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CHAPTER 1

Fertility and the Depopulation of Melanesia: Childlessness, Abortion and Introduced Disease in Simbo and Ontong Java, Solomon Islands

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Depopulation and colonialism: the big picture

Melanesia was one of the last regions of the world to be affected by the process of global integration that effectively began in 1492 with the European colonisation of the New World. It was a process accomplished with the aid of 'Guns, Germs and Steel', to quote the title of Jared Diamond's (1997) account. The process spread to Australia and Polynesia in the late eighteenth century, reaching Fiji in about 1810 and some of the islands in western Melanesia in the 1840s. The 'scramble for the Pacific' by European colonial powers reached its climax in the 1890s, and apart from some small isolated pockets, global integration was completed in the 1930s with the Australian and Dutch expansion into the New Guinea highlands.

In all regions previously isolated from Eurasia and Africa, namely the Americas, Australasia and Oceania, the outcome of contact and colonisation was decided not only by 'guns and steel' but also by 'germs' – by disease pathogens and their demographic

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impacts (Diamond 1997). Before 1492 the indigenous peoples of this global periphery had an advantage over Eurasians and Africans in suffering from a smaller number of infectious diseases, but sustained contact transformed their situation. In the Americas, for example, Crosby (1993) lists the following new diseases introduced after 1492: smallpox, measles, chicken pox, whooping cough, typhus, typhoid fever, bubonic plague, cholera, scarlet fever, malaria, yellow fever, diphtheria and influenza. Whether or not a name should be added or subtracted from this list is relatively unimportant, Crosby suggests, in view of the 'avalanche of disease that decimated all native American peoples, and even obliterated many [societies], … struck by the micro-invaders and the macro-invaders simultaneously' (Crosby 1993: 86).

The scale of depopulation in the Americas, and the process itself, have been much studied by historians in recent decades. The highland populations in the former Aztec and Inca empires are now estimated to have declined by at least 90 percent in the first post-contact century. Mexico's population, for example, fell from about 30 million in 1492 to less than 3 million in 1600 (Blaut 1993: 194). The decline in the Amerindian populations of the tropical lowlands and Caribbean islands is not so fully recorded, but often it was even more extreme.

In Polynesia an equivalent catastrophic decline has been proposed by Stannard (1989) for the population of Hawai'i in the century after 1778. McArthur (1968) studied the demographic histories of Tonga, Samoa, Cook Islands and French Polynesia, and came to more cautious conclusions. Her research suggested that only three of the Polynesian island groups she studied, Tahiti, Marquesas and Rarotonga, suffered really severe post-contact effects. Rarotonga's population was halved, mainly by dysentery, while Tahiti declined from about 35,000 in 1769 to under 8,000 one hundred years later. The Marquesas islands were probably even more severely hit, but the pre-contact population estimates may not be reliable (McArthur 1968: 281). Pirie (1972: 202) blamed gonorrhoea, spread by the crews of visiting whaling ships, for low fertility in the Marquesas in the nineteenth century.

The Australian evidence has also been critically re-examined (Reynolds 2001), and it shows that while a decline in the Aboriginal population was almost universal, both chronology and causation were quite variable. In the state of Victoria, for example, signs of smallpox had been noted in 1830 among the Aboriginal population even before European settlement was successfully established. Aborigines in Victoria numbered about 12,000–15,000 in 1830. Fewer than 2,000 survived to be counted in the

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first census, 33 years later (Flannery 1995). In the Northern Territory populations declined most rapidly from 1900 until 1940, but even in the twentieth century, accurate information is difficult to establish. Introduced infections took a heavy toll, especially sexually transmitted diseases (STDs) that also reduced birth rates. Humanitarians suspected that conditions of hygiene and nutrition were poor for Aborigines on the cattle stations, but the European pastoralists blamed infanticide for the depopulation (McGrath 1987).

A persistent feature of Australian Aboriginal demography at the time of its most rapid decline was the preponderance of males in the population. Children also made up a much smaller proportion of the population than is usual, even among European populations. The large number of men has never been satisfactorily explained, but the small number of children can be attributed to low fertility because of the adult sex imbalance, and to 'horrific infant mortality', respiratory diseases being the most common cause of death (Flannery 1995: 326). In the Northern Territory many trained observers commented on a state of apathy and depression, and noted the detrimental effects of the Aborigines' fatalistic view of illness. Many sick people and pregnant women declined to make use of the limited medical and natal facilities available. Appallingly high maternal and infant death rates were reported by the anthropologists R.M. and C.H. Berndt in the 1940s, and fertility rates were also low. At none of the cattle stations where the Berndts carried out surveys did the average number of children per woman exceed 2.3, while infant mortality rates ranged from 32 to 52 percent (Berndt and Berndt 1954). In their view, 'discontentment, disillusionment, distrust of the future – these factors helped to keep the birth rate low'.

The depopulation of Melanesia: problems with sources

Melanesia as a geographical construct

The region that has become known as 'Melanesia' was a construct of early nineteenth-century cartography, following the European recognition in the late eighteenth century that 'Polynesia' was a vast archipelago with a shared language and therefore, it was presumed, a common culture history. In 1833 the navigator Dumont d'Urville distinguished between Polynesia (the many islands), Micronesia (the small islands) in the North Pacific, and Melanesia (the black islands) for the region stretching

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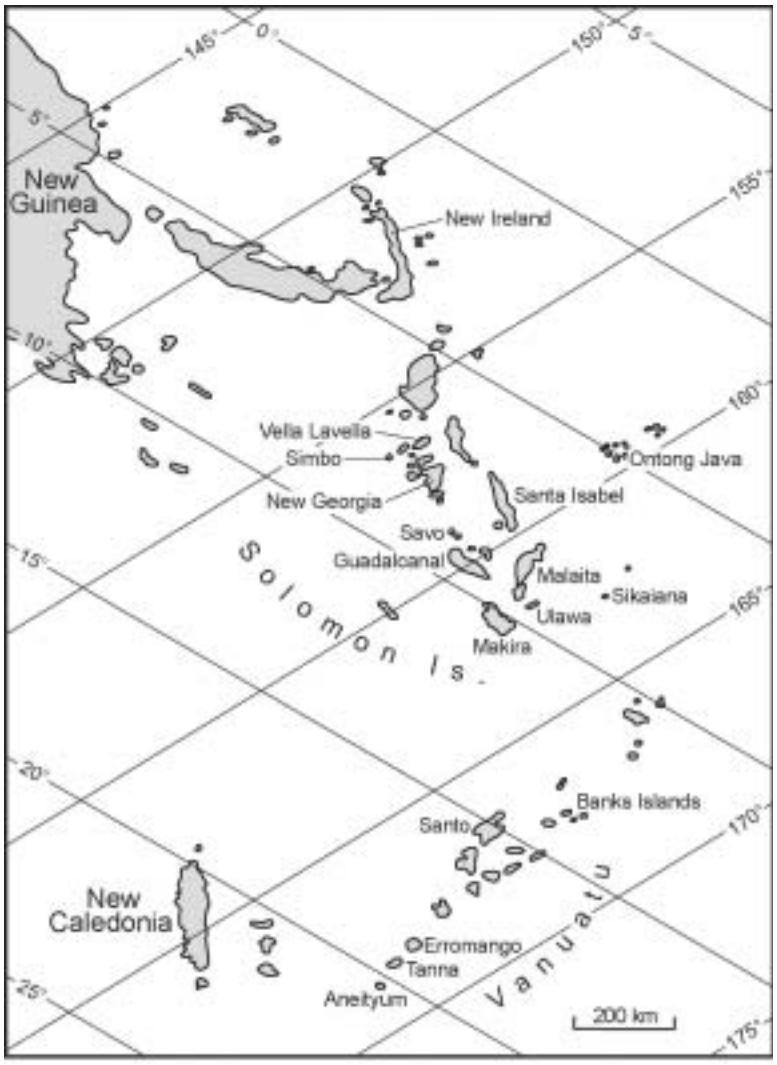

Figure 1.1. *Island Melanesia excluding the Fiji group, showing the names of islands mentioned in the text*

between New Guinea and New Caledonia (Figure 1). D'Urville's Melanesia originally included Australia, but this increasingly British enclave was soon separated by geographers from the rest of the black islands. Later scholars failed to find much genetic, linguistic or ethnographic evidence for a common ancestry for Melanesians, emphasising instead the region's diversity, but the name itself has survived.

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A turning point in the legitimation of the name was the establishment by Anglican missionaries of the Diocese of Melanesia in 1861. Ethnologists started to adopt the term Melanesia (e.g. Rivers 1914, 1922a; Ivens 1927; Hogbin 1930), and in the post-colonial era, local elites began a discourse about the Melanesian Way. As Epeli Hau'ofa has argued, it is justifiable to continue to use the European-imposed threefold division of the Pacific "because the terms are already part of the cultural consciousness of the peoples of Oceania" (Hau'ofa 1994: 161). Furthermore, and despite the diversities of colonial rule (with British, French, German, Dutch and Australian variants), there are many common strands in recent Melanesian history. One example is the traumatic effects of initial contact between the region's indigenous peoples and the outside world, as this paper illustrates.

