some animals were a genuine measure of the infrequency with which they preferred to drink, or if these animals were discouraged from drinking again after having been photographed once or twice. While the data on the frequency of visits may be biased, the photographs do show which individuals approached the troughs at least once and the time of that visit.

Records of which gazelles drank and when were interrupted by various problems: birds perching on a camera knocked it out of alignment; sometimes a flash failed to fire; occasionally a film ended sooner than expected. Sometimes gazelles could not be identified because only one ear was visible in a photograph. Possibly some gazelles visited a trough only at a time when a camera failed and therefore were wrongly regarded as non-drinkers. In practice, the combination of the high camera success rate (> 80% overall) and the low percentage (25%) of single-visit animals amongst the known drinkers suggests that few if any gazelles are likely to have drunk unrecorded.

An active transponder system (Hutchings & Harris, 1996) would be a better alternative method to use. Drinking by gazelles, each tagged before release with a unique transponder, could be detected by an aerial buried close to a trough and recorded by a controller. Gazelles would be unaware of the system, which would record only tagged animals drinking and not other untagged species.

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Estimating the population density of *Galemys pyrenaicus* in four Spanish rivers

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INTRODUCTION

In spite of the studies carried out for several decades on *Galemys pyrenaicus*, no paper has specifically estimated desman densities, although indirect information can be inferred from the studies in the French Pyrenees on the use of space by Stone & Gorman (1985) and Stone (1987*a*).

The present work examines the density of Iberian desman in four mountain streams in northern Spain, the most favourable area for the species in the Iberian Peninsula (Queiroz *et al.*, 1994).

STUDY AREA

Four search campaigns were carried out in mountain rivers during summer 1991. Two searches took place in the Cantabrian mountain range in July, the first in the Autonomous Community of El Principado de Asturias, in the Pigüeña River, near the village of Pigüeña (Natural Park of Somiedo) and the second in the Muniellos River, near Tablizas (Biological Reservation of Muniellos). Two more trapping sites were selected in August on the Spanish side of the Pyrenees, one in Navarra (National Game Reserve of Quinto Real), in the Arga River, near the village of Eugui and one in the Urrobi River, near the town of Burguete.

Both Cantabrian trapping sessions were carried out in streams with similar features: 5–8 m width, near 1 m/s of current velocity and a discharge of over 1 m^3/s. In both cases a dam was located around net number 10. In Somiedo the use of a small hydroelectric power station brought about a notable decrease of the water flow downstream, and, in Muniellos, the dam has been neglected since 1975 so a continuous water flow exists.

Pyrenean streams present some different features from those of the sampled Cantabrian streams. Their width was similar but their current velocity and their discharge were lower (around 0.2 m/s and 0.1–0.2 m^3/s), the summer water temperature was between 1 °C and 3 °C degrees higher, and the wooded canopy of the riverbanks was less dense.

MATERIAL AND METHODS

For trapping purposes, 3 m long unbaited nets were used close to the river banks and were partially submerged to allow the survival of captured desmans, according to the method described by Peyre (1962) and Richard (1973).

In every sample station, 15 nets were set at intervals of 100 m, for 4 nights. Each net was checked day and night, at least 4 times every 24 h to avoid deaths resulting from starvation or cooling.

Since the average home range lengths for males and mated females are 429 m and 301 m, respectively, and they take 2 days to explore the complete territory (Stone, 1987*a*), the distance of 100 m between nets guarantees that the minimum requirement of a distance between nets being a quarter of the longest axis of the average home range (Spitz, 1969), is fulfilled. With this distance between nets, we guessed that during the 96 h of every trapping session, each individual should come close to some net at least 6 times. According to these home range sizes and with the spatial organization showed by Stone & Gorman (1985), a transect of 1400 m could allow, theoretically, a catch of 6 individuals of stable residence, if the occupation of the territory by fixed couples were complete, plus other vagrant or juvenile individuals.

