Acta Zoologica Academiae Scientiarum Hungaricae 49 (Suppl. 1), pp. 77–84, 2003

FIRST RECORD OF THE GARDEN DORMOUSE (*ELIOMYS QUERCINUS*) IN SLOVENIA

KRYŠTUFEK, B.

Slovenian Museum of Natural History, P.O. Box 290, SI–1001 Ljubljana and Science and Research Centre of the Republic of Slovenia Koper Garibaldijeva 18, SI-6000 Koper, Slovenia, E-mail: bkrystufek@pms-lj.si

A Garden dormouse collected in September 2000 at Dane near Stari trg pri Ložu (580 m above sea level), south-central Slovenia, is the first record of this species for this country. By its black subterminal ring on the ventral side of the tail, this specimen resembles the Dalmatian subspecies *Eliomys quercinus dalmaticus*. The Dalmatian race is known from Mediterranean habitats along the north-eastern Adriatic coast, but previous records from further inland are not supported by voucher specimens and are thus doubtful. The specimen from Dane is the first indisputable record for the continental region. Three other dormouse species occur in the same region: *Glis glis, Dryomys nitedula*, and *Muscardinus avellanarius*.

Key words: *Eliomys quercinus dalmaticus*, first record, Slovenia, distribution

INTRODUCTION

The Garden dormouse *Eliomys quercinus* (LINNAEUS, 1766) is one of two species of the south-western Palaearctic genus *Eliomys* (KRYŠTUFEK & KRAFT 1997). It is widespread in western Europe while the rest of its range is composed of widely scattered fragments across central, eastern, and south-eastern Europe and in northern Africa (ROSSOLIMO *et al*. 2001). In recent decades the Garden dormouse has disappeared from some places where it formerly occurred in eastern-central Europe, notably in Slovakia, Czech Republic, Germany, and continental Croatia (MITCHELL-JONES *et al*. 1999). The present paper reports the first documented record of the Garden dormouse in Slovenia, which constitutes a range extension of a small isolated population in the eastern Adriatic littoral. The new locality lies deep within the continental (and not the Mediterranean) region, which has several important implications.

The specimen comes from Dane near Stari trg pri Ložu (580 m above sea level). It was snap trapped unexpectedly in September 2001 in a trap set in a beehive for an unknown rodent that was damaging apples stored in the same place. The stuffed animal is now housed in the Museum of Dormouse hunting in the village of Kozarišče, Slovenia. The specimen is a subadult with grey dorsal pelage, but brown hair on the head indicates the start of a moult into adult brown pelage.

The white ventral side of the tail is interrupted by a black subterminal ring, which is characteristic of *E. q. dalmaticus* DULIĆ & FELTEN, 1962.

Dane is situated on the north-eastern slopes of the Dinaric Alps (Fig. 1), the principal mountain chain stretching along the Adriatic coast from Slovenia in the north-west to Kosovo in the south-east, providing a sharp border between the Mediterranean and the continental climate and vegetation. Mixed beech (*Fagus sylvatica*) and fir (*Abies alba*) forest, the dominant vegetation type in this part of the Dinaric Alps, is widespread around Dane. The limestone bedrock provides a characteristic corroded karstic substrate, but the rock is not exposed, being covered by the continuous forest. As a consequence, the habitat is mesic and the entire climate continental. Mean annual temperature in nearby Postojna (altitude 550 m) is 8.4 °C (mean January and July temperatures are –1.6 and 8.4 °C, respectively), and the precipitation is 1578 mm, spread fairly uniformly through the year (between 89 mm in February and 168 mm in November), and snow cover lasts 47.1 days on average. Such climatic conditions are in sharp contrast with the littoral slopes of the Dinaric Alps, with their hot, dry summers and mild wet winters. Three more dormice species occur in the region around Dane, namely the edible dormouse *Glis glis* (LINNAEUS, 1766), the forest dormouse *Dryomys nitedula* (PALLAS, 1778), and the common dormouse *Muscardinus avellanarius* (LINNAEUS, 1758). The edible dormouse is very common, while the other two are rare (own observations).

