

# Trends in litter size in the Cantabrian brown bear population

## A 25 year-period perspective

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### Introduction

Brown bear monitoring in the Cantabrian Mountains has long been based on estimating the minimum number of females with cubs yearly. This approach has allowed to collect valuable information on bear litter size over time, which may help to better understand bear trends.

Since 1989, the minimum number of females with cubs has increased from 4 and 2 family groups to 34 and 6 in 2016, for the western and eastern segments of this bear population, respectively.

### Methods

**Analysis data:** From data of females with cubs since 1989 we calculated:

- Litter size average of the two segments of Cantabrian population and we compared them building a GLM model with Poisson distributions.
- Percentage of females with cubs for the different litter sizes.
- Litter size over time building a GLM model with binomial distribution.

### Results

Since 1989, the bear litter size in Cantabrian bear population ranged between 1 and 3 cubs, with a mean of  $1.82 \pm 0.65$  cubs (n=452).

Litter size was higher in the western population segment ( $\chi^2=3.4$ ; d.f.=1; P=0.065) Fig.1.

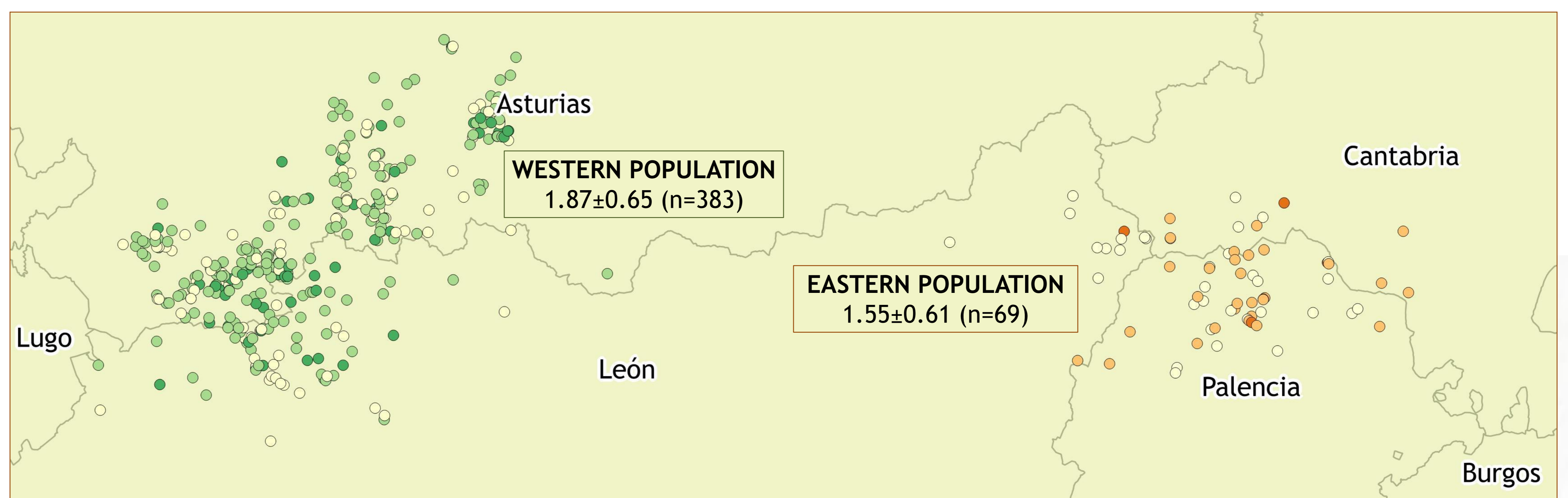


Fig. 1. Map with locations of the different females with cubs since 1989. Colour is according to the number of cubs and the population segment.

The most common litter size in the western segment was 2 cubs, followed by 1 and 3 cubs (Fig.2).

The most common litter size in the eastern segment was 1 cub, followed by 2 and 3 cubs (Fig.3).

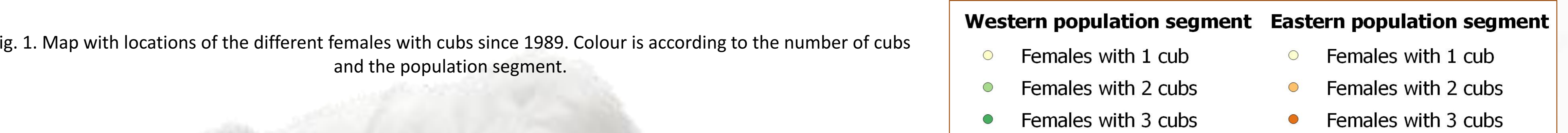


Fig. 2. Number of females with 1, 2 or 3 cubs for western population segment.

