

Appendix 1

ALTERNATIVE HIGHER CLASSIFICATIONS OF NEW ZEALAND RHYTIDIDAE

(a) Powell (1961, 1979)

Family PARYPHANTIDAE

Genus *Paryphanta*

Subgenus *Paryphanta* (*Paryphanta*)

Subgenus *Paryphanta* (*Powelliphanta*)

Genus *Wainuia*

Genus *Rhytida*

Subgenus *Rhytida* (*Rhytida*)

Subgenus *Rhytida* (*Amborhytida*)

Subgenus *Rhytida* (*Rhytidarex*)

Genus *Schizoglossa*

Genus *Delos*

Subgenus *Delos* (*Delos*)

Subgenus *Delos* (*Delouagapia*)

(b) Climo (1977)

Family RHYTIDIDAE

Subfamily RHYTIDINAE

Genus *Rhytida*

Subgenus *Rhytida* (*Rhytida*)

Subgenus *Rhytida* (*Wainuia*)

Genus *Powelliphanta*

Genus *Delos*

Genus *Delouagapia*

Subfamily PARYPHANTINAE

Genus *Paryphanta*

Genus *Rhytidarex*

Subgenus *Rhytidarex* (*Rhytidarex*)

Subgenus *Rhytidarex* (*Amborhytida*)

Genus *Schizoglossa*

Appendix 2

NEW ZEALAND RHYTIDIDAE DISTRIBUTION DATABASE

A research database of rhytidid distribution records is held by Manaaki Whenua, Dunedin. The database consists of one main table (DIST) and various ancillary tables (SPECIES, SOURCE etc.). The fields of DIST are currently as defined in the following table:

Field name	Type¹	Description
Taxon	A3	3-letter code for taxon (defined in SPECIES table)
Source	A4	Code for origin of record (defined in SOURCE table: either a code for a museum, a publication, or the initials of an informant)
Museumno	A8	Museum catalogue number of specimen(s)
Record status	A1	D = Dry, S = Spirit, L = Literature, N = sighting but no specimen
ID by	A4	Identified by... (initials)
Label taxon	A35	Informal identification, as on specimen
Site	A100	Description of locality
Collby	A40	Name of collector or observer
Colldate	A13	Date of observation e.g., 13.iv.1993
Altitude	N	metres asl.
Island	A1	N = North, S = South, O=Other
Subfossil	A1	Y = Yes, N = No
Map260	A3	Map number in 1:50000 NZMS 260 series e.g., M29
Easting	N	Full metre easting (7 digit)
Northing	N	Full metre northing (7 digit)
Map1	A4	Map number in NZMS 1 series (1:63660)
Map1east	N	Yard easting (usually 3 digits)
Map1north	N	Yard northing (usually 3 digits)
Grsource	A1	Code for source of grid reference O = Original (provided by the observer) I = Inserted (estimated from described locality)
Collnote	A255	Other notes on locality, habitat etc.
Specimen notes	A255	Other notes on the specimens

¹. 'A' indicates an alphanumeric field with the given maximum length in characters

'N' indicates a numeric field

Appendix 3

PLANT NAMES

Bracken	<i>Pteridium esculentum</i>
Mamaku	<i>Cyathea medullaris</i>
Wheki	<i>Dicksonia squarrosa</i>
Kanuka	<i>Kunzea ericoides</i>
Hinau	<i>Elaeocarpus dentatus</i>
Red beech	<i>Nothofagus fusca</i>
Silver beech	<i>Nothofagus menziesii</i>
Hard beech	<i>Nothofagus truncata</i>
Black beech	<i>Nothofagus solandri solandri</i>

Appendix 4

SPECIES NOTES AND DISTRIBUTION MAPS

These notes are intended to supplement the distribution maps and record other relevant observations. More complete descriptions of most taxa can be found in Powell (1979) or the original descriptions. The following abbreviations indicate museum specimens: AIM Auckland Institute and Museum, NMNZ Museum of New Zealand, CM Canterbury Museum. Where no repository is indicated there is generally a voucher specimen held privately or at Manaaki Whenua, Dunedin.

***Wainuia clarki* Powell, 1936**

Type: *Wainuia clarki* Powell, 1936. Motutaiko Island, Lake Taupo. Holotype AIM AK72307

Descriptive notes

Distinguished by relatively tight coiling, shell slightly conical and heavy (for *Wainuia*), royal blue rather than purple secretion from the mantle lip, which has whitish inclusions. Shell greenish brown by transmitted light. Larger than *Wainuia urnula*, the other North Island species, and having more teeth on the radula. Diet earthworms; not known to eat amphipods.

Habitat

Under *Dicksonia squarrosa* and among *Phymatodes* sp. in secondary forest (Motuoapa Peninsula, M.G. Efford & M.E. Hearfield, 3.iv.1992); under log in black and red beech forest (Ihaka Spur, P. Herrity & G. Walls, 29.i.1990); in beech remnant on kanuka-covered hillside (Upper Tutaekuri, C. Speedy, -ix.1984); under *Dicksonia squarrosa* and small-leaved *Blechnum* sp. (Upper Tutaekuri catchment, M.G. Efford & M.E. Hearfield, 2.iv.1992).

Distribution (Fig. 4a)

Thought by Powell (1936, 1979) to be restricted to Motutaiko Island in Lake Taupo, *W. clarki* has more recently been found on and near Motuoapa Peninsula on the mainland (e.g., B.F. Hazelwood, 16.ii.1974, NMNZ M62309) and at widely scattered sites in the Kaweka Range including in the south the Upper Tutaekuri catchment (C. Speedy pers. comm., -ix.1984) and Ngaruroro catchment (DoC Napier -x.1989; see their file 11/5 for letter to F.M. Climo), and in the north Ihaka Spur (P. Herrity & G. Walls 29.i.1990). A specimen in the Museum of New Zealand (M62364) from "4000' near Puketituru [sic] Kaweka Range Johnson Coll." appears to represent another eastern locality, but this cannot be precisely fixed. A search in beech forest around Ngahere Hut on the eastern flank of the Kaweka Range, and beside the road between Ngahere Hut and Puketitiri, yielded no specimens (M.G. Efford, 20.xii.1989).

Status

W. clarki appears to be subject to heavy predation where it survives. Surface collections from Ihaka Spur largely comprised broken, predated shells and a

single immature live specimen was found (P. Herrity & G. Walls, 29.i.1990). C. Speedy noted that empty shells were common in *Nothofagus* forest at a site in the Upper Tutaekuri (pers. comm. Nov. 1990), but M.G. Efford & M.E. Hearfield found only 3 live animals in a 2 hour search of similar habitat nearby (2.ii.1992). I. Payton (pers. comm.) reported that *W. clarki* was commonly eaten by blackbirds and thrushes near the Motuoapa Motor Camp.

