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HUMAN EXPLOITATION OF THE SHORT-TAILED SHEARWATER (*PUFFINUS TENUIROSTRIS*)

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(with three tables and six text-figures)

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The short-tailed shearwater or Tasmanian muttonbird *Puffinus tenuirostris* (Temminck, 1835) breeds mainly in Tasmania, particularly on Bass Strait islands. In Tasmania it is a partly protected species, subject to annual open seasons.

Aboriginal exploitation of this species is shown by small amounts of material in several archaeological sites in Tasmania and the Australian mainland; such use was limited by seasonal, technological and cultural choice. Present-day Aboriginal Tasmanians view the muttonbirding industry as one of their major social and economic activities.

On the decline of the seal industry established by Europeans in Bass Strait, some sealers settled on the islands hunting game, farming and collecting shearwaters for their livelihood. Throughout the 19th and early 20th centuries, muttonbirding was the mainstay of the local economy, but in the last 60 years the industry has declined considerably, the annual catch falling from one million to about 300 000 chicks.

Key Words: shearwater, muttonbird, Bass Strait islands, Tasmania.

INTRODUCTION

The short-tailed shearwater *Puffinus tenuirostris* (Temminck, 1985), commonly known as the Tasmanian muttonbird, is one of about 100 species in the relatively small order Procellariiformes. This ancient order probably originated from groups of aquatic birds present at the end of the Cretaceous Period, some 65 million years ago (Brodkorb 1971), but the phylogenetic history of shearwaters is little known (Kuroda 1954). The short-tailed shearwater has not been found in any deposits apart from prehistoric archaeological sites (Bowdler 1984, Friedman 1934a,b, 1941, Vanderwal & Horton 1984).

This species is Australia's most abundant seabird and is also one of the most plentiful birds in the high Arctic during the boreal summer. It is linked to Aboriginal and European settlement in Tasmania, due to its importance as a source of food. In Tasmania at present it is a partly protected species, subject to annual open seasons. Commercial muttonbirders take chicks and sell their meat for human consumption, feathers for bedding and proventricular oil for medicinal and stock use; non-commercial or amateur muttonbirders take chicks for food only. Elsewhere in Australia, short-tailed shearwaters are fully protected and not harvested.

The chronology for this review falls into convenient periods. Exploitation is divided into before 1803, 1803–50, 1850–1930 and after 1930. In 1928 the *Animals and Birds Protection Act* was proclaimed. This regulated wildlife, including muttonbird hunting, until 1970.

BIOLOGY

Most information on the biology of short-tailed shearwaters has been obtained from studies on Fisher Island in the Furneaux Group (fig. 1). The small size of the island (1 ha) has enabled all birds to be banded and their lives followed since 1947 (Serventy 1967, 1974, 1977, Naarding 1981, Serventy & Curry 1984, Wooller *et al.* 1988).

The short-tailed shearwater is a circum-Pacific migrant, spending the boreal summer in the region of the Aleutian Islands. It has a precise breeding regime and first appears at breeding colonies about the third week of September. One egg is laid between 19 November and 2 December, the peak of egg-laying being 24–26 November every year. The incubation period is 53 days; the chicks hatch from mid-January onwards. The chick is in the burrow for about 94 days and reaches its maximum weight of approximately 800 g in early April (Lill & Baldwin 1983). Mean age at first breeding is six years. Mean life is 21 years, although birds can live for more than 36 years (author's observation). Annual mortality in adults is approximately 10% and at least 50% of chicks die before breeding.

The breeding range is restricted to eastern Australia, particularly Tasmania. There are 167 colonies known around the coast of Tasmania and