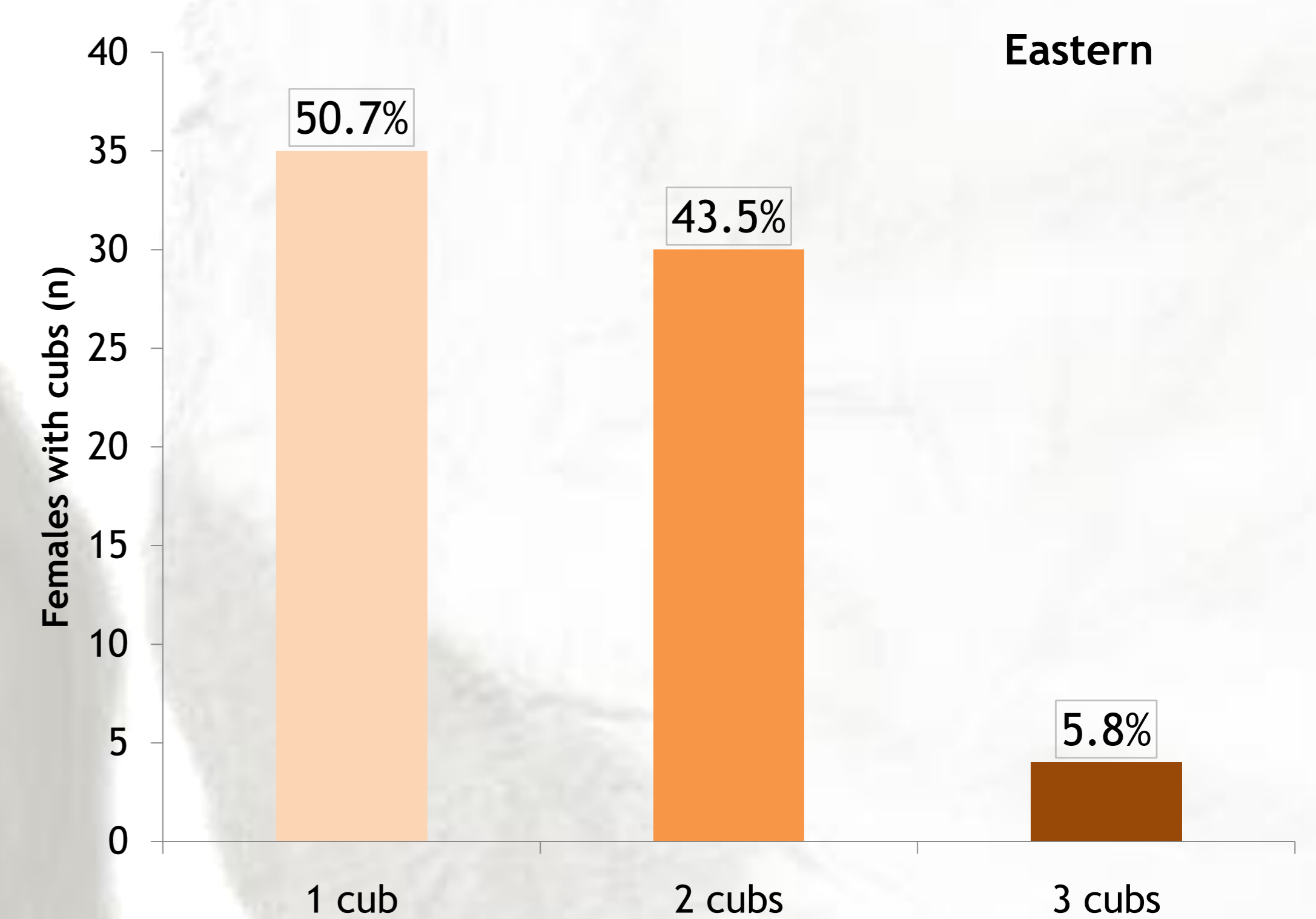


Fig. 3. Number of females with 1, 2 or 3 cubs for eastern population segment.

We did not detect a significant variation in litter size over time within segments.

