

The Population of Oceania in the Second Millennium

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The definition of Oceania in this paper accords with that in current use in United Nations demographic publications and encompasses Australasia (Australia and New Zealand) and the Pacific Islands (Melanesia, Micronesia and Polynesia). The people of Oceania are stretched across one-third of the earth's surface, but 96 per cent of this area is sea in the form of the Pacific Ocean, and, of the remainder, nine-tenths is constituted by the land mass of Australia. Oceania's land surface forms 6.4 per cent of that of the earth, although by the end of the second millennium its inhabitants numbered only 31 million or 0.5 per cent of the world's population.

The bounds of Oceania are essentially political. In the Pacific Ocean they exclude Taiwan, Japan, the Philippines, islands belonging to mainland countries of Asia and the Americas, the western half of the island of New Guinea (claimed successively by Portugal, the Netherlands and Indonesia) and the whole of Indonesia; but do include the French possessions, New Caledonia, French Polynesia, Wallis and Fortuna Islands.

Two factors are important in estimating the population of Oceania over the second millennium. The first is that no part of it possessed a written language at the beginning of the period and so estimates of population for the first half of the period depend on evidence from such diverse sources as archaeology, linguistics and ecology, supplemented in some cases by oral histories and more generally by post-European contact population estimates. The second factor is the division of the population into two parts by settlement history. The southwesterly indigenous populations found in Australia and most of Melanesia are ancient and are part of the movement out of Africa to settle Asia. The Australian Aboriginal population certainly dates back 40,000 years and possibly, and more controversially, 60,000 years (Mulvaney and Kamminga 1999). The population of the New Guinea mainland is certainly just as old. Long before 1000 AD a high degree of population homeostasis must have been achieved. Indeed T.R. Malthus attributes one of his inspirations for the concept of population growth limited by subsistence to James Cook, the great navigator, musing to his diary during the journey up the east coast of Australia that the land must have stable subsistence (what we would now call *biomass*) and that the population must in some way be in equilibrium with it (Malthus 1960:39). In contrast the rest of the Pacific (Polynesia and Micronesia) was settled much later by oceanic migration from East Asia, primarily from Taiwan, and possibly being dependent on advances in boat construction such as the invention of ocean-going outrigger sailing canoes. At the turn of the second millennium the Polynesians (called Maoris when they were in New Zealand) had probably not yet reached New Zealand and throughout outlying islands of Polynesia and Micronesia settlement boundaries were still being pushed forward. According to Spriggs (1997b:64-66) the larger Solomon islands and some nearby smaller islands were peopled well before 8000 BC and settlement spread to parts of island Melanesia and west Polynesia by 1000 BC. Spriggs reports that by 1000 AD most of Oceania had been settled, except for the furthestmost parts of east Polynesia such as New Zealand (see also Lal and Fortune 2000:53-62).

Population density and size also depended on the type of land use, which was in turn influenced by the ecological situation. In Melanesia and much of Polynesia horticulture was practised, supplemented by fishing, especially in Polynesia. Indeed, the importance of fish as a source of food, particularly in the smaller islands, detracts from the value of density of settlement indices (Thomas 1999). In contrast to quite high island population densities, the Australian population depended on hunting and gathering with consequent low population densities except in some littoral areas with plentiful supplies of shellfish

(Lourandos 1997, Mulvaney and Kamminga 1999). During the first half of the millennium a significant part of the Maori population was concentrated in the South Island of New Zealand, feeding mostly on flightless birds and marine mammals. As these became rare (or, as in the case of the moa, extinct), horticulture, based largely on sweet potatoes brought from other Polynesian islands (and originating in South America) developed, predominantly in the warmer North Island (Gibson 1971).

The population history of Oceania during the second millennium can be divided into two halves. The first part stretched from 1000 AD until a little after 1500, during which the populations were almost entirely insulated from the outside world. The second half was one of European penetration with the arrival of the Portuguese in the Moluccas on the edge of Oceania in 1512 and Magellan's expedition landing on Guam in 1521. By the end of the millennium the indigenous population of Oceania formed only one-quarter of the whole, although they constituted a majority everywhere except in Australia (where they formed one-fiftieth of the population) and New Zealand (where they formed one-seventh), the rest of Australasia being predominantly of European (mostly British) descent. By 1900 the whole of Oceania was claimed by European powers (Keesing 1945, Chappell 1999) and it was during the nineteenth century that Europeans in the form of missionaries, traders, administrators and settlers first had a major direct impact on the area. That impact included a decline of the indigenous population through disease, warfare and loss of land, a demographic process that was reversed only in the twentieth century. It also included the conversion of the great majority of the indigenous population to Christianity, and the widespread use of English and French as *lingua franca* and their universal use as official languages.

This paper is divided into the following sections:

1. An overall picture of population change over the millennium and an explanation of the source of the estimates.
2. The situation at the beginning of the millennium.
3. Change in the first half of the millennium.
4. Change in the second half of the millennium.
5. Review of demographic rates.
6. A consideration of densities and urbanization.

1. Estimated population change over the second millennium

Table 1 provides sources of population estimates and Table 2 extrapolations over the millennium; Table 3 summarizes the situation. These are essentially consensus or middle-of-the-road estimates and their sources are discussed in the Appendix. According to the estimates we have gathered, over the millennium the population of Oceania has grown from around 1.5 million to nearly 30.5 million, or twentyfold. Ninety-eight per cent of that growth took place in the final century and a half (see Tables 1-3, Figures 1-3, and Map 1-6). At the beginning of the millennium the population was dominated by the ancient, demographically stable, indigenous populations of Australia and Melanesia, which formed respectively 50 per cent and almost 40 per cent of the total population of Oceania. At its end Australia constituted 62 per cent of its population, New Zealand 13 per cent, Melanesia 21 per cent, Polynesia 2 per cent, and Micronesia 2 per cent. These are 'best estimates' at the time of writing. The margin for error is huge as is shown by precontact estimates for Australian Aborigines varying fivefold, suggesting that cautious estimates for the whole region in 1000AD would place the population between 0.75 and 3 million.

Table 1. Regional Population Estimates for Oceania, 1000 – 2000 AD, and sources of information

Country	Year								
	1100	1700	1788	1800	1828	1843 /1840s	1900	1950 ⁱ	2000 ⁱⁱ
Australia							3,868,560	8,295,000	19,000,000 ⁱⁱⁱ
Indigenous			750,000 ^{iv}				94,560 ^v	76,000 ^{vi}	418,841 ^{vii}
Non-Indigenous			1,030 ^{viii}	7,000 ^{ix}	54,726 ^x	286,000 ^{xi}	3,774,000 ^{xii}	8,219,000	
New Zealand							815,862 ^{xiii}	1,908,000	3,829,600 ^{xiv}
Indigenous	1,000 ^{xv}		100,000 ^{xvi}			80,000 ^{xvii}	45,549 ^{xviii}	115,302 ^{xix}	550,000 ^{xx}
Non-Indigenous						8,700 ^{xxi}	770,313 ^{xxii}		3,279,600
Melanesia							791,600	2,095,000	6,498,000
Papua New Guinea							>540,000 ^{xxiii}	1,613,000	4,807,000
Solomon Islands						100,000-150,000 ^{xxiv}	94,000 (1931) ^{xxv}	90,000	448,000
New Caledonia						90,000 ^{xxvi}	29,200 ^{xxvii}	55,000	218,000
Vanuatu						25,000 (1859) ^{xxviii}	8,400 (1910) ^{xxix}	48,000	200,000
Fiji						140,000 ^{xxx}	120,000 (indig. 94,000) ^{xxxi}	289,000	825,000
Polynesia							111,250	239,000	620,700
French Polynesia						66,000 ^{xxxii}	30,000 ^{xxxiii}	61,000	233,000
Tonga						>18,500 ^{xxxiv}	20,000 ^{xxxv}	41,000	100,000
Cook Islands						15,000-19,000 ^{xxxvi}	9,000 ^{xxxvii}	15,000	19,000
Samoa						56,000 ^{xxxviii}	38,500 ^{xxxix}	84,000	177,000
American Samoa						Included in Samoa above	Included in Samoa above	19,000	64,000
Niue						4,500 ^{xl}		5,000	2,000
Tuvalu						2,800 ^{xli}	3,000 ^{xlii}	5,000	10,000
Wallis & Futuna						3,800 ^{xliii}	5,850 ^{xliv}	7,000	14,200 ^{xlv}
Tokelau						1000 ^{xlvi}	3-400?	2,000	1,500 ^{xlvii}
Micronesia							88,805	153,432	527,000
Federated States of Micronesia						80,000 ^{xlviii}	30,000	32,000	118,000
Guam		12,000 ^{xlix}	4,000 ^l				9,678 ^{li}	60,000	148,000
Kiribati						35,000 ^{lii}	28,000 ^{liii}	32,000	91,000
Marshall Islands						15,000 ^{liv}		13,000	62,000
Nauru						1,400 ^{lv}	1,377 ^{lvi}	3,432 ^{lvii}	12,000
Northern Mariana Is		20,000-30,000 ^{lviii}	0 ^{lix}			1,000 ^{lx}	2,000 ^{lxi}	7,000	77,000
Palau						10,000 ^{lxii}	3,750 ^{lxiii}	6,000	19,000
Regional Total							5,676,077	12,690,432	30,475,300

Notes:¹ Unless otherwise noted, all population figures for 1950 are drawn from United Nations (1999:454-455).² Unless otherwise noted, all 2000 population figures are from ESCAP (2000).³ Australian Bureau of Statistics (2000).⁴ Mulvaney and Kamminga (1999), White and Mulvaney (1987).⁵ Smith (1980:210).⁶ Smith (1980:210).⁷ Australian Bureau of Statistics (1996:29).⁸ Borrie (1994:23); Santow, Borrie and Ruzicka (1988:31).⁹ Borrie (1994:24).¹⁰ Caldwell (1987).¹¹ Caldwell (1987).¹² Skinner (1997:124).¹³ Statistics New Zealand (1999a:20).¹⁴ Statistics New Zealand (2000a).