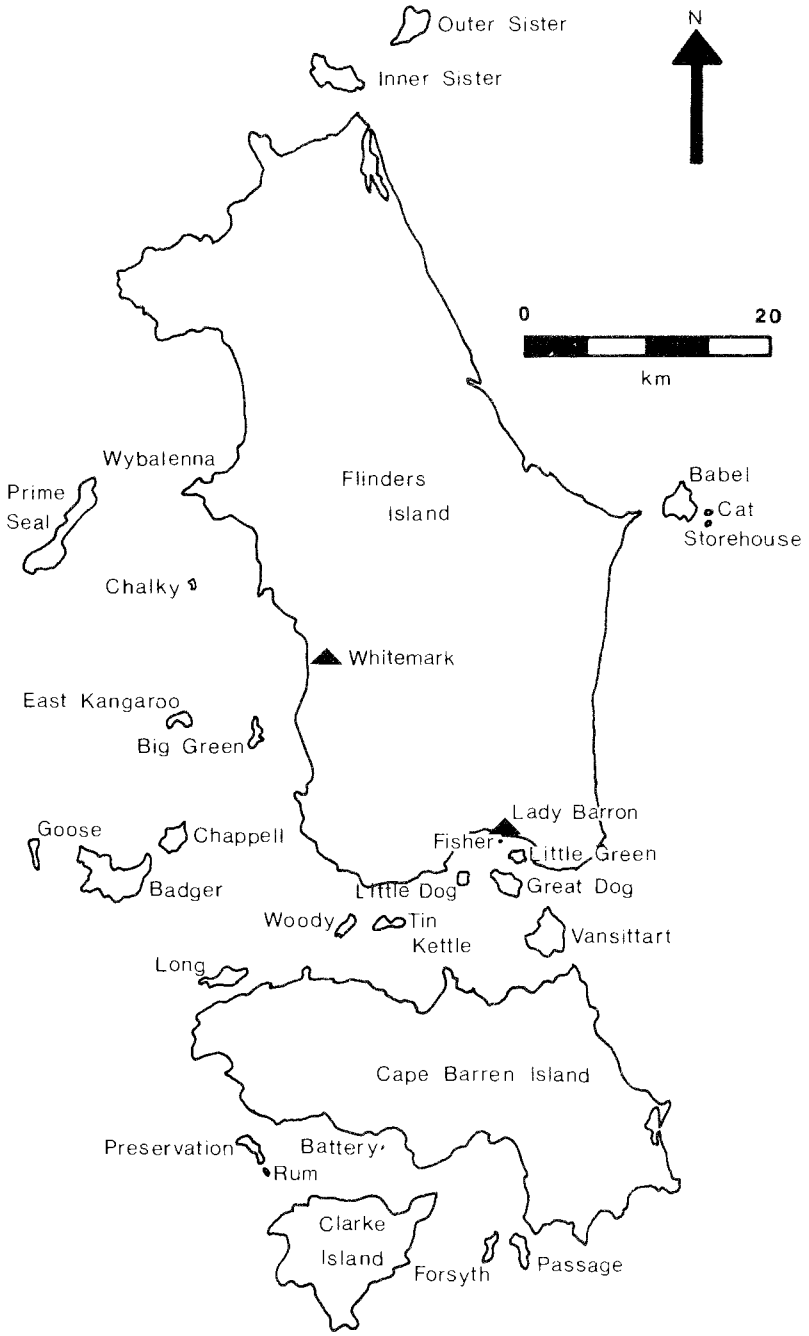

FIG. 1 — Location of place names in the Furneaux Group.

its near offshore islands (fig. 2); it is unlikely that many more colonies remain to be discovered. The total area of colonies is 1527 ha and the number of burrows is estimated at 11.4 million (Skira *et al.* 1986). The largest colony is on Babel Island with an estimated 2.86 million burrows (Towney & Skira 1985). In other Australian States, Victoria has 1.45 million burrows (Harris & Norman 1981), South Australia 1.25 million (A.C. Robinson, pers. comm.), New South Wales 25 700 breeding pairs (Lane 1979) and Western Australia 250 burrows (Lane 1983). Usually 80% of burrows contain eggs and, prior to the harvest season, approximately 50% of burrows contain chicks. The world breeding population of short-tailed shearwaters, based on a total 14.13 million burrows, is 11.3 million breeding pairs, 81% of which are in Tasmania.

EXPLOITATION BY HUMANS

Australia Pre-1803

The present-day Aboriginal population of Tasmania regard the muttonbird industry as one of their major social and economic activities. In this context, muttonbirding has been described as

> "... a traditional seasonal activity, with origins in the pre-history of Tasmania, which developed into an annual happening of significant importance to the Aboriginal communities in Tasmania." (*Tasm. Parl. Pap.* 94, 1978.)

Human occupation in Tasmania and its near offshore islands began about 30 000 years BP (southern Tasmania — Allen *et al.* 1988); later occupation occurred at Cave Bay cave, Hunter Island (23 000 years BP — Bowdler 1984). Ice age hunters in southwestern Tasmania, 20 000 years BP, were the most southerly humans on earth (Kiernan *et al.* 1983). At that time Tasmania was still connected to mainland Australia. The present coastline was formed 7000 to 6000 years ago (Jennings 1971). By the time of European contact, archaeological evidence suggests widespread Aboriginal occupation, with a total population of about 4000 divided among nine tribes.

According to Sutton & Marshall (1980), cultural adaptation by the Tasmanian Aborigines led to a type of settlement pattern and selective coastal hunting strategy similar to that found with Maoris in New Zealand and Morioris in the Chatham Islands. In all these regions, hunting strategies centred on the exploitation of fatty-meat resources (such as seals, albatrosses, petrels and penguins) at the time of year when they were most aggregated, easily taken and fattest. Tasmanian Aborigines did not preserve birds for future consumption, but used the meat immediately.

On the Australian mainland, Aborigines had limited access to shearwater colonies because the colonies were usually on remote, relatively inaccessible islands (Jones & Allen 1979). However, ethnohistorical accounts indicate that, during the early 19th century, some islands adjacent to Wilsons Promontory were visited by Aborigines hunting shearwaters (Smyth 1878, Coutts 1970).

Tasmanian Aborigines were hunter-gatherer people whose technology was elementary but adequate to enable successful adaptation to the wide range of environments in Tasmania. Their economy was marine-orientated for at least certain periods of the year, and the coast formed part of the habitat of every Tasmanian tribe at some stage of its seasonal movements (Jones 1977). They could cross to islands only by canoe/raft or, occasionally, by swimming (Jones 1976, Bowdler 1980). The watercraft were inadequate for reaching more distant islands such as the Furneaux Group and King Island (Jones 1977). Their diet included wallabies, and wombats, while remains of short-tailed shearwaters occur in archaeological sites on Hunter Island in northwestern Tasmania and on Maatsuyker Island and in Louisa Bay in southwestern Tasmania

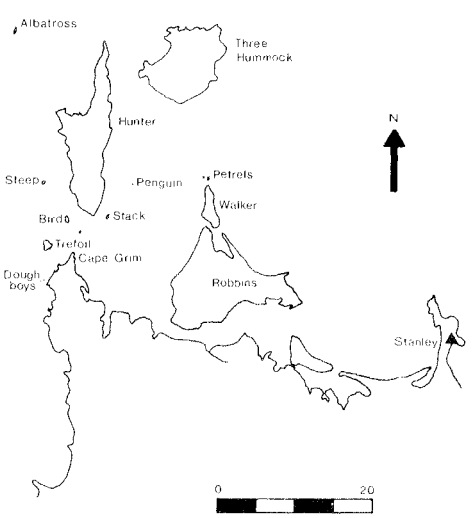

FIG. 2 — Location of place names in the Hunter Group.