Problems with sources: Fiji

Melanesia's engagement with 'guns, germs and steel' did not really begin until after 1800, and the process is therefore well documented by comparison with the history of contact in the New World. Even so, the information available needs careful interpretation. In the absence of proper medical diagnoses or full and accurate population statistics, very often we are forced to rely upon the more casual observations of contemporary observers. Thomas (1994) and Jolly (1998) have reviewed some of the problems we face today in using these accounts, with Fiji as an example. The depopulation of Fiji is relatively well documented, but even here the positionality of observers (missionary, commercial or administrative) and their constructions of Fijian motherhood resulted in a biased analysis of the underlying causes of population change.

In Fiji there was a rapid decline in the indigenous population in the nineteenth century, particularly after about 1850, a trend which continued more slowly into the 1920s. For fifty years after the British colony's establishment in 1874, the state of the Fijian population was a central government concern, and mortality and fertility figures were always one of the first items mentioned in district officers' reports. This concern was used to justify widespread programmes for relocation of villages, improved sanitation, piped water and better housing. However, Thomas (1994: 112–23) points out that because the causes of population decline were poorly understood, it was actually impossible for officials to devise appropriate counter-measures.

In this situation, many policies that were justified in the name of 'sanitation' seem, in fact, to have been designed to make Fijians more visible and easier to administer, for example with the cre-

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ation of larger nucleated settlements centred on the new (and usually crowded) churches and schools. This new settlement pattern and lifestyle appeared orderly and civilised to British eyes, but it also facilitated a more rapid transmission of many diseases, as the fortuitous quarantine effects of population dispersal were removed.

Without accurate theories of epidemiology and demography, the committee appointed in 1893 'to enquire into the decrease of the native population' faced a difficult task. The best that Victorian science could achieve in Fiji was listed in 36 postulated causes of the ongoing population decline. Some of these suggested factors were categorically rejected by the committee in its Report of 1896. For example, the committee discounted the alleged effects on fertility of certain marriage customs that were supposed by some observers to have had detrimental effects through in-breeding. However, many other causes could not be rejected, including many vague and speculative factors said to connect the Fijian temperament with morbidity and mortality. It was claimed that 'mental apathy, laziness and improvidence of the people arise from their climate, their diet, and their communal institutions' (Report, pp. 73–4, cited by Thomas 1994: 114). Here we see that ideological preconceptions, policy concerns and muddled thinking are so hopelessly intertwined, that even the basic 'observations' of colonial agents become suspect.

Claims for 'bad mothering' by Fijian women are a particular example (Jolly 1998). Postulated cause number 36 for depopulation, 'General insouciance of the native mind, heedlessness of mothers, and weakness of maternal instinct', was a claim supported by the testimony of high-ranking Fijian men as well as by many of the European missionaries, colonial officials and ethnographers. Some of the recommendations of the committee were for better infant diets, use of cows' and goats' milk, village crèches, encouragement of early marriage, more effective inquests into infant deaths, and deterrents against abortion. Jolly (1998: 193) points out that in relation to inquests alone, the administrative task was almost impossible. The Fijian population of 1893 was one in which 27 percent of infants died in their first month and 44 percent in their first year. But in any case, the contemporary evidence was overwhelming that exotic infections were the primary cause of this mortality, not neglect by bad mothers.

Problems with sources for western Melanesia

Elsewhere in the region, the administrative effort was more feeble, and it was mainly the missionaries who provide the primary

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evidence. In many cases their testimony also reflects their positionality. Florence Coombe, a teacher at the Melanesian Mission school on Norfolk Island from 1909 to 1919, provides an example at one extreme. Coombe visited numerous islands on the boat Southern Cross:

> Gaua, Banks Islands … Everywhere are traces of a formerly large and strong population. What is left? Villages with only 30 to 50 inhabitants apiece, and amongst them not half a dozen babies. Magic and poisoned arrows have been doing destruction for generations, and sheer ignorance and laziness account for the scarcity of children. (Coombe 1911: 67).

> Guadalcanal, Solomon islands … Everywhere the old men tell the same tale. Long ago the villages were many and large, and thickly populated. But violence and magic have mown down the people. (Coombe 1911: 331).

In point of fact, the regular visits of the Southern Cross were themselves a major cause of the transmission of infectious diseases direct from New Zealand to Melanesia (Hilliard 1978: 156–7).

The resident missionaries are generally more reliable, for example Walter Ivens who worked from 1895 to 1909 on Ulawa and south Malaita. Ivens was a brilliant linguist and an assiduous ethnographer, and the supposed effects of 'magic' form no part of his analysis. However, like all the missionaries he hated the labour trade known as 'blackbirding':

> The government of the Solomons estimates that today Mala [Malaita] has a population of about 65,000 people ... In the past the population was much greater, and the white man must be held responsible for a considerable diminution in the numbers of these people. Mala was a great recruiting ground for the vessels of the Labour Trade, and since the cessation of the Trade [in 1906], dysentery and influenza spread from visiting ships have caused considerable mortality ... The heavy mortality among children is probably owing to hookworm and yaws. (Ivens 1927: 25)

> At present [1925] the villages on Ulawa are nine in number … The sites of deserted villages, *naonga*, are many, and the population which is at present 900 must have been a good deal larger in the past … In 1869 there was a very severe epidemic of dysentery that swept the whole island and carried off possibly a quarter of the population. The epidemic was introduced by some ship, possibly by a vessel seeking labour … (Ivens 1927: 44–5)

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A third example is Lieutenant Boyle Somerville, of the Royal Navy, who spent eight months altogether in 1893 and 1894 surveying Marovo Lagoon, New Georgia island in the western Solomons. Somerville interacted with traders as well as local people, but surprisingly nowhere does he mention the impact of either the labour trade or disease:

> …[I]n the eastern parts [of Marovo] the number of the population has gone down with great rapidity. An old trader of twenty years experience [Frank Wickham] told me that in his recollection the numbers had terribly decreased. This to a large extent is probably due to head-hunting which has … almost annihilated some villages… No doubt head-hunting has always been their custom; but… rifles and especially tomahawks, during the last forty or fifty years, have largely increased its fatal effects; so that where one man's head was taken in olden times, three or more are taken today. (Somerville 1896: 410)

An uncritical reading of this contemporary literature might suggest that each island in Melanesia has its own unique history of European contact, and to some extent this may be true. Undoubtedly some islands had early and intense involvement with trading ships, blackbirders, missionaries and government agents, while other islands were more fortunate in avoiding devastating epidemics, wars or cultural malaise. However, the testimony upon which to base any assessment is patchy, often ill-informed, and always subject to ideological bias. In constructing any general model of underlying causes, these problems of data and its interpretation loom large. We need to focus on rigorous micro-studies of particular societies, where demography and/or epidemiology were analysed in some depth, in order to get beyond the dubious generalisations of an earlier age of scholarship. The islands of Simbo and Ontong Java provide such an opportunity.

The causes of depopulation in Melanesia

Recent studies of the population history of Melanesia have been rather few when compared to other parts of the world. New case studies include Fiji (McArthur 1968; Cliff and Haggett 1985; Jolly 1998), Aneityum in Vanuatu (McArthur 1978; Spriggs 1981), New Caledonia (Sand 1995, 2000), New Ireland (Scragg 1954), the Polynesian Outlier atolls (Bayliss-Smith 1974, 1975a, 1975b), and Marovo Lagoon in the Western Solomons (Bayliss-Smith *et*

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al. 2003). What we lack are new explanatory models which might confirm or refute the classic accounts of Rivers (1922a), Roberts (1927) and Hogbin (1930, 1939). The following sections provide a brief overview of opinions.

McArthur: how reliable are early estimates of population?

Some of the debates have been largely statistical, and concern the reliability of early population estimates. Throughout the Pacific the earliest ships usually reported the presence of many more people than were counted some years later in the first accurate enumerations. Norma McArthur (1968, 1970) was particularly sceptical about the reliability of pre-census estimates, for example those used by Harrisson (1937: 261) for Vanuatu. Harrisson proposed that a total population for the islands of 1,000,000 had collapsed to 600,000 by 1882 and 45,000 in 1935, because of new epidemic diseases. The statistical basis for the 'one million' appears not to have been published, but its origin was probably an extrapolation from the cases of Erromango and Aneityum in southern Vanuatu. It is still unclear how typical was the experience of such islands.

