IMPACT OF COLONIAL SEALING ON SEAL STOCKS AROUND AUSTRALIA, NEW ZEALAND AND SUBANTARCTIC ISLANDS BETWEEN 150 AND 170 DEGREES EAST

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Details of southern elephant seal oil and fur seal and sea lion skin cargoes have been extracted from a large number of secondary sources dealing with Australian and New Zealand maritime history, which in turn referred to numerous primary sources of information. The data were collated and analysed for ten areas in the south-west Pacific region and published recently in two separate larger works. This review is a synthesis and analysis of the impact of the colonial sealing industry on seal stocks in the region, based on those papers, with some minor revisions and reference to works by other authors. Colonial sealing lasted from the late 18th to the mid-19th century and was followed by sporadic hunting until the late 1940s. Southern elephant seals (*Mirounga leonina*) were hunted for their oil; and Australian fur seals (*Arctocephalus pusillus doriferus*), New Zealand fur seals (*Arctocephalus forsteri*), Australian sea lions (*Neophoca cinerea*) and New Zealand sea lions (*Phocarctos hookeri*) were targeted for their skins and some oil. At least 1,081 tons of elephant seal oil were shipped from King Is. between 1802 and 1819, while 8,380 tons were shipped from Macquarie Is. between 1810 and 1919. More than 1.4 million skins of both species of fur seals were harvested between 1792 and 1949, but only 4,000 *Neophoca* and 5,700 *Phocarctos* pelts are recorded as having been shipped by 1840. The Antipodes Islands yielded more than a quarter of the total fur seal skin harvest, and New Zealand and southern Australia each delivered a quarter of the total. Current numbers of the two species of fur seals combined are about a tenth of the crudely estimated size (1.5 million) of the original population. The exploited fur seals and sea lions were probably the same species as occur today at the original sealing localities, apart from Macquarie Is. where the identity of the exploited fur seals remains in doubt. There is some evidence that Maoris and Australian Aborigines hunted seals in pre-European times, resulting in reduced ranges and depleted stocks that were exploited later by colonial sealers.

Key words: elephant seals, oil cargoes, fur seals, sea lions, skin cargoes, exploitation, populations, colonial sealing, aboriginal hunting.

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THIS paper is a condensation and synthesis, with some minor revisions, of two recently published larger works dealing with Australia's colonial sealing industry (Ling 1999a,b). By the early 19th century Australian fur seals (*Arctocephalus pusillus doriferus*), Australian sea lions (*Neophoca cinerea*), New Zealand sea lions (*Phocarctos hookeri*), New Zealand fur seals (*Arctocephalus forsteri*) and southern elephant seals (*Mirounga leonina*) were known to occur in various parts of the Australasian region (here defined as to include Australia, New Zealand and subantarctic islands lying between longitudes 150 and 170 degrees East). The latter two species were particularly abundant on some of the adjacent subantarctic islands. The hunt for fur seals began at the end of the 18th century and very soon all five species of seals were being subjected to heavy exploitation for their skins, blubber oil or both. While the precise identity of the early sealers' quarry at the many sealing localities is not known, it is believed that the sealing industry was based for the most part on the same species in the same areas that they occupy today (Figs. 1, 2). The exception is Macquarie Is. where the identity of the exploited fur seals is still open to considerable doubt (Shaughnessy *et al.* 1988).

Details of oil and skin cargoes appear in numerous publications dealing with Australian and New Zealand maritime history, including those pertaining to the subantarctic islands, e.g. Cumpston (1968, 1974) and McNab (1909) (but see Ling 1999a,b for a more complete listing). These are generally secondary sources of information that have been synthesised into narratives describing various

aspects of our maritime past. They do, however, refer to extensive primary sources such as contemporary newspapers, shipping records, cargo manifests, ships' logs and early historical records from which cargo details have been extracted by the various authors.

