Research in Ceylon Floristics and Taxonomy — a survey

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Introduction

The richness of the Ceylon Flora and its significance to asiatic botany are well known. Fosberg (1969), the doyen of island floras, makes this relevant acknowledgement: "Scientifically the Ceylon Flora is one of the most important in the tropics. Ceylon is the type locality of a great many of the wide-spread plants of the tropics, and the original home of some of them. It is a complex flora, including the majority of the families of plants, and is of great phytogeographic importance." Comments such as Fosberg's are not without foundation. Phylogenetically, the Ceylon Flora exemplifies quite a few of the more primitive families, e.g. the Magnoliaceae, Ranunculaceae and Dilleniaceae. Besides, because of its former geological connections with the Indian mainland and the Malaysian Peninsula, the island bears a flora which shows close affinities with that of these asiatic regions. The most significant feature, perhaps, of this flora is its relatively high degree of endemism — 24% (Peeris, 1976) — which gives it a decided richness "probably greater than that of the Indian Peninsula of the same area." (Trimen, 1885). This feature, coupled with its species diversity of 0.12 (Good, 1969) relative to its surface area, imparts to the Ceylon Flora the distinctive mark of individuality and naturalness.

Such features of rare interest invariably offer the botanist a wide scope for research in the Ceylon Flora. The account that follows evaluates the consequent attempts made during a long historical period of botanical endeavour in the country.

Early attempts

Already during the Dutch occupation of the island Paul Hermann, a physician of the Dutch East India Company, began the first investigations into the Ceylon Flora. His collections, chiefly from the coastal regions, accumulated into a bound herbarium of 4 volumes and inspired Hermann to publish it (1717) as the *Museum Zeylanicum*. Many years later Hermann's herbarium reached Carl Linnaeus who used it (1747) as the basis of his *Flora Zeylanica*. The publication gave Ceylon the singular honour of having its first Flora written by the renowned Swedish botanist himself! A few of these plants described by Linnaeus in the *Flora Zeylanica* were later documented as types of his species listed (1753) in the *Species Plantarum*.

Such early attempts at the study of the Ceylon Flora were necessarily very circumscribed; and the vast range of its complexity had yet to be discovered.

Later attempts

These may be considered to have been confined to the early phase of British colonialism in the country. They were, therefore, entirely illustrative of British endeavour of the nineteenth century. At the time the natural environment (except where British plantations had taken over the land) was as yet largely undisturbed and the indigenous plants faced little danger of extinction or of restricted distribution. The setting, therefore, was ideal for original research and inspired dedicated work as exemplified by the efforts of the first band of botanists from England. These really set the pace of interested research and exposed to the scientific world the floristic wealth of the colony.

The colonial botanists first set about the task of exploration. The sampling collections from the field helped to build up the original herbarium on which future research was to be based. Pioneer collectors from Moon, Walker and Gardner to Thwaites and Trimen made tours into various parts of the country and deposited their collections in the herbarium at Peradeniya. These specimens formed the nucleus of the *C. P.* (Ceylon Plants) *Collections* which still form the better part of the National Herbarium. Unfortunately, such collections reveal one drawback. By modern standards they were not adequately documented.

Initially research by the early British botanists was slight and did not go beyond the preparation of a list of plants and of some isolated papers for publication. This was reflected in the work of Alexander Moon and George Gardner. Moon built up a fairly large herbarium at Peradeniya and his work could only produce (1824) *A catalogue of the indigenous and exotic plants in Ceylon*. Gardner, however, showed a more scientific bent of mind. His investigations brought out real, floristic data which he published (1845—47) as *Contributions towards a Flora of Ceylon*.

In successive years more tangible progress attended research by these pioneer botanists. There was, in fact, an increased tempo of taxonomic activity with the arrival of more qualified men like G. H. K. Thwaites. An academic training helped Thwaites to produce research of quality. He made extensive tours in the country and with his systematic acumen put order into the various C.P. collections. Aided by original observations in the field he closely studied the flora as represented in these collections. Finally he published (1858—64) this wide knowledge in his *Enumeration plantarum Zeylaniae*. For its time this was acknowledged

to be a comprehensive and modern flora of a tropical country. In this work, besides, Thwaites established his reputation as a taxonomist of merit by his creation of 37 endemic genera and about a double of the number of endemic species. He recognized in addition, a number of varieties naming them only by Greek symbols. Though some of these species have been transferred to more appropriate genera most of them are valid even today. Modern taxonomy has confirmed his taxonomic judgments by recognizing his varieties not only as valid new taxa but even as worthy of being raised to specific rank!

