

Early landuse patterns in the Lake Taupo area

SCIENCE FOR CONSERVATION 222

Ann Williams and Tony Walton

Published by
Department of Conservation
P.O. Box 10-420
Wellington, New Zealand

Science for Conservation is a scientific monograph series presenting research funded by New Zealand Department of Conservation (DOC). Manuscripts are internally and externally peer-reviewed; resulting publications are considered part of the formal international scientific literature.

Titles are listed in the DOC Science Publishing catalogue on the departmental website <http://www.doc.govt.nz> and printed copies can be purchased from science.publications@doc.govt.nz

© Copyright June 2003, New Zealand Department of Conservation

ISSN 1173-2946

ISBN 0-478-22422-2

In the interest of forest conservation, DOC Science Publishing supports paperless electronic publishing. When printing, recycled paper is used wherever possible.

This report was prepared for publication by DOC Science Publishing, Science & Research Unit; editing and layout by Lynette Clelland. Publication was approved by the Manager, Science & Research Unit, Science Technology and Information Services, Department of Conservation, Wellington.

CONTENTS

Abstract	5
1. Introduction	6
2. Archaeology	7
2.1 Site survey	7
2.2 Excavations	10
2.3 Rock art	11
3. Maori population during the early European contact period	11
4. Bush-edge settlement	13
5. The clearance of the bush	15
6. Food resources	18
6.1 Terrestrial resources	18
6.1.1 Climatic limitations on kumara horticulture	18
6.1.2 Gourd use	19
6.1.3 Taro	19
6.1.4 Moa	20
6.2 Aquatic resources	20
6.2.1 Fish	20
6.2.2 Shellfish	21
6.2.3 Crayfish	21
6.2.4 Eels	22
6.2.5 Waterfowl	23
7. Use of pumice and obsidian	23
8. Conclusions	24
9. Acknowledgements	25
10. References	25

Early landuse patterns in the Lake Taupo area

Ann Williams^{1,2} and Tony Walton¹

¹ Science & Research Unit, Department of Conservation, PO Box 10-420, Wellington, New Zealand

² Current address: 3 Chisholm Road, Turramurra, NSW 2074, Australia

ABSTRACT

Current models of the prehistory of the Lake Taupo area (North Island, New Zealand) necessarily rely on the patchy evidence from archaeology, historical ethnography, and the natural sciences. Maori occupation of the region had probably begun by the end of the 15th century A.D., but sites known to belong to the early period of settlement are rare. There is little evidence of moa-hunting in the region. In late prehistoric (16th to 18th centuries) and early historic (early to mid 19th century) times settlements were located around Lakes Taupo and Rotoaira and on bush-edges. Maori used a wide range of locally available resources, including birds, fish, and plants, but large areas of the region had few food resources and were little inhabited until the 19th century. Kumara (*Ipomoea batatas*) was grown in some areas. Central North Island obsidian was important locally and in neighbouring regions in the late prehistoric period. Bush clearance was under way by the 16th century, and the bush edge gradually retreated over centuries with settlement following it. The rate of clearance probably increased in the 19th century with the arrival of the European-introduced potato (*Solanum tuberosum*) and other ways of making a living from the land. Greater dispersion was made possible by the productivity of the potato, improved means of transport (horses), and a decrease in warfare. It is likely that small bush-edge settlements became more numerous in the early historical period, and that this is reflected in the many recorded archaeological sites of this antiquity.

Keywords: archaeology, site distribution, excavation, prehistory, early historical period, population size, bush-edge settlements.

© June 2003, Department of Conservation. This paper may be cited as:

Williams, A.; Walton, A. 2003: Early landuse patterns in the Lake Taupo area. *Science for Conservation* 222. 28 p.

1. Introduction

Lake Taupo lies in the centre of the North Island, and was a significant inland centre of Maori population at the end of New Zealand prehistory (conventionally dated to the period 1769–1840 A.D.). The waterways of the lakes and rivers provided a range of food resources and a means of easy movement by waka (canoes) and were, accordingly, one focus for habitation. Many settlements, like Motuopuhi at Lake Rotoaira, occupied lake-side sites (Fig. 1). Ward (1956: 43), studying the period 1830–1880, has suggested that the distribution of resources in the Taupo region limited the areas suitable for settlement and that large parts of the region were virtually uninhabited. However, even areas with no permanent resident population would probably have been visited to gather resources.

Maori had probably begun to occupy the area by the end of the 15th century A.D., but sites of this age are rare and indications of the hunting of moa, a diagnostic feature of early sites elsewhere, are limited. Using historical evidence, Ward (1956: 42) identified the bush-edge as another important location for settlements. He argued that ‘it is likely that as the forest was pushed back older settlements would be abandoned and new ones established closer to the bush edge.’ The rate of forest clearance probably accelerated in the 16th century, and again in the 19th century (following the arrival of European crops, tools and animals). In the 1840s the population was probably of the order of 1400–1500 (Walton 1986: 84).

Archaeological research into the prehistory of the region has been limited. A number of excavations, particularly those at Whakamoenga Cave, have provided some information on the prehistoric environment, economics, and land use. An important source of information is the New Zealand Archaeological Association site records. Many of these have arisen from ad hoc site recording during development such as that undertaken for the Tongariro Power Development Project and for the former New Zealand Forest Service. Many of the sites recorded in these surveys were small settlements consisting of a house and storage pits, and were probably associated with mid to late 19th century occupation.

This review of prehistory and early history of the Lake Taupo region has a particular emphasis on current research questions from the archaeological and historical literature. These concern the size and distribution of population at the end of prehistory, the extent of occupation in the prehistoric period, the scale and rate of clearance of the bush, the relative importance of the various food resources of the region (including cultivated plants), and the role of bush-edge settlements in the settlement pattern of the late prehistoric and early historic periods.

The Tongariro/Taupo Conservancy of the Department of Conservation is used as a convenient unit of analysis. The Conservancy lies between Atiamuri in the north and Waiouru in the south and between Taumarunui in the west and Tarawera in the east. It includes Mounts Ruapehu, Ngauruhoe and Tongariro and Lakes Taupo and Rotoaira. It covers approximately 780 000 ha of land. Approximately 550 archaeological sites have been recorded in this area.



Figure 1. Angas, George French 1822-1886. Rotoaira Lake, Motupoi Pa, Tongariro Oct 24[?] [1844]. Alexander Turnbull Library A-020-037. Motuopuhi pa was the largest settlement at Lake Rotoaira in the 1830s and 1840s. It was situated on a peninsula and was usually approached by waka.

2. Archaeology

2.1 SITE SURVEY

Site recording carried out in Tongariro/Taupo Conservancy has, to date, targeted particular areas. This is partly because the physically demanding nature of the bush and scrub cover hinders extensive systematic survey. The 'patchy' coverage needs to be considered when the current pattern of recorded archaeological sites within the Conservancy is interpreted (Fig. 2). The distribution map shows the location of recorded prehistoric/Maori archaeological sites. In the context of this paper, 'Prehistoric/Maori' sites are those that are characteristically Maori in origin, whether of the pre-European or the post-European contact period. Features such as pits for the storage of kumara (*Ipomoea batatas*) and potato (*Solanum tuberosum*) crops and sites like gunfighter pa are included.

Site surveys have resulted in the discovery of widespread evidence of occupation. Much of this evidence is, however, likely to date to the mid or late 19th century. Prehistoric occupation is likely to have been restricted to favoured areas and to have utilised large areas extensively rather than intensively. Many

