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Diet of the Red-backed Buzzard (*Buteo polyosoma exsul*) and the Short-eared Owl (*Asio flammeus suinda*) in the Juan Fernández Archipelago off Chile

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The Juan Fernández Islands (Robinson Crusoe, Santa Clara and Alejandro Selkirk) off the Chilean coast hold a unique biota featuring high levels of endemism in both plants and terrestrial animals (Castilla 1987, Stuessy et al. 1991). Four raptors inhabit the islands: Peregrine Falcon (*Falco peregrinus*), American Kestrel or Cernícalo de Juan Fernández (*F. sparverius*), Red-backed Buzzard or Blindado (*Buteo polyosoma*), and Short-eared Owl or Nuco (*Asio flammeus*). Of these, two are endemic subspecies: *F. sparverius fernandensis* and *B. polyosoma exsul* (Johnson 1965, Schlatter 1987). These species are threatened by illegal hunting and nest ravaging by introduced mammals (CONAF 1976). In general, Chilean raptors are decreasing due to illegal hunting, habitat alteration, and prey reduction (Jaksić and Jiménez 1986). Even the Short-eared Owl is categorized as inadequately known (Glade 1987). In fact, the biology is poorly if at all known (Schlatter 1987) for the raptors of Juan Fernández Islands and for all oceanic Chilean birds.

The diets of Juan Fernández' Red-backed Buzzard and Short-eared Owl are cases in point. Although there are some data available on their respective diets in continental Chile (Schlatter et al. 1980, Rau et al. 1992), no such quantitative information exists on their diet in Juan Fernández Islands. Anecdotal information suggests that Red-backed Buzzards prey on introduced rodents (*Mus* and *Rattus*), poultry, young goats, and native petrels (*Pterodroma*; Lonnberg 1921, Johnson 1965, Torres and Aguayo 1971). According to Sáiz (1982), Red-backed Buzzards do not consume European rabbits (*Oryctolagus cuniculus*). Short-eared Owls, on the other hand, reportedly prey on *Mus* and *Rattus* and rabbits (CONAF 1976, Sáiz 1982). Herein, we describe quantitatively the diets of island Red-backed Buzzards and Short-eared Owls.

From November 1988 to April 1991 and in January 1992, we collected 26 pellets regurgitated by Red-backed Buzzards (22 from Alejandro Selkirk Island and four from Robinson Crusoe Island), and 20 pellets cast by Short-eared Owls (seven from Santa Clara Island and 13 from Robinson Crusoe Island, as well as prey remains found scattered around a nest). Prey remains were identified to the finest possible level of resolution. Identification of mammalian species was attained by comparison with a reference collection in the Sección Mamíferos, Museo Nacional de Historia Natural, Santiago.

Thirty-six vertebrate prey items were identified from pellets of Red-backed Buzzards, as well as seven invertebrates (three coleopterans, three arachnids, and one decapod). Given the proportion of biomass contributed by vertebrates, we focused our analysis on this prey category (Table 1). The most frequent prey were rodents (47.3%), particularly the introduced house mouse (*Mus musculus*), whereas birds, largely petrels, accounted for 39.8% of the vertebrate prey. Interestingly, it has been suggested that attacks by Red-backed Buzzards may have forced petrels to use burrows to reduce predation risks (Johnson 1965). While this behavior may decrease their vulnerability to buzzards, it is ineffective toward introduced terrestrial predators such as coatis (*Nasua nasua*) and cats (*Felis catus*, Torres and Aguayo 1971).

Red-backed Buzzards also preyed on European rabbits, which accounted for 5.6% of their vertebrate prey. Unidentified fishes made up 5.6% of the prey by number. Housse (1945) mentioned fish remains among the prey of *Buteo polyosoma polyosoma*, suggesting that they were occasional prey when the abundance of mammals and birds was low. Fish may have been consumed as carrion. In fact, *Buteo polyosoma exsul* was observed by one of us (MSS) scavenging on dead fur seal (*Arctocephalus philippii*) pups and eating placentae of Juan Fernández fur seals, a suspected but so far unconfirmed behavior of this raptor (Torres 1987). Three pellets contained some hair attributable to seals. Scavenging suggests that Red-backed Buzzard is an opportunistic raptor.

In central Chile, *B. polyosoma polyosoma* preys largely on native rodents, secondarily on introduced rabbits, and less frequently on native birds (Schlatter et al. 1980). Therefore, this hawk's diet in the Juan Fernández Islands is roughly similar to that in the continent, except for the consumption of fish and large mammal carrion.