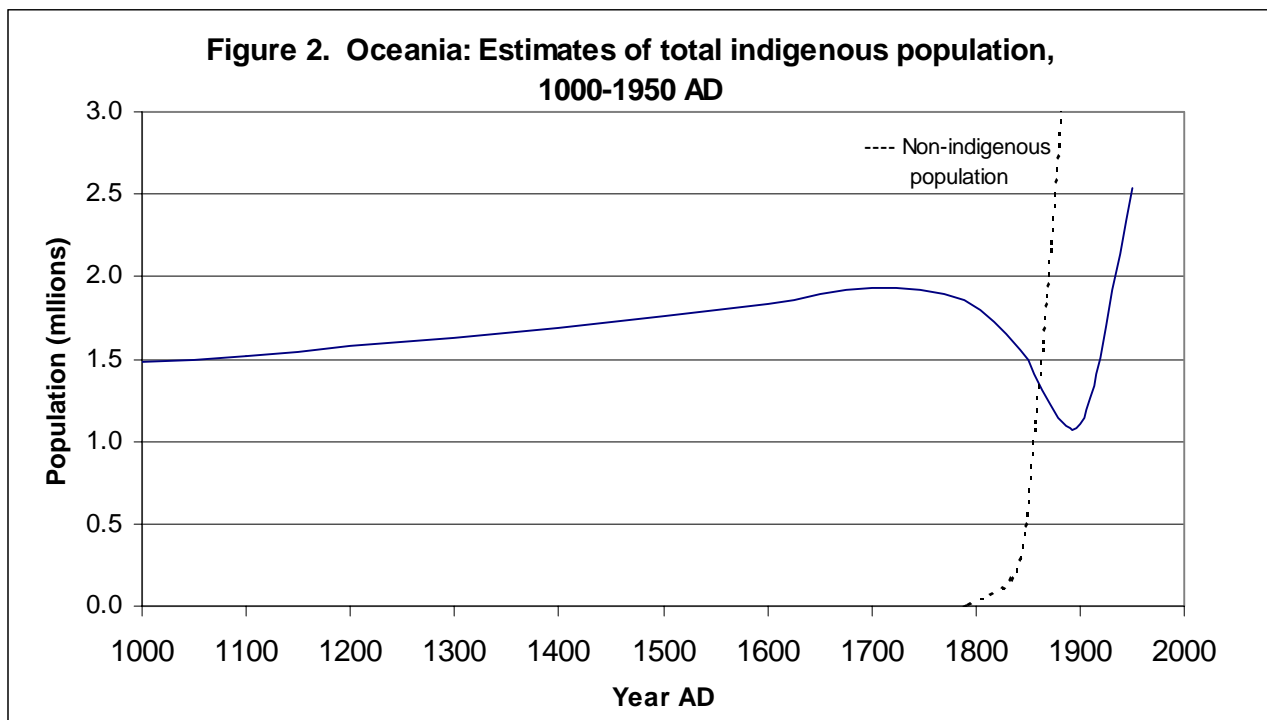
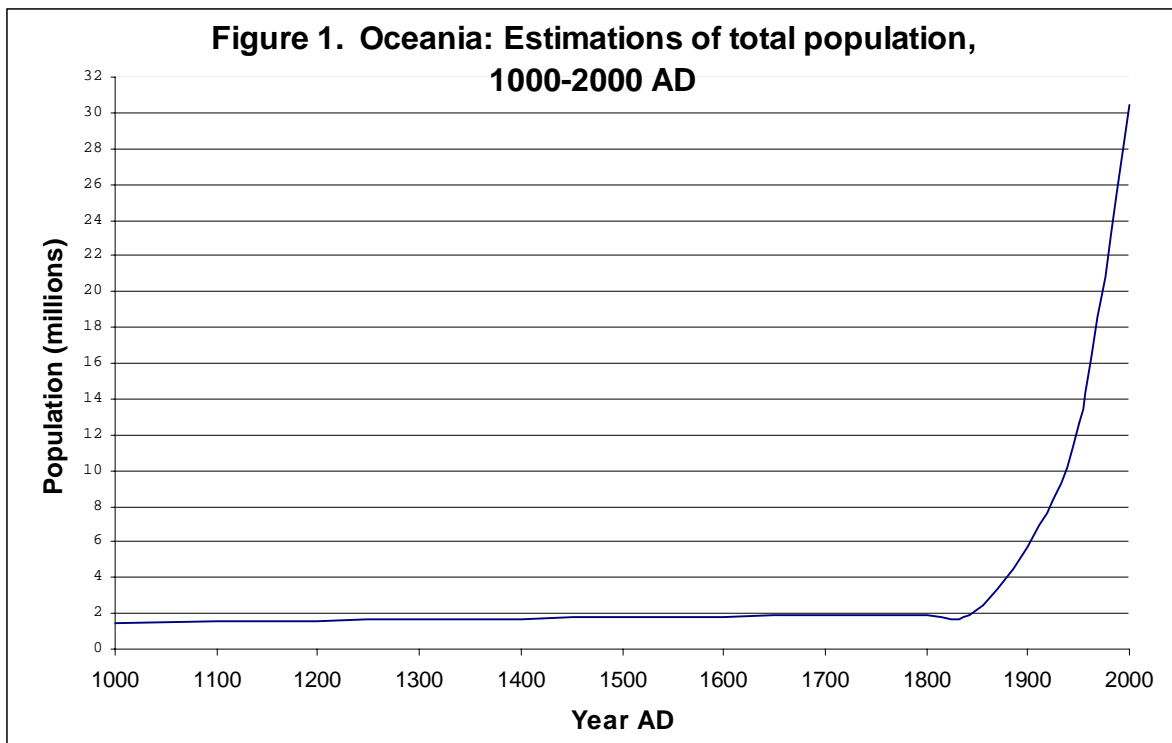
- ¹⁵ While Pool (1991:232) puts initial settlement some 1200 to 1500 years BP, archaeologists have revised estimates of time of first colonization to AD1100 or even later (Davidson, 1992:6; Spriggs, 1997a).
- ¹⁶ Pool (1991:57).
- ¹⁷ Pool (1991:57).
- ¹⁸ Statistics New Zealand (1999a:20).
- ¹⁹ Statistics New Zealand (1999a:20).
- ²⁰ Statistics New Zealand (2000b).
- ²¹ Borrie (1994:94).
- ²² Papps (1985).
- ²³ Van de Kaa (1971:34).
- ²⁴ Denoon (1997b:80-118).
- ²⁵ Lambert (1934:32).
- ²⁶ Denoon (1997b:114).
- ²⁷ Rallu (1990:4).
- ²⁸ Denoon (1995:327).
- ²⁹ Denoon (1995:327).
- ³⁰ Oliver (1989:28), McArthur (1967:10-11).
- ³¹ McArthur (1967:27).
- ³² Denoon (1997b); McArthur (1967).
- ³³ McArthur (1967:315-319).
- ³⁴ McArthur, (1967:72); Denoon (1997b:114) quotes missionary reports of 'about 50,000' in 1847.
- ³⁵ McArthur (1967:82).
- ³⁶ ESCAP (1983:15).
- ³⁷ ESCAP (1983:19).
- ³⁸ McArthur (1967:101).
- ³⁹ McArthur (1967:101).
- ⁴⁰ Smith (1983:36), Tafatu and Tukuitoga (1982:123).
- ⁴¹ Macdonald (1982:6).
- ⁴² Macdonald (1982:6).
- ⁴³ Burrows (1937:15).
- ⁴⁴ Burrows (1937:15).
- ⁴⁵ South Pacific Commission (1998:67).
- ⁴⁶ Huntsman and Hooper (1996:36-37).
- ⁴⁷ South Pacific Commission (1998:65).
- ⁴⁸ Micronesia includes the islands of Yap, Kosrae, Pohnpei, Chuuk, Satawan. Yap had a pop. of 30,000 to 50,000 in 1840s (Ritter 1981:24), declined to 7,500 at end of the century (Meleisea and Schoefield 1997:127). Kosrae 1820s: 3,000 pop (Ritter 1981); 1880s: 300 population (Denoon, 1997a:244). According to Hezel (1983:317) Pohnpei's population declined from 'over 10,000 in the 1820s to less than half that number by 1885'. Gorenflo (1995:59) is sceptical about early estimates of up to 35,000 on Chuuk in the 1930s. According to Gorenflo (1995: 59-63) Chuuk had a population of about 16,000 in 1901.
- ⁴⁹ Rogers (1995:471).
- ⁵⁰ Russell (1998:320), Farrell (1991:179).
- ⁵¹ Nelson and Nelson (1992:170).
- ⁵² Macdonald (1982:6).
- ⁵³ Lambert (1934:20).
- ⁵⁴ Denoon (1997b:114).
- ⁵⁵ Underwood (1989), Viviani (1970:4).
- ⁵⁶ Underwood (1989:8).
- ⁵⁷ Viviani (1970:181).
- ⁵⁸ Denoon (1997b:114) cites 30,000 to 40,000 for the Marianas as a whole, suggesting this estimate for the Marianas minus Guam. According to Farrell (1991), after the colonization of the islands by the Spaniards during the seventeenth century, they forcibly moved the native Chamorros people to Guam and decolonized the Nth Marianas. In 1668 there had been about 40,000 Chamorros in the islands. By 1710 when the Spaniards conducted the first census there were only 3539 left (p.177). Farrell writes that the northern islands 'were to remain uninhabited for nearly a century' (p.179).
- ⁵⁹ Russell (1998:320).
- ⁶⁰ Farrell (1991:234-6).
- ⁶¹ Farrell (1991:258).
- ⁶² Palau Community Action Agency (1977:174), Hezel (1983:318).
- ⁶³ Palau Community Action Agency (1977:174), Hezel (1983:318).

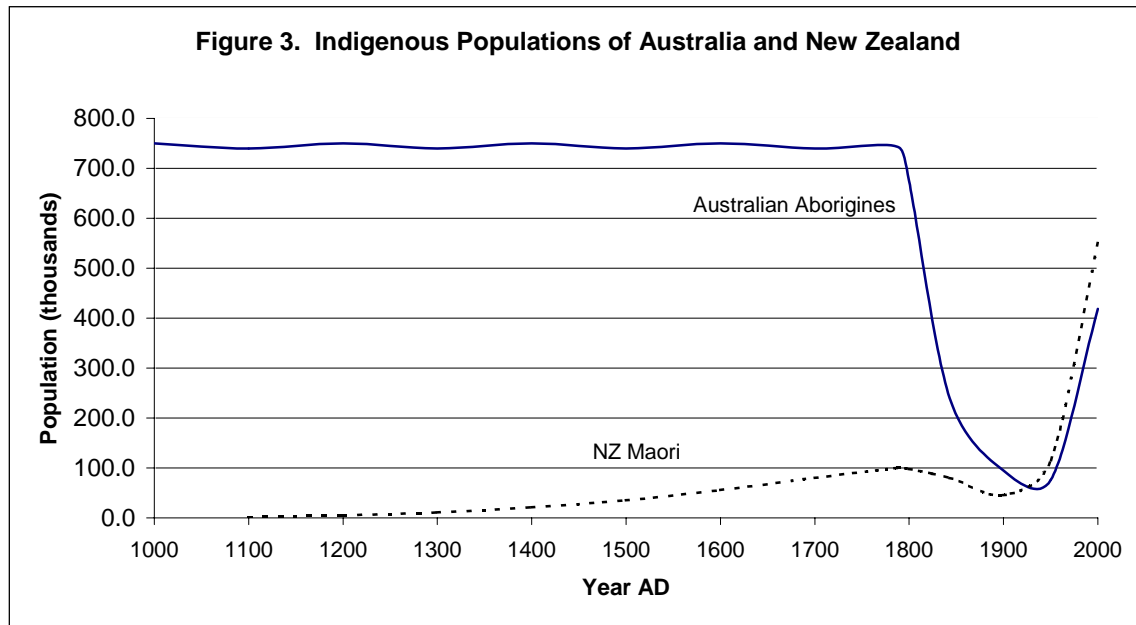
Table 2. Total Population of Oceania and Sub-Regions, 1000 – 2000 AD.