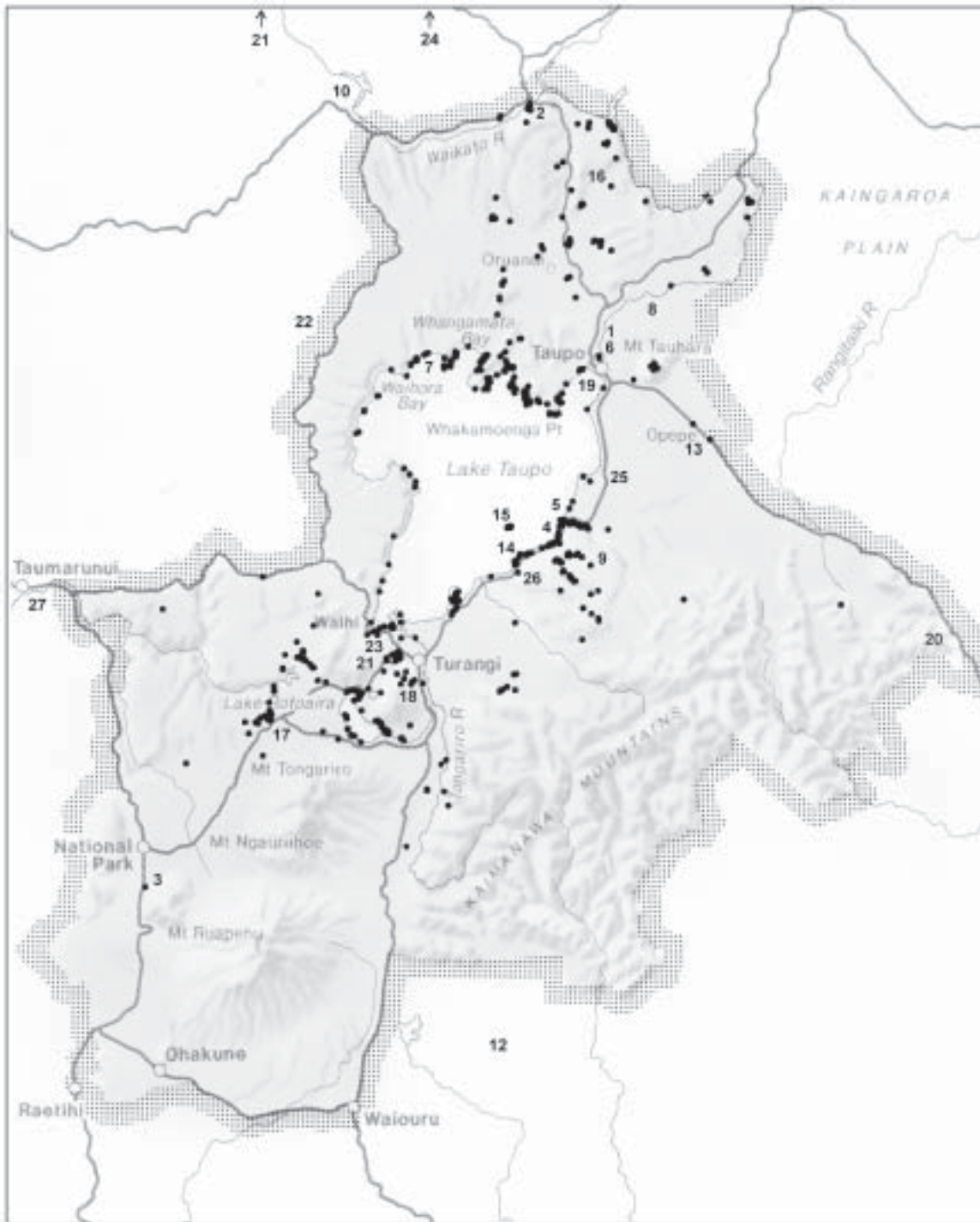


Figure 2. Prehistoric/Maori archaeological sites recorded in Tongariro/Taupo Conservancy. Numbers refer to names mentioned in the text: 1. Aratiatia Rapids, 2. Atiamuri, 3. Erua Swamp, 4. Hallets Bay, 5. Hinemaiaia Stream, 6. Huka Falls, 7. Kawakawa Bay, 8. Lake Rotokawa, 9. Lake Taupo State Forest, 10. Mangakino, 11. Maungatautari, 12. Moawhango Ecological District, 13. Motukino, 14. Motutere Point, 15. Motutaiko I., 16. Orakeikorako, 17. Papakai, 18. Pihanga Range, 19. Tapuaeharuru Bay, 20. Tarawera, 21. Te Ponanga Saddle, 22. Tihoi, 23. Tokaanu, 24. Tokoroa, 25. Waimihia State Forest, 26. Waipahi Bog/Waipahi Stream, 27. Wanganui River.

of the recorded sites are situated on the shores of Lakes Taupo and Rotoaira and on more gently sloping hinterlands. The relative lack of recorded sites immediately inland of Stump Bay, southern Lake Taupo, may be related to changes in lake levels as a result of hydro-electric production, but may also reflect the general swampiness of the area, both today and in the past.

The Tongariro Archaeological Programme, established in 1966 under T. Hosking's direction, was responsible for recording 187 sites in the Lake Rotoaira and Lower Tongariro River area during its 5-6 year term (Newman 1988: 13). Generally, the distribution of sites recorded around the Waihi-Tokaanu area of southern Lake Taupo and across the Pihanga Range to Lake Rotoaira and its hinterlands is a product of Hosking's work (Newman 1988). Hosking used early survey plans to relocate and record some of the depicted settlements and cultivations (Newman 1988). Extensive systematic survey was impractical because of the vegetation cover. A small part of the area was resurveyed by D.C. and G.E. Nevin in June 1979 (Nevin & Nevin 1979a). Some of the sites recorded by Hosking were noted as having been destroyed and only a small number of additional sites were found.

Seventy-seven percent of the sites recorded during the Tongariro Archaeological Programme post-date European contact. The remaining thirteen percent are not so clearly classified into pre- or post-contact and only a few may predate European contact. Newman (1988: 13) argued that these results should not be understood to mean that occupation of the area was more intensive during the 19th century. Differing rates of site survival and the greater ease with which 19th century sites can be located using survey plans and other documentation underpin her argument. There are, however, reasons for thinking that, in many areas, occupation was a late development. With the advent of new crops and livestock, and the removal of the need to worry about defence, many areas seldom occupied and little used in previous centuries were subject to more intensive settlement in the mid to late 19th century. Many of the 'homestead' sites recorded by Hosking date to the late 19th century and early 20th century (Newman 1988: 5-8) and are consistent with a dispersed settlement of hamlets and homesteads such as that noted in the 1880s by Kerry-Nicholls (1884). All current evidence suggests that sites from earlier periods have a limited geographical distribution.

Archaeological site surveys were carried out in some Taupo State Forests for the New Zealand Forest Service. G.E. and D.C. Nevin visited Waimihia State Forest in January 1979. Forestry staff had identified one site and no other sites were located (Nevin & Nevin 1979b). The Nevins carried out three surveys within Lake Taupo State Forest: from October 1978 to January 1979, when approximately 57 sites were recorded (Nevin & Nevin 1979c); in April 1979, when four sites were recorded (Nevin & Nevin 1979d); and in April 1980, when one site was recorded (Nevin & Nevin 1980). D.C. Nevin re-visited the forest in April 1983 and noted the presence of a pa site on a hill near Hatepe (Nevin 1983). The Lake Taupo State Forest results are of interest as the sites there are mostly small occupation sites that date to the 19th century. This again suggests that settlement of some areas away from the lake was a phenomenon peculiar to the mid to late 19th century.

Sites have been recorded on Motutaiko Island consistent with Grace's (1970: 266) comment that the island was used as a defensive stronghold. Sites have also been recorded along tributary rivers and streams, such as the Waikato River and the Hinemaiaia Stream on the eastern side of Lake Taupo. Other sites have been recorded somewhat inland from the lake, such as those on ridges in the vicinity of Waipehi Stream, eastern Lake Taupo; while few have been recorded away from the lakes in the south and south-east of the Conservancy.

P.T. Fletcher has surveyed Mount Pohaturoa near Atiamuri. Surface evidence recorded includes defensive structures, house sites, and storage pits. A previously recorded rockshelter (U17/4) was re-inspected and evidence of occupation in the form of obsidian and stone flakes, freshwater and marine shells, and cut wood found (Fletcher 1996a). A survey undertaken in the Kakaho Stream area north of Tihoi recorded over 80 sites, including cave and rockshelters—some with artwork—pa, and pits (Fletcher 1996b). The surveyed area lies just outside the Conservancy boundary but is of relevance because it lies within the Taupo basin.

The present town of Taupo was built up around an Armed Constabulary camp established at Tapuaeharuru (Adams 1985) in 1869–70. Other historical sites that have been recorded include cemeteries, flax and flour mills, timber mills and sawpits, and early farm settlements. Such places are sometimes depicted on survey maps (see, for example, ML2178 (1883) and ML2177 (1895); WD4039 (1927) for Lake Rotoaira area). The growing European presence in the mid to late 19th century had an impact on settlement as the area was increasingly incorporated into the wider New Zealand economy.

2.2 EXCAVATIONS

Several excavations have been conducted in the Conservancy, although most were small-scale or salvage. Investigations have been carried out at a cave site (T18/52, N93/55) on the western side of Whangamata Bay. Obsidian, wood and freshwater and marine shells, as well as the application of red pigment on the north side and ceiling of the cave, were reported on the New Zealand Archaeological Association site record form, but more detailed results from the excavation were not located. Another investigation, at a late 19th century settlement (U15/15, N94/48), is also known mainly from brief comments on the site record form. For other excavations, however, fuller reports exist. Investigations were carried out at Rua Hoata rockshelter (U17/6, N94/3), situated below the Aratiatia Rapids on the Waikato River, where 54 incised canoe shapes have been recorded (Phillipps 1947; Trotter & McCulloch 1971: 44; Trotter 1978). A small rockshelter (T18/22, N93/5), located in Waihora Bay, was excavated in 1956, although the investigation lacked strict excavation control (Hosking & Leahy 1982). Whakamoenga Cave (U18/4, N94/7), at Whakamoenga Point, was excavated between 1961 and 1963 (Hosking 1962; Leahy 1976). Salvage excavations were undertaken at thirteen sites during the Tongariro Development Project (Newman 1988), with most of the sites investigated dating to the mid to late 19th century. A pa in Halletts Bay (U18/34, N103/10) was the subject of an archaeological investigation in the mid 1980s (Furey 1984). Upgrading of a road on the west side of Tapuaeharuru Bay in 1990 resulted in a salvage excavation of Hapu a Wai (U18/24, N94/37), a European contact period site (N. Ritchie, Department of Conservation, unpubl. data.).