The Garden dormouse has been reported several times from Slovenia. FREYER (1842) recorded *Myoxus nitella* (with *Mus quercinus* L. as its junior synonym) in the vicinity of Ribnica ("bei Reifnitz"). However, as shown later by DESCHMANN (1866), FREYER's specimen was actually *Dryomys nitedula* (*cf*. KRYŠTUFEK 1985). Since DESCMANN's re-identification was neglected subsequently, *E. quercinus* has been repeatedly included in the faunal lists of Slovenia (*cf*. DULIĆ & MIRIĆ 1967, MIRIĆ 1970) and was also given the status of a protected species until 1993. KRYŠTUFEK (1991) rejected it as a member of the Slovenian fauna, while indicating the possibility of its presence in the south-western part of the country.

Another record is available for Slovenia, which has been neglected so far (*cf.* DULIĆ & MIRIĆ 1967). REISER (1933) stated that the Garden dormouse was present around St. Bolfenk on Mt. Pohorje (north-eastern Slovenia), and had been collected, together with three other species of dormice, in a single summer at the same locality. REISER was a resident of the area in question and thus familiar with the local fauna. Nevertheless, his report raises some doubts. REISER did not say that he saw the animals himself, but he did deposit voucher specimens of the local fauna in the Natural History Museum of Vienna (NMW). The NMW has two dormouse species donated by REISER from the region of Mt. Pohorje (*Dryomys nitedula* and *Glis glis*), but only *D. nitedula* is labelled as coming from St. Bolfenk. In addition,

Mt. Pohorje is far outside the known range of the Garden dormouse (STORCH 1978, MITCHELL-JONES *et al*. 1999) and there are no nearby localities on the Austrian side of the Alps (SPITZENBERGER 2001).

There are two more unpublished reports of the Garden dormouse in Slovenia (Fig. 1). A specimen is said to have been trapped in a beech forest near Starod (750 m above sea level) during traditional dormouse hunting in the mid 1980s (B. DEKLEVA, pers. comm.). The animal however, has not been preserved as a voucher specimen. At about the same time another specimen is said to have been observed in a beehive at Sežana (altitude 400 m), on the Kras (Carso Triestino) on the Slovenian–Italian border (B. SLAVEC, pers. comm.). Again, the specimen has not been preserved. The karst region is under a strong Mediterranean influence, but there are no records of the species from adjacent north-eastern Italy (AMORI *et al*. 1995, LAPINI *et al*. 1996). The small mammal fauna of the Kras area has been sampled recently by pit-fall trapping (QUADRACCI 1999) and by analysing owl pellets (LIPEJ 1995, LIPEJ & GJERKEŠ 1996, CRISTOFOLI *et al*. 2002), but no Garden dormice were recorded. It is also noteworthy that a fossil *Eliomys truci* MEIN & MICHAUX, 1970 was reported for the Late Pleistocene (Vistulian) layers of Črni kal (AGUILAR *et al.* 1998). Although at the species level the identity might be incorrect (*cf.* KOWALSKI 2001), it is noteworthy that Črni kal is located between Sežana and Starod (Fig. 1).

The Dalmatian subspecies of the Garden dormouse *E. g. dalmaticus* is considered endemic to Croatia (TVRTKOVIĆ 1994). Morphological (PETROV 1939, DULIĆ & FELTEN 1962) and karyological (VUJOŠEVIĆ *et al*. 1993) evidence suggest Dalmatian dormice are close to *E. q. pallidus* BARRETT-HAMILTON, 1899 from peninsular Italy and Sicily. On the other hand, electrophoretic analysis of 41 loci revealed substantial allelic differences between *E. q. dalmaticus* and *E. q. pallidus* with a relatively high Nei's genetic distance separating them (VUJOŠEVIĆ *et al*. 1993).

Whatever its subspecific position, it is beyond doubt that the range of the Dalmatian Garden dormouse is an isolate, being separated from neighbouring populations in Italy, the Alps and the Carpathians by wide gaps (STORCH 1978). Traditionally, the area of the Dalmatian race was assumed to be restricted to the Adriatic coast and a few adjacent islands (PETROV 1968, 1992), although TVRTKOVIĆ *et al.* (1995) recently reported localities deep inland. The main problem with the records from outside the traditional range is that they are rarely, if at all, supported by voucher specimens (Fig. 1). Extralimital records in TVRTKOVIĆ *et al*. (1995) are either historical (*e.g.* reports for Tuškanec date back to 1886 and 1909, respectively), based on observations by individuals not very familiar with mammals, or both. Mis-identifications are not exceptional with such geographical outliers (see