(figs 2, 3). Those who lived along the northwestern and southwestern coasts relied on shellfish and foods such as seals, sea birds and land mammals that were available all year round, and land birds.

The level of exploitation of shearwaters at this time can only be guessed. The amount of material present in archaeological sites is typically small in quantity compared with other vertebrate remains (tables 1, 2). At Cave Bay cave on Hunter Island, estimated minimum numbers of short-tailed shearwaters were 67 compared to a total vertebrate faunal component of 4065 that also included 84 wallaby, 104 other medium-to-large marsupials and 2737 rodents (Bowdler 1984). At the nearby Stockyard site, shearwaters contributed 0.23% to the vertebrate fauna, based on body weight (O'Connor 1980). In southwestern Tasmania and Maatsuyker Island, the contribution of shearwaters to the total vertebrate fauna, based on body weights, varied from 1 to 6% (Vanderwal & Horton 1984); when invertebrates are included in the analysis, short-tailed shearwaters make up less than 1%.

The range of possible reasons for the lack of shearwater remains is varied. Perhaps other animals such as seals and wallabies were in greater abundance and more readily captured; perhaps shearwaters did not breed in the same locations or in the same numbers as now; perhaps the Aborigines did consume large numbers of these birds but either the evidence does not survive or sites with such evidence have not been investigated by archaeologists. Bowdler (1979) suggested that the return of shearwaters from their migration in September may have been the signal for Tasmanian Aborigines to go to Hunter Island to obtain seals and other foods. That is, the return of the birds was a signal rather than the principal objective. Gaughwin (1978) indicated that the utilisation of shearwaters was limited by seasonal, technological and probably cultural choice, i.e. preference for varied diet. Lack of knowledge of the prehistoric distribution of shearwater colonies means that interpretation of Aboriginal use of short-tailed shearwaters prior to 1803, based on their present distribution, could be unreliable or even grossly misleading.

European exploitation of short-tailed shearwaters began with the beaching of the *Sydney Cove* in February 1797 between Preservation and Rum Islands in the Furneaux Group. The crew landed safely on Preservation Island and erected their tents near shearwater burrows (Cumpston 1973). The birds and a daily allowance of a cupful of rice constituted a great part of their food during more than five months on the island (Flinders 1814).

Between 2 December 1797 and 25 February 1798, on his first exploratory journey into what was later named Bass Strait, George Bass and a party of six seamen subsisted to a large extent on shearwaters during their 900 km trip around the southeastern coast of mainland Australia. They salted birds for their provisions (*Hist. Rec. NSW.* III: 325). Flinders later (1801) described the shearwater's habitat of coming in "... from the sea in the evening in numbers that surprise a person unaccustomed to them."

Australia 1803–50

Tasmanian Aboriginal muttonbirding at the time of European settlement has been summarised by Gaughwin (1978) from the journals of George Augustus Robinson. Tasmanian Aborigines frequently went to the Hunter Group to collect muttonbirds but were reluctant to go when the birds were not present. Robinson was told they knew it was time to go to the islands when the lightwood tree (*Acacia melanoxylon*) flowered in early spring. According to him, they went from Cape Grim to Trefoil Island, Trefoil Island to Bird Island and Bird Island to Hunter Island (Plomley 1966).

Gaughwin (1978) noted that Tasmanian Aborigines were fond of adult birds, eggs and chicks as food; also muttonbird fat and red ochre were mixed together and smeared on their bodies. The birds were present for seven months but only on the islands and available to only a few tribes, principally those living in far northwestern Tasmania. The details of Aboriginal muttonbirding, however, are unclear as Robinson's journals were written thirty years after sealers had made contact with Tasmanian Aborigines.

Within a short period of European settlement of Tasmania in 1803, the Aboriginal population was reduced by a deliberate campaign of extermination and diseases associated with captivity (Ryan 1981). In 1831, the remaining Tasmanian Aborigines were mustered by George Augustus Robinson and settled at Wybalenna on Flinders Island under government supervision (Plomley 1987). While there, the Tasmanian Aborigines maintained their customs of muttonbirding, collecting birds and eggs during their season, mainly from Big Green Island, with smaller amounts from East Kangaroo, Chalky and Prime Seal Islands (Plomley 1987). Plomley described their internment at the settlement as a "weep in silence" in which the return of the birds was probably the highlight of each year's existence. Robinson arranged a type of economic system at