The species is distinctive. In shell shape and dentition it more resembles South Island *W. edwardi* than other North Island *Wainuia* (the closest population of *W. urnula* is only 25 km to the south). mantle pigmentation is blue rather than purple as in most other *Wainuia* species. The two clusters of records (Taupo, Kaweka) are separated by 60 km; the species may exist in the intervening area within the Kaimanawa Forest Park. The overall status of the species would seem to be vulnerable.

***Wainuia urnula urnula* (Pfeiffer, 1855)**

Type: *Helix urnula* Pfeiffer, 1855. Three syntypes from the Cuming collection in the Natural History Museum, London (1966136) and a radula preparation from 1937 (slide 1937-11-6-4). No collection data, locality 'New Zealand'.

Descriptive notes

Shell reddish brown with narrow umbilicus and open coiling. There is considerable geographical variation in shell size and surface sculpture. Specimens from Wainuiomata, Eastbourne and the eastern Hutt hills are distinctly smaller than those from elsewhere in the Rimutaka and Tararua ranges. Maximum shell diameter ranges 20–28.5 mm in different populations. Populations comprising large and small forms are separated by only 500 m across the entrance to Moores Valley, Wainuiomata. Number of radula teeth correlates with adult shell size and this varies between populations.

Subfossil cave specimens were initially described by Dell (1955) as *Rhytida yaldwyni*.

Habitat

Under loose, damp leaf litter and in stable rock piles of both intact and heavily modified forest of various types (silver and hard beech; mixed rimu-rata forest; kanuka; hinau). Commonly under piles of dead tree fern fronds (*Cyathea dealbata* and *Dicksonia squarrosa* but not *C. medullaris*); also under *Blechnum discolor* but seldom *B. capense*; around bases of *Uncinia* spp.; in subalpine tussock (*Chionochloa* sp. A. Fairweather, Ruahine Range).

Distribution (Fig. 4b)

Common in native forest around Wellington, in the Hutt Valley, Wainuiomata, Eastbourne, and in the Rimutaka and Tararua Ranges. Present in the Ruahine Ranges as far north as the road to No Man's Hut (GR U21 909 765, e.g., M.E. Hearfield, 6.v.1992). Only three isolated records from the southern Ruahine Range (Copper Creek, Powell (1946); Delaware - Takapari 3000', H. Robertson, -v.1980; Kumeti Stream, M.G. Efford & M.E. Hearfield, 1.iv.1992). Records from the northern Ruahines are all from above 880 m asl., but at Kumeti Stream, southern Ruahine Range occurs at ca 300 m (M.G. Efford & M.E. Hearfield,

1.iv.1992). Further south it occurs at all altitudes down to near sea level (e.g., 'A.C. O'Connor Porirua 50 feet' Powell 1946; Lowry Bay 20 m, M.G. Efford, 1990). Highest record is from 1474 m on the summit of Mt Pukemoremore, northern Tararua Range (G. Ramsay, 12.ii.1985, NMNZ M84487). Absent from eastern Wairarapa, although known from Eketahuna (B.F. Hazelwood, 7.xii.1975) and subfossil in caves at Ruakokoputuna and Waewaepa, northern end of Puketoi Ra. (Dell 1955; Parkinson 1971). Two old but undated specimens in the Auckland Institute and Museum are from near the summit of Kapiti Island (1700 feet; AK 17027). The current status of the species on Kapiti Island is unknown. The species otherwise occurs only on the mainland.

The northern limit of the distribution is at 1120 m asl. at Panekiri Bluff, Lake Waikaremoana (B. Gill, 13.iv.1992, Auckland Museum; M.G. Efford & J.I. Townsend, 8.xi.1996). Waikaremoana specimens resemble *W. u. urnula* from the northern Ruahines in shell shape, and are definitely not *W. clarki* whose nearest record is at Ihaka Spur in the northern Kaweka Range, 75 km to the southwest. This isolated population requires further taxonomic attention.

The label of the NMNZ specimen M83346 from 'Otakeho, Taranaki. Mackie' Coll. M. Holloway & A.G. Stevenson appears to have been interchanged with that of a specimen of *Rhytida greenwoodi* (M83364) nominally from Korokoro, Petone. The *W. urnula* shell resembles specimens from Korokoro. The inference of a label mixup explains two otherwise anomalous outlying records.

Status

W. urnula seems well able to cope with habitat disturbance. The highest population density encountered was under *Cyathea dealbata* fronds in a simple two-tier kanuka-*Cyathea* forest regenerating several decades after fire in the Wainuiomata River water catchment area (see also Bokeloh 1990).

Adult snails were readily eaten by captive possums (*Trichosurus vulpecula*), rats (*Rattus rattus*) and hedgehogs (*Erinaceus europaeus*) but not apparently by house mice (*Mus domesticus*) (Bokeloh 1990).

Eggs of *W. urnula* were found to be perforated and eaten by *Delos coresia* Gray at three sites (Wainuiomata Scenic Reserve, Hair St. Wainuiomata; East Branch Wainuiomata R.; Otaki River).

The two specimens from Kapiti Island in the Auckland Institute and Museum show distinctive fine rodent perforations in their base. The paired incisors of the predator have left bite marks 2.1 and 2.4 mm across. From the altitude of the record and the narrowness of the perforations these are likely to have been eaten by *Rattus exulans* rather than *R. norvegicus*.

***Wainuia urnula nasuta* Powell, 1946**

Type: *Wainuia urnula nasuta* Powell, 1946. Mt Maude, D'Urville Island 2100 ft. Holotype AIM AK71150

Habitat

Under damp leaf litter in kamahi forest (Port Underwood Saddle, M.G. Efford & B.J. Karl 10.iii.1992). Under *Uncinia* sp. (Wharekupenga Bay, Arapawa Island, B.J. Karl, 11.v.1992); in stable rock piles (Isolated Hill Bivouac, M.G. Efford &

B.J. Karl 10.iii.1992; Kekerengu Stream, M.G. Efford & B.J. Karl 11.iii.1992); under decaying flax leaves (Flaxbourne River, M.G. Efford, 10.xi.1993); among rocks in mixed low forest (mahoe, fuchsia, toru, kamahi, *Olearia*: summit Mt Maude, D'Urville Island, M.E. Hearfield & B.J. Karl, 20.iv.1993).