A small number of published radiocarbon dates are available from archaeological contexts within the Conservancy. Seven dates were obtained from material collected during the excavations at Whakamoenga Cave (NZ648, NZ686, NZ1030, NZ1036, NZ1029, NZ1031, and NZ577). Six of these dates are on charcoal and the seventh is on moa bone (see Section 6.1.4.). All six charcoal

dates are on unidentified charcoal. The charcoal samples used to produce NZ648, NZ1030, NZ1036, NZ1029, and NZ1031 present problems of unknown, and possibly large, inbuilt age. Large lumps of unidentified charcoal were used in NZ648 and, although this sample provided the earliest date (conventional radiocarbon age of 1011 ± 62 BP), Leahy (1976: 46) discarded it as too questionable (see also Anderson 1991: 782). NZ686, which has a conventional radiocarbon date of 610 ± 61 BP, has been accepted as a valid date (Leahy 1976: 46; Anderson 1991: 786), indicating that the earliest occupation of Whakamoenga Cave occurred in the 14th and 15th centuries. Leahy (1976: 46) described the charcoal sample used to generate NZ686 as consisting of 'small, charred twigs'. In absence of identification of species, however, this date should be regarded as providing a maximum age for the early occupation of the cave.

2.3 ROCK ART

There are about 90 recorded rock art sites in the North Island. Just under half of these sites fall within Tongariro/Taupo Conservancy. While some of the sites are well known, most are little studied. The Conservancy is, therefore, a significant but largely overlooked area of North Island rock art. Just over half of the recorded sites contain areas of red colour, generally in the form of dots or circles, dashes or strokes, splashes, or spirals. Slightly less than half of the sites contain rock carvings or incisions. Only two of the recorded sites appear to contain both carved rock surfaces and areas of colour. A survey was undertaken in 1995 of a selection of recorded rock art sites in order to improve the level of formal information available for management, advocacy, and protection purposes. General results of the survey, along with recommendations for further work, are presented in Williams & Tupara (2000).

The antiquity of the rock art and the role of such places in the settlement pattern have not been the subject of any research.

3. Maori population during the early European contact period

An analysis of the distribution of settlements must take into account population size. A number of early estimates were made of the Maori population living in the vicinity of Lake Taupo. Some of these early estimates used a ratio of warriors to the remainder of the population to determine the overall number of people. The earliest located estimate made for the Taupo district is a figure of 1600, suggested by a missionary in 1838 (G.B.P.P. 1838/680: 251). This 1838 estimate is considerably lower than that offered by Bidwill (1841: 40), who visited the district in 1839 and who thought 'the population of the pas on the lake could not be less than 5000.' The 1838 estimate is also lower than Dieffenbach's (1843 II: 79) figure. Dieffenbach visited the district in 1841 (Fig. 3) and suggested there were about 800 warriors living in the Lake Taupo area, with a ratio of



Figure 3. Merret, Joseph Jenner 1815?–1854. View of Taupo from Te Rapa with Tauhara mountain at a distance, where the River Waikato issues from the lake / L. Haghe lith, Day & Haghe lithrs— London, J. Murray [1843]. Alexander Turnbull Library A-015-005.

one warrior to every four individuals (1:4) giving him an overall population of 3200. Reverend J. Hamlin (1915 [1842]: 72), however, claimed that ‘the usual method adopted to get the number of inhabitants, is to multiply the number of fighting men by 3.’ In 1842, Hamlin estimated the number of fighting men living in the Taupo district at 600, with an overall population of 1800. The total population for the North Island was estimated at 120 000 (Hamlin 1915 [1842]: 72; Hill 1903: 175). A somewhat later estimate (G.B.P.P. 1846/337: 47) suggested a figure of 1500 (see Walton 1986: 75). This estimate and Hamlin’s were more in line with the 1838 estimate than with those suggested by Bidwill and Dieffenbach. Figures produced from the middle of the 1850s into the early 1860s favoured a population of around 2000, although these were not all completely independent of one another or of earlier estimates (Taylor 1855: 468; Fenton 1859; Hochstetter 1867: 382–3; Colenso 1868: 424).

Support for the lower population estimates is found in the results of the 1849 census taken by Reverend Thomas Skinner, a Wesleyan missionary stationed at Lake Rotoaira. A total for the Taupo area of about 1100 was produced (Brown Journal 15 December 1849; Walton 1986: 75). Due to the methods and conditions under which the census was conducted, Walton (1986: 78) suggested that Skinner may have under-enumerated by about 30% and that a maximum population in 1849 of around 1500 was not unreasonable. Taking the decline of population through such agencies as warfare and disease into consideration, Walton (1986: 84) proposed that ‘the population of Taupo throughout the 1840s and 1850s was probably somewhere between 1100 and 1600.’

Allowing for the general Maori demographic reaction to European contact (Pool 1977, 1990), it is likely that the population was more numerous in the years prior to European contact. A population at the end of prehistory of no more than about 2000 is suggested.

In addition to population totals, the early literature provides some idea of the distribution of Maori within the Lake Taupo district. Hochstetter (1867: 382–383), travelling through the district in 1859, talked of the Maori ‘living scattered in numerous villages about the lake. The settlements are nearly all situated at the mouths of the rivers running into the lake, the natives preferring to cultivate the fertile river-alluvion.’ Bates (1860: 6) wrote of the ‘great many pas and settlements of natives’ round the shores of the lake. Dieffenbach (1843 I: 360), though producing a relatively high population total, observed ‘Everywhere round Lake Taupo are small native settlements, but the population seems to be scanty, considering the excellent land in the neighbourhood.’ The Reverend T.S. Grace (Brittan et al. 1928: 55–56), residing at a mission station at the southern end of the lake from the mid-1850s, also discussed the widely scattered nature of the population. Comments were also made concerning the extent of the congregations missionaries were able to draw or the size of particular settlements, some of which seem to have been quite small (Wakefield 1845; Angas 1847; Archdeacon Brown Journals 1835–1850; Grace Letters and Journals; Taylor Journals 1833–1873; Cooper 1851; Brittan et al. 1928). In his 1849 census, Reverend Skinner collected population totals for each of 24 places. However, the figures produced may be somewhat misleading, as the inhabitants of smaller settlements may have been counted in with those of larger neighbouring settlements (Walton 1986: 80–81).

Early writers (Archdeacon Brown Journals 1835–1850; Taylor Journals 1833–1873; Grace Letters and Journals; Brittan et al. 1928) frequently discussed the mobile nature of the Taupo populace. Reverend Skinner (Journal 1849–1856) claimed that his collection of census data during the early part of 1849 was hindered by the degree of dispersal as people moved around to fish, snare birds, and visit. Satellite habitations were used whilst cultivation and other activities were undertaken (Dieffenbach 1843; Archdeacon Brown Journals 1835–1850; Skinner Journal 1849–1856; Hochstetter 1867; Tauhara Middle Maori Land Court Records 1886; see also Williams 1988).

Skinner’s census provides a minimum figure for the population in the 1840s. It confirms that the population was small and scattered over a wide area. A few large settlements were recorded, generally close to Lake Taupo. Numbers of small settlements were scattered around the lake and in the interior, particularly at the bush-edge.

4. Bush-edge settlement

Early European records suggest many settlements and cultivations in the Taupo district were located near or on bush edges, either amongst standing trees on the margins or in clearings (recently supported in Fletcher 1996b). Some settlements seemed to have stands of forest nearby in which plots could be cleared for

gardening or in which other resources could be collected. Other communities established gardens and outsettlements some distance from their main settlements. Early visitors often reported finding settlements quite deserted, the people being away in the forest tending to their gardens. If access to bush land for gardens was as important as the literature seems to suggest, then settlements probably shifted over time to maintain contact with a bush-edge moving as a result of human clearance (see Ward 1956; Newman 1988). The importance of bush-edges as places for settlements and cultivation is reflected in early survey maps. Maps from the late 19th and early 20th century recorded the bush-edge on the north and east faces of Mount Pihanga. The mountain was skirted with 'cultivations' and 'old cultivations' (SO14534 (1900); see also Newman 1988), while the bush-edge to the north and west of Lake Rotoaira was peppered with settlements (ML2178 (1883) and ML2177 (1895)).

The wide dispersal of settlements that Ward (1956) documented from maps and other sources was largely a reflection of the pattern in the 1870s and 1880s, at the end of his study period of 1830-1880, and reflected the conditions of that period. The Okahakura Block and vicinity provides a case in point.

The Okahakura Block lies to the west of Lake Rotoaira. It encompasses a large area of low-lying ground covered by swamps and tablelands of wi-grass (tussock, see SO 14534), flanked by hill country. The bush comprised rimu (*Dacrydium cupressinum*), totara (*Podocarpus totara*), and matai (*Podocarpus spicatus*) (Cussen 1895). The Rev. R. Taylor, who was based at Wanganui, visited Taupo on a number of occasions in the 1840s and 1850s. His route sometimes took him through this area on the way from the Whanganui and Manganui-a-te-ao Rivers, west of Mt Ruapehu, to Lake Rotoaira. The only settlement he reported was on the shores of Lake Rotoaira (Mead 1966). There was little reference to settlement in the area until the settlement of Papakai was mentioned in the military records of the late 1860s (Wilson 1961: 42). Settlement in this area may have reflected the advent of sheep and their grazing in tussock grasslands in the vicinity.

