THE ADVENTIVE FLORA OF NEW ZEALAND

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With the publication in 1980 of Volume III of the New Zealand Flora, covering the adventive monocotyledons, excluding grasses, studies of adventives at Botany Division, DSIR, have concentrated on the adventive dicotyledons and conifers. The number of species involved is of course far greater than with the monocots. These studies are to culminate in Volume V (IV deals with the lichens) and this dicot and conifer flora will, in essence, resemble that of the adventive monocots. Also, a series of checklists containing the first record of every adventive dicotyledon and conifer ever recorded in New Zeland, as well as many newly recognised adventives, along with a brief statement of distribution within this country and mention of the region of origin, has been, or is being, published in the New Zealand Journal of Botany.

As the work reaches an advanced stage it is perhaps worthwhile to consider the philosophy behind these taxonomic studies of adventives, in particular the criteria used for considering whether or not a plant is eligible for inclusion in this category.

We are defining adventives as in Volume III, namely, to include all plants which "... are not native to New Zealand and either grow spontaneously outside of cultivation, - unintentional introductions, or have escaped from cultivation and established in the wild..." The word adventive, from the Latin "advena" a stranger or immigrant, thus applies to any introduced plant which grows wild, and embraces all situations ranging from plants which are properly naturalised to those which have only been seen once or a very few times, i.e. transient casuals. It is at once obvious that this is a very wide definition and covers occasional crop impurities which have not persisted, as well as a large number of minor escapes from cultivation. One

reason, for including the latter is that they may well become more common, especially when they are currently being widely cultivated.

The question is often asked what is a weed and can all such plants be regarded as weeds? It must surely be conceded that it is possible to regard all adventives as weeds? However, it is not how most people would define a weed. In Australia, Nigel Wace of the School of Pacific Studies at the Australian National University has been putting the question what is a weed to people from all walks of life and has been getting many and widely differing answers. I was with him last year when he asked a policeman on duty in the middle of Sydney this question and his answer was "a plant in the garden you can't eat". This of course is a very much narrower definition than those of us writing the weed floras of New Zealand are using.

Despite the apparently sharp division between those plants which were directly or indirectly introduced by humans and those which are indigenous (native), there are grey areas, even in New Zealand. The numbers of these plants of uncertain status are not large and one could conclude that the intensity of the arguments as to their real status are at times rather out of proportion. Let us consider the following cases.

In 1975 the Australian orchid Cryptostylis subulata was discovered in New Zealand growing in a swamp in the far north near Rangaunu Harbour. This is a larger and more conspicuous plant than most of our indigenous orchids so it is unlikely to have been present for a long time or else it surely would have been seen before? Thus, it most likely is a recent arrival. Since there is no reason to think that it owes its presence to human agencies, it is a reasonable assumption that the dust-like seed was blown across the Tasman Sea. There is ample evidence for dust and pollen being blown across at times. Is Cryptostylis subulata

indigenous to New Zealand? I believe that it should be considered as such from the time that it became established.

Certain plants described in Volume I (indigenous dicotyledons) only grow in modified or artificial habitats dominated by adventives, especially pastures on the east side of New Zealand. There are examples in the genera: Chenopodium, Gypsophylla, Oxalis, Veronica, and Wahlenbergia. Are they indigenous to this country or were they introduced, possibly as seed brought in with domestic animals from Australia, where these plants mainly also belong? I believe that in absence of any positive evidence for their introduction by humans it can justifiably be argued that such plants could have been here before the arrival of European settlers and subsequently adapted to newly created habitats. They all grow in rather open places and there must have been plenty of open sites before the arrival of humans. Also, much of our indigenous flora must have originated in Australia at some period, because there is a common ancestral relationship for many genera and species.

Then there are the two attractive yellow-flowered species, Hibiscus diversifolius and H. trionum, of which there are a few, mainly widely separated, populations in northern North Auckland and a few offshore islands. Both are described in Volume I of the New Zealand Flora but their status has often been questioned. The first is much more likely to be indigenous because it grows in similar swampy habitats in Norfolk Island and some tropical Poynesian and Melanesian islands, so its presence is not very surprising, and it is therefore reasonable to consider it as having this status. On the other hand, the tropical African and Asian H. trionum does not grow in the tropical South Pacific islands, at least naturally, and in Australia is apparently merely a weed of cultivated ground and is usually considered to be adventive. Thus, it is difficult to see how it could be indigenous to New Zealand.

The other small group of plants with an uncertain status comprise those species which are thought to have arrived in New Zealand in Polynesian canoes long ago. Several have been collected in the Kermadecs, as well as in warmer parts of the North Island, both being places where Maori canoes landed. In all cases they are known to be weeds around Polynesian settlements in the tropical Pacific from the time of Captain James Cook and presumably long before. Examples are the composite Sigesbeckia orientalis, the grass Oplismenus imbecillis, and the sedge Cyperus brevifolius. Of course, the main reason why Polynesian migrations contributed so little to our adventive flora is because people and plants came from islands with a tropical climate and many of the weeds accompanying this movement of peoples were adapted to grow on coral limestone, a habitat absent from New Zealand.

So, the development of the adventive flora as we know it must be largely the direct result of European colonisation. The changes must have been very rapid because by the end of the nineteenth century the indigenous vegetation of the lowland areas of New Zealand had been mostly replaced by communities dominated by introduced cultivated and adventive plants, especially European pasture weeds and ruderal plants, and various woody species, nearly all of which were escapes from cultivation. Thus, the aggressive, colonising ability of the ever-increasing number of invaders was soon very evident. Admittedly, the scene was to some extent set by the propensity of the Polynesians to burn large tracts of land, a trait shared with the pioneers from Europe who could not burn off the vegetation quickly enough. Indeed, no less an authority than J.D. Hooker predicted as early as the middle of the last century that some small genera of indigenous plants would become extinct. Fortunately, this has not happened to any extent, for only the doubtfully distinct genus Trilepidea (Loranthaceae) seems to have disappeared.