Elephant seals were hunted for their oil between 1802 and 1919 at King Is. and some of the neighbouring islands in Bass Strait and at Macquarie Is.; fur seals and sea lions were exploited for their pelts and oil from 1792 to 1948/49; although hunting in the 1920s and 1940s actually was licensed culling of fur seal numbers (McNally and Lynch 1954; Sorensen 1969). As sealing grounds were closely guarded secrets, the early sealers left few records of the identity, distribution and abundance of their quarry from which we can draw comparisons with the situation in regard to contemporary seal populations. Moreover, before commercial sealing began in the late 18th century, pre-European Maoris in New Zealand hunted local seal populations, resulting in significantly reduced distribution and abundance of *A. forsteri* and *P. hookeri* (Smith 1989).

Fig.1. Past and present distribution of fur seals, genus *Arctocephalus*, in Australasian waters; and main areas mentioned in the text. For *A. pusillus doriferus*, solid line depicts current distribution; for *A. forsteri*, unbroken open lines depict current breeding range; broken open lines depict extent of its former range and stragglers in Australia (from Ling 1999b).

Fig.2. Past and present distribution of sea lions *Neophoca cinerea* and *Phocarctos hookeri*, in Australasian waters; and main areas mentioned in the text. Unbroken solid lines depict current known breeding ranges; broken solid lines depict extent of seasonal stragglers; broken open lines depict extent of former ranges (from Ling 1999b).

The purpose of this paper is to summarise the harvests of seal products since the late 18th century in space and time and viewed in the context of the current distribution and abundance of the various exploited seal species. It also contains several minor corrections or additions to the tables in the earlier papers, as well as referring to the works of some other authors not included there.

METHODS

Numerous secondary sources were consulted for details of cargoes of elephant seal oil and fur seal and sea lion skins (see Ling 1999a,b for a full listing) and collated in chronological order. Oil cargoes were cited as tons or gallons - 250 of the latter being deemed to equal one ton. In addition, some cargoes were not quantified but were cited simply as "oil", "a small quantity" or "butts" (1 butt = 96 gallons). Untallied oil cargoes, as these were designated, were calculated as averages of quantified (tallied) cargoes for the year in question (see Ling 1999a for further details). Skin cargoes were either tallied or untallied, the latter being cited variously as "skins", "cargo", "small quantity of skins", "casks" (40 skins), "sacks" (20 skins) or "bundles" (5 skins). Untallied skin cargoes were calculated as averages of all tallied cargoes shipped in a particular decade. Skin numbers were not rounded off, despite the precision implied by not doing so. Percentages, however, were adjusted to the nearest whole number.

Nine sealing areas were designated, somewhat arbitrarily, without regard to political or biogeographic regions as follows: Western Australia (WA), Kangaroo Is., Bass Strait including King Is. (dealt with separately in Ling, 1999b), New Zealand, Bounty Islands, Auckland Islands, Antipodes Islands, Campbell Is., Macquarie Is.

RESULTS

Southern elephant seal oil

At least 1,081 tons of elephant seal oil were obtained at King Is. between 1802 and 1819. However, 95% of this quantity was produced between 1802 and 1809; with almost 75% being produced in the first three years (Table 1). Ling (1999a) estimated that about 10,000 adult and sub adult *M. leonina* of both sexes would have been required to produce this quantity of oil. It is likely, even probable, that every available seal would have been killed without regard for the future of the population. Ling (1999a) also estimated that the pristine population at King Is. was about 10,000 to 17,000. Today it is extinct.

Fur seal skins

Commercial and licensed harvests (culls) of fur seal skins from the entire Australasian region between 1792 and 1948/49 amounted, as far as records permit, to 1,418,174 pelts (Table 2, Fig. 3). Of this total, 1,360,386 skins, or 96% of the total harvest, were obtained by 1830. Regional totals for the nine designated areas are set out in Table 3, and these are analysed in more detail below.

