Fernando Tammaro & Carlo Catonica

New localities of *Sesleria caerulea* (L.) Ardoino (*Poaceae*) in Central Italy (Abruzzo)

Abstract

Tammaro, F. & Catonica, C.: New localities of *Sesleria caerulea* (L.) Ardoino (*Poaceae*) in Central Italy (Abruzzo). — Fl. Medit. 10: 303-310. 2000. — ISSN 1120-4052.

A floristic and environmental (ecological) study on *Sesleria caerulea* (L.) Ardoino (syn. *S. uliginosa* Opiz), new finding for the Central Apennines, is reported. Some morphological and anatomical characteristics and the comparison among three related *Sesleria* species are also pointed out.

Introduction

This record is very interesting for the biogeography of the Central Apennines because is a northern and eastern European relict, rare in Italy.

The species of the genus *Sesleria* Scop. (*Poaceae*) have an extremely varied ecology; in fact, they can be found in arid pastures (*S. tenuifolia* Schrader; *S. albicans* Kit. ex Schultes), rocks (*S. sphaerocephala* Ardoino), gorges and damp cliffs (*S. sadlerana* Janka), screes (*S. nitida* Ten.), beech woods (*S. cylindrica* (Balbis) DC.), swamps (*S. caerulea* (L.) Ardoino), brushwoods and shrubs (*S. autumnalis* (Scop.) Schultz).

The entities of this genus are distributed in central and southern Europe. The main area of distribution of *Sesleria caerulea* (L.) Ardoino , on the contrary, is extended in northern Europe, near the Polar Circle in the Scandinavian peninsula. Discontinuous stations of this entity are in various European territories, from Sweden to Poland, the Baltic Republics, Russia, Germany, Rumania, Bulgaria, Switzerland, Austria, the Ceka Republic, Slovakia, the lands of the ex- Jugoslavia.

According to *Flora Europaea* (Deyl 1980) this species is uncertain for Italy; on the contrary it is reported in Pignatti's Flora of Italy sub *S. uliginosa* Opiz. This plant has been noted only in a few localities of the eastern Italian Alps (Fig. 1), in which it is very rare (Pignatti 1982).

Iconographia selecta: Nevskii S.A. 1963, Rothmaler W. 1991, Conert H. J. 1992, Bo, M., Stenberg, L. & Ericsson, S. 1995.

