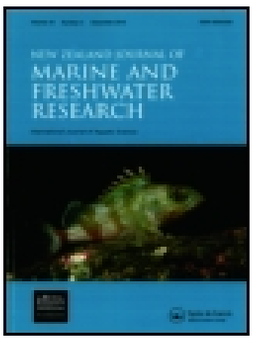

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Short communication

New Zealand sea lion predation on New Zealand fur seals

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Abstract Several sea lion species are known to occasionally hunt fur seals for food, but there have been few reports of New Zealand (Hooker's) sea lions (*Phocarctos hookeri*) hunting and eating New Zealand fur seals (*Arctocephalus forsteri*). We describe the first reported incidence of *P. hookeri* eating *A. forsteri* pups in mainland New Zealand, and present evidence suggesting that it was active predation rather than scavenging. In late April, early May, and early September 1997 we found three sea lion regurgitations containing the remains of fur seal pups on Otago Peninsula, New Zealand. One contained three plastic tags formerly placed on three different female fur seal pups from a nearby breeding colony. When ingested at least two of the three identifiable pups fell within the lower condition quartile calculated from pups at their natal colony. The incidence of such predation may increase with increasing densities of both fur seals and sea lions in Otago, but the impact on the trends in fur seal populations is, and should remain, low.

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INTRODUCTION

Several sea lion species have been reported to hunt fur seals. These include southern sea lions (*Otaria byronia*) eating South American fur seals (*Arctocephalus australis*) (Majluf 1987; Harcourt 1991, 1992, 1993), Steller sea lions (*Eumetopias jubatus*) eating northern fur seals (*Callorhinus ursinus*) (Gentry & Johnson 1981; Reidman 1990), and New Zealand (Hooker's) sea lions (*Phocarctos hookeri*) eating New Zealand fur seals (*A. forsteri*) (M. W. Cawthorne & D. S. Horning cited in Mattlin 1978, 1987), Antarctic fur seals (*A. gazella*), and subantarctic fur seals (*A. tropicalis*) (S. Robinson, Univ. Tasmania unpubl. data).

Observations of this phenomenon are rare (Harcourt 1993). Mattlin (1978, 1987) reported the observation of *A. forsteri* pup remains in a *P. hookeri* regurgitation on the Snares Islands (48° S, 168° E) but he did not indicate whether the remains represented scavenged carcasses or active predation.

In this paper we report for the first time *P. hookeri* eating *A. forsteri* pups in mainland New Zealand. We also present evidence suggesting that this was the result of active predation rather than scavenging. Our aims were to assess the frequency of this behaviour and its potential impact on fur seal populations in southern New Zealand.

METHODS

Study sites and sampling method

While surveying New Zealand sea lions in Otago, South Island, New Zealand (McConkey 1997) we collected regurgitations and scats at monthly intervals during visits to known sea lion haul-out beaches from 1991 to 1997 (Lalas 1997; McConkey

1997). We identified prey species found in regurgitations and scats to assess diet composition by following the procedures outlined in Lalas (1997).

Capture of fur seal pups

To determine seasonal change in fur seal pup weights and condition for comparison to pups identified from sea lion regurgitations (see Results) we captured fur seal pups born at Fuchsia Gully (Ohinepuha), Otago Peninsula (45°50′S, 170°45′E) from January to May 1997. We captured pups by hand on 5 January (n = 68 males and 76 females), 26 February (n = 56 males and 70 females), 30 April (n = 61 males and 52 females), and 27 May 1997 (n = 63 males and 57 females) (see Lalas & Harcourt 1995). For all pups captured we recorded weight (to the nearest 0.1 kg) and standard body length (to the nearest 0.01 m), and placed individually numbered plastic tags (Allflex® New Zealand) in the connective tissue on the trailing edge of both foreflippers (Harcourt et al. 1995).

Analysis

To compare the weight of pups identified from sea lion regurgitations to the population of pups at Fuchsia Gully we calculated the lower quartiles for each capture date. We calculated the condition of fur seal pups by regressing $\log_e$ pup mass (kg) against $\log_e$ length (m) for each sex and capture date (Cone 1989), and applying the regression equation to length to give predicted mass (m_p). The ratio of observed mass (m_o) to m_p gives a relative condition for each sex and capture date. We calculated the lower quartile for condition at Fuchsia Gully to compare to the condition of ingested pups before predation.

RESULTS

Sea lion regurgitations and scats

On 26 April, 9 May, and 2 September 1997 we found three separate sea lion regurgitations containing fur seal body parts. The first regurgitation (found at Victory Beach—45°50′S, 170°44′E) contained hair, skin, and cartilage from fur seal pups formed into a 40 × 8 cm cylinder. Skin fragments ranged from 4 to 50 cm^2.

The second regurgitation (Papanui Beach—45°52′S, 170°45′E) was very fresh. It contained bone (cranium), a whole foreflipper, skin, hair, and three green plastic tags from three different female fur seal pups. All tags had been placed on pups from the fur seal breeding colony at Fuchsia Gully. We also found a sea lion scat containing fur seal pup hair in the vicinity of the second regurgitation.

The third regurgitation (Victory Beach) contained skin fragments with hair from fur seal pups. We found three sea lion scats containing fur seal pup hair near this regurgitation.

Pup weight and condition

Two of the three pups identified from the second regurgitation were within the lower weight quartile for Fuchsia Gully when they were last captured (Fig. 1). All three pups were within the lower condition quartile when they were last captured (Fig. 1). The probability of all three pups falling within this lower condition quartile at random is $(0.25)^3 = 0.016$.