The more prolific taxonomic activity, however, of the nineteenth century coincided with the research of Henry Trimen, successor of Thwaites as director of the Peradeniya Gardens. Trimen augmented the collections of the Peradeniya Herbarium and identified much of this material. Consequent on his field observations and laboratory dissections he published a series of separate, well documented papers on the Flora of the country. One which especially showed the depth of his comprehension of the indigenous flora was (1885) *Remarks on the composition, affinities and origin of the Ceylon Flora*. In keeping with the floristic traditions of the nineteenth century Trimen finally produced (1893—1900) a national flora — *A Handbook to the Flora of Ceylon*.. The scientific world claimed this to be the finest production of its time of a tropical flora. On its part the voluminous publication (5 Parts) proved that Ceylon angiosperm taxonomy was in a progressive state of investigation.

Till recently, Trimen's opus magnum remained the standard reference on the plants of Ceylon. It transformed our early knowledge of the indigenous plants and might justly be called a magisterial work. Its 5 parts alone speak of a broad spectrum of knowledge representative of 192 families. At the end of the nineteenth century Trimen's Flora marked a significant progress in taxonomic research.

Such efforts of the latter half of the nineteth century went to make the great period of enlightenment in Ceylon systematics; and Thwaites and Trimen were its chief architects.

The beginning of the twentieth century set a further stage in Ceylon systematics. This began with the appointment of J. C. Willis as Director of the Peradeniya Gardens, after the demise of Trimen. Willis actually initiated a different emphasis in research in the indigenous flora as he realized that for this period the Ceylon Flora was sufficiently investigated into. However, he only reassessed (1911) the systematics and nomenclature in Trimen's Flora and then directed the major thrust of his research to studying some of the deeper aspects of this flora such as its endemism and biosystematics. He thus produced (1915) an original study of the Ceylon endemics. This was to prove useful later in developing his own theory (1922) on the distribution of indigenous plants.

During Willis' tenure of service research in Ceylon systematics led to the establishment of the first scientific journal. This was the *Annals of the Royal Botanic Gardens, Peradeniya*. Its first issue appeared in June 1901 under Willis' editorship and provided an outlet for better taxonomic work. Willis himself led the initiative by producing (1902) the first monograph of a plant group of Ceylon in which he added a new genus, *Farmeria*, to the long list of Ceylon endemics. The work is an example of a critical monographic study.

The foregoing period of research spanned an endeavour of remarkable achievement. It led to creating the nucleus of a valuable herbarium and had produced two major recognized works — Thwaites' *Enumeratio* and *Trimen's Flora*. These set the sound foundation for further systematic research in the country. Such remarkable achievement was made possible by the pioneer British botanists who well deserve a tribute of praise and gratitude.

Modern attempts

The modern period of Ceylon floristics may be said to have commenced about the first quarter of the twentieth century. Research in the first half of this period was animated largely by the efforts of two British botanists. The first of these was T. Petch, the first to occupy the new post of Systematic Botanist of the Peradeniya Gardens. Petch worked on a few minor taxa of the flowering plants. He did not accomplish much in this line as he turned his attention to the taxonomy of the indigenous fungi.

The more active research of this period, however, was continued by the other Britisher, A. G. H. Alston. He devoted his research to reassessing the status of several genera and species described in Trimen's Flora and worked out improved keys to suit the additional taxa not recorded by Trimen. Alston finally incorporated (1931) his findings in a *Supplement to Trimen's Handbook to the Flora of Ceylon* (*Part 6*). Withs his unrivalled knowledge of typification, Alston introduced 204 nomenclatural changes in his *Supplement*. Through field tours he discovered quite a few new species and recorded a number of naturalized ones previously not known in the flora of Ceylon. The *Supplement*, therefore, made Trimen's Flora a more comprehensive work and marked till recently the last major taxonomic enterprise in the flora of Ceylon.

The lone Ceylonese taxonomist of the period who produced some original research was E. J. Livera. He made notable revisions of a few taxa, though one, (1927) the *Aeginetiaceae* Liv. failed to be recognized by contemporary taxonomy. Livera, however, created a few, valid genera such as *Plaesianthera* (Acanthaceae) and *Petchia* (Apocynaceae), and generally manifested a penchant for original work.