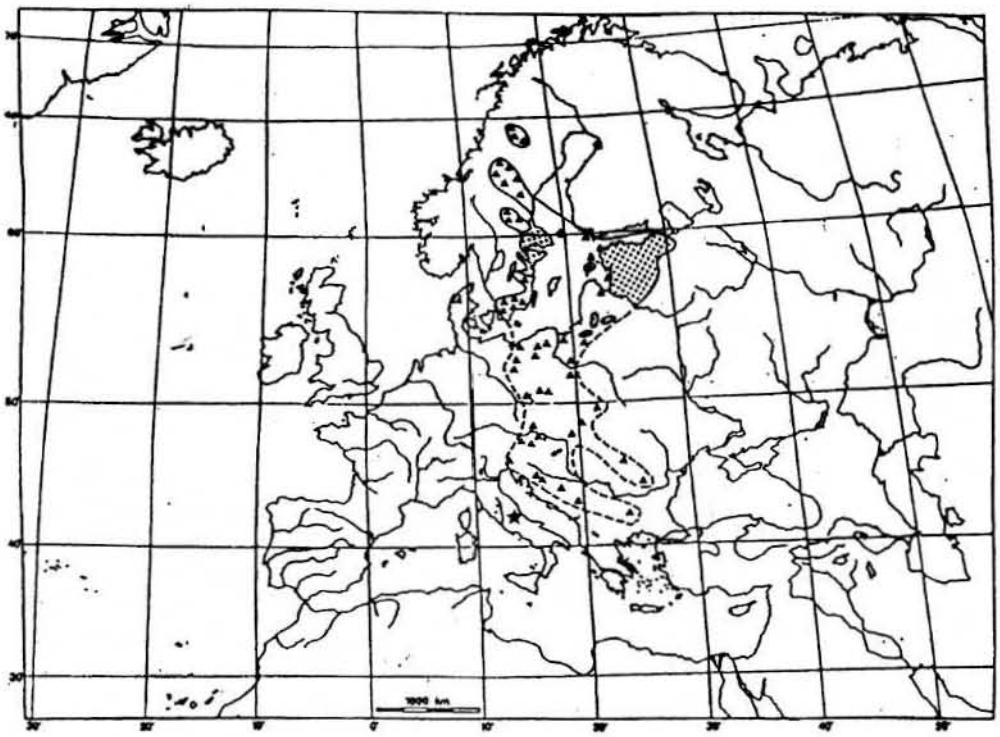

Fig. 1. Distribution of *Sesleria uliginosa* Opiz (from Meusel H., Jager L., Weinart E., 1965, modified). (★)New localities in central Italy.

Materials and Methods

We studied the lower epiderm of leaves in *S. caerulea* (L.) Ardoino, *S. albicans* Kit.ex Schultes subsp. *albicans* and *S. nitida* Ten.

S. caerulea is from the Gran Sasso of Italy, 1600 m a.s.l. (Central Apennines) (AQUI), *S. albicans* from northern Hungaria (Bukkhegység mountains, 570 m a. s. l.) (FI), *S. nitida* from the Laga mountains, at 1500 m. a. s. l., in the Central Apennines (AQUI).

Cross sections were obtained by cutting senile non-flowering shoot leaves with a very thin blade under the stereoscopic microscope, while the epidermal preparations were carried out by means of skinning.

Both cross sections and epidermal preparations were placed on microscope slides with simply water; they were observed under the optical microscope (40˜ and 100˜), drawing their projections.

Results

New reports from Central Italy.

New localities for this species are found in Central Italy (Abruzzo Region):

A) On the Gran Sasso mountainous group on the karstic plateau of Campo Imperatore

(AQ), a valley of tectonic origin, where many signs of the imponent glaciation during the Quaternary age exist. This valley, twenty km long and from three to seven km wide, is located between 1500 and 2000 m above the sea level. This locality is characterized by a continental climate, with cold winters (five or six months with covering of snow) and fresh and often rainy summers.

B) On the Piani di Pezza plateau, M. Velino mountains (AQ), a karstic plateau of the same origin as Campo Imperatore, but at a lower altitude (1400-1550 m) and with a less cold and more steppic-continental climate.

In Central Italy (both at Campo Imperatore and at Piani di Pezza) *Sesleria caerulea* lives from 1400 to 1650 m above the sea level, in small depressions among morainic hillocks, where the accumulation of alluvional soil is possible. These depressions have not efficient drainage and they retain the damp in the ground very well.

Plant description.

Sesleria caerulea (L.) Ardoino from Gran Sasso of Italy have slender, glabrous stems of 15 - 25 cm,. Leaves pruinose above, often convolute, with a rounded apex. Often the apex is mucronate. Leaves of the sterile innovation long as half stem, glabrous, scabrid in the margin (little denticles oriented towards the apex). Ligule 1 mm long, ciliolate (< 0,40 mm). 2-3 uppermost leaves, 0,7 - 2,5 cm long. Spikes 1 - 1,5 cm long, violet; spikelets 5,2 - 5,8 mm, with awned glumes 4,2 - 4,6 mm long, lemma 4,3 - 4,7 mm, with an awn inserted between two lateral tips, densely puberulent in the uper part and at the margin, like the glumes (Fig. 2a, 2b, 2c, 2d, 2e).

Environmental study.

In the new Central Italy localities of *Sesleria caerulea*, the environment is characterized by depression on bottom Quaternary morain in which the accumulation of alluvional materials is possible. The ground will favour the retention of water (humidity). In fact there is no good drainage respect to the surroundings hillocks.