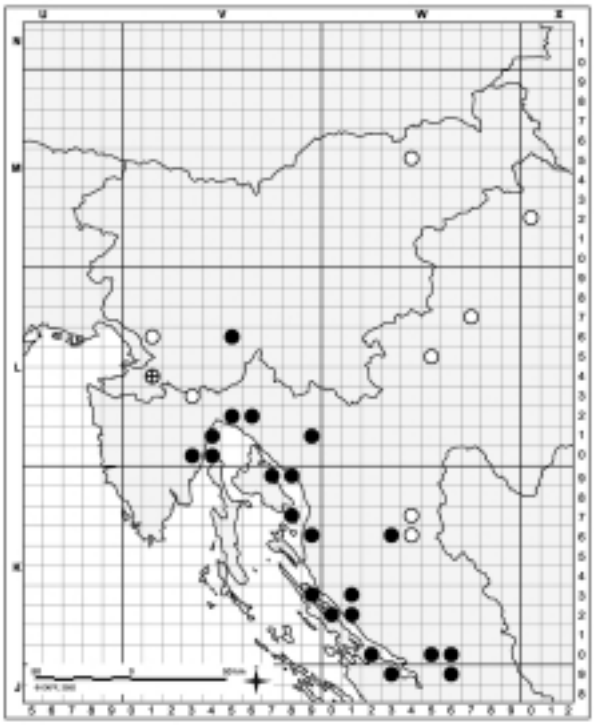

Fig. 1. Distribution of the garden dormouse *Eliomys quercinus* around the north-eastern corner of the Adriatic. Presence is indicated according to 10 × 10 km squares of the UTM grid. Dots – indisputable records; circles – unconfirmed records; crossed circle – Vistulian record of *Eliomys truci* (see text for additional explanation). List of localities: VL14 – Črni kal (AGUILAR *et al*. 1998); VL16 – Sežana, 400 m; VL30 – Mt. Učka (TVRTKOVIĆ *et al*. 1995); VL33 – Starod, 400 m; VL40 – Mošćenička Draga (TVRTKOVIĆ *et al*. 1985); VL41 – Lovorova šuma near Lovran (KORLJEVIĆ 1902); VL52 – vicinity of Rijeka (TVRTKOVIĆ *et al*. 1985); VL56 – Stari trg pri Ložu, Dane 750 m; VL62 – Rijeka, Kamenjak, 490 m (PETROV 1992); VK79 – Krk, Klimno (ĐULIĆ & GELENČIR 1965, ĐULIĆ 1969); VK87 – Krk, Baška (TVRTKOVIĆ *et al*. 1985); VK89 – Novi Vinodolski (TVRTKOVIĆ *et al*. 1995); VK93 – Island of Pag (TVRTKOVIĆ *et al*. 1985); Island of Pag, Vidalići (VUJOŠEVIĆ *et al*. 1993); VK96 – Velebit, Donja Klada, 350–390 m (TVRTKOVIĆ 1984); Velebit, Grabarje, 1000 m (TVRTKOVIĆ 1984); VK96 – Donja Klada (TVRTKOVIĆ *et al*. 1995); VL91 – Mt. Velika Kapela, Matić poljana (TVRTKOVIĆ *et al*. 1995); WK02 – Island of Pag, Metajna (TVRTKOVIĆ *et al*. 1995); WK12 – Trubaja (TVRTKOVIĆ *et al*. 1995); WK13 – Baške Oštarije (ĐULIĆ 1971); WK20 – Miočići-Razanac (TVRTKOVIĆ *et al*. 1995); WJ39 – Posedarje (TVRTKOVIĆ *et al*. 1995); WK36 – Vrhovine (ĐULIĆ 1971); WK46 – National Park "Plitvička jezera": Labudovac (TVRTKOVIĆ *et al*. 1995); WK47 – Lower Plitvice Lake (FRANIĆ 1910, cited from TVRTKOVIĆ *et al*. 1995); WM45 – Mt. Pohorje, Sv. Bolfenk (REISER 1933); WK50 – Tulove grede (TVRTKOVIĆ *et al*. 1995); WL55 – Zdenčina (TVRTKOVIĆ *et al*. 1995); WJ69 – Obli kuk; Jasenice (TVRTKOVIĆ *et al*. 1995); WK60 – Prezid (TVRTKOVIĆ *et al*. 1995); WL77 – Zagreb, Tuškanec (TVRTKOVIĆ *et al*. 1995); XM02 – Varaždin (TVRTKOVIĆ *et al*. 1995). Remark: Locality 'Gornja Klada' could not be identified; the UTM square (VK03), given by TVRTKOVIĆ *et al.* (1995) is evidently wrong.

above and also KROTT 1989, and KREISSL 1991). It is thus safe to claim that the report for Dane is the first indisputable one in this part of Europe, located deep inside the continental region.

