Subsistence activities at 19th-century shore whaling station sites in New Zealand and Australia: a zooarchaeological perspective

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ABSTRACT
This paper examines food subsistence activity patterns in five 19th-century shore whaling stations in New Zealand and Australia. Faunal data are categorised into indigenous and exotic classes and possible explanations behind differing patterns of subsistence activities between sites and their immediate local contexts are explored. Zooarchaeological analyses show that the communities of these whaling station communities supplemented their whaling rations with indigenous and exotic domestic species to varying degrees.

KEY WORDS
Diet,
shore whaling stations,
New Zealand,
Australia,
19th century.

RÉSUMÉ
Activités de subsistances des stations baleinières côtières du XIXe siècle en Nouvelle-Zélande et Australie: une perspective zooarchéologique.
Cet article analyse les activités alimentaires de subksistance des stations baleinières côtières de Nouvelle-Zélande et d'Australie au XIXe siècle. Les données relatives à la faune sont catégorisées selon les classes autochtone et exotique; diverses options expliquant les différents modèles d'activités de subsistance entre les sites et en fonction de leur contexte local immédiat y sont examinées. L'analyse zooarchéologique démontre que les communautés de ces stations baleinières ont, à divers degrés, complété leur ration baleinière de base avec des espèces autochtones ou provenant de leur lieux d'origine.

MOTS CLÉS
Régime alimentaire,
stations baleinières
côtières,
Nouvelle-Zélande,
Australie,
XIXe siècle.

INTRODUCTION

Shore whaling station communities in New Zealand and Australia existed during a relatively short period of history, and offer insight into interactions between immigrant and indigenous men and women. This paper presents food subsistence activity patterns at five 19th-century shore whaling stations in New Zealand and Australia (Fig. 1). Faunal data are categorised into indigenous and exotic classes to explore the subsistence activities undertaken by these shore whaling station communities. Possible explanations behind differing patterns of subsistence activities between sites are explored, taking into account their local geographic, economic and indigenous contexts.

HISTORY OF SHORE WHALING

Shore whaling, as opposed to pelagic whaling, had whaling crews living at or near processing stations on land, with lookouts on highpoints for sighting whales, directing crews in small man-powered boats to pursue and harpoon whales. The origins of shore whaling can be traced back to the Basque whalers of Spain and France. The Basques may have been whaling for more than a millennium, targeting right whales (*Eubalaena glacialis*) in the North Atlantic (Lawrence 2006; Reeves and Smith 2003). Vikings and North-west Coast (British Columbia) Indians were among other early shore whalers (Prickett 1993). Basques were responsible for introducing shore whaling to Brazil in AD 1603, targeting the southern right whales (*Eubalaena australis*) through the 1820s, and then possibly humpback (*Megaptera novaeangliae*) and sperm whales (*Physeter macrocephalus*) (Reeves and Smith 2003). Pelagic whalers from the Netherlands and Britain were hunting in the Arctic, east of Greenland, by the 18th century, while whalers from New England, America, were moving south across the Equator (Gibbs 2010; Lawrence 2006). Whaling vessels began to venture into the Pacific during the 1790s, and within several years there were at least 100 ships operating in the 'South Seas Fishery' (Badger 1988; Lawrence 2006). The captains of whaling vessels were often frugal, hardworking Quakers from Nantucket and had a strong sense of teamwork (Cawthorn 2000). The crews they recruited included Europeans, Maori and other Polynesians, American Indians, Africans, Azore Islanders, Portuguese, Cape Verde Islanders and others (Cawthorn 2000), as portrayed in *Moby Dick* (Melville 1851).

In 1788, two of the ships of the First Fleet arriving in Australia were whale ships and whale oil was the first export of the colony (Lawrence 2006; Lawrence and Staniforth 1998b; Prickett 1993). The first European settlers in Hobart were carried by whale ships in 1803, the year of the first recorded example of commercial whaling in Van Diemen's Land (the original European name for the island of Tasmania); two years later a shore whaling station (tryworks) was set up on the Derwent River estuary (Gibbs 2010; Lawrence and Staniforth 1998b). Apart from the Derwent tryworks the whaling industry at Van Diemen's Land stagnated for a time, because of import duties levied on colonial oil in London and also due to fears of convicts accessing boats; the import duties were dropped in 1823 (Gibbs 2010; Lawrence 2006). Meanwhile British, French, American and even Australian ships pursued both sperm and southern right whales in Australian waters (Lawrence 2006).

The Australian and later New Zealand shore whaling industries developed out of the south seas pelagic whaling industry (Prickett 1993). Shore whaling stations were frequently the context for first encounters between Aboriginal and non-Aboriginal groups – the camps lasted years, allowing more than just fleeting encounters with explorers (Gibbs 2010). Although there are ethno-historical accounts of Australian Aboriginal people feasting on whale meat after whale strandings, eating the meat raw or roasted and rubbing the blubber onto their bodies, there is no evidence to suggest that they were hunting whales prior to the arrival of Europeans (Gibbs 2010). As previous use of whales by Aboriginals had been opportunistic, and the land taken up by whaling stations was small, the operation of the stations did not negatively impact the traditional economy of local Aboriginals. In fact, because the stations processed whales mainly for their baleen and blubber, the local Aboriginals

benefitted from the availability of whale meat, increasing the frequency at which they were able to indulge in a favoured food (Gibbs 2010; Staniforth *et al.* 2001). In south-western Australia it was noted that between May and September, instead of moving inland to hunt kangaroos and escape the heavy coastal rains, the local Aboriginal people were replacing their traditional protein source with whale meat by camping at the stations during whaling season. If these stations had a poor season or failed, the indigenous group had to return to traditional sources, and cross areas inland where kangaroo was progressively being replaced by cattle (Gibbs 2010). In parts of Australia (excluding the south-west), various relationships between indigenous women and whalers are well known (Gibbs 2010; Staniforth *et al.* 2001). For example, in August 1829, George Robinson visited the shore whaling stations at Adventure Bay, Tasmania, and wrote to the three 'firms' expressing his disapproval of the whalers co-habiting with Aboriginal females and "making them subservient to their own carnal appetites" (Plomley 1966: 72, cited in Prickett 1993). In the Bass Strait and Kangaroo Island mixed-race sealing communities that many shore whalers (both in Australia and New Zealand) originated from, the practice of shooting Aboriginal men seated around campfires and abducting women is reported by missionaries. Aborigines also traded women from their own tribes, or women abducted from other tribes (Ryan 1996). At first, women were only available for the sealing season, but as sealers began to stay on beyond the season, so did their 'wives'. By 1816, sealers might have between two and five 'wives', who Robinson described as 'slaves'. By 1830 the coastal tribes of Bass Strait and Kangaroo Island were devastated by the combined effects of shootings of Aboriginal men and the trade and abduction of Aboriginal women. In 1830, in Tasmania's north-east, only three women and 72 men were recorded (Plomley 1966: 108, 966, 1008, cited in Prickett 2008).

The whaling stations often struggled to employ enough workers and eventually Aboriginals were hired (Staniforth *et al.* 2001), with the first records of Aboriginal workers at stations beginning in 1848 (Gibbs 2003, 2010). Some Aboriginal workers

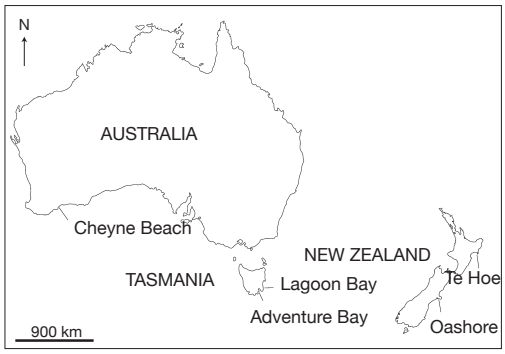

Fig. 1. – Locations of 19th-century shore whaling stations discussed in this paper.

received equivalent pay to their non-Aboriginal colleagues, indicating their equivalent level of skill; this return was shared amongst their community in accordance with traditional customs (Gibbs 2003, 2010). In 1851, at the Cheyne Beach station, 70km east of Albany in Western Australia, the more highly-paid Aboriginal workers received lays (pre-determined percentages of the profits) of £15 each (Gibbs 2003).

