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## A morphometric analysis of *Centaurea* sect. *Dissectae* (*Compositae*)

### Abstract

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The aim of the present paper is to get a deep insight into the taxonomy of the species belonging to *Centaurea* subgenus *Acrolophus* with special concern to the sect. *Dissectae* (Hayek) Dostál.

Stress should be laid on the considerable ecological uniformity characterizing this subgenus. In fact, almost all of the taxa belonging to it very frequently occur in calcareous rocky habitats.

An attempt to assess the status of taxa within the sect. *Dissectae* has been made in comparison with the treatments by Fiori and later Pignatti. In conclusion two intraspecific taxa of earlier authors raised to specific rank resulting in one new name being proposed.

### Introduction

From a taxonomic standpoint, it is difficult to discriminate between the various forms of the section *Dissectae* in the genus *Centaurea*, since their distinctive characters are variable and transient with intermediate forms, which are often considered as the result of hybridization.

Twelve sections are ascribed to *Centaurea* L. subgen. *Acrolophus* (*Compositae*, tribe *Cardueae*). Sect. *Dissectae* (Hayek) Dostál is related to sect. *Pannophyllum* Hayek, differing from it in the lineary segmented leaves and purple flowers of its members (Dostál 1976).

The sect. *Dissectae* includes two species: **a)** *Centaurea ambigua* Guss., which has been recorded in Sicily and might be a hybrid between *C. parlatoris* Heldr. and *C. jacea* L.; **b)** *C. parlatoris* described from Sicily. Within this latter, *C. parlatoris* subsp. *nigra* (Fiori) Dostál (*C. dissecta* var. *nigra* Fiori & var. *montium* Gugler), occurs on the Central Apennines while *C. parlatoris* subsp. *tenorei* (Guss. ex Lacaita) Dostál (*C. tenorei* Guss. ex Lacaita, *C. dissecta* Ten. non Hill), is widespread in southern Italy and Sicily.

This treatment was only partly accepted by Pignatti & Lausi (1982), who, ascribed the following species, all endemic to southern and central Italy, to the *Centaurea parlatoris* Heldr. group: *C. parlatoris* Heldr., recorded in Sicily (Mt. Etna, Peloritani Mountains, Madonie and Egadi islands); *C. tenorei* Guss. ex Lacaita found in Campania on the

Sorrento peninsula; *C. scannensis* (Anzal.) Pignatti (= *C. dissecta* Ten. var. *scannensis* Anzal.) occurring in Abruzzo in the Sagittario gorge between Scanno and Anversa; *C. ambigua* Guss. (= *C. dissecta* Ten. non Hill; *C. dissecta* var. *ambigua* (Guss.) Fiori) recorded on the mountains from the Apuan Alps and the Tuscan-Emilian Apennines to Abruzzo and Matese.

Moreover, Pignatti & Lausi (1982) described four distinct forms of *C. tenorei* within its range of distribution. For *C. ambigua*, instead, he reported two forms with distinct morphological characters, localized in circumscribed ranges, namely the subspecies *ambigua* and *nigra* from the Apuan Alps at 1000-1600 m a.s.l. and the Sibilline Mountains, Gran Sasso and Majella, respectively.

Plants presently known as *C. parlatoris* subsp. *tenorei* were described by Michele Tenore as *C. dissecta* var. *glabrata* Ten. from the top of Mt. S. Angelo at Castellammare and at Pimonte and Gragnano (Tenore 1811). As can be inferred from specimens kept in his herbarium, Giovanni Gussone (NAP) was the first to ascribe the binomial *C. tenorei* to this group. Afterwards, its morphological characters, range of distribution and relationships with the other plants of the genus *Centaurea* were studied more in detail by Lacaita (1922), who confirmed the name used by Gussone treatment.