Despite her general scepticism about the accuracy of early estimates, McArthur (1978) showed that in Aneityum's case, the population estimates made by nineteenth-century shore-based missionaries were basically accurate, and catastrophic mortality did occur. The first reliable census on Aneityum in 1854 lists 3,800 names with about 200 additional persons not included, but even at that early date epidemic mortality had already severely reduced numbers. There are eyewitness accounts of previous epidemics of cholera and/or dysentery in about 1836–8 and 1842–3. These accounts suggest that in each case about 4,000 people had died, which would imply a pre-contact total in the range 9,000-12,000 (Spriggs 1997: 257–9). In 1861 one-third of the surviving population died from measles, with death rates of 40 percent for adult males and 42 percent for adult females (McArthur 1978: 278). The Aneityum population's lowest point was reached in 1941, when just 186 persons remained.

Roberts: 'centuries of decay'?

Most of these accounts, both from Aneityum and elsewhere, place primary emphasis on new sources of mortality following European contact, and this echoes the conclusions of earlier scholars. The historian Stephen Roberts (1927: 73–5), for example, summarised the historical process in the Pacific as involving three intertwined causal factors: 1) the increased scale and effects

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of warfare, following the introduction of firearms and other weapons; 2) the rapid and almost complete abandonment of old practices, social institutions and beliefs, leading to 'psychological despair', loss of the will to live, and neglect of children; and 3) physical causes, notably new epidemic diseases, whose mortality effects became more potent because of factor (2).

Roberts, like certain others, believed that Melanesian populations were already in decline when Europeans first arrived on the scene: 'Little wonder … that diseases wrought such ravages on a stock already enfeebled by centuries of decay, and, at this juncture, lacking the very will to live' (Roberts 1927: 80). But to most scholars the evidence for pre-European decline was unconvincing (Hogbin 1939: 125–6). In apparent contradiction was the evidence for dense settlement and intensive cultivation, as described by Mendana in 1568 and by Quiros in 1616, on islands almost empty of people in the first nineteenth-century accounts (Spriggs 1997: 232–7). For example, the irrigated terraces and permanent villages described by Mendana on Guadalcanal cannot be traced in nineteenth-century records or in oral histories. However, one such site was recently rediscovered by archaeologists, and here post-Spanish abandonment may not have happened until the mid-nineteenth century, when escalating warfare, epidemics and blackbirding resulted in accessible areas on Guadalcanal being emptied of population and the survivors relocating their settlements in the interior (Roe 1993: 23).

Ivens: placing the Roberts model into a three-stage chronology

The Roberts model was put into a chronological framework by Ivens (1930), who wrote with particular reference to Malaita, Solomon Islands. He divided the depopulation process into three overlapping stages, beginning with the onset of labour recruitment (blackbirding) in the 1860s through to the 1890s. Ivens (1930: 42) estimated that only about half of the men recruited ever returned home from Australia, Samoa, New Caledonia or Fiji, and of those who returned, many delayed their marriages or never married at all. Therefore not only did the absentees deplete the population, but also fewer children were born than had been the case in previous years. The second stage was one of escalating warfare between the 1870s and 1890s. The introduction of rifles by traders and blackbirders was the cause of increasing bloodshed and political unrest. The third was the period of epidemic infections, between the 1880s and 1920s. The establishment of copra plantations, regular trade and the migration of large numbers into new coastal villages saw the onset of a new era of high epidemic

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mortality from new diseases, particularly dysentery and influenza. Ivens also observed that 'in the new villages … which sprang up on the coast after the return of the Kanakas [recruited labourers, in 1906–08], everyone suffered either from malaria or from ulcers [yaws], and their cemeteries are literally full of children.' (Ivens 1930: 47).

Hogbin: epidemics as the primary cause of depopulation

The social anthropologist Ian Hogbin (1939), focussing on the Solomon Islands, considered that it was mainly smallpox and dysentery which reduced the population between 1870 and 1900, in a series of epidemics:

> Since then [1900] there have also been periodic outbreaks of chicken-pox, whooping cough, measles and influenza. I have been in a native community myself during two severe epidemics, and the results on both occasions were appalling. No precautions were taken against the spread of infection, and once a person became ill his only chance of recovery was that his natural resistance would triumph, even though this was often partially destroyed through lack of proper nursing and suitable foods. Several new diseases, such as gonorrhoea, tuberculosis, dysentery, and leprosy have also become endemic. (Hogbin 1939: 127)

These new diseases had greater effects because a high proportion of the population was already debilitated by yaws, malaria and hookworm. Infant mortality rates were 'enormous, a fact which is hardly surprising when one recalls the conditions under which parturition takes place', while children's diets were 'unsuitable'.

However, Hogbin was unimpressed by the arguments of Rivers, Roberts and others that emphasised the importance of 'the psychological factor' in morbidity and mortality, as a consequence of the traumatic cultural change that followed missionisation. On the island of Malaita, for example, there seemed to be no differences between Christian and pagan areas in birth and death rates, despite the marked contrast in acculturation and, supposedly, an increased susceptibility in Christian areas to psychosomatic illness (Hogbin 1939: 132–5):

> …[I]n all my fieldwork, not only in Ontong Java and Malaita but in other parts of Melanesia and New Guinea, I have never seen a native die of despair. Apart from accidents, all who perished were organically diseased. Sexual intercourse is also, if anything, on the increase, and everywhere the people still want children. (Hogbin 1939: 136)

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Changes in fertility: of minor importance?

In almost all this literature, changes in fertility are not thought to have been of much importance. There are reports, often anecdotal, that certain customs detrimental to fertility were continuing, such as late marriage and self-induced abortion. On closer inspection, the evidence for such practices often appears unreliable (Underwood 1973). There are also reports, seldom supported by clinical diagnosis, that new STDs were reducing fertility (Pirie 1972). Usually, however, the main focus is on high epidemic mortality, and high endemic levels of infant mortality. The child death rate was being exacerbated by lack of breast milk supplements, poor hygiene, dirty clothing and bad mothering. Unless reforms could be instituted, it was suggested, Melanesians would fail to adjust to the new challenges of modernity. Their populations would not replace the numbers lost to the increased mortality rates, and extinction would become inevitable.

Depopulation and fertility: the conventional model

According to this literature, therefore, in both Melanesia and Polynesia it was changing rates of mortality that resulted in population decline, with fertility rates playing a minor role. The conventional model thus echoes the modern consensus about the causes of post-Columbian depopulation in the Americas, seeing depopulation as the result of new diseases that increased death rates, with birth rates rather little affected. In Island Melanesia (i.e. Bismarck Archipelago, Solomon Islands, Vanuatu, New Caledonia, Fiji) the chronology of the process was somewhat later than in Polynesia, and is summarised in Table 1.1. As in Australia, there were many regional variations, and the model does not apply at all to inland New Guinea where the Highlands valleys were protected from the main onslaught of epidemic disease by the late arrival of Europeans (1920s-1950s). However, in most areas the population decline occurred mainly in the nineteenth century and was driven primarily by epidemic mortality. Fertility may also have fallen in consequence, or it may have been unaffected. In either case the rising birth rates of the twentieth century were too little and too late to protect these populations from several decades of severe and sometimes catastrophic decline, although extreme cases like Aneityum may not be typical.

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Table 1.1. *The depopulation of Island Melanesia: the conventional model*

Period	Demographic processes	Outcome
Pre *c.* 1840	High fertility balanced by high mortality.	Stability
c. 1840–1920	Epidemic mortality much increased; fertility somewhat reduced by death of spouses and failure to re-marry.	Rapid decline, depopulation of small islands and outlying areas
c. 1920–1960s	Control of infectious disease, acquired immunity and rising birth rates as traditional fertility checks are abandoned.	Recovery and slow increase
Post-1960s	Further reduction in incidence and effects of infectious disease; control of malaria (not applicable to Fiji).	Rapid increase

Low birth rates: the case of Makira

The interaction between epidemic mortality and the subsequent fertility of the surviving population is usually difficult to establish from historical sources. Census data are incomplete or unreliable, so that the only evidence available is anecdotal. An example is a log-book entry by the captain of a Solomon Islands copra boat, J.E. Philp:

> Wanomi Bay [Makira]. Thursday June 5th 1913 … At noon I went across to the Marist Mission … Later I joined the fathers at their evening meal … We were discussing population question. Father B. [Babonneau] gave as his experience that the rate of decrease in San Cristoval [Makira] was 60 per cent! Mothers are before marriage made sterile in many cases, or again, children are unwelcome to men who wish to have the services of their women wholly at their disposal for work in gardens … In all the villages infanticide or abortion are commonly practiced. So evidently the population must decrease. (Herr with Rood 1978: 141)

The 'evidence' for these highly suggestive assertions is, unfortunately, very slender. Philp, citing Babonneau, refers to ten mission girls from Wanomi Bay who had all been married for some years. Of these ten, seven were childless and the other two had borne one child each, of whom only one now survived (Herr with Rood 1978: 141). Not only does this information come to us second-hand, but also the sample of women is small and may be unrep-

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resentative. But Philp appears to have been a perceptive and disinterested observer, writing his diary for no particular audience, and he too observed that in most villages on Makira there were 'few young children and many couples without issue' (Herr with Rood 1978: 142).