Distribution (Fig. 4c)

The only definite locality record on D'Urville Island is from Mt Maude. (Mt Maude is the unlabelled hill, summit 632 m, behind Kupe Bay on map NZMS 260 P26). The locality 'Kupi Hill' (e.g., G. Annabel in J.I. Townsend collection) appears to be synonymous with Mt Maude (see label of AIM 33667). An uncatalogued spirit specimen identified as "*Rhytida* sp.", but probably of *W. u. nasuta*, in the Museum of New Zealand was collected by P.M. Johns from "shore vegetation D'Urville Island" on 17.viii.1960.

The species is common at Wharekupenga Bay, Arapawa Island, as evidenced by a long series in the Museum of New Zealand and collections for the present study by B.J. Karl on 11.v.1992 (cf. Te Punga 1953). However, M.J. Meads (pers. comm.) found only a single large live specimen and no shells after several hours intensive searching in the centre of Arapawa Island between Otanerau Bay and East Head in 1979.

Collections have been made from near Port Underwood Saddle over several decades, and the species was found to be common there in March 1992 under *Blechnum discolor* and leaf litter in kamahi forest (M.G. Efford & B.J. Karl).

There are sparse records from the Richmond Range, particularly in the vicinity of Mt Richmond, the Top Valley track to Old Man, and the east branch of the Wairoa River. The species appears to be at low density in forest at the latter two sites where searches of approximately 3 hours yielded only one live specimen at each (M.G. Efford & B.J. Karl 9.iii.1992; M.G. Efford 29.xii.1992). D.J. Roscoe (pers. comm.) has collected land snails intensively throughout the range without finding other sites.

There is only one record from the block of country between the Awatere and Wairau Rivers (Ferny Gair, in rocks at 5000 ft [1600 m] D. Mason, Blenheim). This also is the upper altitude limit for the genus.

From scrub beside the Flaxbourne River near Ward (Elliott 1985; M.G. Efford collection 10.xi.1993), where suitable habitat is limited by the historical conversion of forest to farmland.

Near the southern limit of *W. u. nasuta* there is a cluster of populations at Isolated Hill, Ben More, and Kekerengu River. The identity of records from the Inland Kaikoura Range at Limburn Stream and Tapuaenuku, and from George Stream, is uncertain as it has not yet been possible to check the dentition: these populations may belong to *W. edwardi*.

Status

The species is rare in the western part of its range, including the type locality on D'Urville Island. J.I. Townsend (pers. comm.) has a large subfossil specimen of *Wainuia* collected by C. Coates below the limeworks on Takaka Hill 14.i.1962 which is tentatively identified as *W. urnula nasuta*. This is the only record of *W. urnula nasuta* west of Nelson, and suggests a previously much greater range

for the species. The overall impression is of a few remaining pockets from a previously more extensive distribution. Since much of the Richmond Range remains forested, this contraction cannot be explained by loss of habitat. Predation by introduced predators may be responsible. B.J. Karl and M.E. Hearfield (pers. comm.) report that the species survives at the type locality only in stable rock piles that have escaped disturbance by deer and pigs, and these presumably also provide refuge from predators.

Lowland populations in the vicinity of Ward (e.g., Flaxbourne River, M.G. Efford 10.xi.1993) occur in small fragments of well-shaded habitat in an otherwise dry agricultural landscape. These populations are unlikely to persist.

Strong surviving populations exist locally at Port Underwood Saddle east of Picton, on Mt Robertson (K. Walker pers. comm.), at Isolated Hill, and near Kekerengu.

***Wainuia edwardi* (Suter, 1899)**

Type: *Paryphanta edwardi* Suter, 1899. Hossack Downs, Canterbury. Holotype NMNZ M125373

Habitat

Under loose, damp leaf litter and ferns (*Polystichum vestitum*, *Blechnum capense*) in beech and mixed forest. Under bracken (*Pteridium esculentum*) adjacent to forest remnants (Kekerengu; Mason Bridge). In stable moist rock piles (Coopers Creek, mid-Canterbury); under subalpine *Celmisia* sp. (Mt Fyffe); under *Uncinia* sp. in beech forest (Ashley Gorge)

Distribution (Fig. 4d)

Marlborough south of Kekerengu, including the Seaward Kaikoura Range, the Amuri Range, and at numerous sites coastward of the inland Kaikoura road and north of a line between Waiau and the Conway River mouth including the type locality of *W. fallai* at Monkeyface. Mid-Canterbury at Coopers Creek, Mt Oxford, Ashley Gorge and Mt Richardson. Isolated record among limestone slabs on the south side of Mt Cass near Waipara (J.I. Townsend 19.v.1990 and later). A single specimen in the Museum of New Zealand (M77179) was collected by 'P. Parkinson' at Motunau, but I have been unable to relocate this site (P.G. Parkinson (in litt.) assures me that he did not collect the specimen). Subfossil from limestone talus behind the Edward Percival Marine Laboratory, Kaikoura. Subfossil shells found in loess on the north bank of the Waipara River at Titini may belong to this species, but further material is required. Records from Marlborough north of the Clarence River mouth appear all to belong to *W. urnula nasuta*.

Status

I have been unable to relocate *Wainuia edwardi* at or near the type locality for *W. fallai* at Monkeyface, Kaikoura. Populations are known 6 km to the southwest (Oaro River, G. Loh, 1.ii.1983) and northeast (e.g., Hermitage Bush, G. Loh, 3.ii.1983).

Shells from the mid-Canterbury populations near Mt Oxford and Ashley Gorge are smaller than those from north Canterbury and Kaikoura, and possibly merit

subspecies status (Powell 1946). Trampling and grazing of cover plants (e.g., *Uncinia* sp.) by cattle appear to have reduced the abundance of *Wainuia edwardi* at Ashley Gorge between 1972 and 1989 (pers. obs.).

The population near Mt Cass, 49 km northeast of the nearest mid-Canterbury population, may also be genetically distinct. It is, in any case, important because of its isolation and the unusual habitat type (mixed forest on limestone) in an otherwise impoverished natural landscape. However, it appears to be at very low numbers due partly to the small area of available habitat and partly to rat predation (all empty shells found have been chewed by rats). Publicity without adequate protection may expose this accessible population to depletion by collectors.

