

CONSERVATION OF RARE AND THREATENED PLANT TAXA IN NEW ZEALAND — SOME PRINCIPLES

DAVID R. GIVEN

Botany Division, Department of Scientific and Industrial Research, Christchurch.

SUMMARY: Deficiencies in knowledge of New Zealand plants are outlined, particularly with regard to conservation status and distribution. In an effective and integrated approach to the documentation and study of rare and endangered plants four aspects must be considered: documentation of individual taxa, provision of effective protective legislation, preservation of populations in the wild and in cultivation, and education of both the general public and botanists. In discussing these, mention is made of a documentation scheme currently in operation at Botany Division, and of deficiencies and needs in most aspects of rare and threatened plant conservation. Although there is an increasing interest in such biota, the author concludes that New Zealand has still not achieved a balanced outlook on its unique flora.

INTRODUCTION

Despite 200 years of botanical exploration and research in New Zealand, current knowledge of many indigenous plants is rudimentary. For numerous taxa there has been no appreciable gain in knowledge since first description and for many others we have only fragmentary knowledge of distribution, ecology, breeding systems, physiology, genetics and conservation status. Although the flora of the New Zealand botanical region is of considerable horticultural and scientific interest with 75-80% of indigenous vascular species being endemic (Cockayne, 1928) no accurate and complete compilation of rare and endangered taxa exists. Often the flora of outlying islands is better known than that of the adjacent mainland and Raven and Engelhorn (1971) point out that changes in land-use in New Zealand, particularly in the lowlands, are rapidly modifying the distribution patterns of members of the New Zealand flora.

Recent authors (eg. Melville, 1970a and b, 1971; Iltis, 1967; Meijer, 1973) have stressed the need to conserve adequate populations of threatened biological units. Reasons advanced for this vary from the desirability to preserve gene pools (Frankel and Bennett, 1970) and relict populations of morphologically primitive plants (Melville, 1973) to the need to conserve species of immediate economic importance (Turner, *et al.*, 1968) and of horticultural value (Melville, 1970b). Iltis (1967) argues persuasively against the often assumed right of man to totally mould his environment to suit his political and economic needs.

Specific examples of endangered and recently extinct plant taxa include:

Trochetia melanoxylon (St Helena Ebony)

Once common on St Helena in the South Atlantic and in 1956 known only from a single tree.

Streblorrhiza speciosa (Philip Island Glory Pea)

When discovered in 1774 during Cook's second voyage this beautiful vine festooned the forests of Philip Island near Norfolk Island. Pigs and goats placed on Philip Island by the Norfolk Island penal colony virtually denuded the mile-long island. Although at one time the species was grown in European conservatories it fell into disfavour and is now likely to be totally extinct.

Hebe breviracemosa (Kermadec Island Hebe)

Endemic to the Kermadec Islands, this once common *Hebe* has not been seen in recent years and is probably extinct. It is not known in cultivation.

It should be borne in mind that some plants may be following a natural path to extinction independent of man's efforts. Melville (1970b) cites *Orothamus zeyheri* and the Georgian Plume (*Elliottia racemosa*) as possible examples. The former has an unbranched stem and if the terminal flower is picked no buds develop and the plant dies. The latter produced little viable seed and propagates only with difficulty. Both species are very limited in distribution and the chances of their survival appear slim. However, the number of known extinctions of plants through natural causes are very few compared with

those in which man has played a direct or indirect part.

Estimates by Morton (1971), Melville and others indicate that between 1 in 10 and 1 in 15 of the species of flowering plants on this earth are endangered.

In an effective and integrated approach to the problem, four aspects must be considered. These are: documentation of individual taxa, provision of effective protective legislation, preservation of selected wild populations and cultivation of the threatened taxa, and education of both the general public and botanists.

DOCUMENTATION

To be effective, documentation needs to satisfy four criteria:

1. Data needs to be in a standard, directly comparable form.
2. Information needs to be accurate, contemporary and comprehensive.
3. Data sheets require a clear and concise summary of what is known and what steps need to be taken to adequately protect the taxon.
4. Information needs to be distributed through channels which will ensure its effective use.