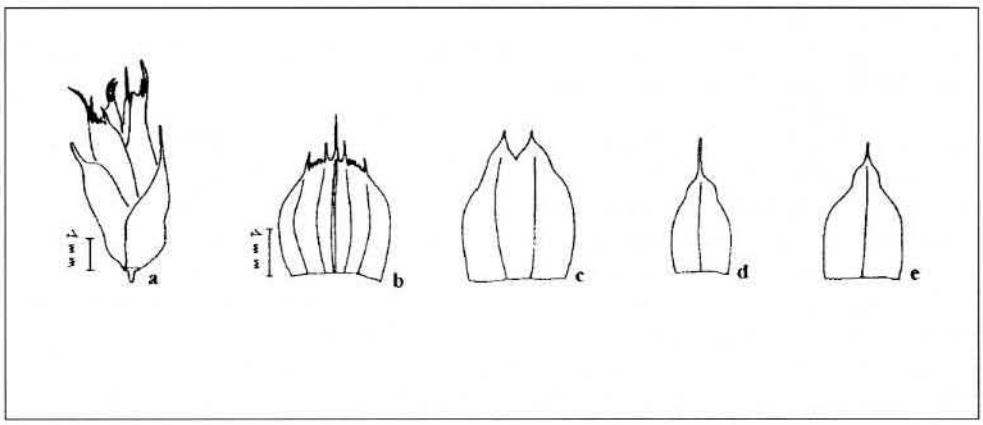

Fig. 2. Drawings from specimens of *Sesleria uliginosa* Opiz from Gran Sasso Italy.
a)Spikelet, b) Lemma, c) Palea, d) Inferior glume, e) Superior glume.

Climate.

According to Rivas-Martinez (1987) a *termicity index* (It) can be used to select different geographycal areas in bioclimatic regions. It = (T+m+M)10 where T is the average of annual temperature, m is the average of the minimum temperatures of the coldest month and M is the average of the maximum temperatures of the coldest month.

Campo Imperatore is at superior subalpine level with It=-28.6 and Piani di Pezza (meteo-station in Ovindoli - AQ) at inferior subalpine level with It=48.2.

The areas of distribution of *Sesleria caerulea* in Central Italy have a mountainous climate with snowy and cold winters (Campo Imperatore m = - 5.84°C, M = - 0.65°C and Ovindoli m = - 4.69°C, M = 2.52) and fresh and rainy summers (Campo Imperatore: average of August = 11.97°C; Ovindoli: average of July = 15.61°C). Both stations have no arid summer period.

Gams (1932, in Ozenda, 1985) performed a continentality index based on annual precipitation (P) and altitude (A); Gams considers the theoretic increase in precipitations in function of the increase in altitude. The cotangent of the report P/A individualize an angle. An increasement of angle corresponds to an increase in continentality. For angle < 40° we stay in the prealpine oceanic zone (with predominant *Fagus sylvatica* L.), while for angle > 50° we stay in intralpine continental zone (with predominant mountainous *Pinus* species.)

Both Campo Imperatore (P = 1149, A = 2125) and Ovindoli (P = 843, A = 1370) have a higher continentality index.

Soil characteristics.

Campo Imperatore, pasture with *Sesleria caerulea* (L.) Ardoino, soil analysis results: $CaCO_3$: absent; hygroscopic water (%): 0.5; clay (%): 4 (sandy-loam texture); silt (%): 4; sand (%): 92; pH: 7.58 (subalcalin soil); C (%): 3.75; N (%): 0.314; C/N: 11.90 (tendency to accumulation of organic substances).

The soil have neutral reaction, no Ca CO_3 present in solution, is poor in C and N because the soil is the result of the accumulation of alluvional materials. The percent of sand is high.

This result is similar to some analyses by Bruno et al. (1965) on soils of M. Portella (Gran Sasso d'Italia).

