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## Distribution and biometry of *Sorex granarius* (Miller, 1910) (Soricinae: Insectivora)

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### Abstract

The area of distribution of *Sorex granarius* is confined to the Iberian Peninsula, including Galicia, the northern half of Portugal and the Central System. This species occupies forestal and supraforestal biotopes, with an altitudinal distribution from sea level to 2000 m.a.s.l. The interval of altitudes where this shrew is found is smaller and higher in the Central System (500–2000 m.a.s.l.).

*Sorex granarius* presents marked craniometric homogeneity, although there is a decremental tendency in size from north to south, the largest specimens occurring in Galicia.

### Introduction

In the Iberian Peninsula, the shrews of the genus *Sorex* with sexual trivalent (*araneus-articus* group, MEYLAN and HAUSSE 1973, *araneus* group, HAUSSE 1976) are represented by three karyologically and biochemically well-characterized species: *Sorex araneus* Linnaeus, 1758; *Sorex coronatus* Millet, 1828; and *Sorex granarius* (MILLER 1910).

*Sorex granarius* was described by MILLER (1910) as a subspecies of *Sorex araneus* (*S. a. granarius*, terra typica La Granja, Segovia). Nonetheless, as a result of the karyological and morphological analysis by HAUSSE et al. (1975), the form *granarius* was raised to species rank.

In 1914, CABRERA attributes a specimen from Vilaboa (La Coruña) to this form and postulates that the distribution of *granarius* is the central and northwestern Iberian Peninsula. Later, various authors report the species in Galicia (HEIM DE BALSAC and DE BEAUFORT 1969; NORES 1979; LOPEZ-FUSTER 1983), the Central System (HAUSSE et al. 1975; CAMPOS 1977; CATZEFLIS et al. 1982; ARENAS 1983; CATZEFLIS 1984; HAUSSE 1984) and Portugal (NIETHAMMER 1970; MADUREIRA and MAGALHAES 1980); MADUREIRA and RAMALINHO 1981; RAMALINHO, in press). The references by ALMAÇA (1968) and GARZON-HEYDT et al. (1971) to *Sorex araneus* in Portugal and the Central System, respectively, in reality correspond to *Sorex granarius*. In contrast, the specimens from Villarreal (Alava) that MALEC and STORCH (1964) consider *Sorex granarius* should be referred to *Sorex coronatus* (HAUSSE et al. 1975).

As for *Sorex* from northern Burgos (Sedano), bibliographic findings are contradictory. According to NIETHAMMER (1956), these specimens pertain to *Sorex granarius* in the light of their coloring and dimensions, while GARZON-HEYDT et al. (1971) assign them to *Sorex araneus* (read *coronatus*). On the basis of HAUSSE's (1984) multivariate analysis, the specimens from Sedano are *Sorex granarius*. Nonetheless, HAUSSE indicates that this diagnosis must be erroneous according to the geographical distribution of *Sorex granarius* and *Sorex coronatus*. In the map of distribution described by HAUSSE et al. (1985), the specific affiliation of these specimens is not mentioned.

The objective of our paper was to establish the morphometric features of *Sorex granarius* and offer our biogeographical findings.

## Material and methods

### Material analysed

Two hundred thirty-five specimens were studied. The material came from the scientific collections of: the Unidad de Zoología Aplicada, deposited at El Encin, Alcalá de Henares; the Department of Vertebrates of the School of Biology, Universidad Central de Barcelona; and the Department of Vertebrates of the School of Biology, Universidad de Salamanca.

The specific determination was realized on the basis of the cranial criteria proposed by MILLER (1912) and HAUSER et al. (1975). For the captured material, also was examined the coloration and body measurements (see CABRERA 1914).

Specimens captured: Madrid: Alto de Guarramillas, 1. Segovia: Puerto de Fuenfria, 1. Avila: Laguna de El Barco, 1. León: Lago de la Baña, 1. La Coruña: Vallegestoso, 1; Ferrol, 1. Lugo: San Ciprián, 2.

Owl pellet material: Segovia: Grado del Pico, 1 skull and 2 mandibles; Riofrio de Riaza, 9 skulls and 9 mandibles. Avila: El Barco de Avila, 75 skulls and 54 mandibles. Cáceres: Hervás, 3 skulls and 3 mandibles; Baños de Montemayor, 1 skull and 1 mandible; Acebo, 1 skull and 1 mandible. Salamanca: Villasrubias, 1 skull and 1 mandible; Candelario, 16 skulls and 13 mandibles. La Coruña: Arines, 1 skull and 1 mandible; Brandomil, 6 skulls and 3 mandibles; Puebla de Caramiñal, 2 mandibles; Montfero, 1 skull and 2 mandibles; Pontedeume, 7 skulls and 2 mandibles. Orense: Castrocaldeas, 5 skulls and 6 mandibles.