KRYŠTUFEK and VOHRALIK (1994) showed that ranges of *E. quercinus* and *Dryomys nitedula* do not overlap which possibly indicates competitive exclusion. Along the north-eastern Adriatic coast, *E. quercinus* is widespread on the littoral slopes of the Dinaric Alps from 100 to 980 m above sea level (TVRTKOVIĆ *et al.* 1995). Of the eleven forest types, populated in Croatia by one or more dormouse species, TVRTKOVIĆ *et al.* (1995) reported *E. quercinus* for five and *D. nitedula* for seven types. The two dormice both occur only within thermophilous beech forests of Seslerio-Fagetum type in the montane belt on the coastal slopes of the Dinaric Alps. However, within this habitat they were never collected sympatrically (TVRTKOVIĆ *et al*. 1995).

The Dalmatian Garden dormouse is listed as a rare species in the Red Data Book of Croatia, apparently because of its low population densities (TVRTKOVIĆ 1994). At the European scale the species is considered vulnerable (MITCHELL-JONES *et al*. 1999) and a considerable decline in numbers and a regression in its range have been reported from various parts of its central European range (MITCHELL-JONES *et al*. 1999). Reasons for this remain unknown. Loss of mountain pastures with shrubby vegetation and boulders, which are transformed through succession into a closed canopy forest, is mentioned as one possible cause (ANDĚRA 1995). During the last century reforestation, largely through natural succession, has occurred on a large scale throughout Slovenia. Over the 107,342 ha of south-western Slovenia, where Dane is located, the forest covers 71% of the area compared to 49% a century ago (ZAFRAN *et al*. 2001). However, there are indications that the Garden dormouse is rare nowadays and was not common during the 19th century either. In particular, the whole of the Dinaric Alps within the borders of Slovenia is a traditional dormouse hunting area (PERŠIČ 1998, KRYŠTUFEK & HABERL 2001). Here the Edible dormouse is hunted as a commodity species every autumn and in beech mast years this activity occurs on large scale. Without exaggeration, edible dormice are hunted by dozens of individuals in the close vicinity of Dane, resulting in thousands of trap nights in the last decade alone. During the 19th century, the annual bag of dormice in southern and south-central Slovenia was estimated at up to 800,000 in good mast years (ŠIVIC 1926). However, although curators of the Provincial Museum of Carniola in Ljubljana (now the Slovenian Museum of Natural History) were aware of *D. nitedula* as a by-catch of the edible dormouse trapping (*cf.* DESCHMANN 1883), no Garden dormice ever reached the Museum from that source.

*

Acknowledgements – I am most grateful to Mr. MARJAN ZAVODNIK, who recognised the Garden dormouse in the collection of the Museum of Dormouse Hunting and drew my attention to it, as well as to the authorities of the Museum (Mr. BOJAN BARAGA) for allowing me to examine the specimen. A local man from Dane, who trapped the animal, kindly replied on my inquiries on the habitat and other circumstances of the capture. Dr. FRIEDERIKA SPITZENBERGER provided information on REISER's specimens in the Naturhistorisches Museum Wien, Vienna, and Dr. FRANC JANŽEKOVIČ (Maribor) drew my attention to the paper by REISER. Distributional map was prepared by ALI ŠALAMUN (Centre for the Cartography of Fauna and Flora, Ljubljana).

REFERENCES

AGUILAR, J. P., CROCHET, J.-Y., KRIVIC, K., MARANDAT, B., MICHAUX, J., SIGE, B. & ŠEBELA, S. (1998) Pleistocene small mammals from some karstic fillings of Slovenia. Preliminary results. *Acta Carsologica* **27**: 141–150.

AMORI, G., CANTINI, M. & ROTA, V. (1995) Distribution and conservation of Italian dormice. *Hystrix* **6**: 331–336.

ANDĚRA, M. (1995) The present status of dormice in the Czech Republic. *Hystrix* **6**: 155–159.

CRISTOFOLI, L., DOLCE, S. & BRESSI, N. (2002) L'alimentazione dell'allocco (Strix aluco L., Aves, Strigiformes) nella Venezia Giulia (Italia-Slovenia). *Atti Mus. Civ. Stor. Nat. Trieste* **49**: 169–186.