Year	Tons	Cumulative total	Cumulative %
1802	27	27	2
1803	460	487	45
1804	313	800	74
1805	87	887	82
1806	67	954	88
1807	59	1,013	94
1808	-	1,013	94
1809	11	1,024	95
1810	2	1,026	95
1811	34	1,060	98
1812	3	1,063	98
1818	4	1,067	99
1819	14	1,081	100

Table 1. Minimum production of southern elephant seal oil at King Is.: 1802 - 1819 (data from Ling 1999a).

Western Australia. Only 7,954 fur seal skins were recorded as having been obtained in WA between 1823 and 1843; with a further 494 skins shipped in 1920 (Abbott 1979; Ling 1999b) for a total of 8,448. It is well known, however, that sealers were operating in this area much earlier, because the 1800 - 1804 Baudin expedition encountered a gang of American sealers at King George Sound in 1803 (Garden 1977). This may have led to an even earlier decline of the *A. forsteri* population at the western extremity of its known range.

Kangaroo Is. (Table 4). Kangaroo Is.'s sealing industry began in 1803 - a year after its discovery by Matthew Flinders - and ended in 1834, apart from 20 skins taken in 1912, during which time 99,691 fur seal skins were shipped to Sydney or Hobart. As Kangaroo Is. was also an important source of salt that was used to cure the seal pelts, ships may well have called there in the course of sealing voyages to other places. Thus seal skins may or may not have originated at Kangaroo Is., so that cargo totals for Kangaroo Is. and Bass Strait separately could be slightly different from those shown in Table 3, without altering the combined total. Of Kangaroo Is.'s total of 99,691 skins, 94,625 or 95% of had been obtained by 1830.

Bass Strait (Table 5). This area includes King Is. to the west, and fur seal skins from that locality are included in the total of 242,564 skins shipped between 1798 and 1948/49. Of that total, 239,898, or 99%, had been harvested by 1830; and the industry was in sharp decline if not virtually finished then.

Fig. 3. Fur seal skin cargoes by decade 1790 - 1950, for the entire region covered by this paper (data from Ling 1999b).

Decade	Number of skins	Annual average	Cumulative total	Cumulative %
1792-1800	40,708	5,089	40,708	3
1801-1810	777,608	77,761	818,316	58
1811-1820	334,037	33,404	1,152,353	81
1821-1830	208,033	20,803	1,360,386	96
1831-1840	34,993	3,499	1,395,379	98
1841-1850	165	17	1,395,544	98
1851-1860	300	30	1,395,844	98
1861-1870	-	-	1,395,844	98
1871-1880	1,366	137	1,397,210	99
1881-1890	537	54	1,397,747	99
1891-1900	2,036	204	1,399,783	99
1901-1910	-	-	1,399,783	99
1911-1920	8,467	847	1,408,250	99
1921-1930	1,462	146	1,409,712	99
1931-1940	102	10	1,409,814	99
1941-1950	8,360	836	1,418,174	100

Table 2. Fur seal skin cargoes by decade from Australian, New Zealand and subantarctic areas combined: 1792 - 1948/49 (data from Ling 1999b).

Area	Number of skins	Percentage of total
Western Australia	8,448	1
Kangaroo Is.	99,691	7
Bass Strait	242,564	17
New Zealand	357,213	25
Bounty Islands	54,448	4
Auckland Islands	42,797	3
Antipodes Islands	383,287	27
Campbell Is.	30,282	2
Macquarie Is.	199,444	14
Total	1,418,174	100

Table 3. Fur seal skin cargoes from nine designated sealing areas: 1792 - 1948/49 (data from Ling 1999b).

Decade/Year	Number of skins	Average per year	Cumulative total	Cumulative %
1803-1810	25,143	3,143	25,143	25
1811-1820	43,005	4,301	68,148	68
1821-1830	26,477	2,648	94,625	95
1831-1834*	5,046	1,262	99,671	100
1912	20	20	99,691	100

Table 4. Fur seal skin cargoes by decade from Kangaroo Is.: 1803 - 1912 (data from Ling 1999b). * including 30 from Guichen Bay in 1931.

