The state of plant conservation on Pacific islands

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Abstract

We examine the status of plant conservation in Oceania, where most islands have experienced two waves of anthropogenic habitat alteration and extinction, following Austronesian and European contact. The most important islands for plant conservation are the high volcanic and makatea islands, since atolls carry exceptionally poor native floras with few or no endemics. Knowledge of the status and distribution of Pacific plants is generally poor and based largely on 20th century brief surveys. Few plant species have been Red-listed except where global assessments have been carried out. Among Red-listed species, proportions threatened are exceptionally high, suggesting that species selection for Red-listing has been based on foreknowledge of threatened status. With a few exceptions, the threat factors having impacts on Pacific plants are poorly known, and conservation is often based on inference from evidence gathered elsewhere. Priority actions include more survey, more Red-listing, more studies of threatened species, more conservation management plans and action, establishing a more comprehensive protected area system robust to climate change, more effective networking and increased international collaboration and assistance.

Keywords

Oceania, Pacific, island, plant, conservation, Red-list

In this paper we consider the state of plant conservation on the Pacific islands of Oceania. This excludes Hawaii and the islands of the eastern Pacific that have recently been reviewed by Caujapé-Castells et al. (2010), and most islands belonging to Pacific rim countries, the Philippines and Indonesia. Our review covers islands belonging to 24 countries and territories (American Samoa, the Cook Islands, Federated States of Micronesia, Fiji, French Polynesia, Guam, Kiribati, the Marshall Islands, Nauru, New Caledonia, Niue, Norfolk Island, the Northern Mariana Islands, Palau, Papua New Guinea, the Pitcairn Islands, Samoa, the Solomon Islands, Tokelau, Tonga, Tuvalu, US Minor Outlying Islands, Vanuatu, Wallis and Futuna). Oceania covers some 30% of the earth's surface but the land area is tiny and many countries have very small human populations, rendering international cooperation both essential and difficult. Countries with populations of a few thousand rely on such international cooperation to achieve their conservation goals, but communication and skill-sharing across such a large region of small islands is expensive. Most Pacific countries lack sufficient financial resources for effective plant conservation, and with their small human populations cannot be expected to provide comprehensive conservation services unaided. Long-term international financial and technical assistance is therefore crucial.

The main threats to the flora of these islands stem from two waves of human contact and settlement: the early Austronesian voyagers from SE Asia who settled most of the islands of Melanesia, Micronesia and Polynesia, and the European influence of the past 500 years. These brought about habitat alteration through land-use change, direct over-exploitation of a few species and, currently most importantly, two waves of introduction of alien species, with consequent extinctions of native plants and animals.

Three kinds of island carry different kinds of flora in the Pacific. Atolls are low-lying and species-poor. As an example, Kiritimati (Christmas) Island (Kiribati) is the atoll with the largest land area in the world, but has a native vascular flora of only some 19 species. In part this results from most atolls having been submerged during sea-level high-stands during the last interglacial. Makatea islands are raised atolls, with a richer, limestone flora, while the most diverse Pacific island floras are found on high volcanic islands (together with the continental fragment islands of New Caledonia and Papua New Guinea). For example, Upolu and Savai'i, the two main islands of Samoa, together make up about four times the land area of Kiritimati, but carry a native vascular flora of c. 800 species, or 40 times as many as Kiritimati, of which about 30% are endemic to Samoa. Makatea and high volcanic islands are therefore the highest priorities for plant conservation.

Knowledge of the status and distribution of Pacific plants, as measured by the IUCN Red List, is poor, apart from conifers and cycads which have been the subject of a global assessment (Table 1). A recent analysis of the Red List for the Pacific (Pippard 2009) reveals that other global assessments, such as for birds and marine species, have resulted in relatively high numbers of species assessed in Pacific countries (Fig. 1), but that virtually no plants have been assessed in most Pacific countries; exceptions include French Polynesia (155 assessments) and the Melanesian countries of Fiji (132), New Caledonia (278), Papua New Guinea (264), the Solomon Islands (60) and Vanuatu (24), but no other Pacific country has more than nine plant assessments. The number of Red-listed plants is thus low for all countries and for the region as a whole, and there are no comprehensive Red Lists of island endemic plants.