The absence of $CaCO_3$ in the solution might be due to an effective evolution of the soil or to some dolomite and sandstone outcrops.

Floristics

The pastures in which *S. caerulea* is found are floristically characterized by a high presence of *Brachypodium genuense* (DC.) Roem. & Schult. (50% of covering); other plants, less abundant, are *Festuca circummediterranea* Patzke, *Trifolium thalii* Vill., *Armeria canescens* (Host) Boiss., *Carlina acaulis* L., *Gentianella columnae* (Ten.) Holub, *Thymus alpigenus* (Kerner) Ronn., *Galium anisophyllum* Vill., *Euphrasia rostkoviana* Hayne, *Ranunculus oreophilus* Bieb., *Cirsium eriophorum* (L.) Scop.

This vegetation belongs to the *Brachypodienon genuensis* Biondi & al. 1994 (*Festuco-Brometea* Br.-Bl. et Tx. 1943 ex Klika et Madac 1944; *Brometalia erecti* Br.-Bl. 1936; *Phleo ambigui-Bromion erecti* Biondi & Blasi, 1982) suballeance of the mountainous and subalpine level in northern and central Apennines.

The chorological analysis in of the floristic surveys with *S. caerulea* shows the predominance of the orophytes, above all the Mediterranean-Mountain plants (38%). Also Boreal (14%), Ende- mic (14%), Central European (16%) and Euro-Asiatic plants (18%) are found significantly. From the point of view of Biological spectrum the Hemicriptophytes (over 95%) predominate.

Anatomical characteristics

The lower epidermis of leaves in *S. caerulea* consists of all elongated cells, (Fig. 3a), while in *S. nitida* (Fig. 3b). and in *S. albicans* (Fig. 3c) of short alternating to the elongated cells. This observation is in agreement with Bielecki (1955) and Conert (1992).

In the examinated entities, the leaf anatomy (cross section) shows two sclerenchyma-strand thickenings at the extremities of the leaf, bulliform cells near the central rib and

