

## An analysis of the Iberian lynx predation upon fallow deer in the coto Donana, SW Spain

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### SUMMARY

Analysed are 1537 scats of lynxes and 24 carcasses of deer killed by lynxes from 1973 to 1984 at the Doñana Biological Reserve. Lynx predation upon deer is low (0%-8% of the prey) and concentrates in Autumn-Winter, when rabbit supply and doe-fawn relationships decrease. Fallow deer are statistically chosen as prey more often than red deer, and fawns more often than adults. Individuals in good and bad physical condition are evenly captured. Lynxes kill deer by biting their throats. They will usually eat the muscular tissue of the shoulders and thighs. One individual lynx can eat from the same carcasse three or four times in two days. Lynx predation seems to account at least for 50% fawn mortality of fallow deer in Doñana. Anyhow, fallow deer have strong habitat restrictions in the area and predation could be a type of starvation related mortality.

### Introduction

At present the Iberian Lynx (Lynx pardina) is the only predator able to kill half-grown deer in the Doñana National Park, where two species of deer exist, the fallow deer (Dama dama) and the red deer (Cervus elaphus). The predator-prey relationships between lynx and deer in the area have received some attention in the past (Valverde, 1957, 1967; Alvarez et al., 1975; Delibes, 1980). However, recent research on the fallow deer population and the ecological behaviour of lynxes have provided us with some new information which partially makes clear this interaction. In our communication we are revising four aspects of the lynx-deer relationships:

- 1.- Seasonal changes in the lynx predation upon deer and factors influencing it.
- 2.- Selectivity in the predation in respect of species, age, sex, physical condition, etc.
- 3.- Lynx behaviour in relation to its kills.
- 4.- Relative importance of lynx predation as a cause of fallow deer mortality.

### Study area and methods

The study was carried out in the Doñana Biological Reserve, a protected area whose surface is about 70 square kilometers. Three main biotopes can be recognized: sand dunes, mediterranean scrublands with high coverture and open marshes that get dry during the summer. Fallow deer use

almost exclusively the ecotone between the scrubland and the marshes, while red deer also use the pure scrubland. The climate is mesomediterranean, with humid and mild winters and dry and hot summers.

Our data belong to two periods: from 1973 to 1976 we collected and analysed more than 1500 lynx scats on a monthly basis (Delibes, 1980). Also, we censused the fallow deer population once a month during 1973 and in the complete period we found eleven carcasses of deer recently killed by lynxes. From 1981 to 1984 we censused the fallow deer population monthly. Besides this, through 1983 and 1984 we radiotracked eleven lynxes (Delibes & Beltrán, 1984). In this second period thirteen new deer carcasses were found.

Results and discussion

Deer represent from 0% to 15% of the biomass consumed by lynxes every month, the annual average being 5.5% (Delibes, 1980). The deer importance in the lynx diet is high from October to February and low from March to September. Increasing role of deer as prey corresponds with a decrease in the rabbit importance in the diet, the former being in autumn-winter the first complementary food for the Iberian lynx, a rabbit specialist (Fig.1).

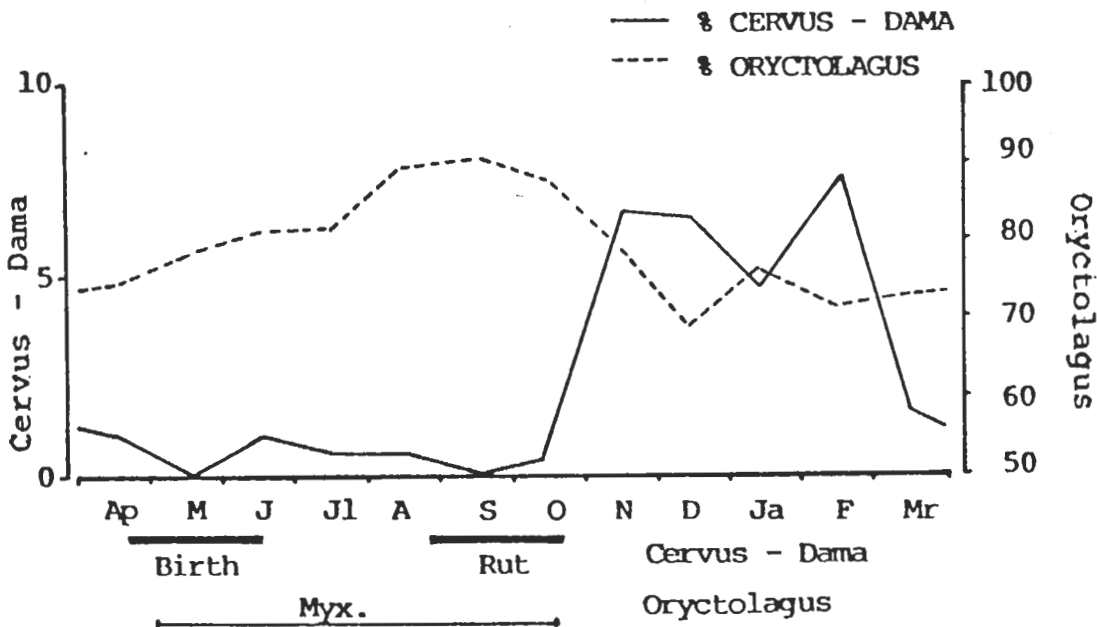


Figure 1.- Annual changes in the importance of Ungulates and Rabbits in the Spanish lynx diet (From Delibes, 1980, mod.).