Wainuia cf. edwardi Mt Tuhua, Westland

Parkinson (1979) alluded to the occurrence of a *Wainuia* population on Mt Tuhua near Lake Kaniere. The only specimen I have seen was collected live near the summit (171°11'E, 42°49'S; NZMG J33 620 189) under tussock and leatherwood by K. Walker & G. Elliott (21.ii.1988) while they were studying *Powelliphanta*. A search by M.G. Efford and J.I. Townsend on 7.xii.1994 at 4 sites above the bushline and three in forest failed to locate any *Wainuia*, although several *Rhytida perampla* were found. The population appears to be very small. Little can be said about its systematic affinities and conservation status until more individuals are found.

Wainuia n.sp. Fiordland

Descriptive notes

Specimens of an undescribed *Wainuia* species have been collected from northern Fiordland since at least 1955, particularly by personnel of the NZ Wildlife Service and Department of Conservation (Museum of New Zealand collections). I am grateful to Daryl Eason for providing live specimens for observation. The most visible distinguishing characteristic of the species is its bright yellow mantle secretion. Shell calcification is variable. Some shells from the Miller Peaks area are thin and collapse when handled. Isolated shells from lower elevations are quite robust, relatively smooth and slightly lower in profile, suggesting an affinity to *Rhytida* (e.g., NMNZ M79920 South of Kaipo R. mouth, K. Morrison, 18.viii.1984 which is labelled '*Rhytida otagoensis*').

Habitat

Under subalpine tussock (*Chionochloa flavescens*: Miller Peaks); under *Blechnum discolor* (Pompolona Hut, Milford Track J. Goulstone); 'under rata slab in open silver beech/rata forest' (Headwaters of Light R., I. Southey); 'mahoe-pigeonwood-kiekie' (South of Kaipo River mouth, K. Morrison).

Distribution (Fig. 4e)

Birch Creek (=Tertiary Creek), N. Arm, Te Anau (G.R.Abrahams, -v.1955, NMNZ M36815); Martins Bay (R.R. Forster & J.S. Dugdale, ca. 30.i.1955, NMNZ M29904 [juveniles only]); Miller Peaks, Murchison Mountains (K. Hawkins, - .i.1974, NMNZ M32755); Harrison Valley Milford Sound 2000' (K. Hawkins, 22.xi.1975, NMNZ M46872); Cats Eye Ridge, north of George Sound (K. Brown

& R. Peacock, 1977, NMNZ M57637); South of Kaipō River mouth NW Fiordland (K. Morrison, 18.viii.1984, NMNZ 79920); Kaipō R. - John O'Groats saddle 2500' (M.J. Meads & A.P. Balance, 7.i.1987, NMNZ M86331); Mid Burn, Stuart Mountains D. Eason 19.xii.1993); Dana Peaks, Murchison Mountains (D. Eason, 21.ii.1994); headwaters of Light River, Sutherland Sound (I. Southey, 6.iii.1995); Pompolona Hut Milford Track (J. Goulstone, 6.iii.1992, NMNZ uncat.);

Status

Uncertain, but apparently not threatened. Locally common in the Miller Peaks area (D. Eason pers. comm.), but other records are mostly of isolated specimens. Occupies a wide range of habitats.

***Rhytida australis* Hutton, 1882**

Type: *Rhytida australis* Hutton 1882, Stewart Island. Holotype CM M1406

Descriptive notes

A distinctively coloured species with a large reddish patch in the umbilicus and the foot and mantle tinged with maroon; variable reddish spirals on upper surface of shell. Shells from surviving populations are small compared to numerous subfossil shells from Native Island.

Distribution (Fig. 4f)

Common throughout Stewart Island and on nearby islands (Big South Cape, Codfish, Small Craft Retreat, Ulva, Native, Bravo). Dell's (1954) observation that there are no locality records south of a line between the south of Paterson Inlet and Mason's Bay has been superseded (e.g., NMNZ M29588 F.M. Climo, Port Pegasus, 22.ii.1972), and B. Patrick has found the species high on Mt Anglem (800 m). Apparently occurs on the South Island mainland at Chalky Sound (J. Leask, July 1952, NMNZ M9631; Mrs E. Smith, no date, AIM uncatalogued).

Status

Probably secure on Stewart Island judging from the large number of localities and its local abundance. The record from Chalky Sound requires confirmation.

***Rhytida greenwoodi greenwoodi* Gray, 1850**

Type: *Helix greenwoodi* Gray, 1850. Type specimen in the British Museum according to Suter 1913.

Descriptive notes

Shell heavily calcified compared to other *Rhytida* species. Yellowish. Periostracum with fine irregular radial wrinkles (plications) extending from upper surface right into umbilicus; radial sculpture regular on protoconch. Body whorl rounded in cross section rather than sharply angled ('keeled') as in *Rhytidarex dunniæ* with which it is sympatric near Auckland.

Habitat

'Deep, well drained litter' (Solem *et al.* 1981 Manukau Peninsula); under fallen fronds of mamaku and wheki (Kaimai Range M.G. Efford & J.I. Townsend - .xi.1996); under *Tradescantia fulminensis* Prouse Reserve, Levin.

Distribution (Fig. 4g)

North Island from Muriwai south to Manakau, Horowhenua, and on Hauraki Gulf Islands including Great Barrier Island. The sole more northerly record ("behind Bob Penniket's house, Warkworth" 3.iii.1985 B. F. Hazelwood NMNZ M76548) is a juvenile possibly of *Amborhytida*; until more material is obtained this record cannot be accepted. Rare or absent south of Taranaki except near Levin. Isolated record from near Wanganui (B.F. Hazelwood Papaiti Road 15.i.1984 NMNZ M79887).

Status

Not threatened. The species was previously much more widespread as shown by the existence of subfossil remains in North Canterbury (Allan 1937), southern Marlborough (Mt Cookson, T. Worthy 27.iii.1993; Kaikoura L.D. Bowring -.ii.1971 NMNZ M24470), eastern North Island (sand dunes at Ocean Beach south of Cape Kidnappers e.g., AIM AK16179).

***Rhytida greenwoodi webbi* Powell, 1949**

Type: *Rhytida greenwoodi webbi* Powell, 1949. Clifton, Takaka. Holotype AIM 1163

Descriptive notes

This taxon is distinguished by a flatter body whorl and generally lower shell than the typical subspecies. Powell (1979) considered that the egg of *R. g. webbi* was much larger than the typical subspecies. However, eggs laid by *R. g. webbi* from Dry River were of very similar size to those of *R. g. greenwoodi* from Levin (pers. obs.). It is possible that O'Connor (1945) confused eggs of *R. g. webbi* and *R. oconnori* (= *R. badfieldi*) from nearby in the Pikikiruna Range. Also, juvenile *R. g. webbi* from East Takaka show a flare of reddish brown in the umbilicus, a character state which Powell (1979) believed to be uniformly absent.