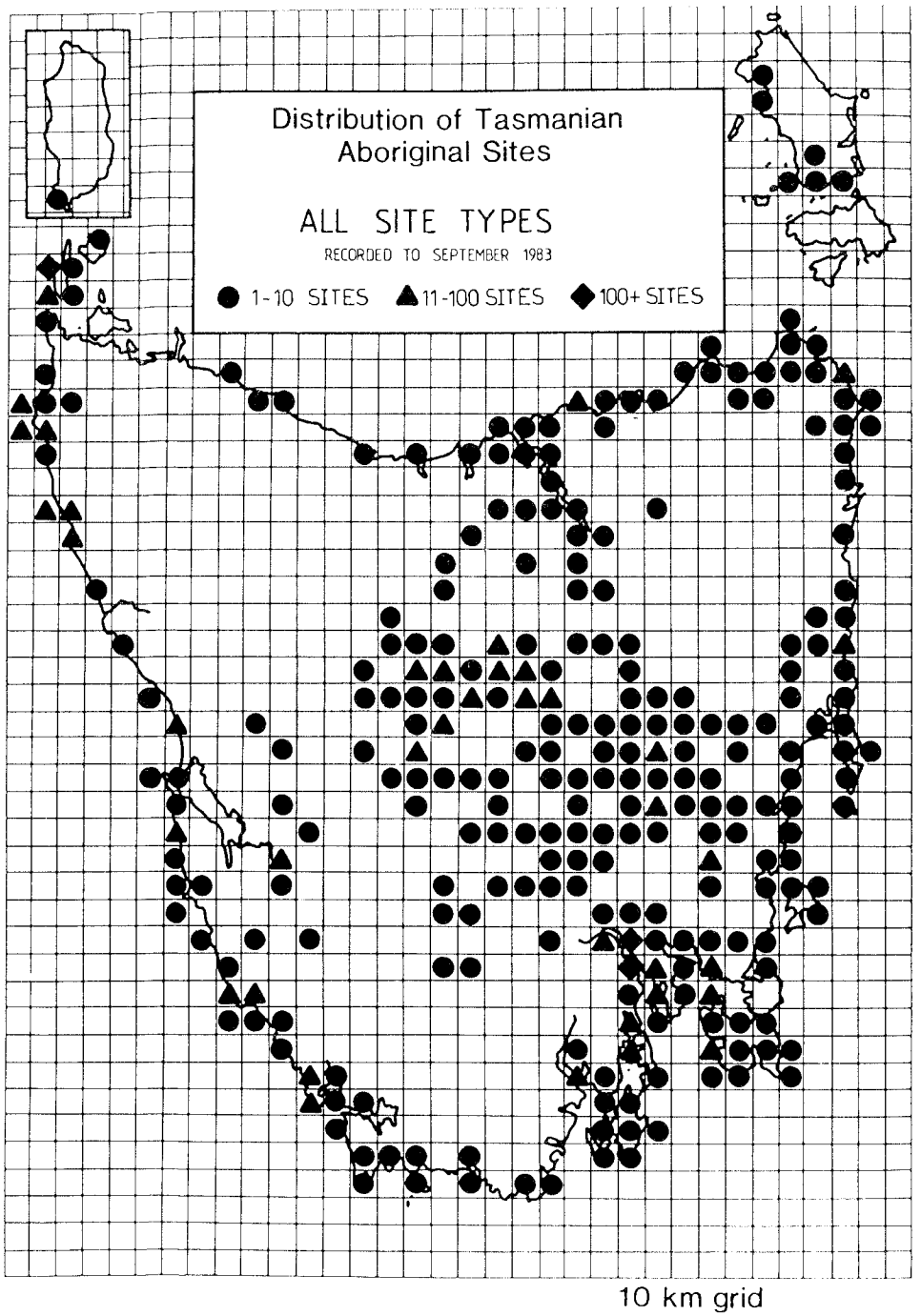

FIG. 3 - Distribution of all Tasmanian aboriginal site types recorded up to September 1983. (Source: Archaeological Section, Department of Parks, Wildlife & Heritage, Hobart, Tasmania.)

TABLE 1
Occurrence of Short-tailed Shearwaters (STSW) and Other Seabirds in Excavated Shell Middens in Tasmania

Site	Layer name	Date (BP) reference	Description
Cave Bay cave	Upper midden	990±90 to 2580±70 (Bowdler 1984)	10 STSW; 1 fairy penguin; 3 albatrosses; 65 other Procellariidae
	Sterile layer	3330±100 to 3960±110	25 STSW; 178 other Procellariidae
	Lower midden	3960±110 to 7180±90	27 STSW; 1 fairy penguin; 60 other Procellariidae
	Upper Pleistocene	6600 to <19 000	5 STSW; 16 other Procellariidae
	Lower Pleistocene	>19 000	3 other Procellariidae
Muttonbird midden		1000 (Bowdler 1979)	7 STSW; 1 fairy penguin
Rookery rockshelter		1370±70 (Bowdler 1979)	14 adult STSW and possibly 5 chicks; 3 other Procellariidae
Stockyard		760±70 (O'Connor 1980)	12 adult STSW; 1 fairy penguin; 1 white-capped albatross; 4 Australian pelicans; 11 diving petrels; 3 fairy prions; 5 black-faced cormorants; 1 Pacific gull
Little Duck Bay		800–1000 (Bowdler 1979)	7 STSW; 4 fairy penguin; 1 white-capped albatross; 1 cormorant
Louisa River 1		2970±200 (Vanderwal & Horton 1984)	27 STSW; 7 white-capped albatross; 42 fairy prions
Louisa River 2		2580±100 to 2830±155 (Vanderwal & Horton 1984)	9 STSW; 1 fairy penguin; 5 white-capped albatross; 6 fairy prions
Louisa River cave 1		No date (Vanderwal & Horton 1984)	4 STSW; 1 intermediate-sized penguin; 1 white-capped albatross; 1 fairy prion
Louisa River cave 2		870±90 (Vanderwal & Horton 1984)	28 STSW; 3 fairy penguin; 1 small albatross; 46 fairy prions; 1 diving petrel
Louisa Creek 1		1250±100 (Vanderwal & Horton 1984)	1 STSW
Maatsuyker Island		400±90 to 570±100 (Vanderwal & Horton	310 STSW; 4 fairy penguins; 10 white-capped albatross; 60 fairy 1984)prions
Tasman Island		Note date (Harris 1984)	STSW — possibly due to human occupation