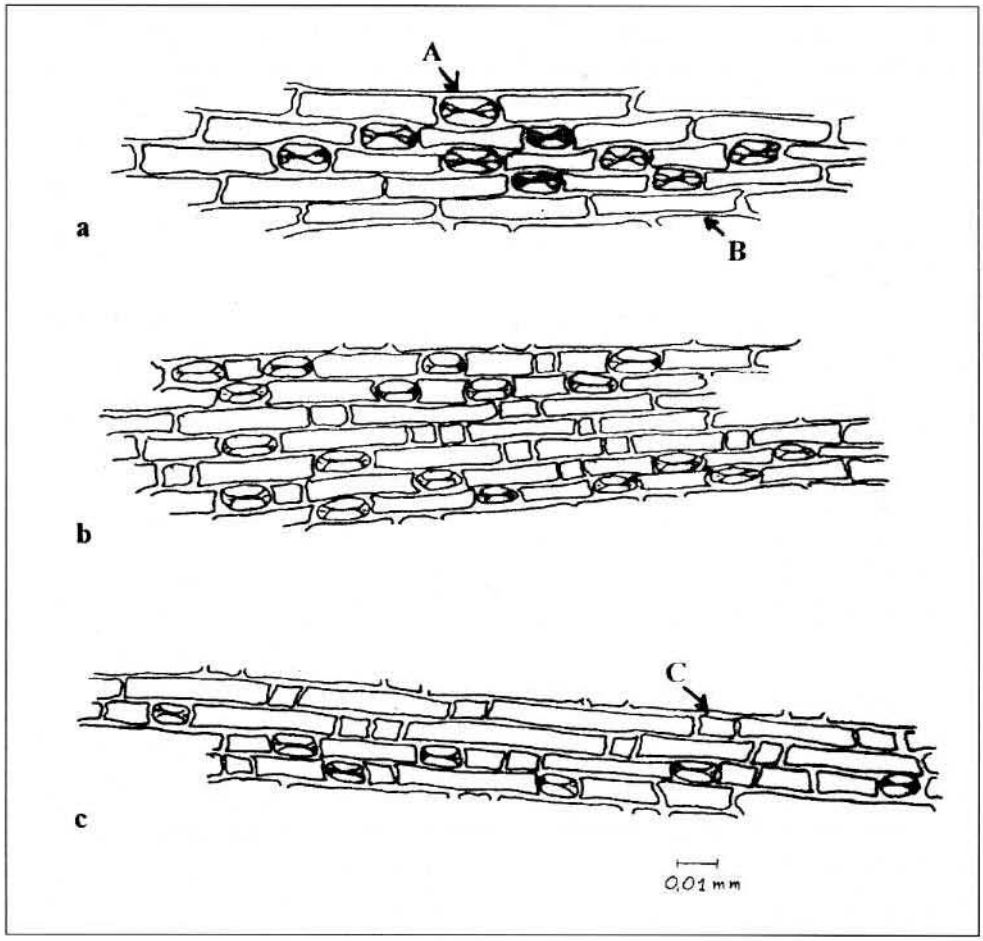

Fig. 3. Drawings from specimens a) *Sesleria uliginosa* Opiz, b) *S. nitida* Ten. C) *S. varia* (Jacq.) Wettst. A: stoma; B: elongated cells; C: short cells.

many (20-24) veins and likewise sclerenchyma-strands, which are contiguous and extending to each epidermis.The interrupted sclerenchyma-strands are found near each vein.

Differences are noted in the central thickening sclerenchyma in *S. caerulea* (sclerenchyma-strands extending to epidermis) (Fig. 4a); in *S. nitida* , interrupted sclerenchyma-strand (Fig. 4b) and in *S. albicans* , no evident sclerenchyma-strand) (Fig. 4c).