Decade/Year	Number of skins	Average per year	Cumulative total	Cumulative %
1798-1800	15,600	5,200	15,600	6
1801-1810	151,815	15,182	167,415	70
1811-1820	45,701	4,570	213,116	88
1821-1830	26,782	2,678	239,898	99
1831-1840	925	93	240,823	99
1858	300	300	241,123	99
1921	750	750	241,873	100
1948/49	691	691	242,564	100

Table 5. Fur seal skin cargoes by decade from Bass Strait: 1798 - 1948/49 (data from Ling 1999b).

Harvests in 1921 and 1948/49 were the result of licensed culls in response to fears that the fur seals were harming commercial fishing operations in Victoria (McNally and Lynch 1954; Warneke 1982).

New Zealand (Table 6). This designated area includes the New Zealand mainland and nearby islands such as those in Foveaux Strait, Stewart Is., the Snares Islands and the more distant Chatham Islands. The total number of fur seal skins shipped from this area amounted to 357,213, 67% of which were taken in the first 27 years and 98% had been harvested by 1840. The 7,668 fur seals killed in 1946 were the result of a licensed cull, again, as in the case of Victoria three years later, because of feared depredation by seals on commercial fish stocks (Sorensen 1969).

Bounty Islands (Table 7). There are records of only five fur seal skin cargoes from the Bounty Islands. In all, 54,448 skins were shipped, of which 53,500 or 98% were harvested in 1808 and 1809. Sealing continued very sporadically on only three other occasions in the next 82 years, when a further 948 skins were obtained.

Auckland Islands (Table 8). Sealing at the Auckland Islands was carried on intermittently over more than a century, but yielded only 42,797 fur seal skins altogether, 94% of which had been harvested by 1838. The next 78 years saw only another 2,747 skins being shipped.

Antipodes Islands (Table 9). Sometimes referred to as the 'seal islands', the Antipodes contributed the largest number of fur seal skins of all nine here-designated sealing areas: 383,287 skins between 1804 and 1825, all but 258 being obtained between 1804 and 1809. More than a quarter of a million skins were shipped in 1806 alone: this amounted to a sixth of the entire harvest over 155 years for the whole region being discussed in this paper.

Campbell Is. (Table 10). Discovered in January 1810, Campbell Is. - named after Robert Campbell, a Sydney merchant heavily involved in the sealing trade - yielded only 30,282 skins between 1810 and 1931, of which 15,200, or half, were obtained in the first year.

Macquarie Is. (Table 11). Within three years of its discovery in July 1810, Macquarie Is. had yielded 152,006 fur seal skins and by 1829, 196,793 or 99% of the total harvest of 199,444 skins had been obtained.

Sea lion skins

Full details of sea lion harvests are given by Ling (1999b). Only 3,969 *N. cinerea* skins are recorded as having been harvested between 1798 and 1920. A further 147 sea lions were killed by survivors of the ill fated Dutch vessel *Zeewyk* which was wrecked at Houtman Abrolhos in 1727 (Abbott 1979). Of this total kill, 2,000 were taken at Kangaroo Is. between 1832 and 1834. In addition to skins, quantities of "seal oil" were often shipped, but the amount and specific sources of the oil - sea lions, fur seals or elephant seals - are not known and so oil cargoes cannot be converted to numbers of a particular species. Across the Tasman Sea, 5,769 *P. hookeri* skins were taken between 1810 and 1894, 4,247 skins being harvested in 1825 alone.

Decade/Year	Number of skins	Average per year	Cumulative total	Cumulative %
1792-1800	25,108	3,137	25,108	7
1801-1810	143,489	14,349	168,597	47
1811-1820	69,284	6,928	237,881	67
1821-1830	91,849	9,185	329,730	92
1831-1840	19,266	1,927	348,996	98
1843	147	147	349,143	98
1874	11	11	349,154	98
1914	91	91	349,245	98
1915	300	300	349,545	98
1946	7,668	7,668	357,213	100

Table 6. Fur seal skin cargoes by decade from New Zealand: 1792 - 1946 (data from Ling 1999b).