TABLE 2
Occurrence of Short-tailed Shearwater (STSW) and Other Seabirds in Excavated Shell Middens on the Australian Mainland

Site	Date (BP) reference	Description
Captain Stevensons Point, Victoria	approx. 650±80 (Coutts *et al.* 1984)	4 *Puffinus* sp.; 6 albatross; 1 gannet
Burrill Lake, NSW	<1660 (Lampert 1971)	1 STSW
Currarong, NSW	1970±80 to 3740±100 (Lampert 1971)	21 STSW
Durras North, NSW	480±80 (Lampert 1966)	Numerous bone-points and unworked bone
Bass Point, NSW	Upper midden, 1379±150 (Bowdler 1970)	15 STSW, bone points
Seton, SA	10 940±160 to 16 110±110 (Hope *et al.* 1977)	1 *Puffinus* sp.

Wybalenna whereby for the sale of salted muttonbirds, wool, wallaby skins and their labour, Aborigines were given credits that they could exchange for items from the settlement. By 1847, only 45 Aborigines remained alive. The settlement at Wybalenna was closed and the survivors removed to Oyster Cove near Hobart (Ryan 1981).

The discovery of numerous seals in Bass Strait in the 18th century led to their exploitation in a short-lived industry. On its demise, European sealers began to settle permanently on islands in Franklin Sound and near Cape Barren Island. These small islands had many attractions of position and natural resources, especially the shearwaters, which could supply both subsistence and a cash crop (Murray-Smith 1973). With small farming, vegetable growing and some hunting (wallabies and seals) a diverse economic base was provided and the abundance of shearwaters, which were present for seven months of the year, gave the settlers a reliable, precise and seemingly endless resource to exploit.

The sealers took Aboriginal women from Tasmania and mainland Australia for wives. John Boultbee, an English adventurer who lived amongst them for several months in 1823, described the muttonbird as follows (Begg & Begg 1979):

> "a nourishing sort of food when eaten with potatoes, to such constitutions as those who are inured to a life of hardiness. At a certain time of the year they grow lean which is the best time for plucking the feathers and a black woman will pluck 500 birds per day for her work — the feathers are usually sold for flour, spirits, etc."

From the Furneaux Group Boultbee sailed to King Island and to islands off Victoria. Disgusted with his fellow companions, he tried a solitary existence on Phillip Island but eventually his lack of wilderness experience caused him to destroy a shearwater colony by fire (Begg & Begg 1979).

James Backhouse and his fellow Quaker missionary, George Walker, visited the Furneaux Group in 1832. In those days feathers were the main product obtained from adult birds; a method of catching the birds is described by Backhouse & Taylor (1862):

> "a pit is dug near the sea-shore, six or eight feet square, and half that depth. A hedge of shrubs or sticks is formed in two lines, enclosing a great number of the holes, and converging towards the pit. A similar hedge is erected on the far side of the pit to hide the view of the ocean. A few men take their stations at the end of the enclosure furthest from the excavation, and when the birds sally forth in the morning, they urge them onwards towards the pit. Being unable to hide among the grass and scrub that surrounds them, they tumble into the pit one after another, and are suffocated."

Preservation, Woody and Vansittart Islands were the principal homes for the Europeans, who had resided permanently in the area since about 1815. In about 1839, the price received for feathers was 3d a pound (Stokes 1846) but several years later only 2d a pound (Elwes 1854). Stokes noted that the cargo of two boats he saw consisted of 30 bags, each weighing nearly 30 pounds or "the spoil of 18 000 birds". Apart from feathers the European sealers collected adult birds to salt or smoke, eggs in November–December and fledglings for their oil and fat. The young birds were either salted after being plucked and cleaned or smoked and dried in the large chimneys of the huts (Broadfoot 1845). Occasionally huts were destroyed when the chimney or roof caught alight (*Launceston Examiner* 30 May 1899). The sealers sailed to Launceston two or three times a year to sell their goods at the markets and returned with stores for the next six months (Stokes 1846). The oil was sold in Launceston from 4s. to 4s.6d. a gallon (Elwes 1854) and mainly used in lamps. Later, as technology caught up with the 19th century, it was also used for machinery, railway engines and carriages, and medicinal purposes, while the fat was used for soap-making, in foundries for smelting, tanning and for machinery (*Launceston Examiner* 26 April 1892).

The first fifty years of the 19th century were a period of establishing permanency of occupation. Government interferences from Hobart came through Robinson, who wanted the Furneaux Group for Aboriginal settlement and all sealers to be deported. An Act was passed requiring sealers and others to depart the Straits (*6 William IV No. 15*, 1836, repealed by *26 Victoria No. 5*, 1863), but it had little influence on settlement of the islands.

Australia 1850–1930

During the 19th century and the early decades of the 20th century, muttonbirding was the mainstay for the Islanders. Other employment came from hunting wallabies, sealing, making shell necklaces, shearing sheep and gathering resin from grasstrees *Xanthorrhoea australis* for varnish. Occasionally whale strandings were utilised (Skira 1987). Initially most people went to Chappell Island with their goods, chattels, cats and dogs. Towards the early part of the 20th century, Babel Island became the focus of muttonbirding.

The season extended over a period of seven weeks and was a family affair. The men caught the birds, the children cut off wings and feet, and the women plucked, scalded and helped to open and pack the birds in brine. Muttonbirding was a very social occasion, an opportunity for families to renew friendships with other seldom-seen families. The strong social tradition continued even as late as the 1930's, when activities such as dances were still held on Saturday night on Great Dog Island during the season (Dorothy Cook, pers. comm.).

