

5. Results

5.1 SUMMARY OF SPECIES DISTRIBUTIONS

The distribution database contains 1187 locality records, 927 for *Rhytida* and 260 for *Wainuia*, including some duplicates. Six percent of all records are of subfossils, mostly from cave deposits. Fig. 2 shows the combined occurrence of all species by 10 000 m x 10 000 m grid square. At least one species was recorded from 406 grid squares (391 excluding subfossil records). *Rhytida* species were recorded in 333 squares (318 excluding subfossils) and *Wainuia* species in 94 squares (90 excluding subfossils).

The number of 10 000 m x 10 000 m grid squares containing records of each species or subspecies ranged from 2 to 105 (Table 1). Subfossil records extended the known range to additional grid squares in 12 of the 17 taxa.

Generalised range maps for all taxa are presented for quick reference in Fig. 3. The distributions are mapped in detail in Fig. 4 (see Appendix 4) and discussed in the species accounts (Appendix 4).

5.2 ASSESSMENT OF CONSERVATION STATUS

Data relevant to conservation status are discussed in the species notes (Appendix 4). Direct assessment of population trends is not currently possible as no population study has been conducted for any species of *Wainuia* or *Rhytida*. A tentative priority ranking was therefore performed using the scoring system adopted for other invertebrates in Department of Conservation (1994b). The results provide a coarse and somewhat subjective indication of conservation priorities (Table 2). They can be criticised for failing to adequately incorporate uncertainty in our present knowledge, and for not identifying critically threatened populations within some species or subspecies.

6. Discussion

6.1 DISTRIBUTION

The greatest diversity of *Rhytida* and *Wainuia* species occurs in the northern South Island. Only one *Rhytida* species (*R. g. greenwoodi*) occurs in the North Island compared to at least eight in the South Island and one on Stewart Island. *Wainuia* species are more evenly distributed with two in the North Island and three in the South Island, putting on one side the doubtful status of the Mt Tuhua and Lake Waikaremoana populations. Except for *Powelliphanta* which is predominantly a southern genus, all other New Zealand rhytidid genera occur

