HISTORICAL ECOLOGY: A CRITIQUE OF FRANÇOIS PÉRON'S ACCOUNT OF SOUTHERN ELEPHANT SEALS, *MIROUNGA LEONINA* (LINN.), AT KING ISLAND, BASS STRAIT, IN 1802

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(with one text-figure and two plates)

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François Péron's quite detailed observations of Southern Elephant Seals, *Mirounga leonina* (Linn.), at King Island, Tasmania, in December 1802, are considered in the light of current knowledge of this species. Acute observations of the elephant seal and its behaviour, as well as remarks about its life history, which appears to have differed slightly from that observed recently at sub-Antarctic Macquarie Island, the nearest current breeding site, were recorded. There is a suggestion that the breeding season at King Island may have been earlier than where Southern Elephant Seals now occur in the sub-Antarctic, possibly due to King Island being closer to the equator. Péron noted that Aborigines at Port Jackson called them *Mirourong*, from which their current generic name was derived, and they still frequent this coast. He does not mention seeing small immature elephant seals at King Island in December when this age class hauls out to moult on Macquarie Island. The presence then of (probably exaggeratedly) large males again suggests that the annual cycle at King Island may have been in advance of that observed at Macquarie Island today. Péron's growth rates were far in excess of those now known for the species anywhere: how he arrived at them he does not record; possibly this and other information was related to him by the sealers.

Key Words: Historical ecology, François Péron, Southern Elephant Seals, *Mirounga leonina,* King Island.

INTRODUCTION

Much biological (and anthropological) information can be gleaned from the writings of early explorers and navigators, as well as the secondary works of modern historians studying human history based on exhaustive study of many kinds of old (primary) sources of information. Careful extraction and analysis of facts and figures from these sources by trained biologists may allow the synthesis of very useful information about the early ecology and natural history of a particular area or biota which can be compared with contemporary knowledge. Quite often, statistical data collated from old accounts and catch records may then be applied to quantitative analysis of, for example, past animal populations and the effects on them of human exploitation (see Hindell & Burton 1988, Ling 1999a, b, 2002) to assist in stock analyses.

This discipline has been labelled historical ecology or ecological history (Lunney *et al.* 1999, Ling 2007). Holm *et al.* (2001, p. XIII) broadened its name to environmental history and its scope to "the integrated analysis of ecosytems and human societies, in particular the place of humankind in the historical development of ecosystems", such as the effects of human exploitation of natural resources and land development. Historical ecology does not go as far back in time as palaeoecology, which relies on markers such as fossils, sediments, rocks and ice cores for its interpretation.

The current study is a further example of its application. It aims to compare observations of Southern Elephant Seals, *Mirounga leonina* (Linn.), at King Island, Tasmania (40°S, 144°E) (fig. 1), in 1802 with what we know about the species today.

François Péron was the naturalist aboard *Le Géographe*, the lead ship of Captain Nicholas Baudin's "voyage of discovery to southern lands", 1800–1804. In France he studied medicine and was appointed trainee zoologist to the expedition on the recommendation of the great anatomist and zoologist Georges Cuvier. The expedition carried two artists, Charles-Alexander Lesueur and Nicholas M. Petit.

Péron was commissioned to write the official narrative account of the expedition upon its return to France. The first volume, comprising chapters I to XXI, was completed and published in 1807 after the death of Baudin (Péron 1807), and an English translation appeared just two years later (Péron 1809) a year before Péron died, possibly to capitalise on the British interest in what France was up to in those days (see Fornasiero & West-Sooby 2014). Louis de Freycinet, the expedition's cartographer, completed the second volume, chapters XXII to XXXIV (Péron & Freycinet 1816). Helen Micco (1971) translated chapters XXII and XXIII of this edition. These early works were subsequently revised by Freycinet and published as two volumes (Péron & Freycinet 1824). The first English translation of this edition was published recently in two volumes by the Friends of the State Library of South Australia. Because there never had been an English version of Volume II published in its entirety, it was produced first (Péron & Freycinet 2003), followed by Volume I (Péron & Freycinet 2009). These superb new translations by Christine Cornell will allow many more scholars of various disciplines to have access to early observations on natural history (and anthropology) in the Indo-Pacific region than hitherto, when only the French texts were available.