DESCHMANN, C. (1866) Ueber das Vorkommen des Baumschläfers, Myoxus Dryas Schl., in Krain nebst einer Enklärung des zeitweise massenhaften Auftretens des Siebenschläfers, Myoxus Glis L. *Mitt. Museal-Ver. für Krain, Laibach.* Pp. 214–218.

DESCHMANN, C. (1883) Der Billichfang in Krain. *Zeitschrift des Deutschen und Oesterreichischen Alpenvereins* **14**: 121–135.

DULIĆ, B. (1969) Distribution quantitative et qualitative des Insectivores et des Rongeurs sur quelques îles de l'Adriatique. *Rapp. Comm. Int. Mer Médit*. **19**: 829–831.

DULIĆ, B. (1971) Mammals of Dinaric Karst and their ecological properties. pp. 213–237. *Simpozij o zaštiti prirode u našem kršu*. Jugoslavenska akademija znanosti i umjetnosti, Zagreb.

DULIC, B. & FELTEN, H. (1962) Säugetiere (Mammalia) aus Dalmatien. *Senckenbergiana biologica* **43**: 417–423.

DULIĆ, B. & GELENČIR, J. (1965) La répartition des quelques petits mammiféres sur l'ile de krk (Adriatique septentrionale) au point de vue écologique (Note préliminaire). *Rapp. et Proc.-verb. C.I.E.S.M.M.* **17**: 517–520.

DULIĆ, B. & MIRIĆ, Đ. (1967) *Catalogus Faunae Jugoslaviae*. *IV/4 Mammalia*. Academia Scientiarum et Artium Slovenica, Ljubljana, 46 pp.

FREYER, H. (1842) *Fauna der in Krain bekannten Säugetiere, Vögel, Reptilien und Fische nach Cuvier's System geordnet mit Abbildungens-Citaten und Angabe des Vorkommens*. Laibach, 90 pp.

KORLJEVIĆ, A. (1902) Popis sisara hrvatske faune, koji so prispjeli »narodnomu zoološkomu muzeju« u Zagrebu do konca godine 1900. *Glasnik Hrvatskog narodnog društva* **14**: 1–10.

KOWALSKI, K. (2001) Pleistocene Rodents of Europe. *Folia Quaternaria* **72**: 3–389.

KREISSL, E. (1991) Kommt der Gartenschläfer (*Eliomys quercinus*) auch heute noch in der Steiermark vor? (Mammalia, Gliridae). *Mitt. Abt. Zool. Landesmus. Joanneum* **44**: 13–16.

KROTT, P. (1989) Ein erster Beleg des Gartenschläfers (*Eliomys quercinus* Linnaeus, 1766) für die Steiermark (Mammalia, Gliridae). *Mitt. Abt. Zool. Landesmus. Joanneum* **43**: 23–24.

KRYŠTUFEK, B. (1985) Forest dormouse Dryomys nitedula (Pallas, 1778) – Rodentia, Mammalia – in Yugoslavia. *Scopolia* **9**: 1–36.

KRYŠTUFEK, B. (1991) *Mammals of Slovenia*. Prirodoslovni muzej Slovenije, Ljubljana, 294 pp.

KRYŠTUFEK, B. & HABERL, W. (2001) Dormouse associations in Slovenia – a new approach to an old tradition. *Trakya Univ. J. Scientific Res. B* **2**: 171–177.

KRYŠTUFEK, B. & KRAFT, R. (1997) Cranial variation and taxonomy of the garden dormice (Eliomys Wagner, 1840) in the circum-Mediterranean realm. *Mammalia* **61**: 411–429.

KRYŠTUFEK, B. & VOHRALIK, V. (1994) Distribution of the forest dormouse Dryomys nitedula (Pallas, 1779) (Rodentia, Myoxidae) in Europe. *Mammal review* **24**: 161–177.

LAPINI, L., DALL'ASTA, A., DUBLO, L., SPOTO, M. & VERNIER, E. (1996) Materiali per una teriofauna dell'Italia nord-orientale (Mammalia, Friuli-Venezia Giulia). *Gortania* **17(1995)**: 149–248.

LIPEJ, L. (1995) Feeding habits of the eagle owl Bubo bubo from the Karst Edge near Črni kal. *Falco* **9**:21–24.

LIPEJ, L. & GJERKEŠ, M. (1996) Diet of the tawny owl (Strix aluco) in the karst environment near Škocjanske jame (SW Slovenia). *Acta carsologica* **25**: 351–363.

