

# Appendix 1

COMMON AND SCIENTIFIC NAMES OF SPECIES MENTIONED IN THE TEXT (\*DENOTES EXOTIC SPECIES, INTRODUCED TO NEW ZEALAND)

## ***Fauna***

### **Birds**

Adzebill	<i>Aptornis otidiformis</i>
Blackbird*	<i>Turdus merula</i>
Kiwi	<i>Apteryx</i> spp.
Moa	<i>Dinornis novaezelandiae</i>
Moa	<i>Dinornis struthoides</i>
Moa	<i>Anomalopteryx didiformis</i>
New Zealand crow	<i>Palaecorax moriorum</i>
New Zealand owl nightjar	<i>Aegotheles novaezealandiae</i>
Piopio	<i>Turnagra capensis</i>
Song thrush*	<i>Turdus philomelos clarkii</i>
Takahe	<i>Porphyrio mantelli</i>
Weka	<i>Gallirallus australis</i>

### **Reptiles**

Tuatara	<i>Sphenodon punctatus</i>
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### **Mammals**

Goat*	<i>Capra hircus</i>
Hedgehog*	<i>Erinaceus europaeus</i>
Kiore (Polynesian rat)*	<i>Rattus exulans</i>
Mouse*	<i>Mus musculus</i>
Norway rat*	<i>Rattus norvegicus</i>
Pig*	<i>Sus scrofa</i>
Possum*	<i>Trichosurus vulpecula</i>
Red deer*	<i>Cervus elaphus</i>
Ship rat*	<i>Rattus rattus</i>

### **Flora**

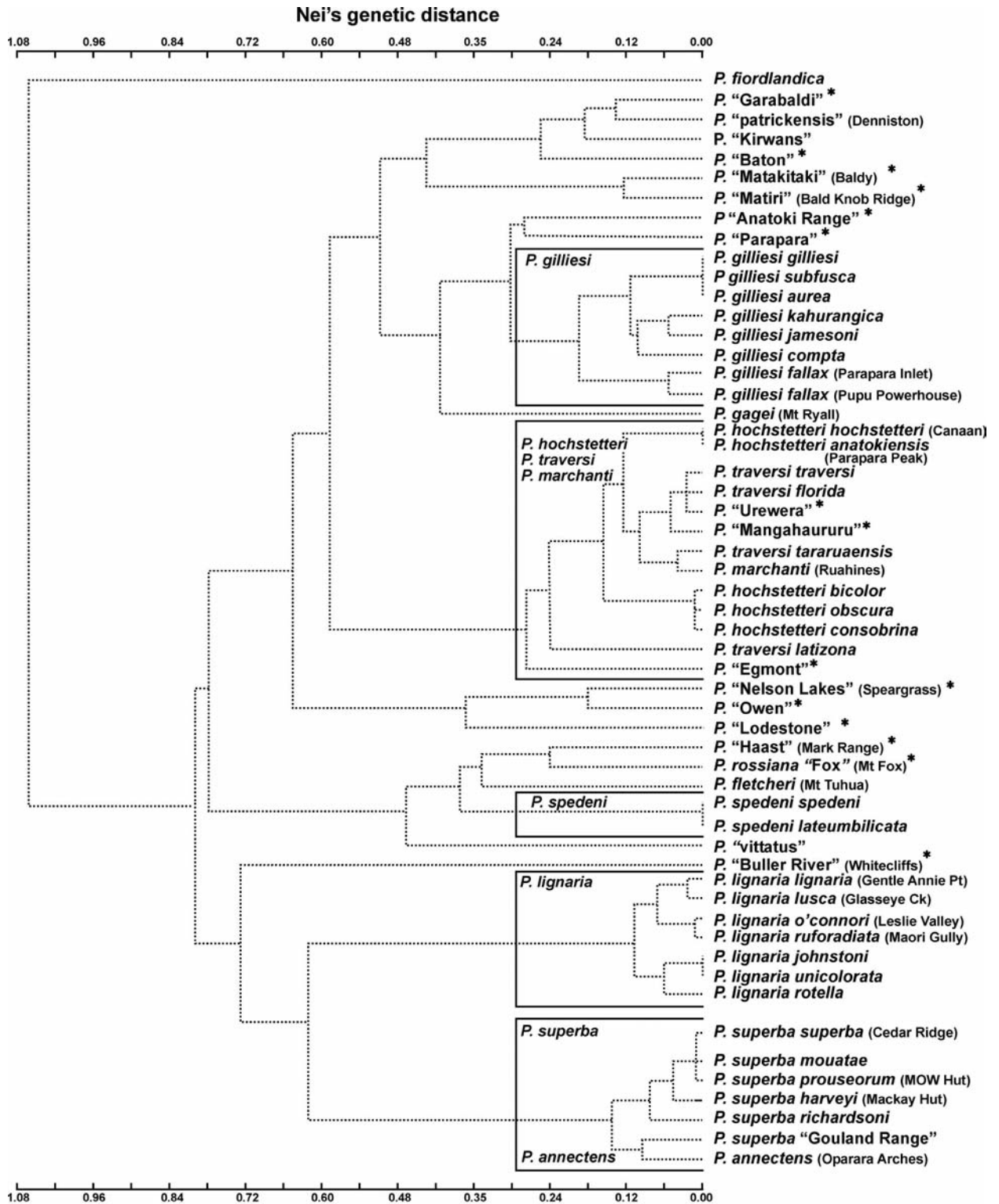
Barberry*	<i>Berberis glaucocarpa</i>
Blackberry*	<i>Rubus fruticosus</i> agg.
Black maire	<i>Nestegis cunninghamii</i>