Two maps, one each from 1883 and 1895, show extensive use of the block in the late 19th century. Survey plan ML2178 (1883), entitled Plan of Okahukura Block, is by James Simms and William Cussen, and was drawn at 40 chains to an inch. This map recorded 19 settlements including Te Upoko o Pouroto, Te Pukukotukutuku, Te Wairoa, Te Maro o Kaiora, and other unnamed settlements on the bush-edge to the west of Lake Rotoaira along the flanks of the Hauhungaroa Range. On the tablelands were Papakai, Otukou, Waipipi, and an unnamed settlement. Of these, Papakai, Waipipi, and the unnamed settlement were shown adjacent to areas of bush. Along the bush-edge on northeast flanks of the Kakaramea Range were Omanu, Kaikoura, and Waimanu. Ngongo, Opotaka, Kotukutuku, and Mapouriki were shown on the shores of Lake Rotoaira with the first three near to bush on the Kakaramea Range. This was not reflected in the 1881 census that did, however, list Papakai as having 43 inhabitants (A.J.H.R. 1881 G3: 24). A network of tracks linked the settlements. The importance of sheep was indicated by a shepherd's hut and sheep yards.

Survey plan ML2177 (1895), entitled Plan of Subdivision of Okahukura Block, is by William Cussen and was drawn at a scale of 20 chains to an inch. This map, done more than a decade after ML2178, recorded a smaller area. Settlements depicted were Te Upoko o Pouroto, Te Pukukotukutuku, Te Wairoa, Te Porere, Te Maro o Kaiora, Papakai, and Otukou, with the last also shown adjacent to an

area of bush. Of the settlements, only Te Porere was not shown on the earlier ML2178. A sheepyard and a hut were shown in two places, neither corresponding to that depicted on ML2178.

Kerry-Nichols (1884: 300) travelled north along the inland tracks on the western side of Lake Taupo in 1883 and noted that 'on the small elevations... which fringed the bush, several whares were dotted about in picturesque situations.' In one place he referred to these settlements as 'homesteads.'

New areas were opened up for settlement firstly for growing potatoes and then for other crops and livestock. By the 1880s there was increasing individualisation of land titles, and new economic possibilities. It is likely that the bush-edge became more important as a location for settlement in the mid to late 19th century than it was in earlier times. This evidence contradicts Ward's (1956: 41) suggestion that 'by 1880 many of the more remote settlements had been deserted while the population became grouped in modern villages close to Lake Taupo'.

5. The clearance of the bush

The Taupo eruption of about 1800 years ago had a major impact on the vegetation of the Taupo district and large areas of forest were destroyed. After the eruption, forest, scrub, and other vegetation began to re-colonise the district. Work done comparatively recently suggests that almost all of the Tongariro/Taupo Conservancy, including the Kaingaroa Plain, was forested at the time of Maori arrival and that the forest extended down to the edges of Lake Taupo. Exceptions were areas of swamp and thermal activity, alpine areas, and areas around Ngauruhoe and Tongariro which were affected by eruptions from Ngauruhoe (K. Hackwell, pers. comm. 1993). Some expanses of scrub and fern may, therefore, have existed when Maori arrived. A variety of resources including birds, bracken or fern root, berries, fruits, seeds, leaves and timber would have been present in the forested and fern-covered regions.

There is little doubt about the human role in the widespread clearance of the forest from about 650 years ago (see, for example, McGlone 1983; Rogers 1987; Horrocks & Ogden 1998). Although both archaeological and historical evidence for the human role in forest clearance in the Taupo district is convincing, large areas undoubtedly remained covered in bush, particularly the more rugged areas. Early European travellers wrote of stands of forest or wood around the lake and on surrounding hills and mountain ranges. Sometimes the stands described seemed reasonably compact, perhaps associated with a settlement or cultivations, while at other times they seemed very extensive, covering hill and mountainsides often, but not always, back from the lake.

References to preserved or fresh bush birds occasionally appear in the literature. While visiting Maori settlements at the southern end of Lake Taupo, Wakefield (1845 II: 105), Angus (1847 II: 110), and Cooper (1851: 70-71) all noted the use of preserved bush birds. There was forest on the Pihanga Mountain Range at the time these visitors passed through and it is possible that

some of the birds they referred to were caught there. Meade (1870) consumed fresh woodpigeons (*Hemiphaga novaseelandia*) whilst at Oruanui, which were probably snared in the forests that clothed the hills surrounding the settlement. Evidence to the Maori Land Court by Maniapoto recorded the former and current use of the forest on Mount Tauhara as a birding ground (Tauhara Middle Maori Land Court Records 1886). Nevertheless, it seems certain that, by around the mid-1800s, forest clearance had contributed to a retreat of the bush-edge well away from the lake (see Ward 1956).

The picture of forest clearance that seems to be taking shape is one of a continuity of clearance during prehistoric times and extending well into the early historic era. Results of excavations at Whakamoenga Cave suggest a decline in consumption of forest birds over time (Leahy 1976: 47). It is reasonable to assume that bush birds represented in Whakamoenga reflected the presence of bush around the cave. The later decline of bush birds is, therefore, assumed to indicate clearance of forest in the neighbourhood. Fewer bush birds eaten in the second occupation may indicate that Maori were visiting the forest less because it was increasingly difficult to access. This is consistent with a picture of burning and clearance derived from pollen analysis, but an alternative interpretation is depletion of the bird populations.

Interesting information comes from 138 coprolites or faeces found in Whakamoenga Cave. A sample of these was analysed by Denis Byrne (1973; see also Leahy 1976: 53). Those he examined suggested that bracken or fern root (*Pteridium esculentum*) was eaten in the second and third occupations but not, apparently, in the first occupation. He commented that coprolites from the early levels of Whakamoenga Cave contained very pulpy material, possibly the residue of berries or kumara. This could indicate easy access to forest. However, it seems likely that fern root was eaten in the first occupation and possibly missed through sampling error, as suggested by Leahy (1976: 61), although it *may* have been eaten in comparatively smaller proportions. The remains of fern root in coprolites from the second occupation, along with the decline in bush birds, may indicate an increase in the bracken fern cover around the cave and a corresponding retreat of forest away from the cave. Investigations at Waihora Rockshelter, which was probably in use between the 17th and late 18th century, indicated that the inhabitants prepared and ate fern root. Little bush bird bone was identified from Waihora, suggesting to the researchers that, by the time the rockshelter was in use, most of the surrounding bush had been cleared by burning (Hosking & Leahy 1982: 97).

McGlone (1983) has investigated the pollen record at Waipehi Bog, eastern Lake Taupo. This bog is the only site within the Taupo district that McGlone discusses in his 1983 paper, which otherwise draws on his work in both the North and South Islands. McGlone's analysis of the Waipehi Bog data indicated a forest clearance horizon at around 750 years ago or earlier. The pollen diagram suggests that from about 750 years ago, both matai (*Podocarpus spicatus*-renamed *Prumnopitys paxifolia*) and bracken fern increased at the site. From about 400 years ago, matai generally declined while bracken fern, with a few fluctuations, greatly increased, suggesting a more constant burning of the vegetation (McGlone 1983). The general sequence at Waipehi Bog is consistent with the Whakamoenga Cave data. Horrock & Ogden's (1998: 291) results from Erua Swamp confirm sustained human interference commenced in the region after c. 650–560 B.P.

Rogers (1987: 155) argues that the 'overwhelming evidence from the Moawhango Ecological District is for a concentrated fire deforestation episode in Polynesian times, 600–400 years ago'. Rogers draws on McGlone's (1983) discussion of the economic and cultural reasons for the use of fire by Maori (for example, land clearance to encourage growth of bracken fern, for cultivation, for travel, for settlement and security, and for hunting). He suggests that vegetation was deliberately burned in order to facilitate travel at high altitudes in the district and, perhaps, to promote hunting. Climatic conditions preclude clearance for cultivation.

There are many references in the ethnographic literature to the clearing of vegetation by Maori for a number of purposes, such as travelling and gardening (see Dieffenbach 1843 I: 368). Some of these references suggest that the clearance was fairly localised, while others indicate that it was quite extensive. At least some of the expanses of fern and scrubland noted by early European visitors seem certain to have been the result of burning. Reverend H.J. Fletcher (1914) argued that much forest was cleared in the quest for the fern root that, he suggested, was the staple food of the pre-European contact Taupo Maori. Fletcher suggested that forest stands at localities such as Opepe, Motukino, Tauhara, and Oruanui represented remnants of once extensive forests. It seems possible that repeated burning of the bracken reflected in the Waipahi Bog record was a deliberate strategy to stimulate fern root production for food.