Generally, archaeological evidence of Aboriginal people (whether as workers, wives or children of workers, or as community groups present for whale meat feasting) at whaling stations is limited, but at Port Collinson whaling station tools made from flaked black bottle glass may have been manufactured by Aboriginal people (Staniforth *et al.* 2001). Evidence, both historical and archaeological, of non-Aboriginal women and children at shore whaling stations in Australia is also limited, but occasional mentions are made by visiting ship captains of wives and children at stations (Staniforth *et al.* 2001). For example, at Cheyne Beach, Western Australia, headsman John Thomas lived at the station with his wife Fanny and three daughters (Lawrence 2006).

The first recorded whaling vessel to visit New Zealand, the *William and Ann*, anchored in Doubtless Bay, Northland in 1792 (Cawthorn 2000; Lawrence 2006). Pelagic whaling ships financed from Britain, France, America and Australia were thereafter active in New Zealand waters. Prior to the arrival of ship- and shore-based whaling in New Zealand,

prehistoric Maori did not actively pursue maritime whaling, as their canoes were unsuitable for hunting whales. Instead, they relied on incidental captures or strandings of whales. Maori exploited whales for their meat, fat, oil and bone. Harpoons have been found in prehistoric archaeological sites, but these are thought to have been used for occasional dolphin hunting (Smith 1989). By 1826, Maori made up a substantial proportion of the whaling crews working in New Zealand waters (Badger 1988; Cawthorn 2000). Young Maori were attracted to working on whaling vessels as hunting and harpooning whales appealed to their competitive natures (Cawthorn 2000: 4). After the right whale industry developed in Tasmania, Australians began to set up whaling station operations across the Tasman Sea in New Zealand in the late 1820s and early 1830s (Lawrence 2006). The earliest known New Zealand shore whaling stations were established at Preservation Inlet, Fiordland and Te Awaiti on the Tory Channel, near Cook Strait by 1829 and many others followed in the 1830s and 1840s (Prickett 2002). The skills and the commercial arrangements developed in Tasmania were later utilised in the New Zealand industry as Tasmanians financed whaling stations in New Zealand (Lawrence 2006; Prickett 1998; Prickett 2002). Crews were enrolled from Sydney and Hobart, where they received and spent an advance, before boarding a vessel for their voyage to New Zealand. They took various supplies and provisions with them – some for personal use, some for trade with Maori – which were put under the care of the chief headsman (Wakefield 1845). Australians who stayed on in New Zealand to develop the shore whaling industry locally, included a number of part-Aboriginal Tasmanian men, such as George Morrison, who in 1844 established the station at Wairoa (Hawke's Bay, eastern North Island), and Tommy Chaseland at Foveaux Strait, considered one of New Zealand's best whalers (Prickett 2008; Russell 2008; Shortland 1851). Other part-Aboriginal whalers included Samuel Harrington at the Wairoa, Te Hoe and several of the Mahia stations, Ned Tomlins at the Waikokopu station, 'Darkie Coon' at the Wairoa and Te Hoe stations, and Jemmy Moody, a white Tasmanian who worked at the Te Hoe station (Lambert 1925; Prickett 1993; Prickett 2008). After 1838 the Sydney owners were often more inclined to stay in New Zealand, and visited Sydney periodically to dispose of the oil (Carrick 1902).

In New Zealand, when setting up a station, the station owner negotiated with the local tribe on whose land the station was to be located (Evison 1993). Tribal *rohe* or territories were strongly defended in a context of competition for resources, tribal politics and spiritual world view. The strong relationship Maori had (and still have) with the land meant that the immigrant whalers could not 'ignore' or treat badly the local indigenous peoples; to do so would be at their own peril. Maori were particularly adept in battle, and had a strong sense of *utu*, or recompense for right or wrong doing. Initially, at the start of the sealing and whaling seasons, Maori women were traded for the season, but this later changed to permanent relationships, as occurred in the Bass Strait (Prickett 2008). With shore whaling stations situated on Maori land, mutually beneficial relationships between Maori and whalers developed; wives were often provided through consultation with the chief, binding the whalers to the tribe. The wives attended to cooking, making flax ropes and sometimes tended vegetable gardens (Shortland 1851; Thomson 1922). The Maori wives of whalers often became permanent and legal, though the couples often had to wait some years for a visiting missionary to make the union official (Cawthorn 2000). The intermarriage of whalers with local Maori women was mutually beneficial – the chief had access to employment, boats, trypots (cast iron pots for rendering oil from whale blubber) and other necessary items, as well as monetary gain, while the whaler was protected by the tribe during times of skirmishing, especially during the 1830s (e.g. Tommy Chaseland and his wife Puna on Stewart Island [Russell 2008]). In general, Maori provided fresh vegetables, root crops, firewood and freshwater in trade for guns, blankets and pigs (Cawthorn 2000: 5). Whalers sometimes purchased land from Maori, and participated in the expansion of agriculture in New Zealand, during the decline of whaling returns (Cawthorn 2000). In the early-19th century, Maori whalers learnt skills such as

coopering, carpentry and boat building, and of course, the techniques of whaling, which not only became useful in the shore whaling industry that established in New Zealand soon after, but also in the large-scale European settlement of New Zealand (Cawthorn 2000: 6; Prickett 1998: 53). The 1830s were the most profitable period for the southern oil trade (Prickett 2002). In New Zealand the trade peaked quickly, with many stations closing in the 1840s and early 1850s; in Australia the industry lasted longer, with some stations still operating in the 1870s.

ARCHAEOLOGY OF SHORE WHALING

A search of available literature on the archaeology of shore whaling station sites indicates that most research has been undertaken in Australia and New Zealand (e.g. Gibbs 1995; Lawrence and Staniforth 1998a; Prickett 1998), with the exception of one project in South Georgia, in the Antarctic (Basberg 2004). Research has included both survey and excavation, with the latter in a minimal number of sites and geographic areas. The historical and archaeological background to the five sites reviewed in this study is summarised below.

Te Hoe

During the mid-19th century, the Mahia Peninsula became the principal whaling base on the North Island east coast (Prickett 2002). By 1847 there were 17 five-oared boats operating out of stations in Hawke's Bay, where £3000 worth of oil and £700 of whale bone was produced that year (Smith and Prickett 2008). In 1851 it was estimated that 140 Europeans lived on the Mahia Peninsula, working as whalers, and that the number of Maori involved in the industry there was probably double that (MacKay 1966). Historical records on Te Hoe are scarce, but it is believed to have operated as a whaling station from about 1840, possibly through to the 1890s or later (Lambert 1925; Smith and Prickett 2008). One whaler there, Joseph Carroll, was a blacksmith by trade, and was probably the owner of the station at one stage. Carroll married a local woman by the name of Tapuke, of Ngati Kahungunu; their son James Carroll (Timi Kara) later became acting prime minister in 1909 and 1911 (Lambert 1925). Other whaling masters at Te Hoe included Captain Mansfield and John Smith (Smith and Prickett 2008). In January and February of 2005, Ian Smith and Nigel Prickett directed a four-week excavation at Te Hoe, as part of the Marsden Grant project on New Zealand Shore Whaling stations and the emergence of Pakeha culture. A total of 193m² units were excavated; faunal remains were collected from six of the ten excavation areas. Bulk samples were also carefully removed from one area to allow for fine-detailed analysis of archaeobotanical remains.

Oashore

The shore whaling station at Oashore, Banks Peninsula, was set up during 1839. In this year there were 24 British and five Maori men employed there, while 17 Maori women and three Europeans resided at the Oashore, Peraki and Ikoraki Stations (Haynes in prep.). Production probably reached its peak in 1844, when 35 men were employed and four boats were in use. In 1848 the station was sold and incorporated into George Rhodes' Kaituna sheep run. Rhodes commissioned Octavius Carrington to survey the station in 1849 and Kaituna station hands operated the whaling station during the winter off-season until the mid-1850s. From this time the station was no longer catching and processing whales, but used as farm accommodation (Smith and Prickett 2006). Excavations at Oashore in 2004 were directed by Ian Smith and Nigel Prickett, as part of the same project that funded excavations at Te Hoe (Smith and Prickett 2006). Faunal remains were recovered from six out of seven excavated areas at the site; 125.4m² units were excavated (Ian Smith pers. comm.)