Year	Number of skins	Cumulative total	Cumulative %
1808	38,000	38,000	70
1809	15,500	53,500	98
1829	28	53,528	98
1880	620	54,148	99
1891	300	54,448	100

Table 7. Fur seal skin cargoes from the Bounty Islands: 1808 - 1891 (data from Ling 1999b).

Decade/Year	Number of skins	Average per year	Cumulative total	Cumulative %
1808-1809	5,000	2,500	5,000	12
1824-1826	30,700	10,233	35,700	83
1833-1838	4,350	1,450	40,050	94
1872-1873	550	275	40,600	95
1881-1889	537	134	41,137	96
1891-1894	1,160	580	42,297	99
1916	500	500	42,797	100

Table 8. Fur seal skin cargoes by decade from the Auckland Islands: 1808 - 1916 (data from Ling 1999b).

Year	Number of skins	Cumulative total	Cumulative %
1804	20,000	20,000	5
1805	400	20,400	5
1806	252,787	273,187	71
1807	32,919	306,106	80
1808	26,823	332,929	87
1809	50,100	383,029	100
1825	258	383,287	100

Table 9. Fur seal skin cargoes from the Antipodes Islands: 1804 - 1825 (data from Ling 1999b).

Decade/Year	Number of skins	Average per year	Cumulative total	Cumulative %
1810 (3)	15,200	15,200	15,200	50
1823-1825 (3)	6,194	2,065	21,394	71
1832+1835 (2)	340	170	21,734	72
1873+1877 (2)	125	63	21,859	72
1891+1894 (2)	516	258	22,375	74
1911-1919 (9)	7,093	788	29,468	97
1922-1924 (3)	712	237	30,180	100
1931	102	102	30,282	100

Table 10. Fur seal skin cargoes by decade from Campbell Is.: 1810 - 1931. Figures in parenthesis are number of cargoes in each decade (data from Ling 1999b).

Decade/Year	Number of skins	Average per year	Cumulative total	Cumulative %
1810-1819	172,082	17,208	172,082	86
1820-1829	24,711	2,471	196,793	99
1837	2,471*	2,471	199,264	100
1874	60	60	199,324	100
1894	60*	60	199,384	100
1914	60*	60	199,444	100

Table 11. Fur seal skin cargoes by decade from Macquarie Is.: 1810 - 1914 (data from Ling 1999b). * untallied cargo calculated as average.

DISCUSSION

Southern elephant seals

It took less than a decade for the elephant seal oil industry to reduce the King Is. population of *M. leonina* to extinction. Peron (1816, in Micco 1971) described the shores of King Is. in the summer of 1802 as being "covered with a prodigious number of amphibians" (seals), but he did not attempt to estimate actual numbers of elephant seals that were there at the time of his visit. As some of the seals were "not less than eight to ten metres long", Peron must have seen a few large adult male stragglers and sub-adult males that would have been ashore, as well as numerous smaller moulting juveniles of both sexes, according to what we know today of the elephant seal's annual cycle (Carrick *et al.* 1962). While the largest seals would undoubtedly have been the sealers' preferred quarry, it is likely that all available seals would have been killed and rendered into oil. Crude estimates of the number of elephant seals killed and the size of the unexploited population give a figure for both of around 10,000; although the latter may have been as high as 17,000 (Ling 1999a). Some breeding and recruitment may have occurred before the total collapse of the industry, so the more realistic pre-sealing population may have been about 10,000. The last 182 years have seen only one published record of *M. leonina* at King Is. (Barnett 1980); but they occasionally haul out on beaches in south-eastern Australia, including Tasmania, and have given birth to pups there (Pemberton and Skira 1989) and in the south-east of South Australia (SA) (unpubl. data).

There is still a large but apparently decreasing population of *M. leonina* at Macquarie Is., where they were exploited heavily for their oil between 1810 and 1919. An estimated 8,380 tons of oil were shipped from the island, with the most productive phase being in the first 20 years and resulting in the population being reduced by 70% between 1820 and 1830. The pre-sealing population was estimated from a mathematical model to have been 93,000 to 110,000 animals, to which numbers the population is believed to have recovered by 1913 (Hindell and Burton 1988).