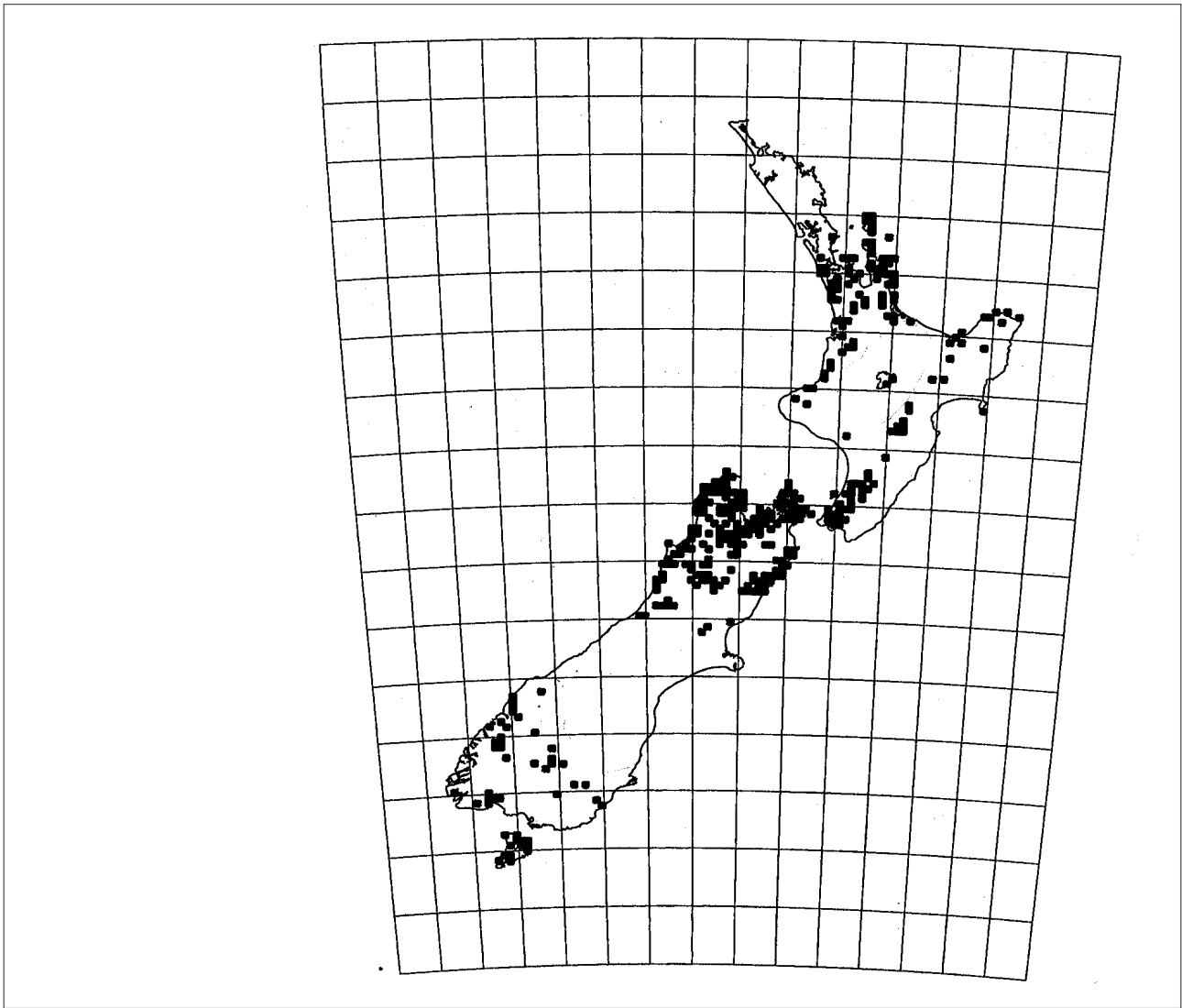


FIGURE 2. COMBINED DISTRIBUTION RECORDS OF ALL *Wainuia* AND *Rhytida* SPECIES BY 10 000 M GRID SQUARE.

exclusively or predominantly in the North Island (*Rhytidarex*, *Delos*, *Paryphanta*, *Delouagapia*, *Schizoglossa*), so regional species diversity in the family as a whole tends to decline with latitude (cf. Solem *et al.* 1981).

Rhytida and *Wainuia* appear to be totally absent from the 'waist' of the South Island between latitudes 43° 15' and 44° 15' S, and from north Otago and south Canterbury. On the west of the divide this gap may be bridged by further collecting, and on the east it probably reflects a lack of suitable habitats.

Solem *et al.* (1981: 475) considered that "... *Wainuia* has a dislocated relictual distribution". Additional distribution records have bridged some gaps, but also added outlying locations (Mt Tuhua, Lake Waikaremoana, Richmond Range, Fiordland).

The occurrence of *Wainuia urnula* on both sides of Cook Strait was advanced by Te Punga (1953) as evidence for a recent, western land bridge. On current evidence this appears less plausible: *W. urnula nasuta* occurs not only on D'Urville Island but also in the east on Arapawa Island and on the mainland in eastern Marlborough. Further, it differs consistently in dentition from the North