Habitat

Under *Astelia* on limestone outcrops (Type). Under *Dicksonia squarrosa* litter, Dry River, East Takaka (M.G. Efford, D.J. Bokeloh & M.J. Meads, 12.iii.90)

Distribution (Fig. 4h)

Western flank of the northern Pikikiruna Range, including Clifton and Dry River, East Takaka.

A thin-shelled form unlike either of the named subspecies lives at the Motueka River Gorge, Richmond Range, Nelson (e.g., F.M. Climo, 14.iv.1992, NMNZ M109562).

Status

Powell (1949) considered the subspecies extremely restricted in distribution. More extensive collecting shows it to be present in moderate numbers at several sites in East Takaka, but it must still be considered vulnerable. The extent of the live population at Motueka River Gorge is unknown, but apparently very localised.

***Rhytida meesoni* Suter, 1891**

Type: *Rhytida meesoni* Suter, 1891. Wairoa Gorge, Nelson. Syntypes (6) NMNZ M125139

Descriptive notes

The smallest *Rhytida* species: shell up to 11.5 mm (Powell 1979), with a wide umbilicus and shiny surface. Mantle pigment yellow or absent.

Habitat

Nothofagus forest (Deep Stream, Waiau River, P.M. Johns, 11.ii.1963; Appletree Flat, Cobb Valley, D.J. Roscoe 8.i.1982; Lake Rotoiti, D.J. Roscoe, 28.xii.1981; Hope Saddle, D.J. Roscoe, 25.iv.1980); under large rock and under flax (Flora Track, Mt Arthur, D.J. Roscoe, 13.xi.1982); under *Blechnum* sp. (St. Arnaud, D.J. Roscoe, 1.v.1983); under *Uncinia* sp. and *Polystichum vestitum* in *Nothofagus fusca* forest (Wairau Valley, M.G. Efford & J.I. Townsend, 12.xi.1993); mixed beech litter (Brooklyn Domain, Motueka, D.J. Roscoe, 30.ix.1981); among stones (Ben Nevis Track, D.J. Roscoe, 20.iii.1992); among tree ferns and kiekie (Rai Saddle, D.J. Roscoe, 14.xi.1985); under logs (Mt Riley 3000', Ponder, NMNZ no date); among *Dicksonia* fronds (Nydia Walkway, Havelock, D.J. Roscoe, 12.i.1983); 'in long grass under small shrubs' (Kirk Peninsula, D'Urville Island, AIM no date); 'under flax and stunted manuka' (Nukuwaiata I., O. Chetwodes, D.J. Roscoe & P. Cresswell, 4.iv.1981); under *Blechnum discolor* (near Port Underwood road saddle, M.G. Efford, 12.iii.1980); among tussock at 3900' (Mt Stokes, Marlborough Sounds, J.I. Townsend, 29.v.1969)

Distribution (Fig. 4i)

Marlborough Sounds, Nelson and scattered localities in southern Marlborough. Outlying record from the Buller Gorge should be checked (1 km west of O'Sullivan's bridge, 24.iv.1977, D.J. Roscoe pers. comm.). This record and some others in the west may refer to *R. perampla*. Parkinson (1979) considered *R. meesoni* to be confined to east Nelson and Marlborough.

Status

Widespread and locally common near Nelson and in the Marlborough Sounds. Sparsely distributed in southern Marlborough. Not threatened.

***Rhytida patula* Hutton, 1882**

Type *Rhytida patula* Hutton, 1882. Greymouth. Lectotype (Powell 1936) CM M122

Descriptive notes

Either a single variable species or a complex of related species. In western populations the upper surface of the shell has a characteristic dull sheen due to the fine microsculpture. Includes Parkinson's (1979) "*Rhytida* n.sp." from the Lewis Pass. Shell colour of live animals varies from reddish brown to yellowish tan.

Habitat

Under *Tradescantia* (Cobden, M.G. Efford & J.I. Townsend, 14.xi.1993); in fibrous material at base of mamaku stems (Twelve Mile Bluff near Barrytown, M.G. Efford & J. I. Townsend, 14.xi.1993); under mamaku fronds (Fox River, M.G. Efford 12.vii.1996); under rotting log (Rapahoe Range, D.J. Roscoe, 29.i.1983); under flax (17-mile Bluff near Barrytown, F.M. Climo, 8.xii.1990, NMNZ M107010; Green Island, Wharariki Beach, F.M. Climo, 11.i.1980, NMNZ M62998); nikau groves (Kaihoka Lakes Scenic Reserve, F.M. Climo & K. Mahlfeld, 16.iv.1992, NMNZ M110021); under skirts of *Polystichum vestitum* (Lewis Pass, M.G. Efford, 14.xi.1993).

Distribution (Fig. 4j)

Central and northern west coast of the South Island, extending east across Lewis Pass.

Status

Widespread and also common at several localities (near Greymouth, Green Island Wharariki Beach). Not threatened in the west. Less numerous and possibly vulnerable in the east near Lewis Pass.

***Rhytida perampla* (Powell, 1946)**

Type *Rhytida meesoni perampla* Powell, 1946. Anatoki Forks 2400' Takaka AIM 71107

Descriptive notes

Either a single variable species or a complex of related species. Small to medium-sized shell with narrow umbilicus and inflated body whorl. Fine oblique chords rising over the periphery of the shell towards the aperture in some populations (e.g., Otira) but missing in others. Mantle secretion unpigmented.

Habitat

Under rocks (Kawatiri Junction, D.J. Roscoe, 28.i.1983); under tussock and low *Polystichum* sp. (Mt Arthur, M.G. Efford, 20.ii.1994); under tussock & *Celmisia* sp. (Mt Tuhua, J. I. Townsend); in damp moss (Rahu Saddle, M.G. Efford & J.I. Townsend, 14.xi.1993); tussock 4000' (Taramakau Valley, L. Best, 15.i.1969, NMNZ); under *Blechnum discolor* (Lake Kaniere, M.G. Efford, -.ix.1992); under

flax (mouth of Kohaihai River, northern Westland, P. Jamieson 8.iii.1976; Mt Arthur, R.K. Dell 27.i.1948, NMNZ M4114); under tree fern litter (*Cyathea dealbata*) and among rocks (Moss's Bush Reserve, Riwaka, M.G. Efford, 19.ii.1994).