However, among the Red-listed plants, high proportions are threatened (Critically Endangered, Endangered or Vulnerable) (Fig. 2). New Caledonia has the highest proportion of threatened plants in the region (80% of those red-listed), and c. 50% of those listed for Fiji and Papua New Guinea are threatened. Other countries with few assessments have disproportionately high numbers of threatened plants: 100% in the Cook Islands, Nauru and the Northern Marianas, although absolute numbers are small since so few species have been assessed. A conclusion from this is that botanists doing Pacific plant Red-listing have tended to focus on species that they already know or suspect to be threatened.

Our knowledge of the status and distribution of Pacific plants depends largely on checklists and floras of island groups, which were mostly written during the 20th century and often based on short visits by botanists. These data could be used for additional Red-listing but accuracy would be improved by additional survey. We also know little in detail about threats to Pacific island plants. The impacts of the most important threat factors are mostly inferred from landscape scale effects (e.g. land clearance) or studies elsewhere (e.g. invasives impacts). Introduced species are widely considered to be the greatest current threat, but impacts of most invasives, especially plants, are largely unstudied in the region. Further, local-scale effects of global climate change are almost entirely unknown, as global climate models do not permit reliable prediction at the scale of individual islands. Red-list evaluations of threats are therefore often vague at best. The result of this uncertainty and inference is that conservation action is often based largely on parallels: information on threats and conservation needs collected elsewhere. In some cases this is valid, as inference based on landscape-scale changes such as habitat clearance are often obvious, and at least good enough for immediate conservation planning to be carried out with some confidence of success. In other cases, threat effects are obscure and require on-site study to inform the development of adequate conservation plans.

Based on the above, priority needs for plant conservation in the Pacific can be summarised as:

- More survey and floras, especially on high islands and makatea.

- More Red-listing, especially for mosses, algae, ferns, lichens and flowering plants.
- More threat and impact studies and conservation management plans for plants and vegetation communities.
- Down-scaling of climate change predictive models.
- A more comprehensive and representative protected area system, robust to climate change effects.
- Improved networking to maximise learning from experiences elsewhere.

Possible initiatives to improve networking and collaboration include the formation of a global island plant conservation network and a Pacific island plant specialist group within IUCN's Species Survival Commission. Among the species that have so far been Red-listed, there are some obvious candidates for immediate conservation action, while others would benefit from biological study to elucidate threats. Climate change is the great unknown for Pacific islands. Sea-level rise can be confidently predicted to cause the loss of low-lying but species-poor atolls, and probably to bring about a general increase in the frequency and intensity of cyclones, which will cause greater disturbance to the detriment of native vegetation (especially forests) and the probable benefit of more adaptable invasive plants. However a general increase in temperature may translate into different effects at local level, while changes in rainfall patterns across the Pacific are highly uncertain at present. Both temperature and rainfall will bring about changes in vegetation zonation, especially on high islands, but we cannot yet predict what kind of change will occur on individual islands.