Merely asking people for vague suggestions for a "protected plant list" is an ineffectual method of approach. To do so usually results in a motley collection of national emblems, colourful large-flowered alpinists and personal idiosyncracies. There is a tendency to give undue importance to conspicuous plants, or those that are best known to the individual. Such a list does not take account of the fact that not enough is known about many taxa to enable their conservation status to be determined.

A particular problem is that of defining what is "rare" or "endangered". Both are relative terms and undefinable in isolation although comparison of rare plant lists compiled by different authors indicates that within certain limits most botanists have similar concepts of each. Rare plants may be regarded as those infrequently found within their area of distribution or having an extremely small geographic range, the total area of distribution being less than a predetermined limit. Endangered plants are generally considered to be those whose geographic range or abundance within the known range has become markedly reduced in historic times. Inclusion in an endangered plant list is in many instances on the basis of personal judgment by the compiler who will take into account the relative decline in abundance of taxa being

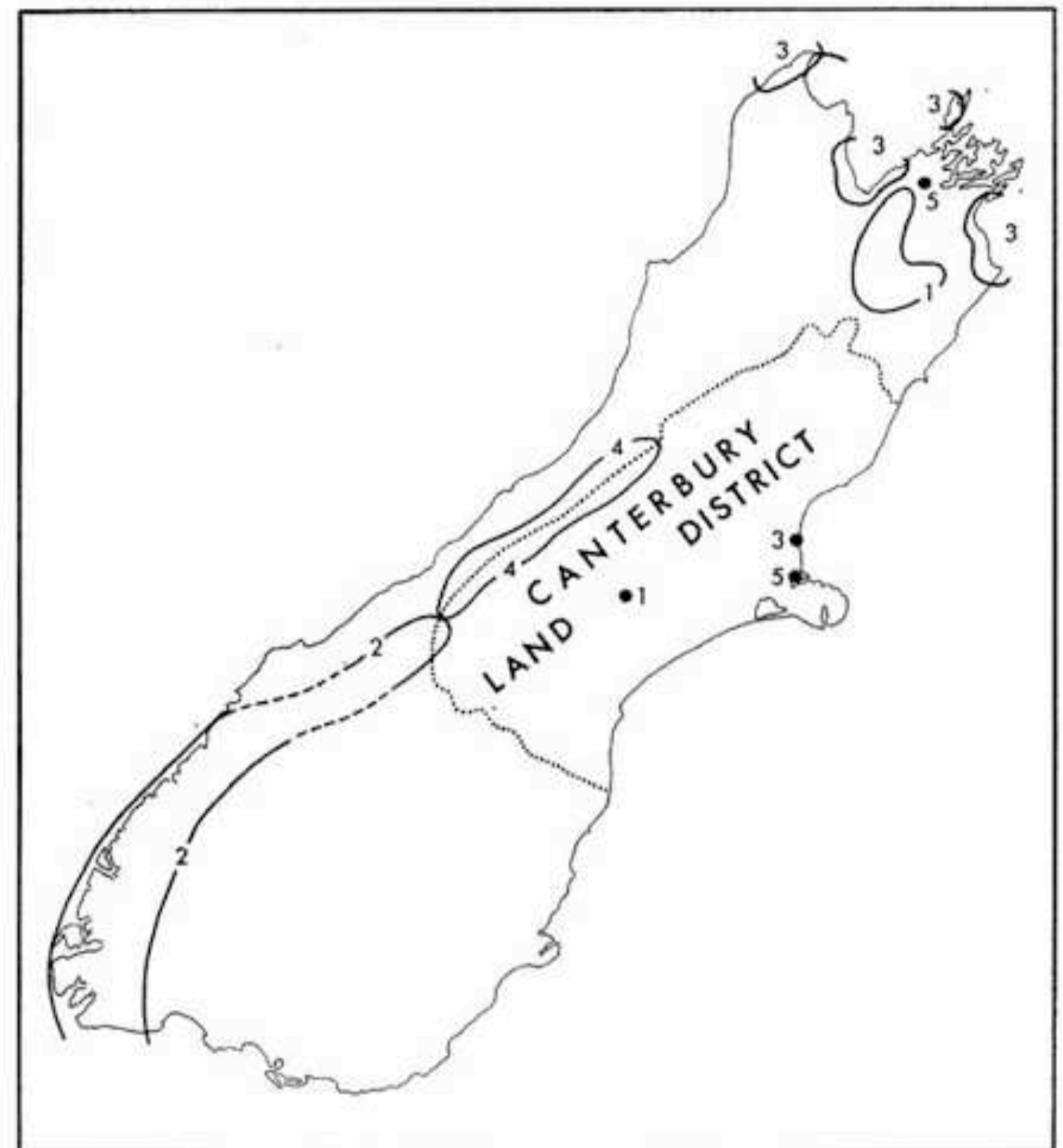


FIGURE 1. *Distribution in South Island of some rare and endangered species in relation to Canterbury District.* 1. *Leucogenes leontopodium*; 2. *Dracophyllum menziesii*; 3. *Spinifex hirsutus*; 4. *Ranunculus godleyanus*; 5. *Cotula nana*.

investigated and those considered more secure. Careful consideration has to be taken of whether taxa are equally rare or endangered over whole geographic ranges. For example, *Leucogenes leontopodium*, *Dracophyllum menziesii* and *Spinifex hirsutus* would appear on a list of rare plants in Canterbury Land District but not on a register of rare plants of New Zealand. Each is known only from a small number of records in Canterbury but is more widely distributed elsewhere. In contrast, *Ranunculus godleyanus* would be a candidate for lists of both New Zealand and Canterbury threatened plants and *Cotula nana* would appear on similar lists of rare plants (Fig. 1).

Few comprehensive annotated registers of rare and endangered plant taxa have been compiled. The *Red Data Book for Angiosperms* (Melville, 1970c) has so far only dealt with a very small proportion of the 20,000 or more rare and endangered plants throughout the world. Lists of rare endemic plants of Europe are currently in preparation (Walters, 1971). These are primarily based on information in the *Flora Europaea* with further data being added by local experts. Local surveys such as that of

Belgium by Delvosalle, *et al.