Distribution (Fig. 4k)

Northwest Nelson; also in the vicinity of Reefton and east to Garnet Peak, Lewis Pass (P.M. Johns 15.x.1962 NMNZ M22806), and in a southern cluster of sites from Totara Valley near Ross (e.g., J.I. Townsend 21.xii.1960) through to Otira (e.g., A.W.B. Powell 30.xii.1927 AIM AK3512).

Status

Widespread and not threatened.

***Rhytida oconnori* Powell, 1946**

Type: *Rhytida oconnori* Powell, 1946. Holotype Punipaua Creek, West Nelson AIM 71108

Descriptive notes

Shell large (up to 33 mm maximum diameter), inflated, delicate; colour an even mid-tan with a mauve sheen inside the aperture. Eggs large (5.5 mm). Newly hatched snails have a reddish brown mark in the umbilicus and spiral dorsal stripe.

The extant form from Pikipiruna Range was described originally as *R. badfieldi* Powell, 1949 (see Parkinson 1971).

Habitat

In deep leaf litter among boulders in silver beech forest (Canaan, M.G. Efford, K. Walker & G. Elliot, 19.ii.1994); under *Blechnum discolor* on forest edge (Canaan, M.G. Efford, 3.i.1993)

Distribution (Fig. 4l)

Abel Tasman National Park north of Canaan and in the upper Wainui River valley. Isolated specimens from Awaroa Inlet (A. Penniket, -.xi.1981, NMNZ M70134) and 'Awarua Bay near Separation Point' (A.C. O'Connor, -.ii.1949, AIM; possibly a reference to Awaroa Inlet).

Subfossil from caves near Paturau and Takaka, and from Honeycomb Hill Cave, Oparara. Record from Fox's Lair Cave, Fox River (T. Worthy 18.x.1991 NMNZ M114572) requires further investigation as it may be a large *R. patula*.

Status

Localised and vulnerable. The species now occupies only a remnant of its previous range. Only doubtfully extant outside a 1 km radius of N26 012 297.

***Rhytida otagoensis* Powell, 1930**

Type *Rhytida otagoensis* Powell, 1930. Holotype Bluecliff, west side of Te Waewae Bay, Southland. C.E. Clark 1920 AIM M4365.

Descriptive notes

Shell glossy but coarsely sculptured with rising oblique chords, irregular plications (crinkly appearance) and distinct growth checks, possibly related to periodic feeding. Yellowish tan.

Habitat

In red beech forest inside decaying bark tubes (Whiskey Gully, Blue Mountains, G. Mason); under *Blechnum* sp. (northern Blue Mountains J.I. Townsend and M.G. Efford); under *Polystichum vestitum* (Kaitangata, M.G. Efford 18.viii.1996); under *Uncinia* sp. and under moss and among limestone cobbles (Tuapeka West, M.G. Efford); subalpine tussock and scrub (Hector Mountains B. McKinlay & J.I. Townsend).

Distribution (Fig. 4m)

Published records are from Bluecliff, western side of Te Waewae Bay (type) and Balclutha. Present data show a scattered but much more extensive range both in beech forest and in subalpine tussock and scrub (Waitutu, Hump Ridge, Blue, Hector, Garvie, Nokomai, Mataura Mountains). Recently also from Tree Island in Lake Wakitipu (B. Patrick 31.x.1994). A single specimen from South Westland is tentatively assigned to *R. otagoensis* (confluence of Waipara and Arawhata Rivers, M. Thomas -xi.1991; held by I. Payton). A record based on a juvenile shell from near Te Anau requires further investigation (bridge 2.56 km north of Te Anau, D.J. Roscoe 7.v.1984 NMNZ M103473).

Status

Not immediately threatened. Survives at many widely scattered localities. Apparently common only in western Southland and at a few more northerly locations near Piano Flat and Kaitangata. Now absent from the Catlins, although a subfossil specimen collected by R. Wallace in sandhills just north of Pounaweia (NMNZ M85784) indicates the distribution was once more extensive.

***Rhytida stephenensis* Powell, 1930**

Type: *Rhytida stephenensis* Powell, 1930. Holotype Stephens Island, Cook Strait, H. Hamilton NMNZ M1753.

Descriptive notes

Shell large, robust, and usually heavily sculptured with oblique ridges. Animal grey with no mantle pigment.

Habitat

Under *Polystichum vestitum* (Irongate Stream, Kaikoura, M.G. Efford, 10.xi.1993); among limestone cobbles under mahoe (Waima River, M.G. Efford, 11.iii.1992); under *Uncinia* sp. (Puhipuhi Stream, Kaikoura, M.G. Efford, 15.v.1989); under flax near coast (Motu Ngaratiti Island, Pelorus Sound, R.K.

Dell, 12.ix.1948, NMNZ M23770); among rocks near stream (Outer Chetwode Island, P.M. Johns, 28.vii.1963, NMNZ spirit coll.); among stones (Thorn River, Cobb Valley, J. Goulstone, -.i.1985).

Distribution (Fig. 4n)

R. stephenensis occurs on islands in the Marlborough Sounds (Stephens, Glasgow, Maud, Outer Chetwode, Motu Ngaratiti, Bird, Motungaroa), and at several mainland sites in eastern Marlborough. Outlying records from northwest Nelson ('10 miles up Takaka Valley, Nelson', J.H. Henderson, 1922, AIM AK4340; Thorn River headwaters J. Goulstone, -.i.1985) appear to indicate a previously more extensive distribution.

Status

Common on predator-free Stephens Island, and present in reasonable numbers at some mainland sites (e.g., Irongate Stream, Kaikoura). Rat-chewed shells are common at some sites (e.g., Puhipuhi Stream). It is likely that rat predation is contributing to a long-term decline on the mainland.

The extent of the population at Thorn River is unknown.

***Rhytida* n.sp.** Wairau R.

Descriptive notes

An undescribed species clearly distinguishable from Lewis Pass *R. patula* and from *R. greenwoodi*. Shell yellowish and globose with coarse and irregular growth lines. Some shells have irregular brown radial bands. Mantle pigmentation dull orange.