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Table 1. Percent of prey in the diet of Red-backed Buzzard (*Buteo polyosoma exsul*) and Short-eared Owl (*Asio flammeus suinda*) in the Juan Fernández Archipelago.

PREY CATEGORIES	*BUTEO*	*ASIO*
Mammals		
House mouse (*Mus musculus*)	41.7	0.0
European rabbit (*Oryctolagus cuniculus*)	5.6	60.7
Rodentia: unidentified	5.6	10.7
Mammal: unidentified	2.6	10.7
Birds		
Pterodroma	27.8	17.9
Birds: unidentified	11.1	0.0
Fishes		
Fish: unidentified	5.6	0.0
Total prey	36	28

A total of 28 prey items, all vertebrates, were determined for Short-eared Owl (Table 1). The most frequent were European rabbits, both adults and juveniles (eight and nine individuals, respectively). Secondarily, Short-eared Owls preyed on birds, particularly both adults and eggs of petrels, as well as on unidentified rodents. In continental Chile, Short-eared Owls consume rodents almost exclusively, mostly native species, and a negligible number of invertebrates (Rau et al. 1992).

Despite our small sample, it is noteworthy that in the Juan Fernández Islands both Red-backed Buzzards and Short-eared Owls preyed largely on introduced mammals: 53% by number in the Red-backed Buzzard and 71% in the Short-eared Owl. The staple prey appeared to be rabbits and murid rodents, species which are threatening the survival of several native species on the islands. The European rabbit, for instance, precludes the recruitment of seedlings of endangered native shrubs, such as *Chenopodium crusoeanum*. Acevedo (1990) stated that an effective recovery plan for the flora of Juan Fernández ought to consider the eradication or a severe population reduction of rabbits. Rabbit eradication, however, will depress the prey base for the Short-eared Owl. On the other hand, murids affect the survival of several ground-nesting birds, including petrels regarded as vulnerable (Glade 1987, Rottman and López-Callejas 1992) by preying upon their eggs. As with rabbit control, controlling those exotic rodents in order to ensure the survival of some bird species may have the secondary effect of diminishing the resource base for raptors whose conservation is also of concern.

Chilean raptors tend to be opportunistic predators, concentrating on the most abundant and vulnerable prey available (see Jaksić and Simonetti 1987 for a review), exhibiting both functional and numerical responses to changes in their resource spectrum (see Crespo 1966, Dalby 1975). Therefore, if faced with a decline in the abundance of exotic species by their control or eradication, raptors may turn to native birds which already are threatened. Alternatively, raptors may respond numerically, with a population reduction coupled to the decline of their staple prey, which also represents a problem given the fragile conservation status of these raptors. This paradoxical situation should be considered when planning for the control of introduced rabbits and rats, a mandatory action if the survival of several unique species of the Juan Fernández Islands are to be saved from extinction.

RESUMEN.—En base al análisis de regurgitados, estudiamos la dieta del Aguilucho de Más Afuera (*Buteo polyosoma exsul*) y del Nuco (*Asio flammeus suinda*) en el Archipiélago de Juan Fernández. El aguilucho consume principalmente múridos (introducidos) y aves. En menor medida depreda sobre conejos, consumiendo además peces y mamíferos marinos como carroña. El nuco consume principalmente conejos, fardelas y múridos. En ambas rapaces destaca que la mitad de su dieta la componen especies exóticas.

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OBSERVATIONS OF WINTERING GYRFALCONS (*FALCO RUSTICOLUS*) HUNTING SAGE GROUSE (*CENTROCERCUS UROPHASIANUS*) IN WYOMING AND MONTANA U.S.A.

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Little has been written on the prey preferences of wintering Gyrfalcons (*Falco rusticolus*) outside of their breeding range (Palmer 1988, Dobler 1989, Sanchez 1993). Most summaries of Gyrfalcon prey selection are from data collected during the breeding season (Sherrod 1978). Although wintering Gyrfalcons occur within the range of Sage Grouse (*Centrocercus urophasianus*; Cade 1982, Johnsgard 1983), we found no reports of wild Gyrfalcons preying upon this species. However, captive Gyrfalcons flown in falconry are reported to be able to kill Sage Grouse (Christopher and Hardaswick 1988).

Between 8 November and 6 December 1992, CSG and SP observed an individual Gyrfalcon on 10 separate days (identification was based on comparisons of photographs) 14 km east of Lander, Wyoming. The Gyrfalcon appeared to be an adult female based on its plumage, yellow feet,