Lagoon Bay

James Kelly and Thomas Hewitt applied for a whaling station licence at the southern end of Lagoon Bay, Forestier Peninsula Tasmania, which was granted in 1838 on the condition that two constables were employed there (Law-

rence 2006). The lease was for three years, and except for 1842 when the government forced the closure of all whaling stations on the Forestier Peninsula, whaling continued in 1844, in spite of Kelly's bankruptcy. In 1848 Kelly and Hewitt applied for another three year lease, and archaeological evidence indicates that the station may have operated for at least one more season (Lawrence 2002). A further, final application to extend the lease was lodged in 1851, but it is unclear whether this was taken up (Lawrence 2006). The shore whaling station site at Lagoon Bay, Tasmania, was excavated by Susan Lawrence in 1999, as part of the Archaeology of Whaling in Southern Australia and New Zealand project. All materials excavated from the site were subjected to analysis, and the faunal remains were analysed by Tucker (1999). The area excavated at Lagoon Bay totalled 280m² units.

Adventure Bay

Thomas Lucas had been whaling at Adventure Bay, South Bruny Island, Tasmania, since 1825 (possibly from ships moored in the bay) when he went into business with James Kelly, applying for an allotment and establishing a shore whaling station there in 1829 (Lawrence 2002; Lawrence 2006). This was one of four stations operating in Adventure Bay during the 1830s (Lawrence 2006). In 1833 the station employed 24 boatsmen and three boats (Prickett 1993). By 1841 the three acre allotment had certified for £200 of improvements. In the early 1840s whale numbers were stating to decline, and in 1842 Kelly was bankrupt. Whaling activities at the station are believed to have ended at this time (Lawrence 2006). The Kelly and Lucas station site was excavated in 1997 by a team led by Susan Lawrence. Six trenches, totalling 388.5m², were excavated. Faunal materials from Adventure Bay were analysed by Tucker (1999).

Cheyne Beach

The shore whaling station at Cheyne Beach, Western Australia, was established by merchant Captain John Thomas of Albany in 1846 (Gibbs 2006). The station is known to have been occupied almost continuously between 1846 and 1877, but was small in scale with two whaleboats and 12-14 registered whalers (Gibbs 2006). The site was part of a PhD research project conducted by Martin Gibbs (1995, 2006, 2010). Excavations were carried out at Cheyne Beach over four seasons from 1989 to 1991. At the Cheyne Beach station, there are records of Aboriginal whalers including: Jack Hansome (1861-1878, boat steerer); Jack Hardy (1861-1877, boat hand); Tommy King (1867-1872, boat hand) ; Billy Nadingbert (1861, boat steerer); Nebinyan (1862-1877, boat hand); Rattler Nuterwert (1861-1875, boat hand); and Dicky Taylor (1861-1875, boat hand) (Gibbs 2003: 6).

METHODS

The faunal data from five 19th-century shore-whaling station sites in New Zealand and Australia were compared. Numbers of Identified Specimens (NISP) and Minimum Number of Individuals (MNI) data were determined for the sites at Te Hoe and Oashore; NISP, MNI and weight data for Adventure Bay and Lagoon Bay was gathered from Lawrence (2002, 2006). The MNI values of these four assemblages were then converted into relative (percentage) MNI values and ranked. NISP is defined as "the total number of bone fragments of a certain type of animal in an assemblage" while MNI is "the minimum number of animals represented in an assemblage given the numbers of different body parts present" (Landon 1996: 140). The strengths and weaknesses of both measures have been discussed at length (Klein and Cruz-Uribe 1984; Landon 1996; Lyman 1994a, 1994b, 2008; Reitz and Scarry 1985; Watson 1979); this discussion will not be repeated here. The ranking of percentage MNI values was considered the most appropriate measure of the relative frequency with which various subsistence activities were pursued. No attempt was made to evaluate the relative dietary importance of the foods acquired by these activities, which would have required conversion of taxon frequencies into meat weights and/or energy yields. While

protocols and conversion factors for doing this are available for the indigenous New Zealand fauna (Smith 2011a), they were not easily accessible for their Australian equivalents. Faunal data from Cheyne Beach was derived from Gibbs (1995) where it is quantified by bone weight. MNI for a selection of species were subsequently reported (Gibbs 2010: 90-94), but as these did not include the full array of taxa there is no option but to rely upon the bone weights to deduce the relative abundance of taxa. This is problematic, as shell and mammal bones are far denser and heavier than either fish or bird bone, making the results not directly comparable with MNI. However, as long as this is kept in mind during the interpretation, it allows one further site to be drawn into the comparison. Furthermore, percentage weight values from Adventure Bay and Lagoon Bay were available for comparison. Data from each site were then organised to group the indigenous and exotic components of the fauna and the relative abundance of these components at the five sites compared.

While the recovery methods of the Tasmanian and New Zealand assemblages were consistent, because the excavations were led by the same directors, it is more difficult to guarantee this across all of the excavated assemblages; however the stated methods appear comparable (Gibbs 2005: 116; James-Lee 2006: 68-73; Lawrence and Tucker 2002: 25-26). All assemblages have unique taphonomic histories, impacted on by different factors which affect the excavated deposits. These can include "weathering, winnowing of assemblages by fluvial transport, destruction of remains by scavengers, decomposition by adverse soil chemistry, and disturbance by burrowing animals" (Reitz and Scarry 1985: 10-11). It is important to note that differences in the taphonomic histories of assemblages, particularly from different sites, can introduce biases into the data (Reitz and Scarry 1985: 9). For example, Lawrence and Tucker (2002: 25) note the higher degree of fragmentation in the Lagoon Bay assemblage compared to Adventure Bay, and suggest this may be the result of a greater degree of trampling at the former; they also note that "the sheet deposits at Adventure Bay were more deeply buried and more likely to favour the preservation of smaller elements" (Lawrence and Tucker 2002: 30).

RESULTS

Te Hoe

Within all classes of the Te Hoe assemblage there is a wide breadth of taxa, whether from domesticated mammals, fish and shellfish, or coastal and forest birds. Shellfish are the overwhelmingly dominant faunal class, contributing 97.55% of MNI, with *Lunella smaragda* (cats eye) the most common species (Table 6.1). The remaining 2.45% of total assemblage MNI includes fish, indigenous and exotic bird, and indigenous and exotic mammal classes. The largest of the vertebrate classes is fish with 45.28% of vertebrate MNI (1.11% of total MNI), followed by exotic mammal with 27.36% of vertebrate MNI (0.67% of total assemblage MNI), indigenous bird at 22.64% of vertebrate MNI (0.55% of total assemblage MNI) and low values for indigenous mammal and exotic bird at 2.83% and 1.89% of vertebrate MNI respectively (0.07% and 0.05% of total assemblage MNI). The most common fish species are *Myliobatis tenuicaudatus* (eagle ray), *Latridopsis ciliaris* (blue moki), *Notolabrus celidotus* (spotty) and *Conger verreauxi* (conger eel). *M. tenuicaudatus* could have been speared in the sandy bay at Te Hoe, while *L. ciliaris* could have been taken from September to November by net or large fishhook over rock reefs or sand depths of 20-200m, which was the traditional method around the East Cape, presumably from the whaleboats (Crosby 1966; Leach 1979; Paul 2000). The bird assemblage comprises a wide range of indigenous species, with particular focus on *Eudyptula minor* (little blue penguin) and *Pachyptila turtur* (fairy prion) and a number of other species represented by only one individual. While *E. minor* could have been hunted on the beach, *P. turtur* is a marine bird (Moon 1996) probably caught from whaleboats. The remaining bird species are mainly wetland or marine species, with a few forest-dwelling species. One exotic bird, *Gallus gallus* (chicken) is present, but in very small numbers. Indigenous mammals, such as fur seal and dolphin, seem to have played only a minor role in supplementing the diet, but would have added variety.