Country	Year AD												
	1000	1100	1200	1300	1400	1500	1600	1700	1800	1850	1900	1950	2000
Australia	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	682,000	655,000	3,868,560	8,295,000	19,000,000
Indigenous									675,000	250,000	94,560	76,000	418,841
Non-Indigenous									7,000	405,000	3,774,000	8,219,000	18,581,159
New Zealand		1,000	5,000	11,000	21,000	35,000	56,000	80,000	98,000	105,000	815,862	1,908,000	3,829,600
Indigenous										77,000	45,549	115,302	550,000
Non-Indigenous										28,000	770,313	1,792,698	3,279,600
Melanesia	564,000	592,000	621,000	652,000	684,000	718,000	753,000	790,000	868,000	911,000	791,600	2,095,000	6,498,000
Papua New Guinea										540,000	>540,000	1,613,000	4,807,000
Solomon Islands										124,000	94,000	90,000	448,000
New Caledonia										85,000	29,200	55,000	218,000
Vanuatu										25,000	8,400	48,000	200,000
Fiji										137,000	120,000 (indig. 94,000)	289,000	825,000
Polynesia	78,000	86,000	95,000	104,000	114,000	125,000	137,000	150,000	165,000	163,600	111,250	239,000	620,700
French Polynesia										62,000	30,000	61,000	233,000
Tonga										18,500	20,000	41,000	100,000
Cook Islands										16,000	9,000	15,000	19,000
Samoa										55,000	38,500	84,000	177,000
American Samoa												19,000	64,000
Niue										4,500		5,000	2,000
Tuvalu										2,800	3,000	5,000	10,000
Wallis & Futuna										3,800	5,850	7,000	14,200
Tokelau										1000	400	2,000	1,500
Micronesia	86,000	95,000	104,000	114,000	125,000	137,000	151,000	165,950	140,000	141,200	88,805	153,432	527,000
Federated States of Micronesia									70,000	77,000	76,000	30,000	118,000
Guam								12,000	4,000	5,800	9,678	60,000	148,000
Kiribati								31,000	34,000	34,000	28,000	32,000	91,000
Marshall Islands								13,000	14,000	14,000	14,000	13,000	62,000
Nauru								1,250	1,350	1,400	1,377	3,432	12,000
Northern Mariana Is								30,000	0	1,000	2,000	7,000	77,000
Palau								8,700	9,600	9,000	3,750	6,000	19,000
Regional Total	1,478,000	1,524,000	1,575,000	1,631,000	1,694,000	1,765,000	1,837,000	1,936,000	1,953,000	1,975,800	5,676,077	12,690,432	30,475,300

Table 3. Summary of Total Population of Oceania and Sub-Regions, 1000 – 2000 AD.

	Year AD												
	1000	1100	1200	1300	1400	1500	1600	1700	1800	1850	1900	1950	2000
Australia	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	682,000	655,000	3,868,560	8,295,000	19,000,000
New Zealand		1,000	5,000	11,000	21,000	35,000	56,000	80,000	98,000	105,000	815,862	1,908,000	3,829,600
Melanesia	564,000	592,000	621,000	652,000	684,000	718,000	753,000	790,000	868,000	911,000	791,600	2,095,000	6,498,000
Polynesia	78,000	86,000	95,000	104,000	114,000	125,000	137,000	150,000	165,000	163,600	111,250	239,000	620,700
Micronesia	86,000	95,000	104,000	114,000	125,000	137,000	151,000	165,950	140,000	141,200	88,805	153,432	527,000
Oceania	1,478,000	1,524,000	1,575,000	1,631,000	1,694,000	1,765,000	1,837,000	1,936,000	1,953,000	1,975,800	5,676,077	12,690,432	30,475,300





2. The situation at the beginning of the millennium

Over the previous 40,000 years or more there had probably been successive waves of population migration from eastern Indonesia to form the Aboriginal population of Australia. Even the earliest migrants must have made open sea journeys of at least 300 kilometres, an extraordinary maritime achievement for that time. Long before 1000 AD the population had probably stabilized around 750,000 with an average density of about one person per ten square kilometres. This is not a surprising figure for hunters and gatherers in a predominantly arid land. Nevertheless, it should be noted that little progress has been made in estimating the continent's precontact stable population by calculations from biomass, and all estimates are based on observations after European settlement in 1788. That employed here is from Mulvaney and Kamminga (1999) and White and Mulvaney (1987), and is not far short of that of Smith (forthcoming), but is well above earlier estimates.

In Melanesia, the population most subject to doubt is that of Papua New Guinea because the area of the country is much larger than any other Melanesian country and because large populations in its mountainous hinterland were unknown to the outside world until the 1930s. Its first national census was not held until 1966. Much of Papua and New Guinea, and possibly the larger islands of the Solomons and Vanuatu, were settled between 10,000 and 30,000 years ago and probably had a near-stationary population by 1000 AD. The situation is even more complex in island Melanesia where the majority of the population is Melanesian but where there is evidence of more recent migration and cultural influences from Polynesia since around 1300 AD (Spriggs 1997a, 1997b:67).

Much more recently, probably no earlier than the second millennium BC, the Austronesian advance out of Taiwan had progressed to the southern Philippines and eastern Indonesia, whence Austronesians emerged into the Pacific onto the small islands around the Admiralty group north of New Guinea. From there they eventually went on to settle most of the islands of Melanesia and all the habitable islands of Micronesia and Polynesia. This process was still continuing at the beginning of the second millennium, as is shown by the fact that, although some authorities have suggested that the first Polynesians had arrived in New Zealand by that time to form the Maori population, most now argue that the first canoeloads of Polynesian settlers arrived over the first two centuries of the second millennium (Spriggs 1997b). Much of the evidence for these movements comes from linguistics, which establishes an origin

in the Tahiti area for the Maoris (Davidson 1992), but there is also information from archaeological sources and even the oral tradition.

Nevertheless, the population estimates for 1000 AD are primarily extrapolations based on post-European contact population estimates (constructed from just after 1500 until well into the second half of the twentieth century) together with assumptions about the stability or quasi-stability of the population at earlier dates.

3. The first half of the millennium

The period 1000-1500 AD produced little spectacular change. The population of Australia and much of Melanesia was probably near-stationary, affected perhaps by long climatic swings. Some of Melanesia was still being settled and the forest was probably being slowly pushed back. Therefore, although population growth over this period is estimated to be zero for Australia, it may have been around 25 to 30 per cent over the 500-year period in Melanesia.

The situation was very different in New Zealand and the smaller island territories that constituted Polynesia and Micronesia, where continued settlement and natural growth probably doubled the population during the period. The extreme was found among the Polynesian population of New Zealand (Maoris), where the growth was from zero to perhaps 35,000. Although the Maori settlers were of predominantly horticultural background and probably landed first on the warm temperate coast in the far north of the North Island (one of the few frost-free places in New Zealand where the older Polynesian staple, taro, would grow), for several hundred years a substantial minority of the population was on the South Island living on flightless birds and marine mammals (seals and dolphins) on the coast. As human population grew and some of the animals neared extinction (although the largest species of moa, the world's largest bird, did not finally disappear until the seventeenth century and smaller species until the nineteenth century), the population balance moved further toward the North Island (where 95 per cent of Maoris now live) with subsistence centred on the cultivation of sweet potatoes (Gibson 1971; Davidson 1984; Pool 1985).

The sweet potato, originating in South America, was probably transferred in some way to the Pacific during the first millennium AD. It supplemented Pacific diets and made possible a much denser Polynesian settlement of New Zealand, over most of which taro would not grow. In the second half of the millennium, from when the Portuguese introduced it around 1550, the sweet potato was to allow the growth of dense populations in the New Guinea highlands where half that country's population now lives. It now appears that the sweet potato may have been introduced to parts of Oceania before Portuguese contact. In his classic study of the subject, Yen (1974:259-267) hypothesizes a 'tripartite' process of introduction. First, Polynesian voyagers brought the sweet potato from South America to Polynesia before the second millennium, from where it subsequently diffused to other parts of Polynesia, eastern Melanesia and New Zealand. Later, the Portuguese and Spanish voyages of the sixteenth century transported it from America to Indonesia and the Philippines. In New Zealand, the sweet potato was probably introduced by the earliest Polynesian settlers in the first two centuries of the millennium (Davidson 1984:117).

In spite of the steady growth of population in Polynesia, Micronesia and New Zealand, the preponderance of the population was located in Australia and Melanesia (perhaps 90 per cent in 1000, 83 per cent in 1500, and 84 per cent in 2000). Therefore, population growth in the entire Oceania region in the half-millennium was only around 20 per cent.

4. The second half of the millennium

The second half of the millennium witnessed a very different demographic history from the first because of the European penetration of the region. This was heralded by Magellan's voyage across the Pacific in 1520 and his landing on Guam in the group of islands he called the Ladrões, but which later became the Marianas (now Guam and the North Marianas). Permanent European settlements soon appeared close to Oceania, but beyond its borders as defined here. The Portuguese founded Macao on the Chinese coast in 1557 and the Spanish took possession of Cebu in the Philippines in 1565. Nevertheless, it was more than another century before the Spanish seized Guam in 1668 (Meleisea and Schoeffel 1997). The major positive European contribution to population growth was the further spread of the sweet potato from South America which ultimately fostered dense populations in Highland New Guinea (Green 2000).

The major European colonial movement began with the British annexation and settlement of New South Wales (then defined as the eastern half of Australia) in 1788. Thereafter, Sydney became the main base for European penetration of the South Pacific (Borrie 1994). The region was penetrated by missionaries, sealers and whalers, traders and 'blackbirders' privateers who recruited and pressganged Melanesians from Vanuatu and the Solomons for work on cotton and sugar plantations in Fiji, Samoa and Queensland, Australia. By 1814 missionaries and settlers, mostly from Australia, were appearing in New Zealand which Britain formally annexed in 1840. The European suzerainty over Oceania was completed in 1883 with the German annexation of the northeastern part of New Guinea and Queensland's annexation of the southeastern part, taken over by Britain in 1884 (Denoon, Mein-Smith and Wyndham 2000). It was no accident that this occurred at the same time as the partition of Africa, as imperialism reached its zenith.

These movements over the last quarter of the millennium are treated under three headings: (a) the European penetration, (b) the decline in numbers of the indigenous population, and (c) the recovery in indigenous populations.

(a) The European penetration

Mass European settlement was restricted to Australia and New Zealand but it was sufficient to change the demographic balance of Oceania. In 1800 the non-indigenous population of Australia and New Zealand, overwhelmingly British in origin, constituted one per cent of Australasia's total population. By the late 1840s the proportion had reached 48 per cent and by 1900 it was 97 per cent, peaking in 1950 at 98 per cent. Between 1900 and 1950 the Australian and New Zealand non-indigenous population formed 80 per cent of the entire population of Oceania, while the indigenous population probably amounted to around 18 per cent (the other non-indigenous population being Indian settlers in Fiji and scattered European minorities elsewhere). After 1950 the indigenous population began to increase again both in terms of numbers and as a proportion of the total population because of higher levels of natural increase.

The non-indigenous settlement of Australia and New Zealand was a policy of the British and colonial governments with the majority of migrants being financially assisted until the last quarter of the twentieth century (Borrie 1994). This policy was furthered by the legal doctrine of *terra nullius* which maintained that the indigenous hunters and gatherers of Australia and the South Island of New Zealand did not actually own the land over which they roamed and that it was accordingly available for European farming (Reynolds 1987). This doctrine began to be modified by judicial decisions and legislative action only late in the twentieth century. The other mass migration was the recruitment of indentured Indian labour for agricultural work in Fiji from the late nineteenth century; the Indian population eventually grew to approximately equal that of the indigenous population (McArthur 1967). During the last quarter of the twentieth century the migration from outside Oceania into Australia altered, as a result of administrative and legislative changes, so that around half the immigrant stream came from Asia

(Australian Bureau of Statistics 2000). New Zealand received a major intraregional migration stream so that by 2000 one-quarter of Oceania's Polynesian population (other than Maoris) lived there (Statistics New Zealand 1999b, Rallu and Ahlburg 1999).

(b) The decline of the indigenous population

Nearly everywhere in Oceania the opening up to the outside world had a disastrous impact on the indigenous population. The indigenous population either lost land for hunting and horticulture or they lived on small islands with coastal people at risk of imported infectious disease or blackbirding or of sterilizing sexually transmitted disease. Only the highlands of tropical, mountainous Papua New Guinea remained largely isolated until well into the present century.