Habitat

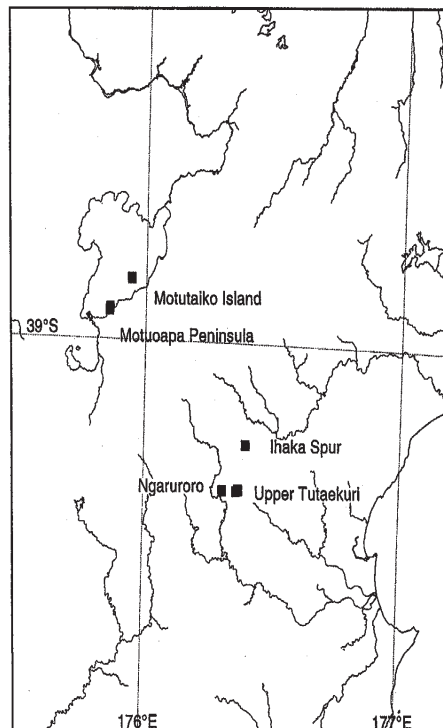
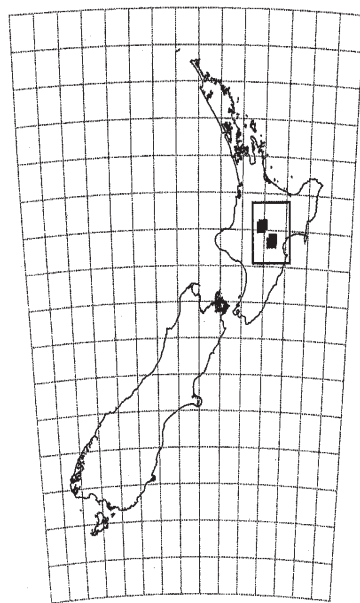
Crawling at night on boulders and logs in red beech forest (Six Mile Creek, M.G. Efford & J.I. Townsend, 12.xi.1993).

Distribution (Fig. 4o)

Inland Marlborough: Lake Tennyson (R.M. Bull & J.I. Townsend, 19.ii.1966); Wairau Valley, Nelson (J.I. Townsend, 15.xi.1958); Six Mile Creek, Upper Wairau Valley (M.G. Efford & J.I. Townsend, 12.xi.1993); Hukere Stream, Travers River, Nelson Lakes (juvenile; P. Jamieson, 6.iv.1980).

Suter (1913) reported *R. greenwoodi* from 'Lake Guyon Run, Nelson' but no specimen appears to have survived (cf. Powell 1949). Lake Guyon is 11 km from Lake Tennyson, a locality for the undescribed *Rhytida* "Wairau" which resembles *R. greenwoodi* in size and robustness. Suter's record is therefore tentatively assigned to the new species.

Wainuia clarki



Wainuia urnula urnula

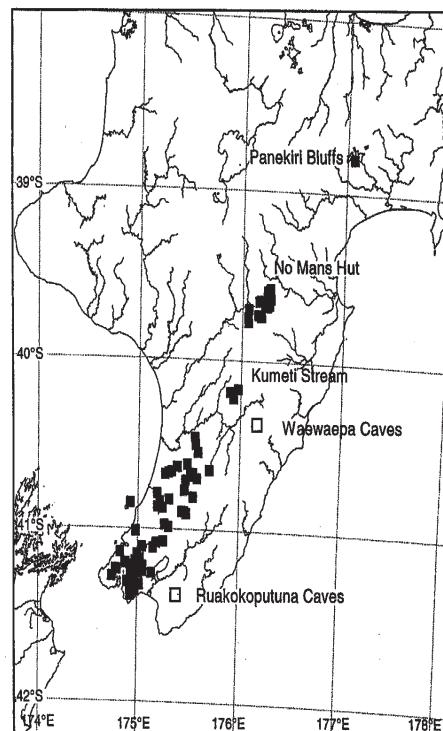
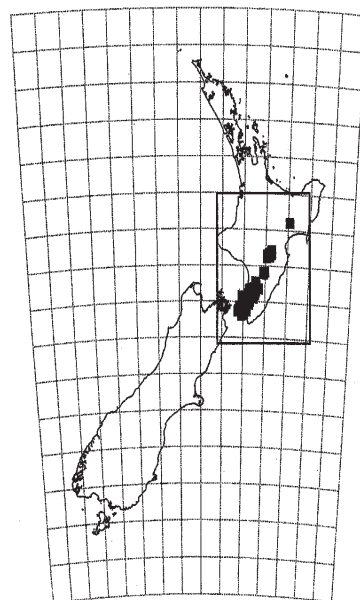
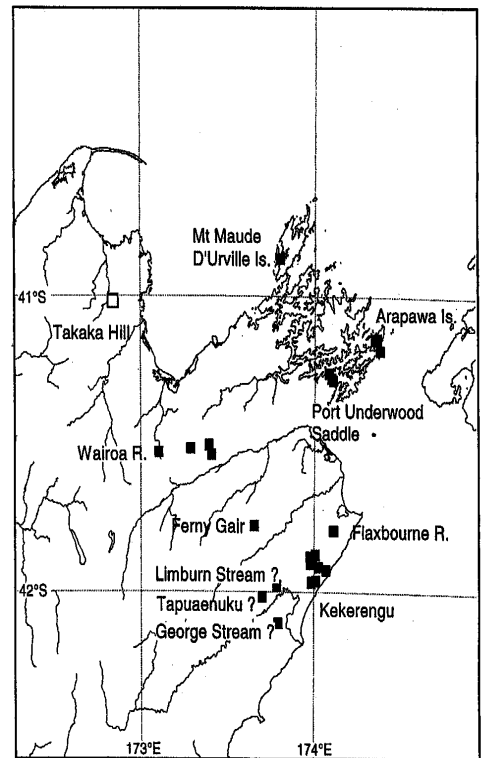
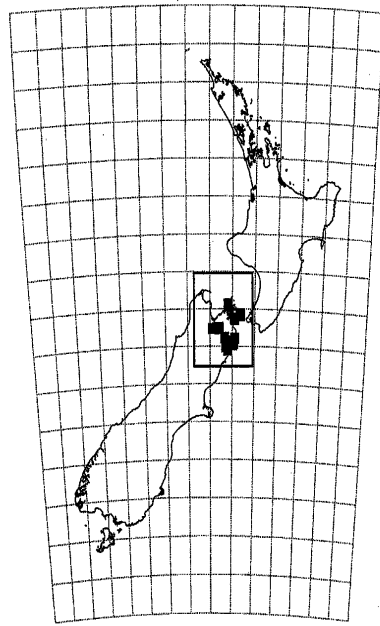


FIGURE 4. SPECIES DISTRIBUTION MAPS. SEE APPENDIX 4 FOR NOTES. BACKGROUND GRID IS IN DEGREES OF LATITUDE AND LONGITUDE (33°S - 49°S; 165°E - 180°E). FILLED SQUARES ARE RECENT RECORDS; OPEN SQUARES ARE SUBFOSSIL RECORDS.

