

Avian predators as a biological control system of common vole (*Microtus arvalis*) populations in NW Spain: experimental set-up and preliminary results.

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1.- STUDY AREA

We report on the preliminary results of the use of nest-boxes for barn owls (*Tyto alba*) and common kestrel (*Falco tinnunculus*) on croplands, as an experimental pest control program of common vole (*Microtus arvalis*) plagues.

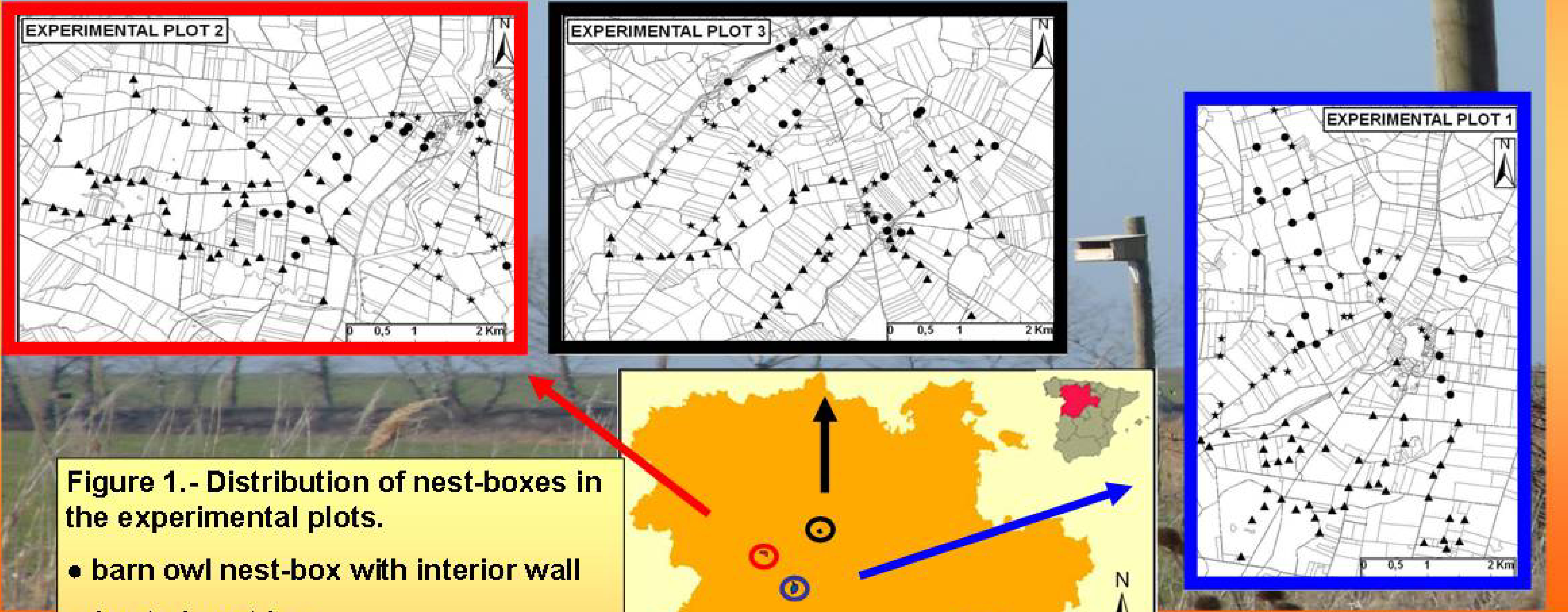


Figure 1.- Distribution of nest-boxes in the experimental plots.

- barn owl nest-box with interior wall
- ▲ kestrel nest-box
- ★ barn owl nest-box without interior wall.

2.- MATERIALS AND METHODS

We selected three control plots and three nest-box plot of 2000 ha each (Figure 1). In every one, we installed 300 nest-boxes.

Census Methods

Kestrel abundance was estimated using a kilometric index of abundance (KIA).

The abundance of rodents was measured using 420 Sherman LFAHD traps and an indirect abundance index (IAI) (Jareño 2010) based on the presence of fresh droppings and/or vegetation clipping of voles.

Vole consumption by kestrels

Analyzing the proportion of fresh pellets at nests containing only vole hair, to be used as an index of vole consumption

Data analysis

GLMM with voles and kestrels abundance (dependent variables) to explore differences between areas, years and treatments. Variation in the IAI was analyzed using GLMM, and the vole consumption by kestrels with a Binomial proportion.