Low birth rates following epidemics: Fiji

We are in a better position to analyse the interactions of mortality and fertility in the case of the Fiji islands, where careful estimates of each district's population date back to 1874 and the first census took place in 1881. From these and other sources the measles epidemic of 1874 can be studied in some detail. Although McArthur (1968: 350) considered its impact 'was probably quite exceptional … [because] conditions for its spread were extraordinarily favourable', the one-third death rate among adults was probably not unusual in smaller island populations before the twentieth century. What was 'exceptional' about Fiji in 1874 was that the epidemic spread throughout the islands, so its demographic effects became visible in the national census data for decades to come.

The impact of this extreme epidemic on the population's future viability was the result of two factors. The first was the immediate impact of high child mortality. Those infants already born in 1874 ran the double risk of dying from measles or dying from neglect because their parents and relatives were sick or dead. Contemporary observers considered that small girls were particularly at risk (McArthur 1968: 30). The second was the creation of a large number of widows and widowers whose reproductive lives were terminated or at least attenuated. It is likely that with a one-third adult mortality rate, less than half of all marriages survive an epidemic (McArthur 1968: 351), and as a result births in subsequent years are greatly reduced.

As a result of these two factors working together, the 1873–77 age cohort in Fiji was greatly depleted in numbers. These reduced numbers, especially of girls, had an impact on birth rates 20 years later in the 1890s and 1900s, when the cohort reached marriage age (McArthur 1968: 351). Fortunately in Fiji subsequent epidemics (influenza in 1891, whooping cough also in 1891, measles again in 1903) were less severe, and in 1905, births exceeded deaths for the first time since at least 1874.

The 1874 measles disaster in Fiji affected the entire population, but a more normal pattern in Melanesia was for epidemics to be more localised, with an impact on a single island or a group of islands in frequent canoe contact with each other. If contact with

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the outside world resulted in these small populations experiencing epidemic mortality repeatedly, and if we assume that marriage practices did not quickly adapt, then we might predict more and more childless marriages and an accelerating decline in the number of surviving children each decade. There is indeed good evidence that supports this model from some of William Rivers' almost forgotten research in the western Solomons.

Childless marriages on Simbo and Vella Lavella

All the evidence suggests that the impact of 'guns, germs and steel' was no less severe in the Solomon Islands than elsewhere in the Pacific, but as already discussed, the process was and is poorly documented. Although the islands were declared a British Protectorate in 1893, no census took place until 1931. Population estimates for the Solomons group as a whole around 1900 ranged from 100,000 to 150,000, and all observers agreed that total numbers were in decline, with some small islands becoming depopulated (Bennett 1987: 151). The head of administration was Charles Woodford, whose first visits to the islands had been in the 1880s. In his public writings he spoke only of his fear of labour shortages in the future (e.g. BSIP 1911: 47). However, in 1910 Woodford wrote in a confidential report that 'nothing in the way of the most paternal legislation or fostering care, carried out at any expense whatever, can prevent the eventual extinction of the Melanesian race from the Pacific' (cited by Hilliard 1978: 157).

As described above, contemporary observers blamed depopulation on the combined effects of disease, labour recruiting and warfare. The social anthropologist William Rivers (1922b) was one of the few to emphasise instead the low birth rate. Rivers based his opinion on the field data that he collected with Arthur Hocart in 1908 on the islands of Tanna and Santo in the New Hebrides (Vanuatu), and in Vella Lavella and Simbo in the western Solomons. He became convinced of the importance of low fertility from his analysis of genealogies. On Simbo, these covered the entire population and were based on about four months of careful questioning and cross-checking. For the larger island of Vella Lavella, also in the western Solomons, the genealogies represent 'random samples taken from various villages of the coast', and are regarded by Rivers as 'less trustworthy'. His data from Santo and Tanna (Vanuatu) are based, in each case, on brief visits and the genealogies of single families, but interestingly these also show the same patterns (Rivers 1922b: 100–3).

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The method adopted by Rivers was based on the discovery that he had made in the Torres Strait islands in 1899:

> I discovered that people preserved in their memories with great fidelity a complete and accurate record of their descent and relationships. It was possible to collect pedigrees so ample in all collateral lines that they could serve as a source of statistical enquiry into such features as the average size of family, infant mortality, and other subjects which furnish the basis for conclusions concerning the fluctuations of population. (Rivers 1922b: 96–7)

Comparing three different generations, Rivers felt confident that he could make comparisons over time in the size of families, the proportion of childless marriages, and the child mortality rate as a percentage of the total number born.

The results of his analysis are summarised in Table 1.2. The precise chronology of each generation is obviously uncertain, but when the three generations are compared some clear trends can be detected. Generation I must have been born in about the 1820s and 1830s, and were in their fertile married years between the 1840s and 1870s. In this generation there were 2.0 children per married couple, and on average this cohort of children suffered 11 percent mortality before marriage. Altogether 19 percent of all marriages were childless. Generation II were born in the 1840s–1850s, and were married and fertile in the 1860s–1890s. There were 1.3 children per married couple, and this cohort of children suffered 27 percent mortality before marriage. In Generation II 46 percent of all marriages were childless. Generation III were born in the 1860s–1870s, and were married and fertile from about the 1880s until the 1908 survey. Until 1908, there were only 0.7 children per couple and 53 percent of marriages were childless. For a few couples in this generation, their families were still incomplete at the time of the 1908 survey, so these figures slightly underestimate true fertility rates.

Rivers (1922b: 99–101) was struck mainly by the dramatic changes between Generation I and II, within cohorts where he regarded the data as fairly complete, and reasonably accurate with respect to the number of childless marriages. He was more cautious in his interpretation of the apparent rise in infant mortality:

> It is a question whether children who died young may not have been in many cases forgotten in the case of the earliest generation and therefore omitted when the pedigrees were collected, and in this case the increase in infant mortality would not be as great as

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Table 1.2. *Fertility on Simbo for three generations: those born approximately 1830s and 1840s (Generation I, married and fertile c. 1850-70); those born approximately 1850s and 1860s (Generation II, married and fertile c. 1870-90); and those born approximately 1870s and 1880s (Generation III, married and fertile c. 1890 until 1908). Data source: Rivers (1922b: 98)*

Rivers' Generation[1]	Estimated period of fertility[2]	Marriages where the woman was of child-bearing age during the period of the Generation[3]						Total number of persons recorded for the Generation	
		Total number of marriages	Childless	1–2 children	3–5 children	6 or children	Number of children doubtful[4]	Children born (number per marriage)[5]	Children that died before age of marriage[6]
I	*c.* 1850–*c.* 1870	207	40	90	68	9	0	407 (1.9)	44 (11%)
II	*c.* 1870–*c.* 1890	295	136	85	56	10	8	379 (1.3)	101 (27%)
III	c. 1890–1908	110	58	36	6	0	10	72 (0.7)	33 (46%)

Notes

(1) Rivers divided his genealogies into three successive generations numbered I, II and III, Generation III being families recently completed or nearing completion in 1908. He stated that 'the division into generations was necessarily rough, but was effected before any attempt was made to estimate fertility' (Rivers 1922b: 198).

(2) Based on an estimated 20 years between generations apart from the 18 years of the incomplete Generation III.

(3) Numbers are calculated from the statistics provided by Rivers (1922b: 98) for the percentage of marriages in each category.

(4) Rivers (1922b: 95) admits that the apparent changes in birth rate between Generation II and III 'may be illusory owing to certain families [10 in the Simbo case] being still incomplete'. In contrast the eight families in Generation II where the number of children is 'doubtful' apparently reflects some gaps in the data.

(5) Rivers admits that these figures are likely to underestimate fertility: 'There is the possibility that male children who died young would be remembered better and that some female children who died in infancy may have been forgotten and therefore omitted' (Rivers 1922b: 100).

(6) Rivers (1922b: 98) describes this category as 'children who died young', but it is clear from his method of deriving this category that 'death before marriage' is what he means, although most would indeed have died as infants.

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> represented in the table. It will be noted that mortality is definitely greater in the case of male children, but here again there is the possibility that male children who died young would be remembered better and that some female children who died in infancy may have been forgotten and therefore omitted. (Rivers 1922b: 100)

The record collected by Rivers and Hocart from Vella Lavella, western Solomons, was similar and showed an even more serious decline in fertility. The data are a sample rather than a complete island genealogy, and 'I did not know the people and their circumstances as I knew them in Eddystone [Simbo]'. The proportion of childless marriages in Vella in Generation I was low (12 percent) and similar to Simbo, but it rose to 35 percent in Generation II (marriages undertaken between the 1870s and 1880s). The childless proportion rose to an extraordinary 72 percent in Generation III, and of the few children born between about 1890 and 1908, approximately one in four died.