In Oceania as a whole the indigenous population probably declined in numbers between 1600 and 1900 by over 40 per cent from nearly two million to not much more than one million. Excluding Papua New Guinea, numbers probably fell by almost 60 per cent. In Australia the indigenous population decline was catastrophic, probably being around 87 per cent from 1788 until about 1937 (see Butlin 1983; Mulvaney and Kamminga 1999), while the New Zealand Maori population more than halved between 1820 and the end of the nineteenth century (Pool 1977, 1991). In both Australia and New Zealand the indigenous population almost certainly declined at first more rapidly than settlers could arrive, so that the total populations at first settlement were not regained in either for almost two-thirds of a century. The process began with the disastrous Spanish attempt to concentrate the Mariana population on Guam in the late seventeenth century, a policy of nucleation for administrative and religious reasons that they had pursued in the New World (Farrell 1991; Russell 1998).

The reasons for this horrific population loss are still debated (Lal and Fortune 2000; Denoon *et al.*, 2000). There was intentional killing in the Marianas by the Spanish, in the Solomons and Vanuatu during blackbirding, in New Zealand in the Maori Wars during the 1860s, and over a long period in Australia in incidents often associated with disputes over the killing of the settlers' sheep and cattle, or perceived threats to settlers or police. There was a loss of subsistence which was more noticeable when the immigrants took over farmland in New Zealand's North Island but more disastrous when in Australia and New Zealand's South Island the settlers' grazing animals displaced the native fauna and flora which had provided the indigenous population with food (Reynolds 1982; Pool 1991; Kunitz 1994).

The major factor in the population decline, as in the New World, was undoubtedly the exposure to pathogens which had long existed in Europe and Asia among populations with various degrees of immunity to them (Marshall 1993; Kunitz 1994). Smallpox, measles, influenza and even mumps ravaged the populations which had been isolated on islands large and small. With changes in diet, the levels of diabetes may also have risen. With greater alcohol consumption, liver and circulatory disease shortened lives. Some island populations were decimated when a visitor or a returning native brought infectious disease to the island. Ironically, in the twentieth century the sea boundaries of these islands facilitated campaigns to eradicate various infectious diseases.

A complementary reason for the reduction or reversal of natural increase was the spread of sexually transmitted diseases. These diseases arrived early from sailors in visiting ships, sandalwood traders and others seeking sexual relations with local women, and, among a previously protected population they were virulent and often sterilizing. In Papua New Guinea STDs reached their height around the coasts at the beginning of the twentieth century but not until the 1960s in the mountainous interior when the first highway was built (Marshall 1993; Kunitz 1994).

(c) The recovery in indigenous numbers

The reversal of the decline in Polynesian numbers began at the end of the nineteenth century, but that of the Australian Aborigines not until the 1930s or later. The reasons are by no means clear. Violence had

lessened, and stronger administrative control could be employed to contain epidemics, to improve sanitation, and to carry out vaccination programs. Some advance was made against venereal disease. The European colonization of all parts of Australia was not complete until the 1930s. In Reynolds's (1982) terms, the frontier of white settlement was still sweeping across Australia until that time, hence the Aboriginal population decline did not reach its lowest point until the process was complete. It is true that disease had progressed far in advance of the contact frontier (Butlin 1983), but dispossession and officially condoned acts of aggression had continued until the 1930s (Smith 1980:232, Reynolds 1982, 1987). Only then, as Smith (1980) notes, could the remnants of the indigenous population begin to recover.

The higher rate of indigenous natural increase after the 1930s was also assisted by persistent high birth rates. Whilst the European settlers' fertility levels in both Australia and New Zealand fell in the last quarter of the nineteenth century, the indigenous populations of the Pacific as well as those of Australia and New Zealand delayed the onset of their decline for almost another century until the late 1960s and early 1970s (Pool 1977; Pool *et al.* 1982; Taylor 1997).

Some of the recovery in Aboriginal and Maori numbers was more apparent than real as more persons of mixed ancestry identified themselves as being indigenous partly because of educational and other benefits and partly because of a growing pride in indigenous identity (Pool 1991; Taylor 1997). While the indigenous population of both countries depended on natural increase for its growth (except for Polynesian migration to New Zealand), the settler population continued to be augmented by immigration (Castles 1988; Statistics New Zealand 1999b).

The recovery in population numbers when it finally occurred was impressive. By 2000 the indigenous population of Oceania was around 8.6 million, over five times that of 1000 AD, more than four times the previous peak in the late eighteenth century, and over seven times the population at its lowest point around 1900. Admittedly, they were no longer more than one-quarter of the total population but this reflected the overwhelming European occupation of Australia and New Zealand.

In the third quarter of the nineteenth century the European settler population of Australia and New Zealand constituted one half of the population of Oceania. Nearly all women married and on average bore 6-7 children. But the total fertility rate of this group was to fall to about 4 in 1900, 3 in the early 1920s, just above 2 in the early 1930s and 1.7 by 2000. The pattern among the indigenous population of Oceania was very different. All had exhibited total fertility rates similar to the pretransitional levels of the settler population, 6-7, but Maori, Polynesian and Micronesian rates did not begin to fall until the late 1960s and Australian Aboriginal and Melanesian rates until the early 1970s. Nor has there yet been convergence. Maori total fertility rates are still above 2, Australian Aboriginal and Polynesian rates around 3, and Melanesian and, somewhat surprisingly, Micronesian rates not far below 5 (Ruzicka and Caldwell 1982; Khawaja 1985; United Nations 1999).

By 2000 life expectancy at birth among the settler populations of Australia and New Zealand was around 79 years, among the world's highest, as had been the case one hundred years earlier. Maori expectancy was seven years shorter, and that of Aboriginals 20 years shorter (Statistics New Zealand 1999b; ABS 2000). The latter figure is largely attributable to very high middle-age mortality from circulatory ailments and diabetes. Part of the explanation must lie in the social marginalization of a small minority group rather than marginalization by the health system. The Polynesian, Micronesian and Melanesian life expectancies at birth had risen to around 72, 70 and 60 years respectively (UN 1999). This order reflects per capita incomes. It also demonstrates how modern medicine can eradicate epidemic disease in the small islands of Polynesia and Micronesia while meeting greater difficulties in large islands with mountainous hinterlands and poor communications like Melanesia's Papua New Guinea.

5. Land use, population density and urbanization

Oceania exhibited major transformations in land use patterns and agricultural systems over the millennium, associated with processes of migration and settlement of new islands during the first half of the period, and European colonisation and modernisation during the final three centuries. Early in the millennium the major distinction that can be made is between Australia and the rest of Oceania. In Australia the one million or so Aboriginal people followed a predominantly hunter-gatherer subsistence economy (Mulvaney and Kamminga 1999) until this began to be radically transformed from 1788.

In the Pacific Islands, Papua New Guinea and New Zealand, indigenous people traditionally engaged in shifting cultivation and animal husbandry for subsistence. The most important crops included taro, yams, gourd, banana and sweet potato. This was supplemented by fishing and gathering shellfish, especially on smaller islands and coastal communities. Traditional horticulture underwent gradual intensification throughout the precontact period as new land was converted to gardens and as new islands were settled. At the same time, archaeological evidence suggests that horticultural intensification was also increased by Islanders discovering new methods of raising yields through irrigation and drainage of garden plots (Thomas 1999:125, Clarke, Manner and Thaman 1999:355-358).

European colonisation of the entire region and European settlement of Australia and New Zealand transformed the pre-colonial economies. The white settler societies of Australia and New Zealand established rural economies based on family-farming units engaged in pastoralism and farming, producing commodities, particularly wool and wheat (Lawrence 1987:105), for Britain, their own populations, and increasingly for other countries. Outside Australia and New Zealand, Pacific people maintained traditional subsistence agricultural practices alongside new production systems for the market. Coconut, copra, sugar, coffee, cocoa, fish and some minerals became the chief exports (Pool *et al.* 1982).

Population density and nutritional density are shown in Table 4. Comparisons of land area are not very meaningful in Oceania. Micronesia and Polynesia consist of small islands, but they can support dense populations because of much larger areas of sea around them. The sea has always provided food, but after 1800 income was derived from coaling and supplying ships and, more recently, from selling such oceanic rights as those of tuna fishing. Other income such as fly-over rights and tourism also derive from their insular situation. All were colonies and, facilitated by their small populations, most still receive considerable economic help from their ex-colonial masters. Disproportionate numbers have migrated to New Zealand and the United States, and lesser numbers to Australia, and the remittance of money from these groups is an important source of income. So for many, is tourism (Caldwell, Harrison and Quiggin 1980; South Pacific Commission 1998).

Table 4. Population Densities and Nutritional Densities, Oceania

Country	Population Densities ^{1iv} (persons/sq km)					Nutritional Densities ^{1v} (persons/ sq km cultivated area)			
	Year AD					Year AD			
				1950	2000				2000
Australia				1	2.47				98
New Zealand				7.1	14.29				116.8
Melanesia									
Papua New Guinea				3.5	10.38				870
Solomon Islands				3.2	15.36				717
New Caledonia				3	11.3				91.7
Vanuatu				3.9	15.3				129
Fiji				15.8	44.1				283
Polynesia									
French Polynesia				17	63.1				825
Tonga				63	139				208
Cook Islands				63	82.6				271
Samoa				29	62.5				145
American Samoa				95	321				2133
Niue				19	7				29
Tuvalu				192	381				-- (no data)
Wallis & Futuna				27	57				--
Tokelau				167	125				--
Micronesia									
Federated States of Micronesia				45.6	165.7				322
Guam				110	298				1233
Kiribati				39	112				246
Marshall Islands				72	286				2067
Nauru				163	546				--
Nthn. Mariana Islands				15	163				--
Palau				12.3	39				--

¹ Calculated from population data and total land area data from ESCAP, <http://www.unescap.org/stat/statdata/apinfig.htm>, and data from the Secretariat of the Pacific Community, Demography Programme, http://www.spc.int/demog/pop_data2000.html

² Calculated from current population data (2000) and total arable and crop land area data from ESCAP, <http://www.unescap.org/stat/statdata/apinfig.htm>

Australia makes up 90 per cent of all land area in Oceania, but, at least partly because of its aridity, accounts for only 62 per cent of the population. Papua New Guinea has a further 5 per cent of the region's land (and 15 per cent of the population) and New Zealand 3 per cent of the land (and 12 per cent of the population). The remaining 2 per cent of the land is occupied by the remaining 11 per cent of the population. Oceania, with a population density of four persons per square kilometre, is the least densely settled of all the world's major regions, but this situation is entirely accounted for by Australia with 2.5 persons per square kilometre. In contrast, Micronesia, with 200 per square kilometre, is more densely settled than China, and Polynesia, with 60 per square kilometre, is close to the situation of Europe. New Zealand (14 per square kilometre) and Melanesia (12 per square kilometre) have greater densities than North America. On the other hand, Australia's density exceeds only those of Mongolia and Western Sahara and equals Namibia and French Guyana (Population Reference Bureau 2000; see Maps 1 and 2).

Oceania's urban population is 70 per cent of the total, comparable with Europe, Latin America and North America, and twice the level found in Asia and Africa (see Table 5) (UN 2000a). The explanation once again is the dichotomy between Australia and New Zealand on the one hand and the Pacific Islands on the other. Australia and New Zealand evince levels of urbanization around 89 per cent, level with the United Kingdom and the Netherlands and below only Belgium, Iceland and Malta in the world. The level in Australia is significantly higher than the 77 per cent found in the United States, a settlement land of similar size. The explanation lies partly in Australia's late European settlement and partly in its aridity. The first European settlers arrived in Australia in 1788, almost two centuries later than in the United States. The Australian settlers, in contrast to those in Virginia or New England, found little land suited to small-holding intensive farming and the future of agriculture was to lie with extensive pastoralism (sheep and cattle) and large-scale wheat production in climatically marginal lands. The world of 1788 was a far more commercial and monetized place than that of 1606, and subsistence farming never developed among Australian settlers. From 1788 all farms sold all, or nearly all, their produce, and bought their needs from the market. And there were no farmers among the indigenous population. Thus there were no peasant farmers to migrate to the towns as the industrial revolution changed the world. Country towns were small and little more than service centres for farmers. Australia had a population of only about half a million (of whom half were Aboriginal) when the railway train was invented in 1825 and one million when the first local lines were laid in the early 1850s. The major development of the wheat industry awaited the arrival of those railways on the inland plains. At the birth of the mass motor age, taken here to be 1909 when the Model T Ford car was first produced, the total population was still only four million. The fact that the population has quintupled since then and the fairly high level of car ownership, together with extensive and early metropolitan train and tram networks, explains why Australia's cities consist largely of suburbs with little residential population in the central cities. The city growth was fuelled by wealth from exports, especially gold and wool. In the second half of the nineteenth century Australia, followed by New Zealand, had the highest real per capita income in the world (*cf.* Maddison 1995: Appendix D).