Given the short trapping period, animals were marked only by cutting a fingernail, using Twigg's (1975) coded system, so that this slight marking should allow identification of the individuals and avoid injuries due to amputations during the trapping session.

In this study recaptures have been scarce. From a total of 23 specimens caught, only 3 were recaptured, at 170–269 m away from the point of release.

Because of the low rate of recaptures of *Galemys pyrenaicus* we estimated their density using a removal sampling method that considers only animals caught for the first time. Thus, density was obtained using the Zippin method of successive removals based on the constant catch probability during the trap period, in such a way that, having a constant catch effort, the number of animals caught per night diminishes noticeably over time (Zippin, 1956).

To verify whether the catches fitted the condition of significant reduction during the 4 nights, we used the criteria recommended by Smith *et al.* (1975), which state that the significance level of the linear correlation coefficient between daily catches and the cumulative previous catches should be lower than 0.05.

Specimens were weighed and measured in order to obtain the biometrical values for distinguishing juveniles from adults. We found no specimens under 50 g, a value given by Peyre (1962) and Stone (1987*b*) to identify both age categories.

Specimens were sexed by feeling of the pubic simphysis externally as described by Richard & Vallete Vaillard (1969) and by measuring the distance between the anal and urinary papillae, which is longer in males.

RESULTS

In three cases, the recommended condition of a the daily catch decrease was attained. The Muniellos River sample only reached a marginally significant value ($P = 0.72$), but was considered suitable owing to the difficulty of using the low figures obtained over only 4 days and the small error showed by the density estimation.

In our study, the densities obtained vary between 2.8 and 7.3 individuals/km and its estimations bear an acceptable degree of accuracy (Table 1). Only at the Pigüeña River is the confidence interval very wide, even though the correlation coefficient, as a value of the decreasing catches, is adequate ($P < 0.02$); the confidence limits may become larger because of the slow decrease of daily catches.

The catches were not homogeneously located along the sampled streams. In all the samplings, catches were concentrated in a part of the transect, other portions remaining empty of desmans, since neither desmans nor spraints were found. The average density of spraints

Table 1. Number caught and densities of desman, with a confidence interval of 95%

Rivers	Catches	Individuals/km	% occuped by desmans	Individuals/km adjusted
Pigüeña	7	7.3 (± 5.5)	50	14.6
Muniellos	7	5.0 (± 1.3)	65	7
Arga	4	2.9 (± 0.1)	62	4.7
Urrobi	3	2.8 (± 0.2)	70	4.1

was 13.3/km in the stretches of river where the catches took place, and 3.3/km in the no-catch areas. Somiedo catches and spraints were limited to the stretch located upstream of the dam, with no signs of their presence downstream where the water flow was low. In the remaining streams, desmans were also caught only in part of the sampled stretches, but there are no apparent habitat differences to explain their absence elsewhere. In the Muniellos and Urrobi Rivers desmans were taken in the first half the transect while in the Arga River animals were taken around the central area. Between 30 and 50% of the sampled river lengths had no desmans, i.e. approx. 40% of the checked areas seemed to lack desmans. This apparent void could be interpreted as areas of low probability of capture, filled, in the best of cases by non-resident individuals.

If we adjust the densities to refer only to the occupied areas (Table 1) their values are almost double.

There were 10 males to 12 females, figures which do not differ from the expected sex ratio of 1:1 ($\chi^2 = 0.045$; d.f. = 1; $P = 0.5$).

Most of the specimens ($n = 16$) were caught at sunset or in the first night hours, fewer were caught before sunrise ($n = 8$) and a small number ($n = 2$) came into the nets during daytime.

DISCUSSION

Although the density values obtained are precarious because of the low number of desmans captured, they are quite similar for the different locations and probably represent adequate values.