### Body, skull and jaw measurements

We used the following measurements: CC = head + body length. C = tail length. P = hind foot length. O = ear length. Peso = weight in grams. LCI = condyle-incisor length. LCB = condyle-basal length. LR = rostral length. LCC = length of skull case. LSB = staphylion-basion length. AIO = interorbital width. AZ = zygomatic width. ACC = skull case width. SDS = length of upper dental series.  $P^4-M^3$  =  $P^4-M^3$  length.  $\alpha$  = labial length of the mandible.  $\beta$  = length of articular process.  $\gamma$  = inclination of the coronoid process.  $\delta$  = mandibular foramen. LIA = incisor-angle length. LM = mandibular length. LFT = length of internal temporal fossa. SDI = length of lower dental series.  $M_1-M_3$  =  $M_1-M_3$  length.  $LM_3$  = maximum  $M_3$  length, LA = articular length of mandible. HC = coronoid height (Fig. 1).

The cranial measurements and mandibular LA and HC were realized with a Mitutoyo caliper,  $\pm 0.02$  mm precision. For the other mandibular measurements, a "Reichert Mak MS" stereomicroscope ocular micrometer was used. The precision of this instrument, by lens, was: 1:1 lens,  $\pm 0.065$  mm ( $\alpha$ , LIA, LM, SDI,  $M_1-M_3$ ); 1:4 lens,  $\pm 0.015$  mm ( $\beta$ ,  $\gamma$ , LFT, LM); 1:10 lens,  $\pm 0.006$  mm ( $\delta$ ). We used the method described by SANS-COMA (1979) for the measurements with stereomicroscope, which is inspired by that proposed by HAUSER and JAMMOT (1974), based on use of the "bloc comparateur optique" conceived by JAMMOT (1973).

### Biomathematical analyses

Data were processed with an IBM 3083/XE01 computer of the Calculation Center of the University of Barcelona. Sample means were compared by variance analysis – ANOVA – and paired samples by the Tukey method. The degree of intersample affinity for each variable was evaluated by the Student-Newman-Keuls test (DIXON 1983: BMDP program p7D).

## Results and conclusions

### Distribution and habitat

*Sorex granarius* is distributed throughout the Central System, from Sierra de Ayllón (Spain) to Serra da Estrela (Portugal), extending throughout Portugal from north of the "Tajo" River to Galicia (Fig. 2).

In the Central System, the species is located at altitudes between 500 and 2000 meters, occupying the supra- and oromediterranean bioclimatic levels (RIVAS-MARTINEZ 1981, 1983). In this area, where captures were scant, *Sorex granarius* was found especially in forest biotopes: woods of *Fagus sylvatica* (Cantalajas), *Pinus silvestris* (Balsain, Hoyos del Espino), *Quercus pyrenaica* (Candelario) and *Quercus rotundifolia* (La Maya). *Sorex granarius* also occupies cultivated lands that replace autochthonous forests, like green