By the time Fletcher (1914) was writing, European-introduced potato had already been grown in the Taupo district for probably close to a century. Records left by some early European visitors to Taupo suggested that woodland was cleared for potato cultivation, and some visitors thought that a very considerable amount was cleared for this purpose (see, for example, Bidwill 1841). Fletcher himself suggested that forests were being cleared within the memory of living men, putting it after the introduction of the potato. It is difficult, therefore, to clearly separate the effect of burning for fern root production from that of potato gardening in the early historic period. There is an abundance of references in the ethnographic literature to potato grounds, to the obtaining of potatoes from the Maori, and to the eating of potatoes. Kerry-Nichols (1884: 163) noted that at Tokaanu 'the principal staple of diet, here as elsewhere, is pork and potatoes, but besides this the lake yields several varieties of fish.' Many of the storage pits found in the Taupo district could have been used to store potato tubers (see, for example, Newman 1988), providing food through the winter and seed tubers for propagation. Crawford depicted underground store houses and whata at Tokaanu in 1862 without indicating what was being stored (Fig. 4) although he found 'good crops of potatoes, wheat, kumera, taro, tobacco and water-melons' being grown there (Crawford 1880: 143).

Cameron (1964) discussed the idea of extensive Maori impact on the forests of the country, including around Lake Taupo, during the first half of the 19th century, largely resulting from potato cultivation. Cameron argued that the arrival of iron tools enabled Maori to clear forest on a large scale and at an accelerated rate. The key role ascribed to new tools is debatable. There is evidence in the ethnographic literature of traditional tools being used to work the ground and early references to European agricultural tools around the Taupo district are not numerous. Nevertheless, it does seem likely that Cameron's suggestions regarding the increased pace of clearance following the arrival of European-introduced crops and tools are generally correct.

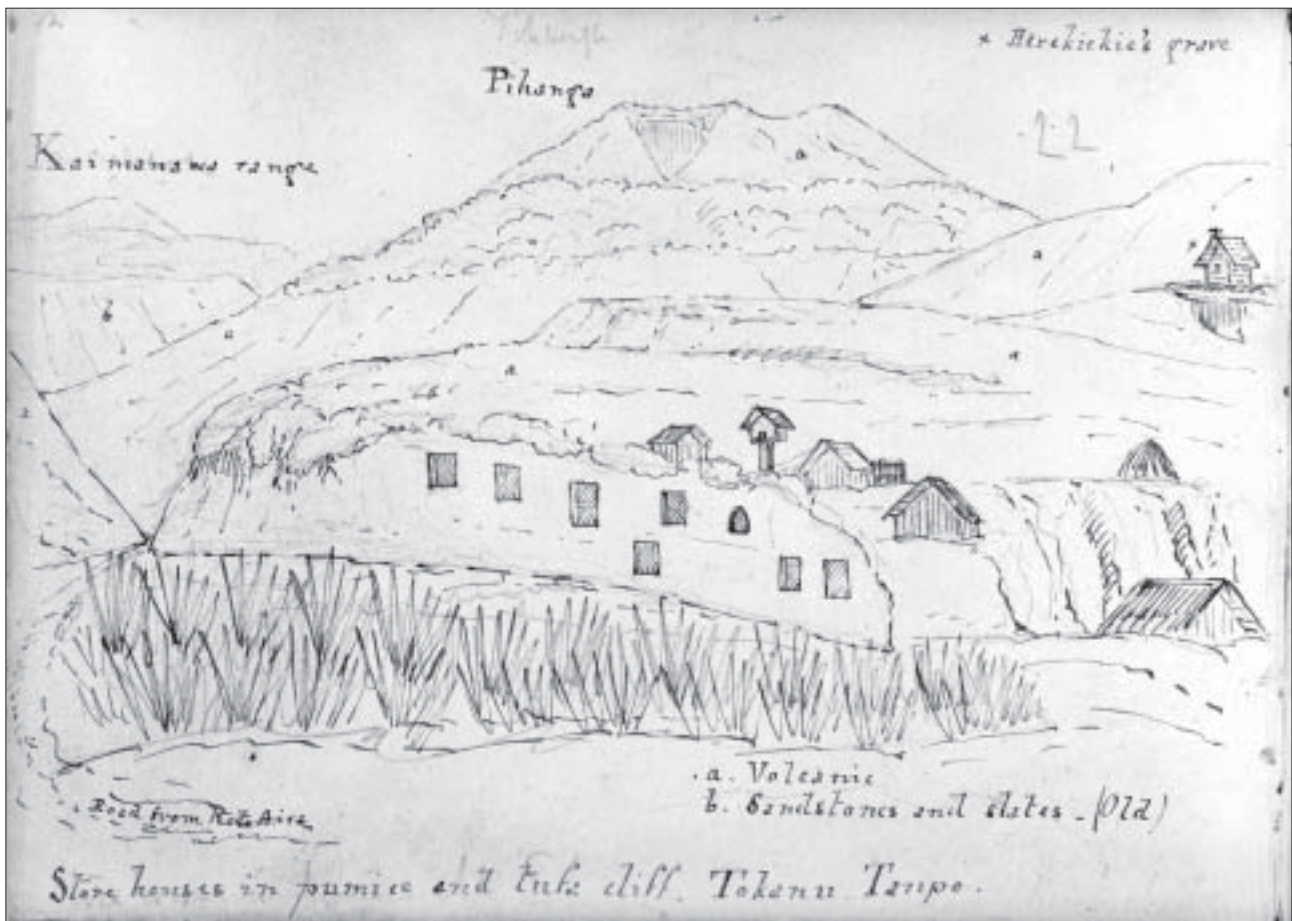


Figure 4. Crawford, James Coutts 1817-1889. Store houses in pumice and tufa cliff, Tokaanu, Taupo. Jan ?25 1862. Alexander Turnbull Library E-041-022.

6. Food resources

This section is primarily concerned with a number of food resources that were potentially available in late prehistoric times, although some discussion of European-introduced crops is included. European-introduced potato was already widely grown when sustained European contact with the Taupo region began in the late 1830s. Although potato rapidly became an important crop, it did not, however, entirely displace pre-European contact sources of food such as bracken fern root.

6.1 TERRESTRIAL RESOURCES

6.1.1 Climatic limitations on kumara horticulture

The question of whether kumara was grown in the region, and how important it was, is unresolved. There is a consensus in the archaeological literature that it was very difficult, if not impossible, to grow kumara in the Central North Island. Taylor (1958: 78) commented that it was impossible, or at best extremely difficult, to grow kumara there. Groube (1970: 157) identified 10 climatic regions in the North Island based, in part, upon climatic characteristics, such as

growing season length, frost severity, and below-surface winter temperatures. He claimed that kumara was both cultivated and stored in the Rotorua-Taupo area but identified this region as having a difficult climate for kumara growing. Leahy (1976: 61, 68) argued both that 'it seems doubtful whether kumara was ever grown in the Taupo area' and that it was, at best, 'very marginal.' Davidson (1984: 35) suggested that kumara horticulture was not possible.

Leahy's comments are interesting in the light of ethnographic information quoted (Leahy 1976: 36) which provided evidence of kumara cultivation in the district in the historical period. Some plants may have been recently introduced varieties, but the likelihood is that at least some of the plantations seen by early European travellers contained pre-European varieties (see Williams 1988). On the other hand, conditions in most areas, such as around Lake Rotoaira, were not suitable for kumara growing.

Microclimates would have existed in the Taupo region within which cultivation was feasible, such as along sheltered river terraces with alluvial soils or on sheltered slopes with a sunny aspect. In addition, the effects of frost may have been reduced by planting crops amongst trees and shrubs or on the bush line. Examples exist in the ethnographic literature of the ameliorating effect of thermal activity. Because of the warmth of the ground surrounding their settlement, Orakeikorako Maori were able to raise crops of vegetables several weeks earlier than neighbouring groups (Taylor 1855: 224). Warm ground was used by Rotorua Maori to hasten the shooting of seed kumara (Wade 1842: 145) and it is possible that similar techniques were known and practised by Taupo Maori.

There is little doubt that kumara were cultivated in the district, but the amounts grown were probably reasonably limited and the amount of land cleared to facilitate production probably correspondingly small. At least some of the many storage pits found within Tongariro/Taupo Conservancy are likely to have been used to store kumara tubers, both for eating and for seed.

6.1.2 Gourd use

Evidence of gourds (*Laenaria siceraria*) was recovered during investigations at Whakamoenga Cave (Leahy 1976: 60-61) and at Waihora Rockshelter (Hosking & Leahy 1982: 88). Remains were located throughout the occupation sequence in each site. Charred pieces of gourd or pieces coated with ochre were found in both sites, while Whakamoenga Cave also produced fragments displaying decoration and pieces that had been stitched together following breakage of the gourd. Fragments of gourd with the stalk still adhering were recovered from both sites and were interpreted as probably indicating the use of gourds as a source of food. Gourd seeds were recovered from Whakamoenga Cave

A small number of ethnographic references attest to the fact that gourd was grown and used within the district (Wakefield 1845 II: 105; Angas 1847 II: 110; Cooper 1851; Taylor Journals 1833-1873 Volume 8; Bates 1860).