FIG. 1. — King Island showing, among others, places mentioned in the text. Councillor Island (previously known as Sea Elephant Rock) is shown, but not named, just below the words Pt Cowper on the eastern side of the island. Shell Company of Australia, reproduced with permission.

The expedition stopped off at King Island at the western end of Bass Strait from 6–28 December 1802, during which period Péron spent a considerable time ashore observing its natural history in general and Southern Elephant Seals in particular; he also described the sealing industry at the time of his visit (Péron & Freycinet 2003). When the naturalists arrived they found the sealers' camp set up on a hilltop at the northern end of Sea Elephant Bay (see pl. 1A); so they established their base at the head of the bay about six miles (9.5 kilometres) southward (see pl. 1B), near Fraser Bluff, and where the small township of Naracoopa is now situated. Plate 4 in Micco (1971) depicts a sketch by one of the expedition's artists, Nicholas M. Petit, of the French scientists' camp at Sea Elephant Bay. According to Michael Crow (pers. comm. 2012), no archaeological evidence from the Frenchmens' visit has ever been found, despite concerted efforts by members of the King Island Historical Society to locate any relevant material.

DISCOVERY AND NAMING OF THE SOUTHERN ELEPHANT SEAL

Péron's account includes what is possibly one of the earliest, if not the first, of many detailed descriptions of the intensively studied elephant seal's life history. Péron writes of his own quite acute observations as well as those related to him by the sealers who had already spent the previous 13 months on King Island prosecuting their industry and where they were able to record – probably only mentally – the Southern Elephant Seal's annual cycle. They appear also to have seen and hunted them elsewhere; possibly at Juan Fernandez Island (33°S, 77°W) in the Pacific, and described it to Peron during his short visit.

He begins with a brief summary of the discovery and naming of the elephant seal, in which he states that the natives of Port Jackson called it *Mirourong,* from which Gray (1827) derived the current generic name *Mirounga*. The Australian Aborigines, therefore, certainly must have known about the elephant seal long before European settlement; and there are modern records of Southern Elephant Seals occurring on the New South Wales coast today (Llewellyn *et al* 1994).

Péron credits the Dutch with being the first to mention the "sea lion" seen on the island of Juan de Fernandez (Anon 1623 *in* Péron & Freycinet 2003). Linnaeus (1758) gave the Southern Elephant Seal its first name, *Phoca leonina,* with its type locality restricted to Juan Fernandez Island. However, Péron decided to name it as a new species, *Phoca proboscidea* (or Trunk Seal), because of the large pendulous snout of males. He correctly distinguished elephant seals from northern and southern sea lions on the basis of their characteristic proboscis and thick mane, respectively, in males.

Péron rightly believed that the Southern Elephant Seal had a circumpolar distribution on islands lying between latitudes 35°S and 55°S. In Australia it was confined to islands off northwestern Tasmania, especially King Island

PLATE 1 — Blowhole Beach, Sea Elephant Bay: A, looking north towards Point Cowper, with Sea Elephant Rock (now Councillor Island) showing faintly on the horizon at far right; B, looking south towards Fraser Bluff near where the French scientists' camp is believed to have been located.

and its environs. There is also archaeological evidence that a breeding population of Southern Elephant Seals existed on the northwestern Tasmanian mainland, but was wiped out in prehistoric times by Aboriginals for whom they were an important food resource (Bryden *et al.* 1999). The species possibly also may have ranged as far north as southern New Zealand. In his study into the archaeology of New Zealand sealing, Smith (2002, p. 15, Fig. 6) reproduced a chart made by Eber Bunker, one of the early American whalers in the Antipodes, that shows a small island off the south coast of Stewart Island (43°S) underneath which the word "elephant"' appears. This is possibly a reference to the sighting of elephant seals there – in a similar latitude to that of King Island.

LIFE HISTORY AND POPULATION DYNAMICS

Péron does not say which elephant seals were taken for oil in terms of size, age or sex. Was the "catch" composed of large (immature and mature) males, big animals of both sexes, or all that were available regardless of size? He mentions that some seals were killed with a heavy blow on the nose which, in my experience, would be effective only on smaller animals – certainly not the large males which, according to Péron, were killed by means of a sharp lance driven into the left side, thereby piercing the heart.