* (1969) and Willis in Frankenberg (1971) who lists the rare plants of Victoria, Australia serve to indicate the magnitude of the problem. Early in 1971 a pilot scheme was started at Botany Division, DSIR, aiming at producing a preliminary list and analysis of rare and threatened elements of the New Zealand flora. The project which will be described in greater detail elsewhere indicates that approximately 10% of the New Zealand flora requires documentation to determine conservation status of taxa. To the present approximately 100 taxa have been documented and it is envisaged that reports on the rare and endangered plants of each land district will be produced. Taxa for study are selected from suggestions made to the author and standard information sheets are compiled and then circulated for comment among individuals familiar with either the area in which each taxon is found or with the particular taxonomic group to which it belongs. Comments are cross-checked and, if necessary, additional data is sought. Final reports for each taxon consist of a two page data sheet concluded by a summary of conservation status and recommendations for further action. An unexpected benefit from this scheme has been to indicate urgent need in some genera for taxonomic, geographic or ecological studies.

LEGISLATION

New Zealand has had, since 1934, a Native Plants Protection Act, in which, "every person commits an offence who takes any protected native plant that is growing on any Crown land, or in any State Forest or public reserve, or on any road or street, or who, without the consent of the owner or occupier of any private land, takes any protected native plant that its growing thereon". Effective use of the act was curtailed by the recent decision in the case of Davy versus Birkenhead Borough Council when the lower court magistrate ruled that the action was inadmissible since the plants in question, Pohutukawa (*Metrosideros excelsa*), were "hand-grown by man for ornamentation in a suburban borough" and hence were not native for the purposes of the Act. Furthermore, ruling was made that a tree was not a plant under the meaning of the Act, the strict dictionary definition of a plant being "sprout, cutting or slip", for "to a botanist, a tree is a plant, but this is a legal issue" (*Auckland Star* 4 October, 1973).

Few countries have evolved effective legislation protecting rare or endangered plants, and in those which have, selection of taxa for inclusion in schedules have often been on an arbitrary and un-

scientific basis. Some acts are probably of greater educational than legislative value. The Dogwood, Rhododendron and Trillium Protection Act, 1960 in British Columbia, for example, does not provide real and effective protection to the species in question as it does not protect adequately against disturbance or destruction of plants on private land or by public works, free miners, surveyors or lumbermen. The Act is however, of considerable educational value in drawing attention to the need to conserve depleted plant species. A more effective Act passed recently in Ontario (the Endangered Species Act, 1971) allows for the Lieutenant Governor in Council to make regulations declaring any species of fauna or flora to be threatened with extinction and for him to post suitable regulations protecting known populations and habitats. The Act is binding on the Crown and is not limited by conflicting legislation. Selection of taxa for consideration under this Act is expected to be on a scientific basis since, "to have blanket regulations respecting wildflowers or broad groups of mammals, birds, fish or reptiles will make a mockery of the legislation and indeed decrease the values which are the basis of the whole concept" (Walden, 1973).