Bog pine	<i>Halocarpus bidwillii</i>
Broadleaf	General term for hardwoods
Bush rice grass	<i>Microlaena avenacea</i>
Bush tussock	<i>Chionochloa cheesmanii</i>
Cabbage tree	<i>Cordyline</i> spp.
Cedar	<i>Libocedrus bidwillii</i>
Crown fern	<i>Blechnum discolor</i>
Five-finger	<i>Pseudopanax arboreus</i>
Flax	<i>Phormium tenax</i>
Gorse*	<i>Ulex europaeus</i>
Hard beech	<i>Nothofagus truncata</i>
Hinau	<i>Elaeocarpus dentatus</i>
Honey suckle*	<i>Lonicera periclymenum</i>
Inaka	<i>Dracophyllum filifolium</i>
Kahikatea	<i>Dacrycarpus dacrydioides</i>
Kamaha	<i>Weinmannia racemosa</i>
Kanuka	<i>Kunzea ericoides</i>
Kapuka	<i>Griselinia litoralis</i>
Karaka	<i>Corynocarpus laevigatus</i>
Karamu	<i>Coprosma robusta</i>
Kawakawa	<i>Macropiper excelsum</i>
Kiekie	<i>Freycinetia banksii</i>
Kohekohe	<i>Dysoxylum spectabile</i>
Kohuhu	<i>Pittosporum tenuifolium</i>
Leatherwood	<i>Brachyglottis rotundifolia</i>
Lemonwood	<i>Pittosporum eugenioides</i>
Mahoe	<i>Melicytus ramiflorus</i>
Maire tawake	<i>Syzygium maire</i>
Manuka	<i>Leptospermum scoparium</i>
Mapou	<i>Myrsine australis</i>
Matai	<i>Prumnopitys taxifolia</i>
Miro	<i>Prumnopitys ferruginea</i>
Mid-ribbed snow tussock	<i>Chionochloa pallens</i>
Mountain beech	<i>Nothofagus solandri</i> var. <i>cliffortioides</i>
Mountain flax	<i>Phormium cookianum</i>
Mountain holly	<i>Olearia ilicifolia</i>
Mountain toatoa (mountain celery pine)	<i>Phyllocladus alpinus</i>
Mountain wineberry	<i>Aristotelia fruticosa</i>
Narrow-leaved lacebark	<i>Hoberia sexstylosa</i>
Narrow-leaved snow tussock	<i>Chionochloa rigida</i>
Nikau	<i>Rhopalostylis sapida</i>
Northern rata	<i>Metrosideros robusta</i>
Pahautea (mountain cedar)	<i>Libocedrus bidwillii</i>