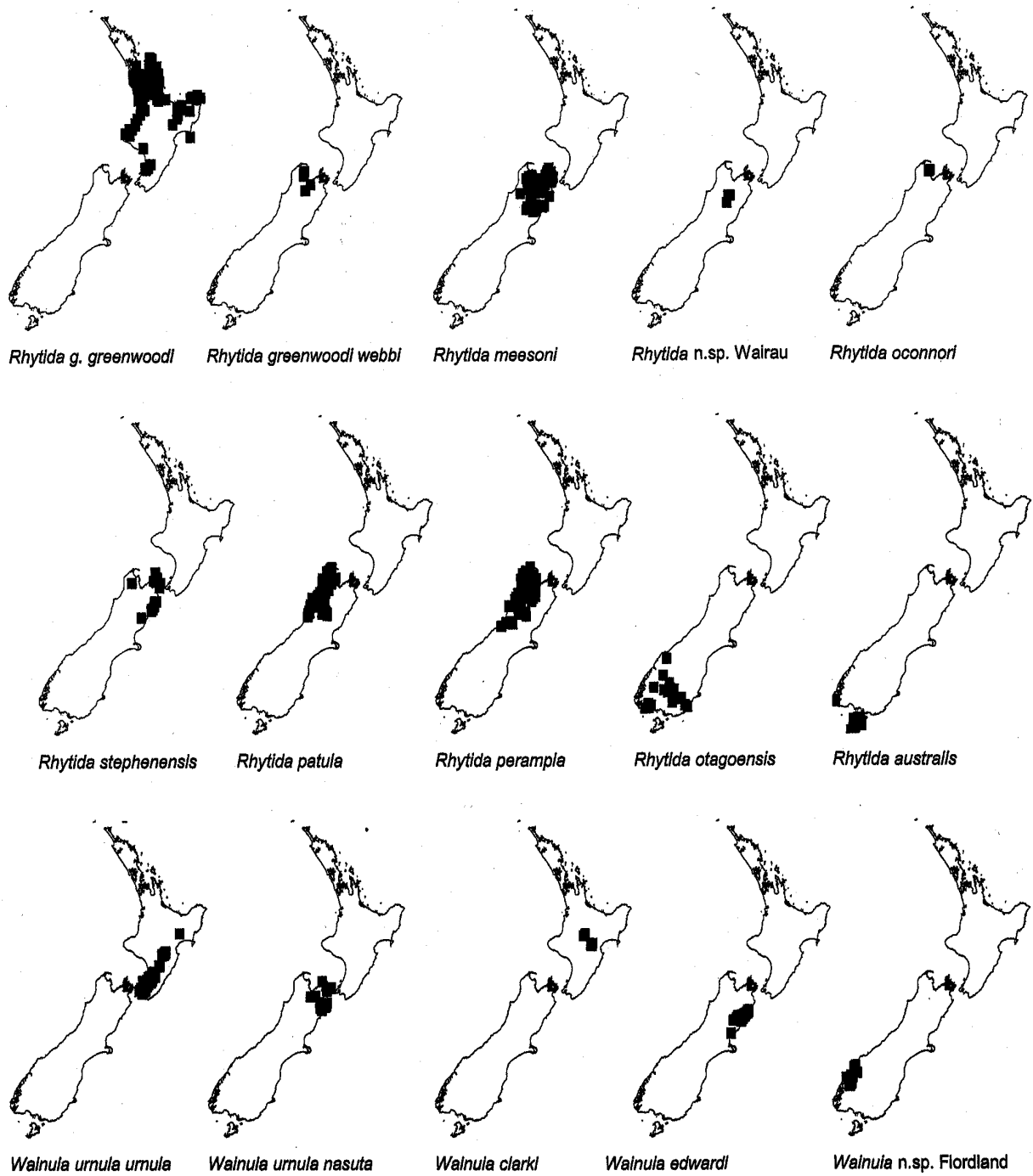


FIGURE 3. COMPARATIVE OUTLINE DISTRIBUTION MAPS OF *Rhytida* AND *Wainuia* SPECIES.

Island *W. u. urnula* (Efford unpubl.) and may even be a separate species. Nevertheless, a study of the relationships of *Wainuia urnula* across Cook Strait and the parallel pattern of relationships among populations of *Rhytida stephenensis* and *R. greenwoodi* might throw interesting light on the evolutionary history of the area.