Our results agree closely with those obtained by Stone & Gorman (1985) for an Artillac stream (French Pyrenees), although they used different methods. Thus, the presence of a couple of desmans every 429 m (the male territory is the limiting factor for the settling of other resident couples) means the existence of 4.7 individuals/km, practically the average of our densities. If desmans are only present in 60% of the sampled stream lengths, the adjusted densities (Table 1) for the Spanish Pyrenean side are very close to the ones expected from French Pyrenean data. In the Cantabrian streams the density is higher and this could be due either to more vagrant individuals or to territories being shorter; our trapping system does not allow us to tell which.

Peyre (1956) also noted river stretches lacking desmans and he considered them to be unfavourable areas within suitable habitats. Similarly, Richard (1973*a*) has noted that some tracts of river always give good trapping results, but in other seemingly similar tracts of river no captures are made. In most of our sampling areas, there were no appreciable habitat changes between occupied and unoccupied areas, the only exception being the severe reduction of the water flow downstream caused by the dam in the Pigüeña River, where no desmans were caught and no dipper *Cinclus cinclus* were observed. The presence of *G. pyrenaicus* is very closely related to that of *C. cinclus* because their foraging strategies are the same, especially during the breeding season (Bertrand, 1993).

The desman densities we obtained were from areas where the environmental conditions seem to be optimal for the species. In any case, our trapping results show a lower density of desmans from the Pyrenees than from the Cantabrian range, although it is impossible to establish any reason for this difference. In the Mediterranean mountains where the desman is present, density will foreseeably be much lower. Qualitative trapping in the Sistema Central gave very poor results (J. Gisbert, pers. comm.). This suggests large unoccupied zones between demes of animals concentrated in the most favourable points.

The time distribution of catches through the day also shows evidence of intensive nocturnal activity greater than that expected from the timing activity pattern given by Stone (1987*b*). A main nocturnal activity is clear but it appears to be divided into two peaks: the most intensive activity being around 23:00 and less activity between 4:00 and 5:00. Diurnal catches did not reach 8% of the total and occurred between 10:00 and 14:00 (official summer time).

Several improvements could be made to our methods for future studies. Moving the trapping season to a later date will probably cause a larger number of juveniles to be caught and allow for easier identification of adults. In this study it was not possible to get authorization for trapping until the end of the fishing season and, starting in July, we did find individuals weighing under 50 g while 18% of desmans captured by Stone (1987*a*) from May to July weighed under 45 g. The distance between traps seems to be adequate given the home range of the species, so to increase the catch number and therefore the reliability of the results, the length of the trapping line could be increased to 2–3 km. In practice, it could prove difficult to maintain a constant catch effort using many nets because the large size of the nets makes them obvious and vulnerable. In our survey, the theft of several nets nullified the results of two other desman trapping sessions.

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Summer foods of the Andean hog-nosed skunk (*Conepatus chinga*) in Patagonia

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INTRODUCTION

The Andean hog-nosed skunk *Conepatus chinga* inhabits South America from Bolivia in the north to as far south as Neuquén province in Argentina (Redford & Eisenberg, 1992). In spite of its wide distribution and its value as a furbearer in Argentina (Fujita & Calvo, 1982), little is known about Andean hog-nosed skunk ecology, including its foods. It seems to forage solitarily during the night in open savannas and in arid and shrubby areas (Cabrera & Yepes, 1960; Mares *et al.*, 1996), capturing arthropods (mainly beetles and arachnids) and occasionally small mammals and preying on eggs and fledling birds (Cabrera & Yepes, 1960; Redford & Eisenberg, 1992; Mares *et al.*, 1996). Here we present the first quantitative study on the diet of this species, based on the analysis of faeces collected during the summer season in two localities in Argentinean Patagonia.

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STUDY AREA AND METHODS

Faecal droppings were mainly collected during January–February 1995 in two areas, 22 km apart, called Sañicó and Puesto Alamo. Sañicó is a high, rocky, flat and dry area 700 m above sea level, whereas Puesto Alamo is a more rainy grassy area in the bottom of a river valley, 800 m above sea level. Both sampling plots were in the Andean Precordillera, in north-western Patagonia (70°30′–71°30′W; 39°30′–40°20′S), which includes steep elevational (from 600 to 1400 m above