Pate	<i>Schefflera digitata</i>
Pigeonwood	<i>Hedycarya arborea</i>
Pink pine	<i>Halocarpus biformis</i>
Podocarps	(Any member of Family Podocarpaceae, e.g. rimu, totara, kahikatea, matai, miro)
Pokaka	<i>Elaeocarpus bookerianus</i>
Pukatea	<i>Laurelia novae-zelandiae</i>
Putaputaweta	<i>Carpodetus serratus</i>
Prickly shield fern	<i>Polystichum vestitum</i>
Quintinia	<i>Quintinia acutifolia</i>
Raupo	<i>Typha orientalis</i>
Red beech	<i>Nothofagus fusca</i>
Red tussock	<i>Chionochloa rubra</i>
Rewarewa	<i>Knightsia excelsa</i>
Rimu	<i>Dacrydium cupressinum</i>
Scarlet climbing rata	<i>Metrosideros fulgens</i>
Small-leaved milk tree	<i>Streblus microphyllus</i>
Silver beech	<i>Nothofagus menziesii</i>
Snow totara	<i>Podocarpus nivalis</i>
Southern rata	<i>Metrosideros umbellata</i>
Supplejack	<i>Ripogonum scandens</i>
Tawa	<i>Beilschmiedia tawa</i>
Toitoi	<i>Cortaderia</i> spp.
Toro	<i>Myrsine salicina</i>
Totara	<i>Podocarpus totara</i>
Turpentine scrub	<i>Dracophyllum uniflorum</i>
Wandering willy*	<i>Tradescantia fluminensis</i>
Weeping matipo	<i>Myrsine divaricata</i>
Wheki	<i>Dicksonia squarrosa</i>
White maire	<i>Nestegis lanceolata</i>
Willow*	<i>Salix</i> spp.
Wire rush	<i>Empodisma minus</i>
Yellow-silver pine	<i>Lepidothamnus intermedius</i>

# Appendix 2

PHENOGRAM (ÜPGMA) OF 55 *POWELLIPHANTA* POPULATIONS STUDIED USING NEI'S (1978) *D*, GENERATED BY THE BIOSYS PACKAGE (SWOFFORD AND SELANDER 1981) (K.J. WALKER UNPUBL. DATA)



\* Newly discovered, undescribed taxa

# Appendix 3

TAXONOMY OF *POWELLIPHANTA* USED IN THIS PLAN (POWELL 1979), INCLUDING PROPOSED REVISIONS AND ADDITIONS (K.J. WALKER, UNPUBL. DATA)

<p><b><u>gilliesi series</u></b></p> <p><b><i>Powelliphanta gilliesi</i></b>  <i>P. gilliesi gilliesi</i>  <i>P. gilliesi subfusca</i>  <i>P. gilliesi aurea</i>  <i>P. gilliesi brunnea</i></p> <p><i>P. gilliesi kaiburangica</i>  <i>P. gilliesi</i> “Heaphy”  <i>P. gilliesi jamesoni</i>  <i>P. gilliesi montana</i>  <i>P. gilliesi compta</i></p> <p><i>P. gilliesi fallax</i></p> <p><b><i>Powelliphanta</i> “Parapara”</b></p> <p><b><i>Powelliphanta</i> “Anatoki Peak”</b></p>	<p>Clear division genetically into the three groups below.</p> <p>Genetic make-up not examined.</p> <p>Genetic make-up not examined.  Division into additional subspecies likely.</p> <p>A cryptic species formerly in <i>P.g. fallax</i>.</p>
<p><b><i>Powelliphanta gagei</i></b></p>	<p>Formerly <i>P. rossiana gagei</i>, here restored to species. The complex variation within Paparoa Range snails will require further taxonomic changes.</p>
<p><b><u>plain, northern, alpine series</u></b></p> <p><b><i>Powelliphanta</i> “patrickensis”</b></p> <p><b><i>Powelliphanta</i> “Garibaldi”</b></p> <p><b><i>Powelliphanta</i> “Baton”</b></p> <p><b><i>Powelliphanta</i> “Kirwans”</b></p> <p><b><i>Powelliphanta</i> “Matiri”</b></p> <p><b><i>Powelliphanta</i> “Matakitaki”</b></p>	<p>Clear division genetically into two groups.</p> <p>Formerly <i>P. rossiana patrickensis</i>, here elevated to species level.</p> <p>“Matiri” and “Matakitaki” both subspecies of the same, new, undescribed species.</p>
<p><b><u>plain southern alpine series</u></b></p> <p><b><i>Powelliphanta fletcheri</i></b></p> <p><b><i>Powelliphanta rossiana</i></b>  <i>P. rossiana rossiana</i>  <i>P. rossiana</i> “Fox”</p> <p><b><i>Powelliphanta</i> “Haast”</b></p> <p><b><i>Powelliphanta spedeni</i></b>  <i>P.s. spedeni</i>  <i>P.s. laterumbilicata</i></p>	<p>Formerly <i>P. rossiana fletcheri</i>, here restored to species level.</p> <p>Genetic make-up not examined.  Genetical relationship to <i>P. rossiana rossiana</i> untested.</p>
<p><b><i>Powelliphanta</i> “vitattus”</b></p>	<p>Previous tag name <i>Powelliphanta</i> “Wolf River”.</p>