3.- RESULTS

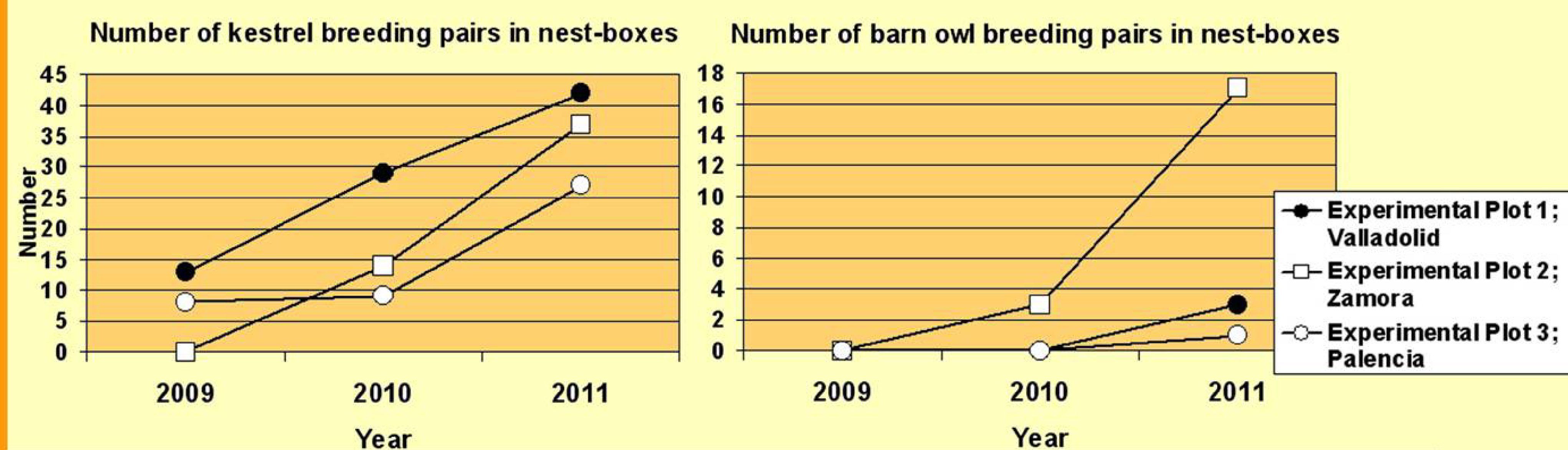


Figure 2. Number of kestrel and barn owl breeding pairs in nest-boxes during 2009-2011 in the three experimental plots.