Since the 1960s, however, there has been an estimated - and as yet unexplained - 2% annual decline in the Macquarie Is. *M. leonina* population which numbered about 78,000 in 1990 (Laws 1994) and could be even less today. Hindell *et al.* (1994) advanced two hypotheses to explain the population decline: one involved equilibrium processes after intense sealing pressure and the other invoked oceanic environmental factors affecting food resources. More research is needed to address these critical questions.

Fur seals

At least 1.4 million fur seals were killed for their pelts or in licensed culls and their pelts sold between 1792 and 1948/49 in the Australia-New Zealand-subantarctic region. Fur seal skins appear among cargoes of colonial and other vessels listed in the many accounts of Australasian maritime history. This is probably a minimum figure, as waste and unreported cargoes may well have amounted to a significant additional number of skins. Fur seals were driven and killed on land and many could have escaped - only to be killed at a later date, or die at sea from injuries inflicted by the sealers. However, the 'lay' system, which was performance-based, by which sealers (and whalers) were paid, should have at least minimised loss, and wastage through spoilage of skins. In the present context the figures must be taken at face value for the purpose of further analysis.

By 1830, 96% of the total harvest of fur seal skins had been taken from the entire region (Table 2) and all individual areas except Campbell Is. had delivered between 92% and 100% of their total catch (Tables 4 - 11). Thus, in less than 40 years - and sealing did not really begin in earnest until the early 1800s - stocks had been reduced to dangerously low levels. From the 1850s onwards, cargoes were, with few exceptions, mixed and contained only some hundreds of seal skins as more and more effort had to be expended in searching for the small numbers of

surviving seals scattered among their original island habitats, and pursuing other commercial enterprises.

It is difficult, if not impossible, to estimate the size of the original fur seal populations. However, a very crude calculation using the De Lury method, plotting catch per unit effort (for which the number of skins per voyage each year can be the only measure) against accumulated catch (see Mackintosh 1965: 191-192), gives a figure of about 400,000 for the size of the original Antipodes Islands population of fur seals (unpubl. data). Applying this logic to the whole region suggests that the pre-European fur seal population may have been around 1.5 million. Richards (1994) estimated that the total fur seal stocks in the New Zealand region alone would have exceeded 1.25 million. However, given that some recruitment would be taking place while breeding stocks lasted, it is likely that the harvest figures would exceed those of the pre-sealing populations; except, perhaps, at the Antipodes Islands, where sealing was all over in six years.

Ling (1999b) adduces evidence to suggest that the two species of fur seals that inhabit the region today, *A. forsteri* and *A. p. doriferus*, occupied the same areas during the colonial sealing era; with the identity of original species at Macquarie Is., however, still being open to conjecture. Thus seal skin cargoes from New Zealand and its subantarctic islands would have been entirely *A. forsteri*, while those from Bass Strait and Kangaroo Is. would have been 'mixed', with *A. p. doriferus* predominating in cargoes stated to have come from Bass Strait and a majority of *A. forsteri* in cargoes stated to have come from Kangaroo Is. and WA.

The most recent estimates of *A. forsteri* populations in SA are 9,100 at Kangaroo Is. (Shaughnessy *et al.* 1995), 22,900 at the Neptune Islands (Shaughnessy *et al.* 1996) and, in WA, 15,100 - with a 3% annual rate of increase (Gales *et al*. 2000). Goldsworthy and Crawley (1995) estimated that the New Zealand population of *A. forsteri* numbered about 50,000. Surprisingly, the fur seal population at the Bounty Islands exceeds 21,000 and is still increasing slowly. There are almost no *A. forsteri* at the Antipodes Islands, Auckland Islands or Campbell Is.; and only about 600 at Macquarie Is. (Shaughnessy *et al.* 1988; Taylor 1990, 1992, 1996).