<p><b><u>striped, northern, alpine series</u></b></p> <p><b><i>Powelliphanta</i> “Nelson Lakes”</b></p> <p><b><i>Powelliphanta</i> “Owen”</b></p> <p><b><i>Powelliphanta</i> “Lodestone”</b></p>	<p>Includes populations at Speargrass, St Arnaud Range and Mt Murchison.</p>
<p><b><u>superba – lignaria series</u></b></p> <p><b><i>Powelliphanta superba</i></b>  <i>P. superba superba</i>  <i>P. superba mouatae</i>  <i>P. superba prouseorum</i>  <i>P. superba harveyi</i>  <i>P. superba richardsoni</i></p> <p><i>P. superba</i> “Goulard Range”  <i>P. superba</i> “Gunner River”</p> <p><b><i>Powelliphanta annectens</i></b></p> <p><b><i>Powelliphanta lignaria</i></b>  <i>P. lignaria lignaria</i>  <i>P. lignaria lusca</i>  <i>P. lignaria o’connori</i>  <i>P. lignaria ruforadiata</i>  <i>P. lignaria johnstoni</i>  <i>P. lignaria rotella</i>  <i>P. lignaria unicolorata</i></p>	<p>Genetic make-up not examined. Division into separate lowland and upland subspecies likely.</p>
<p><b><i>Powelliphanta</i> “Buller River”</b></p>	
<p><b><u>hochstetteri – traversi – marchanti series</u></b></p> <p><b><i>Powelliphanta</i> “Egmont”</b></p> <p><b><i>Powelliphanta hochstetteri</i></b>  <i>P. hochstetteri hochstetteri</i>  <i>P. hochstetteri anatokiensis</i></p> <p><i>P. hochstetteri obscura</i>  <i>P. hochstetteri bicolor</i>  <i>P. hochstetteri consobrina</i></p> <p><b><i>Powelliphanta traversi</i></b>  <i>P. traversi traversi</i>  <i>P. traversi florida</i>  <i>P. traversi koputaroa</i>  <i>P. traversi otakia</i>  <i>P. traversi latizona</i>  <i>P. traversi tararuaensis</i></p> <p><b><i>Powelliphanta marchanti</i></b></p> <p><b><i>Powelliphanta</i> “Maungaharuru”</b></p> <p><b><i>Powelliphanta</i> “Urewera”</b></p>	<p>Genetically, morphologically and geographically two distinct groups. Distinct yellow-based and brown-based forms recognised. Distinct red-form and yellow-form recognised.</p> <p>All forms restored here to subspecific status.</p> <p>Genetic make-up not examined.  Genetic make-up not examined.</p> <p>Ruahine, Kaimanawa and Kaweka Range populations.</p> <p>Possibly subspecies of <i>P. marchanti</i>.</p> <p>Possibly subspecies of <i>P. marchanti</i>.</p>
<p><b><i>Powelliphanta fiordlandica</i></b></p>	<p>Requires placement in new undescribed sub-genus of <i>Powelliphanta</i>.</p>