Table 5. Urbanization in the Oceania Region, per cent of total population (per cent annual growth rate in brackets)

Country	Year AD							
	1881	1891	1901	1911	1950 ^{lxvi}	1966	1976	2000 ^{lxvii}
Australia	30 ^{lxviii}		35 ^{lxix}	57 ^{lxx}	75.1			85 (1.0)
New Zealand	40.1 ^{lxxi}	43.4 ^{lxxii}	45.6 ^{lxxiii}		72.5			86 (1.1)
Melanesia								
Papua New Guinea					0.7	5 (16.1) ^{lxxiv}		17 (3.9)
Solomon Islands					8.3		>9 ^{lxxv}	20 (5.8)
New Caledonia					48.8			77 (3.4)
Vanuatu					6.1			21 (4.3)
Fiji					24.4	33.4 ^{lxxvi}	37 ^{lxxvii}	49 (2.9)
Polynesia								
French Polynesia					27.0			53 (1.3)
Tonga					31.2 ^{lxxviii}	34.4	33.6	32 (0.8)
Cook Islands					31.6	52 ^{lxxix}	47	59 (0.6)
Samoa					12.9	19.4 ^{lxxx}	21.1 ^{lxxxi}	22 (2.4)
American Samoa								48
Niue					23.5			35
Tuvalu								42
Wallis & Futuna								0
Tokelau								0
Micronesia								
Federated States of Micronesia								27 (0.4)
Guam					17.2			39 (2.5)
Kiribati					9.5			37
Marshall Islands								66
Nauru								100
Northern Mariana Islands								90
Palau								71

¹ United Nations (1993:80).² UN ESCAP Population and Development Indicators for Asia and the Pacific, 2000, <http://www.unescap.org>; South Pacific Commission (1998).³ Borrie (1994:148).⁴ Borrie (1994: 148).⁵ Australian Bureau of Statistics (2000).⁶ Papps (1985:10-28).⁷ Papps (1985: 10-28)⁸ Papps (1985: 10-28)⁹ National Statistical Office (1993:158-171).

¹⁰ Economic and Social Commission for Asia and the Pacific (1982: 49).

¹¹ ESCAP (1982: 19).

¹² ESCAP (1982).

¹³ ESCAP (1982: 111).

¹⁴ ESCAP (1982: 137).

¹⁵ ESCAP (1982: 89).

¹⁶ ESCAP (1982).

Thus, the early European colonial outposts and ports – including Sydney, Melbourne and Auckland – remain major centres of power, economic activity and population for the entire Oceania region. The first city to reach 100,000 was Melbourne during the 1850s gold rush and, at over 3.4 million by the end of the millennium, this city remains the second largest in the region following Sydney with over 4.0 million. By 1900 there were only three cities in the entire region with populations over 100,000: Melbourne (484,000), Sydney (481,000) and Brisbane (119,000) (Caldwell 1987). Over 17.8 million people out of 30.5 million, or 58 per cent of Oceania's total population, currently live in the major cities of Australia (Sydney, Melbourne, Brisbane, Perth, Adelaide, Canberra, Hobart and Darwin) (Hugo 2001). If we include the three major cities of New Zealand, Auckland, Wellington and Christchurch, 64 per cent of the entire regional population are concentrated in the major cities of those two countries. Moreover, these cities dominate economic activity and economic growth in Oceania. The only two cities in Oceania to be listed by the United Nations (2000b) as being among the world's largest agglomerations are Sydney and Melbourne. They are ranked in the 63rd and 81st places respectively, but, together, they constitute 37 per cent of the population of Australia and almost one-quarter of that of Oceania. Sydney and Auckland, with about one-sixth of Oceania's population between them, remain the major ports for the Pacific Islands and the major destinations of their migrants.

Discussion

Demographically, Oceania is the world's residual. Its 0.5 per cent of the world's population invariably comes at the end of all global compilations of population. It is confined to only one ocean, the Pacific, and omits large populations contained wholly within that ocean: 127 million in Japan, 80 million in the Philippines, and 22 million in Taiwan. It does not contain bordering countries that also face other oceans, such as Indonesia, Canada, United States and Mexico, but it does include Australia, which also has Indian Ocean shores. It includes Polynesia, but excludes the Polynesians who live in Hawaii (counted as the United States) and lists with New Zealand almost half the Polynesians as the Maoris of that country. It contains the eastern but not the western half of the island of New Guinea.

Oceania has been a major player in globalization and has paid a price. Two-thirds of the population (mostly in Australia and New Zealand) are of European descent and almost half of Fiji's population is of Indian descent. Although the Pacific Islands are increasingly being bypassed in an age of long-distance air transport, they were for centuries right in the path of maritime transport and provided excellent harbours. The result was that every Oceanic territory became a European colony (although between the two world wars much of Micronesia — the Marianas, the Carolinas, the Marshall Islands and Palau — were administered by Japan). The population became almost entirely Christian, so that even in Papua New Guinea the census now lists only four per cent of the population as adhering to traditional religions. The largest non-Christian populations are the Indians of Fiji (Hindus and Muslims), and recent Asian migrants to Australia and New Zealand. English, and less commonly French, became the official language and often the *lingua franca* too.

The estimates presented here of the populations before the nineteenth century owe something to linguistic, anthropological and archaeological evidence, but little more than whether they were settled or not and the probable origin of settlers. More important have been estimates of indigenous population at

the time of first substantial European contact or administration, but even these were often calculated decades later after better counts, but also usually after steep declines in the indigenous population largely from disease but also from violence. The Australian constitution long forbade the counting of Aborigines and they were first officially included in a census in 1971, although officials had earlier attempted supplementary counts. Researchers have proposed Aboriginal population estimates for 1788 (the first British settlement and annexation of most of the continent) ranging from 300,000 (Radcliffe-Brown 1930) to 1,500,000 (Butlin 1983). As all population estimates before 1788 are based on the 1788 figure and as Australia probably always accounted for half the population of Oceania, the earlier regional population estimates must be treated with great caution.

Theory, ideology and community attitudes play significant roles in estimating both first-contact populations and also earlier ones. In the Australian case official estimates published during the 1920s of the 1788 Aboriginal population were around 150,000, perhaps justifying the *terra nullius* legal concept that the land at that time had not really been occupied. Subsequently Radcliffe-Brown's (1930) figure of 300,000 was generally accepted until Butlin (1983) argued for a precontact population of 1,500,000, primarily maintaining that the mortality from smallpox had probably been greatly underestimated. Subsequently, others moved towards the Butlin figure, with White and Mulvaney (1987) positing 750,000 and Smith (forthcoming) 1,000,000. The important point is that little in the way of new evidence had been discovered, but the guilt of the settler community at Aboriginal dispossession and decimation had grown to the point where there was an apprehension of underestimating the extent of that disaster.

The approach to pre-1788 Australian population is usually a purely Malthusian one, based on the long settlement of the continent and the fact that the economy was a hunting and gathering one, presupposed to be living in equilibrium with the fauna and flora (the megafauna had disappeared tens of thousands of years earlier, possibly because of Aboriginal hunting). A similar approach underlies the Melanesian estimates, but superimposed upon that thesis is some continued settlement of islands and, more importantly, the arrival of new foodstuffs, especially the South American sweet potato which was particularly suited to the North Island of New Zealand and the New Guinea Highlands where it allowed a multiplication of the population. Micronesian and Polynesian population estimates are strongly influenced by evidence of first population arrivals and theories about the subsequent build up of numbers. New Zealand estimates have been affected by the debate about whether the Maoris arrived before 1000 AD - politically a significant date and also testifying to longer possession of the land before European settlers arrived. They have also been affected by theories as to whether the balance between hunting and cultivation and the related balance between the populations of the South and North Islands reversed.

Boserup's (1965) theory has barely been mentioned. The near-stationary populations of Australia and Melanesia do not appear to have changed methods of cultivation during the precontact part of the second millennium with ensuing population growth, although millennia before the lowland inhabitants of New Guinea appear to have added drainage to their techniques for cultivating taro, presumably enhancing population carrying capacities (Denoon 1997c). The change closest to the Boserup hypothesis is the arrival of the sweet potato in the Pacific from South America. This allowed the Maoris, whose ancestors had been agriculturists before coming to New Zealand where taro was difficult to grow, to change the foraging-horticulture balance. Later, it enabled the New Guinea Highlands to support more people than was the case with their pre-existing crops. Methods of cultivation, types of crop and whole economies changed with the arrival of European settlers and administrators who had employed such methods in Europe. This not only allowed the post-contact populations of Australia and New Zealand to multiply by 25 and almost 40 times respectively by the end of the millennium, but Melanesia, Polynesia and Micronesia to multiply 5-8 times during the twentieth century and the whole of Oceania by over five

times. This was hardly a response to changing cultivation methods caused by increased population pressures.

A more suitable theoretical approach to the post-contact erosion of the indigenous population and its subsequent recovery would be an epidemiological one. This would have to explain why the hunting and gathering population of Australia was more greatly affected by new diseases than the agricultural populations of New Zealand and Melanesia. The alternatives would be either to decide that too much emphasis is at present being laid on the impact of smallpox and other disease on Aborigines rather than on the loss of foraging land, or that the estimates of precontact population are too high. Kunitz (1994:110) argues that 'it was not diseases acting independently that reduced the population but violence, together with the destruction of the environments on which they depended, and consequent starvation and disease'. The colonial context, and the effects of violence, and dispossession from land and livelihoods, Kunitz writes, greatly compounded the effects of disease. Populations that were less affected by dislocation and violence, such as Polynesians in Hawaii and New Zealand, both agricultural populations, did not suffer as badly from introduced diseases and were better able to recover.

The Australasian demographic experience challenges demographic transition theory (Caldwell 2001). In spite of increasing contact between indigenous and settler communities and per capita incomes among the indigenous populations increasingly above Asian levels, Maori and Aboriginal fertility transition did not begin until parallel transitions were occurring in the 1960s and 1970s around the Third World.

Finally change was not spread evenly over the millennium. During that thousand-year span, the population of Oceania probably multiplied twenty-fold, increasing by almost 29 million persons. But, of that increase, one per cent occurred during the first eight centuries, 13 per cent during the nineteenth century, and 86 per cent in the course of the twentieth century.

It is difficult to characterise the relationship between population growth and economic change in Oceania over the millennium in general or region-wide terms. Based on archaeological demography we have argued that before European contact a fairly straightforward relationship may have existed, with the hunter-gather population of Australia limited by environmental and cultural factors and remaining stable, while agricultural intensification and extensification in other parts of the region enabled a slow but steady increase. But European contact, colonisation and peopling of Australia and New Zealand triggered a range of demographic and economic outcomes. For the colonised indigenous peoples everywhere in the region the effect was largely disastrous. Australian Aborigines, the largest population in the region prior to the late 18th century, have been the hardest hit. The great majority remain poor and marginalised within the most economically developed and prosperous nation in the region.