MIRIĆ, D. (1970) *Ključi za določevanje živali. Sesalci, Mammalia.* Inštitut za biologijo Univerze v Ljubljani, Ljubljana, 132 pp.

MITCHELL-JONES, A. J., AMORI, G., BOGDANOWICZ, W., KRYŠTUFEK, B., REIJNDERS, P. J. H., SPITZENBERGER, F., STUBBE, M., THISSEN, J. B. M., VOHRALIK, V. & ZIMA, J. (1999) *The Atlas of European Mammals*. Poyser Natural History, London, 484 pp.

PERŠIČ, M. (1998) Dormouse hunting as part of Slovene national identity. *Natura Croatica* **7**: 199–211.

PETROV, B. M. (1939) New facts concerning the distribution of some mammals in Jugoslavia. *Zapiski Ruskago Nauchnago Instituta Beograd* **14**: 77–83.

PETROV, B. (1968) Korrekturen und Bemerkungen zu den Verbreitungskarten im Van den Brink'schen Buch "Die Säugetiere Europas" für das Territorium Jugoslawiens. *Säugetierkundliche Mitteilungen* **16**: 39–52.

PETROV, B. M. (1992) Mammals of Yugoslavia. Insectivores and rodents. *Natural History Museum in Belgrade, Supplementa, Special issue* **37**: 1–186.

QUADRACCI, A. (1999) *Osservazioni sui micromammiferi del Carso Italiano*. Unpublished Thesis. Universita degli studi di Trieste, Trieste, 116 pp.

REISER, O. (1933) *Sv. Bolfenk na Pohorju*. Topografska slika. Maribor, 36 pp.

ROSSOLIMO, O. L., POTAPOVA, E. G., PAVLINOV, I.YA., KRUSKOP, S. V. & VOLTZIT, O. V. (2001) *Dormice (Myoxidae) of the World*. Moscow University Publisher, Moscow, 231 pp.

SPITZENBERGER, F. (2001) *Die Säugetiere Österreichs*. Bundesministerium für Land- und Forstwirtschaft, Umwelt und Wasserwirtschaft, Graz, 894 pp.

STORCH, G. (1978) Eliomys quercinus (Linnaeus, 1766) – Gartenschläfer. Pp. 208–225. *In* NIETHAMMER, J. & KRAPP, F. (eds) *Handbuch der Säugetiere Europas. Bd. 1, Rodentia 1 (Sciuridae, Castoridae, Gliridae, Muridae)*. Akademische Verlagsgesellschaft, Wiesbaden.

ŠIVIC, A. (1926) Polh (Myoxus glis L.). *Lovec* **13**: 65–69.

TVRTKOVIĆ, N. (1984) Vertical distribution of amphibians, reptiles and mammals on the northern part of Mt. Velebit (Croatia, Yugoslavia). *Bilten društva ekologa Bosne i Hercegovine. Broj 2 – III kongres ekologa Jugoslavije, Knjiga I, Sarajevo,* pp. 403–407.

TVRTKOVIĆ, N. (1994) Eliomys quercinus dalmaticus Đulić *et* Felten 1962. Pp. 80–81. *Crvena knjiga životinjskih svojti Republike Hrvatske. Sisavci*. Zavod za zaštitu prirode, Zagreb.

TVRTKOVIĆ, N., DULIĆ, B. & MRAKOVČIĆ, M. (1985) Distribution of Insectivora and Rodentia on the north-east Adriatic coast (Yugoslavia). *Acta Zool. Fenn.* **170**: 201–203.

TVRTKOVIĆ, N., DULIĆ, B. & GRUBEŠIĆ, M. (1995) Distribution and habitats of dormice in Croatia. *Hystrix* **6**: 199–207.

VUJOŠEVIĆ, M., FILIPPUCCI, M. G., BLAGOJEVIĆ, J. & KRYŠTUFEK, B. (1993) Evolutionary genetics and systematics of the garden dormouse, Eliomys Wagner, 1840. 4 – Karyotype and allozyme analyses of E. quercinus dalmaticus from Yugoslavia. *Boll. Zool*. **60**: 47–51.

ZAFRAN, J., UDOVIČ, M., SMREKAR, A., BERCE, M. & TREBEC, A. (2001) *Postojnsko gozdnogospodarsko območje (Forestry Management District of Postojna).* Zavod za gozdove Slovenije, Območna enota Postojna, Postojna.

Accepted September 15, 2003, published November 30, 2003