No two *Wainuia* species are known to occur sympatrically, but there are several instances of a large *Rhytida* species coexisting with a smaller one (e.g., *R. stephenensis* and *R. meesoni* Waima River; *R. greenwoodi webbi* and *R. meesoni* Takaka Hill). Many further examples of sympatry between rhytidid genera can be adduced (e.g., *Powelliphanta traversi latizona*, *R. g. greenwoodi* and *W. u. urnula* at Greenaways Bush, Levin; *R. g. greenwoodi*, *Schizoglossa novoseelandica* and *Delos jeffreysiana* Kaimai Range and Mamaku Plateau).

6.2 CONSERVATION

General policy

Formal protection under the Wildlife Act has been increasingly extended to invertebrates. Sherley (1989) considered protection a prerequisite for attracting conservation resources, but this limitation no longer appears to be absolute so long as there is adequate information (viz. listings in Department of Conservation 1994b). Legal protection of invertebrates is handicapped by the uncertain systematic status of many taxa. There is also a strong argument that it may stifle the accumulation of information necessary for their conservation. Almost all the existing data have resulted from the unfettered curiosity and enthusiasm of amateurs. Collection of voucher specimens remains essential in a field where even the taxonomic judgements of professionals are often flawed.

There is a pressure to attach a name to any variety that is morphologically recognisable. Naming of variants may have been responsible for an unhealthy focus by collectors on *Powelliphanta* populations such as *P. gilliesi brunnea* and *P. traversi otakia*. It is suggested that DOC should be willing to safeguard distinctive populations within a species in advance of any formal determination of subspecific identity. (The Mt Cass population of *Wainuia edwardi* and the D'Urville Island population of *W. urnula nasuta* come into this category). Future systematic research is in any case likely to resolve differences not externally apparent, so this is a reasonable strategy for preserving genetic diversity. Within taxa that are *a priori* vulnerable and that are difficult to census, a realistic target is to maintain the present geographic range of the taxon. Work on *Wainuia* has shown unexpected patterns of ecological differentiation (M.G. Efford, in press), in a group of which Parkinson (1979) said "There is little to distinguish any of these species except size and disjunct distributions". Clearly we should aim to retain the maximum possible number of extant populations regardless of their nomenclatural status.

Vulnerable populations

Outlying subfossil records of several species (*R. greenwoodi*, *R. stephenensis*, *R. oconnori*, *R. otagoensis*, *W. urnula*) suggest that there has been range

contraction since the Holocene. Remaining populations are often patchy and individuals are smaller than in subfossil samples.

In general, these snails are vulnerable to habitat modification, trampling and several introduced predators (rats, hedgehogs, possums, blackbirds and thrushes). However, only in a few extreme cases can populations be said to be endangered to the extent of requiring active management. These are:

Wainuia edwardi at Glenafric Road, Mt Cass, North Canterbury

This outlying population exists at the edge of an unfenced bush remnant surrounded by pasture and grazed by stock. Snails have survived here among boulders where they are relatively protected from trampling and desiccation. Nevertheless, the known extent of the population is so small (< 1 ha) that continuing rat predation poses a serious threat.

Wainuia urnula nasuta at the type locality on D'Urville Island

This is a small remnant population surviving in boulder piles. Feral ungulates (deer, goats, and pigs) are the main threat (B.J. Karl and M.E. Hearfield, pers. comm.)

Several other populations are apparently sparse or localised and the appropriate management action is to gather more distributional data (see Recommendations). *Wainuia urnula nasuta* appears to occur only at very low densities across much of its remaining mainland distribution in the Richmond Range, Nelson, and its range is therefore likely to contract further. It is doubtful whether effective means exist to prevent this.