The subsistence life of the Islanders was a bush economy which Robinson & Ghostkeeper (1987) described as a livelihood reliant on renewable-resource gathering and harvesting. Such an economy results in a strong relationship between human social groups and their resource base (Usher & Wenzel 1987), in this case shearwaters and wallabies. Work, leisure, family life and living become intertwined into cohesive whole which, according to Robinson & Ghostkeeper (1987), tends to be information rich and mass poor. Other features of people involved in a bush economy are that the household unit is generally more stable over time and endures for many years. The Islander community of Bass Strait exemplifies these features, for it lasted well over 100 years and the social differences between it and other Tasmanians always made the Islanders conspicuous, surviving all attempts to make its people conform to the 'norm'.

The number of Aboriginal Tasmanians living on the Furneaux Islands through the century is difficult to establish. Broadfoot (1845) said, in June 1844, there were five to six huts and 15 to 16 people on Woody Island. In September 1849, Elwes (1854) counted six houses, six adults and four children on Vansittart Island. The total population was probably not more than 50 to 60 during the 1850's. In 1870, 84 or 35% of the total population were Aboriginal Tasmanians (table 3). This percentage was the highest ever achieved and was only approached in 1933, a decade to be recalled later as the "good times" (Ryan 1981). The main occupations of Aboriginal Tasmanians living on Cape Barren Island early in the 20th century were labouring and hunting, including muttonbird harvesting (fig. 4). For example, hunters constituted 42% of the work-force on Cape Barren Island in 1909. Labouring soon became the main occupation, although census data show that trapping was still important in the 1920's. Other occupations were boat-building, carpentering, mining, farming, while all women did domestic or home duties. These occupations were temporarily suspended during the muttonbird season, when everyone joined in the harvest. Later on, from the 1930's, most people depended on government handouts for year round support so muttonbirding must have given them some

TABLE 3
Population Statistics for the Furneaux Group

Year*	Population		Total	Aborigines		Population 20+ years	
	Male	Female		Male	Female	Male	Female
1870	138	104	242		84	59	49
1881	137	115	252	–	–	–	–
1901	–	–	–	79	78	–	–
1911	366	250	616	–	–	215	111
1921	522	383	905	82	68	289	231
1933	567	436	1003	139	112	328	224
1947	471	382	853	105	76	297	223
1954	574	453	1027	–	–	347	243
1961	814	593	1407	–	–	460	298
1966	703	531	1234	–	–	417	285
1971	533	435	968	–	–	340	279
1976	509	448	957	–	–	342	288
1981	538	501	1039	–	–	351	315
1986	521	489	1010	45	49	355	335

* Sources: 1870–1901, *Tas. Parl. Paps.*; 1911–86, Australian Bureau of Statistics.

independence and extra cash to buy things which otherwise were out of reach.

The best accounts we have of this unique Islander community are from the writings of Church of England missionaries such as Nixon (1857), Reibey (*Tasm. Parl. Pap.* 17. Legislative Council 1862 Letter from the Venerable Archdeacon Reibey, on the subject of the half-caste islanders in the Straits; *Tasm. Parl. Pap.* 48. Legislative Council 1863 Half-caste islanders in Bass's Straits Report of the Ven. Archdeacon Reibey), Montgomery (Ryan 1981; Hart 1963) and, in particular, Cannon Marcus Brownrigg who visited the islands on 13 occasions between 1872 and 1885 (Murray-Smith 1979). Bishop Nixon had nothing to say about muttonbirding, as he arrived after the season, but he had several restless nights on Vansittart Island due to the smell of his muttonbird feather mattress and the "incessant invasion of fleas" from it. In 1862, Archdeacon Reibey found the Islanders simple and primitive, free from the vices of more civilised life (*Tasm. Parl. Pap.* 17. 1862). Sixty-five people attended one of his church services on Chappell Island. Ten years later, on Chappell Island, Brownrigg held a service in the third week of February for 30 people who had begun to gather for the muttonbird season. The schoolmaster had even erected his tent on the island to continue teaching the children (Murray-Smith 1979).

Brownrigg could never reconcile himself to muttonbirding. He was revolted by the activities and the smell. On his first visit in 1872 he described Chappell Island as very bleak and barren looking, and infested with snakes (Murray-Smith 1979). He

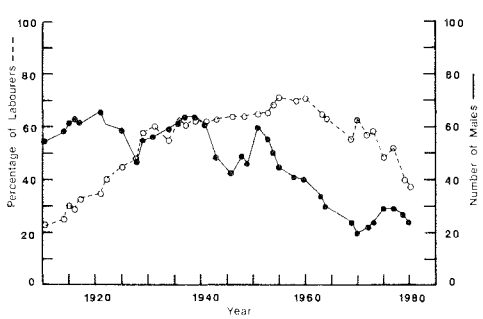

FIG. 4 — Variation in number of males, 20 years and over on Cape Barren Island, and percentage of these who occupation was listed as labourer. (Source: Commonwealth Electoral rolls.)

was struck by the crudeness of the huts which he described (Murray-Smith 1979) as:

> "... odd looking structures; they seldom exceeded four feet in height at the walls, and about six feet at the ridge. The sides and roof are made up of light sticks, and covered in with long coarse grass. An opening at the side forms the door, and a few stones built up at one end serves for the fireplace. Grass is then strewed upon the earthen floor, and the habitation is considered to be complete. These huts are tenanted only during the 'season', being manifestly unsuited for the colder portions of the year."