Two facts can explain the increase in autumn in the role of deer as food of the lynx: an important decrease in the abundance and the availability of rabbits and the beginning of the rutting period of deer, when does take less care of their young and the vulnerability of these increases (Lent, 1971).

The number of red deer is slightly higher than that of fallow deer in the Reserve. However, their proportions in the diet of lynxes are 1:2.66 in the scats and 1:5 when found carcasses are considered. This means that fallow deer are preyed above their abundance in relation with red deer. We consider three species-specific deer facts for an explanation of this preference: size, rutting season and habitat use pattern. On average, red deer are bigger than fallow deer and size seems to be an important clue for lynx predation. Rutting in the fallow deer takes place in October, when rabbit availability is at its minimum, while rutting in the red deer occurs during August-September. Finally, as said, fallow deer use exclusively the border of the marshes (a relatively open and restricted habitat preferred by the lynx) probably being easier to locate and ambush than red deer, which use the scrubland.

All the four autopsied red deer were juvenile under one year old. For the fallow deer, predation upon juveniles is statistically higher (chi-square = 24.24, 1 d.f.,  $p < 0.001$ ) than upon the pooled adults and subadults. We have not any data on the physical condition of the deer populations in Doñana. Then, a differential predation on sick and weak individuals cannot be confirmed. However, we know that sick fallow deer are killed as often as individual in good condition, at least among juveniles.

Some studies in the area would point at a preferential predation upon males among the juvenile fallow deer (San José, 1984), in good agreeing with the results of other similar works (i.e. Bergerud, 1971). However, our data, though in a short number, do not confirm this assertion.

The autopsies of deer killed by the lynx reveal that the death is caused by suffocation, by means of a bite on the larynx (Fig. 2). This coincides with the technique cited for other authors for other species of the genus (i.e. Borg, 1962) or the family (i.e. Wilson, 1984). Probably small lynxes (as the Iberian lynx or the bobcat) are the smaller members of the Felidae able to usually kill deer by this procedure.

After killing it, the lynx drags the deer into the scrubs. This behaviour has been observed often. The predator usually eats from the thighs, the shoulders or the neck of the deer. The amount of meat eaten by meal varies from one to three kilograms (in the last case by one pair of lynxes). It was formerly thought that the Iberian lynx ate only once from each prey, leaving it next (Valverde, 1957; Delibes, 1980). Nowadays we know thanks to the radio-tracking studies that one individual lynx eats from one to four times of each deer, the number of times depending very much on the finding of the

carcasse by wild boars. Returning to their prey is known of other species of the genus (i.e. Young, 1958; Haglund, 1966; Nellis & Keith, 1968).



Figure 2.- Fallow-deer fawn three months old killed by a Spanish lynx. The autopsy shows four punctures (arrows in the picture) corresponding to the lynx canines and the location of the throat bite.

The last question in our communication refers to the impact of the lynx predation upon the fallow deer population. The continuous pursuit of the fallow deer population along the year reveals two periods of important juvenile mortality. The first one coincides in time with the birth season (May-June) and the second one with Autumn-Winter. As we know, the lynx has very little influence on the post-partum mortality, but it probably is the major cause of the observed mortality during Autumn-Winter. We have been able to find 32 dead fallow deer on the field (all the year around). From these, 50% were undoubtedly killed by lynxes, most of the remaining ones having died from unknown causes but probably also preyed. This suggests that lynx predation is an important factor of mortality for the fallow deer in the area. However, as stated before (Delibes, 1980), this could be a sort of starvation-related mortality, fallow deer being, as in other areas (i.e. Barret, 1984), mainly controlled by

environmental factors and habitat restriction. In fact, its population in the Doñana Biological Reserve grew from 1973 to 1981, decreased abruptly in 1981-82 coinciding with a severe drought in this period, and newly increased from 1983, reaching the level of 1973 (Fig. 3). All these trends suggest a certain stability and the existence of density-dependent mechanisms of mortality.

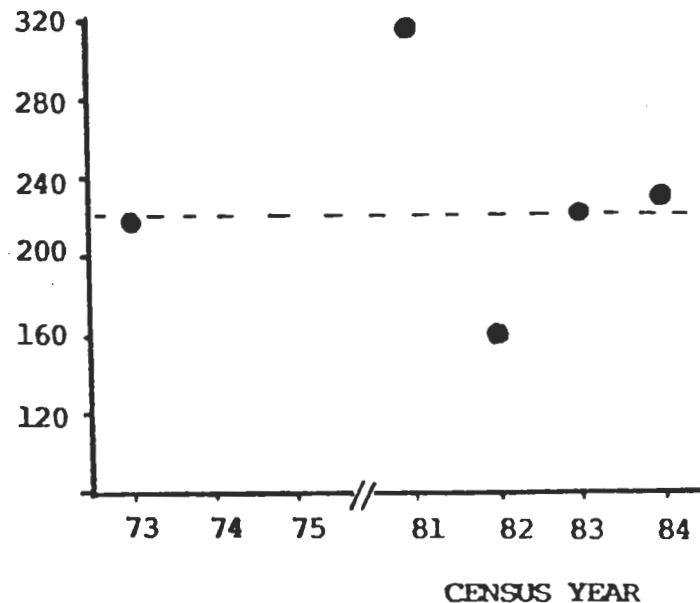


Figure 3.- Fallow deer numbers in the Biological Reserve of Doñana from 1973 to 1984.