References

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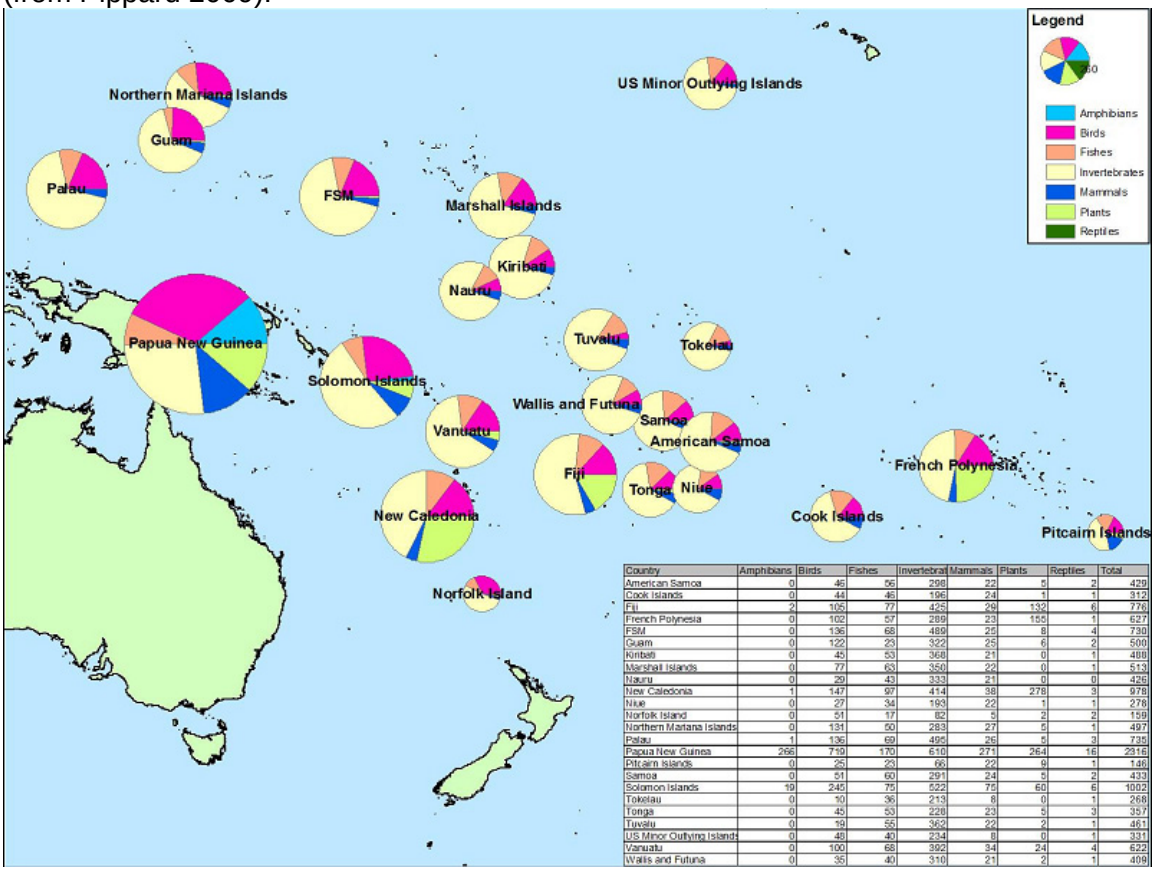
Table 1. Status of plant red-listing in the Pacific (adapted from Pippard 2009).

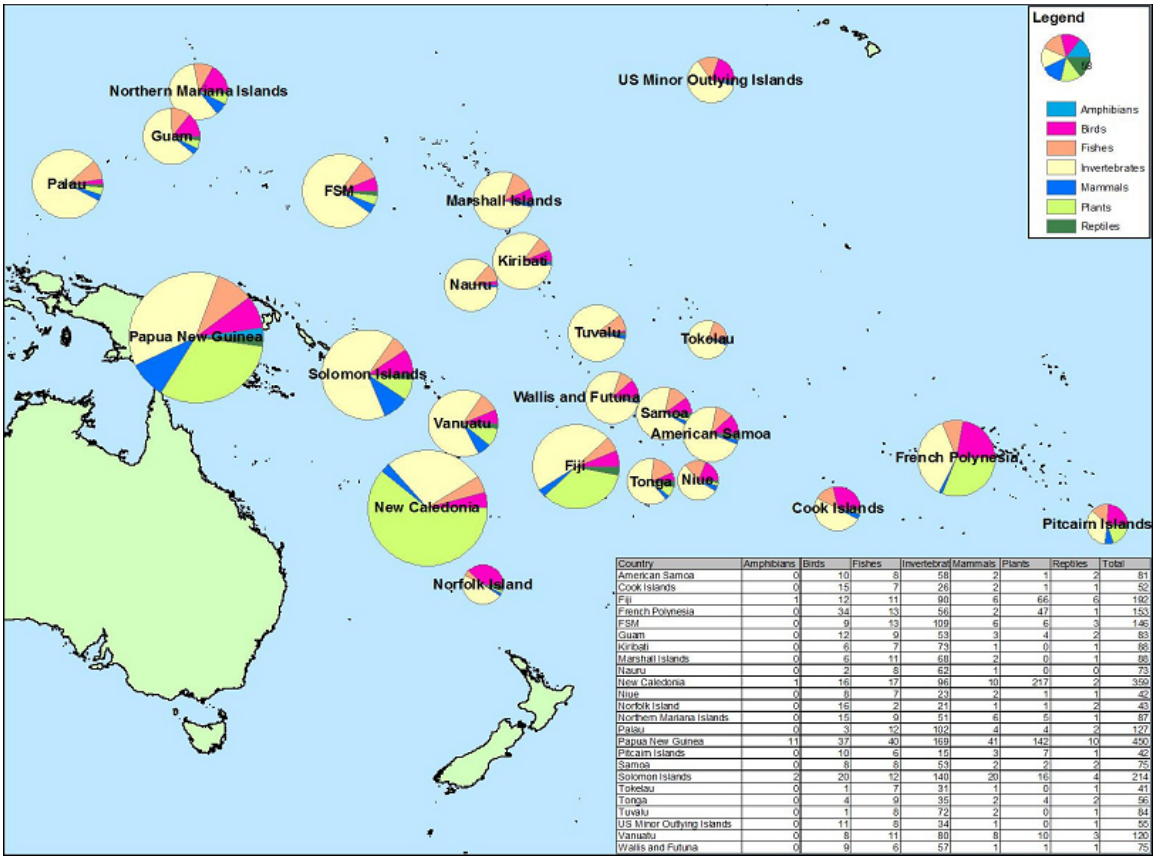
"PLANTS"	Estimated number of described Pacific island species	Number of assessed Pacific island species	Estimated % of Pacific island species assessed
Bryophytes	2650	5	<1%
Pteridophytes	2680	0	0
Gymnosperms	254	96	38%
Dicots (Magnoliopsida)	14138	703	5%
Monocots (Liliopsida)	6087	71	1%
Green Algae	285	0	0
Red Algae	406	0	0
Fungi	2627	0	0
Others	225+	0	0
TOTAL	29352+	875	3%