# Appendix 4

## POWELLIPHANTA POPULATIONS KNOWN TO HAVE ORIGINATED FROM ARTIFICIAL TRANSLOCATIONS

SPECIES	SITE TRANSFERRED FROM	SITE TRANSFERRED TO	DATE OF TRANSLOCATION	NUMBER OF SNAILS MOVED	COMMENT
<i>P. hochstetteri hochstetteri</i> (yellow-based form)	Canaan, Abel Tasman National Park	Atarau, Grey Valley, West Coast. K31/855-734	1978	4	Liberated by Cam Keown into red and silver beech forest, with some podocarps. Population currently small and affected by rats, but potential for expansion from edge of forest into much larger forest area.
<i>P. hochstetteri hochstetteri</i> (yellow-based form)	Canaan, Abel Tasman National Park	Just below Mt Robert carpark, Nelson Lakes National Park. N29/942-317	Unknown	Unknown	Low density population currently confined to several hectares of beech forest, surrounded by grass and regenerating shrublands. Potential to spread into large area of adjacent beech forest.
<i>P. hochstetteri</i>	Unknown	Farm at Kaikou, near Mangakahia, Northland.	Unknown	Unknown	Three empty shells found by the Wildlife Service in 1980. Identified by A.W.B. Powell as ' <i>P. hochstetteri</i> from high elevation in the Tasman mountains, west Nelson' (Ogle 1982).
<i>P. gilliesi subfusca</i>	Unknown	Drumduan, Cable Bay, northeast Nelson. Approximately O27/453-026	Unknown, but according to the locals in the 1960s, they had been there for 100 years (Elliott 1970).	Unknown	Low-density population in small part of larger tawa forest block. Stock (horses and goats) keeping forest floor bare and probably keeping snail population small.
<i>P. gilliesi (subfusca?)</i>	Unknown	Kings Park Reserve, Greymouth. J32/634-602	Unknown. First reported in 1986, large population in 1997; translocation probably at least 60 years earlier.	Unknown	Substantial population (4 live snails and 29 shells and 3.5 live snails/person hour search) within at least 3 ha of a much larger forest block (secondary rata/kamahia forest on limestone scarp with sinkholes). Significant rat and weka predation probably slowing snail population growth. Shells are similar to but distinguishable from <i>P. g. subfusca</i> : founder effect?
<i>P. traversi latizona</i>	Greenaways Bush	Khandallah Reserve, Wellington.	About 1945 by Mr A.C. O'Connor (Powell 1946)	40	Low population in small part of a larger forest reserve.
<i>P. annectens</i>	Oparara River to Swanburn Creek? (location presumed on basis of shell characteristics).	Hokitika Airport Reserve. 42° 42.867'S, 170° 58.653' E	Unknown. Probably about 1970s or 1980s.	Unknown	Low density population (2 live snails in 5 person-hour search; or 0.4 snails/person hour) in regenerating 3 m tall gorse, manuka and <i>Gabnia</i> , surrounded by pasture and residential sections with only limited opportunities for wider spread.

# Appendix 5

SUMMARY OF RECOMMENDED RECOVERY ACTIONS FOR *POWELLIPHANTA* TAXA, LISTED IN DECREASING ORDER OF THREAT WITHIN DEPARTMENT OF CONSERVATION AREAS. THREAT CATEGORIES AND RANKINGS FOLLOW THOSE OF HITCHMOUGH (2002)

AREA OFFICE  (*denotes taxa found in more than one area)	SPECIES	RANKING  (in decreasing order of threat within each Area)	RECOVERY RECOMMENDATIONS												
			Habitat Protection					Predator Control					Monitor	Survey	Taxonomy
			Legal protection	Increase area/ link colonies	Weed control	Deer control	Goat control	Fence stock out	Possums	Pigs	Rats	Thrush	Hedgehog	Snail population size, trends and effectiveness of management	Survey distribution of taxa and health of snail colonies
<b>NELSON/MARLBOROUGH CONSERVANCY</b>															
<b>Golden Bay</b>	<i>P. gilliesi brunnea</i>	Nationally Critical	✓	✓	✓		✓			✓	✓	✓	✓		
	<i>P. gilliesi</i> "Haidinger"	Nationally Critical						✓					✓	✓	✓
	<i>P.</i> "Anatoki Range"	Nationally Critical											✓	✓	✓
	<i>P. superba richardsoni</i>	Nationally Endangered						✓					✓		
	<i>P. superba mouatae</i>	Nationally Endangered						✓					✓		
	<i>P. superba proussorum</i> *	Nationally Endangered						✓					✓	✓	
	<i>P. superba</i> "Goulard Range" *	Nationally Endangered											✓	✓	✓
	<i>P. hochstetteri anatokiensis</i> (red-form)	Nationally Endangered						✓					✓		✓
	<i>P. hochstetteri anatokiensis</i> (yellow-form)	Nationally Endangered						✓	✓				✓		✓
	<i>P. gilliesi aurea</i>	Nationally Endangered	✓				✓	✓					✓	✓	
	<i>P. gilliesi montana</i>	Nationally Endangered				✓	✓	✓					✓		
	<i>P. gilliesi jamesoni</i>	Nationally Endangered						✓		✓			✓		✓
	<i>P. gilliesi gilliesi</i>	Nationally Endangered	✓				✓	✓	✓	✓			✓		
	<i>P. gilliesi kahurangi</i>	Nationally Endangered	✓				✓	✓	✓	✓			✓		
	<i>P.</i> "Parapara"	Nationally Endangered						✓					✓		✓
	<i>P. gilliesi compta</i>	Vulnerable				✓		✓		✓			✓		
	<i>P. superba superba</i>	Serious Decline					✓	✓					✓		
	<i>P. hochstetteri hochstetteri</i> *	Gradual Decline	✓				✓	✓	✓				✓		
<i>P. gilliesi subfusca</i>	Gradual Decline	✓	✓									✓			
<i>P. gilliesi fallax</i>	Gradual Decline						✓	✓	✓	✓		✓		✓	