A continual and at present insoluble problem in ensuring the survival of rare or endangered plants in biological reserves or parks, concerns the nature of "hard" legislation which can, where conflict occurs, take precedence over "soft" legislation. Most New Zealand environmental legislation including that affecting reserves and National Parks is "soft" in comparison to legislation conflicting, wholly or in part, with nature conservation. Of chief concern is the Mining Act, 1970, against the provisions of which there are insufficient safeguards to ensure complete protection of rare and endangered taxa. The existence of approximately 30 unco-ordinated Acts administered by numerous independent government departments indicates that the conclusion of Elder (1973) that most American environmental law is irrelevant, may be true in New Zealand. Only co-ordinated legislation governing nature reserves and embodying adequate safeguards against non-conservational legislation can be considered relevant to the needs of endangered plants and animals.

There is an urgent need in New Zealand for effective unambiguous legislation giving protection to rare and endangered plant taxa independent of that offered through National Park, Scenic Reserve and allied legislation. The provisions of an Act should be binding on all parties including the Crown and should not be rendered ineffectual by limitations imposed by "stronger" legislation such as that cur-

rently embodied in the Mining Act, 1970.

PRESERVATION

Once a taxon has been documented thoroughly and is possibly granted some degree of legal protection, physical protection may be warranted to preserve some or all remaining populations. Standard practice in New Zealand has been to locate populations in existing legally protected reserves or to establish new reserves. Molloy (1971) points out that New Zealand has the legal and administrative structure necessary for this purpose and that the acquisition of such reserves does not pose any major problems provided that proposals are thoughtfully prepared and are put through the appropriate channels. The same author points out, however, that the main problem with biological reserves concerns future control and management. Some reserves may preserve rare and endangered plants without any appreciable management beyond adequate fencing and periodic monitoring of population size and structure. In many others there will be a need to carry out controlled grazing, cutting or even burning. The effects of land use on adjacent areas may indirectly affect the reserve and may require the establishment of a marginal "neutral" zone to protect the biologically important core of a reserve. The gradual establishment of advisory committees for local bodies and National Parks and provision for finance for management purposes will go a long way towards ensuring the survival of taxa of currently low conservation status.

Apart from protection by reservation, attention needs to be given to protection by cultivation in botanic gardens and even the encouragement of commercial propagation and distribution of horticulturally desirable species. Melville (1970b) has demonstrated that numerous plants virtually extinct in their native habitats owe their continued existence to cultivation. The Chinese *Ginkgo biloba* would be known only as a fossil were it not preserved for centuries in the gardens of Chinese temples until its discovery by Western horticulturists. *Pinus radiata* may have risked extinction had it not been planted as a source of softwood timber and pulp in many countries including New Zealand. Propagation of *Tecomanthe speciosa* from the only known plant on Great King, in the Three Kings Islands has guaranteed the survival of this beautiful New Zealand climbing plant. Conservation of species and genic material is seen by Morton (1971) as one of the major functions—perhaps the major function—of botanic gardens. He points out that this will mean a necessary increase in both number of botanic

gardens and in the funds available to them. In referring to the establishment of a national garden system in Canada, Taylor (1971) points out that the function of botanic gardens are fourfold, including development and preservation of living and herbarium collections, participation in development and preservation of special gene resource pools, research and education, and provision of resources to provide programmes of regional botanical interest. Proposals for a National Botanic Garden Scheme for Canada at present being studied by the government of Canada include minimal requirements for botanic gardens. That New Zealand gardens are unable to fulfil these is an indictment, indicating that the need to reconsider the function of botanic gardens in this country in relation to conservational (and other) needs is long overdue.

