwats., as Iwatsuki made no such combination in the reference cited or elsewhere.

*392. *Bolbitis sinuata* (C.Presl) Hennipman - Nicobar Islands (Hennipman, 1977; Dixit and Sinha, 2001); S.E. Asia.

*393. *Elaphoglossum nilgiricum* Krajina *ex* Sledge (**endemic**) - very rare. S. India. IUCN (1998) listed it from S. India as Endangered.

*394. *Elaphoglossum stigmatolepis* (Fée) T.Moore (**endemic**) - very rare. S. India. IUCN (1998) listed it from S. India as Vulnerable.

*395. *Lomagramma sumatrana* Alderw. - very rare. Nicobar Islands (Dixit and Sinha, 2001); Sumatra and Malaya.

Near-threatened

396. *Elaphoglossum beddomei* Sledge (**endemic**) - S. India. IUCN (1998) listed it from S. India as Rare.

397. *Lomagramma sorbifolia* (Willd.) Ching (syn.: ?*Bolbitis nagalandensis* R.R.Rao & Jamir) - Far N.E. India (N. and E. Arunachal Pradesh (inc. Namdapha, *CRFJ*); ?Nagaland).

Rare

398. *Bolbitis semicordata* (Baker) Ching (**endemic**) - S. India.

399. *Elaphoglossum angulatum* (Blume) T.Moore - Sri Lanka and S. India.

400. *Bolbitis presliana* (Fée) Ching (**endemic**) - S. India.

Davalliaceae

Although Tsutsumi and Kato (2007) and Kato and Tsutsumi (2008, in press) have recognised *Humata* and *Wibelia*, mainly on moleculological grounds, we prefer to merge them within *Davallia*, partly on the grounds of a practical morphological basis. The genus *Araiostegia* was also sunk by them into *Davallodes*, but their morphology is so utterly different that this cannot be accepted here and further consideration as to how far moleculological/cladistic findings relate to systematics, evolution and taxonomy is undoubtedly required. We recognise *Araiostegia* here despite all the genera of the family being uncritically sunk into *Davallia* by Nooteboom (2007) due to some overlap between them in the indusial characteristics *etc*. of a few species. Some species formerly placed in *Araiostegia* have been separated by Tsutsumi and Kato into a new genus *Araiostegiella*, which we accept here as a genus close to *Araiostegia*.

At risk

*401. *Davallia pectinata* Sm. (syn.: *Humata pectinata* (Sm.) Desv.) - Nicobar Islands; Malesia and Oceania.

*402. *Davallia heterophylla* Sm. (syn.: *Humata heterophylla* (Sm.) Desv.) - Nicobar Islands; S.E. Asia to Oceania.

Rare

403. *Araiostegia hymenophylloides* (Blume) Copel. (syn.: *Davallodes hymenophylloides* (Blume) M.Kato & C.Tsutsumi (2008, in press)) - Sri Lanka; S. India; ?far N.E. India (?Nagaland; ?Meghalaya). Reports in some N.E. Indian fern Floras were probably in error; it was also reported recently from Darjeeling in error.

404. *Araiostegiella hookeri* (T.Moore *ex* Bedd., 1866) Fras.-Jenk. (2008a, in press) (syn.: *Acrophorus hookeri* T. Moore *ex* Bedd. (1866); *Leucostegia hookeri* (T.Moore *ex* Bedd.) Bedd. (1883); *Araiostegia hookeri* (T. Moore *ex* Bedd.) Ching; *Davallia clarkei* Baker, *nom. superfl*. for *Acrophorus hookeri* T.Moore *ex* Bedd.; *Araiostegia clarkei* (C. Chr.) Copel.; *A. hopei* Panigrahi & S.K.Basu; *Araiostegiella clarkei* (Baker) M.Kato & C.Tsutsumi, 2008, in press) - N.W. India (Himachal Pradesh; Uttarakhand); Nepal; N.E. India (W. Bengal, Darjeeling; Sikkim). Although Beddome later said that his *A. hookeri* (*t*. 95), *i.e.* his specimen from Khasia, was a synonym of what is now called *Gymnogrammitis dareiformis* (Hook.) Ching *ex* Tardieu & C.Chr., this cannot be accepted as correct as he originally cited Moore's name, clearly described and figured the indusia and also included a W. Himalayan locality for *A. hookeri*. In particular, he treated *G. dareiformis* separately (*t*. 174) and explicitly contrasted it to the indusiate *A. hookeri*. The main and central part of his concept of *A. hookeri* was therefore of the indusiate species and not of *G. dareiformis*. It must be lectotypified by the Sirmur specimen he cited, in agreement with the protologue. The full frond he illustrated without sori, but not the detailed drawings with indusia, was *G. dareiformis* from Khasia, but cannot alter the application of the name itself to the indusiate species. As Baker's protologue of *A. clarkei* also cited Moore's *A. hookeri* and again described the indusia it must be the same as Beddome's *A. hookeri* and is a superfluous name for it (see Fraser-Jenkins, 2008a, in press). This species should not therefore be called *A. clarkei*, as was done in contrast to normal Indian usage by Nooteboom (1994).