In 1872 the season here consisted of oiling, fatting and salting. Oiling was catching fledglings that were not large enough for processing, obtaining the oil and using the carcase for fatting. On average

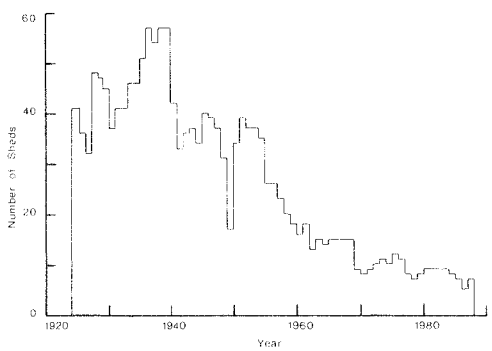

FIG. 5 — Seasonal fluctuations in number of muttonbird sheds in the Furneaux Group, 1924–88.

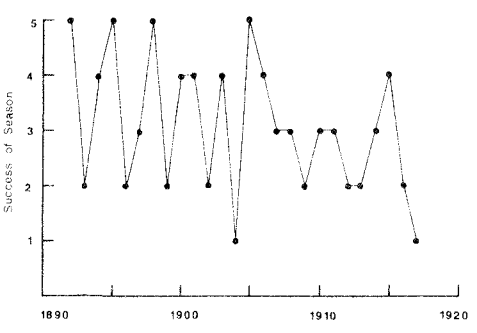

FIG. 6 — Annual muttonbird seasons from 1892-1917. Scale: 1, exceptionally poor season; 2, below average; 3, average; 4, above average; 5, exceptionally good.

100 birds produced one gallon of oil and a good season would yield about 3000 gallons of oil (Murray-Smith 1979). Fatting was trying out the skins in a pot or boiler and collecting the fat; in certain instances pressure was also used in trying out. The third stage was salting, in which birds were salted and packed in barrels. Enough feathers were gathered during the course of this season for no special attack to be made upon the birds, as was done in the early years of the industry. By 1892, oiling and fatting of young fledglings was prohibited and only the entrails of older fledglings reduced (*Launcestion Examiner* 26 April 1892). The season has remained like this up to the present day, except that fat is no longer obtained.

Chappell Island remained the main muttonbirding island for so long because of its large quantity of birds, its accessibility and its close proximity to the settlement on Cape Barren Island and other islands. It had 105 inhabitants in April 1879 (*Tasm. Parl. Pap.* 56. 1879 Bass's Straits: Report of Dr. Vines upon the fever in the islands). In 1890, Bishop Montgomery found 21 families muttonbirding on Chappell Island (Montgomery 1892). Montgomery was an energetic person with great social concern for Aboriginal Tasmanians on the islands (Hart 1963, Stephens 1985) and also showed much interest in the fauna, especially short-tailed shearwaters. He prevailed upon the Government to bring in the first laws governing the season, in which muttonbirding was only permitted between 20 March and 20 May (*Tasm. Gov. Gaz.* 15 Dec. 1891). Chappell Island probably peaked in the 1890's/1900's; nearly 200 people were engaged in muttonbirding at 20 sheds in 1890 (*Launceston Examiner* 8 May 1890) and 155 in 1908 (*Tasm. Parl. Pap.* 57. 1908 Furneaux Islands: Report upon the state of the islands by Mr. J.E.C. Lord, Commissioner of Police). In 1908 there were only 78 persons employed on Babel Island; however, by 1936 there were 24 sheds operating there and only six on Chappell Island. On other islands in 1936 there were 12 sheds on Great Dog Island, six on Little Green Island and three on Little Dog Island (fig. 5).

Little sailing boats picked up the casks of birds, oil and fat from each shed on the birding islands. They were brought into Launceston, most sold locally and some exported to the mainland or, later, as far away as Germany and New Zealand. There are very few figures for the number of birds caught in the 19th century, the only information available being subjective opinions of correspondents to the *Launceston Examiner* on what sort of season occurred. These opinions have been graded from 1 (exceptionally poor) to 5 (exceptionally good) and

depicted in figure 6; this shows that each season was different but that exceptionally good and bad seasons occurred infrequently.

Time had caught up with the Islanders during the second half of the 19th century. Alienation of the Furneaux Group by Europeans began under the *Waste Lands Acts* of 1861–70. Parts of Chappell Island were leased and stocked (Ryan 1981) and in 1887 land on Flinders Island was made available for sale following a survey of the island (*Tasm. Parl. Pap.* 62. 1887 Report on Flinders' Island, by John W. Brown Surveyor) bringing about a rapid increase in population.

In June 1863 Archdeacon Reibey found 28 men, 27 women and 48 children scattered around the islands (*Tasm. Parl. Pap.* 48, 1863). The first census for the Furneaux Group gathered on 7 February 1870 gave a population of 242 (138 males:104 females) of whom 132 were 16 years or older (table 3). Only 13 men were engaged in farming or seafaring, the remaining adults were either hunters, self-employed or, in the case of women, doing home duties. Less than half the population could read or write. In 1881 the population was 252 (137 males : 115 females). Electoral role figures available since 1910 show that the population of Cape Barren Island increased in the 1920's and then steadily declined (fig. 6). The tradition of hunting, which included muttonbirding, continued after the First World War. In the 1911 census 81 men gave their livelihood as the capture of animals and their products. In 1921, 140 were engaged in hunting but occupations changed over the years as people looked for steady income, mainly as labourers (fig. 6).