Methodological problems with genealogical data

It would perhaps be unwise to submit these data to more elaborate analysis, given the approximations intrinsic to the method that Rivers adopted. Nonetheless there is now a large body of data in historical demography generated using basically similar methods of family reconstitution. An example is Hollingsworth's (1964) genealogies for the offspring of British peers in the period since 1550. The data show that between 1550 and 1699, 18 percent of all the marriages of the sons of peers (sample size 1,741) were childless, while 20 percent of their daughters' marriages (sample size 1,520) were childless (Hollingsworth 1964: 46). The proportion of childless marriages rises in some periods to 23 percent, but the true rate is never less than 16 percent (Hollingsworth 1964: 47).

Data of this kind are regarded as essentially accurate because they come from genealogies based upon well-preserved and tolerably complete historical documents, rather than ethnographic sources. In the ethnographic cases, it is always difficult to know if the genealogies recounted by informants are representative, as their only source is the testimony of families that happened to survive to the present day. In a truly random sample there should be a considerable number of families that died out, and so had no one to preserve a memory of them (Hollingsworth 1969: 211). As well as the omission of extinct families, ethnographic genealogies

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may also fail to represent the biological facts of descent and relatedness for other reasons:

> Informants engage in activities known to anthropologists as telescoping, clipping and patching in order to distort the biological facts so that they can be used to rationalise the social, political and economic needs and desires of the informants or the group … These deficiencies suggest that ethnographers exercise some caution in generalising about size, sex ratios, age, and rates of growth for populations for which only ethnographic evidence is available. (Morrill and Dyke 1980: 1–2, 9)

At this remove, and because of Rivers' own early death in 1922 before his Simbo ethnography was fully published, it is difficult to know how far such comments should erode our faith in his data as a source of demographic insights. However, what is impressive about the Rivers data is that he himself exercised great care in its collection, and was cautious in its interpretation. Moreover consistent results were achieved on the two islands Simbo and Vella Lavella (and were not contradicted by sample genealogies from Vanuatu). The data deserve to be taken seriously, even if Rivers' own interpretations need to be looked at again.

The chronology of population change in western Solomons

Tentatively, therefore, we can use the Rivers data set to construct a chronology for demographic change in this region, as follows. Firstly, there is the period between about 1790 and the 1830s, when the first low-intensity contacts took place. At this time the Simbo population was still geographically dispersed, and epidemic mortality was probably small. Secondly, between about the 1830s and the 1870s there was an increasing intensity of contact, as Simbo became an entrepôt for trade and a magnet for visiting ships and beachcombers. Almost certainly many new diseases were introduced, and headhunting escalated. By 1850 bush populations were moving to the coast, but it is unclear if this was the cause or the effect of population decline. As mortality increased, the birth rate declined. And thirdly, between about the 1870s and 1910, there was a period when resident foreign traders used Simbo as a centre for copra trading, and labour recruiters made frequent visits. The population was ravaged by diseases that reduced birth rates severely. Headhunting could no longer be sustained, but was suppressed in any case by British colonial author-

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ities after 1896. In 1903 the Methodist Mission established a toehold; and the population fell to about 400 in 1908.

This history can be pieced together from written accounts, and in 1908 it could probably have been greatly amplified by oral histories if Rivers and Hocart had not been so intent on reconstructing custom rather than studying colonial change. The Rivers-Hocart expedition took place at least 120 years after first contact, which was probably initiated with John Shortland's visit in *Alexander* in 1788. Shortland named the island Eddystone, and his sailors traded 'nails, beads and other trifles' with Simbo men who, unafraid, boarded his ship from their canoes. Ignoring invitations, Shortland decided not to land (Dureau 2001: 133-5). Shortland recommended the route via Simbo as 'the safest and most expeditious passage … from Port Jackson to China', and within a few years more intense interactions were taking place. In 1803 the whaling ship *Patterson* recorded that 30 canoes with nearly 200 men came out from Simbo to trade (Bennett 1987: 350; pers. comm.). In 1812 Captain Bristow of the ship *Thames* reported the island was 'very thickly inhabited, which prevented them landing; it seemed full of trees, but coconuts only were obtained' (Purdy 1816: 103). In contrast, in 1908 Rivers and Hocart found there were no sea-going canoes left, and the declining population numbered only about 400 (Hocart 1922: 74).

We have no information from these brief accounts about whether or not new diseases were introduced, and no real indications of the size of the pre-contact population. However, we can assume it was relatively stable, with moderate to high fertility balanced by moderate to high mortality. Infant deaths resulted in particular from endemic malaria, while adult men died in warfare. Dureau (1998: 244) points to cultural practices on Simbo that reduced fertility, including the separate residence of men while they prepared for bonito fishing and headhunting expeditions, the breast-feeding of infants for up to four years, and the use of contraceptives, abortifacients and infanticide 'in order to maintain the ideal of two dependent children per woman'. At this remove, it is impossible to know how far this 'ideal' was actually realised.

Possibly the impact of Europeans on the Simbo population was slight until the 1830s, which is when Simbo began to gain its reputation as a safe haven for castaways. In 1839 there is a record of a white man who had left a whaling ship to live on Sikaiana atoll being transported to Simbo by another whaler (Bennett 1987: 356). The first people within Rivers' Generation I were born in the 1820s and 1830s at this time of increasingly frequent visits, as

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ships took advantage of Simbo's strategic location and its safe anchorage in the stormy Northwest season.

Andrew Cheyne stayed there for six weeks in 1844, curing bêche-de-mer, procuring turtle shell, and digging up sulphur from the volcano (Shineberg 1971: 303–14). The people already seemed very familiar with trade goods and trading practices, and had begun to cultivate sweet potatoes. Cheyne met three Englishmen who had been living on the island for some time, after running away from ships. He found that the Simbo chiefs and bigmen were seeking to monopolise the New Georgia trade, stockpiling turtle shell to exchange for tomahawks so they could dominate political relations with their neighbours. Cheyne left four white men on Simbo with trade goods, and later he wrote a book describing the islanders as 'on friendly terms with Europeans (which their neighbours are not)', and recommending that 'strangers should procure pilots and interpreters at the Eddystone before going to any of the other islands' (Cheyne 1852). Thirty years later this advice was still being plagiarised almost verbatim in other sailing directories (Findlay 1884: 864).

There is some confirmation of this interaction in the oral history provided to Hocart by Sulutava (Dureau 2001: 139–40). Sulutava's account indicates that the first white men to visit the island wanted turtle shell as well as bananas and coconuts. Later six white men lived on the island, each one remembered by name. Of these, three were married to Simbo women but only one of them had children. The white men took part in wars against Rendova and Marovo (Dureau 2001: 140).

It would be surprising if major new diseases had not been introduced to Simbo in this period, but the only evidence that we have is highly indirect. Hocart (1922: 76–7) recorded the recollections of a man over 70 years old in 1908, who remembered the time when the population was divided into 'bush' and 'saltwater' communities. Most people lived inland in hamlets, and these people only migrated to the coast and learnt how to fish after this informant became an adult, probably around 1845–50. In Miller's archaeological survey at least 23 inland settlement sites were mapped as well as numerous shrines also located in places remote from the present-day coastal villages (Miller 1979: 28). Was this change in settlement pattern the cause or the effect of population decline? Cheyne (1852: 64) mentions 'fleets' of well-constructed canoes travelling from Simbo for raids up to 100 miles away, each canoe carrying 30–40 men. It is hard to imagine the 1908 population of 400 being able to man even three such vessels. It would require a total of 4,000 people on

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Simbo to assemble a fleet of 30 war canoes, but unfortunately such figures are purely speculative.

Solomon Islands trade boomed in the 1870s, with regular contact with Australia by steamer and numerous labour recruiting vessels (blackbirders) and copra traders visiting the islands. When Douglas Rannie, Government Agent on the vessel *Heron*, visited Simbo in 1884 to recruit workers for the Queensland cane fields, there were already two other vessels there – the schooner *Atlantic*, trading for copra, coconut oil, pearl and turtle shell, and the *Albatross* from Fiji, also recruiting labour (Rannie 1912: 22–9). The hostility that Rannie encountered (in marked contrast to friendly welcomes in previous decades) he attributed to the large number of young men that had been 'stolen' in the recent past by blackbirders: 'When I stepped ashore I saw several hundred men emerge from the thick scrub skirting the road. They were all armed'. Of course the reference to 'several hundred men' is far from constituting a census, but his further description of 'a procession' of canoes, with 22 warriors in the leading canoe (Rannie 1912: 29, 26), does not suggest a population or society in a state of total collapse.