From the 1930s activity in floristic and taxonomic research became a responsibility of the local

botanists; and the only centre where such activity was continued was the National Herbarium of the Department of Agriculture. Unfortunately, priority in agricultural research had already gained ground in this department and interest in the indigenous plants suffered as a result.

The years following the last war saw increasing international recognition of ecology dominating the field of botany. Research in local floristics and taxonomy, therefore, failed to enthuse further interest in the country. This was reflected in the meagre output of investigations into the local plants during this period notwithstanding the firm foundation laid by Trimen's Flora. For years the collections of the National Herbarium, for instance, continued to remain stagnant; and only sporadic work at Peradeniya by J. E. Senaratna produced occasional papers of notes and observations chiefly on naturalized species. Subsequent, however, on an interest in the economic importance of grasses Senaratna produced (1956) a commendable monograph, *The Grasses of Ceylon*, which despite certain shortcomings marked a significant milestone in Ceylonese effort in taxonomy.

What little interest that yet lingered at the Department of Agriculture died down in the sixties. Amidst an atmosphere of taxonomic indifference lone botanists in this field had to carry on as isolated individuals. In spite of this handicap, D. M. A. Jayaweera did some original research (1963) in the genus *Mussaenda* (Rubiaceae). He followed this with a gradual revision of the Orchidaceae of Ceylon as a side interest to his duties as superintendent of the Peradeniya Gardens. He completed the revision in manuscript form for publication in the *Revised Handbook to the Flora of Ceylon* (vol. 2, 1981).

About the same time L. H. Cramer undertook research in the Flora of the Galle District and completed (1968) this taxonomic study as a thesis for the Ph. D. degree.

It is unfortunate that from the time research in plant taxonomy became entirely a national responsibility the then University of Ceylon undertook no major share in this task. This was partly attributable to the rise of interest in ecology and to the lack of employment opportunities to graduates with any specialization in plant taxonomy. However, the sole university botanist who accomplished some research in this field was B. A. Abeywickrama. His main contribution (1959) was *A provisional check list of the flowering plants of Ceylon*. This was a revised nomenclature for his time of the Ceylon plants, based chiefly on Trimen's Flora and Alston's Supplement. It had, besides, the merit of having readjusted the out-dated status of quite a few genera and species held by Trimen or Alston.

Till the late sixties Trimen's Flora continued to be the main source of information on our indigenous plants. Except for the work of the Ceylonese botanists mentioned so far no other research in the indigenous plants, either of a monographic or revisionary nature, was produced. For thirty odd years, Ceylon taxonomy remained in somewhat of a backward state. By the late sixties, therefore, it became apparent that if the allied branches of botany had to progress in the country they needed the enlightening guidance of a revised Flora. But to undertake the needed task the country lacked the resources either of competent personnel or of finance.

It was in this context that in 1968 the University of Peradeniya requested the Smithsonian Institution of Washington to undertake the big task of revising Trimen's much out-dated Flora. The work got under way as the Flora of Ceylon Project and was a joint venture of the Smithsonian Institution, the University of Ceylon and the Department of Agriculture. Except for work of the four Ceylonese collaborators (two from the University of Ceylon) the revisionary research done was largely a combined effort of distinguished botanists from different countries abroad.

The *Revised Handbook to the Flora of Ceylon* represents somewhat of a new departure from Trimen's plan of presentation. According to modern standards, the nomenclature has been based on typification, the synonymy made more complete, while references to literature include citations to monographs when these were available. An improved feature of the revision is the citation of specimens which clarifies the basis of the author's concept of species. Additional information on ecology is also provided. All these improvements give the Revised Handbook the format of a modern, research Flora, a good example, perhaps, of van Steenis' (1957) concept of a "creative" regional Flora.

The general presentation of the Revised Handbook is good, though the standard of each revision varies according to the experience of the author. Variations in the style of writing indicate a certain freedom by the various authors within a set of prescribed guide-lines. There has been, therefore, no rigid editorial control as has been maintained for large Floras such as the *Flora Europea*.

The research accomplished in this work has been considerable, taking count of only the extensive tours and collections made over a period of eleven years (1968—1979). The final production, though still incomplete, has carried the progress of Sri Lanka Botany beyond limits not realized before, and will remain for many years to come the most advanced study of the native flora of the country.