6.1.3 Taro

Pre-European contact varieties of taro (*Colocasia esculanta*) may have been cultivated in the Taupo district, although with the crop requiring a growing season of around seven months (Leach 1984), any such cultivation would have

been confined to the most favourable areas and conditions. Some early European travellers through the Taupo district noted the cultivation and use of taro (Best Journal for May 1841 in N. Taylor 1966; Angas 1847 II: 109; Cooper 1851). It seems quite possible, however, that at least some of these references are to varieties of taro introduced after European contact with New Zealand (see Williams 1988).

6.1.4 Moa

There is little evidence of moa-hunting in the region. An early moa hunter site near Tokoroa just to the north of Lake Taupo is one of a very few known inland North Island moa hunter sites. Moa bones, early adzes, and obsidian flakes were found at the site. It has been suggested that the site may represent a camp made by early people exploring, or in transit through, the interior of the island and who stopped long enough to build structures, as evidenced by the presence of post holes (Law 1973; Anderson 1989: 114). In addition, moa remains in reported association with human occupation have been identified from the Moawhango-Upper Rangitikei River region, east of Waiouru (Batley 1960; Newman 1988: 66; see also Rogers 1987).

Moa bone found in Whakamoenga Cave was initially thought to be associated with the hunting of moa and the human occupation of the cave (Leahy 1976: 51; Anderson 1989: 114). However, a radiocarbon determination on moa bone from Whakamoenga has returned a radiocarbon age of 4747 ± 80 years B.P. (NZ 577) (McFadgen 1995), indicating that some of the moa bone in the cave may derive from a natural deposit. At present, there is a lack of definitive archaeological information confirming that moa were hunted within Tongariro-Taupo Conservancy. People occupying Whakamoenga used moa bone, whether from natural or from cultural deposits, for industrial purposes.

References to moa bone are found in ethnographic literature (see, for example, Kerry-Nicholls 1884 regarding Lake Rotoaira; Hochstetter 1959) but most such bone was probably from natural sources and was not associated with moa hunting. Natural deposits of moa bone have been found. Hosking investigated a moa found in a tomo or sinkhole (T19/29, N102/30) along the Te Ponanga Saddle road during the Tongariro Archaeological Programme. It was inferred that the moa fell into the sinkhole while in the bush foraging for food (Newman 1988: 128).

6.2 Aquatic resources

Pre-European contact Maori living within the region had access to a variety of aquatic resources. Lakes, lagoons, swamps, rivers, and streams provided fish, shellfish, crayfish, and waterfowl, but not eels.

6.2.1 Fish

Within Lake Taupo, koaro (*Galaxias brevipinnis*) and, probably, common bully (*Gobiomorphus cotidianus*) were available for harvest, although fish of both species are comparatively small. Some of the first European travellers through the Taupo district (in the early 1840s) reported being fed inanga or whitebait. Inanga was undoubtedly used with reference to the young of *Galaxias brevipinnis* (Phillipps 1940; McDowall 1990: 104-113; refer Strickland 1990)

but possibly also included the young of bully. Early European travellers speak of an abundance of small fish in Lake Taupo. Later writers make similar statements and claim that these fish formed the food of the Maori for many months in the year, sufficient being caught both for day-to-day use and to preserve and store (e.g. Fletcher 1919: 262, Grace 1970: 509). Fletcher (1919: 262) states that inanga were fished from September to March.

Fish bone was reported from Whakamoenga Cave and was thought to compare well with species of *Galaxias* found locally in lakes and streams. At least some of the bone was assumed to belong to *G. brevipinnis*. The number of fish represented in the cave over time is small (Leahy 1976). Whitebait-sized fish, however, would leave no bony material in an archaeological context. No fish bone was reported from Waihora Rockshelter (Hosking & Leahy 1982). Pieces of netting were found in the upper layers of Whakamoenga Cave (Leahy 1976: 58). Fragments of netting were reported from Rua Hoata Rockshelter (Phillips 1947).

6.2.2 Shellfish

The role played by the kakahi or freshwater mussel (*Hyridella menziesi*) in the diet of the Taupo Maori is unclear. Grace (1970) suggested that Taupo's kakahi were never very abundant and were less favoured than other freshwater fauna. While a couple of early European travellers through the region noted the presence of shellfish in the lake (Hochstetter 1867; Taylor 1855), there is little indication within the ethnographic literature of its relative importance as a food source.

Archaeological information on the use of *Hyridella* casts little light on their importance in the diet. A small number of *Hyridella* shells were excavated from Waihora Rockshelter. About half of these were covered with kokowai and the use of the mussel flesh as a food item seems uncertain (Hosking & Leahy 1982: 87). On the other hand, *Hyridella* shells found within Whakamoenga Cave generally seem to indicate the use of the shellfish flesh as food rather than the use of the shells as tools. The number of shells present increased within the Whakamoenga sequence over time, suggesting a growing reliance upon the mussels as a source of food (Leahy 1976: 51-53). This increase notwithstanding, the minimum numbers present in any occupation would not appear to reflect a substantial food source, even for a small group of intermittent occupancy. *Hyridella* shells were found in Rua Hoata Rockshelter by Michael Trotter during test excavations in February 1978 (Trotter 1978). Phillipps (1947) reported that a collection of material from the rockshelter included shells that had been used as scrapers. Unfortunately, Phillipps does not say whether these shells belonged to marine or to freshwater species.

6.2.3 Crayfish

Freshwater crayfish or koura (*Paranephrops planifrons*) were present in Lake Taupo and its tributaries. Large populations of koura are present in the lake today (H. Keys, Department of Conservation, pers. comm. 1993). Statements have been made concerning abundant koura populations, the large catches that were to be made (Fletcher 1919: 263; Best 1929; Grace 1970: 514), and how the koura were relished as a food (Best 1929; Hill Papers 1893-1928). However,

very little evidence of koura consumption has been recovered from excavations within the Taupo district. A possible claw was recovered from Whakamoenga Cave (Leahy 1976: 56). In the ethnographic literature consulted, some commentators noted koura as present within the lake (Dieffenbach 1843; Hochstetter 1867; Taylor Journals 1833–1873 Volume 3). Others reported on Maori in their travelling parties consuming koura (Bidwill 1841: 64) and gathering koura for consumption by Europeans (Bates 1860). Bidwill (1841: 31) also commented upon a group of Waikato Maori who were temporarily camped near the Waikato River, within about a day's tramp from Lake Taupo, in order that they might harvest crayfish, shellfish, and aquatic birds. It is probable that Taupo Maori with access to such resources may have acted similarly. Wakefield, at Tokaanu in December 1841, discussed the use of koura as a trade item for pipes and tobacco, rather than as an item in the Maori diet (Wakefield 1845 II: 108). Evidence given in the Tauhara Middle Maori Land Court hearings in 1886 suggests that at least some koura harvested from the lake were used as bait. Generally, then, reports left by early European travellers through the district confirm the use of koura as a food source but provide comparatively little information about the role of koura in the diet of the Maori whose settlements they visited.

6.2.4 Eels

It is unlikely that Lake Taupo had a viable natural population of eels (*Anguilla* spp.) during the pre-European contact period. Eels breed at sea. Juveniles heading landward from spawning grounds enter freshwater streams and rivers and migrate upstream. Eels are renowned for their climbing capabilities and for their ability to cross damp land (McDowall 1990). However, it appears probable that such natural physical obstacles as the Maungatautari Falls (Hutton & Hector 1872) and the Huka Falls on the Waikato River (McDowall 1990) frustrated both upstream migration and the establishment of a substantial resident population within the lake. It is possible that eels may have entered Taupo by crossing between catchments in which they occurred, such as the Rangitaiki (Hutton & Hector 1872) and the Wanganui Rivers (Fletcher 1919: 259), and the lake. This hypothesis appears largely unsubstantiated, although small numbers of eels are reputed to have been harvested from Lake Rotoaira, having arrived from the Wanganui River catchment (Fletcher 1919; refer McDowall 1990).

Maori living around Lake Taupo may have sought to remedy the deficiency in eels by a process of capture, transfer to Taupo, and release. Such a process is documented in Hutton & Hector (1872) and in Hobbs (1954) (see also Grace 1970: 509 and McDowall 1990). Under these conditions, the eel populations would not have been self-renewing: human-assisted augmentation to stock reduced by harvest would have been required. On this basis, there is little possibility that there were sufficient concentrations of eels in Lake Taupo to serve as a significant food source for pre-European contact Taupo Maori. No evidence for eels was recovered from Whakamoenga Cave or, apparently, from Waihora Rockshelter (Leahy 1976; Hosking & Leahy 1982) but this is not unexpected, given the general archaeological invisibility of eeling. The lack of eels is important, for elsewhere they provided an important source of vitamins, fat, and oil. Eels may have figured more prominently in the diet of people located near or with access to such rivers as the Wanganui and the Rangitaiki.