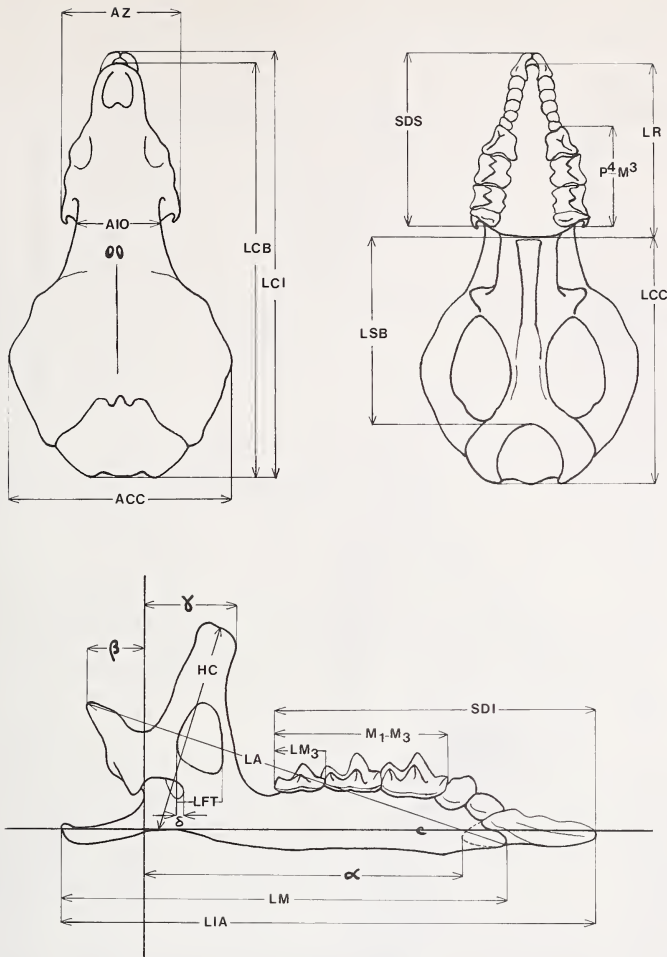
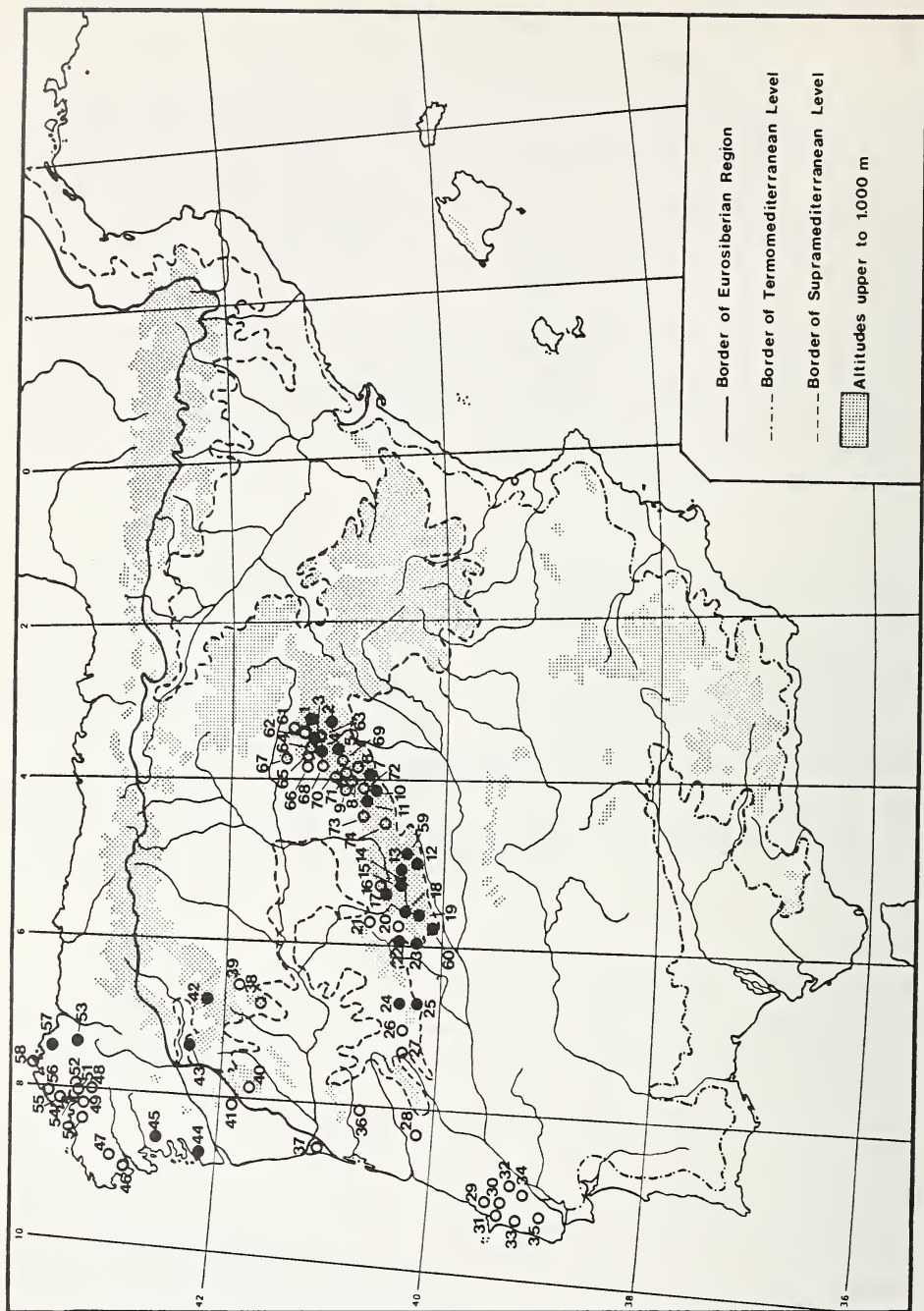


Fig. 1. Cranial and mandibular measurements of *Sorex granarius*

gardens (El Barco de Avila) and forests of *Castanea sativa* (Hervás) and *Pinus pinaster* (Villasrubias). Above the forest level, the species was captured in granite rock falls adjacent to areas of *Nardus stricta* (Laguna de El Barco, Galayos). From the western extreme of the Central System, the distribution of *Sorex granarius* is at progressively lower altitudes, appearing at the mesomediterranean level and reaching the coast of Portugal and Galicia. According to MADUREIRA and RAMALINHO (1981), the species is present in Portugal in almost all the biotopes with a bushy stratum, being more abundant in densely vegetated, relatively humid terrain. In northern Portugal, *Sorex granarius* introduces itself into the eurosiberian region, penetrating in Galicia, where it occupies the *Quercus pyrenaica* woods and areas where the natural forest has been replaced by *Eucaliptus* and *Pinus pinaster* plantations.

Generally speaking, the territories occupied by *Sorex granarius* are characterized by mean annual temperatures of 3–15 °C with cold to extremely cold winters and mean annual precipitation in excess of 600 mm.