The future prospect

The work of the Flora of Ceylon Project marks one of the glorious chapters in the history of botanical research in the country. The Revised Handbook itself (presently out in 3 volumes) does not seal the end of further research in Sri Lankan floristics and taxonomy. Additional headway remains to be made in this area if botanical science is to continue the search for more information on our plants.

Research on 83 families, for instance, yet remain to be done for the *Revised Handbook* including data, on large families such as the Acanthaceae and some major tribes of a few others such as the Rubiaceae and Leguminosae. And among the family treatments published or yet to be published one still has to clarify some difficult points in concepts in specific delimitation, given the complex range of variation in many of our tropical species. Critical analysis still remains to be done regarding the validity of the separation of such allied species as *Limnophila aquatica* (Roxb.) Alston and *L. indica* (L.) Druce, or of such allied genera as *Coleus* Lour. and *Plectranthus* L' Herit. The mature experience of van Steenis has led him to consider (1957) "specific delimitation as the basis of all taxonomy and the *conditio sine qua non* for the exactness of the status of all higher categories."

District Floras form an additional need in the botany of Ceylon, particularly in the context of new universities in different provinces of the country. Written up in the nature of Concise Floras these could provide much ecological information particularly with regard to the restricted distribution of the local endemics. They serve a useful guide to schools and universities; and their compilation could prove to be a practical means of harnessing undergraduate talent in learning the mechanics of flora writing. The only close approach to such a Flora is Alston's (1938) *The Kandy Flora* which circumscribes, however, only a limited area of Kandy and its environs. District Floras covering such vulnerable eco-systems as the Peak Wilderness, Horton Plains and Sinharaja Forest will broaden the basis for any future revision of the flora of Sri Lanka.

Ceylon floristics will continue to provide yet better opportunities for research if systematic studies are broadened to include serious monographic work. Such attempts should be a follow-up of the general floristic work done so far. The only monographs published so far have been very few — (Willis, 1902; Livera, 1924; Senaratna, 1956; Jayaweera, 1963; Cramer, 1978) If more such monographic work had been done in the past, this would have rendered the revision of the Ceylon Flora a less difficult task. Many genera in our flora, for instance, need to be reassessed through monographic studies. As sampling examples mention may be made of *Hedyotis* and *Oldenlandia* in the Rubiaceae, *Justicia* and *Strobilanthes* in the Acanthaceae, *Glochidion* in the Euphorbiaceae and *Dendrobium* in the Orchidaceae.

Much additional work, therefore, still attends the aftermath of the Flora of Ceylon Project. This could be attained through a new approach to the conduct of systematic botany. The basic climate for this has been well initiated by the recent work in the country of eminent taxonomists such as A. G. H. Kostermans, E. J. H. Corner, T. Koyama and N. Moldenke, collaborators of the recent flora project. Further, there are additional collections of a vast range of well-documented authentic material deposited in the National Herbarium, and, not the least, the volumes of a modern, research flora based on Trimen's Handbook.

Fortunate circumstances of the kind have brought about a cumulative influence on the Sri Lankan scene in floristics and taxonomy. Amidst this climate and the present trends of fundamental research in the country it is up to the universities to explore the yet untried aspects of Sri Lankan systematics. There is, in fact, in certain of the new universities an awareness of this need. The torch of interest has to be set ablaze so that in our future methodology an advance might be made towards the more modern aspects of taxonomy such as numerical taxonomy, biochemical systematics and micromolecular systematics. The universities might even envisage for the distant future the use of the SEM as a routine tool in their taxonomic laboratories.

Priority for more floristic research in the country is all the more imperative given the alarming rate of destruction of both known and unknown plant resources. Before long taxonomy might not have the requisite material for furthering research in the uncommon indigenous species and in those which are of doubtful status. This research should be enlarged to include population studies, reproductive biology and patterns of dispersal and distribution.

The pace of floristic and taxonomic research, therefore, has to be increased before further destruction of the natural environment could take place. The danger of extinction of species before appropriate investigations presents a constant threat to taxonomic research in Sri Lanka: and it is through continued activity in this field that systematic botany could provide both the vital information the country requires on our indigenous plants, and the necessary preconditions for resource and conservation action.

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