6.2.5 Waterfowl

The ethnographic literature contains references to large numbers of waterfowl, especially ducks, particularly around southern Lake Taupo and Lake Rotokawa (Wakefield 1845 II: 106; McLean 1845; Taylor Journals 1833–1873, Volume 3; Angas 1847 II: 127; Cooper 1851; Smith 1953; Best Journal for May 1841 in N. Taylor 1966; Bidwill 1841: 45, 54 on Lake Rotoaira). A particularly descriptive episode by H. Meade (1870: 81) detailed the capture of moulting, flightless ducks on Lake Rotokawa. However, apart from further references in Meade (1870: 98), few sources have mentioned waterfowl as part of the diet. In addition, Lake Taupo midden assemblages analysed to date do not fully bear out the ethnographic descriptions of large numbers of waterfowl. By comparison with bush and scrub birds, waterfowl seem poorly represented, especially in Whakamoenga Cave where more than three times as many bush and scrub birds as waterfowl have been identified (minimum numbers—Leahy 1976: 48). In Waihora Rockshelter, twice as many bush and scrub birds as waterfowl have been identified (minimum numbers—Millener 1981: 819). It is possible that the occupants of Whakamoenga Cave and Waihora Rockshelter had restricted access to waterfowl populations. Sites belonging to people more advantageously situated may demonstrate a greater emphasis on waterfowl.

In addition to the resources found within the district, Thomson (1859: 161) stated that Taupo Maori traded woven mats for dried sea fish with coastal tribes. Marine shellfish shells were found in Whakamoenga Cave (Leahy 1976: 52), Waihora Rockshelter (Hosking & Leahy 1982: 87) and Rua Hoata Rockshelter (Trotter 1978) and many appear to have been used as tools. The Taupo Maori may have visited coastal areas and harvested marine fish and shellfish.

7. Use of pumice and obsidian

Pumice artefacts were found in Whakamoenga Cave (Leahy 1976: 64) and Waihora Rockshelter (Hosking & Leahy 1982). Included amongst these artefacts were net floats or buoys, bowls, and patu. Some of the worked pumice had been fashioned into ‘bowls’ that had reached varying stages of manufacture. Some of these may have been ‘blanks’ intended for use elsewhere (Leahy 1976: 64).

The Lake Taupo area had a major resource available in the form of obsidian. Numerous obsidian flakes were found in Whakamoenga Cave, at least some of which came from the source at Whangamata Bay (Leahy 1976: 65). Flakes of obsidian were found in Waihora Rockshelter and at least some was probably collected from the Whangamata Bay area (Hosking & Leahy 1982: 89).

There has been a study of the sources of obsidian found in archaeological sites throughout the North Island (B. McFadgen, Department of Conservation, pers. comm. 1993). Pieces of obsidian, collected from archaeological sites of varying ages, were analysed and assigned to one of six source areas. One source area was the Central North Island, where much of the obsidian was identified as coming from northern Lake Taupo deposits at Whangamata Bay and to the

north, and at Motutere Point. For the purposes of the investigation, the North Island was divided into geographical regions and comparisons were made of the amount of obsidian derived from the six source areas found in each region. Preliminary results indicate that Central North Island sources of obsidian were extremely important locally. Furthermore, Central North Island obsidian was widely distributed around the North Island and was particularly prevalent in sites along the southern North Island west coast and in Hawkes Bay.

The Maraetai obsidian sources (see Ward 1973) fall within McFadgen's Central North Island source area and are located just north of the northern Tongariro/Taupo Conservancy boundary between Atiamuri and Mangakino. A small quantity of obsidian identified as coming from the Maraetai sources has been found in archaeological sites in the North Island (B. McFadgen, Department of Conservation, pers. comm. 1993).

Obsidian identified as coming from the Central North Island deposits (including northern Lake Taupo and Maraetai sources) has been found in the South Island (B. McFadgen, Department of Conservation, pers. comm. 1993; see also Davidson 1984: 198).

Further research on archaeological sites of known age throughout New Zealand that contain obsidian from Taupo sources would help clarify the pattern of distribution of Taupo obsidian, both geographically and chronologically. Such investigation would shed light on the early occupation and settlement of the Taupo region and its economic relationships with other regions.

8. Conclusions

This paper has focussed on a number of issues arising from the archaeological and historical literature relating to occupation in the vicinity of Lake Taupo. Some conclusions have been drawn concerning the size and distribution of population at the end of prehistory, the extent of occupation in the prehistoric period, the scale and rate of clearance of the bush, the utilisation of the various food resources of the region (including cultivated plants), and the role of bush-edge settlement in the late prehistoric and early historic periods.

It is likely that small numbers of people lived in the Taupo region in the late prehistoric and early historic period, with the population being mobile and dispersed. In late prehistory the population may have been around 2000 people, but by the late 1840s it was approximately 1500 and falling. Settlements in both prehistoric and early historic times were located around the major lakes and on bush-edges. People utilised a range of locally available resources, including birds, fish, and plants but large areas were little inhabited until the 19th century. There is little evidence of moa-hunting in the region. Kumara was probably grown only in restricted areas. Forest was cleared for a number of purposes including the cultivation of crops and fernroot and to facilitate travel. In relation to the latter, Ward's (1956) model of a bush-edge gradually retreating over centuries and taking settlement with it remains compelling. Bush clearance was under way by the 16th century, and the bush-edge gradually

retreated away from Lake Taupo. The rate of clearance probably increased in the 19th century with the introduction of the potato and other ways of making a living from the land. Greater dispersion was made possible by the greater productivity of potato, improved means of transport (horses), and a decrease in warfare. As a result, bush-edge settlements became more important in the early historical period. Central North Island obsidian was important locally and in neighbouring regions, such as Hawkes Bay, in the prehistoric period.

9. Acknowledgements

This paper has its origins in an MA thesis (Williams 1988), University of Auckland; and DOC Science & Research Unit investigation number 1797. Thanks to Dr Bruce McFadgen for providing material on the Central North Island obsidian source area, to Kevin Hackwell for answering many questions on the reforestation of the Taupo district following the Taupo Pumice eruption, to Tony Batley, Aidan Challis, Kevin Jones, Harry Keys, Tony Nightingale, Elizabeth Pishief, and Theo Stephens for commenting on earlier drafts of this paper, to Chris Edkins for cartography, and to all others who have helped in some way.

10. References

- Adams, P. 1985: The Armed Constabulary and the origins of Taupo. *Historic Places in New Zealand* 9: 26-27.
- A.J.H.R. Appendices to the Journals of the House of Representatives.
- Anderson, A. 1989: Prodigious birds: Moas and moa-hunting in prehistoric New Zealand. Cambridge University Press, Cambridge.
- Anderson, A. 1991: The chronology of colonisation in New Zealand. *Antiquity* 65: 767-795.
- Angas, G.F. 1847: Savage life and scenes in Australia and New Zealand: Being an artist's impression of countries and people of the Antipodes. Smith, Elder and Co., London.
- Bates, H.S. 1860: Travel in New Zealand. Typescript of a diary held at Auckland Institute and Museum.
- Batley, R.A.L. 1960: Inland Patea. *New Zealand Archaeological Association Newsletter* 3(4): 14-16.
- Best, E. 1929: Fishing methods and devices of the Maori. Government Printer, Wellington.
- Bidwill, J.C. 1841: Rambles in New Zealand. Orr, London. Facsimile reprint by Capper Press, Christchurch, 1974.
- Brittan, S.J.; Brittan, G.F.; Grace, A.V. 1928: A pioneer missionary amongst the Maoris. C.W. Brittan, G.H. Bennett and Co., Palmerston North.
- Brown, Archdeacon A.N.: Journals 1835-1850. Typescript, Auckland Museum and Institute, Auckland.
- Byrne, D. 1973: Prehistoric coprolites. Unpublished M.A. thesis, University of Auckland.