When Péron was on King Island during much of December 1802, immature elephant seals should have been ashore undergoing their annual moult, according to what we now know about the annual cycle of this species at sub-Antarctic Macquarie Island (54°S, 158°E) (Carrick *et al.* 1962b, Ling 2012). There should not have been any breeding females or large breeding males present at this time of the year. However, Lesueur's illustration, also of the French scientists' camp at the head of Sea Elephant Bay, clearly shows large males with their pendulous proboscises as well as what appear to be smaller males sparring on the beach (see Plate 1 in Ling 1999a).

While Péron did not attempt to quantify the population size of elephant seals which he encountered on King Island, there are several references which indicate that the numbers were quite large. In an historical tribute to François Péron in Micco's (1971) translation of chapter XXIII in the 1816 edition of Péron's journal, Louis Freycinet stated (p. 38) that Péron "studied the history of the gigantic seals that assembled in thousands on the shore". Péron himself in Péron & Freycinet (2003) observed that "the shores of this island are all covered with a prodigious number of amphibians" (his term for any animal that lives in or out of water). When the scientific party landed, "the entire head of this (Sea Elephant) bay was covered in elephant seals". However, none of the illustrations in the many publications associated with the Baudin expedition show more than a few seals – and certainly not the prodigious numbers or thousands quoted by Freycinet and Péron. Nevertheless, the quantities of elephant seal oil landed at Sydney and other ports and stated to have come from King Island suggest that a significant population of Southern Elephant Seals did inhabit the island before its discovery and naming in 1801 (see Cumpston 1973; Ling 1999a).

It is difficult to know with any reasonable certainty how big the King Island elephant seal population might have been before it came to be exploited for oil at the beginning of the nineteenth century. The main problems with any attempts to estimate the original numbers lie in not knowing the composition of the "catch" in terms of sex, age and size of the seals taken because of a complete lack of records and the different amounts of oil each class of seal produced. Adult males and some bigger females may have been big enough to deliver useful amounts of oil (Péron stated that a very large male could produce about 140 gallons, or half a ton, of oil). Cumpston (1968), on anecdotal evidence, said that adult males and adult females yielded 0.5 and 0.1 ton of oil, respectively. Hindell & Burton (1988) used oil yields of 180 kg and 70 kg per adult male and female, respectively, from which they estimated that the original elephant seal population at Macquarie Island before sailing began was 93 000 to 110 000. Using the latter figures, Ling (1999a) devised a formula to convert oil quantities to seal numbers and calculated that it took between 10 000 and 17 000 seals to produce 1 100 to 1 300 tons of oil. Another calculation using double the notional numbers of only adult males and females (to allow for numbers of immature seals) required to deliver one year's (1803) lower (460 tons) and upper (563 tons) yields suggests a population of between 11 500 and 14 000 seals. Some 8380 tons of oil were produced at Macquarie Island from 93 000 to 110 000 seals, roughly equating to one ton of oil from 11 to 13 seals, presumably of many sizes. Using these crude figures, the King Island population can be estimated to have numbered between 12 100 to 14 300 and 14 300 to 16 900 animals, respectively. Based on these three methods of calculation, King Island's pristine Southern Elephant Seal population would have been around 15 000. Péron's thousands may have been about right.

It should be noted that, within these figures lies the fact that, while seal hunting was proceeding between 1802 and 1819, the seals were continuing to breed – albeit in ever-decreasing numbers – and replace those that had been killed, until the population was virtually extinct. Macquarie Island's has recovered, King Island's never did.

DESCRIPTION

Péron's description of the Southern Elephant Seal is consistent with much of what we know today, apart from the dimensions he gave for what undoubtedly were adult males, which he stated grew up to 20, 25 or even to 30 feet in length and 15 to 18 feet in girth (6.1, 7.6, 9.1 and 4.5 to 5.4 metres, respectively). The largest male measured at the Falkland Islands (52°S, 59°W) was 20 feet in length, although a slightly bigger one was seen but not measured (Laws 1953). As in many older accounts dealing with the sizes of wild animals, Péron's appear to be exaggerated at the higher end of the scale. Carrick *et al.* (1962a) stated that elephant seals at Macquarie Island, to which the King Island seals may have been related, did not grow quite to the same size as those at South Georgia (54°S, 37°W) – possibly due to the latter lying south of the Antarctic Convergence and, hence, being a true Antarctic island, bringing into operation Bergmann's rule about animal size increasing with closer proximity to the poles and attendant greater cooling. Thus the maximum length of elephant seals at King Island probably would have been about six metres.