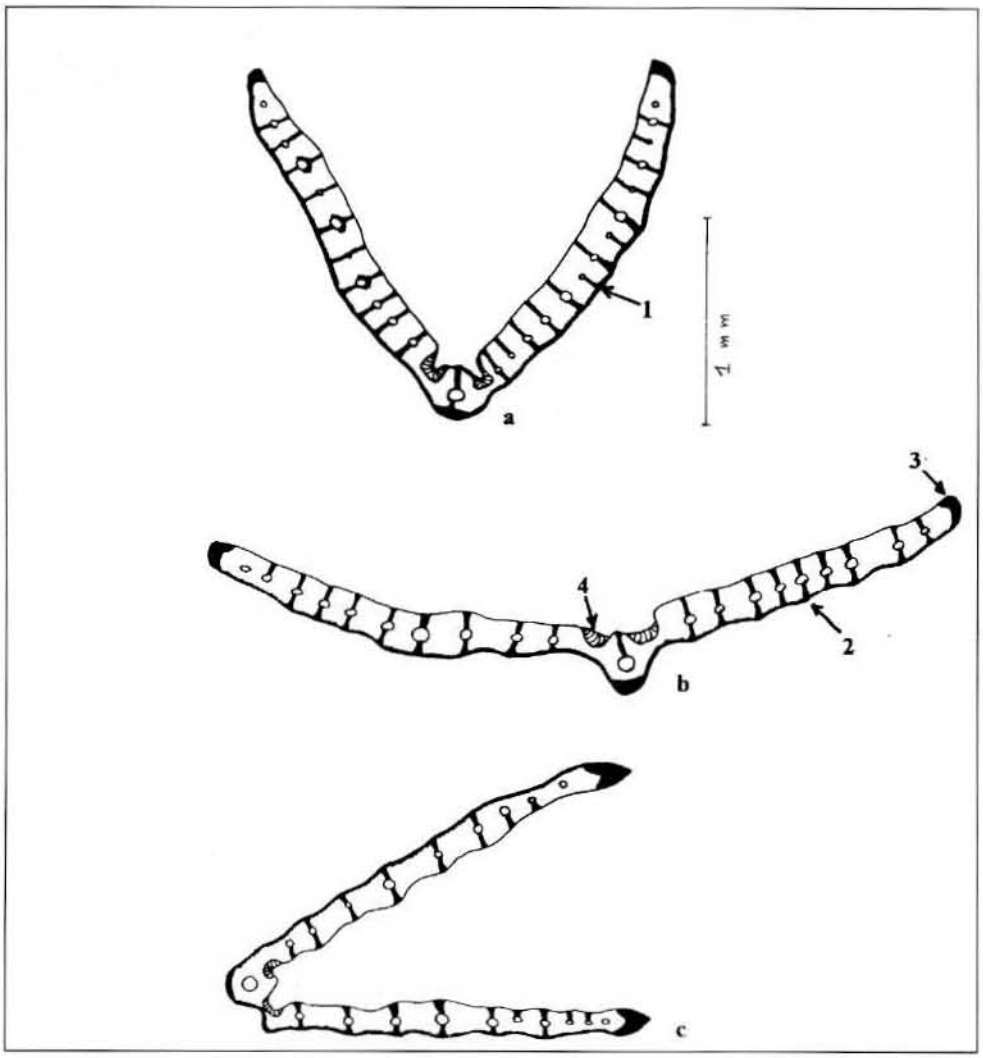

Fig. 4. Drawings from leaves cross sections of a) *Sesleria uliginosa* Opiz, b) *S. nitida* Ten., c) *S. varia* (Jacq.) Wettst.
1) Interrupted sclerenchyma-strand.
2) Sclerenchyma-strand extending to each epidermis and vein.
3) External thickening sclerenchyma-strand.
4) Bulliform cells.

Discussion

Sesleria caerulea (L.) Ardoino in Central Italy is of phytogeographic significance because it is a glacial relict, that came to the central Appennines during the glaciations in the Quaternary Age and now restricted only to a few localized areas of the Gran Sasso of Italy and M. Velino, but with abundant populations.

The central-Italian territory is the southest for the areal of *S. caerulea.*

The central Apennine entity can probably be differentied from the parental more northesn populations for the different ecology of the central Apennines and the genetic isolation due to geographical position.

We propose an analytical key for the studied *Sesleria* species.

1 - Young pruinose leaves; subglobose inflorescence, 7 - 9 mm wide, 10 - 15 mm long; leaf apex with a keel; lower epiderm of leaves all with elongated cells. Usually in damp. ..... *S. caerulea* (syn. *S. uliginosa*)

1* - Leaves not always pruinose; inflorescence elongate(up to 30 mm); leaf apex without a keel; lower epiderm of leaves with elongated cells alternating with short ones. Dry calcareous grasslands.

2* - Uppermost leaf more than 35 mm; leaves 6 mm wide; inflorescence 9-14 mm wide; lanceolate glumes, with 3-5 awns. Central and southern Italy ..... *S. nitida*

2* - Uppermost leaf not more than 20 mm; leaves 2.5-3(5) mm wide; inflorescence 5 - 7 mm wide; glumes ovato-lanceolate, acuminate, generally unawned. Central and western Europe, extending to northern Apennines ..... *S. albicans*

Appendix

Observed specimens in Herbaria of *Sesleria caerulea* from Italy.

