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## Lineage – Scientific methodology

### Annual distribution of New Zealand fur seal

1. Literature sources were searched for distribution information.
  - a. Scientific papers, published texts, unpublished reports and university theses
  - b. BIOSIS Previews (1993–2009)
  - c. Aquatic Sciences and Fisheries Abstracts (1960–2009)
  - d. Fish and Fisheries Worldwide (1971–2009)
  - e. NZ Science, Scopus, Science Direct (up to 2009)
  - f. Department of Conservation library databases
2. Summary
  - a. Information was integrated from the literature and expert opinion and distributional zones were hand-drawn on a template map.
  - b. A distributional “hotspot” is where the species would be expected to be found in high density relative to its density elsewhere. Most hotspot areas will be associated with breeding colonies (rookeries). The numbers of fur seals that use areas to haulout between breeding seasons are difficult to quantify because of the high variation in the numbers ashore at a given time. Thus, precise definitions of terrestrial areas used by fur seals are difficult and the areas shown by hotspots are approximate.
  - c. The 90% distribution is the area in which 90% by number of the species are to be found. This includes most of the published areas fur seals use to haul out or breed. The most northern haulout is at Three Kings Islands (especially between June and October) and the most southern haulout is at Macquarie Island (Wilson 1981). There is little recent published information on these northern fur seal locations.
  - d. The 100% distribution is the full range – the area in which virtually all individuals of the species are to be found within New Zealand waters. Fur seals in the marine environment are likely to be in waters that extend out to beyond the continental shelf edge and the locations of fur seal captures by fishing vessels show that they may occur in deeper waters off the west coast South Island (at least 2000 m) (see Baird 2005). In the terrestrial environment, fur seals may haulout in preferred rocky coastlines around New Zealand (see below).
  - e. New Zealand fur seals in New Zealand waters are classed as Not Threatened (Hitchmough et al. 2007). These fur seals are found in New Zealand, southern Australia, and Macquarie Island (see Crawley 1990, Shaughnessy et al. 1994, Goldsworthy et al. 1998).
  - f. New Zealand fur seals are distributed throughout New Zealand waters and haulouts and breeding colonies are found on many areas of coastline and offshore islands of the South Island, southern North

- Island, Chatham Islands, and sub-Antarctic islands (Wilson 1981, Mattlin 1987, Crawley 1990).
- g. The historical distribution of New Zealand fur seal breeding colonies was more extensive than the present day distribution (Mattlin 1987, Taylor 1992, Lalas & Harcourt 1995, Lalas & Bradshaw 2001). Harvesting by sealers heavily reduced populations until 1894 when the Government closed the fur seal fishery, though Campbell Island fur seals continued to be harvested under special permits until 1946. The Marine Mammal Protection Act (1978) gives total protection to fur seals, though fur seals are caught in commercial fishing operations, particularly during trawl fishing (Baird 2005). Populations are now increasing in all areas of their current range: around New Zealand, southern and western Australia, and sub-Antarctic islands (Crawley 1990, Taylor 1992, Dix 1993, Shaughnessy et al. 1994, Taylor et al. 1995, Carey 1998, Lalas & Murphy 1998, Lalas & Bradshaw 2001).
  - h. A national census has been considered, but not actioned. Wilson (1981) provides the most recent synthesis of fur seal counts and estimates. A census of the west coast South Island fur seals taken in 2009 will be available soon.
  - i. Fur seals live most of their lives at sea and generally use continental shelf and slope waters to forage, though information is only available for lactating female fur seals. Foraging trips off the Otago Peninsula showed a mean of  $3.26 \pm 1.1$  days during the early stages of lactation (Harcourt et al. 1995), and most dives associated with these trips were at night. Lactating females from the west coast South Island can dive to  $> 250$  m and for  $> 8$  min in duration, and their average dive depth, duration, and bottom time increases from summer through winter (Mattlin et al 1998). They tend to have shallow dives and feed at night during summer. In autumn and winter as the dive depths increase the fur seals are more likely to be further from the land and at or beyond the edge of the continental shelf (Mattlin et al 1998, Harcourt & Davis 1997).
  - j. Fur seals go ashore in summer to breed at rookeries and also during the rest of the year, particularly winter, they congregate in land in haulouts to rest and moult (Crawley 1990). The numbers of fur seals that haulout in nonbreeding colonies vary by season and area, and fur seals may move between colonies (see Bradshaw et al. 1999). Wilson (1981) also describes “immature colonies” as those haulouts in which more than 40% of the animals are young seals.
  - k. Preferred rookery and haulout habitats include exposed rocky shores with some protection (especially for pups), such as rocky headlands and piles of large boulders backed by steep rock cliffs. Rookeries include crevices and ledges and escape zones (Ryan et al. 1997), whereas haulouts are more likely to be on coasts with large rock platforms or layered rock slabs (Taylor et al. 1995) and may be less exposed to the sun (Ryan et al. 1997).

### 3. References

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