TABLE 1 (start). – Relative abundance of fauna at Te Hoe (after James-Lee 2006).

Taxon	Common name	NISP	Total MNI	Total MNI %
Turbo smaragda	Cats eye	1744	1020	23.56
Cookia sulcata	Cooks turban	1563	738	17.05
Melagraphia aethiops	Spotted top shell	683	483	11.16
Limpet sp.	Limpet sp.	166	125	2.89
Whelk sp.	Whelk sp.	317	130	3.00
Haustrum haustorium	Dark rock shell	67	62	1.43
Cominella sp.	*Cominella* sp.	54	47	1.09
Amphibola crenata	Mud snail	42	30	0.69
Haliotis iris	Paua	145	25	0.58
Barnacle sp.	Barnacle sp.	85	17	0.39
Thais orbita	White rock shell	15	15	0.35
Evechinus chloroticus	Kina	93	5	0.12
Scutus breviculus	Shield shell	5	5	0.12
Trochus viridius	Green top shell	2	1	0.02
Haustrum haustorium?	Dark rock shell?	2	2	0.05
Cookia sulcata?	Cooks turban?	1	1	0.02
Diloma bicanaliculata	Knobbed top shell	1	1	0.02
Maoricolpus roseus	Turret shell	1	1	0.02
Penion sulcatus	Siphon whelk	2	1	0.02
Argobuccinum pustulosum tumidum	Swollen trumpet shell	1	1	0.02
Gastropod sp.	Gastropod sp.	765	28	0.65
Paphies subtriangulata	Tuatua	1225	605	13.98
Austrovenus stutchburyi	Cockle	1614	601	13.88
Paphies australis	Pipi	528	264	6.10
Ostrea sp.	Oyster sp.	4	4	0.09
Mussel sp.	Mussel sp.	6	2	0.05
Bivalve sp.	Bivalve sp.	658	9	0.21
Indigenous shellfish total		**9789**	**4223**	**97.55**
Myliobatis tenuicaudatus	Eagle ray	16	14	0.32
Latridopsis ciliaris	Blue moki	14	9	0.21
Notolabrus celidotus	Spotty	12	7	0.16
Conger verreauxi	Conger eel	19	4	0.09
Pagrus auratus	Snapper	15	3	0.07
Chelidonichthys kumu	Red gurnard	5	2	0.05
Thyrsites atun	Barracouta	9	2	0.05
Lepidopus caudatus	Frost fish	1	1	0.02
Parapercis colias	Blue cod	2	1	0.02
Allomycterus jaculiferus	Porcupine fish	2	1	0.02
Nemadactylus macropterus	Tarakihi	2	1	0.02
Pseudophycis bachus	Red cod	3	2	0.05
Arripis trutta	Kahawai	1	1	0.02
Fish sp.	Fish sp.	1416	0	0.00
Indigenous fish total		**1517**	**48**	**1.11**
Eudyptula minor	Little blue penguin	65	5	0.12
Pachyptila turtur	Fairy prion	6	2	0.05
Hemiphaga novaeseelandiae	Kereru	5	1	0.02
Rallidae sp.	Rail sp.	3	1	0.02
Puffinus gavia	Fluttering shearwater	2	1	0.02
Prosthemadra novaeseelandiae	Tui	2	1	0.02
Cyanoramphus sp.	Parakeet sp.	2	1	0.02
Phalacrocorax melanoleucos brevirostris	Little shag	1	1	0.02
Aythya novaeseelandiae	New Zealand scaup	1	1	0.02
Pelacanoides urinatrix urinatrix	Common diving petrel	1	1	0.02
Anas platyrhynchos platyrhynchos	Mallard	1	1	0.02
Puffinus tenuirostris	Short-tailed shearwater	1	1	0.02
Pelagodroma marina	White-faced storm petrel	1	1	0.02
Procellaria parkinsoni	Black petrel	1	1	0.02

TABLE 1 (end). – Relative abundance of fauna at Te Hoe (after James-Lee 2006).

Taxon	Common name	NISP	Total MNI	Total MNI %
Larus bulleri	Black-billed gull	1	1	0.02
Nestor meridionalis	Kaka	1	1	0.02
Diamedea sp.	Mollymawk sp.	1	1	0.02
c.f. Pterodroma magentae	c.f. Chatham taiko/magenta petrel	1	1	0.02
Callaeas wilsoni?	North Island kokako?	1	1	0.02
Anatidae sp.	Duck sp.	1	0	0.00
Procelleriidae sp.	Petrel sp.	1	0	0.00
Spheniscidae sp.	Penguin sp.	2	0	0.00
Puffinus sp.	Shearwater sp.	1	0	0.00
Bird sp.	Bird sp.	196	0	0.00
Indigenous bird total		**298**	**24**	**0.55**
Gallus gallus	Chicken	14	2	0.05
Exotic bird total			**2**	**0.05**
Ovis aries	Sheep	395	11	0.25
Sus scrofa	Pig	251	6	0.14
Rattus sp.	Rat	24	5	0.12
Trichosurus vulpecula	Brushtail possum	20	2	0.05
Canis familiaris	Dog	21	1	0.02
Bos taurus	Cattle	19	1	0.02
Oryctolagus cuniculus	Rabbit	19	1	0.02
Felis catus	Cat	11	1	0.02
Canis familiaris?	Dog?	2	1	0.02
Medium mammal sp.	Medium mammal sp.	2947	0	0.00
Medium large mammal sp.	Medium large mammal sp.	75	0	0.00
Small mammal sp.	Small mammal sp.	72	0	0.00
Large mammal sp.	Large mammal sp.	53	0	0.00
Bos taurus?	Cattle?	8	0	0.00
Bos taurus/Equus ferus	Cattle/horse	2	0	0.00
Felis catus?	Cat?	2	0	0.00
Bos taurus/Sus scrofa	Cattle/pig	1	0	0.00
Exotic mammal total		**3922**	**29**	**0.67**
Arctocephalus fosteri	Fur seal	26	2	0.05
Lagenorhynchus obscurus?	Dusky dolphin?	1	1	0.02
Arctocephalus fosteri?	Fur seal?	1	0	0.00
Delphinidae sp.	Dolphin sp.	1	0	0.00
Arctocephalus fosteri/Canis familiaris	Fur seal/dog	1	0	0.00
Indigenous mammal total		**30**	**3**	**0.07**
Assemblage total		15556	4329	100.00

No evidence of butchery was detected on indigenous mammals in the Te Hoe assemblage.

If the MNI of *Sus scrofa* (pig), *Ovis aries* (sheep) and *Bos taurus* (cattle) are added together, the result is a combined total of 0.42% of the total assemblage MNI, or 16.98% of vertebrate MNI. Many fragments from elements such as rib and vertebrae could not be confidently identified to specific taxa, and were placed in taxonomic groups including mammal sp., medium mammal sp., *Ovis aries/Sus scrofa*, large mammal sp., *cf. Ovis aries*, small mammal sp., small medium mammal sp. and *cf. Bos taurus*. These did not contribute to MNI values as they are assumed to be accounted for in MNI totals for securely identified taxa, such as *Sus scrofa* (pig), *Ovis aries* (sheep) and *Bos taurus* (cattle). Analysis of butchery units of beef, pork and mutton that were present in the Te Hoe assemblage indicates that beef was an uncommon luxury; given the narrow range of cattle bones it is likely that the Te Hoe residents traded for their beef, rather than having cows butchered 'on the hoof' at the whaling station (James-Lee

TABLE 2. – Relative abundance of fauna at Oashore (after James-Lee 2006).