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405. *Araiostegiella perdurans* (Christ) M.Kato & C.Tsutsumi (2008, in press) (syn.: *Araiostegia perdurans* (Christ) Copel.; *Araiostegia parvipinnula* (Hayata) Copel.; *Araiostegia parva* (C. Chr.) Ching) - N.E. India (Sikkim; Arunachal Pradesh); Bhutan. Mistakenly sunk by Nooteboom (1994) into *A. hookeri* (above), under the name *Davallia clarkei* Baker, but *A. perdurans* is a distinct and much larger plant with a thicker rhizome and more finely dissect frond.
406. *Davallia assamica* (Bedd.) Baker (syn.: *Humata assamica* (Bedd.) Diels.) - far N.E. India (Arunachal Pradesh; Nagaland).
407. *Davallia denticulata* (Burm.f.) Mett. *ex* Kuhn (syn.: *Wibelia denticulata* (Burm.f.) M.Kato & C.Tsutsumi, 2008, in press) - Sri Lanka; Andaman Islands; Nicobar Islands; S. India.
408. *Davallia divaricata* Blume (syn.: *Araiostegia divaricata* (Blume) M.Kato; *Wibelia divaricata* (Blume) M.Kato & C.Tsutsumi, in press) - far N.E. India (Assam; Arunachal Pradesh; Manipur; Meghalaya).
409. *Davallia repens* (L.f.) Kuhn, *nom. cons*. (syn.: *Humata repens* (L.f.) Diels; *Davallia pedata* Sm.) - Sri Lanka; Andaman Islands (Dixit and Sinha, 2001); S. India; N.E. India (Sikkim; Nagaland; Meghalaya; Mizoram); S.E. Asia; Australia and Oceania.
410. *Davallia solida* (G.Forst.) Sw. - Andaman Islands and Nicobar Islands; far N.E. India (Meghalaya); Myanmar; Thailand; S.E. Asia and Australia.

Blechnaceae

At risk

411. *Blechnum finlaysonianum* Hook. & Grev. - Andaman Islands and Nicobar Islands (Dixit and Sinha, 2001); Thailand; S.E. Asia; New Guinea.
*412. *Blechnum melanopus* Hook. (syn.: *Blechnidium melanopus* (Hook.) T.Moore - very rare. Far N.E. India (Meghalaya); China; Taiwan.
*413. *Blechnum melanocaulon* (Brack.) T.C. Chambers & P.A. Farrant subsp. *pallens* T.C. Chambers & P.A. Farrant, *Blumea* 46: 283-350 (2001) (*B. colensoi* and *B. patersonii sensu auct. Ind., non* (Hook.) Wakef. and (R.Br.) Mett. respectively) - very rare. Sri Lanka; S. India; Malesia to Oceania.

Near-threatened

414. *Brainea insignis* (Hook.) J.Sm. (syn.: *Blechnum insigne* (Hook.) C.M.Kuo) - far N.E. India (Meghalaya, locally abundant, partly fire-resistant); Myanmar; S. China; Malesia.

Marsileaceae

Marsilea in India is in a similar state of confusion to *Isoetes*, with a number of taxa reported and new taxa described but all requiring verification as to whether they constitute genuinely distinct species, which is probably rather unlikely. Most of the new names have been treated as if endemic to India, or to small regions within India, and have been said to be rare or endangered, but this is somewhat meaningless until they have been properly identified and assessed on an international scale in Asia (*i.e*. as was carried out by Launert in Africa). They have not been classified here as to their threatened status. The names reported are listed below with some preliminary synonymisation carried out by Fraser-Jenkins (1997). The two common species that are definitely present in India, as also in Africa, are the widespread *M. minuta* L. and the more southerly Indian *M. coromandelina* Willd., though *M. aegyptiaca* is also present and *M. condensata* may perhaps also be accepted as a good species present in India. Reports of the European species, *M. quadrifolia* L. (syn.: *M. coromandelica* Burm.f., *nom. superfl. illeg.*), from Kashmir *etc*. refer to *M. minuta*, as do those of the distinct Philippine and Australian species, *M. crenata* C.Presl. Launert (1968) has pointed out that the great variability of *M. coromandelina* and *M. minuta* has caused students much difficulty and misunderstanding.