Most of the Pacific Islands entered a period of rapid population and economic growth after World War II. During the post-war period the islands became one of the highest recipients of international aid per capita in the world. The major employers became government bureaucracies and tourism. While fertility rates and, in most cases, population growth, have remained high, post-War economic growth began to stagnate during the early 1980s as international development aid declined and the prices of natural resources and agricultural products on the world market fell (Pool *et al.* 1982, Rallu and Ahlburg 1999).

One of the striking demographic results of the growing economic polarisation of the countries of Oceania has been a huge outmigration of people from poor Pacific Island states to seek work in wealthy Pacific Rim countries. For instance, Rallu and Ahlburg (1999:263) report that by the early 1990s "42% of Tongans and almost 50% of Samoans lived overseas", predominantly in New Zealand, Australia and the United States. This has meant that remittances from family members living overseas have become the primary source of foreign currency and income in many Pacific countries (Rallu and Ahlburg 1999:264).

Appendix: Discussion of the sources and population estimates

The pre-historical population estimates that we present in Table 2 are mainly based on three kinds of data derived from the demographic, historical and archaeological literature. First, we searched the literature for historical and demographic estimates of population at first contact. Second, we drew on the archaeological literature for estimates of how long Australia and the islands of Oceania have been settled by humans. Third, following archaeologists such as Kirch (2000), Thomas (1999), Beaton (1990) and Davidson (1990), we assumed that population growth roughly followed a logistic curve eventually reaching a roughly stable figure limited by both environmental and cultural factors.

Pre-European contact population estimates for most of the countries in Oceania remain speculative and highly contested in the academic literature and, as the archaeological evidence has proved open to differing interpretations, extrapolating backwards to arrive at estimates for 1000 AD may be so speculative as to be almost meaningless. Indeed, some archaeologists refuse to offer estimates of total pre-contact populations, as they argue that the evidence on which to make credible calculations simply does not exist (Beaton 1990; Davidson 1990). Nevertheless, while taking into account the inaccurate and speculative nature of precontact estimates and paying careful attention to the sorts of evidence used, we would argue that important trends and insights into population change can be gained.

For example, estimates of the pre-contact Aboriginal population of Australia have varied between 150,000 and 1,500,000. As White and Mulvaney (1987) note, estimates of the original population serve a political purpose, diminishing or emphasizing the moral responsibility of the colonizers for the destruction of the Aboriginal population. Radcliffe-Brown's estimate of about 300,000, based on historical evidence and notions of carrying capacity in different ecological zones, was widely accepted until the mid-1980s (Radcliffe-Brown 1930; Jones 1970, 1982; Smith 1980). The work of Butlin (1983), an economic historian, stimulated a radical revision upwards of estimates of precontact Aboriginal population. Butlin used models and simulations of population dynamics to simulate the process of depopulation of Aborigines in Victoria and NSW during 1788-1850. In particular, Butlin took greater account of the effects of disease, especially smallpox, drawing on comparative evidence of the decimation of other indigenous populations by the arrival of colonial settlers as in North and South America, where indigenous population possibly declined to ten per cent of precontact numbers (Butlin 1983). He suggested that the precontact population of southeast Australia may have been five times the number proposed by Radcliffe-Brown, and that the devastating effects of disease were much greater than previously realized, implying that disease moved much faster than the frontier and consequently that Europeans never saw examples of Aboriginal populations in their precontact conditions (Butlin 1983).

Although Butlin's population estimates have been contested and criticized on a range of grounds, his argument about the need to take the devastating effects of disease into account has had great influence, and has contributed to the revision of population estimates upwards. Reviewing Butlin's work, White and Mulvaney (1987) argue that the effect of disease was probably less in tropical zones, which had established, long-term contact with Indonesian fishermen. They concluded that 750,000 people is a reasonable estimate of the Aboriginal population in 1788 (White and Mulvaney 1987). Estimates of this order have now become more widely accepted. In the most recent published review of the evidence Mulvaney and Kamminga (1999: 69) write that the 'Aboriginal population size in 1788 is some hundreds of thousands, perhaps at most three-quarters of a million'.

It is now generally accepted that the Aboriginal people first colonized Australia some 40,000 to 60,000 years ago (Lourandos 1997; Mulvaney and Kamminga 1999). There is some evidence that the indigenous population was dynamic throughout Australian prehistory, especially during the Holocene period, shown

for instance by the increased intensification of archaeological sites and artifact densities from about five to six thousand years ago (Beaton, 1990; Lourandos 1997). The time periods involved are so great, however, that even a relatively dynamic model of population change in the prehistoric period implies little difference between a precontact population at 1788 and 1000 AD. Therefore, we have followed Davidson's (1990) model of low population and slow growth until a relatively stable total population was reached in the mid-Holocene. This suggests that the population 1000 AD differed little from that at 1788. This accords with Mulvaney and Kamminga's (1999:65) argument that the population had reached a relatively stable figure, constrained by environmental resources but also cultural practices with ecological repercussions, well before European contact. This is not to argue, however, for a totally stable and static population throughout that period. As Davidson (1990) argues, the total population probably fluctuated around that figure, reflecting much greater fluctuations in local populations throughout the country over time.

Prehistorical estimates for Papua New Guinea may be even more difficult and speculative. First, following current nation-state boundaries we have not included West Papua (now a province of Indonesia) in our estimates at all, even though for most of the second millennium no such arbitrary division of the population would have been possible. Second, the first systematic censuses were conducted only in 1966. That census estimated the total population at the time to be 2.15 million (National Statistical Office 1993). Partial data for populations under colonial government control were collected early in the twentieth century, with a total enumerated population of 152,075 recorded in New Guinea in 1914 and a population of 162,531 counted in Papua in 1919-22 (National Statistical Office 1993). Van de Kaa (1971) argues that these figures missed at least another 225,000 people living in the highlands. This suggests a population estimate of at least 540,000 in New Guinea and Papua in the early 1900s.

Precontact population estimates for the remaining Pacific islands have been derived from a range of sources, as cited in Table 1. McArthur (1967) remains an excellent review of population estimates for Fiji, Tonga, Samoa, Cook Islands and French Polynesia, drawing together historical sources with demographic analysis of their reliability. The historian (Denoon 1995, 1997a, b, c; Denoon *et al.*, 2000) also brings together a wide range of historical and demographic data in his discussions of Pacific Island depopulation. Apart from the work of these two authors, historical and anthropological accounts of specific islands and nation-states also provide population estimates. For the most part, the primary sources are accounts from early European explorers and missionaries, as well as early colonial 'musters' and censuses.

Like Australia, mainland Papua New Guinea was first settled some 40,000 to 50,000 years ago (Skeldon 1982). According to Spriggs (1997a, b) settlement of island Melanesia also started around that time, with a second period of migration from Southeast Asia about 3200 years ago. Apart from the great antiquity of first settlement, however, two other factors need to be considered in the population dynamics of Melanesia over the second millennium. The first is that new migration continued throughout the millennium. During the last 700 years or so there was a flow of Polynesian migration into island Melanesia (Spriggs 1997a). The second is that it is now widely accepted that the sweet potato arrived in Papua New Guinea during the late seventeenth to early eighteenth century and stimulated the rapid intensification of food production, and hence population growth, in the highlands from that time until European contact and colonization (Green 2000). Therefore, we have posited low growth of about 5 per cent a century until the eighteenth century, with growth then increasing to about 10 per cent a century until contact.

If our estimates of Australia's prehistoric population are based on assumptions about a very long period of settlement, for New Zealand the situation is quite the opposite. New Zealand was the last land mass in the world to be colonized by humans, as East Polynesians journeyed down across the Pacific (Davidson

1984). The date remains disputed. Archaeological evidence and radio-carbon dating place initial settlement in the period AD 1000 to 1200 (Davidson 1992:6; Spriggs 1997a). According to Davidson (1984:117) the sweet potato was probably introduced by New Zealand's earliest Polynesian settlers in the first two centuries of the millennium. The sweet potato, as well as plants such as taro, gourds and yams, became the basis for Maori horticulture (Yen 1974:297-308). During the second millennium the Polynesian colonizers increased rapidly to a population of around 100,000 by the time of first European contact in 1769 (Pool 1991). In his earlier work Pool put forward a significantly higher estimate of a Maori population of between 125,000 and 175,000 in 1769 (Pool 1977; Bedford and Pool 1985). Therefore, his 1991 estimate represents a substantial revision downwards of his earlier calculations. Other authorities fall quite close to Pool's later work. The geographer Lewthwaite (1999) has also recently published a thorough review of the evidence and argues for 'estimates not much exceeding 100,000'. Archaeologists such as Green and Davidson (cited in Lewthwaite 1999) propose estimates of around 125,000. Whatever the population it seems likely that it was still climbing rapidly up to 1769, as reflected in our estimates.

Polynesia and Micronesia were also settled much later than mainland Australia and PNG. According to Spriggs (1997b), settlement of Polynesia and Micronesia began about 1,200 BC and continued into the first two centuries of the second millennium, as the late human colonization of New Zealand shows. Moreover, archaeological and historical evidence suggests that horticultural expansion and intensification continued throughout the second millennium before European colonization (Denoon 1997a; Thomas 1999). Therefore, in Table 2 we have speculated that the population grew steadily from initial settlement until European contact, albeit at a relatively low rate of about 10 per cent a century.

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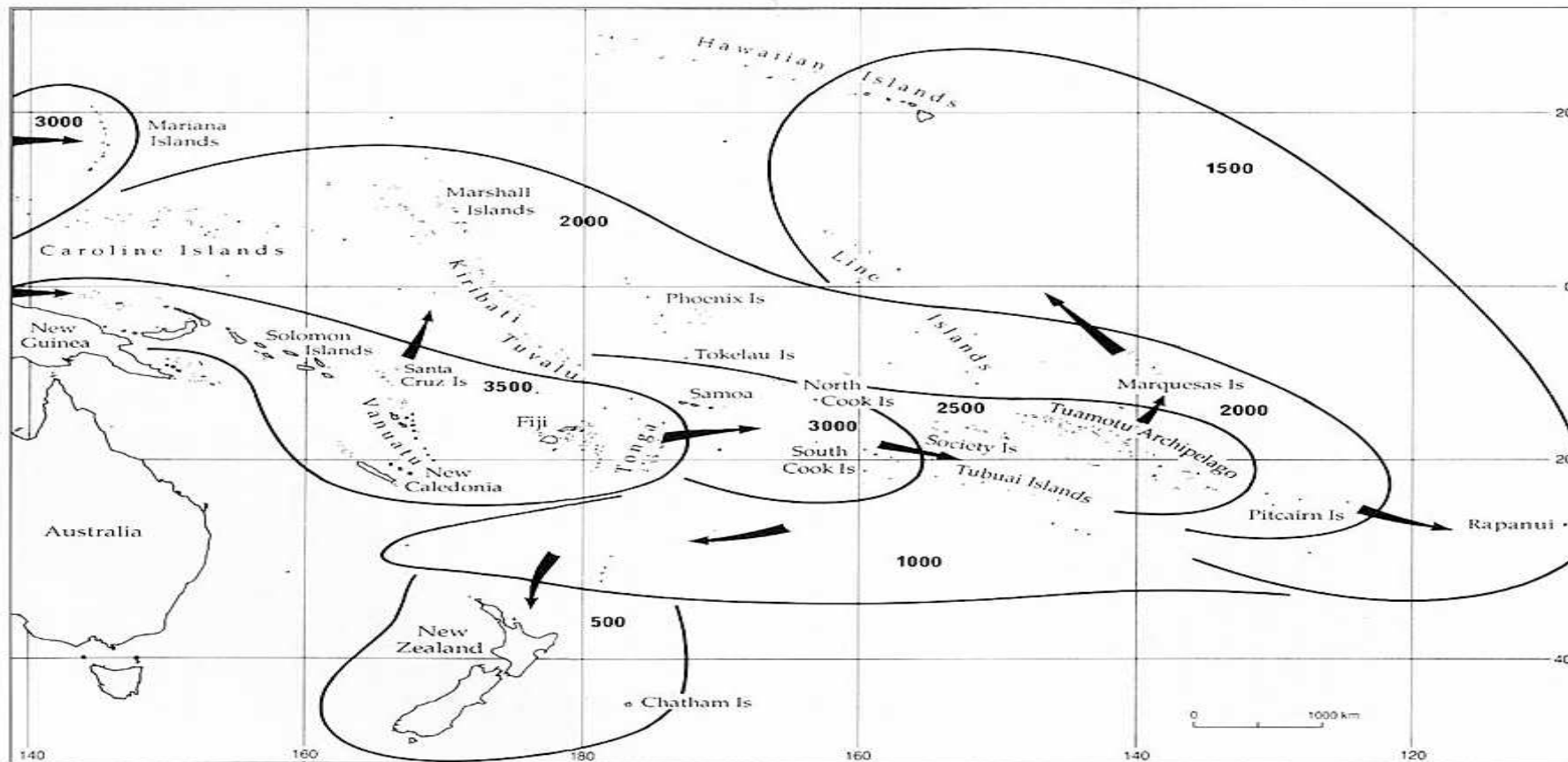
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Notes