EDUCATION

Without a sense of responsibility among biologists, sympathetic administrators and the wholehearted support of the general public, any scheme devised to document and protect rare or endangered plants is doomed to failure. Recently there have been moves in several countries to introduce codes of conduct by botanical associations and others (eg. Richards, 1972) and such a move in New Zealand, particularly among horticulturally inclined groups might go a long way towards ensuring that the rare and endangered but horticulturally desirable plants of today survive tomorrow. Such a code would recommend that members of participating organisations do not pick or collect any specimens of taxa designated as rare and that for other taxa care be exercised when collecting, photographing or otherwise disturbing plants. A code of this type relies heavily on the social conscience of the individual and the stigma attached to knowingly transgressing its recommendations.

The educational value of legislation should not be overlooked. As mentioned earlier, certain acts are probably of greater educational than legal value and no piece of protective legislation guarantees the safety of the object for which it is designed. It can only function as a deterrent and as a means of punishing one who has committed a crime. The best framed plant protection act in the world will not restore a species rendered extinct by the predations of someone who has destroyed the last remaining plants. However, such an act might bring to public notice the existence of something unique and part of our heritage, which if lost can never be restored. A problem is to know how much attention to draw towards rare and endangered plants. To say too little

about a particular taxon leaves many individuals ignorant of needs and concerns. To say too much leads to destruction of habitat and even the taxon through the well-intentioned but unfortunate efforts of amateur and professional alike, scrambling to grow, photograph or glimpse the last vestiges of a once viable species. For this reason the location of populations of rare plants in many countries are now entrusted to only a select few. In contrast, Meijer (1973) considers that publicity may be beneficial and that rare plants can become tourist attractions. He cites *Rafflesia*, *Livistona* palm and *Sequoia* as examples, but these and other instances involve bizarre, conspicuous or otherwise tourist-attracting plants. A parallel example in New Zealand might be the continued protection of *Agathis australis* (Kauri) but preservation of this kind cannot be regarded as of value to more than a limited range of taxa.

Currently, considerable success has been achieved overseas by the use of publicity material for the general public. The *Ligue Suisse pour la Protection de la Nature*, for example, has produced several large posters each showing some of the protected plants from a particular part of Switzerland. An accompanying handbook (Landolt, 1970) uses the same illustrations as plates and contains a concise text outlining the need to conserve rare plants and measures taken to do so. A similar but less comprehensive poster has been produced by the Botanical Society of the British Isles. Nevertheless, the contention of Iltis (1967) that botanists have paid lip service to the problem of conserving species of considerable rarity is still largely true. Recent publications such as the *New Zealand Conservation Handbook* (Morrison, 1974) demonstrate this in their almost total lack of reference to New Zealand's distinctive flora and vegetation and the need to encourage a responsible attitude towards both.

CONCLUSION

Attention to the four aspects of rare and endangered plant conservation outlined, should enable an effective programme of documentation and protection to be undertaken. Until the problems mentioned can be solved, efforts to do this can only be regarded as defective. There is reason to be proud of the unique flora and fauna of New Zealand but less reason to be proud of past (and to some extent) present treatment of it by an essentially pragmatic and utilitarian society. New Zealand has come a long way from the nineteenth century "slash and burn" policies so dear to the hearts of many pioneers

but still has far to go before a balanced outlook on its flora and fauna is achieved. Knowledge gained as we achieve this will enable biologists to present more reasonable and valid arguments for consideration of rare and endangered taxa in land-use planning. Recently developed objective numerical methods for assessing the value of floral and faunal elements capable of being understood by non-biologists (eg. Mennema, 1973) rely on a reasonably complete knowledge of the conservation status and distribution of taxa.

Present indications are that there is an increasing interest in rare and endangered biota. It is encouraging that conservation of threatened groups of animals and plants is listed as one of five priorities for world conservation by the World Wildlife Fund and International Union for Conservation of Nature (*Biological Conservation* 4(3), 1972, 168) because, as Iltis (1967) tersely puts the question, "if not we, who shall speak for the flowers—if not now, when?"

ACKNOWLEDGMENTS

I am grateful to colleagues at Botany Division who for several years have endured persistent questions and reports on this topic. While overseas during 1973-74 I had the benefit of discussions with numerous others working in this and associated fields. In particular I acknowledge the comments and criticisms of Dr G. Argus and Dr R. L. Taylor (Canada); Dr R. Melville, Dr S. M. Walters and Dr F. Perring (United Kingdom); Dr J. Mennema and Dr J. M. Willems (Netherlands); and Dr M. E. D. Poore (I.U.C.N., Switzerland). Fig. 1 was drafted by Miss J. Mulholland from the author's original.