AREA OFFICE  (*denotes taxa found in more than one area)	SPECIES	RANKING  (in decreasing order of threat within each Area)	RECOVERY RECOMMENDATIONS														
Motueka	<i>P. "Baton"</i>	Nationally Critical					✓	✓							✓	✓	✓
	<i>P. "Owen"</i>	Nationally Endangered								✓					✓	✓	✓
	<i>P. lignaria o'connori</i> *	Vulnerable					✓	✓		✓		✓			✓	✓	
	<i>P. hochstetteri hochstetteri</i> *	Gradual Decline	✓					✓	✓		✓	✓			✓		
	<i>P. hochstetteri consobrina</i> *	Gradual Decline													✓		
	<i>P. "Lodestone"</i>	Range Restricted														✓	✓
	<i>P. "Garibaldi"</i>	Range Restricted														✓	✓
St Arnaud	<i>P. "Matiri"</i>	Range Restricted													✓		✓
	<i>P. "Matakitaki"</i>	Range Restricted														✓	✓
	<i>P. "Nelson Lakes"</i>	Range Restricted					✓								✓	✓	✓
South Marlborough	<i>P. hochstetteri consobrina</i> *	Gradual Decline													✓		
	<i>P. hochstetteri bicolor</i> *	Gradual Decline					✓	✓		✓	✓				✓		
Sounds	<i>P. hochstetteri bicolor</i> *	Gradual Decline					✓	✓		✓	✓				✓		
	<i>P. hochstetteri obscura</i>	Gradual Decline					✓	✓		✓	✓				✓		
<b>WEST COAST CONSERVANCY</b>																	
Buller	<i>P. superba prouseorum</i> *	Nationally Endangered													✓	✓	
	<i>P. superba harveyi</i>	Nationally Endangered													✓		
	<i>P. superba "Gouland Range"</i> *	Nationally Endangered													✓	✓	✓
	<i>P. superba "Gunner River"</i>	Nationally Endangered					✓			✓		✓			✓	✓	✓
	<i>P. gilliesi "Heaphy"</i>	Nationally Endangered					✓			✓		✓			✓	✓	✓
	<i>P. lignaria rotella</i>	Nationally Endangered		✓						✓					✓		
	<i>P. lignaria jobnstoni</i>	Nationally Endangered	✓	✓						✓					✓		
	<i>P. lignaria ruforadiata</i>	Nationally Endangered								✓		✓			✓	✓	
	<i>P. "patrickensis"</i>	Nationally Endangered	✓							✓					✓		✓
	<i>P. "Buller River"</i>	Nationally Endangered	✓								✓	✓		✓	✓	✓	✓
	<i>P. lignaria unicolorata</i>	Vulnerable								✓		✓			✓	✓	
	<i>P. lignaria o'connori</i> *	Vulnerable					✓	✓		✓		✓			✓	✓	
	<i>P. lignaria lignaria</i>	Vulnerable	✓						✓	✓					✓		
	<i>P. lignaria lusca</i>	Vulnerable	✓						✓	✓					✓		
	<i>P. annectens</i>	Serious Decline	✓	✓						✓		✓			✓		

