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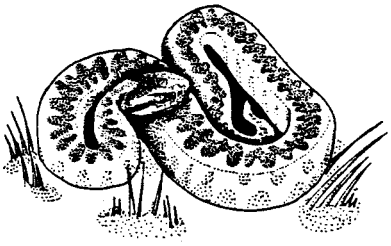

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by

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Reintroduction of *Psammodromus hispanicus* in a coastal sand area of NE Spain

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Psammodromus hispanicus is a small lacertid lizard which ranges all the Iberian Peninsula, excepting the north and the Pyrenean Mountains (BARBADILLO 1987) and the SE of France (FRETEY 1987). It is nominally protected by Spanish law (Boletín Oficial del Estado 56: 4999-5002, 6. 3. 1981). Recent studies have analyzed its ecological trends and natural history (PASCUAL & PEREZ-MELLADO 1987, 1989, POLLO & PEREZ-MELLADO 1988, 1989, 1990, CARRETERO & LLORENTE, in press). It occurs mainly in the Mediterranean garigue or in more open areas, around patchy dense vegetation (ARNOLD 1987, CARRASCAL et al. 1989). It is common to see animals moving quickly from one plant (20-30 cm high) to another.

In the NE of the Iberian Peninsula, the most dense populations are located in the coast, particularly in sandy areas. The development of the Herpetological Atlas of Catalonia (unpublished data) and Languedoc-Rousillon (GENIEZ & CHEYLAN 1987) have allowed us to prove that the range of distribution of this species is not continuous. At the present, French and Spanish populations are not connected (Fig. 1) but they were probably a continuum in the recent past (FELIX pers. com.). The northernmost Spanish population is located in Pals Beach (UTM 31TEG25) where *P. hispanicus* and its congeneric species *P. algirus* live together. The southernmost French records are close to the Spanish frontier.

The intermediate zone (Alt Empordà region) has some favourable sites to be occupied, such as the coastal dunes between Muga and Fluvià rivers (Fig. 2). *P. algirus* is present there and has been previously studied (CARRETERO & LLORENTE 1989). The psammophilous vegetation (*Theucrium, Echinophora, Ammophila, Pancratium*) and the habitat structure are quite similar to other coastal locations of the Spanish *Psammodromus*. Indeed, a record near that site was published at the beginning of this century (MALUQUER 1916).

The above facts have induced us to believe that the species has become extinct recently. Probably the tourist industry (destruction of psammophilous vegetation near beaches) is responsible. Now, this zone belongs to the Parc Natural dels Aiguamolls de l'Empordà created in 1985 and it receives complete protection.

Since the creation of the park, the possibility of reintroducing the species has been planned with two consecutive objectives:

1. – Management: re-creation of a stable population of *Psammodromus hispanicus*.

2. – Ecology: employment of this reintroduction as a tool to know how both *Psammodromus* species use the same ecological resources.

Only the first point is being carried out and it is reported here. The next step was to decide when and where to obtain the animals.

The reproduction of the species has been previously studied in the NE of Spain (CARRETERO & LLORENTE in press). This lizard has a one-year cycle (Fig. 3). Young are born from July to September. They grow up very fast, becoming adults during the next spring. There is no winter diapause period. The life is very short. Only 5% of the adult lizards can breed in the second year. Two clutches have been detected in large females and they are reflected in the ovarian cycle (Fig. 4).

Material and methods

In order to maximize the number of initial individuals it was important to use adults during the reproductive period. Particularly, it was interesting that females were able to lay two clutches in the introduction area. The best moment for doing that was in April-May, since females already carry the eggs of the first clutch (Fig. 4).

The best places to capture animals are the abundant populations (20 individuals/ha) in the Llobregat Delta near Barcelona, which have been observed for a long time.

Thirty adult specimens (19 males and 11 females) were captured in a locality near Barcelona (Gava beach UTM 31TDF16) on 4th May, 1990. Seven females had oviductal eggs and 3 had copulation marks. Snout-vent length (mm) and weight (g)

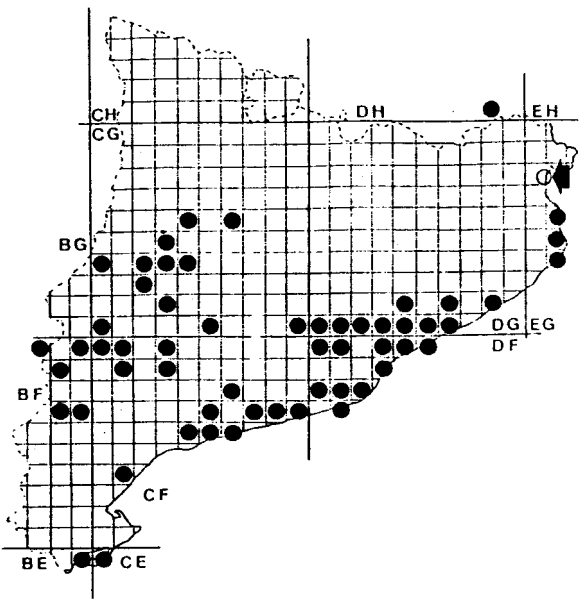

Fig. 1. Distribution of *Psammodromus hispanicus* in Catalonia, NE Spain (unpublished data from the Herpetological Atlas of Catalonia). The arrow marks the reintroduction area

were measured and the specimens were marked individually by toe clipping. The lizards were released the next day in an open area close to Muga river (UTM squares 31TEG1075, 0975 and 0974).