It is nonetheless tempting to date the beginnings of the rapid decline of the Simbo population to the 1870s, following the rise in trade and labour recruitment. Starting in this decade visiting ships made more frequent visits, contacting a population now living in nucleated coastal villages vulnerable to epidemic disease transmission and the acquisition of new endemic diseases. Starting in 1869 there were white traders resident in Gizo, and many were established on the mainland of New Georgia after 1880 and on Simbo itself after 1896 (Bennett 1987: 386). In Roviana, the Methodist leader George Brown noticed in 1899 'a great apparent decrease in the population from that which I had seen twenty years before', an impression which traders like Wickham confirmed (Brown 1908: 516).

Simbo's favoured location and resources may have made its population especially vulnerable. Bennett (1987: 365–7) has listed the cargoes of ships trading from Solomon Islands to the port of Sydney, and records "sulphur" on seven different occasions between 1870 and 1880. There is one record of 20 tons (in 1872), two records of 15 tons (both in 1871), 6 tons in 1876, and 5 tons in 1880. Simbo, Vella Lavella and Savo are the only known sources of sulphur in Solomon Islands, but only the Simbo deposit is easily accessible (Grover 1955). The island had been a noted supplier since 1844, when Cheyne (1852: 63) loaded his ship with 'two or three tons' daily. He recommended that 'a large

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quantity of sulphur might easily be collected, which the natives might carry down in baskets to the stony beach, and it could be brought down to the cove in boats in fine weather'. In the 1880s, as well as the labour recruiters already described, traders were also visiting Simbo for turtle shell, pearl shell, copra and ivory nuts (Collinson 1926). It seems likely that the rapid decline in numbers dates from this period, following the introduction of new infections.

Reasons for Simbo fertility decline

The evidence suggests that Simbo's high levels of mortality and its fertility decline both date from the period after *c.* 1870, and continued up to (and beyond) the time of the Rivers-Hocart expedition of 1908. But in 1908 Rivers was surprised to find no clear evidence of epidemics of introduced disease:

> There is no record of any very severe epidemics. Tubercle and dysentery, the two most deadly diseases in Melanesia, do not appear to be, or to have been, especially active; and though both the chief forms of venereal disease exist on the island, they do not seem to have done any great amount of mischief. (Rivers 1922b: 101)

Several of the other factors commonly cited in Melanesia, including changes in clothing, house type, alcohol use and firearms, were also absent or negligible in their effects on Simbo in 1908. Because of this diagnosis, and confronted by the data on low birth rates that he generated from his genealogies, Rivers concluded that what he called 'the psychological factor' had to be invoked. Suggested effects were the reluctance of women to conceive, their eagerness to secure abortions, and their neglect of babies. By the 1870s these practices were seen as having a severe effect on population replacement, as shown by the reduced family size and high infant mortality rates. His overall conclusion has often been cited:

> We have here only another effect of the loss of interest in life which I have held to be so potent in enhancing mortality. The people say to themselves: 'Why should we bring children into the world only to work for the white man?' Measures which, before the coming of the European, were used chiefly to prevent illegitimacy have become the instrument of racial suicide. (Rivers 1922b: 104)

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How far can this conclusion be trusted, when the ethnography upon it was based seems to have been relatively slight? During their fieldwork in Melanesia, neither Rivers nor Hocart seems to have had any significant interaction with female informants. Rivers himself focussed on Simbo kinship, which was the main reason for his genealogical work, as well as religious belief and sexual behaviour (Rivers 1914: 252–4, 1924, 1926). Hocart collected data on ritual, magic, ethno-medicine, and warfare (e.g. Hocart 1922, 1925, 1931). Although he was a qualified doctor, Rivers seems not to have undertaken medical diagnoses on Simbo in any systematic way, beyond treating one of his assistants for pneumonia.

In fact, there is enough published information to implicate strongly both introduced epidemics and the endemic sexually transmitted diseases (STDs) in the island's demographic history. The District Commissioner reported in 1906:

> There has been a tremendous amount of sickness among the natives, both in Simbo and Rubiana [Roviana]. They have been dying every day and are still doing so. It is carrying off all the old men and women. (Edge-Partington 1907: 22)

Rivers (1924: 32–48) states that he and Hocart were told of 'about a hundred examples of … conjoined processes of taboo and medicine'. They recorded in detail 60 cases, which included magical spells and ritual practices connected to conditions like insanity and epilepsy as well as remedies for introduced infections like pneumonia and dysentery. Epidemics were attributed to a spiritual power called Ave, whose coming was indicated by broken rainbows, shooting stars, red clouds, raindrops falling during sunshine, and also by the presence of fever, headache and cough (Rivers 1924: 47). The impression conveyed by these accounts is of a community in which much effort was invested in protection from many sources of morbidity and mortality, although perhaps this emphasis reflects in part the ethnographers' own strong interest in these topics.

The impact of STDs was not emphasised by Rivers (1922b: 101), but he reported their presence on Simbo ('both the chief forms'), and their symptoms were recorded in clinical detail by Hocart (1925: 237). These graphic descriptions are enough to demonstrate a close knowledge by Simbo men of the effects of both gonorrhoea and syphilis (S. Ulijaszek, pers. comm.). However, given the widespread prevalence among Simbo children of yaws, a disease spread by *Treponema pallidum* ssp. *pertenue*, the impact of syphilis (*T. pallidum* ssp. *pallidum*) may have been

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diminished by acquired immunity (Pirie 1972: 188–9). Gonorrhoea was probably the more important STD, as in New Ireland (Scragg 1954). Rivers' (1926: 71–96) own account from Simbo of sexual beliefs and practices before and after marriage indicate that STDs, if present, would have quickly spread through the unmarried population. He considered it 'exceptional and almost certainly unknown in the past' that a woman remained a virgin before marriage, and having multiple sexual partners was an accepted and integral part of a young woman's puberty rituals.

It seems unlikely that white men in the nineteenth century were in any way excluded from sexual relations with unmarried women, and as a probable outcome the widespread STD infection of men and women would have been inevitable. Rivers alludes to contraceptive and abortion practices, but his evidence consists of hearsay about rituals, spells and the ingestion of plants with unknown pharmacological properties, with no evidence at all for their efficacy. Instead, STD infection itself can account for many of the cases observed by Rivers of childlessness. It is well known from studies in West Africa that syphilis increases the rate of miscarriage, and among women who do suffer a spontaneous abortion permanent sterility often follows. In West Africa gonorrhoea also leads to sterility among both men and women (Retel-Laurentin and Benoit 1976: 291). In a rural area of Upper Volta where 31.5 percent of women had syphilis, 28 percent of women aged 50 and over were childless and 24 percent of their pregnancies had ended in miscarriages or stillbirths (Retel-Laurentin and Benoit 1976: 280). In this case the proportion of women who were childless appears very comparable to Simbo and Vella Lavella in the late nineteenth century, but whereas Rivers was inclined to blame women for securing their childlessness through induced abortion or contraception, STDs could easily have achieved the same result.

We can conclude that in the western Solomons the effects of STDs on spontaneous abortion (miscarriage) and on sterility were combined with the effects of epidemic disease on adult mortality. Such deaths resulted in many marriages being terminated by the loss of one spouse. As a result fewer children were born and inevitably there was some neglect of orphans. Finally, the high infant mortality rate among the small numbers of children born further reduced the population's capacity for replacement. The result was a decline that probably started before 1850 and accelerated in the last two decades of the nineteenth century.

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Simbo after 1908

The depopulation trend on Simbo was not reversed until the mid-twentieth century. The first national census by the Protectorate government was not until 1931, and it recorded 344 persons living in five villages on the island (J.A. Bennett, pers. comm.). In addition there may have been small numbers living away from the island. It is likely that the recovery of the population did not begin until the 1930s, and only accelerated rapidly with health improvements in the 1950s. In 1960 the population had grown well in excess of 600 (Scheffler 1962: 137). Malaria eradication campaigns in the 1960s greatly reduced infant mortality levels, and by 1990 the number living on the island totalled 1,400 to 2,000 people 'depending upon the season' (Dureau 1998: 242–3). The *de jure* population of 2,000 included people living in urban or development areas, or married into other islands. With the collapse of the central Solomons state in 1999–2003, many of this diaspora will have returned home, and the current population may now exceed 2,000 people, all subsisting off the island's 12 square kilometres of land resources. It is quite possible that after 150 years the population densities of the mid-nineteenth century are again being experienced.

The depopulation of Ontong Java

A final example of the role of fertility in depopulation is provided by the atoll of Ontong Java, a Polynesian outlier located 270 km north of Santa Isabel in Solomon Islands. Ontong Java, like Simbo, is a well-documented case of the interactions between mortality and fertility, in the context of new introduced disease. This brief review will summarise evidence presented in detail elsewhere (Bayliss-Smith 1974, 1975a, 1975b), focussing in particular on the data for women's reproductive histories in the twentieth century collected by myself in 1972.