Lacaita distinguished three varieties slightly different from one another. The first, (*C. tenorei* s. str.) occurring on the top of Mt. S. Angelo (*locus classicus*), and on the Lattari Mountains as well as Mt. Cerreto, is characterized by the wide hyaline margin of the appendages of the involucre bracts, and is the only form having the pappus markedly shorter than the achene. The second variety (*C. tenorei* var. *montaltensis* Lacaita) is widespread on the dolomitic rocks of the mountains near Maiori and Minori, and is characterized by silvery setae, greatly developed hyaline membrane and pappus subequal to the achene. *C. tenorei* var. *maritima* Lacaita, the third variety, occurs along the coasts of the Sorrento peninsula and is characterized by tomentose and cobweb-like indumentum, slight leaf succulence, capitula larger than in the other forms and the pappus as long as the achene. Afterwards, this last variety was variously treated by Italian botanists. Fiori (1923-29) included it in *C. dissecta* Ten., considering the var. *maritima* Lacaita, as corresponding to the homonymous form identified by Lacaita, and the var. *glabrata* Ten. as including the other two forms mentioned by this author. More recently, Pignatti & Lausi (1982) proposed the specific status for *C. tenorei* and included 4 intraspecific entities (the 3 mentioned by Lacaita and the 1 growing on the mountains overhanging Scala); nevertheless he stressed their insignificance from a taxonomic standpoint.

Conversely, the classification of *C. ambigua* is quite complex (its specific nomenclature mirrors this difficulty). In fact, Fiori (1908), included in *C. dissecta* Ten. several forms discriminated on the basis of involucre size and some characters of the setae, justifying this distinction with the uniformity of the characters found in the populations studied. Anzalone (1960) first and then Pignatti & Lausi (1982) re-evaluated and reduced the degree of distinction between these forms, since they found several intermediate populations, among which a *C. dissecta* var. *scannensis* Anzal. population that thus far had been considered to have well-distinct and uniform characters.

Pignatti & Lausi (1982) observed that the differences between the two subspecies of *C. ambigua* Guss. were so profound that they might be considered as separate species. In fact, involucre size and shape, traits and colour of the setae, pappus/achene ratio, floret arrange-

ment seem to support this hypothesis. However, populations with intermediate characters have been found, the ranking of which is uncertain. Moreover, the wide variability in their characters makes the differences indistinct: the tomentum ranges from floccose and persistent (mostly in high-mountain plants) to sparse and ephemeral, and at flowering some populations can appear completely green or greenish-grey; the appendages usually have dark blades and clear setae, but are often completely black in the populations of subsp. *nigra* which grows in rocky environments. The *C. ambigua* Guss. population found in the *locus classicus* represents a race with an extreme aspect and clear appendages; they were first found only on the Maiella group and then in the Cinquemiglia Plain as well, and would be a variety of *C. ambigua* Guss. subsp. *ambigua*. This would suggest that this race might not be taxonomically significant and hence should be placed in a lower rank. However, since the binomial *C. dissecta* Ten. is not valid due to the existence of a previous binomial *C. dissecta* Hill. Gussone's binomial is the addest and valid and therefore available for the whole species.

*C. parlatoris* subsp. *parlatoris* from Sicily, having well distinct and independent characters, has been considered differently over time from the taxonomic standpoint. It was considered by Fiori (1923-1929) as a variety of *C. dissecta* Ten. referred to *C. parlatoris* f. *virescens*, described by Gussone (1826) from the Madonie and other areas of Sicily. According to Anzalone (1960), this group should be better investigated in order to clarify its taxonomic features and distribution, since many authors (Bonnet & Barratte 1896; Battandier & Trabut 1902) reported its presence in North Africa as well. The herbarium specimens kept in the HCI in Florence (FI) include individuals from Greece and Tunisia. In analyzing this species, Anzalone (1960) agreed that it was an independent species endemic to Sicily and Egadi Islands. Pignatti & Lausi (1982) re-assigned a full specific status to *C. parlatoris* with characters well distinct from *C. tenorei* and *C. ambigua*.

Pignatti & Lausi (1982) added *C. scannensis* (Anzal.) Pignatti (= *C. dissecta* var. *scannensis* Anzal.) to the group *C. parlatoris* Heldr. In their book on the flora of the Abruzzo National Park, Anzalone & Bazzicelli (1959-1960 a,b) referred some specimens of a plant found in the Sagittario gorge, near Scanno, in Abruzzo, to *C. dissecta* Ten. var. *ambigua* (Guss.). However, they pointed out that this classification was provisional and needed further investigation. Anzalone (1960) performed further observations, concluding that the plant analyzed no doubt belonged to the *C. dissecta* Ten. group (according to Fiori 1923-29); however, since it could not be assigned to any of the subgroupings known at that time, he considered it as a new variety, named *scannensis*. It is a floccose-tomentose plant with 7-to-10-mm capitula and white setae. The same author concluded that the varietal status of this new taxon was quite provisional, and pointed out the need for a more appropriate and exact classification, which would be only possible studying the whole group thoroughly. Pignatti & Lausi (1982) considered the distinctive features of this group so marked that he elevated it to the rank of species.