The zone was visited 10 times since the introduction. Two to four observers registered actively the plants and bushes during 3 hours at the period of maximum activity looking for active animals. Captured animals were measured, and marked if new captures. Observed lizards were also noted.

Results

Most of the introduced animals disappeared after three months of observations. Their growth was slow (about 0.04 mm/day).

Young lizards were not observed until September when some of them had reached the minimum adult size (see PASCUAL & PEREZ-MELLADO 1989, CARRETERO & LLORENTE, in press). As a consequence, the growing rates of the juveniles were higher than those of the adults. The SVL of the hatchlings is about 23-25 mm (see the same references). If we assume the 15th July as hatching date (a conservative estimation), it results in 0.16 mm/day approximately (Fig. 6).

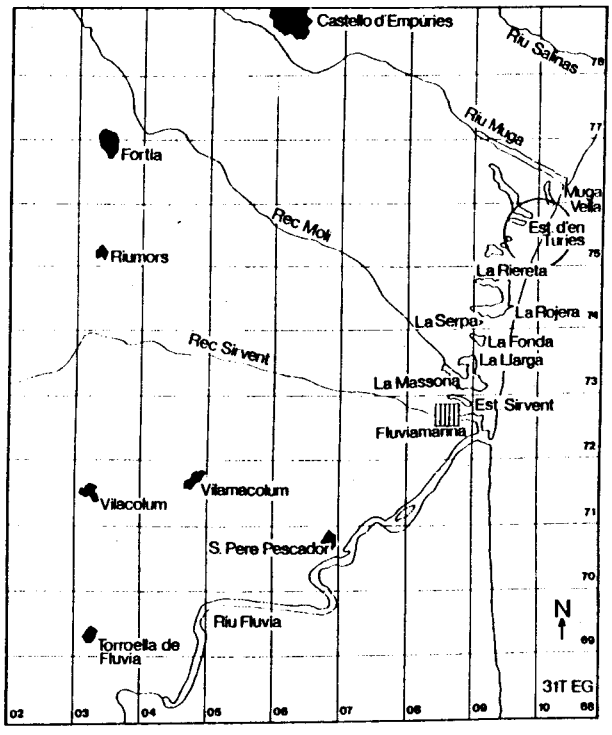

Fig. 2. Location of the reintroduction area

A total of 24 unmarked individuals (17 males and 6 females) were observed. Only one introduced animal survived to the next spring. During this season gravid females and males with sexual colouration were detected among the new individuals. Clutches were detected in two females.

On the other hand, the total number of *Psammodromus algirus*, the other sympatric species, decreased gradually towards summer. Most of them were immature individuals.

Discussion and perspectives

Looking at the results, it can be concluded that the introduced animals bred successfully in that season in the study area.

The chronology of the species is very similar to that in other Mediterranean localities. *P. hispanicus* tends to a *r*-strategy and the new cohort replaces quickly the old one every year. This feature allows this lizard to be the first colonizer of new areas inside its distribution range (SANTOS & TELLERIA 1988). However, it also produces great variations in population size (PASCUAL & PEREZ-MELLADO 1989) depending on the conditions of the year (climate and food).

The decrease of *P. algirus* must be interpreted as the natural mortality of juveniles. Only some of them (about 10%) will become adults. Habitat competition

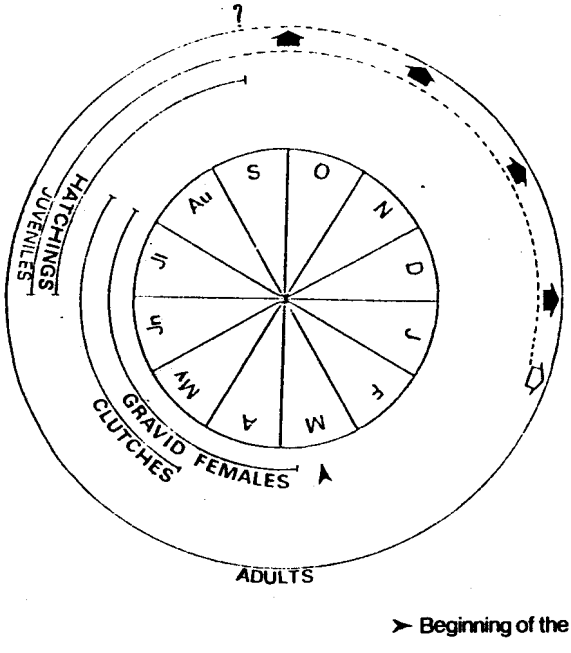

Fig. 3. Annual variation of gonads and fat bodies in males and females. The arrow marks the best moment for the reintroduction (see text)

with its congeneric species plays probably a negligible role (CARRASCAL et al. 1989).