Pemberton and Kirkwood (1994) estimated the *A. p. doriferus* population at between 35,000 and 60,000. Shaughnessy *et al.* (2000) found that pup abundance at Seal Rocks, Victoria, in 1997/98 was increasing at a rate of 6.4% a year, compared with 2.4% in 1991/92. Such demonstrated rates of increase mean that current populations may well be substantially higher than the figures given above. Nevertheless, on the basis of the most recent and not so recent figures, fur seals of both species together number about one-tenth of the pre-exploitation population which might have numbered about 1.5 million, despite the fact that 150 years have passed since the colonial sealing industry collapsed.

This contrasts markedly with the situation at South Georgia where the Antarctic fur seal, *Arctocephalus gazella*, which was also heavily exploited in the early 19th century, has recovered to number more than a million (Doidge *et al.* 1986). The reason may be that Australasian fur seals consume some commercial as well as non-commercial species of fish and cephalopods (Warneke and Shaughnessy 1985); whereas fur seals at South Georgia feed on krill which still occurs in prodigious quantities - the more so since the demise of the krill-consuming great whales (Doidge *et al.* 1986).

Sea lions

Sea lion pelts lack any fine underfur and were of much lower commercial value than the more luxuriant fur seal skins. Nevertheless, some 4,000 *N. cinerea* skins and almost 6,000 *P. hookeri* skins appear amongst the colonial shipping records. Unknown numbers of sea lions of both species may also have been killed for their oil, females being much larger than female fur seals and males being considerably bigger than *A. forsteri* males. Thus "seal oil" may have included both fur seal and sea lion oil and even elephant seal oil, but only the latter when specifically mentioned was quantified, so the number and specific identity of otariid seals from which oil was produced cannot be calculated. Moreover, some of those killed for pelts also may have been processed for oil.

While early writers often remarked upon large numbers of fur seals or elephant seals to be seen at the various island haul-outs which they visited, there do not appear to be any references to a great abundance of sea lions of either species. The numbers taken may therefore be as much a reflection of the small size of the original populations as of the low commercial value of the pelts. Even today *N. cinerea* number only 9,900 to 12,400 (Dennis and Shaughnessy 1996); and Childerhouse and Gales (1998) estimate the *P. hookeri* population, which occurs mainly on the Auckland Islands, to be between 11,600 and 15,200. These figures, incidentally, are about twice the number of sea lion skins that are recorded in documented cargoes.

It should also not be forgotten that seal populations in Australia and New Zealand were exploited by Aborigines and Maoris, respectively,

well before the colonial sealing industry began at the end of the 18th century. Bryden *et al.* (1999) suggest that Aboriginal exploitation of smaller *M. leonina* in north-west Tasmania led to the extinction of a breeding colony there well before the King Is. population was exterminated by colonial sealers. Likewise, in New Zealand which was settled by Polynesians (Maoris) a thousand years ago, the distribution and abundance of fur seals and sea lions had already changed before colonial sealing started (Smith 1989). Sea lions and fur seals were actively hunted, leading ultimately to extinction of some populations. By the end of the pre-European period in New Zealand the fur seals' breeding range had been restricted to the less (human) populated areas. It is not possible to know how many seals were actually taken, but over a period of 800 years the number must have been large enough to have affected the distribution and numbers of both fur seals and sea lions. The impact of Aboriginal hunting of fur seals and sea lions in Australia cannot be determined; however Wood Jones (1925) has identified remains of *Neophoca* from kitchen middens in north-west Tasmania. Thus, by the end of the 18th century commercial sealing around New Zealand was directed at an already depleted resource. The Bass Strait *M. leonina* population may also have been smaller by the time colonial sealers arrived on the scene.

Finally, it is hoped that this paper and those others on which it is based will encourage more study of early historical records of distribution, abundance and exploitation, if any, of Australian fauna (and flora). This discipline, which may be termed ecological history (Lunney *et al.* 1999), can certainly help us to understand better, and perhaps alleviate some of the current problems with our biota.

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