One very acute observation by Péron was of the facial vibrissae, two groups of which, the mystacials (whiskers) and supraorbitals (eyebrows), he stated were present on the elephant seal. In fact, there is a third group (rhinals) on the snout (Ling 1966). While he did not enumerate these sensory hairs in their respective groups, he noticed what he termed their "screwed" shape, which has been

described more recently as beaded, bumpy or wavy, and slightly flattened, as opposed to being smooth and round in cross-section as in otariid and some other phocid seals (Ling 1966, 1977, Ginter *et al.* 2010). Péron did not speculate on the possible functional significance of the shape of these prominent hairs or, indeed, the vibrissae themselves, which are still a subject of considerable conjecture. Ginter *et al.* (2010) alluded to three possible functions: drag reduction, increased sensitivity, and reduced interference to environmental, including prey, signals.

Péron remarked on the short, coarse hairs of the elephant seals' coat which rendered it unsuitable as fur, but stated that the hide could be turned into quite good leather for making harness. This was in contrast to the fine pelts of fur seals (probably Australian, *Arctocephalus pusillus doriferus* Wood Jones, 1925 or *A Forsteri* (Lesson, 1828) many thousands of which Péron saw in the sealers' camp, along with barrels of seal oil (see also Ling 1999b).

One relic of the fur seal industry on King Island is what is known as the Sealers' Wall near Surprise Bay at the southern end of the island. It is believed fur seals were driven inland from a small cove to be trapped by the stone wall and then killed and skinned. More than 48 000 fur seal skins were harvested at King Island between 1801 and 1819 (Ling 1999a, 2002).

With his eye for detail, it would be very surprising for Péron not to have seen and commented on the elephant seal's dramatic form of moult – shared only with monk seals – if it had been taking place at the time of his visit to King Island. These seals shed their old fur attached to large ragged sheets of dry, cornified epidermis which peels off rather like sunburnt human skin (Carrick *et al.* 1962b, Ling 1965, 2012). Surely, Péron would have noticed this, but nowhere does he mention this almost unique and dramatic form of moult. Immature elephant seals of both sexes should have been undergoing their annual moult in December, if they were following the Macquarie Island timetable. However, the artist, Charles-Alexandre Lesueur's quite accurate coloured picture (p. 31 in Péron & Freycinet 2003) depicts large male elephant seals showing no signs of peeling skin with hairs attached. Judging by the size of these animals' proboscises, they appear to be approximately of breeding age; which raises the question as to how their presence on King Island in early December may be reconciled with what is known today about their annual cycle.

The sealers found that only the tongue was edible and they avoided eating the liver for reasons unexplained. They possibly were not aware of the high vitamin A content of the liver, as is known today (Southcott *et al.* 1971). Certainly, indigenous people around the world have known for a long time to avoid eating the livers of carnivorous animals that they killed for food.

BREEDING SEASON AND GROWTH

Péron contended from reading other authors that Southern Elephant Seals did not reside permanently on their particular islands but came and went at different times of the year. They were said to migrate from north to south and south to north. The first northern migration was believed to take place in mid-June and the seals arrived at King Island in large numbers at the end of that month. According to the island/s sealers, the shores were covered by them; but which age and sex categories Péron did not record.

Péron stated that, a month after their arrival, the females start giving birth surrounded by males which prevented them from going back into the sea until the end of lactation. At Juan Fernandez Island, according to Péron, the females also go ashore in mid-June to have their young and stay until the end of September fasting all the while; i.e., for 3½ months! These seem rather curious observations, because it is now known that mating takes place just before the end of lactation, soon after which the cows go to sea to recuperate from their four- to five-week breeding fast (Carrick *et al.* 1962b).

Lactation was said by Péron to last seven to eight weeks at King Island after which the females went down to the sea with their pups, in order either to teach their young to swim or to recuperate after the breeding fast; the pups being constantly herded by older seals to keep them close to the shoreline. After three to four weeks at sea the females were said to haul out again for the purpose of mating: fertilisation, said Péron, occurred at the end of September and parturition in mid-July, meaning that, according to Péron's figures, gestation took about 9½ months. Péron did not state how he arrived at the observations cited above; they read as if he was reporting what the sealers had told him. In any case, the life history of *Mirounga leonina* at King Island, as outlined by Péron, differed starkly from what we now know about the species at its various sub-Antarctic breeding sites. Maybe the sealers were reporting what they had observed at Juan Fernandez. Péron, of course, was not at King Island when the elephant seals reputedly were breeding.