## Biometry

The origin of the material, predominantly from owl pellets, precludes our establishing the somatometric and biological characteristics of *Sorex granarius*. Nonetheless, since the bibliographic data on these aspects are restricted to those communicated by MILLER (1912), we consider it interesting to offer the body measurements obtained in 10 specimens from diverse localities (Table 1).

Table 1. Body measurements of *Sorex granarius*

| Locality                       | Date         | Sex | CC   | C    | P    | O   | Weight |
|--------------------------------|--------------|-----|------|------|------|-----|--------|
| Balsain (Segovia)              | 23. 04. 1977 | ♀   | 64.0 | 39.0 | 12.0 | 7.4 | —      |
| Alto de Guarramillas (Segovia) | —            | ♀   | 51.0 | 37.0 | 12.0 | 6.4 | 6.0    |
| Laguna de El Barco (Ávila)     | 23. 06. 1984 | ♀   | 51.0 | 38.0 | 12.0 | 7.6 | 8.1*   |
| Gontán-Quende (Lugo)           | 23. 07. 1979 | —   | 50.0 | 36.0 | 11.0 | 5.6 | —      |
| Vilas, S. Ciprián (Lugo)       | 11. 08. 1978 | —   | 61.0 | 41.0 | 12.0 | 6.9 | 7.5    |
| S. Ciprián (Lugo)              | 26. 07. 1976 | —   | 61.0 | 39.0 | 12.0 | 7.1 | 6.5    |
| Ferrol (Coruña)                | 24. 09. 1973 | —   | 63.0 | 40.0 | 12.0 | 7.6 | —      |
| Ferrol (Coruña)                | 24. 09. 1973 | —   | 58.0 | 41.0 | 12.0 | 7.3 | —      |
| Vallegestoso (Coruña)          | 30. 05. 1976 | ♀   | 65.5 | 46.0 | 12.0 | 5.3 | —      |
| El Barco de Ávila (Ávila)      | 29. 08. 1987 | ♀   | 68.0 | 39.0 | 11.5 | 6.0 | 6.5    |

\* = weight corresponding to a pregnant female

Moreover, in view of the fragmentary nature of craniometric information, we list in Table 2 the values of cranial variables obtained in our specimens from Galicia (the data from Gredos and Guadarrama are insufficient). Our findings concur with those communi-

Fig. 2. Distribution of *Sorex granarius* in the Iberian Peninsula. Black circles: own data. White circles: references in literature. 1: Grado del Pico (Segovia), 2: Cantalojas (Guadalajara), 3: Riofrio de Ríaza (Segovia), 4: Cerezo de Arriba (Segovia), 5: Pto. de Somosierra (Madrid), 6: Rascafría (CATZEFLIS et al. 1982), 7: Alto de Guarramillas (Madrid), 8: Balsain (GARZON et al. 1971), 9: La Granja (MILLER 1910), 10: Cercedilla (Madrid), 11: Pto. de Fuenfria (Segovia), 12: Galayos (Ávila), 13: Barajas (Ávila), 14: Hoyos del Espino (Ávila), 15: Navalperal de Tormes (Ávila), 16: Piedrahita (HAUSER 1984), 17: Santiago del Collado (Ávila), 18: El Barco de Ávila (Ávila), 19: Laguna de El Barco (Ávila), 20: Candelario (HAUSER et al. 1975), 21: La Maya (CAMPOS 1977), 22: Baños de Montemayor (Cáceres), 23: Hervás, (Cáceres), 24: Villarrubias (Salamanca), 25: Acebo (Cáceres), 26: Sabugal (MADUREIRA and MAGALHAES 1980), 27: Belmonte (MADUREIRA and RAMALINHO 1981), 28. Miranda do Corvo (MADUREIRA and RAMALINHO 1981), 29: Caldas da Rainha (MADUREIRA and RAMALINHO 1981), 30: Obidos (RAMALINHO in press), 31: Serra d'El Rei (RAMALINHO in press), 32: Rio Maior (NIETHAMMER 1970), 33: Lourinhã (RAMALINHO in press), 34: Epinera-Cercal (NIETHAMMER 1970), 35: Tapada de Mafra (MADUREIRA and RAMALINHO 1981), 36: Torredeira (RAMALINHO in press), 37: Grijo (RAMALINHO in press), 38: Serra da Nogueira (RAMALINHO in press), 39: Cernadilla (HAUSER 1984), 40: Cabeceiras de Basto (MADUREIRA and MAGALHAES 1980), 41: Géres (MADUREIRA and RAMALINHO 1981), 42: Lago de la Baña (León), 43: Panjón-Nigrán (Pontevedra), 44: Castrocaldelas (LOPEZ-FUSTER 1983), 45: Caldas de Reyes (Pontevedra), 46: Puebla del Caramiñal (LOPEZ-FUSTER 1983), 47: Bandomil (LOPEZ-FUSTER 1983), 48: Montesalgueiro (NORES 1979), 49: Betanzos (NORES 1979), 50: Vilaboa (CABRERA 1914), 51: Pontedeume (LOPEZ-FUSTER 1983), 52: Caaveiro (NORES 1979), 53: Gontán-Quende (Lugo), 54: Montfero (LOPEZ-FUSTER 1983), 55: Ferrol (NORES 1979), 56: Lagoa (NORES 1979), 57: San Ciprián (Lugo), 58: Estaca de Bares (NORES 1979), 59: San Esteban del Valle (Ávila), 60: Monasterio de Yuste (Cáceres), 61: Estebanvela (ARENAS 1983), 62: Villacorta (ARENAS 1983), 63: Pto. de la Quesera (ARENAS 1983), 64: Ríaza (ARENAS 1983), 65: Sequera de Fresno (ARENAS 1983), 66: Encinas (ARENAS 1983), 67: Valdevacas (ARENAS 1983), 68: Sotillo (ARENAS 1983), 69: Gallegos (ARENAS 1983), 70: da Cuesta (ARENAS 1983), 71: Sotosalbos (ARENAS 1983), 72: Peñalara (ARENAS 1983), 73: Revenga (ARENAS 1983), 74: El Espinar (ARENAS 1983)