Figure 1. The numbers of Red-listed species in the Pacific, by country and taxonomic group (from Pippard 2009).



Country	Amphibians	Birds	Fishes	Invertebrat	Mammals	Plants	Reptiles	Total
American Samoa	0	46	56	298	22	5	2	429
Cook Islands	0	44	46	196	24	1	1	312
Fiji	2	105	77	425	29	132	6	776
French Polynesia	0	102	57	289	23	155	1	627
FSM	0	136	68	489	25	8	4	730
Guam	0	122	23	322	25	6	2	500
Kiribati	0	45	53	368	21	0	1	488
Marshall Islands	0	77	63	350	22	0	1	513
Nauru	0	29	43	333	21	0	0	426
New Caledonia	1	147	97	414	38	278	3	978
Niue	0	27	34	193	22	1	1	278
Norfolk Island	0	51	17	82	5	2	2	159
Northern Mariana Islands	0	131	50	283	27	5	1	497
Palau	1	136	69	495	26	5	3	735
Papua New Guinea	266	719	170	616	271	264	16	2316
Pitcairn Islands	0	25	23	66	22	9	1	146
Samoa	0	51	60	291	24	5	2	433
Solomon Islands	19	245	75	522	75	60	6	1002
Tokelau	0	10	36	213	8	0	1	268
Tonga	0	45	53	228	23	5	3	357
Tuvalu	0	19	55	362	22	2	1	461
US Minor Outlying Islands	0	48	40	234	8	0	1	331
Vanuatu	0	100	68	392	34	24	4	622
Wallis and Futuna	0	35	40	310	21	2	1	409

Figure 2. Numbers of threatened species in the Pacific, by country and taxonomic group (from Pippard 2009).



Country	Amphibians	Birds	Fishes	Invertebrat	Mammals	Plants	Reptiles	Total
American Samoa	0	10	8	58	2	1	2	81
Cook Islands	0	15	7	26	2	1	1	52
Fiji	1	12	11	90	6	66	6	192
French Polynesia	0	34	13	56	2	47	1	153
FSM	0	9	13	109	5	5	3	146
Guam	0	12	9	53	3	4	2	83
Kiribati	0	6	7	73	1	0	1	88
Marshall Islands	0	6	11	68	2	0	1	88
Nauru	0	2	8	62	1	0	0	73
New Caledonia	1	16	17	96	10	217	2	359
Niue	0	8	7	23	2	1	1	42
Norfolk Island	0	16	2	21	1	1	2	43
Northern Mariana Islands	0	15	9	51	6	5	1	87
Palau	0	3	12	102	4	4	2	127
Papua New Guinea	11	37	40	169	41	142	10	450
Pitcairn Islands	0	10	6	15	3	7	1	42
Samoa	0	8	8	53	2	2	2	75
Solomon Islands	2	20	12	140	20	16	4	214
Tokelau	0	1	7	31	1	0	1	41
Tonga	0	4	9	35	2	4	2	56
Tuvalu	0	1	8	72	2	0	1	84
US Minor Outlying Islands	0	11	8	34	1	0	1	55
Vanuatu	0	8	11	80	8	10	3	120
Wallis and Futuna	0	9	6	57	1	1	1	75