- Prato Ciampbal, 480 m. Verzegnis (Udine) prealpi Carniche, 1-5-70, leg. P.Marzona(TSB)
- prov. Udine. Alpi Carniche: palude lago Cima Corso, 840 m., 15-VII-1980 leg. L. Poldini(TSB)
- Cima di Laste (Moena) granito m. 2250, 26-07-1972, leg. S. Pignatti (TSB).
- Friuli Torsa, 24-5-1959, leg. E. e S. Pignatti (TSB).
- Friuli: Sorgenti della Roggia Ribosa (Codroipo), 20 m. s.l.m., 9-6-1969, leg. G. Armano (TSB).
- Paludetto di Misurina 1750 m., 11-VII-1977 leg. S. Pignatti (TSB).
- Risorgive friulane,Prov. Udine, Bertiolo 25 m. s.l.m. Ass: Erucastro-Schoenetum, 25-IV-1972,leg. L. Poldini (TSB).
- provincia di Pordenone, torbiere basse presso Vigonovo 17-IV-1983, leg. L. Poldini (TSB).
- bosco dei Leoni (Aquileia), residui di una torbiera 21-4-1985, leg. L. Poldini (TSB).
- Passo del Tonale 1800 m., 20-VI-1962, leg. S. Pignatti(TSB).(uncertain)

Acknowledgements

Research carried out with a financial support by Italian Ministry of University (MURST 40%).

References.

Bielecki E. 1955: Cyto-taxonomical studies in *Oreochloa disticha* Link, *Sesleria uliginosa* Opiz and *S. calcari* Opiz. — Acta Soc. Botan. Poloniae, **XXIV(1)**: 145-162.

Bruno F., Furnari F., Sibilio 1965: Saggio comparativo tra vegetazione e suolo sul versante Sud-Est di M. Portella (Gran Sasso d'Italia) — Ann. Botan. (Roma) **XXVIII(2):** 391-462.

Conert H. J., 1992: gen. *Sesleria* Scop. — Pp. 473 – 486 in: Hegi G., Illustrierte Flora von Mitteleuropa, Band I, Teil, **3**. —. Berlin-Hamburg.

Deyl M. 1980: Genus *Sesleria* Scop. — Pp. 173-177 in: Flora Europaea, **5.** — Cambridge University Press.

Hess H. E., Landolt E. & Hirzel R. 1967: gen. *Sesleria* Scop. — Pp. 292-295 in: Flora der Schweiz, **1**. — Birkhauser Verlag, Basel und Stuttgart.

Janchen E. 1964: Der korrekte Name des Kalk-Blaugrases. — Phyton (Austria) **11**: 27-30.

Lucchese F. 1988: La distinzione dei complessi *Brachypodium pinnatum* e *B. rupestre* nelle Alpi orientali e dinariche. — Atti Simposio Soc. Estalpino-Dinarica Fitosociol. Feltre, 29 Giugno-3 Luglio 1988: 147-160.

Meusel H., Jager L., Weinart E. 1965: Vergleichende chorologie der Zentraleuropaischen — Flora. vol **1** Jena., Karten: n. 552/64, text p. 38.

Mossberg B., Stenberg L. & Ericsson S.,1995: Gyldendals Store Nordiske Flora, Gyldendals Norsk Forlag, — Oslo.

Nevskii S. A. 1963: gen. *Sesleria* Scop. — Pp. 239-241, 246-247 in: Komarov, L. Flora of the U.S.S.R., vol.**2** & **5**. Editor. Israel Program for Scientific Translations.

Pignatti S. 1982: Genus *Sesleria* Scop. — Pp. 505-509 in: Flora d'Italia, **3.** — Bologna.

Rivas-Martinez S. 1987: Nociones sobre Fitosociologia, Biogeografia y Bioclimatologia — La vegetacion de Espana — Madrid

Rothmaler W. 1991: Excursionflora von Deutschland, 3, Atlas der Gefassplanzen, Volk und Wissen Verlag GmbH. — Berlin.

Ujhelyi J. 1959: Revision des especes du genre Sesleria en Italie. — Webbia **14(2)**: 597-614.

Addresses of the authors:

Prof. Tammaro Fernando, Lab. Systematic Botany, University of L'Aquila (Italy), Via Vetoio loc. Coppito 67100 L'Aquila.

Dr. Catonica Carlo, Environmental Sciences Dept., University of L'Aquila (Italy), Via Vetoio loc. Coppito 67100 L'Aquila.