- Cameron, R.J. 1964: Destruction of the indigenous forests for Maori agriculture during the nineteenth century. *New Zealand Journal of Forestry* 9: 98–109.
- Colenso, W. 1868: On the Maori races of New Zealand. *Transactions and Proceedings of the New Zealand Institute* 1: 339–424.
- Cooper, G.S. 1851: Journal of an expedition overland from Auckland to Taranaki by way of Rotorua, Taupo and the West Coast undertaken in the summer of 1849–1850. Williamson and Wilson, Auckland.
- Crawford, J.C. 1880: Recollections of Travel in Australia and New Zealand. Trubner & Co., London.
- Davidson, J. 1984: The Prehistory of New Zealand. Longman Paull Ltd, Auckland.
- Dieffenbach, E. 1843: Travels in New Zealand. John Murray, London.
- Fenton, F.D. 1859: Observations on the state of the aboriginal inhabitants of New Zealand. W.C. Wilson, Auckland.
- Fletcher, Reverend H.J. 1914: Notes on comparatively recent changes in the vegetation of the Taupo district. *Transactions of the New Zealand Institute* 47: 70–72.
- Fletcher, Reverend H.J. 1919: The edible fish of Taupo-Nui-a-Tia. *Transactions of the New Zealand Institute* 51: 259–264.
- Fletcher, P.T. 1996a: Archaeological survey of Mount Pohaturua. Report prepared for Carter Holt Harvey (unpublished).
- Fletcher, P.T. 1996b: Archaeological survey of Te Kohatu Block Area, Western Taupo. Report prepared for Carter Holt Harvey and landowners (unpublished).
- Furey, L. 1984: Report on a salvage investigation at Orana pa, N103/10, Lake Taupo. Report in New Zealand Archaeological Association Central File collections (unpublished).
- G.G.P.P.: Great Britain Parliamentary Papers.
- George, M. 1990: Ohakune—Opening to a New World. Kapai Enterprises, Wanganui.
- Grace, Reverend T.S.: Letters and journals of the Maori missionary, the late Reverend Grace. Alexander Turnbull Library, Wellington.
- Grace, John Te H. 1970: Tuwharetoa—The history of the Maori people of the Taupo District. A.H. and A.W. Reed Ltd.
- Groube, L.M. 1970: The origin and development of earthwork fortifications in the Pacific. In Green, R.; Kelly, M. (Eds): Studies in Oceanic Culture History Volume 1: 133–164. *Pacific Anthropological Records* 11. Bernice P. Bishop Museum, Hawaii.
- Hamlin, J. 1915: Estimate of the Maori population of the North Island circa 1840. *Journal of the Polynesian Society* 24: 72–74.
- Hill, H. MS Papers 146: 1893–1928. Alexander Turnbull Library, Wellington.
- Hill, H. 1903: The Maoris today and tomorrow (No. 2). *Transactions and Proceedings of the New Zealand Institute* 35: 169–186.
- Hobbs, D.F. 1954: How they caught Tangaroa's eels. *Pacific Discovery* 7(4): 23–28.
- Hochstetter, F. von 1867: New Zealand: Its physical geography, geology and natural history. J.G. Cotta, Stuttgart.
- Hochstetter, F. von 1959: The Geology of New Zealand. Edited by C.A. Fleming. Government Printer, Wellington.
- Horrocks, M.; Ogden, J. 1998: Fine resolution palynology of Erua Swamp, Tongariro, New Zealand, since the Taupo Tephra eruption of c. 1718 B.P. *New Zealand Journal of Botany* 36: 285–293.
- Hosking, T. 1962: Report on excavations of Whakamoenga Cave, Lake Taupo. *New Zealand Archaeological Association Newsletter* 5(1): 22–30.
- Hosking, T.; Leahy, A. 1982: Investigations at Rockshelter N93/5, Waihora Bay, Taupo, New Zealand. *Records of the Auckland Institute and Museum* 19: 81–99.

- Hutton, F.W.; Hector, J. 1872: Fishes of New Zealand. James Hughes, Wellington.
- Kerry-Nicholls, J.H. 1884: The King Country: or, explorations in New Zealand. A narrative of 600 miles of travel through Maoriland. Facsimile reprint by Capper Press, Christchurch, 1974.
- Law, G. 1973: Tokoroa moa-hunter site, N75/1. *New Zealand Archaeological Association Newsletter 16(4)*: 150-164.
- Leach, H. 1984: 1000 years of gardening in New Zealand. A.H. and A.W. Reed, Wellington, New Zealand.
- Leahy, A. 1976: Whakamoenga Cave: Taupo N94/7—A report on the ecology, economy and stratigraphy. *Records of the Auckland Institute and Museum 13*: 29-75.
- McDowall, R.M. 1990: New Zealand Freshwater Fishes: A Natural History and Guide. Heinemann Reed/MAF Publishing Group, Auckland.
- McGlone, M. 1983. Polynesian deforestation of New Zealand: A preliminary synthesis. *Archaeology in Oceania 18*: 11-25.
- McFadgen, B.G. 1995. A radiocarbon date of moa bone from Whakamoenga Cave, site U18/4, northeast Lake Taupo. *Archaeology in New Zealand 38(4)*: 257-8.
- McFadgen, B.G.; Williams, A. 2000: Mapping some archaeological features of the Opepe Bush Scenic and Historic Reserve. *Science and Research Internal Report 174*. Department of Conservation.
- McLean, D. 1845: Extracts from a Journal kept during a visit to the Tribes of the Interior of the Northern Island of New Zealand. Alexander Turnbull Library, Wellington, New Zealand.
- Mead, A.D. 1966: Richard Taylor—Missionary Trampler. A.H. and A.W. Reed, Wellington.
- Meade, H. 1870: A ride through the disturbed districts of New Zealand: Together with some account of the South Sea Islands. John Murray, London.
- Millener, P.R. 1981: The quaternary avifauna of the North Island, New Zealand. Unpublished PhD. thesis, Department of Geology, University of Auckland.
- Mitchell, J. 1983: The history and archaeology of the Armed Constabulary archaeological sites along the Napier-Taupo Road, 1869-1885. Unpublished M.A. Research essay, Department of Anthropology, University of Auckland.
- Nevin, D.C.; Nevin, G.E. 1979a: Archaeological site survey—Rotoaira State Forest 141. June 1979. New Zealand Forest Service report.
- Nevin, G.E.; Nevin, D.C. 1979b: Archaeological site survey—Waimihia State Forest 120. New Zealand Forest Service report.
- Nevin, G.E.; Nevin, D.C. 1979c: Archaeological site survey—Lake Taupo State Forest, SF 115, Rotorua Conservancy. New Zealand Forest Service report.
- Nevin, G.E.; Nevin, D.C. 1979d: Archaeological site survey—Lake Taupo State Forest, SF 115, Rotorua Conservancy. New Zealand Forest Service report.
- Nevin, G.E.; Nevin, D.C. 1980: Archaeological site survey—Lake Taupo State Forest, SF 115, Rotorua Conservancy. New Zealand Forest Service report.
- Nevin, D.C. 1983: Archaeological site survey—Lake Taupo State Forest, Rotorua Conservancy. New Zealand Forest Service report.
- Newman, M. 1988: Archaeological investigations in the vicinity of Lake Rotoaira and the Lower Tongariro River 1966-1971. *New Zealand Historic Places Trust Publication 21*. Wellington.
- Phillipps, W.J. 1940: The fishes of New Zealand. Thomas Avery and Sons Ltd. New Plymouth.
- Phillipps, W.J. 1947. The Rua Hoata Shelter, Waikato River. *Journal of the Polynesian Society 6(4)*: 336-339.
- Pool, D.I. 1977: The Maori population of New Zealand 1769-1971. Auckland University Press, Auckland.

- Pool, D.I. 1990: *Te Iwi Maori. A New Zealand population past, present & projected*. Auckland University Press, Auckland.
- Rogers, G.M. 1987: *Landscape history of Moawhango Ecological District*. Unpublished PhD thesis, Victoria University of Wellington.
- Skinner, Reverend T. 1849: *Journal 1849–1856*. Alexander Turnbull Library, Wellington.
- Smith, S.P. 1953: *An 1858 Journey into the interior. The Diary of S. Percy Smith describing a journey from Taranaki to the Taupo and Rotorua Districts*. Taranaki Herald Co. Ltd, New Plymouth.
- Statistics of New Zealand 1857, Auckland.
- Strickland, R.R. 1990: *Nga tini a Tangaroa—a Maori-English, English-Maori dictionary of fish names*. New Zealand Fisheries. Occasional Publication No. 5. MAF Fisheries, Wellington.
- Taylor, N. 1958: *Soil Science and New Zealand prehistory*. *New Zealand Science Review* 7: 71–79.
- Taylor, N.M. 1966: *The Journal of Ensign Best 1837–1843*. Government Printer, Wellington.
- Taylor, Reverend R. *Journals 1833–1873*. Typescript, Alexander Turnbull Library, Wellington.
- Taylor, Reverend R. 1855: *Te Ika a Maui or New Zealand and its inhabitants*. Wertheim and McIntosh, London.
- Thomson, A.S. 1859: *The Story of New Zealand: Past and Present—Savage and Civilised*. John Murray, London.
- Trotter, M. 1978. *Rua Hoata—report of an inspection*. Report to New Zealand Historic Places Trust.
- Trotter, M.; McCulloch, B. 1971: *Prehistoric rock art of New Zealand*. A.H. and A.W. Reed Ltd, Wellington.
- Wade, W.R. 1842: *A journey into the Northern Island of New Zealand: Interspersed with various information relative to the country and people*. George Rolwegan, Hobart Town.
- Wakefield, E.J. 1845: *Adventure in New Zealand from 1839–1844: with some account of the beginning of the British colonisation of the islands*. John Murray, London.
- Walton, A.J. 1986. *The population of the Lake Taupo region, New Zealand, 1839–1859*. *New Zealand Journal of Archaeology* 8: 73–88.
- Ward, G.K. 1973: *Obsidian source localities in the North Island of New Zealand*. *New Zealand Archaeological Association Newsletter* 16(3): 85–103.
- Ward, R.G. 1956: *Maori settlement in the Taupo Country 1830–1880*. *Journal of the Polynesian Society* 65: 41–44.
- Williams, A. 1988: *Land and Lake: Taupo Maori economy to 1860*. Unpublished M.A. thesis, Department of Anthropology, University of Auckland.
- Williams, A.; Tupara, N. 2000: *Rock art conservation survey, Tongariro/Taupo Conservancy*, Department of Conservation.
- Wilson, O. 1961: *War in the tussock: Te Kooti and the battle of Te Porere*. Government Printer, Wellington.