Marsilea aegyptiaca Willd. - a good species from Africa and India (W.C. and E.C. India).
Marsilea ballardii Gupta = *M. aegyptiaca*. W.C. India (Rajasthan).
Marsilea ballardii var. *rajasthanensis* (Gupta) S.Almeida & M.Almeida (syn.: *M. rajasthanensis* Gupta; *M. rajasthanensis* var. *ballardii* (Gupta) Gupta, *comb. inval.*) = *M. aegyptiaca*. W.C. India (Rajasthan).
Marsilea brachycarpa A.Braun = *M. minuta*. S. India.
Marsilea brachypus A.Braun = *M. minuta*. S. India.
Marsilea condensata Baker. W.C. India (Rajasthan).
Marsilea coromandelina Willd. S. India.
Marsilea diffusa Lepr. *ex* A.Braun (cultivated) = *M. minuta*.
Marsilea gracilenta A.Braun = *M. minuta*. S. India.
Marsilea kedarmalii Bhardwaja, Gena & D'Souza = ?*M. coromandelina*. S. India.
Marsilea maheshwarii Gopal = *M. minuta*. S. India.
Marsilea major (Haines) N.P.Chowdhury = *M. minuta*. N.C. India (Bihar).
Marsilea minuta L. Throughout India.
Marsilea minuta var. indica Gupta = *M. minuta*. W. India (Maharashtra).
Marsilea poonensis Kolhatkar. W. India (Maharashtra, Pune).

NON-THREATENED TAXA REPORTED IN ERROR

In the course of preparation of this work 84 taxa which are either synonyms or are in some other way not threatened in India have been found to have been

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included in earlier works (Jain, 1980; Dixit, 1983; Datta, 1983; Bir, 1987, 1988; Nayar and Sastry, 1987, 1988, 1990; IUCN, 1998). These are listed below, though it should be noted that a number of additional species from this list were reported as Endangered whose status we have changed above to Near-threatened or Rare. In addition, reference has been made below as well as under each relevant genus above to the 44 Indian species reported in IUCN's (1998) Red List, based on various local reports, of which just over half were neither threatened nor rare. These taxa need to be deleted from present or future publications concerning India.