Table 2. Values of descriptive statistics of cranial variables in *Sorex granarius* from Galicia

|                                | n  | $\bar{x}$ | s   | $\Sigma x^2$ | min. | max. |
|--------------------------------|----|-----------|-----|--------------|------|------|
| LCI                            | 2  | 18.2      | 0.1 | 663          | 18.1 | 18.3 |
| LCB                            | 4  | 17.7      | 0.1 | 1246         | 17.5 | 17.8 |
| LR                             | 23 | 7.5       | 0.2 | 1285         | 7.2  | 7.8  |
| LCC                            | 5  | 10.2      | 0.2 | 516          | 9.9  | 10.4 |
| LSB                            | 5  | 8.0       | 0.3 | 317          | 7.6  | 8.3  |
| AIO                            | 22 | 3.8       | 0.1 | 317          | 3.5  | 4.1  |
| AZ                             | 13 | 5.3       | 0.1 | 363          | 5.1  | 5.4  |
| ACC                            | 3  | 8.7       | 0.4 | 229          | 8.3  | 9.0  |
| SDS                            | 10 | 7.7       | 0.2 | 590          | 7.3  | 7.9  |
| P <sup>4</sup> -M <sup>3</sup> | 19 | 4.3       | 0.1 | 353          | 4.1  | 4.5  |

Table 3. Values of descriptive statistics of jaw measurements of *Sorex granarius* from Galicia (GA), Gredos (GR) and Guadarrama (GU)

|                                |    | n  | $\bar{x}$ | s   | $\Sigma x^2$ | min.  | max.  |
|--------------------------------|----|----|-----------|-----|--------------|-------|-------|
| $\alpha$                       | GA | 20 | 6.3       | 0.2 | 793          | 5.80  | 6.72  |
|                                | GR | 73 | 6.3       | 0.2 | 2901         | 5.80  | 6.59  |
|                                | GU | 13 | 6.1       | 0.1 | 486          | 5.93  | 6.33  |
| $\beta$                        | GA | 20 | 1.2       | 0.1 | 27           | 1.00  | 1.29  |
|                                | GR | 73 | 1.1       | 0.1 | 96           | 0.87  | 1.29  |
|                                | GU | 13 | 1.1       | 0.1 | 16           | 0.94  | 1.26  |
| $\gamma$                       | GA | 20 | 1.9       | 0.2 | 72           | 1.52  | 2.23  |
|                                | GR | 73 | 1.9       | 0.1 | 256          | 1.51  | 2.29  |
|                                | GU | 13 | 1.9       | 0.2 | 49           | 1.68  | 2.26  |
| $\delta$                       | GA | 20 | 0.2       | 0.1 | 1            | 0.04  | 0.37  |
|                                | GR | 73 | 0.2       | 0.1 | 3            | 0.00  | 0.41  |
|                                | GU | 13 | 0.1       | 0.1 | 0            | 0.00  | 0.38  |
| LIA                            | GA | 15 | 11.7      | 0.2 | 2058         | 11.33 | 12.13 |
|                                | GR | 60 | 11.4      | 0.3 | 7832         | 10.94 | 11.99 |
|                                | GU | 10 | 11.3      | 0.3 | 1276         | 10.94 | 11.60 |
| LM                             | GA | 15 | 9.6       | 0.2 | 1387         | 9.36  | 10.02 |
|                                | GR | 64 | 9.5       | 0.3 | 5791         | 9.09  | 10.15 |
|                                | GU | 10 | 9.4       | 0.2 | 886          | 9.23  | 9.62  |
| SDI                            | GA | 15 | 7.2       | 0.2 | 774          | 6.85  | 7.38  |
|                                | GR | 58 | 6.9       | 0.2 | 2764         | 6.33  | 7.25  |
|                                | GU | 11 | 6.9       | 0.2 | 522          | 6.59  | 7.25  |
| LFT                            | GA | 20 | 1.0       | 0.1 | 21           | 0.90  | 1.16  |
|                                | GR | 73 | 1.0       | 0.1 | 75           | 0.78  | 1.23  |
|                                | GU | 13 | 1.0       | 0.1 | 12           | 0.81  | 1.13  |
| M <sub>1</sub> -M <sub>3</sub> | GA | 16 | 3.7       | 0.1 | 219          | 3.56  | 3.82  |
|                                | GR | 62 | 3.6       | 0.1 | 810          | 3.43  | 3.95  |
|                                | GU | 11 | 3.6       | 0.1 | 144          | 3.56  | 3.82  |
| LM <sub>3</sub>                | GA | 16 | 1.0       | 0.0 | 16           | 0.94  | 1.07  |
|                                | GR | 55 | 1.0       | 0.0 | 55           | 0.94  | 1.10  |
|                                | GU | 11 | 1.0       | 0.0 | 11           | 0.97  | 1.07  |
| LA                             | GA | 20 | 9.1       | 0.3 | 1661         | 8.70  | 9.60  |
|                                | GR | 71 | 9.1       | 0.2 | 5816         | 8.60  | 9.50  |
|                                | GU | 13 | 9.1       | 0.2 | 1070         | 8.80  | 9.40  |
| HC                             | GA | 20 | 4.3       | 0.2 | 369          | 4.00  | 4.60  |
|                                | GR | 73 | 4.2       | 0.1 | 1309         | 3.90  | 4.60  |
|                                | GU | 13 | 4.3       | 0.2 | 236          | 4.00  | 4.50  |