The atoll consists of two main villages, Pelau in the north and Luangiua in the south, with other smaller settlements occupied on an occasional basis. The earlier contact history of Ontong Java mirrors that of Melanesia as a whole, but the atoll's isolation, difficulties of lagoon access, poor anchorage, and organised resistance by the chiefs meant that contacts with the outside world were less intense until the 1870s. Beginning in the 1830s, there are occasional records of visits by whaling ships – for example, in 1867 the bark *Stephanie*, being short of crew after a smallpox epi-

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demic aboard, called at the atoll and left 'with four of the natives on board' (Anon. 1867). However, until 1874 no ship entered the lagoon. In that year the *James Birnie* landed at both Luangiua and Pelau to collect and cure bêche-de-mer. Following a dispute, the ship was attacked and burnt, and many of the crew were killed (Woodford 1916: 32). In 1875 *H.M.S. Beagle* was sent on a punitive expedition and shelled Luangiua village, and in that decade visiting ships became more and more frequent. Ontong Java labour was recruited to work in German Samoa in 1878, and there are other records of blackbirder recruitment in the 1880s (Finsch 1881; Findlay 1884: 872; Wawn 1888, 1893). Copra traders also began to visit, and in 1895 a permanent trading station was established (Anon. 1895).

By about 1880, therefore, all the pre-conditions were in place for the introduction of new infections. According to Parkinson (1890), malaria first came to the atoll in the 1880s, and there are indications also of a measles epidemic. By 1889 the custom was already established of ritually cleansing the boats of visiting ships to guard against the introduction of sickness (Anon. 1890). On the other hand, visitors in the 1890s were still impressed by the size of the Ontong Java population, which was estimated to be '3–4,000' in 1900 and 'over 3,000' in 1901 (Admiralty 1908; Bennigsen 1901). A trader, Harold Markham, who was resident at Luangiua from 1907 to 1923, made various estimates of the population of Ontong Java at the beginning of his stay, according to second-hand reports. Of these a quoted figure of 2,500 is the most plausible, but still possibly an exaggeration (Bayliss-Smith 1974, 1975b: 427). More careful estimates in 1910 by German ethnographers, based in part on village maps, lead to an estimate of 1,300–1,400 (Sarfert and Damm 1929). The population decline after 1910 is well documented, and it continued until 1939 when just 588 people remained. Thereafter there was a recovery, gradual at first but more rapid after malaria eradication campaigns in the 1960s.

Ontong Java mortality and fertility, 1920s to 1972

We focus here on the period between the 1920s and 1972, which includes the last 20 years of actual decline. In a census of July 1921, 1,016 people were enumerated, 804 in Luangiua and 212 in Pelau. The total had fallen to 698 in 1928, when the anthropologist Ian Hogbin conducted his Ph.D. fieldwork there, and it reached its lowest ebb in July 1939 when 588 people remained (Bayliss-Smith 1975b).

Hogbin (1930) attributed the decline to an enhanced death rate that he linked to a combination of psychosomatic and patho-

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logical causes. He firmly rejected the notion that 'psychological factors' as such had any impact on mortality. However, he did suggest that the rapid transformation of traditional culture in the twentieth century, itself accelerated by depopulation, and the people's own interpretations of the supernatural origins of sickness, did lead in many cases to a fatally passive state of mind in times of ill health. These psychosomatic complications significantly increased the mortality from endemic malaria and tuberculosis, and from epidemic influenza and other exotic infections. The primary causes of decline were therefore physical, but the impact of disease was heightened by the people's 'state of mind which acquiesces in extinction' (Hogbin 1930: 65). Later accounts by medically trained officials put the emphasis exclusively on disease pathogens, in particular malaria and respiratory tract infections (e.g. Brownlees 1939; Black 1952; Hollins 1957). In 1928 four serious epidemics were remembered as having occurred since 1900 (Hogbin 1930), including influenza in 1906 which killed 30–40 persons per day (Sarfert and Damm 1929). The 1918 'Spanish' influenza pandemic reached Solomon Islands, and resulted in a suspension of labour recruiting, but its demographic impact is unknown (Bennett 1987: 176–7).

In relation to fertility decline, certain factors relevant to Simbo and other islands cannot be invoked in the Ontong Java case. There is no evidence for STDs, and Hogbin (1930, 1931a) rejected the idea of changes in sexual behaviour. In 1928 induced abortion was rare and infanticide was practically unknown. Similarly, diets were not much altered, weaning practices were unchanged, and the quality of childcare seemed unaffected by the small modifications in lifestyle induced by the copra economy. From the end of blackbirding until the 1950s, out-migration was a negligible factor.

We can nevertheless see indications that birth rates were being affected by the new sources of mortality. In 1928, out of more than 300 adult women on the atoll, Hogbin found only two cases where women had never married, but "very frequently" families remained small because of the death of one spouse and the failure of the other to re-marry. A medical assistant stationed on the atoll for five months in 1939 counted in his census 25 widowers and 42 widows of whom many were still in their reproductive years (Kuper 1939). Childlessness was probably masked by adoption practices, but a negative impact on the birth rate can be inferred.

Introduced malaria

The role of malaria on Ontong Java also needs to be considered. The atoll's high rainfall and plentiful habitats for mosquitoes,

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which include *Anopheles farauti*, mean that vectors for the spread of *Plasmodium* parasites are present (Black 1952). Ian Hogbin told me in 1970 that he had never encountered worse mosquitoes anywhere, in a lifetime of fieldwork in Solomons and New Guinea, than those he experienced in Ontong Java in 1928. Once malaria was introduced, it was able to spread rapidly among people who often were living in crowded village settlements.

Extremely high rates of infection have been recorded on the atoll. In 1928 it was reported that 89 percent of the persons examined had enlarged spleens (Hogbin 1930). In 1940, 50 out of 60 children examined had palpable spleens, as did 7 percent of adults (Turner 1940). In 1952 Robert Black, a South Pacific Commission consultant, found that 'the amount of malaria has increased over the past decade in both groups of people, especially at Leuaniua [Luangiua], so that malaria is now hyperendemic and is probably approaching the holoendemic level at Leuaniua'. Black used the 1950 WHO classification, defining 'hyperendemic' as a situation where spleen rates in children were constantly over 50 percent and the spleen rate in adults was high, whereas 'holoendemic' was where the spleen rate in children was constantly over 75 percent but the spleen rate in adults was low, with strong adult tolerance of the disease. He identified *Plasmodium falciparum*, *P. vivax* and *P. malariae* at Luangiua, while in Pelau only *P. vivax* was found (Black 1952: 6–7).

As well as high infant mortality, malaria infection results in periodic attacks on the adult population. If they survive childhood infection, adults achieve semi-immunity to such attacks, but their resistance to other diseases is reduced. The malignant tertian malaria caused by *P. falciparum* is particularly deadly, and would have caused mass mortality in the virgin population of the late nineteenth century. Some idea of its potential impact can be gauged from the high rates of morbidity among American troops on Guadalcanal, and later the catastrophic mortality rates among Japanese prisoners of war (McGregor 1968). An additional effect of malaria on women is to increase greatly the incidence of miscarriages, premature births and stillbirths among women. This effect has been cited in several cases where malaria has spread to previously uninfected populations (e.g. Cilento 1928; Jones 1967; Groube 1993).

The recovery of the Ontong Java population dates from the 1940s, and can be related to the state of relative quarantine that the atoll experienced during the Second World War and the lesser incidence of epidemic infections in the post-war period. Malaria

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control in the 1960s greatly improved fetal and infant survival rates, and numbers began to increase rapidly. In 1970, 854 people resided on the atoll and a further 202 were living elsewhere in Solomon Islands or PNG (Bayliss-Smith 1975b: 464–6). In 1986 the resident population reached 1,408 people, and an additional 350–400 people were living in Honiara and elsewhere (Bayliss-Smith 1986: 4–10). Today's population may exceed 2,000, perhaps matching again its nineteenth-century size.

Miscarriages, stillbirths and child deaths

We can gain an indication of the demographic impact of malaria by considering the reproductive histories of 110 women aged over 30 whom I interviewed in Luangiua and Pelau in 1972. At the time of this fieldwork I had resided on Ontong Java for a total of 14 months during two periods, June 1970–May 1971 and June–August 1972. In my first period of fieldwork, I conducted a population census visiting every house, and this was updated and improved in 1972. In addition I had carried out numerous other surveys of fishing and gardening, and had become well-known to almost the entire population. Trust had been further improved by my wife's role as teacher in the primary school. Few of the women spoke pidgin and I conducted my interviews with them using interpreters (David Kaia'enga in Luangiua, Patterson Pohiu at Pelau), but by 1972 my command of the Ontong Java language was sufficient for me to understand much of the dialogue. The information that women supplied to me was often confirmed (sometimes corrected) by others in the household. None of the topics discussed seemed to be regarded as either private or particularly sensitive, apart from the obvious sadness that these women felt in recalling the many deaths and disappointments during their childbearing years.