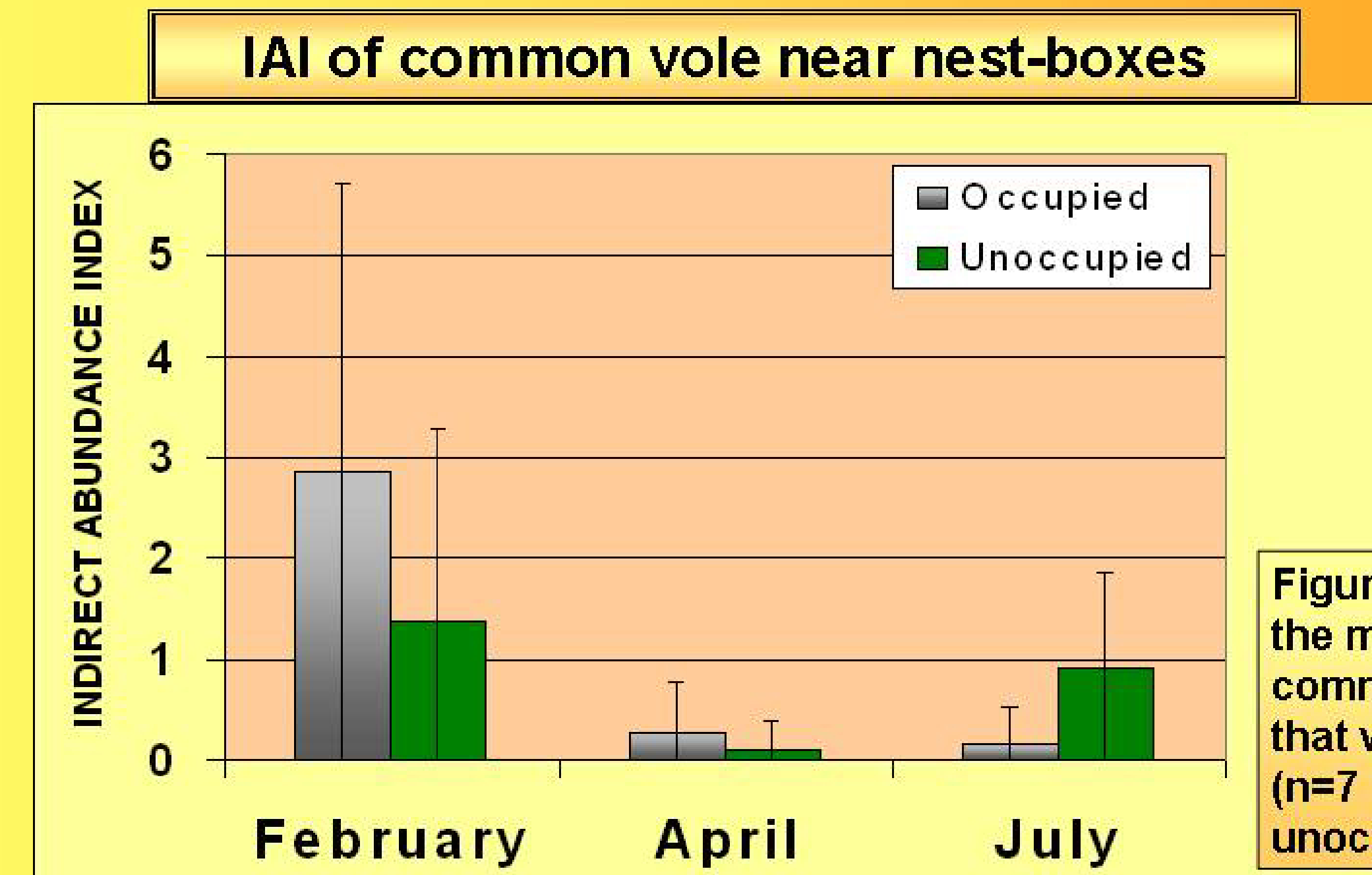


Figure 3.- Monthly differences in the mean (± S.E.) abundance of common vole near nest-boxes that were occupied by kestrels (n=7 each month) or unoccupied (n=11 each month).

	2010 (%)	2011 (%)	NUMBER OF PELLETS ANALISED		Z	P<0,005
			2010	2011		
EXPERIMENTAL PLOT 1 (Valladolid)	68,72	87,84	243	255	-5,19	0,0000
EXPERIMENTAL PLOT 2 (Zamora)	No datos	86,86	No datos	274	No datos	
EXPERIMENTAL PLOT 3 (Palencia)	43,48	57,30	46	185	-1,68	0,046

Table 1.- Differences between years in the percentage of *Falco tinnunculus* pellets with *Microtus arvalis* as the only prey.

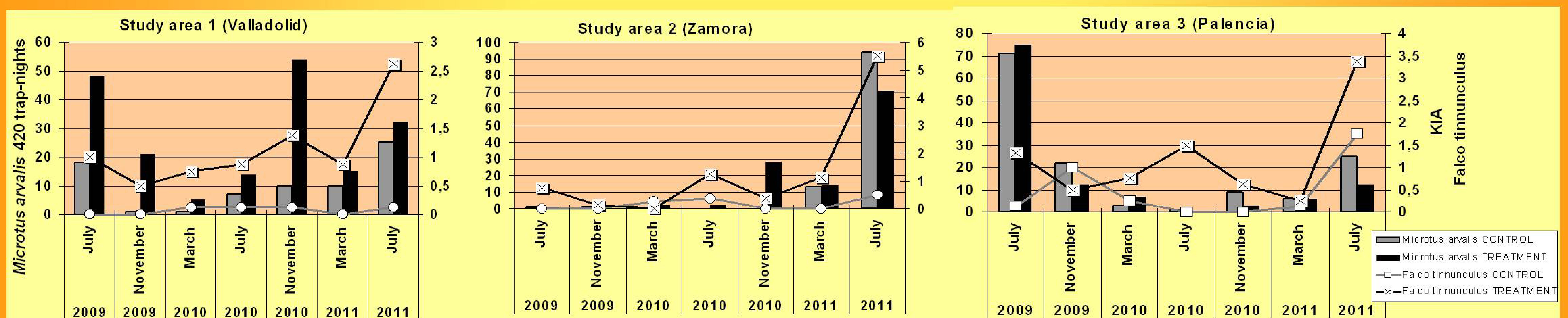


Figure 4. Temporal variations in the abundance of *Microtus arvalis* and of *Falco tinnunculus* (Kilometric Index of Abundance, falcons per km) in the control and experimental plots in each of the three study areas.

4.- CONCLUSIONS

Nest-box provisioning in Spanish cropland areas increases local barn owl and common kestrel population densities, indicating that nest site availability is a main limiting factor in the population dynamics of both species. Vole abundance was different between areas depending of the year, but we did not find significant differences between control and nest-box plots. Overall, these preliminary results suggest that avian predators could be at least partially limiting vole populations, keeping them at an intermediate fluctuating density in the study area where predator population settled sooner (Villalar de los Comuneros), limiting vole densities during the increase phase of the cycle in comparison to nest-box plots in areas where predators settled later (Palencia and Zamora) and/or limiting vole densities near poles holding nest-boxes, which would be consistent with results obtained in a nearby mountain area (Fargallo *et al.*, 2009)

5.- REFERENCES

- Fargallo JA, Martínez-Padilla J, Viñuela J, Blanco G, Torre I, Vergara P, De Neve L 2009 Kestrel-prey dynamic in a Mediterranean region: the effect of generalist predation and climatic factors. *PlosOne* 4 (2): e4311 (2009).
 Jareño D, Determinación de la abundancia de topillo campesino *Microtus arvalis* mediante índices indirectos: validación y aplicación. *MSc Thesis*, IREC, Ciudad Real, Spain (2010).