Species	Common name	NISP	MNI	% MNI
Mytilidae sp.	Mussel sp.	682	15	42.86
Lunella smaragda	Cats eye	20	3	8.57
Diloma aethiops	Spotted top shell	11	2	5.71
Gastropod sp.	Gastropod sp.	2	2	5.71
Cookia sulcata	Cooks turban	1	1	2.86
Cirripedia sp.	Barnacle sp.	4	1	2.86
Cardiidae sp.	Cockle sp.	1	1	2.86
Bivalve sp.	Bivlave sp.	26	0	0.00
Shell sp.	Shell sp.	672	0	0.00
Indigenous shell total		**1419**	**25**	**71.43**
Notolabrus celidotus	Spotty	1	1	2.86
Fish *(Polyprion oxygeneios?)*	Fish (hapuka?)	1	0	0.00
Fish sp.	Fish sp.	44	0	0.00
Indigenous fish total		**46**	**1**	**2.86**
Larus dominicanus	Black-backed gull	3	1	2.86
Macronectes giganteus	Giant petrel	1	1	2.86
Spheniscidae sp.	Penguin sp.	2	1	2.86
Indigenous bird total		**6**	**3**	**8.57**
Sus scrofa	Pig	44	2	5.71
Ovis aries	Sheep	34	2	5.71
Bos taurus	Cattle	2	1	2.86
Oryctolagus cuniculus	Rabbit	4	1	2.86
Mammal sp.	Mammal sp.	686	0	0.00
Medium mammal sp.	Medium mammal sp.	107	0	0.00
Large mammal sp.	Large mammal sp.	15	0	0.00
Ovis aries?	Sheep?	7	0	0.00
Small mammal sp.	Small mammal sp.	7	0	0.00
Small medium mammal sp.	Small medium mammal sp.	2	0	0.00
Bos taurus?	Cattle?	1	0	0.00
Exotic mammal total		**909**	**6**	**17.14**
Assemblage total		**2380**	**35**	**100.00**

2006). It appears likely that the head was purchased whole, including the jaw, and cooked as a soup or something similar. Pork was more common, and a wide range of elements are represented, indicating that pigs were available locally at Te Hoe, either in a semi-feral state or in a more formal arrangement, such as in a pig pen or sty. The most common pork cut was 'hand', which refers to the shoulder joint. Mutton was by far the most common meat at Te Hoe and reasonably 'meaty' butchery units were consumed by the site occupants. In her research on meat supply in 19th-century New Zealand, Watson (2000) concluded that pork, usually Maori-raised, was the most commonly eaten meat by the earliest European immigrants to New Zealand, supplemented with a variety of indigenous shellfish, fish and birds. Their choice was limited by availability; although attempts at introducing goats began with Cook in 1777 (McNab 1913; Middleton 2005; Thomson 1922), and cattle and sheep were introduced into New Zealand during 1814, they were not widespread. For the colonial settlers (as opposed to the earlier missionaries, sealers and whalers), this situation started to change as bush was cleared and beef and mutton became more widely available, especially in the South Island (Watson 2000). It seems at Te Hoe that the historic assemblage falls into the latter stage, with 1840 the probable date for the beginning of operations of the whaling station. Maori-raised and feral pigs would have been widely available, but sheep were becoming widespread during the period of main activity at the station, about the same time that the (relatively) large scale immigration of the early settlers was occurring.

Table 3. – Relative abundance of fauna at Lagoon Bay (after Lawrence 2002, 2006, 2010).

Taxon	Common name	NISP	MNI	% MNI
Ostrea angasi	Oyster	1258	1258	51.75
Subninella undulata	Turbot shell	963	963	39.61
Shellfish sp.	Shellfish sp.	111	111	4.57
Mytilus planulatus	Mussel	42	42	1.73
Cellana solida	Limpet	17	17	0.70
Notohaliotis ruber	Abalone	6	6	0.25
Pectin meridionalis	Scallop	3	3	0.12
Katelysia scalrina	Cockle	1	1	0.04
Cypraea	Cowrie	1	1	0.04
Indigenous shellfish total		2402	2402	98.81
Arripis trutta	Salmon	2	1	0.04
Pagrus auratus	Snapper	3	1	0.04
Medium fish sp.	Medium fish (1-5kg)	4	1	0.04
Small fish sp.	Small fish (<1kg)	27	1	0.04
Indigenous fish total		36	4	0.16
Puffinus tenuirostris	Mutton bird	5	1	0.04
Medium bird sp.	Medium bird (1-5kg)	37	1	0.04
Small bird sp.	Small bird (<1kg)	9	1	0.04
Indigenous bird total		**51**	**3**	**0.12**
Gallus gallus	Chicken	1	1	0.04
Exotic bird total		1	1	0.04
Trichosurus vulpecula	Brushtail possum	9	2	0.08
Arctocephalus pusillus	Australian fur seal	2	1	0.04
Bettongia gaimardi	Eastern bettong	23	1	0.04
Dasyurus viverrinus	Native cat	1	1	0.04
Permelidae sp.	Bandicoot sp.	1	1	0.04
Rattus lutreolous	Swamp rat	3	1	0.04
Vombatus ursinus	Wombat	1	1	0.04
Pseudocheirus peregrinus	Ringtail possum	1	1	0.04
Macropus sp.	Kangaroo sp. (sml 1-8kg)	12	3	0.12
Indigenous mammal total		**53**	**12**	**0.49**
Ovis aries	Sheep	208	5	0.21
Sus scrofa	Pig	13	2	0.08
Bos taurus	Cattle	150	1	0.04
Oryctolagus cuniculus	Rabbit	1	1	0.04
Exotic mammal total		**372**	**9**	**0.37**
Assemblage total		**2915**	**2431**	**100.00**

Oashore

Oashore has a very small assemblage with a total MNI of 35, so interpretation from results is tentative at best. It is unlikely that this is the result of sampling error, as every suspected feature at the site was investigated (Ian Smith pers. comm.). The Oashore assemblage MNI is dominated by shellfish, but at lower levels than Te Hoe, with 71.43% (Table 2). The most common taxon is Mytilidae (mussel) at 43.86% of MNI. Amongst the vertebrates, exotic mammals are the dominant class with 17.14% of total MNI, or 59.99% of vertebrate MNI. As at Te Hoe, many element portions could not be identified to species and have been described under broader taxonomic groups, such as *Sus scrofa*/*Ovis aries* or medium mammal; these generally do not contribute to MNI values. Indigenous bird makes up 8.57% total MNI, or 30.00% of vertebrate MNI. Fish constituted the remaining 2.86% of total MNI, or 10.01% of vertebrate MNI. There are no indigenous mammals or exotic birds present. In terms of relative frequencies, it can be cautiously suggested that shellfishing was the most common subsistence activity, but in the light of its coastal location the low numbers of both shellfish and fish is quite striking.

Lagoon Bay

Lagoon Bay has an overall NISP of 2915 and an MNI total of 2431, with shellfish contributing 98.81% of the total MNI (and 50.56% by weight) (Table 3). *Ostrea angasi* (oyster) and *Subninella undulata* (turbot shell) are the dominant shellfish species targeted. *O. angasi* was popular with both Aboriginal people and Europeans (Lawrence 2006). Only four individual fish are represented, contributing 0.16% of total MNI (and 0.04% by weight). No single taxon is dominant; *Arripis trutta* (East Australian salmon) and *Pagrus auratus* (snapper) are the only two fish identifiable to species level in the Lagoon Bay assemblage. *A. trutta* could have been caught from shore, while *P. auratus* could have been caught from whale boats in deeper waters (Lawrence 2006). Indigenous bird is another small class in the Lagoon Bay assemblage at 0.12% of total MNI (and 0.22% by weight), contributing only three individuals; *Puffinus tenuirostris* (mutton bird) was the only specimen identifiable to species. The remains of both fish and bird were poorly preserved (especially compared with Adventure Bay) and it is likely that the relative abundance is unrepresentative. Indigenous mammal is the largest vertebrate class, totalling 0.49% of total MNI (but only 1.02% by weight). Although there are a wide variety of species, there are very few of each kind. *Macropus* sp. (small kangaroo) and *Trichosurus vulpecula* (brushtail possum) are the two more frequent indigenous mammal species, and are likely to have been hunted for food (Lawrence 2006). Chop and cut marks, indicative of butchery, are present on one specimen each of *T. vulpecula, Macropus* sp., *Permelidae* sp. and *Vombatus ursinus* (Lawrence and Tucker 2002: 29).