Elsewhere in Australia muttonbirding was carried on to any extent only in Victoria, where eggs and chicks were collected principally for home consumption (*Launceston Examiner* 12 April 1873, Campbell 1900). The taking of birds was prohibited there sometime during the 1920's (Lewis 1923).

Australia Post-1930

A decline in the number of muttonbird sheds in the Furneaux Group occurred in the 1930's. This decade was greatly affected by social conditions brought about by the Great Depression which forced people to leave Cape Barren Island and seek work on Flinders Island or Tasmania. Figure 6 shows a steady decline in the number of men on Cape Barren Island from about 60 in 1920 to only 20 in 1980. In the last 60 years, the annual take has declined from almost one million to about 300 000 chicks (Skira 1987). The reasons are mainly social, such as changing eating habits in Tasmania (as people have no longer grown up with a tradition of muttonbirding), increasing expenses and decreasing participation in muttonbirding by younger Aboriginal Tasmanians.

By 1961, when the population in the Furneaux Group was 1407 (table 3), shearwaters had become relatively unimportant economically although the social tradition was still strong (Skira 1987). The value of the 1985 commercial season in Tasmania was $328 000 of which $120 000 was contributed from the Furneaux Group and $208 000 from the Hunter Group.

Hand-in-hand with commercial muttonbirding was the taking of birds purely for home consumption. The taking by amateurs began early in the settlement of Tasmania but became widespread only when shearwaters first began to breed near population centres, approximately 60 years ago. Access to colonies by vehicles and boats became easy, and muttonbirding reached its peak in 1977 when almost 8000 licences were sold. In recent years, the season has only been permitted on the west coast and Bass Strait islands. The daily bag quota is 10 birds on the west coast and 25 birds in Bass Strait.

New Zealand

Thirty-two petrel and seven albatross species breed in the New Zealand region (Readers Digest 1985). A large number of these were once exploited by Maoris and the Morioris (Scarlett 1979, Davidson 1984) and for the most part taken from areas where they breed at present. In fact, the inhabitants found almost every bird edible and even ate specimens (e.g. short-tailed shearwater) washed up on beaches. Today, only the sooty shearwater *Puffinus griseus* and grey-faced petrel *Pterodroma macroptera* are allowed to be taken by Maoris and their descendants, and only the former may be sold commercially. Occasionally the mottled petrel *Pterodroma inexpectata* is taken in association with these (Robertson & Bell 1984).

The short-tailed shearwater has been recovered from two middens in the Chatham Islands (one bird each — Sutton 1979), one at Tiwai Point, South Island (two birds — Sutton & Marshall 1980) and from middens at Tom Bowling Bay, North Island, and at Marfell Beach, South Island (Scarlett 1979); they were all probably gathered from the beach.

Northern Hemisphere

The two principal ethnic groups of the Arctic are the Aleuts and Inuits (Eskimos). The Aleuts did not eat short-tailed shearwaters or did so sparingly. Murie (1959), who spent much time with this group does not mention their harvesting of this species.

Information on use of short-tailed shearwaters by Inuits is conflicting. Portenko (1972) states that despite shearwaters being present in large numbers they are not eaten by local people, giving lack of meat and fat on the birds as the reason. However, short-tailed shearwaters have been found in prehistoric Inuit sites (Friedmann 1934a, b, 1941) – one coracoid each from St Lawrence Island (2000 years old) and Amaknak Island (probably 1000 years old) and two humeri from Cape Prince of Wales (1000 years old). Friedmann (1941) concludes, because of the scarcity of remains, that the short-tailed shearwater was rarely eaten by the Inuits of Cape Prince of Wales region. Murie (1959) mentions that the Inuit inhabitants of St Lawrence Island have certain taboos in connection with eating the bird. However, Robert Day (pers. comm.) writes that Dr Francis Fay, who until recently lived with the Inuits for many years on St Lawrence Island, stated that they do hunt short-tailed shearwaters and find them to be "very fat and very tasty" and that Murie probably obtained secondhand his information that they were taboo.

There is no evidence that short-tailed shearwaters, frequently washed up on beaches along the east coast of Japan, were used for food (Oka & Maruyama 1986), but until recently the Japanese harvested small numbers of the native streaked shearwater *Calonectris leucomelas* which breeds in large numbers, mainly on islands off Honshu.

CONCLUSION

Short-tailed shearwaters have been exploited by humans for thousands of years throughout their migratory range. In Tasmania, archaeological evidence indicates that Aboriginals used them as incidental food to other vertebrates such as seals, wallabies, wombats and wildfowl.

The arrival of Europeans in Tasmania changed muttonbirding from a dietary activity to one on which a bush economy was maintained for many years. The sealers who settled on the Bass Strait islands hunted game, farmed the land and collected shearwaters for their livelihood. The early industry was unaware of the importance of conservation of the birds and adult birds, eggs and chicks were taken from October to May. It was only about the 1860's that muttonbirding became confined to chicks.

Until the 1920's muttonbirding was the main economic activity of Bass Strait islanders. Annual catches of up to one million chicks were reported and over 200 people used to gather on Babel Island alone. The tradition of muttonbirding changed with the advent of the Second World War, when social influences and modern life styles brought altered attitudes. Today, commercial muttonbirding is regarded as a declining industry.

Alongside commercial muttonbirding was the taking of birds for home consumption only. Amateur muttonbirding led eventually to bag limits and other restrictions as hunting pressure became excessive, to the point where, since 1987, it has been restricted to the west coast and Bass Strait Island, and to only two weeks. Over-exploitation, physical damage to colonies and changing social attitudes to muttonbirding or "shearwater slaughter" are some of the causal factors.

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