1. *Angiopteris evecta* (G. Forst.) Hoffm., from Tahiti - error for *A. indica* Desv. and *A. helferiana* C. Presl (Fraser-Jenkins, 2008a, in prep.), neither of which is threatened or rare.
2. *Arachniodes aristata* (G. Forst.) Tindale - neither threatened nor rare, though not a very common species.
3. *Araiostegia delavayi* (Bedd. *ex* C.B. Clarke & Baker) Ching - synonym of the common *A. pulchra* (D. Don) Copel., not, as tentatively placed by Fraser-Jenkins (1997) pending study of its type, of *A. beddomei* (C. Hope) Ching (see Fraser-Jenkins, 2008a, in press).
4. *Araiostegia pulchra* (D. Don) Copel. (syn.: *A. pseudocystopteris* (Kunze) Copel.) - abundantly common in N., C. and S. India wherever there is a reasonable rainfall.
5. *Arthromeris repandula* Ching - synonym of *A. mairei* (Brause) Ching, which is common and widespread in the Himalayan region.
6. *Asplenium cheilosorum* Kunze *ex* Mett. - rather common in most of N. and S. India.
7. *Asplenium* x *breynii* K. Koch - synonym of the spontaneous, sterile hybrid, *A.* x *alternifolium* Wulfen (below).
8. *Asplenium* x *germanicum* Weiss, *nom. inval*. (syn.: *A.* x *germanicum* Asch. & Graebn., *A.* x *breynii* Retz., *nom. illeg.*, *A.* x *breynii* K. Koch) - synonym of *A.* x *alternifolium* Wulfen and merely a spontaneous sterile hybrid (*A. septentrionale* (L.) Hoffm. subsp. *septentrionale* x *A. trichomanes* L. subsp. *trichomanes*), so cannot be treated as if a threatened or rare species.
9. *Asplenium unilaterale* Lam. - at least *sensu* Bir, is generally common. True *A. unilaterale* is uncommon in N. India and generally confused with other related species in Sect. *Hymenasplenium*.
10. *Asplenium unilaterale* Lam. var. *delicatulum* Parish *ex* Bedd. - synonym of the common species, *A. amoenum* C.Presl (Fraser-Jenkins, 2008, in press).
11. *Asplenium unilaterale* var. *udum* Atk. *ex* Bedd. - synonym of *A. amoenum* C.Presl.
12. *Azolla pinnata* R.Br. - actually *A. pinnata* subsp. *asiatica* R.M.K.Saunders & K.Fowler, abundant and widespread over large areas in India and Asia.
13. *Belvisia callifolia* (Christ) Copel. - synonym of *B. mucronata* (Fée) Copel., but only *B. henryi* (Hieron. *ex* C.Chr.) Raymond is certainly known in India, in the Himalaya (Hovenkamp and Franken, 1993).
14. *Blechnum orientale* L. - one of the commonest and most widespread eastern and southern Indian species.
15. *Botrychium lanuginosum* Wall. *ex* Hook. & Grev. - abundant in the Central and Eastern Himalaya at the upper-mid altitude level.
16. *Ceratopteris thalictroides* (L.) Brongn. - a common species of sluggish streams and a widespread weed in rice-fields. In Masuyama's (2007 and in press) recent revision of the species aggregate in Asia the Himalayan tetraploid, also present in other parts of India etc., is recognised as a distinct entity with a distinct morphology, especially in its stipe to blade length, which may be appropriately treated at the specific rank
17. *Christella clarkei* (Bedd.) Holttum - synonym of *Thelypteris clarkei* (Bedd.) C.F.Reed, common throughout the Himalaya from C. Nepal eastwards and in China *etc*. It was formerly known under its synonym, *T. cylindothrix* (Rosenst.) K.Iwats. (see Fraser-Jenkins, 1997). IUCN (1998) listed it from Sikkim only, as Vulnerable, due to taxonomic error in separating it from *T. cylindothrix*.
18. *Christella* x *kumaunica* Holttum, *pro sp*. - synonym of *Thelypteris* x *kumaunica* (Holttum) Fras.-Jenk., a spontaneous sterile hybrid with abortive spores, presumably between *T. arida* (D.Don) C.V.Morton and ?*T. jaculosa* (Christ) Panigrahi, not relevant to the concept of threatened species. IUCN (1998) listed it as a species from Kumaon (Uttarakhand) as Vulnerable.
19. *Coniogramme indica* Fée - synonym of *C. fraxinea* (D.Don) Fée *ex* Diels (see Fraser-Jenkins, 1997); a very common and widespread species in N. and S. India; Nepal; Bhutan *etc*. IUCN (1998) listed *C. indica* from N.E. India only, as Endangered.
20. *Crepidomanes insigne* (Bosch) S.H.Fu - synonym of *Trichomanes latealatum* (Bosch) Christ, very common and widespread.
21. *Cryptogramme gracilis* (Michx.) Clute - synonym of *C. stelleri* (S.G.Gmel.) Prantl, rather common at high altitude throughout the Himalaya.