The future of the introduced population is still uncertain. Despite its reproductive potencial, the perspectives depend not only on the abundance of the next generation but also on the conservation of habitat structure (HONEGGER 1981).

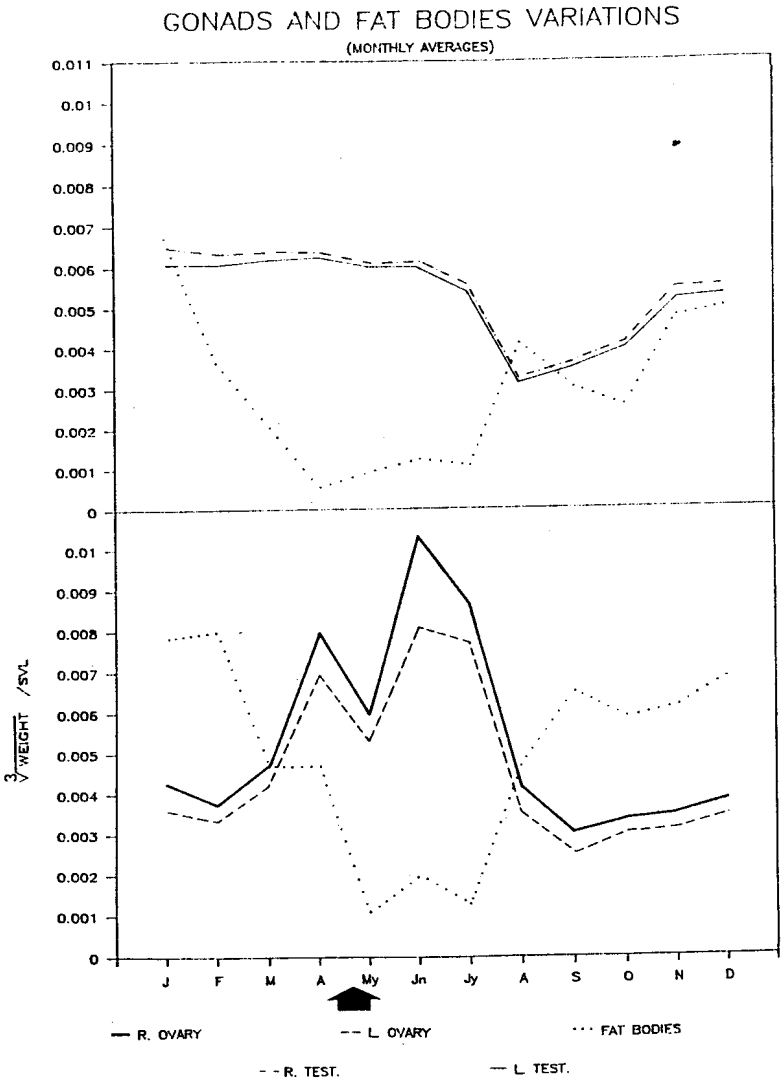

Fig. 4. Reproductive cycle of *Psammodromus hispanicus* in NE Spain (from CARRETERO & LLORENTE in press)

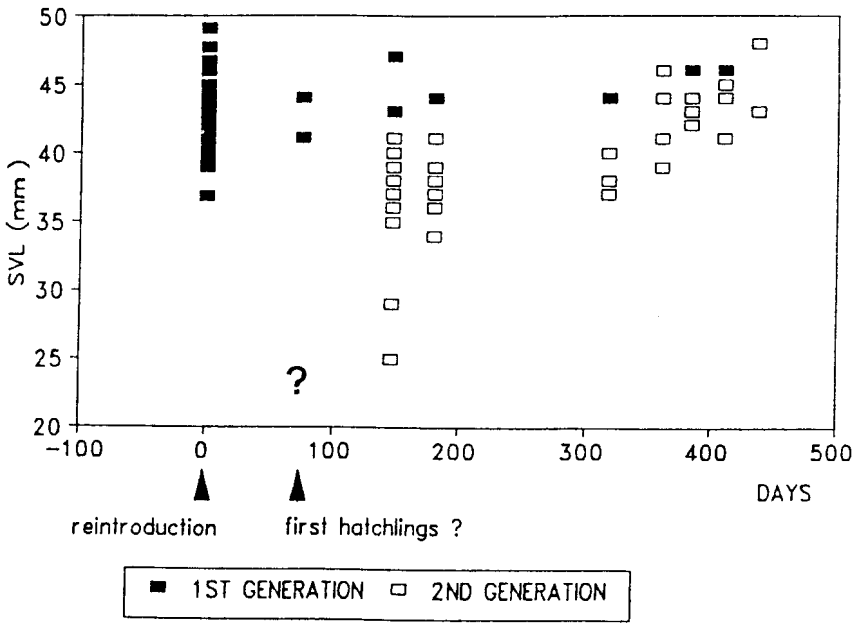

Fig. 5. Sizes of the animals found in the periodic visits. Two generations are represented (explanation in text)

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