General management needs

Many of the taxa recognised in this report are morphologically variable and may prove, on closer examination, to comprise several distinct species. The tentative taxonomic decisions outlined in Section 2.1 cannot substitute for actual taxonomic research. Confirmation of the taxonomic status of populations is a necessary adjunct to species management, and tends to motivate that management. *Rhytida* and *Wainuia* species generally lack the external colour patterns that have been used to distinguish subspecies in *Powelliphanta*. It is therefore necessary to resort to the methods of molecular systematics, particularly DNA sequencing, to distinguish species and develop a phylogeny (M.G. Efford, R. Howitt and D. Gleeson, pers. comm.).

General surveys sometimes miss local populations of *Wainuia* or *Rhytida* as their shells are too small and cryptic to be noticed in surface collections, but too sparsely distributed to appear in litter samples. This implies that significant and interesting populations remain to be discovered. Intensive field surveys can probably only be justified in a few cases where opportunistic collecting has already identified an isolated and potentially vulnerable population (see Recommendations). The value of opportunistic collecting can be increased by centralised data management and feedback to fieldworkers regarding the significance of their observations.

It will probably always be relatively hard to obtain resources for species management of poorly known and inconspicuous taxa, such as the *Wainuia* and *Rhytida* species discussed here. However, if a relatively small investment can

significantly reduce a species' chances of extinction then it makes sense to extend the 'species conservation' mantle over it, rather than to rely on diffuse 'ecosystem protection' measures. For example, predator control or fencing to exclude feral and domestic ungulates will generally be considered too expensive to be used in the preservation of widely distributed rhytidid species. However, useful gains may be achieved by protecting relatively small areas for these immobile species, so long as protection is sustained over decades. I envisage multiple 'mini-reserves' of 0.5 to 5 ha to maintain selected local populations. Such reserves should be conceived not as an alternative to extensive conservation, but as a safety net should more extensive management fail. Mini-reserves are not sufficient in themselves to ensure the long-term survival of species. The concept requires more development and field experimentation. Within small areas it is also feasible to manipulate the microhabitat in ways that discourage predation (e.g., creation of shaded boulder piles). The introduced weed *Tradescantia fluminensis* provides dense ground cover that appears to provide excellent habitat for *Rhytida* spp. It may therefore help to retain *Tradescantia* in some intensively managed patches, at least as an interim measure. Mini-reserves should be developed now for currently viable populations of potentially threatened species, rather than as a last resort. This strategy would allow managers to perfect methods for intensive management and monitoring before the decline of a species became critical.

7. Recommendations

- Urgent action is required to save the unusual population of *Wainuia edwardi* (Suter) at Glenafric Road, Mt Cass, North Canterbury. This should include a survey to determine the extent of the population, fencing of the bush remnant, and rat control.
- The population of *Wainuia urnula nasuta* Powell at its type locality on Mt Maude, D'Urville Island, should be fenced to protect it from deer and pigs.
- The taxonomic and conservation status of *Wainuia* cf. *edwardi* on Mt Tuhua, Westland, should be determined by further collecting and analysis.
- Plans should be developed for the conservation of *Rhytida oconnori* in Abel Tasman National Park, and of *Rhytida greenwoodi webbi* in adjacent areas of East Takaka.
- Field staff should be alerted to the need for more detailed distribution data on *Wainuia clarki* in the Kaweka and possibly Kaimanawa Ranges, *Wainuia urnula urnula* in Urewera National Park, *Rhytida* n.sp. in the upper Wairau Valley, *Rhytida* cf. *greenwoodi* in the southern Richmond Range (Motueka River Gorge), and *Rhytida stephenensis* in the Cobb Valley, northwest Nelson.
- The distribution database should be maintained on an annual basis and any novel findings passed on to Conservancies. The database could easily be extended to include other New Zealand Rhytididae.
- The systematics of the Rhytididae should be pursued using both molecular tools and rigorous analyses of anatomy and external morphology.

- A protocol should be established for the intensive management of threatened snail populations within ‘mini-reserves’ possibly as small as 1 ha. The effectiveness of simultaneous fencing, predator control and habitat manipulation should be evaluated using replicated experimental and control areas.

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