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22. *Cyathea decipiens* (J.Scott *ex* Bedd.) C.B. Clarke & Baker - synonym of *C. spinulosa* Wall. *ex* Hook., rather common in N. and S. India.
23. *Cyathea gigantea* (Wall. *ex* Holttum) Holttum - a rather common species throughout much of India.
24. *Cyathea latebrosa* (Hook.) Copel. - error for *C. khasyana* (T.Moore *ex* Kuhn) Domin, vulnerable, occurring in N.E. India *etc*.
25. *Cyathea ornata* (J.Scott *ex* Bedd.) Copel. - synonym of *C. khasyana* (T.Moore *ex* Kuhn) Domin, near-threatened, occurring in N.E. India *etc*.
26. *Cyathea spinulosa* Wall. *ex* Hook. - rather common species in N. and S. India.
27. *Cyclogramma squamaestipes* (C.B.Clarke) Tagawa - synonym of *Thelypteris squamaestipes* (C.B.Clarke) Ching, scattered but fairly common from C. Nepal eastwards into China. IUCN (1998) listed *C. squamaestipes* from Sikkim only, as Rare.
28. *Cyrtomium microindusium* Sa.Kurata - synonym of *Cyrtomium anomalum* (Zenker) Fras.-Jenk. (2008a, in press), common throughout N. India; Nepal; Bhutan *etc*. and present in S. India (rare). IUCN (1998) listed *C. microindusium* from Japan only, as Vulnerable.
29. *Davallia membranulosa* Wall. *ex* Hook. (syn.: *Paradavallodes membranulosum* (Wall. *ex* Hook.) Ching), *i.e. Davallodes membranulosa* (Wall. *ex* Hook.) Copel. - a common species in the C. and E. Himalaya.
30. *Dennstaedtia elwesii* (Bedd.) Bedd. - synonym of *D. appendiculata* (Wall. *ex* Hook.) J.Sm. (see Fraser-Jenkins, 1997), W. Himalaya and very common throughout the C. and E. Himalaya *etc*.
31. *Deparia boryana* (Willd.) M.Kato (syn.: *Dryoathyrium boryanum* (Willd.) Ching) - an abundantly common and widespread species, though the S. Indian representatives belong to a distinct taxon.
32. *Dicranopteris linearis* var. *sebastineana* ["*sebastiana*"] Panigrahi & R.D.Dixit - synonym of the common and widespread N. and S. Indian, Chinese *etc*. *D. taiwanensis* Ching & P.S. Chiu (see Fraser-Jenkins, 1997). IUCN (1998) listed var. "*sebastiana*" from S. India only, as Vulnerable.
33. *Doodia aspera* R.Br. - a diploid species native to Australia not present in the Indian subcontinent. Reports from S. India are in error for the adventive tetraploid Australian species, *D. caudata* (Cav.) R.Br., also naturalised in Sri Lanka. But a second Sri Lankan and Javan native species is *D. dives* Kunze (Parris, 2006-7).
34. *Drynaria mollis* Bedd. - very common W. and E. Himalayan species of highish altitude.
35. *Drynaria propinqua* (Wall. *ex* Mett.) J. Sm. *ex* Bedd. - abundantly common and widespread species, throughout the Himalaya, and on trees in Kathmandu; Darjeeling *etc*.
36. *Drynaria quercifolia* (L.) J.Sm. - the commonest, abundant low-altitude *Drynaria*, in large numbers on trees and walls, even in cities, from C. Nepal eastwards and in N. and S. India.
37. *Dryopteris gamblei* (C.Hope) C.Chr. (syn.: *D. darjeelingensis* Fras.-Jenk.) - common throughout the Himalaya from Kumaon (Uttarakhand) to Nepal; Bhutan; China *etc*. (Fraser-Jenkins, 1997). IUCN (1998) listed it from N.E. India and Bhutan only, as Vulnerable.
38. *Dryopteris sparsa* (D.Don) Kuntze - common and widespread in N. India from Kumaon eastwards to China; Myanmar; Thailand and S.E. Asia; E. to the Philippines and N. Australia (as subsp. *sparsa*) and in S. India; the E. Indo-Himalaya; China and S. Japan as subsp. *rectangularis* Fras.-Jenk. (2008a, in press). IUCN (1998) listed *D. sparsa* from Australia only, as Rare.
39. *Equisetum arvense* L. - common in the N.W. and W. Himalaya and reaches as far E. as N.W. Nepal, well into or behind the Himalayan main ranges.
40. *Equisetum ramosissimum* Desf. - abundant throughout India with many, often more westerly-Himalayan plants matching the European, while others mainly, but not exclusively further east and in the south, match the smoother-stemmed form previously known as *E. debile* Roxb. *ex* Vaucher, or *E. ramosissimum* subsp. *debile* (Roxb. *ex* Vaucher) Hauke, which are synonyms of *E. ramosissimum*.
41. *Isoetes coromandelina* L.f. subsp. *coromandelina* - fairly common and widespread throughout most of India.
42. *Isoetes rajasthanensis* Gena & Bhardwaja - a dubious species requiring further study.
43. *Isoetes reticulata* Gena & Bhardwaja - a dubious species requiring further study.
44. *Isoetes tuberculata* Gena & Bhardwaja - synonym of the fairly common and widespread *I. coromandelina* L.f.
45. *Lycopodiella cernua* (L.) Pic.Serm. - a common species throughout most of India, often in secondary habitats such as roadsides roadsides, not under any threat.
46. *Lycopodium clavatum* L. - this boreal N. American and European species is not present in India where it is entirely replaced by the common species, *L. japonicum* Thunb., common and

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widespread even though over-collected for adorning gates *etc*.