Table 4. Individual comparison between paired samples for each analysed variable, according to Tukey's method

|           | GA-GR | GA-GU | GR-GU |                   |                   |                   |                |
|-----------|-------|-------|-------|-------------------|-------------------|-------------------|----------------|
| $\alpha$  | 0     | <0.05 | <0.01 | GU<br>6.11<br>13  | GA<br>6.29<br>20  | GR<br>6.30<br>73  | $\bar{x}$<br>n |
| $\beta$   | 0     | 0     | 0     | GU<br>1.09<br>13  | GR<br>1.14<br>73  | GA<br>1.15<br>20  | $\bar{x}$<br>n |
| $\gamma$  | 0     | 0     | 0     | GR<br>1.87<br>73  | GA<br>1.89<br>13  | GU<br>1.93<br>20  | $\bar{x}$<br>n |
| $\delta$  | 0     | 0     | 0     | GU<br>0.14<br>13  | GA<br>0.19<br>20  | GR<br>0.19<br>73  | $\bar{x}$<br>n |
| LIA       | <0.01 | <0.01 | 0     | GU<br>11.29<br>10 | GR<br>11.42<br>60 | GA<br>11.71<br>15 | $\bar{x}$<br>n |
| LM        | 0     | 0     | 0     | GU<br>9.41<br>10  | GR<br>9.51<br>64  | GA<br>9.63<br>15  | $\bar{x}$<br>n |
| SDI       | <0.01 | <0.01 | 0     | GU<br>6.89<br>11  | GR<br>6.90<br>58  | GA<br>7.18<br>15  | $\bar{x}$<br>n |
| LFT       | 0     | 0     | 0     | GU<br>0.97<br>13  | GR<br>1.01<br>73  | GA<br>1.02<br>20  | $\bar{x}$<br>n |
| $M_1-M_3$ | <0.01 | 0     | 0     | GR<br>3.61<br>62  | GU<br>3.62<br>11  | GA<br>3.70<br>12  | $\bar{x}$<br>n |
| $LM_3$    | 0     | 0     | 0     | GR<br>1.00<br>55  | GA<br>1.01<br>16  | GU<br>1.02<br>11  | $\bar{x}$<br>n |
| LA        | 0     | 0     | 0     | GR<br>9.05<br>71  | GU<br>9.07<br>13  | GA<br>9.11<br>20  | $\bar{x}$<br>n |
| HC        | 0     | 0     | 0     | GR<br>4.23<br>73  | GU<br>4.26<br>13  | GA<br>4.29<br>20  | $\bar{x}$<br>n |

Results of Student-Newman-Keuls multiple test of rank for Galicia (GA), Gredos (GR) and Guadarrama (GU). 0 = Not significant differences

cated by MILLER (1912), HAUSSEY et al. (1975), MADUREIRA and MAGALHAES (1980), NORES (1979) and RAMALINHO (1981).