#### RESUMEN

Entre 1973 y 1984 hemos analizado 1537 excrementos de lince ibérico y examinado 24 cadáveres de cérvidos cazados por los linces, en la Reserva Biológica de Doñana. La predación sobre los cérvidos es baja (0%-8% de los individuos presa) concentrándose durante el otoño-invierno, cuando la disponibilidad del conejo y la interacción madre-cría en los cérvidos disminuyen. Como presa son elegidos significativamente los gamos frente a los ciervos, y los juveniles frente a los adultos, siendo predados en igual proporción individuos en buena y mala condición física. El lince ibérico mata a los cérvidos por asfixia mordiéndoles en la garganta. Las partes más frecuentemente devoradas son los músculos de los cuartos traseros y paletillas. Un lince puede comer del mismo cérvido tres o cuatro veces en dos días. La predación por el lince parece ser responsable de al menos el 50% de las muertes observadas en los gamos de Doñana. En todo caso, el gamo tiene fuertes restricciones de hábitat en el área y esta predación podría ser un tipo de mortalidad relacionada con la falta de alimento.

## RESUME

Entre 1973 et 1984 nous avons analysé 1537 excréments de lynx pardelle recueillis dans la Réserve Biologique de Doñana et examiné 24 cervidés tués par le lynx dans la même zone. La prédation sur les cervidés est assez basse (0%-8% des individus proies) et concentrée durant l'automne et l'hiver, quand la disponibilité de lapins et les liens mère-faon diminuent. Les daims sont sélectionnés par le lynx significativement face aux cerfs, et les jeunes des deux espèces face aux adultes. Individus saines et malades sont capturés dans les mêmes proportions. Le lynx pardelle tue les cervidés par asphyxie en les mordant à la gorge, devant le larynx. Les parties les plus fréquemment dévorées sont les muscles de l'épaule et de la cuisse. Un lynx peut se nourrir du même cervidé trois ou quatre fois en deux jours. La prédation par les lynxes paraît être responsable d'au moins 50% des mortes connues des daims à Doñana. De toutes façons, cette prédation pourrait être pour eux un type de mortalité relationnée avec le manque de nourriture.

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Literature

- Alvarez, F.; Braza, F. & Norzagaray, A. (1975): Estructura social del gamo, (Dama dama, Mammalia, Cervidae) en Doñana. Ardeola, 21 (special vol.): 1129-1142.
- Barrett, M.W. (1984): Movements, habitat use and predation on proghorn fawns in Alberta. J. Wildl. Manage., 48(2): 542-550.
- Bergerud, A.T. (1971): The population dynamics of Newfoundland Caribou. Wildlife Monographs, 25. 55pp.
- Borg, K. (1962): Predation on roe deer in Sweden. J. Wildl. Manage., 26(2): 133-136.
- Delibes, M. (1980): El lince ibérico. Ecología y comportamiento alimenticios en el Coto Doñana. Doñana Acta Vertebrata, vol. especial 7(3), 128 pp.
- Delibes, M. & Beltrán, J.F. (1984): Ecología del lince ibérico en el Parque Nacional de Doñana. Quercus, 14: 4-9.
- Haglund, B. (1966): Winter habits of the Lynx (Lynx lynx L.) and Wolverine (Gulo gulo L.) as revealed by tracking in the snow. Viltrevy, 4: 81-299.

- Lent, P.C. (1971): Mother-Infant relationships in Ungulates. In: The Behaviour of Ungulates and its relation to management. Pp.: 14-55. IUCN (ed.). The University of Calgary, Alberta, Canada.
- Nellis, C.H. & Keith, L.B. (1968): Hunting activities and success of lynxes in Alberta. J. Wildl. Manage., 32: 718-722.
- San José, C. (1984): La inversión parental en el gamo (Dama dama L.). Tesina de licenciatura. Universidad Complutense, Madrid. 92 pp.
- Valverde, J.A. (1957): Notes écologiques sur le Lynx d'Espagne Felis lynx pardina Temminck. Terre et Vie, 1: 51-67.
- Valverde, J.A. (1967): Estructura de una comunidad de vertebrados terrestres. Monografías Estación Biológica de Doñana, CSIC, Madrid, reimpresión, 218 pp.
- Wilson, P. (1984): Puma predation on guanacos in Torres del Paine National Park, Chile. Mammalia, 48(4): 515-522.
- Young, S.P. (1958): The bobcat of North America. Wildlife Management Institute, Washington DC.

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