At Macquarie Island, breeding bulls (beachmasters) start arriving in early August, followed by the cows towards the end of that month. Pups are born from early September to early November, numbers peaking in early October. The maximum number of bulls is reached in late September and cows in mid-October. The latter are ashore five days before pupping and about 23 days after, lactating. Mating takes place towards the end of lactation. The fat weaned pups spend a further five to six weeks on the island during which time they play in the water and learn to swim, unaccompanied by their mothers. They start to leave in December and all are gone before the end of January. Immature seals are ashore moulting between November and January, adult females moult during January and February, and adult males moult from February to April; some even remaining until early June (Carrick *et al.* 1962b).

We also know today that after mating and fertilisation there is a period of about 14 weeks in which a many-celled blastocyst remains free in the reproductive tract – a phenomenon now termed delayed implantation or embryonic diapause – of which Péron undoubtedly would

have been unaware. Foetal development, according to these figures, thus takes about 8½ months.

Labour was stated by Péron to last five to six minutes, during which time the females appeared to suffer some pain, while the males "look on with indifference". A single pup was produced: sealers are reported to have witnessed only one instance of a twin birth in five to six years of operation (presumably at locations other than King Island) prior to 1802. The fasting females grew thinner and some were seen to die during the pupping season at King Island.

At birth the pup was said to weigh about 70 pounds (32 kg) and measure four to five feet (122 to 152 cm) in length. Carrick *et al.* (1962a) stated that newborn pups at Macquarie Island weigh about 83 pounds (37 kg) and are approximately 50 inches (127 cm) long; they tend to be slightly smaller than pups born at more southerly Signy Island (61°S, 46°W) in the South Atlantic. Péron stated that male pups at King Island were larger at birth than females – although he was not there to see them – which is consistent with the findings at Macquarie Island, where observations were far more detailed (Carrick *et al.* 1962a). He also contended that this trend continued in later generations of pups. Carrick *et al.* (1962a) found that pups at Macquarie Island did not begin to put on weight before they were three to 12 days old (average about six days). Female pups trebled their birth weight in 17 days, males in 18 days at Signy Island (Laws 1953). Growth of pups, according to Péron, however, is so rapid that they gained about 4 feet (122 cm) and 100 pounds (45 kg) in the first week! Péron does not describe how he arrived at these figures; certainly there was no mention of any attempt to weigh or measure pups.

Further growth was said by Péron to be so rapid that young seals (presumably males) reach lengths of 18 to 25 feet (5.5 to 7.6 m) by the end of their third year, which is the normal limit to their size (Carrick *et al* 1962a); he mentioned that from then on they increased only in girth. Péron stated that the sealers believed the Southern Elephant Seal's life span to be about 25 to 30 years. Those figures are slightly inconsistent with what we know today. Two females marked as pups were resighted 23 years later and may have lived another two years (Hindell & Little 1988); and Laws (1953) believed that the maximum age attained by males was 18 to 20 years, based on the study of tooth rings. It was believed in earlier times that elephant seals went inland to die, but this has not been reported in modern writings.

The appearance of the characteristic pendulous proboscis indicated to Péron the attainment of sexual maturity by the large males. It is now known that sexual maturity (i.e., the presence of viable sperm) is in fact reached at three to four years of age, beyond which further physical growth, including the proboscis, takes place; but breeding status is not reached until at least nine to 10 years of age (Laws 1953). Of course, Péron had no means of telling how old harem bulls might have been. He did note, however, or more likely was informed by the sealers, that the harem master dominated in the mating of females, with other (subordinate) males then mating indiscriminately. Mating was reported to last about 12 to 15 minutes.

BEHAVIOUR

Péron also gave a masterly account of the elephant seal's general behaviour. At King Island they were known to cross over sand dunes 15 to 20 feet (4.6 to 6.1 m) high, beyond which there were little pools of fresh water to provide wallows to lie in. I believe, after visiting King Island that Péron may have been referring to what is now known as the Sea Elephant River and its flood plain, inland from the northern end of Sea Elephant Bay (pl. 2). However, the Fraser River at the southern end of the bay could just as likely figure in this behaviour; moreover, the black rutile beach there would be favoured by elephant seals, because of the warm black sand. He noted that elephant seals exclusively hauled out on beaches rather than rocks, which fur seals use, and also remarked upon the seals' habit of scooping up wet sand with their foreflippers and throwing it over their bodies when the weather was hot, as it would have been in December. They slept on sand or in the sea or wallows, while all the time some kept a watch out "in case of danger" but he did not state from what. Their senses, according to Péron, are not very acute; the eyes are adapted more to vision in water than in air, being flat with thick lenses and a possibly viscous vitreous humor.