Table 3 shows the statistics for the descriptive mandibular parameters of the Galicia, Gredos and Guadarrama samples. Comparison of the sample means (ANOVA test) discloses notable biometric similarity among populations. Significant differences were detected only in  $\alpha$  ( $F = 6.24$ ,  $p < 0.01$ ), LIA ( $F = 8.71$ ,  $p < 0.01$ ), SDI ( $F = 10.30$ ,  $p < 0.01$ ) and  $M_1-M_3$  ( $F = 4.76$ ,  $p < 0.01$ ).

Individual comparisons between pairs of samples (Table 4) also confirm the scant divergence of peninsular *Sorex granarius* populations. Between the populations of Galicia

and Gredos, we only found statistically significant differences in LIA ( $p < 0.01$ ), SDI ( $p < 0.01$ ) and  $M_1-M_3$  ( $p < 0.01$ ). Between the Galicia and Guadarrama samples, the most marked divergences were in  $\alpha$  ( $p < 0.05$ ), LIA ( $p < 0.01$ ) and SDI ( $p < 0.01$ ). Between Gredos and Guadarrama, there was an even greater degree of biometric similarity, only  $\alpha$  showing significant differences ( $p < 0.01$ ).

In view of the mean values obtained for all these populations (see Table 3), the specimens from Galicia generally evidence the largest mandibular dimensions, although these differences lack statistical significance (observe values of  $\beta$ , LIA, LM, SDI, LFT,  $M_1-M_3$ , LC and HC). Due to their biometrical similarity, the relationship between the sizes of the Gredos and Guadarrama samples has not been completely defined.

To determine the degree of intersample affinity in each parameter, mean values were processed by the Student-Newman-Keuls test. In the graphic representation of results (Table 4), the populations with mean values not significantly heterogeneous are underlined (SOKAL and ROHLF 1979). The resulting diagrams evidence the close relationship among the populations analysed. The only variable to statistically separate the Guadarrama population was  $\alpha$ , which was smaller in this sample. The specimens from Galicia differ from Gredos and Guadarrama in LIA, SDI and  $M_1-M_3$ , the mean values of these parameters being higher in the Galicia samples.

On the basis of these findings, although there was no evidence of intraspecific mandibular biometric differences in *Sorex granarius*, there was a general tendency to smaller size from north to south. It is interesting to point out that in the Iberian Peninsula, *Crocidura russula* and *Crocidura suaveolens* have been found to present a clinal variation consisting in progressive reduction of craniometric values to the south (REY and LANDIN 1973; REY and REY 1974; SANS-COMA et al. 1987).

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### Zusammenfassung

#### *Verbreitung und Biometrie von Sorex granarius* (Miller, 1910) (Soricinae: Insectivora)

Die Verbreitung von *Sorex granarius* ist auf die Pyrenäen-Halbinsel beschränkt. Hier ist diese Art in Gallizien, der nördlichen Hälfte von Portugal und im Zentralgebirge anzutreffen. *Sorex granarius* bewohnt vorwiegend Waldgebiete. Die vertikale Verbreitung erstreckt sich von der Meereshöhe bis zur Höhe von 2000 m. Im Zentralgebirge ist dieses Intervall kleiner (500–2000 m). Die Biometrie der Schädel von untersuchten Individuen ist sehr gleichartig, obwohl sich eine Tendenz zur Größenabnahme von Norden nach Süden beobachten läßt. Die größten Schädel wurden in Gallizien gefunden.

### Literature

- ALMAÇA, C. (1968): La faune mammalogique du Portugal dans la checklist of Palearctic and Indian Mammals, 1951, par Ellerman et Morrison-Scott. Arq. Mus. Boc., 2 série, 12.
- ARENAS, A. (1983): Atlas de Micromamíferos de Segovia. Un modelo de análisis zoogeográfico de Insectívoros y Roedores mediante egagrópilas de lechuza. Tesina, Univ. Madrid.
- CABRERA, A. (1914): Fauna Ibérica. Mamíferos. Mus. Nac. Ciencias Nat.: Madrid.
- CAMPOS, F. (1977): Régimen alimenticio de *Tyto alba* en las provincias de Salamanca y Zamora. Ardeola 24, 105–119.
- CATZEFLIS, F. (1984): Systematique biochimique. Taxonomie et phylogenie des musaraignes d'Europe (Soricidae, Mammalia). Thèse, Université Lausanne.
- CATZEFLIS, F.; GRAF, J.-D.; HAUSER, J.; VOGEL, P. (1982): Comparaison biochimique des Musaraignes du genre *Sorex* en Europe occidentale (Soricidae, Mammalia). Z. zool. Syst. Evolut.-forsch. 20, 223–233.
- DIXON, W. J. (1983): BMDP Statistical Software. Berkeley: University of California Press.