DISCUSSION

New Zealand sea lions are rarely seen with prey, and all known records are of males taking fish during daylight in shallow water close to shore (Lalas 1997). We cannot confirm that the regurgitated remains resulted from active predation rather than scavenging on carcasses. However, our results do suggest that the sea lion predator swallowed entire pups rather than feeding on portions, and *P. hookeri* are known to usually swallow prey whole (Lalas 1997). Pelagic feeding of whole organisms by sea lions suggests that the fur seal pups were alive and swimming when eaten. In addition, a New Zealand sea lion captured and abducted a small New Zealand fur seal while swimming 5 m offshore of Cape Saunders, Otago Peninsula (45°53′S, 170°44′E) on 6 May 1997 (G. Clark pers. comm.). This abduction and possible predation immediately before the discovery of the second regurgitation supports the suggestion of predation rather than scavenging.

One might expect sea lions to target smaller, weaker pups if they are easier to catch than larger, stronger pups. Since all pups fell within the lower condition quartile our limited sample supports this hypothesis. The observation that all three pups ingested weighed <10 kg (Fig. 1) corresponds to the 11 kg maximum prey size recorded for New Zealand sea lions at Papanui Beach (Lalas 1997).

It is unlikely that New Zealand sea lions have eaten many fur seal pups in Otago in recent years. The intensity of beach searches for sea lion scats and regurgitations (Lalas 1997; McConkey 1997)

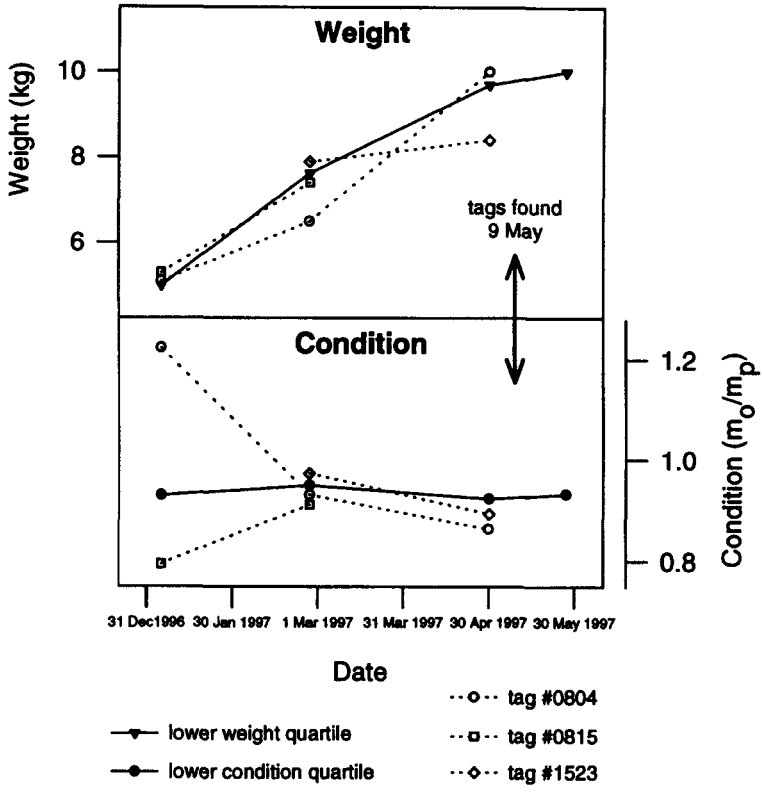

Fig. 1 Seasonal change in weight and condition of pups found in a sea lion regurgitation on 9 May 1997. Lower weight and condition quartile for female pups at the breeding colony of Fuchsia Gully, Otago Peninsula, New Zealand, are presented for comparison.

suggests a high probability of detecting such events. However, numbers of fur seals and sea lions have increased recently (Lalas & Harcourt 1995; Taylor et al. 1995; Taylor 1982, 1992, 1996; Lalas 1997; McConkey 1997). Fur seals began breeding in Otago c. 1980 and have increased at a rate of 25% per annum (Lalas & Harcourt 1995). Sea lions at Otago Peninsula have increased from 10–15 in 1986–87 (Beentjes 1989) to 43 in 1995 (McConkey 1997), with the first successful breeding recorded in 1992–93. We can only speculate on whether the incidence of sea lion predation on fur seal pups will increase. Predation may occur more frequently if current trends in numbers of both species continue (Lowry & Fay 1984). Alternatively, the same sea lion may have been responsible for all regurgitations, indicating an individual variation or anomaly in prey selection (Harcourt 1993).

We must stress that the observation of *P. hookeri* eating *A. forsteri* pups should not be confused with the more common behaviour of sea lions abducting pups, yearlings, and females of their own species and others (Marlow 1975; Wilson 1979; Campagna et al. 1988; Harcourt 1993; Miller et al. 1996). Death by abduction appears to be the by-product of aggressive sexual behaviour by sub-adult sea lions and does not represent active hunting or eating (Campagna et al. 1988; Harcourt 1993).

Even with the possibility of increasing sea lion predation on fur seals, the frequency should remain too low to affect the rate of increase of fur seal populations. Individual sea lions may be efficient predators of fur seals (Harcourt 1993; S. Robinson pers. comm.), but if the pattern of predation reflects that observed for *O. byronia* on *A. australis* (Harcourt 1993) then the incidences of this type of behaviour are rare (Reidman 1990).

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