The smallest of all the faunal classes, exotic bird, contains only one individual, *Gallus gallus* (chicken) contributing 0.04% of total MNI (and 0.01% of total weight). The exotic mammal class is more substantial, contributing 0.37% of MNI (and the largest weight class at 48.14%) for the Lagoon Bay assemblage. *Ovis aries* (sheep) is the most common species, followed by *Sus scrofa* (pig) and *Bos taurus* (cattle). However the NISP counts indicate that more beef may have been consumed than mutton, taking into consideration the greater meat to bone ratio of cattle (Lawrence 2006). Goat (*Capra hircus*) meat was not listed in supplies provided by Kelly (Lawrence 2002) and it is unlikely that goats were kept on the station. *Oryctolagus cuniculus* (rabbit), like chicken, appears to have played a minor, supplementary role in the diet. Element analysis indicates that sheep were likely kept and butchered on site, while some of the cattle were butchered off-site (Lawrence 2006).

Adventure Bay

The Adventure Bay assemblage total NISP is 10,938 and the total MNI is 7,319. Indigenous shellfish account for 98.82% of the total MNI (and 22.73% of weight), with *Subninella undulata* (turbot shell) the dominant species (Table 4). The indigenous fish class is substantial, making up 0.34% of total MNI (but only 0.31% of weight). *Pseudoeranx dentex* (trevally) and *Pseudolabrus tetricus* (blue-throated wrasse) are the two most common species, followed by *Dinolestes lewini* (long-finned pike). The two latter species could have been caught from the beach or rocks with lines, while the former was more likely caught in deeper waters from whaleboats (Lawrence 2006, 2010). While the Adventure Bay fish assemblage is larger at Lagoon Bay, it is still small and indicates that fishing was probably opportunistic. The indigenous bird class at Adventure Bay is more substantial than at Lagoon Bay, contributing 0.26% of assemblage MNI (or 0.43% by weight). *Eudyptula minor* (fairy or blue penguin) and *Puffinus tenuirostris* (mutton bird) are the two most common species, followed by *Strepera fulignosa* (black currawong). As *P. tenuirostris* was favoured by whalers and Aboriginals it is unsurprising that they are a preferred resource at Adventure Bay (Lawrence 2006, 2010). *E. minor* may have been hunted not only for food and possibly as a source of oil (Lawrence 2006). Evidence of butchery was identified on three indigenous bird species (*E. minor, P. tenuirostris* and *Dromaieus novahollandiae*). The indigenous mammal class again is represented by a wide range of species but in low numbers, and makes up 0.16% of total assemblage MNI (and 0.50% by weight). *Arctocephalus pusillus* (Australian fur seal) would have supplied not only a large amount of meat, but also blubber to render into

TABLE 4. – Relative abundance of fauna at Adventure Bay (after Lawrence 2002, 2006, 2010).

Taxon	Common name	NISP	MNI	%MNI
Subninella undulata	Turbot shell	5969	5969	81.55
Shellfish sp.	Shellfish sp.	482	482	6.59
Mytilus planulatus	Mussel	378	378	5.16
Cellana sollida	Limpet	319	319	4.36
Notohaliotis ruber	Abalone	70	70	0.96
Poneroplax albida	Chiton	8	8	0.11
Nassariidae sp.	Whelk sp.	5	5	0.07
Voluteidae sp.	Volute sp.	2	2	0.03
Indigenous shellfish total		7233	7233	98.83
Pseudoeranx dentex	Trevally	48	4	0.05
Pseudolabrus tetricus	Blue-throated wrasse	13	4	0.05
Dinolestes lewini	Long-finned pike	217	3	0.04
Medium fish sp.	Medium fish (1-5kg) sp.	145	3	0.04
Platycephalus conatus	Deep water flathead	39	2	0.03
Arripis trutta	Salmon	21	1	0.01
Caesioperca rasor	Barber perch	31	1	0.01
Pagrus auratus	Snapper	1	1	0.01
Monacanthidae sp.	Leatherjacket sp.	5	1	0.01
Myxus elongatus	Sand grey mullet	36	1	0.01
Sarda australis	Australian bonito	1	1	0.01
Large fish sp.	Large fish (>5kg) sp.	4	1	0.01
Small fish sp.	Small fish (<1kg) sp.	223	1	0.01
Fish sp.	Fish sp.	10	1	0.01
Indigenous fish total		**794**	**25**	**0.34**
Eudyptula minor	Fairy penguin	23	4	0.05
Puffinus tenuirostris	Mutton bird	12	4	0.05
Strepera fulignosa	Black currawong	9	3	0.04
Dromaius novahollandiae	Emu	9	2	0.03
Larus novahollandiae	Silver gull	2	1	0.01
Colluricincla harmonica	Grey thrush	3	1	0.01
Diomedidae sp.	Great albatross sp.	4	1	0.01
Large bird sp.	Large bird (>5kg) sp.	1	1	0.01
Medium bird sp.	Medium bird (1-5kg) sp.	12	1	0.01
Small bird sp.	Small bird (<1kg) sp.	27	1	0.01
Indigenous bird total		**102**	**19**	**0.26**
Macropus sp.	Kangaroo sp. (sml 1-8kg)	46	2	0.03
Arctocephalus pusillus	Australian fur seal	4	1	0.01
Dasyurus viverrinus	Native cat	1	1	0.01
Hydomys chrysogaster	Water rat	4	1	0.01
Muridae sp.	Rats and mice	1	1	0.01
Permelidae sp.	Bandicoot sp.	3	1	0.01
Rattus lutreolous	Swamp rat	2	1	0.01
Thylogale billardieri	Tasmanian pademelon	1	1	0.01
Trichosurus vulpecula	Brushtail possum	5	1	0.01
Vombatus ursinus	Wombat	1	1	0.01
Pseudocheirus peregrinus	Ringtail possum	6	1	0.01
Indigenous mammal total		**74**	**12**	**0.16**
Gallus gallus	Chicken	3	1	0.01
Exotic bird total		**3**	**1**	**0.01**
Ovis aries	Sheep	1253	13	0.18
Bos taurus	Cattle	1238	6	0.08
Oryctolagus cuniculus	Rabbit	74	5	0.07
Sus scrofa	Pig	131	5	0.07
Exotic mammal total		**2696**	**29**	**0.40**
Assemblage total		**10902**	**7319**	**100.00**

TABLE 5. – Relative abundance of fauna at Cheyne Beach as indicated by bone weight (after Gibbs 1995).

Taxon	Common name	Total weight (g)	% Total weight
Nerita atramentosa + *Austrocochlea constricta*	Periwinkles	10544	33.54
Shell sp.	Shell sp.	3143.6	10.00
Haliotis (roei?)	Abalone	1301.5	4.14
Patella laticostata	Limpet	1006.3	3.20
Thais orbita	Thaid	867.7	2.76
Phalium pauciruge	Helmet shell	837.7	2.66
Turbo torquatus	Turbo	329.3	1.05
Oliva australis	Olive shell	235.1	0.75
Naticidae	Moon snail	146.7	0.47
Indigenous shell total		**18411.9**	**58.56**
Fish sp.	Fish sp.	772.2	2.46
Indigenous fish total		**772.2**	**2.46**
Mammal sp.	Mammal sp.	5827.6	18.53
Ovis aries	Sheep	5465.1	17.38
Sus scrofa	Pig	245.6	0.78
Bos taurus	Cow	182.6	0.58
Phocidae sp.	Seal sp.	135.1	0.43
Delphinidae sp.	Dolphin sp.	54.2	0.17
Oryctolagus cuniculus	Rabbit	1.4	0.00
Exotic mammal total		**11911.6**	**37.88**
Setonix brachyurus	Quokka	235.3	0.75
Indigenous mammal total		235.3	0.75
Bird sp.	Bird sp.	110.5	0.35
indigenous bird total		**110.5**	**0.35**
Assemblage total		31441.5	100.00

oil; the remainder of the species are much smaller (and may not have been deposited as a result of human subsistence activity), and only *Macropus* sp. (small kangaroo) is represented by more than one individual (Lawrence 2006). The latter was popular with colonial settlers who hunted them for both sport and meat; in Tasmania *Macropus major* (Forester kangaroo) and *Macropus giganteus* (eastern grey kangaroo) were almost hunted to extinction by the 1850s (Lawrence 2010). Three indigenous species (*Permelidae* sp., *Macropus* sp. and *A. pusillus*) show evidence of cut marks in the Adventure Bay assemblage (Lawrence and Tucker 2002: 29).