REFERENCES

- COCKAYNE, L. 1928. *The Vegetation of New Zealand—Die Vegetation der Erde XIV*. Leipzig. Ed. 2. 456 pp.
- DELVOSALLE, L.; DEMARET, F.; LAMBINON, J.; LAWALREE, J. 1969. *Plantes rares, disparues ou menacées de disparition en Belgique: L' appauvrissement de la flora indigene*. Administration des eaux et forets: Service des Réserves Naturelles domaniales et de la Nature. Travaux 4. 129 pp.
- ELDER, P. S. 1973. American environmental law—a survey of developments. Part II. *Bulletin of the Conservation Council of Canada*. May 1973; 6-11.
- FRANKEL, OTTO; BENNETT, E. 1970. *Genetic Resources in Plants: their exploration and conservation*. I.B.P. Handbook 11. 554 pp.
- FRANKENBERG, JUDITH. 1971. *Nature Conservation in Victoria—a survey*. Victorian National Parks Association. 145 pp.
- ILTIS, HUGH. 1967. To the taxonomist and ecologist whose fight is the preservation of nature. *BioScience* December 1967: 886-890.

- LANDOLT, ELIAS. 1970. *Plantes protégées de Suisse*. Ligue Suisse pour la Protection de la Nature. Adaption française: J. L. Richard. 215 pp.
- MEIER, W. 1973. Endangered plant life. *Biological Conservation* 5: 163-167.
- MELVILLE, R. 1970a. Plant conservation and the Red Book. *Biological Conservation* 2: 185-188.
- MELVILLE, R. 1970b. Plant conservation in relation to horticulture. *Journal of the Royal Horticultural Society* 95: 473-480.
- MELVILLE, R. 1970c. *Angiospermae*, a compilation, in *Red Data Books* 5, I.U.C.N. Survival Service Commission, Morges. 12 p., 68 sheets.
- MELVILLE, R. 1971. Endangered Angiosperms and conservation in Australia. *Bulletin Jardin Botanique Naturelle Belgique* 41: 145-152.
- MELVILLE, R. 1973. Relict plants in the Australian flora and their conservation in A. B. Costin and R. H. Groves (eds.) *Nature Conservation in the Pacific*. A.N.U. Press, pp. 83-90.
- MENNEMA, J. 1973. Een vegetatiewaardering van het stroomdallandschap van het Merkske (N.-Br.), gebaseerd op een floristische inventarisatie. *Gorteria* 6: 157-180.
- MOLLOY, B. P. J. 1971. Possibilities and problems for nature conservation in a closely settled area. *Proceedings of the New Zealand Ecological Society* 18: 25-37.
- MORRISON, PETER (ed.). 1974. *The New Zealand Conservation Handbook*. Heinmann. 150 pp.
- MORTON, J. K. 1971. The role of botanic gardens in conservation of species and genic material, in Rice, Peter F. (ed.). *Proceedings of the Symposium on A National Botanic Garden System for Canada*. Royal Botanic Gardens, Hamilton, *Technical Bulletin* 6: 46-54.
- RAVEN, PETER; ENGELHORN, TAMARA. 1971. A plea for the collection of common plants. *New Zealand Journal of Botany* 9: 217-222.
- RICHARDS, A. J. 1972. The code of conduct: a list of rare plants. *Watsonia* 9: 67-72.
- TAYLOR, ROY L. 1971. A new policy for botanical gardens in Canada. in Rice, Peter F. (ed.): 10-21.
- TURNER, J. S.; SMITHERS, C. N.; HOOGLAND, R. D. 1968. *The Conservation of Norfolk Island*. Australian Conservation Foundation Special Publication 1. 41 pp.
- WALDEN, F. A. 1973. *Endangered Species in Ontario*. Address to the Annual Meeting of Ontario Federation of Naturalists. Toronto, April 27-29.
- WALTERS, S. M. 1971. Index to the rare endemic vascular plants of Europe. *Boissiera* 19: 87-89.