Their locomotion was described as being slow and laborious, bodies quivering like a huge bladder full of jelly, with frequent stops to rest. No more accurate a description can be found in modern literature.

The elephant seal's habit of swallowing pebbles was also remarked upon by Péron who surmised that this was to maintain tautness of the stomach – towards what end was not stated. However, he too may have been thinking about curbing "hunger pangs", which Shaw (cited by Laws 1956a) suggested in 1801 – a year before Péron's observations – and with which Bryden (1999) agreed. Others today suggest that the stones may assist in digestion, dealing with internal parasites by acting as some kind of grinding mill, or perhaps acting as a sieve to retain larger particles of food, in other species of seals (Needham 1997).

According to Péron, females and young males sound like the bellowing of a vigorous bull, but the adult males' vocalisation resembles more of a loud gargle. This they utter in the course of the many fights during the breeding season, when they compete for mastery of the females. They crash into each other's chest, jaw against jaw, with much blood flowing from the face. Péron believed that the thick layer of blubber prevented contact between any wounds and the air, and also from excessive bleeding. He also noted that elephant seals suffered wounds at sea: from what he did not say, but several species of large toothed whales would be obvious candidates both around the Australian coast and in the sub-Antarctic, while sharks also could well prey on them in Australian waters. Other injuries could be sustained by being dashed against rocks.

Despite the ferocity of agonistic behaviour during the

PLATE 2 — Looking northeast to the mouth of the Sea Elephant River emptying on to Nine Mile Beach. The river mouth is said to have retreated about a kilometre southwards since the early nineteenth century.

breeding season, Péron believed the elephant seal had an "extremely gentle and easy-going nature" and could easily be tamed: citing an instance of a sealer adopting a young one as a pet.

EXPLOITATION AND CONSERVATION

Finally, Péron issued a prescient warning about the consequences of uncontrolled slaughter of marine mammals in general and the Southern Elephant Seals of King Island in particular. While the seal oil industry there lasted from 1802 to 1819, over 80% of oil production occurred in the first four years and 95% in only seven years (Ling 1999a). By that time there were so few seals left that the industry was hardly viable. Today there are no elephant seals on King Island, apart from occasional stragglers which land there and elsewhere around Australia's southern coasts, where pups have been born in southern Tasmania (Pemberton & Skira 1989) and southeastern South Australia (Shaughnessy *et al.* 2012). Péron's prediction sadly was all too accurate: a healthy breeding population no longer exists at King Island.

PÉRON'S LEGACY

For a trainee zoologist in only his early twenties, François, Péron showed remarkable powers of observation of nature, and his colourful and sometimes flowery language does not in any way detract from many of his quite accurate descriptions. Some of the timetables given for various phases of the elephant seal's annual cycle are somewhat contrary to what we know today from many intensive studies at, for example, Macquarie Island. There is a possibility, however, that latitudinal and consequent day-length differences between the two islands may indeed account for at least some differences or discrepancies (see Temte 1991). Furthermore, many of the dimensions given for elephant seals by Péron are very wide of the modern mark; and some of his statements undoubtedly were based on hearsay from the sealers. Notwithstanding these reservations, Péron provides us with a very good account of Southern Elephant Seals at King Island more than two centuries ago and only 14 years after European settlement began in Australia.

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REFERENCES

Bryden, M.M. 1999: Stones in the stomachs of southern elephant seals. *Marine Mammal Science* **15**: 1370–1373.

Bryden, M.M., O'Connor, S. & Jones, R. 1999: Archaeological evidence for the extinction of a breeding population of elephant seals in Tasmania in prehistoric times. *International Journal of Osteoarchaeology* **9**: 430–437.

Carrick, R., Csordas, S.E. & Ingham, S.E. 1962a: Studies on the southern elephant seal, *Mirounga leonina* L.: IV. Breeding and development. *CSIRO Wildlife Research* **7**: 161–197.