- ⁱ Unless otherwise noted, all population figures for 1950 are drawn from United Nations (1999:454-455).
- ⁱⁱ Unless otherwise noted, all 2000 population figures are from ESCAP (2000).
- ⁱⁱⁱ Australian Bureau of Statistics (2000).
- ^{iv} Mulvaney and Kamminga (1999), White and Mulvaney (1987).
- ^v Smith (1980:210).
- ^{vi} Smith (1980:210).
- ^{vii} Australian Bureau of Statistics (1996:29).
- ^{viii} Borrie (1994:23); Santow, Borrie and Ruzicka (1988:31).
- ^{ix} Borrie (1994:24).
- ^x Caldwell (1987).
- ^{xi} Caldwell (1987).
- ^{xii} Skinner (1997:124).
- ^{xiii} Statistics New Zealand (1999a:20).
- ^{xiv} Statistics New Zealand (2000a).
- ^{xv} While Pool (1991:232) puts initial settlement some 1200 to 1500 years BP, archaeologists have revised estimates of time of first colonization to AD1100 or even later (Davidson, 1992:6; Spriggs, 1997a).
- ^{xvi} Pool (1991:57).
- ^{xvii} Pool (1991:57).
- ^{xviii} Statistics New Zealand (1999a:20).
- ^{xix} Statistics New Zealand (1999a:20).
- ^{xx} Statistics New Zealand (2000b).
- ^{xxi} Borrie (1994:94).
- ^{xxii} Papps (1985).
- ^{xxiii} Van de Kaa (1971:34).
- ^{xxiv} Denoon (1997b:80-118).
- ^{xxv} Lambert (1934:32).
- ^{xxvi} Denoon (1997b:114).
- ^{xxvii} Rallu (1990:4).
- ^{xxviii} Denoon (1995:327).
- ^{xxix} Denoon (1995:327).
- ^{xxx} Oliver (1989:28), McArthur (1967:10-11).
- ^{xxxi} McArthur (1967:27).
- ^{xxxii} Denoon (1997b); McArthur (1967).
- ^{xxxiii} McArthur (1967:315-319).
- ^{xxxiv} McArthur, (1967:72); Denoon (1997b:114) quotes missionary reports of 'about 50,000' in 1847.
- ^{xxxv} McArthur (1967:82).
- ^{xxxvi} ESCAP (1983:15).
- ^{xxxvii} ESCAP (1983:19).
- ^{xxxviii} McArthur (1967:101).
- ^{xxxix} McArthur (1967:101).
- ^{xl} Smith (1983:36), Tafatu and Tukuitoga (1982:123).

- xli Macdonald (1982:6).
- xliii Macdonald (1982:6).
- xliiii Burrows (1937:15).
- xliv Burrows (1937:15).
- xlv South Pacific Commission (1998:67).
- xlvi Huntsman and Hooper (1996:36-37).
- xlvii South Pacific Commission (1998:65).
- xlviii Micronesia includes the islands of Yap, Kosrae, Pohnpei, Chuuk, Satawan. Yap had a pop. of 30,000 to 50,000 in 1840s (Ritter 1981:24), declined to 7,500 at end of the century (Meleisea and Schoefield 1997:127). Kosrae 1820s: 3,000 pop (Ritter 1981); 1880s: 300 population (Denoon, 1997a:244). According to Hezel (1983:317) Pohnpei's population declined from 'over 10,000 in the 1820s to less than half that number by 1885'. Gorenflo (1995:59) is sceptical about early estimates of up to 35,000 on Chuuk in the 1930s. According to Gorenflo (1995: 59-63) Chuuk had a population of about 16,000 in 1901.
- xlix Rogers (1995:471).
- ¹ Russell (1998:320), Farrell (1991:179).
- ^{li} Nelson and Nelson (1992:170).
- ^{lii} Macdonald (1982:6).
- ^{liii} Lambert (1934:20).
- ^{liv} Denoon (1997b:114).
- ^{lv} Underwood (1989), Viviani (1970:4).
- ^{lvi} Underwood (1989:8).
- ^{lvii} Viviani (1970:181).
- ^{lviii} Denoon (1997b:114) cites 30,000 to 40,000 for the Marianas as a whole, suggesting this estimate for the Marianas minus Guam. According to Farrell (1991), after the colonization of the islands by the Spaniards during the seventeenth century, they forcibly moved the native Chamorros people to Guam and decolonized the Nth Marianas. In 1668 there had been about 40,000 Chamorros in the islands. By 1710 when the Spaniards conducted the first census there were only 3539 left (p.177). Farrell writes that the northern islands 'were to remain uninhabited for nearly a century' (p.179).
- ^{lix} Russell (1998:320).
- ^{lx} Farrell (1991:234-6).
- ^{lxi} Farrell (1991:258).
- ^{lxii} Palau Community Action Agency (1977:174), Hezel (1983:318).
- ^{lxiii} Palau Community Action Agency (1977:174), Hezel (1983:318).
- ^{lxiv} Calculated from population data and total land area data from ESCAP, <http://www.unescap.org/stat/statdata/apinfig.htm>, and data from the Secretariat of the Pacific Community, Demography Programme, http://www.spc.int/demog/pop_data2000.html
- ^{lxv} Calculated from current population data (2000) and total arable and crop land area data from ESCAP, <http://www.unescap.org/stat/statdata/apinfig.htm>
- ^{lxvi} United Nations (1993:80).
- ^{lxvii} UN ESCAP Population and Development Indicators for Asia and the Pacific, 2000, <http://www.unescap.org>; South Pacific Commission (1998).
- ^{lxviii} Borrie (1994:148).
- ^{lxix} Borrie (1994: 148).
- ^{lxx} Australian Bureau of Statistics (2000).
- ^{lxxi} Papps (1985:10-28).
- ^{lxxii} Papps (1985: 10-28)
- ^{lxxiii} Papps (1985: 10-28)
- ^{lxxiv} National Statistical Office (1993:158-171).
- ^{lxxv} Economic and Social Commission for Asia and the Pacific (1982: 49).
- ^{lxxvi} ESCAP (1982: 19).
- ^{lxxvii} ESCAP (1982).
- ^{lxxviii} ESCAP (1982: 111)
- ^{lxxix} ESCAP (1982: 137).
- ^{lxxx} ESCAP (1982: 89).
- ^{lxxxi} ESCAP (1982).

Map 1: Major population movements into the Pacific Islands before 1000 AD.



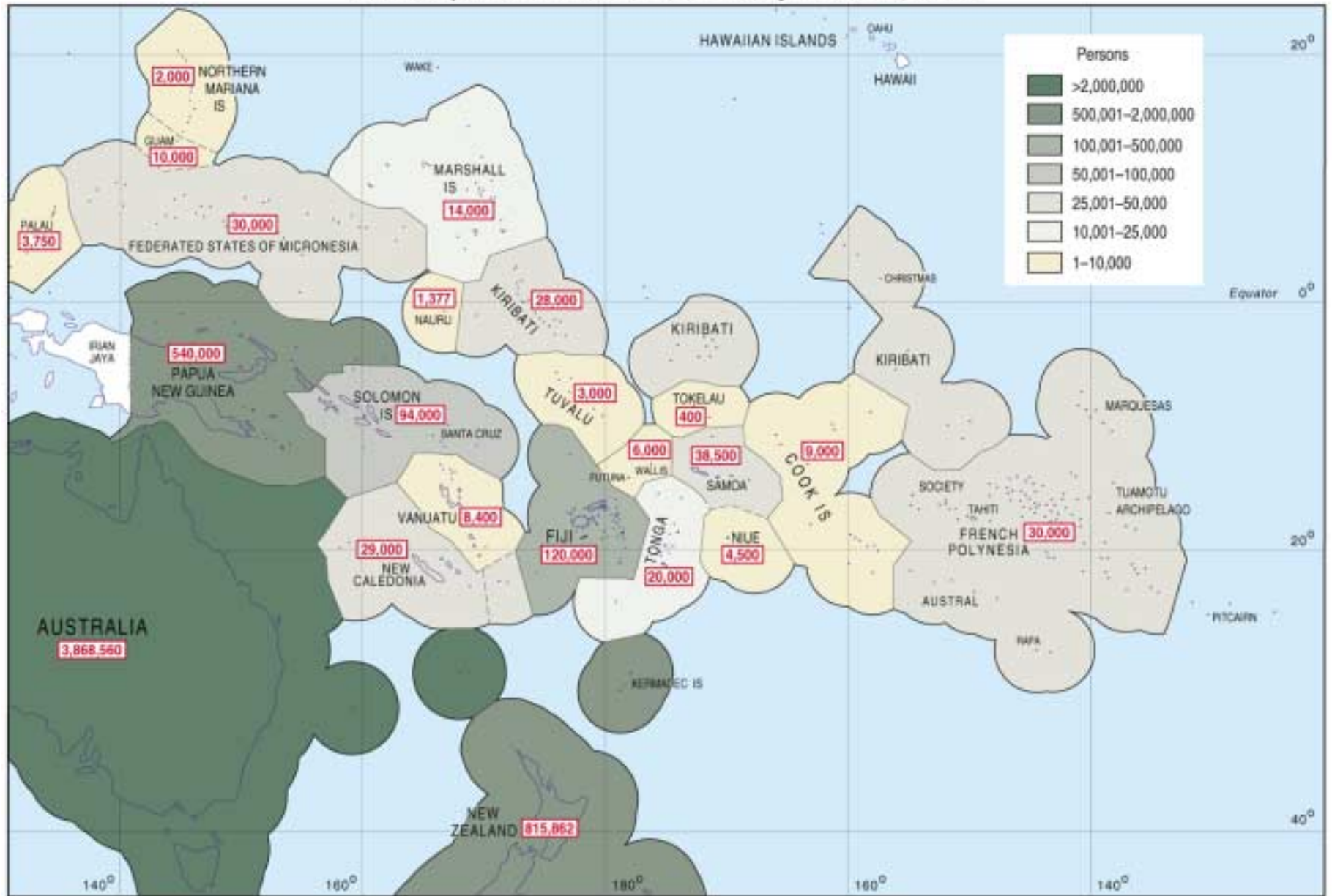
Map 2: Population estimates for the regions of Oceania, 1700AD