The exotic bird class is again the smallest in the Adventure Bay assemblage, contributing just 0.01% of total MNI (and 0.01% by weight). Only one individual is represented – chicken. The exotic mammal class is much more significant, contributing 0.40% of total MNI (and 76.02% by weight). Sheep is the dominant species, followed closely by cattle. Like Lagoon Bay, goat (*Capra hircus*) meat was not listed in supplies provided by Kelly to the whalers (Lawrence 2002) and it is unlikely that goats were kept on the station. It is likely that beef was eaten more often than mutton at Adventure Bay, because of the higher meat-to-bone ratio of cattle (Lawrence 2006). Pig and rabbit are also present in significant numbers; the latter was introduced into Van Dieman's Land in 1820s as an intended food source (Lawrence 2006). Analysis of element representation suggests that sheep were kept and butchered on site, while beef and pork were brought on to the site as 'salt meat' (Lawrence 2006, 2010). The native land mammal proportion is much lower at Adventure Bay compared to Lagoon Bay. This could be perhaps because the Adventure Bay site had better access to food supplies, such as a farm run by the station owner at the north end of Bruny Island, and therefore had less need to rely on native animals in their diet. However, native birds were more common at Adventure Bay than at the other sites; reasons for this are unclear but may include better local conditions for the preservation of bird and fish bone.

Cheyne Beach

It is important to note that the importance of the shellfish class in relative abundance is exaggerated when measured by weight. In the Cheyne Beach assemblage, shell was the heaviest class, making up 58.56% of weight (compared to 50.56% and 22.73% at Lagoon Bay and Adventure Bay respectively), with intertidal rock-dwelling *Nerita atramentosa* (black nerite) and *Austrocochlea constricta* (ribbed top shell) the most common species (Table 5). Fish were the most common native vertebrate class at Cheyne Beach, but only contributed 2.46% of weight (compared to 0.04% and 0.31% at Lagoon Bay and Adventure Bay respectively), and no elements were identifiable to species. Although fish remains are relatively abundant, there was no evidence of fish hooks or other artefacts associated with fishing excavated, suggesting that perhaps nets were used or that fish were traded from nearby Bald Island. Few bird remains were recovered, contributing only 0.35% of MNI (compared to 0.22% and 0.43% at Lagoon Bay and Adventure Bay respectively); no remains were identified to species. Bird bone appears to have suffered from post-depositional attrition, making conclusions difficult to draw. However, on the results observed it seems that bird was not a dietary staple. Birds and small mammals are likely to be under-represented here because of their lower bone densities. The indigenous mammal class consists of one species, *Setonix brachyurous* (quokka), contributing 0.75% of total assemblage weight (compared to 1.02% and 0.50% at Lagoon Bay and Adventure Bay respectively). Quokka represents the most likely target for regular hunting, though they were unlikely to have been a staple. The exotic mammal class was the second heaviest faunal class at 37.88% of total weight (compared to 48.14% and 76.02% at Lagoon Bay and Adventure Bay respectively) with sheep dominant. Gibbs notes that it is unlikely that goat (*Capra hircus*) could be present in the assemblage as census data for Albany record no goats in the period 1845-850; between 1855 and 1875 goats never reached higher than 48 in total, in comparison with 124,005 sheep by 1875 (Gibbs 2005: Table 6). At Cheyne Beach it seems likely that sheep were slaughtered and butchered on site (Gibbs 1995, 2006). Gibbs suggested that salted meats were possibly consumed, due to the abundance of short sections of rib. Cattle were much less common and butchery patterns for beef were not discussed. It was not clear whether rabbit was consumed at the site or was deposited through natural rabbit burrowing. At Cheyne Beach the bone weights indicate a greater meat yield of indigenous mammals compared to indigenous birds and fish. This calorific yield advantage would have made mammals more attractive for hunting and supplementing the whalers' regular provisions.

DISCUSSION

On board pelagic whale ships, provisions included pork and beef, which were kept in heavily salted water in 300-pound casks. When needed, the beef or pork cuts were soaked for a week in seawater to reduce the salt content to edible levels and often boiled or cooked in a stew. Fatty cuts of salt beef or pork rendered lard and grease during boiling, which was skimmed off, referred to by whalers as 'slush'. Slush was an important source of calories for men rowing for an entire day, or towing a whale in calm seas and then during the 12 hour cutting-in and trying-out process, on top of the daily work of a sailor (Gifford 1998). Another staple on whale ships was 'seabiscuit' or 'hardtack', brought abroad in casks, which was made from a flour-and-water dough, unsalted and unleavened, and then baked and dried. It had a long storage life but was extremely hard to bite through; sailors either soaked it in soup or coffee, or broke it into small pieces. Cooks also used the ground up hardtack as a thickener. While there is much in the historical literature that describes the dreary and often inedible diet of whalers, Gifford (1998) details how their diet was supplemented with fish, birds and even seals while at sea, and provisions were restocked whenever ships called into port. Due to the demanding nature of whaling work, a diet high in energy and of good standard was required to keep whalers working at their peak, ensuring a better return for the financers (Gifford 1998).

Shore-based whalers had the advantages of not being at sea – they could supplement the rations

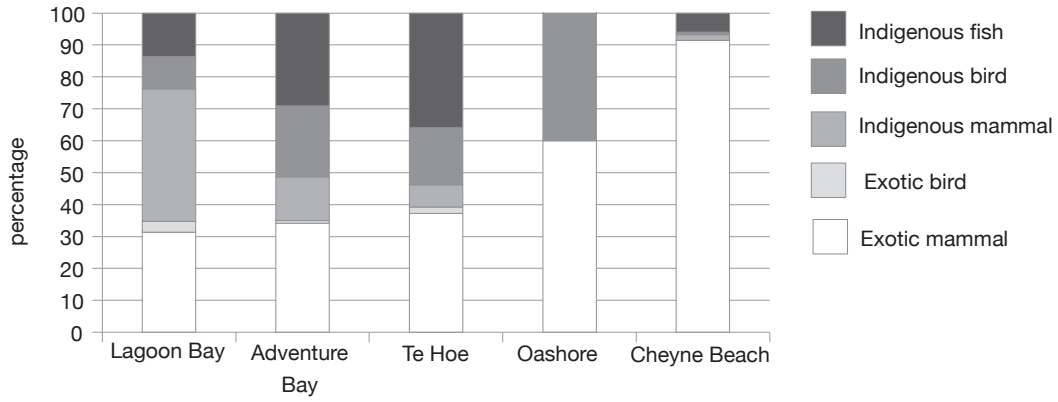

Fig. 2. – Relative abundance of vertebral classes by site (%MNI for the first four sites and %Weight for Cheyne Beach).

supplied by the station owner with easily accessible local resources, whether they be from indigenous mammals, birds, fish and shellfish, or from exotic domestic and feral mammals and birds. Station owners could also provide fresh meat from their own farms in place of salt meat, though this depended on the owner and the location of the station. For example, the owner of the Adventure and Lagoon Bay station, James Kelly, supplied his stations with vegetables and fresh mutton from his own farms (Lawrence 2010). While it has been noted that whalers sometimes cooked their food in whale oil, and some American whalers ate whale meat regularly while British whalers avoided eating it if possible (Mawer 1999), it is unclear whether any of the whalers at the five whaling station sites presented here consumed whale meat. The quantities of meat on a whale carcass mean that butchered meat would be unlikely to leave many, if any, cut marks on elements; the porous, light weight nature of the whalebone relative to its size means that even if cut marks were made, weathering of the whalebone removes any evidence of them. However, marks on whale bones at Adventure Bay suggest that holes were drilled through in order to hang up the bones, which aided the extraction of additional oil (Lawrence 2006).