The question arises as to why New Zealand flora writers have segregated indigenous from adventive plants, whereas they are combined in the great majority of floras elsewhere? It was Hooker himself who was the first to do this when he relegated the adventive plants to a small appendix in "Flora Novae-Zelandiae" (1855). Yet they are integrated in his monumental "flora of British India", as well as his colleague and contemporary George Bentham's equally impressive "Flora of Australia". The reason I believe lies in the fact that New Zealand was one of the few countries where the indigenous and adventive plants could be so easily distinguished, coupled with the familiarity of the latter to European botanists. After all, it was understandable that people who had come halfway round the world to see a new and strange flora, were not going to be very excited or interested in the back garden weeds that they had known all their lives. On the other hand, in the tropical and sub-tropical countries nearer the equator, including many parts of Australia, the two groups of plants were often difficult to distinguish because their identity was often uncertain, let alone the status. An important factor in this uncertainty was that unlike New Zealand, the adventives were generally not European plants.

After Hooker this segregation continued, although to be fair, Kirk did include adventives in his "The Students Flora of New Zealand and the Outlying Islands" (1899). Also Cheeseman in his preface to the first edition of the "Manual of the New Zealand Flora" (p. VI, 1906), informs us that he was "...directed to confine it to the indigenous plants, thus departing from the plan followed by Kirk...". In 1940 H.H. Allan produced his "A Handbook of the Naturalised Flora of New Zealand". This excluded indigenous plants, whereas twenty years later his "Flora of New Zealand I: Dicotyledons", did the opposite and did not even have a tail-end list of adventives as has Cheesman. The other work on adventives that I should perhaps mention, mainly because

of its popularity (it has run into seven editions), rather than its botanical competence and thoroughness, is "Weeds of New Zealand" by F.W. Hilgendorf.

It is therefore not surprising that there has developed an almost single-minded concentration on indigenous plants to the virtual exclusion of adventives by so many professional and amateur botanists fron high school and undergraduate level onwards. The result is that for many naturalists at least half of the wild plants of New Zealand have been beyond the pale, and knowledge of them has been a closed book. The situation is exacerbated because the majority of species, comprising the vegetation around the main areas of settlement in the country, e.g. most of lowland Canterbury, are neglected adventives. However, it would be remiss of me not to mention two people who are notable exceptions in that they are or were interested in such plants. Early in the history of European settlement of Canterbury J.B. Armstrong collected adventives and published lists of them In recent times A.J. Healy has done the same and one can get a good idea of the weedy communities and their composition here in his chapter in "The natural History of Canterbury" edited by G.A. Knox (1968).

In recognition of this situation, Volume III dealing with the adventive monocotyledons, excluding grasses, and the future Volume V dealing with adventive dicotyledons and gymnosperms, can be regarded as bridging or transitional floras. This is because, although primarily concerned with adventives, all related indigenous species are, or will be, described, related genera which have no indigenous species are keyed out, and all families are combined in a key. The reasons for not producing fully integrated floras just now is that the indigenous monocots had been recently published (Volume II, 1970) and for the dicots the delay which would have been caused by carrying out the number of revisions so sorely needed amongst the indigenous plants would have been

too great. Thus, as Volumes II and III have to be used in conjunction, so will Volumes I and V.

Despite the succession of segregated floras, reasons why integration should be implemented as soon as possible are very compelling. Probably the most obvious is the ecological argument, because in so many lowland communities (especially coastal, wetland and many open, partly modified hill country slopes) there is a mixed flora of indigenous and adventive plants, and there are no built-in labels denoting a plants' origin. I know that it has often been said that indigenous plants have a distinctive appearance, but this mostly applies to our woody forest plants, amongst which very few adventives grow unless the habitat has been disturbed. A good exampls of the spread of one of these exceptions is Leycesteria formosa, Himalayan honeysuckle, which is now present in many forested areas and is particularly common in cut-over forest stands. Incidentally, this oft stated physiognomic uniqueness of New Zealand trees and shrubs would never have become so widely believed if the equivalent forests of S.E Australia, New Caledonia and southern South America had been used for comparison instead of introduced species from Northern Hemisphere temperate communities. The exception is our peculiar divaricating flora, which has no counterpart elsewhere. In contrast to the predominantly indigenous communities just mentioned, artifical ones such as lawns and arable land may contain a few indigenous species, e.g. in both can occur Dichondra repens, Mercury Bay weed.

There are very good taxonomic reasons why our floras should be integrated, and I cannot do better than refer readers to Volume III and its 95 species of Carex (73 indigenous and 22 adventive) and 47 species of Juncus (16 indigenous and 31 adventive). It is hard to imagine a more unsatisfactory situation than having such large genera, many species of which are superficially similar in general appearance, treated separately. Amongst the dicots there

are similar instances, e.g., Chenopodium, Epilobium, Myosotis, Oxalis and Ranunculus. Furthermore, in Pomaderris, the single Australian adventive species is much more closely related to one of the New Zealand species than is the later to most of the other indigenous ones.

Thus, I believe that such facts lead to the inescapable conclusion that there must ultimately be a single completely integrated flora of New Zealand. It will be very appropriate then that in the not too distant future, the first such modern flora of New Zealand will describe the large family of grasses.

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