However, there were more cases of females with 3 cubs in both population segments over time (Fig 4; Fig. 5). Worth mentioning, the proportion of females with 1 cub increased in the western population segment (Fig. 4)

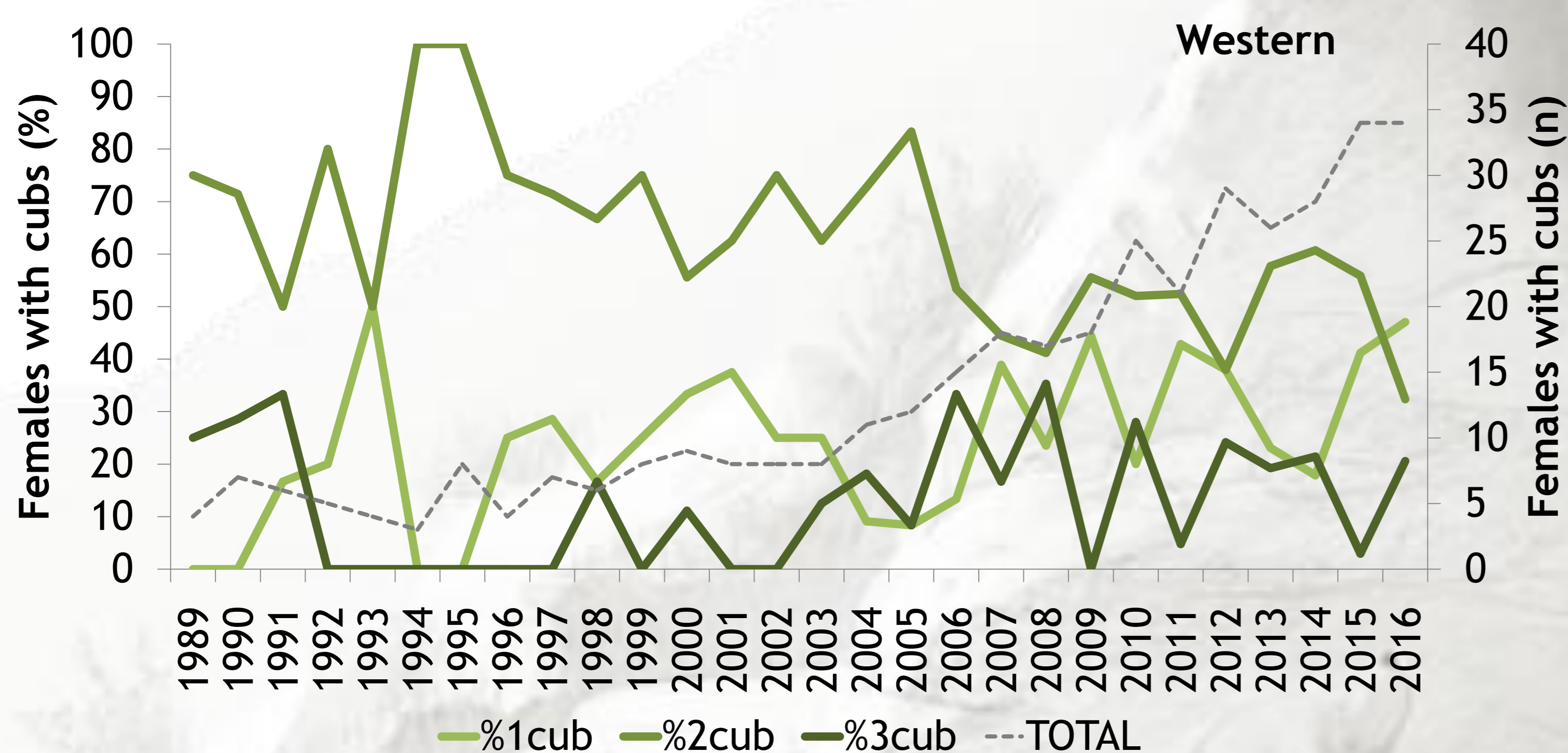


Fig. 4. Percentage of females with 1, 2 or 3 cubs in western population segment since 1989.