47. *Lycopodium hamiltonii* Spreng. - synonym of *Huperzia hamiltonii* (Spreng.) Trevis., which is common in higher-mid altitude forest and even degraded forest areas in the W., C. and E. Himalaya and in S. India.
48. *Lycopodium lucidulum* Michx., synonym of *Huperzia lucidula* (Michx.) Trevis., from N. America only - misapplied by Clarke and others to *Huperzia herteriana* (Kümmerle) T.Sen & U.Sen, which is rather common at higher altitude in the E. Indo-Himalaya *etc*.
49. *Lycopodium setaceum* D.Don - synonym of *Huperzia pulcherrima* (Wall. *ex* Hook. & Grev.) Pic.Serm., common in the W., C. and E. Himalaya *etc*.
50. *Lycopodium setaceum* D.Don var. *subulifolium* (Wall. *ex* Hook. & Grev.) C.B.Clarke - synonym of *Huperzia subulifolia* (Wall. *ex* Hook. & Grev.) Trevis., common from Kumaon eastwards, which may perhaps only be a growth-form of *H. pulcherrima*, requiring further study.
51. *Lycopodium serratum* Thunb. - synonym of *Huperzia serrata* (Thunb.) Rothm., which is of local, but rather common occurrence in the C. and E. Himalaya *etc*.
52. *Mecodium exsertum* (Wall. *ex* Hook.) Copel. - synonym of *Hymenophyllum exsertum* Wall. *ex* Hook., one of the commonest Filmy Ferns, abundant in the Himalayan region, except the far west.
53. *Mecodium javanicum* (Spreng.) Copel. - synonym of *Hymenophyllum javanicum* Spreng., a common species in the Indo-Himalaya and also in S. India.
54. *Mecodium polyanthos* (Blume) Copel., synonym of *Hymenophyllum polyanthos* Sw. from C. and S. America - error for *Hymenophyllum tenellum* D.Don, the commonest Indian Filmy Fern, abundant and widespread throughout India (Fraser-Jenkins, 2008a, in prep.).
55. *Metathelypteris decipiens* (C.B.Clarke) Ching - synonym of *Thelypteris decipiens* (C.B.Clarke) Ching, common from E. Nepal eastwards to China *etc*. Listed by IUCN (1998) from Darjeeling and Meghalaya only, as Rare.
56. *Microsorum linguaeforme* (Mett.) Copel. from S.E. Asia - this was reported as an exotic adventive, escaped from cultivation in S. India, with two of the three localities merely being cultivated plants. Not native and thus hardly to be considered as a threatened species.
57. *Microsorum normale* (D. Don) Ching (syn.: *Neocheiropteris normalis* (D. Don) Tagawa, *Tricholepidium normale* (D.Don) Ching) - a rather common species in Nepal and N.E. India *etc*.
58. *Microsorum punctatum* (L.) Copel. - a very common and widespread species in N.E. and S. India.
59. *Ophioglossum costatum* R.Br. - uncommon, but scattered over a wide area and often overlooked, though reported from the W. Himalaya in error.
60. *Ophioglossum petiolatum* Hook. - a common taxon in mountain areas throughout N. and C. India and also present in the South. Due to variation in shape Wieffering (1964) thought it to be a developmental form of *O. reticulatum* L. with more pointed and less cordate-based sterile fronds, but it appears to be a distinct species.
61. *Ophioglossum reticulatum* L. - a very common and widespread species throughout India.
62. *Ophioglossum vulgatum* L. - a mainly European species, not present in India, though often reported in error for *O. reticulatum*.
63. *Osmunda cinnamomea* L. - a common species throughout the Indo-Himalaya, occurring as subsp. *vestita* (Wall. *ex* Milde) Å.Löve & D.Löve.
64. *Peranema cyatheoides* D.Don - a common species in the C. and E. Himalaya, from Kumaon eastwards.
65. *Platycerium alcicorne* (Willem.) Desv. - this is an African species, cultivated widely in Asia, including India and Nepal, but has not become adventive. Reports from N.E. India are in error for the species At risk, *P. wallichii* Hook., which Wallich called *P. alcicorne* Wall., *nom. nud*.
66. *Phymatopteris stracheyi* (Ching) Pic.Serm. - synonym of the very common and widespread *P. quasidivaricata* (Hayata) Pic.Serm.
67. *Pseudocyclosorus gamblei* Holttum & J.W.Grimes - synonym of *Thelypteris tylodes* (Kunze) Ching, common throughout the Himalaya and in S. India; China *etc*. IUCN (1998) listed *P. gamblei* from S. India only, as Endangered.
68. *Pseudocyclosorus griseus* (Baker) Holttum & J.W.Grimes - synonym of *Thelypteris ochthodes* (Kunze) Ching; common throughout S. India and probably also present in the N.E. and Myanmar. IUCN (1998) listed *P. griseus* from S. India only, as Endangered.
69. *Pseudodrynaria coronans* (Wall. *ex* Mett.) Ching - synonym of *Aglaomorpha coronans* (Wall. *ex* Mett.) Copel., a common lower-altitude species from Nepal eastwards through all N.E. India.
70. *Pteris confusa* T.G.Walker - synonym of *P. arisanensis* Tagawa, common from Nepal

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eastwards and in S. India and Sri Lanka. IUCN (1998) listed *P. confusa* from Sri Lanka only, as Indeterminate.