- GARZON-HEYDT, J.; CASTROVIEJO, S.; CASTROVIEJO, J. (1971): Notas preliminares sobre la distribución de algunos micromamíferos en el norte de España. *Säugetierkd. Mitt.* 19, 217–222.
- HAUSSER, J. (1976): Contribution à l'étude des Musaraignes du genre *Sorex* (Cytotaxonomie, Morphologie, Répartition). Thèse, Université Lausanne.
- (1984): Genetic drift and selection: Their respective weights in the morphological and genetic differentiation of four species of shrews in Southern Europe (Insectivora, Soricidae). *Z. zool. Syst. Evolut.-forsch.* 22, 302–320.
- HAUSSER, J.; CATZEFLIS, F.; MEYLAN, A.; VOGEL, P. (1985): Speciation in the *Sorex araneus* complex (Mammalia: Insectivora). *Acta Zool. Fennica* 170, 125–130.
- HAUSSER, J.; GRAF, J.-D.; MEYLAN, A. (1975): Données nouvelles sur les *Sorex* d'Espagne et des Pyrénées (Mammalia, Insectivora). *Bull. Soc. Vaud. Sc. Nat.* 348, 241–252.
- HAUSSER, J.; JAMMOT, D. (1974): Etude biometrique des machoires chez les *Sorex* du groupe *araneus* en Europe continentale (Mammalia, Insectivora). *Bull. Soc. Vaud. Sc. Nat.* 348, 241–252.
- HEIM DE BALSAC, H.; DE BEAUFORT, F. (1969): Contribution à l'étude des micromammifères du Nord-ouest de l'Espagne (Santander, Asturias, Galice, Leon). *Mammalia* 33, 367–380.
- JAMMOT, D. (1973): Mise au point d'un "bloc comparateur optique" pour les necessités d'une ostéometrie fine. *Mammalia* 37, 122–125.
- LOPEZ-FUSTER, M. J. (1983): Sobre los géneros *Sorex* Linnaeus, 1758, *Suncus* Ehrenberg, 1833 y *Crocidura* Wagler, 1832 (Insectivora, Soricidae) en el Nordeste de la Peninsula Ibérica. Tesis Doctoral, Universidad Barcelona.
- MADUREIRA, M. L.; MAGALHAES, C. M. (1980): Small mammals of Portugal. *Arq. Mus. Bocage*, 2 ser., 7, 179–214.
- MADUREIRA, M. L.; RAMALINHO, M. G. (1981): Notas sobre a distribuicao, diagnose e ecologia dos Insectivora e Rodentia portugueses. *Arq. Mus. Bocage*, ser. A, 1, 165–263.
- MALEC, F.; STORCH, G. (1964): Einige Kleinsäuger (Mammalia: Insectivora, Rodentia) aus Nordspanien. *Z. Säugetierkunde* 29, 220–230.
- MEYLAN, A.; HAUSSER, J. (1973): Les chromosomes des *Sorex* du groupe *araneus-arcticus* (Mammalia, Insectivora). *Z. Säugetierkunde* 38, 143–158.
- MILLER, G. S. (1910): Description of six new European Mammals. *Ann. Mag. Nat. Hist.*, Ser. 8, 6, 458–461.
- (1912): Catalogue of the Mammals of Western Europe. London: British Museum (Nat. Hist.).
- NIETHAMMER, J. (1956): Insektenfresser und Nager Spaniens. *Bonn. Zool. Beitr.* 7, 249–295.
- (1970): Über Kleinsäuger aus Portugal. *Bonn. Zool. Beitr.* 21, 89–118.
- NORES, C. (1979): Nuevas aportaciones al conocimiento de la subfamilia Soricinae (Mammalia, Insectivora) en los distritos Cantábrico y Lusitano. Tesis Licenciatura, Universidad Oviedo.
- RAMALINHO, M. G. (1981): Portuguese Soricinae. A review of recent data (in press).
- REY, J. M.; LANDIN, A. (1973): Sobre la presencia de *Crocidura suaveolens* en el sur de Andalucía (Mammalia, Insectivora). *Bol. R. Soc. Esp. Hist. Nat. (Biol.)* 71, 9–16.
- REY, J. C.; REY, J. M. (1974): Nota preliminar sobre las musarañas del género *Crocidura* Wagler, 1832 en las islas Baleares. *Bol. Est. Centr. Ecol.* 3, 79–85.
- RIVAS-MARTINEZ, S. (1981): Les étages bioclimatiques de la végétation de la Péninsule Ibérique. *Anal. Jardin Botánico de Madrid* 37, 251–268.
- (1983): Pisos bioclimáticos de España. *Lazaroa* 5, 33–43.
- SANS-COMA, V. (1979): Beitrag zur Kenntnis der Waldspitzmaus, *Sorex araneus* Linné, 1758, in Katalonien, Spanien. *Säugetierkd. Mitt.* 27, 96–106.
- SANS-COMA, V.; LOPEZ-FUSTER, M. J.; VARGAS, J. M. (1983): Sobre la musaraña común, *Crocidura russula* (Hermann, 1780) en el sur de la Peninsula Ibérica. In: Mamíferos y Helmintos. Ed. by M. BACH. Barcelona (in press).
- SOKAL, R. R.; ROHLF, F. J. (1979): Biometria. Barcelona: Ed. Blume.

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