Carrick, R., Csordas, S.E., Ingham, S.E. & Keith, K. 1962b: Studies on the southern elephant seal, *Mirounga leonina* L.: III. The annual cycle in relation to age and sex. *CSIRO Wildlife Research* **7**: 119–160.

Cumpston, J.S. 1968: Macquarie Island. ANARE Scientific Reports, Series A1 Narrative. Antarctic Division, Department of External Affairs, Melbourne: 380 pp.

Cumpston, J.S. 1973: *First Visitors to Bass Strait*. Roebuck Society Publication No. 7, Canberra: 103 pp.

Fornasiero, J. & West-Sooby, J. (eds) 2014: *French Designs on Colonial New South Wales. François Péron's Memoir on the English Settlements in New Holland, Van Diemen's Land and the Archipelagos of the Great Pacific Ocean*. Friends of the State Library of South Australia Inc., Adelaide: 396 pp.

Ginter, C.C., Fish, F.E. & Marshall, C.D. 2010: Morphological analysis of the bumpy profile of phocid vibrissae. *Marine Mammal Science* **26**: 733–743.

Gray, J.E. 1827: *A synopsis of the species of the class Mammalia.* George B. Whittaker, London, 5 Vols.

Hindell, M.A. & Burton, H.R. 1988: The history of the elephant seal industry at Macquarie Island and an estimate of the pre-sealing numbers. *Papers and Proceedings of the Royal Society of Tasmania* **122**: 159–176.

Hindell, M.A. & Little, G.J. 1988: Longevity, fertility and philopatry of two female elephant seals, *Mirounga leonina*, at Macquarie Island, *Marine Mammal Science* **A**: 168-171.

Holm, P., Starkey, D.J. & Smith, T.D. 2001: Introduction. *In* Holm, P., Smith, T.D. & Starkey, D.J. (eds): *The Exploited Seas*: *New Directions for Marine Environmental History*. International Maritime Economic History Association Research in Maritime History No 21, St John's : XIII-XIX: 216 pp.

Laws, R.M. 1953: The elephant seal *Mirounga leonina* (Linn.) I. Growth and age. Falkland Islands Dependencies Survey. Scientific Reports No. 8: 1–62.

Laws, R.M. 1956: The elephant seal *Mirounga leonina* Linn.: II. General, social and reproductive behaviour. Falkland Islands Dependencies Reports No. 13: 1–88.

Ling, J.K. 1965: Hair growth and moulting in the southern elephant seal, *Mirounga leonina* Linn.: *In* Lyne A.G. & Short, B.F. (eds) *Biology of the Skin and Hair Growth*, Angus and Robertson, Sydney: 525–544.

Ling, J.K. 1966: The skin and hair of the southern elephant seal, *Mirounga leonina* Linn.: I. The facial vibrissae. *Australian Journal of Zoology* **14**: 855–866.

Ling, J.K. 1977: Vibrissae of marine mammals. *In* Harrison, R.J. (ed.): *Functional Anatomy of Marine Mammals*, Volume 2. Academic Press, London: 387–415.

Ling, J.K. 1999a: Elephant seal oil cargoes from King Island, Bass Strait, 1802-1819: with estimates of numbers killed and size of the original population. *Papers and Proceedings of the Royal Society of Tasmania* **133**: 51–56.

Ling, J.K. 1999b: Exploitation of fur seals and sea lions from Australian, New Zealand and adjacent subantarctic islands during the eighteenth, nineteenth and twentieth centuries. *Australian Zoologist* **31**: 323–350.

Ling, J. 2002: Impact of colonial sealing on seal stocks around Australia, New Zealand and subantarctic islands between 150 and 170 degrees east. *Australian Mammalogy* **24**: 117–126.

Ling, J. 2007: Ecological history. Tracing biological events in the recent past from human historical documentation: marine mammals. *South Australian Naturalist* **81**: 91–93.

Ling, J.K. 2012: The skin and hair of the southern elephant seal, *Mirounga leonina* Linn.: IV. Annual cycle of pelage follicle activity and moult. *Australian Journal of Zoology* **60**: 259–271.

Linnaeus, C. 1758: *Systema naturae per regna tria naturae, secundum classes, ordines, genera, species cum characteribus, differentiis, synonymis, locis. Temus 1. Editio decima, reformata. Impensis Direct.* Laurentii Salvii, Holmiae Stockholm: 824 pp.