Table 6 presents all five assemblages by faunal class and relative abundance. These numbers indicate that shellfish gathering was occurring at all five stations; at Oashore *Mytilidae* (mussels) were gathered from rocks; *Lunella smaragdus* (cat's eye), *Cookia sulcata* (cooks turban) and *Melagraphia aethiops* (spotted top shell) were also gathered from rocks at Te Hoe; *Ostrea angasi* (native oyster) may have been gathered from rocks or sand-mud shores at Lagoon Bay; at Adventure Bay *Subninella undulata* (turbot shell) was gathered from rocks; and at Cheyne Beach the intertidal rocks were the habitat where *Nerita atramentosa* (black nerite) and *Austrocochlea constricta* (ribbed top shell) were gathered.

As the shellfish %MNI dominates the assemblages, it has been removed from the assemblage totals in Figure 6.2. The Cheyne Beach assemblage immediately stands out with its high percentage weight value for exotic mammal and low percentages of indigenous vertebrates. Oashore also has a high percentage value for exotic mammal, however indigenous vertebrates still account for 40% of the assemblage MNI. Although present in low numbers, there are elements from low meat yielding extremities of sheep, pig and cattle, indicating that the two former species at least were likely butchered on site, and probably even kept by the whalers themselves. Mutton and then pork were the most common meats, while beef was relatively rare. Similarly, at Te Hoe mutton and pork were also more plentiful than beef, and the former were likely to have been butchered at the station and probably kept on the hoof (James-Lee 2006). At both Lagoon and Adventure Bays, mutton seems to have been butchered locally, while beef and pork were probably brought to the site pre-butchered.

TABLE 6. – Relative abundance of faunal class by site.

Faunal Class	Te Hoe % MNI	Oashore % MNI	Lagoon Bay % MNI	Adventure Bay % MNI	Cheyne Beach % Weight (g)
Indigenous bird	0.64	8.57	0.12	0.26	0.35
Exotic bird	0.07	0.00	0.04	0.01	0.00
Indigenous mammal	0.25	0.00	0.49	0.16	0.75
Exotic mammal	1.33	17.14	0.37	0.40	37.88
Indigenous shell	96.44	71.43	98.81	98.83	58.56
Indigenous fish	1.28	2.86	0.16	0.34	2.46
Total	100.00	100.00	100.00	100.00	100.00

Much of the beef and probably most of the pork that was eaten at Lagoon Bay were likely salted meats, as only 'meatier' bones were found for these taxa (Lawrence 2002). At Cheyne Beach it seems likely that sheep was butchered on site and kept on or nearby the station. Pork was much less common than mutton, and was probably butchered off site. Beef was also less common than mutton and appears to have been brought to the station as salted meat (Gibbs 1995, 2006). The Te Hoe, Lagoon Bay and Adventure Bay assemblages show similar patterns of lower reliance on exotic mammal than Oashore and Cheyne Beach, and also a small supplement of exotic bird (namely chicken), while their use of indigenous vertebrates is much higher.

If the weights of the Australian vertebrate assemblages excluding shellfish are briefly considered, then the exotic proportion is far greater, 98% for both the Tasmanian stations (Lawrence and Tucker 2002: 29) and 78% for Cheyne Beach (Gibbs 2005: 117). The Tasmanian stations exploited a greater diversity of taxa than was the case at Cheyne Beach, but the overall proportion of native species at the latter site was greater, and in all three cases it was a minimal component of the diet.

At Te Hoe in particular, and to a lesser extent Adventure Bay, fishing was a semi-regular if not regularly occurring activity. At Oashore, Lagoon Bay and Cheyne Beach the proportions of indigenous fish is not as high, although this may be a result of taphonomic processes, Oashore and Lagoon Bay have much lower MNI totals. At Lagoon Bay, hunting of a range of indigenous mammal species appears to have occurred, however there is little emphasis on particular species; they appear to have been taken opportunistically, as was the case at Adventure Bay. At Te Hoe, however, marine mammals including *Arctocephalus forsteri* and *Delphinidae* were specifically targeted. Hunting of indigenous birds appears more frequent at Oashore, Te Hoe and Adventure Bay; at Oashore however this distortion may result from the assemblage size. At Te Hoe and Adventure Bay the focus is on marine birds (including *E. minor*, desirable for their oil as well as their meat); although the larger *Dromaius novahollandiae* is also present at Adventure Bay. At these two stations it appears that hunting of marine birds was a semi-regular occurrence. It is interesting to note that at Te Hoe and Oashore, indigenous bird MNI values are low; we know from prehistoric studies (e.g. Smith 2011b) that birds were scarce by late prehistory, especially in the North Island.

CONCLUSION

The immigrant whalers living on New Zealand shore whaling stations found themselves in lands lacking native land mammals, but the sea provided rich seafood resources such as shellfish, fish and sea mammals, while the land supplied bird life. The intermarriage of immigrant whalers with local Maori women meant that the rations of a whaler could be supplemented with the knowledge of the local food economy – both added variety to what were assumedly monotonous and previously limited diets. Pork became an established part of the Maori diet in the 19th century, and this is visible at

Te Hoe; mutton is dominant as the most common meat cut, and points to the later role that mutton and lamb would come to play in the history of the diet in New Zealand, and in its export economy.

In prehistoric and contact period New Zealand, women were the traditional gatherers of shellfish. The Maori wives of the whalers at Te Hoe were likely supplementing the food provisions of their husbands with shellfish and other locally available resources. Although individual shellfish contain small amounts of meat and energy, they were an easily accessible and reliable resource, and would have added variety to the diet. At Oashore it is also likely that this would have also been the case. At Cheyne Beach, there were not only Aboriginal men working at the whaling station, but also the local Aboriginal groups camped by the station to feast on unwanted whale meat. While it is problematic to treat geographically and culturally diverse Aboriginal people as a homogenous cultural group, traditionally it is believed that Aboriginal women were the gatherers of shellfish, plant foods, honey, eggs, small mammals, reptiles, fish, crustaceans and insects. Men on the other hand generally participated in hunting activities, catching large mammals (e.g. kangaroo), birds (e.g. emu), reptiles (e.g. turtles) and fish (O'Dea *et al.* 1991). Pelagic whalers were also known to have gathered shellfish when they mounted shore parties, including clams, oysters mussels and crabs (Gifford 1998). Without historic eye-witness accounts of shellfish gathering at shore whaling stations, it is difficult to draw concrete conclusions; however, it seems reasonable to assume that indigenous women at both New Zealand and Australian stations were more likely to be the main gatherers of shellfish.

Although some Australian whaling crews included indigenous locals (Lawrence 2002: 214; Gibbs 2006: 116), the bi-cultural context of Australian shore whaling stations was somewhat different to their contemporaries in New Zealand. Because Aboriginal groups were traditionally nomadic hunter-gatherers, moving over large areas of land which were much less densely populated than in New Zealand, there was less economic incentive for whalers in Australia to take indigenous wives, and little need for whalers to negotiate with local tribes for land access or protection (although gender ratios of immigrants at the time did make Aboriginal women appealing for companionship) (Gibbs 2003). Additionally, the ecological context was also different in Australia; shore whalers there had access to a variety of indigenous land mammals that were not present in New Zealand. Australian whalers would have been able to supplement their station rations with opportunistic hunting of game such as kangaroo, possum or wombat. Indigenous birds could have also been caught on occasions.

In both countries, if station owners also owned farms they were more likely to provide fresh meat and vegetables to their crews, probably creating less incentive for whalers to hunt and fish indigenous resources, as James Kelly did at Adventure Bay. In addition, whalers, particularly those living with wives and children on site, could tend their own gardens and even raise their own livestock. In New Zealand pigs quickly became a source of trade for Maori with pelagic whalers and other ships; by the mid-1820s pigs were plentiful, by the 1850s feral pigs were widely established throughout New Zealand (Carrick 1902; Wodzicki 1950).

The communities that lived and worked at shore whaling stations in Western Australia, Tasmania and New Zealand adapted to their local resources and cultural contexts; their subsistence activities supplemented and added variety to their daily routines and diets.

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