AREA OFFICE <small>(*denotes taxa found in more than one area)</small>	SPECIES	RANKING <small>(in decreasing order of threat within each Area)</small>	RECOVERY RECOMMENDATIONS														
Greymouth	<i>P. gagei</i>	Range Restricted	✓												✓		✓
	<i>P.</i> "Kirwans"	Range Restricted									✓				✓	✓	✓
Hokitika	<i>P. rossiana rossiana</i>	Endangered	✓												✓	✓	✓
	<i>P. fletcheri</i>	Range Restricted				✓									✓	✓	✓
Franz Josef	<i>P. rossiana</i> "Fox" *	Range Restricted														✓	✓
South Westland	<i>P. rossiana</i> "Fox" *	Range Restricted														✓	✓
	<i>P.</i> "Haast"	Range Restricted				✓				✓					✓	✓	✓
	<i>P.</i> "vittatus"	Range Restricted				✓				✓					✓	✓	✓
<b>SOUTHLAND CONSERVANCY</b>																	
Te Anau	<i>P. fiordlandica</i>	Vulnerable													✓	✓	✓
	<i>P. spedeni spedeni</i>	Serious Decline	✓												✓		
	<i>P. spedeni lateumbilicata</i>	Range Restricted													✓	✓	
	<i>P.</i> "vittatus"	Range Restricted				✓				✓					✓	✓	
<b>WELLINGTON CONSERVANCY</b>																	
Kapiti	<i>P. traversi otakia</i>	Nationally Critical	✓	✓	✓					✓		✓	✓	✓	✓		
	<i>P. traversi traversi</i>	Nationally Endangered	✓	✓	✓					✓		✓		✓		✓	
	<i>P. traversi koputaroa</i>	Nationally Endangered	✓	✓	✓					✓		✓	✓	✓			✓
	<i>P. traversi florida</i>	Nationally Endangered								✓		✓			✓	✓	
	<i>P. traversi latizona</i>	Nationally Endangered	✓	✓						✓		✓			✓		✓
	<i>P. traversi tararuaensis</i> *	Nationally Endangered	✓	✓		✓			✓		✓	✓			✓	✓	
<b>WANGANUI CONSERVANCY</b>																	
Palmerston	<i>P. traversi tararuaensis</i> *	Nationally Endangered	✓	✓		✓		✓		✓	✓			✓	✓		
North	<i>P. marchanti</i> *	Serious Decline				✓				✓				✓	✓		✓
Stratford	<i>P.</i> "Egmont"	Range Restricted					✓			✓				✓	✓		✓
<b>TONGARIRO/TAUPO CONSERVANCY</b>																	
Turangi/ Taupo	<i>P. marchanti</i> *	Serious Decline				✓				✓				✓	✓		✓

<b>AREA OFFICE</b>  <small>(*denotes taxa found in more than one area)</small>	<b>SPECIES</b>	<b>RANKING</b>  <small>(in decreasing order of threat within each Area)</small>	<b>RECOVERY RECOMMENDATIONS</b>													
<b>EAST COAST/HAWKES BAY CONSERVANCY</b>																
<b>Hawkes Bay</b>	<i>P.</i> “Maungaharuru”	Nationally Endangered	✓	✓		✓	✓		✓	✓				✓	✓	✓
	<i>P. marchanti</i> *	Serious Decline				✓			✓					✓	✓	✓
<b>Aniwaniwa</b>	<i>P.</i> “Urewera”	Serious Decline				✓			✓				✓	✓	✓	

# Appendix 6

## GLOSSARY OF TECHNICAL TERMS

Aperture	The entrance to the shell.
Axial stripes	Longitudinal colour bands.
Body whorl	The last and largest whorl.
Dorsal surface	The top half of the shell.
Globose	Spherical, bowl shaped.
Mantle	Tissue sheet that forms the roof of the 'lung' of the air-breathing (pulmonate) snails. The anterior lip of the mantle secretes the shell and is the main tissue visible in the aperture when a snail has withdrawn into its shell. The mantle also secretes mucus, which may be highly pigmented.
Parietal callus	Hard, thickened material on the inner shell wall, just inside the aperture. The parietal callus is variable in colour and texture in <i>Powelliphanta</i> . In most species the callus is smooth, but in <i>P. annectens</i> and some of the <i>P. superba</i> and <i>P. gilliesi</i> subspecies, the callus is covered with small, hard lumps. The size and density of these granulations varies between and within these taxa. The parietal callus changes colour after death of the snail as the shell weathers outdoors; first turning white, then flaking off entirely. The predictable timing of this process allows reasonably accurate estimation of time spent outdoors since death.
Periphery	Circumference at the widest part of the shell.
Spiral stripes	Colour bands along the same plane as the periphery.
Striae	Slight furrow or ridge on shell surface.
Umbilicus	Cavity formed on the underside of a shell by the surrounding body whorl.
Ventral surface	The underside of the shell.
Whorl	One complete rotation of the growing shell.