For simplicity's sake, the following analysis will ignore some differences between the two atoll communities, Luangiua and Pelau, which are explored in detail elsewhere (Bayliss-Smith 1975b). The 110 women who were interviewed represented a 95 percent sample of all women in these age categories living on the atoll in 1972. The sample included only three who reported no pregnancies at all in their lives. Two others had been pregnant at least once but were childless because of miscarriages, infant deaths and/or widowhood. Unlike on Simbo, the proportion of childless marriages on Ontong Java does not seem to have been abnormal in the period studied, whereas the somewhat low frequencies of pregnancy and the high levels of fetal and infant mortality were much more significant.

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Inter-pregnancy intervals

The mean age of marriage for women in the sample was 19 years. I obtained reliable information on the onset of menopause from 30 older women, but four of these women said they had stopped menstruating before the age of 35 years, for unknown reasons. Excluding these four individuals generates an average age of 42 years for menopause. Since very few pregnancies occurred before marriage, the data suggest a potential reproductive period of about 22 years, which in practice was reduced by early widowhood to an actual average of 18.2 years for the 76 post-menopausal women in the sample (Bayliss-Smith 1975b: 453). How many pregnancies did these women experience in their period of potential childbearing?

In total, 792 pregnancies were reported giving rise to 803 zygotes (there were 11 twins) and to 692 live births (Table 1.3). The sample is sub-divided by time period in Table 1.3, which also shows a calculated mean inter-pregnancy interval and a mean inter-birth interval. In both cases these intervals have shortened since the 1920s, and particularly in the most recent period 1961–72. Between the early 1920s and 1940 many pregnancies (at least 30 percent) resulted in miscarriage, stillbirth or death of the infant within a week. Such events might have permitted a woman to become pregnant again quickly, with an inter-pregnancy interval of 12 months or less. Despite this potential for

Table 1.3. *The reproductive histories of 110 Ontong Java women aged over 30 years in 1972: mean intervals between perceived pregnancies and between live births, for four different time periods, 1920s–1972*

Period	Perceived pregnancies		Live births	
	Sample size	Mean interval (months)	Sample size	Mean interval (months)
1921–40	108	31.4	91	37.4
1941–50	186	31.0	166	33.7
1951–60	236	29.0	217	32.6
1961–72	262	25.7	218	30.7
Entire period	792	28.7	692	32.9

Source: Bayliss-Smith (1975b: 440–59), with slight revisions in the light of new information collected in 1986. The intervals were calculated by counting the number of pregnancies/live births that occurred in each time period, and then dividing this figure into the total number of reproductive years available. Reproductive years were counted as the period during which each woman was both married and below the age of menopause, either reported (in 30 cases) or assumed (in 46 cases, based on 42 years which was the average reported age of menopause – see text).

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reduction, the mean inter-pregnancy interval was prolonged, being 31.4 months before 1940 and 31.0 months from 1941 to 1950. These intervals are close to the physiological maximum that has been observed in populations with extended lactation and almost no infant mortality (Wrigley 1969: 92). As nutritional stress is unconvincing as an explanation – the atoll diet is rich in coconut fat and fish protein – we therefore need to invoke cultural explanations for the delayed onset of pregnancy.

Very few women travelled away from the atoll until the 1960s, and customs surrounding marriage, sex and childbirth probably remained unchanged until at least the 1950s. The Anglican Mission did not achieve its first success on Ontong Java until 1936, and few girls attended even primary school until the 1960s. We can therefore envisage a persistence of cultural practices that separated spouses for long periods, for example women's residence for mourning in the cemeteries, and ritualised avoidance of sexual intercourse after the first childbirth (Hogbin 1931a, 1931b; Bayliss-Smith 1975b). Probably the effects of these practices and of prolonged breast-feeding only began to diminish in the 1950s. By 1961–72 the mean inter-pregnancy interval had fallen to 25.7 months, despite an improvement in fetal and infant mortality rates that might have resulted in the opposite trend.

Mortality rates of birth cohorts

The percent mortality of cohorts originating in different time periods is shown in Table 1.4. Fetal mortality is necessarily an estimate based on the women's own perception of a pregnancy. As in all societies, early miscarriages are either unrecognised or are forgotten, and the data from Ontong Java undoubtedly omit them. In many cases the sex of a spontaneously aborted fetus was known to the mother and was reported to me, indicating that late miscarriages were mainly what I recorded. We might also expect some under-reporting because of forgetfulness by some older women. In Table 1.4, stillbirths are added to the category of miscarriages. Taken together they account for 17 percent (at least) of all pregnancies in the period before 1940. Infant deaths occurring between birth and the age of 5 years account for another 19 percent loss, with further deaths occurring in this cohort before it reaches the age of 20 years. This measure, mortality from conception (as perceived by the mother) until age 20 years, remains very high (between 39 and 44 percent) until the end of the 1950s.

The more conventional mortality measure, deaths from birth to age 20 years, removed more than 30 percent of all those in cohorts born from 1920 to 1960. While not as catastrophic as the

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Table 1.4. *Ontong Java cohorts for perceived pregnancies and for live births, showing mortality up to age of 20, by time period, 1921–72*

Period	Number reported		Number of deaths at different stages			Mortality rates (%)	
	Pregnancies	Zygotes	Miscarriage or stillbirth	Birth to age 4	Age 4 to age 19	Conception to age 19	Birth age age 19
1921–1940	108	109	18	21	8	43	32
1941–1950	186	190	24	39	12	39	31
1951–1960	236	241	24	70	13	44	38
1961–1972	262	263	45	32	10	33	19
Entire period	792	803	111	162	43	39	30

Source: as Table 3. My census of 1986 enabled the mortality of the 1960–72 birth cohort to be updated to include deaths in the years 1972–86. However, as those individuals born between 1966 and 1972 had not yet reached the age of 20 in 1986, the mortality rate given for the age group 5–19 may be a slight underestimate. However, rather few deaths occur in late teenage years, especially under the conditions of the late 1980s, so the mortality rate shown is probably very close to being correct.

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mortality reported on Simbo and Vella Lavella by Rivers (see Table 1.2), such losses greatly erode the possibilities for demographic recovery. Only after 1960 does the situation begin to improve. If such infant and child mortality rates were characteristic of the period between about 1880 to 1920, and if epidemic mortality was also striking down adults in significant numbers thus terminating marriages and cutting the numbers of pregnancies, then the rapid depopulation of Ontong Java over this period can be explained readily

Undoubtedly it is malaria's impact that is mainly responsible for both fetal and infant mortality levels on the scale indicated by the Ontong Java data. It is impossible now to reconstruct fully the history of malaria in Solomon Islands, but it is clear that population movements within the colonial state did much to spread new forms of the disease to populations previously quarantined or semi-immune. New nucleated villages, meeting houses, churches and schools also did much to facilitate transmission of the parasite to susceptible individuals, one new *Plasmodium* species had been introduced. Perhaps even the arrival of new strains of existing *Plasmodium* species could overcome the locally-acquired semi-immunity of adults, and thus produce new epidemics (Groube 1993).

On Ontong Java the demographic recovery of the 1940s took place at a time of enforced isolation because of the Second World War and its aftermath. All epidemic infections were much less severe, even though the existing malaria infection had become endemic. Respiratory infections and measles were absent or less prevalent in the 1950s, and in the 1960s malaria control began. The World Health Organization malaria control programme became fully effective in 1970, spraying houses with DDT and at the same time treating malaria cases with chloroquine. In the 1960s the mortality of the birth cohort was halved, at a time when inter-pregnancy intervals were falling with new customs affecting marriage and sexual intercourse. Ontong Java's traumatic colonial experience with 'guns, germs and steel' was finally at an end.

Conclusion

The two case studies have shown that where micro-scale data are available, more complex explanations for depopulation must be constructed than those assumed by most contemporary observers. Both Simbo (syphilis and gonorrhoea) and Ontong Java (malaria) demonstrate the subtle and hidden effects of the new infections. By affecting age structures and terminating reproductive lives

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through widowhood, epidemics have insidious effects on fertility as well as on death rates. Through high rates of sterility, fetal loss and infant mortality, such diseases in turn reduce birth rates. The cases of Simbo and Ontong Java also illustrate the difficulties faced by weak colonial authorities in countering depopulation, when so much of the discourse surrounding the question was based on ignorance, bias and muddled thinking.

To avoid the simplistic generalisations of an earlier age of scholarship, we need to study the depopulation of Melanesia through a nuanced reading of the historical sources, better epidemiology, and an explicit analysis of the interactions between fertility and mortality. There are implications for the historical demography of the Americas, where epidemic mortality is often assumed to be a sufficient explanation for depopulation, in a region lacking the wide range of information sources that we have available in Melanesia. Guns and steel were important aspects of colonialism, but the role of Germs is more subtle than is usually assumed, and in Melanesia it is a factor needing much further research.

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