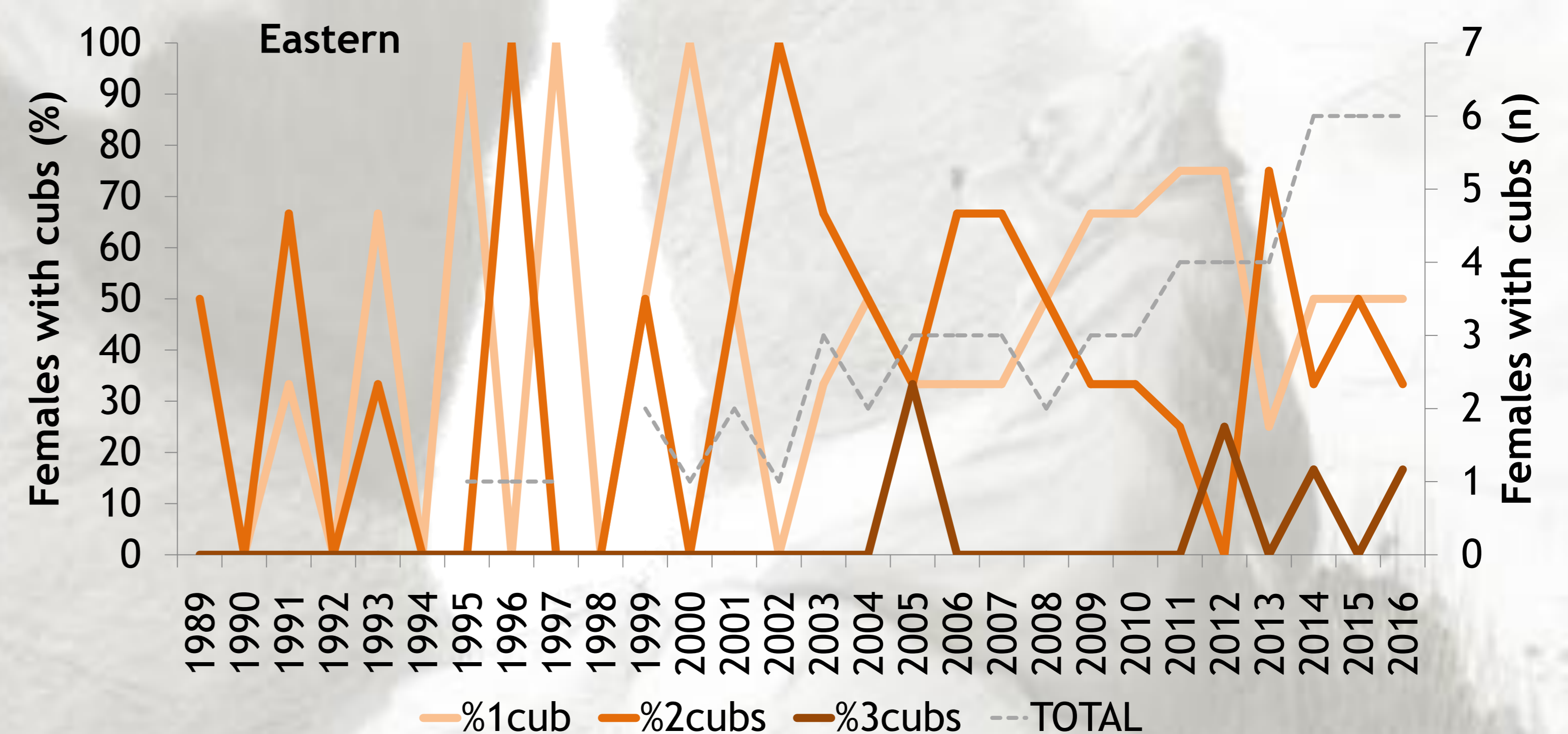


Fig. 5. Percentage of females with 1, 2 or 3 cubs in eastern population segment since 1989.

### Discussion

-Despite the increasing trend of this bear population, mean litter size in the Cantabrian brown bear population is one of the lowest sizes reported in the literature<sup>1, 2, 3</sup>, excepting for some decreasing or saturated bear populations<sup>3, 4, 5</sup>.

-Litters with 3 cubs are the less frequent in both population segments. However, following the trend of the population, they have increased over time. Similarly, females with 1 cub has also increased over time in western population segment.

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**References.** 1. Frković, A., Huber, D., Kusak, J. (2001) Brown bear litter sizes in Croatia. *Ursus* 12: 103-106. 2. Swenson, J.E. and Sandegren, F. (2000) Conservation of European brown bear populations; experiences from Scandinavia. In: J.F. Layna, B. Heredia, G. Palomero and I. Doadrio (Eds.). *La conservación del oso pardo en Europa: un reto de cara al siglo XXI*. Fundación Biodiversidad, Ministerio de Medio Ambiente, Madrid: 111-116. 3. McLellan, B.N. (1989) Dynamics of a grizzly bear population during period of industrial resource extraction. III. Natality and rate of increase. *Canadian Journal of Zoology* 67: 1865-1868. 4. Dupré, E., Genovesi, P. and Pedrotti, L. (2000) Studio di fattibilità per la reintroduzione dell'orso bruno (*Ursus arctos*) sulle Alpi centrali. *Biol. Cons. Fauna* 105: 1-96. 5. Camarra, J.J. (1990) L'Ours dans les Pyrénées: Suivi de la population de 1979 a 1988. *Bull. Mens. Office National de la Chasse* 142: 18-22. 6. Mace, R.D. and Waller, J.S. (1998) Demography and population trend of grizzly bears in the Swan Mountains, Montana. *Conservation Biology* 12: 1005-1016.