Llewellyn, L., Ellis, M., Martin, J. & Ferguson, A. 1994: *Atlas of New South Wales Wildlife: Marine Mammals and Reptiles*. N.S.W. National Parks and Wildlife Service, Hurstville, N.S.W.: 26 pp.

Lunney, D., Dawson, L. & Law, B. 1999: Zoology in the new millennium. *Australian Zoologist* **31**: 321–322.

Micco, H.M. 1971: *King island and the Sealing Trade 1802. A Translation of Chapters XXII and XIII of the Narrative by Francois Péron published in the Official Account of the Voyage of Discovery to the Southern lands Undertaken in the Corvettes le Géographe, Le naturaliste and the Schooner Casuarina, during the years 1800 to 1804, under the command of Captain Nicolas Baudin*, Roebuck Society Publication No. 3, Canberra: 51 pp.

Needham, D.J. 1977: The role of stones in the sea lion stomach: investigations using contrast radiography and fluoroscopy. *In* Hindel, M. & Kemper, C. (eds): *Marine Mammal Research in the Southern Hemisphere* Vol 1: *Status, Ecology and Medicine.* Surrey Beatty & Sons, Chipping Norton: 164–169.

Pemberton, D. & Skira, I.J. 1989: Elephant seals in Tasmania. *Victorian Naturalist* **106**: 202–204.

Péron, F. 1807: *Voyages de Découvertes aux Terres Australes, exécuté par ordre de sa majesté, empereur et roi, sur les corvettes le Geographe, le Naturaliste, et la goelette le Casuarina, pendant les annes 1800, 1801, 1802, 1803 et 1804. Historique*, tome I, Imprimerie imperiale, Paris: 498 pp.

Péron, F. 1809: *A Voyage of Discovery to the Southern Hemisphere, Performed by Order of the Emperor Napoleon, during the Years 1801, 1802, 1803 and 1804*. Prepared for the press by F. Péron; translated from the French, vol. 1, *Collection of Modern and Contemporary Voyages and Travels* printed for Richard Phillips, London: 316 pp. A facsimile of this translation was produced in 1975 by Marsh Walsh, North Melbourne.

Péron, F. & Freycinet, L. de 1816: *Voyage de découvertes aux terres australes, exécuté par ordre de sa majesté l'Empereur et Roi sur les corvettes le Géographé, le Naturaliste, et la goélette le Casuarina, pendant les années 1800, 1801, 1802, 1803 et 1804. Historique*, tome II. Imprimerie royale, Paris: 471 pp.

Péron, F. & Freycinet, L. de 1824: *Voyage de découvertes aux Terres Australes fait par ordre du gouvernment, sur les corvettes le géographe, le Naturaliste, et la goélette le Casuarina pendant les annes 1800, 1801, 1802, 1803 et 1804. Historique*. Arthus Bertrand, Paris: tome I, 398 pp; tome II, 530 pp; tome III 429 pp; tome IV: 356 pp.

Péron, F. & Freycinet, L. de 2003: *Voyage of Discovery to the Southern Lands*, Second edition 1824, Vol. II, comprising Chapters XXII to XXXIV. Translated from the French by Christine Cornell. Friends of the State Library of South Australia, Adelaide: 279 pp.

Péron, F. & Freycinet, L. de 2009: *Voyage of Discovery to the Southern Lands*, Second edition 1824, Vol. 1, comprising chapters I to XXI. Translated from the French by Christine Cornell. Friends of the State Library of South Australia, Adelaide: 430 pp.

Shaughnessy, P.D., Kemper, C.M. & Ling, J.K. 2012: Records of vagrant phocid seals Family Phocidae) in South Australia. *Australian Mammalogy* **34:** 155–169.

Shaw, G. 1801: *General Zoology*. London.

Smith, I.W.G. 2002: *The New Zealand Sealing Industry: History, Archaeology and Heritage Management*. New Zealand Department of Conservation, Wellington: 72 pp.

Southcott, R.V., Chesterfield, N.J. & Lugg, D.J. 1971: Vitamin A content of the livers of huskies and some seals from Antarctic and Subantarctic regions. *Medical Journal of Australia* **I**: 311–313.

Temte, J.L. 1985: Photoperiod and delayed implantation in the northern fur seal *Callorhinus ursinus***.** *Journal of Reproduction and Fertility* **73:** 127–131.

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