71. *Pteris gongalensis* T.G. Walker - perhaps confined to Sri Lanka, though also reported from S. India. IUCN (1998) listed it from Sri Lanka only, as Indeterminate.
72. *Salvinia natans* (L.) All. - a western element reaching N. Pakistan and N.W. India (the lakes of Indian Kashmir), but neither rare nor threatened there. Its apparent demise and die-back, said to be due to pollution of, among others, the Dal Lake, is a natural annual phenomenon every Autumn, followed by regrowth from spores in Spring. It also occurs in the N.E. and S. of India, but is often confused with the widespread adventive, *S. molesta* D.S.Mitch., or with the rarer, N.E. Indian *S. cucullata* Roxb. *ex* Bory. The species are easily distinguished in the living state by the arrangement of the hairs on the upper surface of the leaf and by the sporangiophores.
73. *Selaginella rajasthanensis* Gena, Bhardwaja & A.K. Yadav. - synonym of the rather common and widespread *S. reticulata* (Hook. & Grev.) Spring.
74. *Selaginella monospora* Spring. - this is one of the commoner, more widespread and abundant species, covering large areas in the E. Himalaya.
75. *Stenochlaena palustris* (Burm.f.) Bedd. - very common throughout NE India, from S.E. Nepal eastwards, also in S. India, including in secondary habitats.
76. *Trichomanes schmidianum* Zenker *ex* Taschner (syn.: *Crepidomanes schmidianum* (Zenker *ex* Taschner) K.Iwats., *Trichomanes latifrons* Bosch) - fairly common from the C. and E. Himalaya and present in S. India.

77-79. *Trigonospora angustifrons* Sledge, *T. glandulosa* Sledge and *T. zeylanica* (Ching) Sledge, all described from and said to be endemic to Sri Lanka - probably all minor forms and synonyms of *Thelypteris calcarata* (Blume) Holttum, from S. India and Sri Lanka. IUCN (1998) listed all three from Sri Lanka only, as Indeterminate.

80. *Trigonospora obtusiloba* Sledge, described from Sri Lanka as if endemic - probably a synonym of *Thelypteris caudipinna* Ching, which is fairly common in N. and S. India and Sri Lanka. IUCN (1998) listed it from Sri Lanka only, as Indeterminate.
81. *Vittaria flexuosa* Fée - a very common and widespread species.
82. *Vittaria garhwalensis* R.D.Dixit - synonym of *V. flexuosa* (above). A highly immature, small specimen.
83. *Vittaria himalayensis* Ching - synonym of *V. taeniophylla* Copel., common from the W. to E. Himalaya; China; Taiwan and S.E. Asia to the Philippines.
84. *Woodsia andersonii* (Bedd.) Christ - scattered but not rare, from the W. and E. Himalaya of India; Nepal; Bhutan; Tibet and S.W. China. IUCN (1998) listed it from Kumaon only, with its world-status as Extinct or Endangered.

CONCLUDING REMARKS

Between one third and a half of Indian Pteridophyte-species appear to be under threat or rare and in a number of cases these species were described as common, or relatively so, in the "classical" works of Beddome, Clarke and Hope from the late 19th century. It therefore appears that a considerable decline has occurred since that time, the main cause of which is undoubtedly the ever-increasing level of deforestation throughout the region. Approximately 15% (16-17%) or *c*. one sixth of Indian Pteridophyte species are Critically endangered and thus very rare species which are very seldom seen. Of the Critically endangered species, the present study combined with Fraser-Jenkins (2008b, in press) has allowed us to identify 13 species to be considered of top priority, being Indian endemics, which as they exist nowhere else, will be permanently eliminated from the world's biodiversity resources if they become extinct in India. The particular habitats and localities of these species should therefore be made an urgent and special study of, including locality-mapping, and specifically targeted by State Governments *etc*. for immediate and strict conservation. Cases also need to be submitted for their official inclusion in the IUCN Red-List. These species are:

Selaginella cataractarum Alston - Tamil Nadu.
Arthromeris notholaenoides V.K. Rawat & Fras.-Jenk. - Arunachal Pradesh.
Oreogrammitis austroindica (Parris) Parris - Tamil Nadu.
Asplenium exiguum Bedd. - Tamil Nadu.
Thelypteris didymochlaenoides (C.B. Clarke) Ching - Meghalaya.
Thelypteris namburensis (Bedd.) C.F. Reed - Assam; Arunachal Pradesh.
Dryopteris austroindica Fras.-Jenk. - Tamil Nadu.
Polystichum manickamianum Benniamin, Fras.-Jenk. & Irud. - Tamil Nadu.
Polystichum polyodon Wall. *ex* Ching - Meghalaya.

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Polystichum subinerme (Kunze) Fras.-Jenk. - Kerala; Tamil Nadu.

Tectaria subconfluens (Bedd.) Ching - Meghalaya.

Elaphoglossum nilgiricum Krajina *ex* Sledge - Kerala; Tamil Nadu.

Elaphoglossum stigmatolepis (Fée) T.Moore - Tamil Nadu.

These specially targeted species may increase slightly in number following further taxonomic revision of some of the dubious species mentioned above. They will also increase if studies in neighbouring countries reveal that non-endemic species which are Critically endangered in India are in the same state in all the other Countries in which they occur, and thus that their World-wide status is tenuous and critical. It must also be of concern that no less than 27 out of the 46 currently accepted political Indian endemic Pteridophytes appear in the present list as threatened species of one category or another.

As yet, effective solutions have not been found to combat this common world-wide problem, though the first step is obviously to inculcate public awareness of the extent of the problem, which has gradually begun to be generally appreciated. Pteridophyes are no exception to the general pattern and as many of them are forest-dwelling species they can be taken as good indicators of the extent of the problems of deforestation and habitat-destruction. It is to be hoped that effective measures may be increased to create a network of strict sample-reserves throughout the nation, properly protected against grazing, disturbance and deforestation, which currently continue to affect reserves despite their apparent protected status. Other methods intended to promote conservation, such as the international Convention on Biodiversity, are generally irrelevant to actual conservation on the ground in most scenarios apart from commercially exploited species.

In preparing the present assessment it rapidly became obvious that considerable nomenclatural revision required to be incorporated in order to avoid synonyms being treated as if separate species and to ensure correct naming. We have therefore taken steps to incorporate recent revision carried out locally and internationally by various authors. However we have been unable to assess all the species of two genera, *Isoetes* and *Marsilea*, due to the unclear taxonomic status of many recently described taxa within them. All the apparent species of these two genera reported from India have therefore been listed without classification in terms of threat or rarity. Taxonomic revision has resulted in one new combination and two *nomina nova* being validated here, while others in press are referred to in the list.

As a result of recent revision of Indian endemic species, we have accepted only 27 endemics and possible endemics among the threatened and rare pteridophytes of political India, which is a much lower figure than was previously published. This is in keeping with less than 10% of reported endemics being accepted by Fraser-Jenkins (2008b, in press).

Greater precision and some further additions should result from taxonomic reinvestigation of some dubious species and from future botanical exploration in botanically rich, but under-collected areas of the Country, particularly in the less known further North-Eastern region of India.

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印度受威脅蕨類植物狀況總覽

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摘　　要

作者根據田野調查的結果，以及參考現有標本館藏標本、出版文獻的資料，評估印度境內生存受威脅的稀有蕨類植物，將其歸類於不同的稀有程度等級。本研究提供這些稀有物種在印度的分布資料，除此之外，也提供部份的印度境外分布資料。作者採用現代分類學的概念及命名法則。本研究顯示分布於印度境內 950-1000 種蕨類植物中，有 414 種正受到生存威脅或是極為稀有（219 種瀕危，包括 160 種嚴重瀕臨滅絕；82 種接近受威脅，113 種稀有），約占印度蕨類總數的 41-43%。84 種過去被認為稀有的種類，在此評估排除在面臨威脅名單之外。本研究報告提出一萊蕨屬新組合，以及鐵角蕨屬、金星蕨屬的新替代名稱，並將其合法化（*Leptochilus pothifolius* (D.Don) Fras.-Jenk., *Asplenium rivulare* Fras.-Jenk. and *Thelypteris chandrae* Fras.-Jenk.）。

關鍵詞：蕨類植物、蕨類、印度、受威脅、瀕危、稀有、分類學、特有種、新名稱。

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