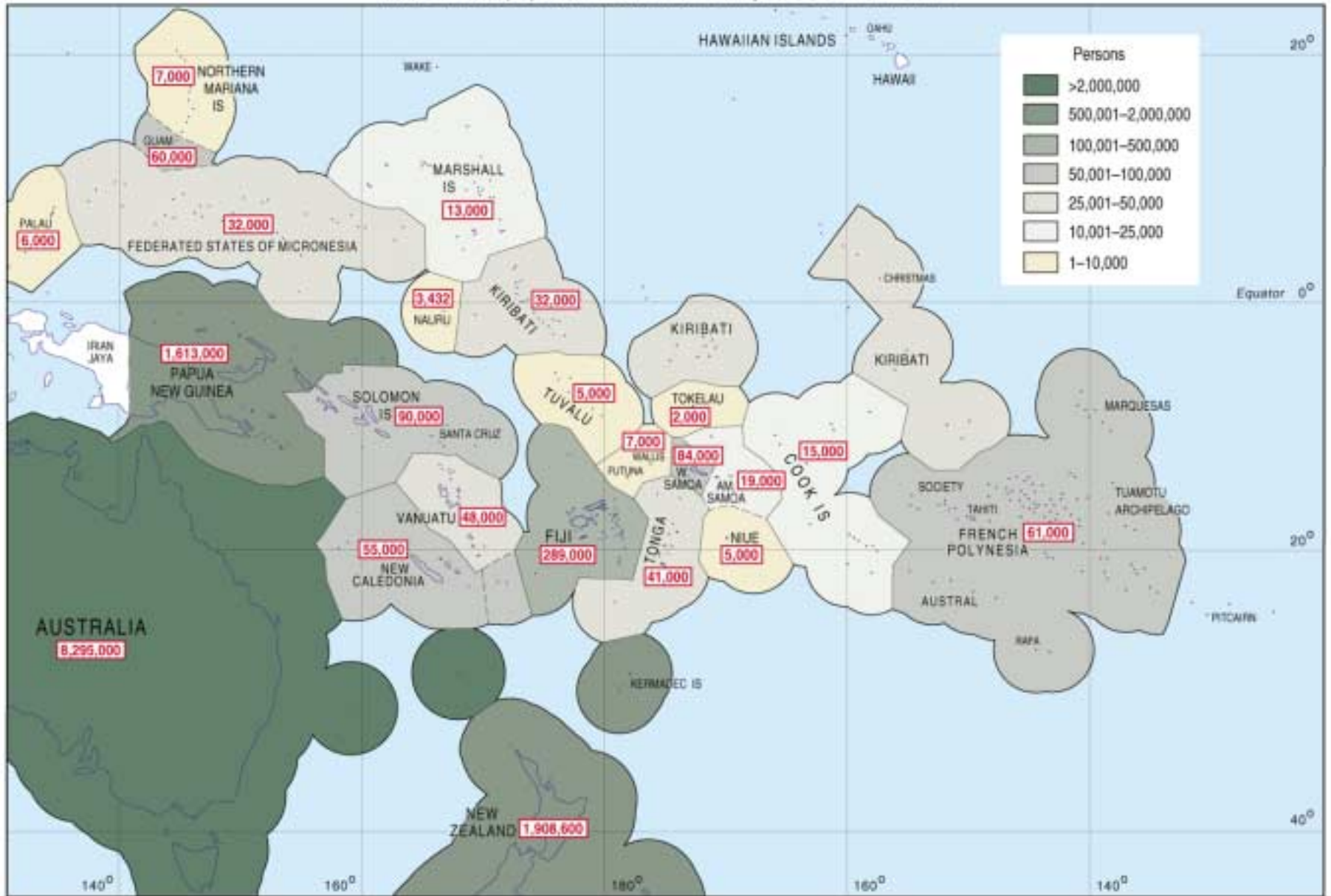
Map 3: Population estimates for the regions of Oceania, 1800AD



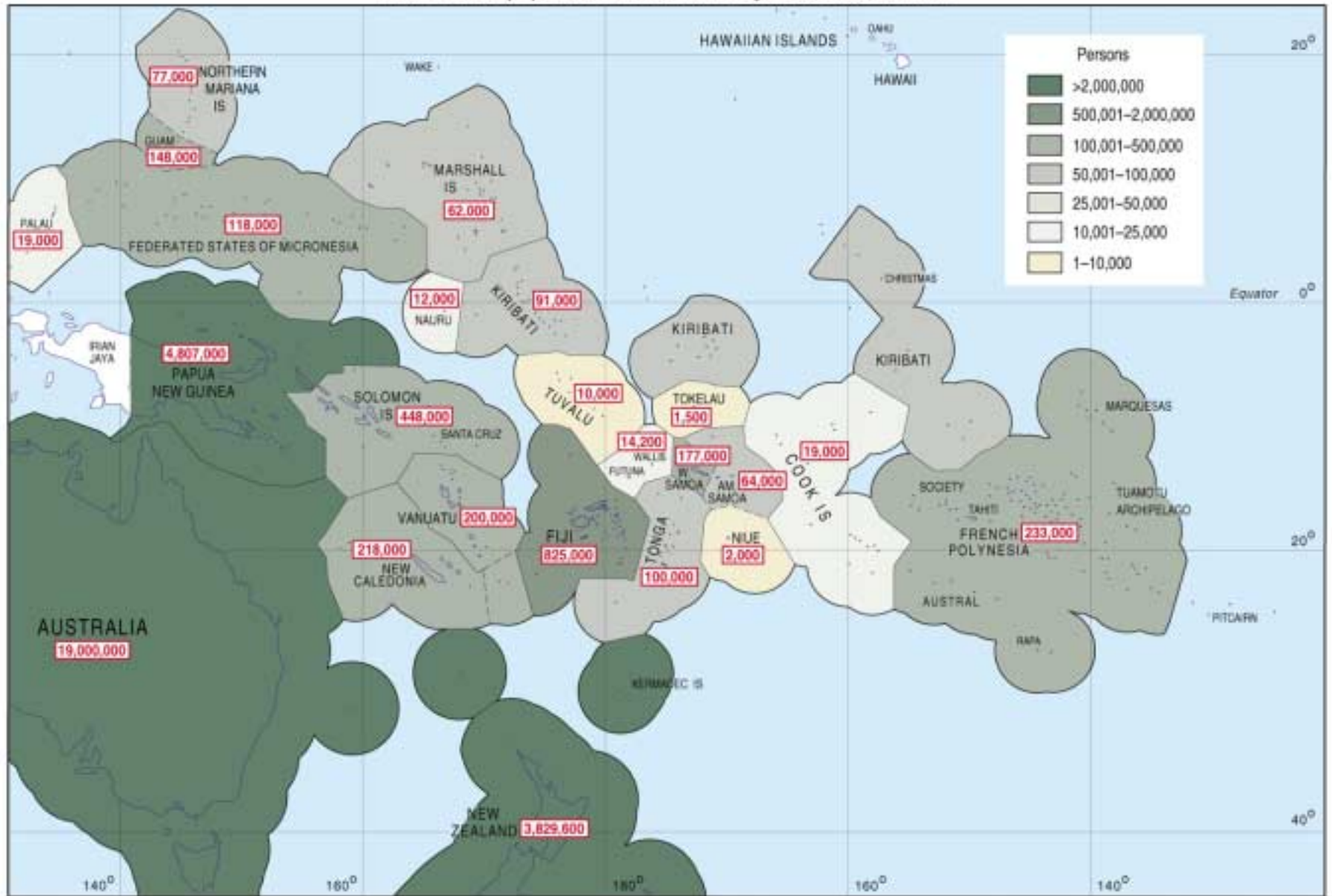
MAP 4: Population estimates for each "country" in Oceania, 1900AD



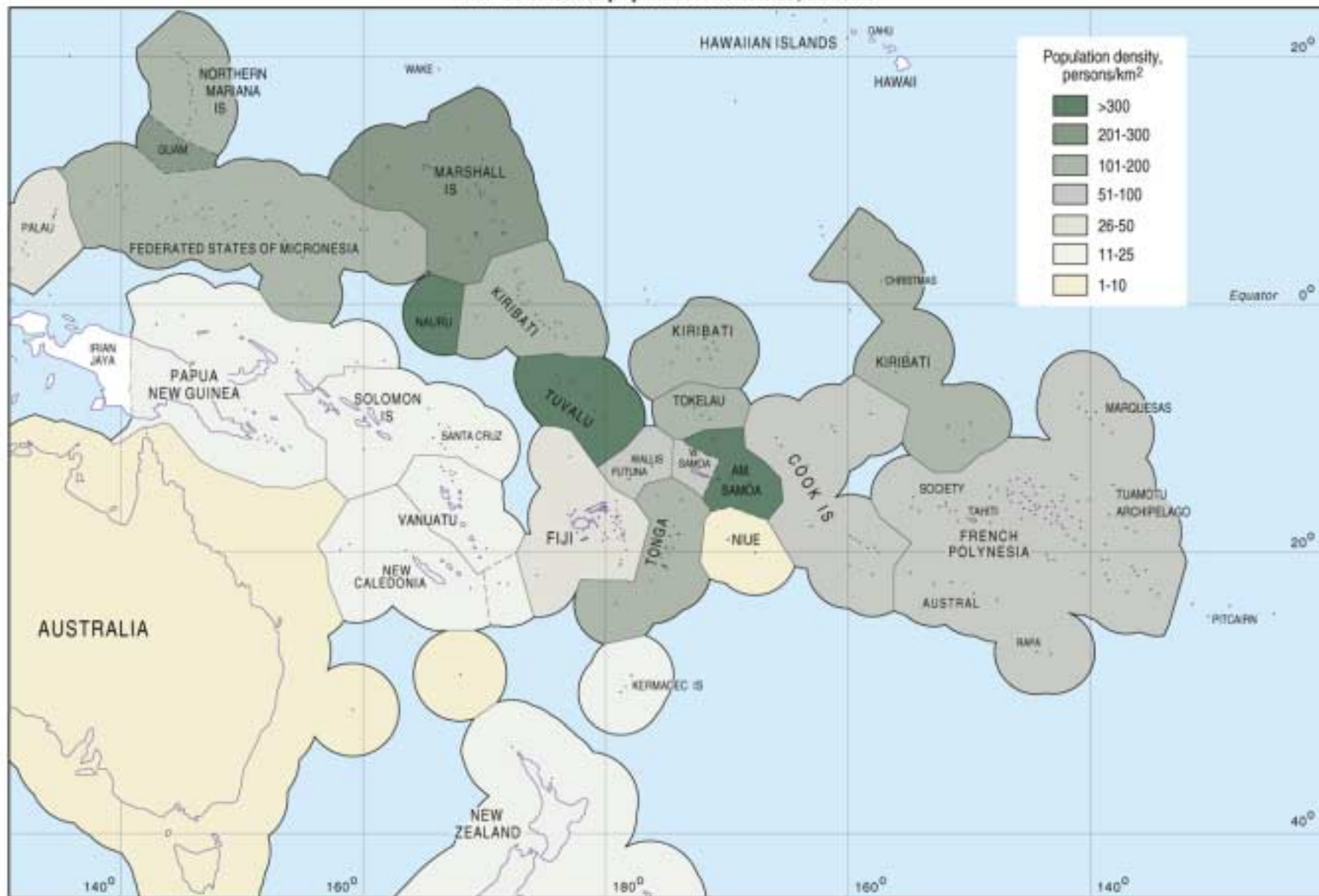
MAP 5: Total population for each country in Oceania, 1950AD



MAP 6: Total population for each country in Oceania, 2000AD



MAP 7: Oceania population densities, 2000AD



MAP 8: Urbanisation in Oceania , 2000AD