a. *Wainuia clarki* Powell, 1936, b. *Wainuia urnula urnula* (Pfeiffer, 1855)

Wainuia urnula nasuta



Wainuia edwardi

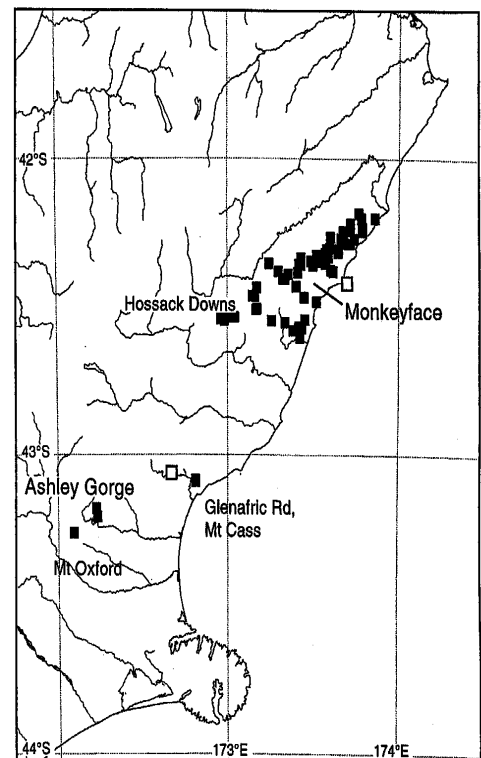
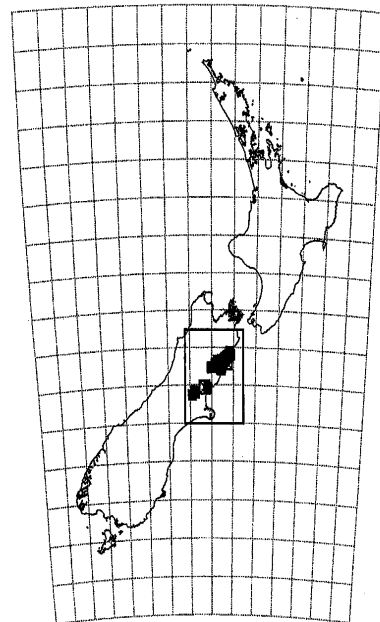
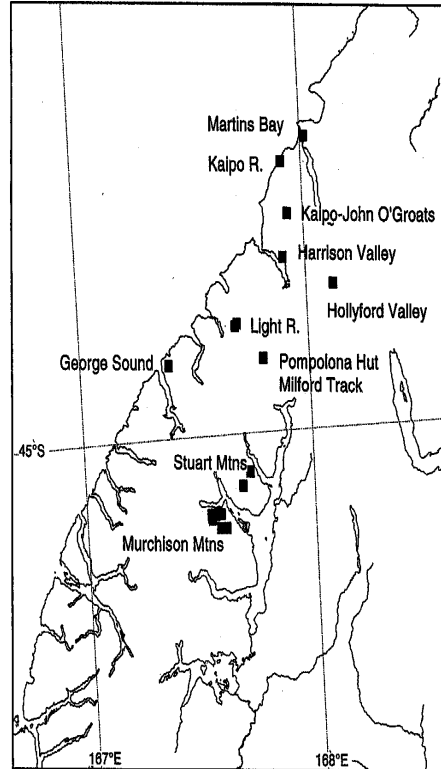
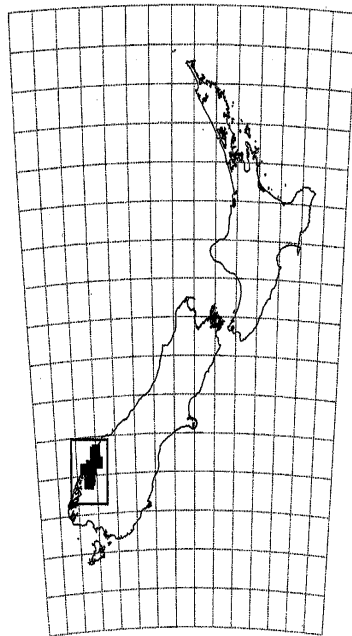


FIGURE 4 c. *Wainuia urnula nasuta* Powell, 1946; d. *Wainuia edwardi* (Suter, 1899).

Wainuia n.sp. Fiordland



Rhytida australis

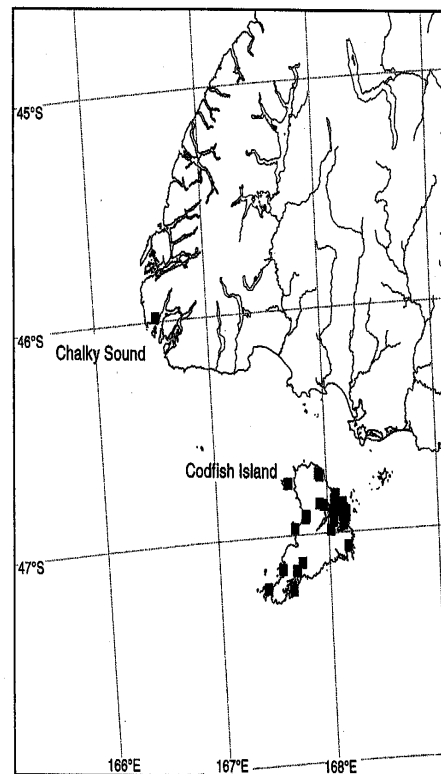
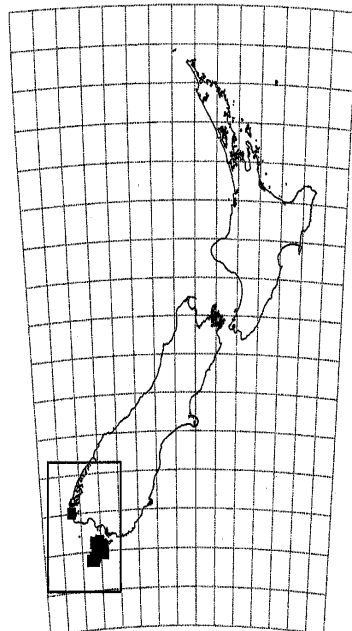


FIGURE 4 e. *Wainuia* n. sp. Fiordland; f. *Rhytida australis* Hutton, 1882.

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