The above re-examination of the taxonomy of the species belonging to the sect. *Dissectae* raises some doubts on the real and exact classification of the whole complex. The unsolved issues can be summarized in the following points:

- distribution of *C. parlatoris* subsp. *tenorei* and the quantitative evaluation of the various forms referred to this group;
- the taxonomic rank of *C. parlatoris* subsp. *tenorei* and *C. parlatoris* subsp. *nigra*;

- the range of distribution of *C. parlatoris* Heldr. and its taxonomic identity;
- a more extensive knowledge of the group *C. ambigua*, as well as the taxonomic status and the range of distribution of its forms;
- the taxonomic rank of *C. scannensis* ;
- the rearrangement of the sect. *Dissectae* on the basis of the data obtained from the present study.

## Materials and methods

The probable distinguishing characteristics of the different forms were listed first. They were derived from the different descriptions reported (Tenore 1811; Gussone 1826; Heldreich 1844; Fiori 1923-1929; Lacaita 1922; Anzalone 1961; Dostál 1976 a; Pignatti & Lausi 1982) and checked on the basis of the protologues for the different species. A total of 48 characters were used, namely:

**Size and habit of the plant** (height; habit; number of branches in the apical two thirds of the plant; coloration).

**Hairiness** (type of hairiness; density of cauline tomentum).

**Entire primordial leaves** (length; width; shape, margin).

**Lower leaves** (length, width, general shape; length of the lateral segments; width of the lateral segments; number of segments per side; length of the terminal segment; width of the terminal segment; shape of the terminal segment).

**Higher cauline leaves – the three leaves just below the capitula** (length; width, general shape).

**Capitulum** (number of capitula; length of the horizontal axis; length of the vertical axis; shape).

**Median involucre bracts** (total length; total width; length of the appendage of the involucre scales; width of the appendage of the involucre bracts; length of the major lateral seta; mucro length; number of setae per side; colour of the appendage exclusive of the setae; colour of the lateral setae).

**Achene** (length of achene; width of achene; total length; length of inner pappus; length of outer pappus; ratio of achene length to external pappus length).

The specimens were collected on the entire geographic range of sect. *Dissectae*, namely: for *C. tenorei* the morphological investigation was performed on all of the gamodemes mentioned by Pignatti & Lausi (1982), analyzing specimens of the form *maritima* collected along the coasts of the Sorrento peninsula, specimens of the form *montaltensis* Lacaita collected on Avocata di Maiori, specimens of the form from the mountains overhanging Scala collected at Scala and Amalfi, specimens of the form ascribable to the *typus* collected on Mt. S. Angelo at tre Pizzi a Castellammare.

For *C. parlatoris*, the investigation was performed on specimens collected in Sicily at S. Martino, Isnello, Monte Scuderi, Etna.

For investigations on *C. scannensis*, specimens from the Sagittario gorge near Scanno were used.

The investigations on *C. ambigua* were performed on specimens of the subspecies *nigra* collected on Mt. Gran Sasso, Mt. Meta, Mt. Amaro, Mt. Velino, Caparacotta, Cinquemiglia

plain as well as on specimens of the subspecies *ambigua* from the *locus classicus* between Caramanico and Roccamorice.

The morphometric analyses showed some variability in the characters used, marked differences being observed in the primordial leaves and in the lower ones. However, several uniform and well characterized features were also found, namely: capitulum shape, length of the vertical axis of capitulum, length of the horizontal axis of capitulum, width of achene; length of inner and outer pappus; involucre shape.

### Statistical analyses

The data were worked out by PCA and PCO. Principal components analysis (PCA) is one of the best known and earliest ordination methods, first described by Pearson (1901). Mathematically, PCA consists of an eigenanalysis of a covariance or correlation matrix calculated on the original measurement data. Graphically, it can be described as a rotation of a swarm of data points in multidimensional space so that the first axis represents the greatest amount of variation in the data set, the axis perpendicular to the first represents the second, and so forth.

Principal coordinates analysis (PCO) can be viewed as a more general form of PCA. Whereas in PCA the use of a covariance or correlation matrix is implicit, PCO can use a variety of different measures of distance or similarity. It then performs an eigenanalysis of the matrix, giving eigenvalues and eigenvectors. The main advantage of PCO is that many different kinds of similarity or distance measures can be used. For instance, if you are taking real measurements whereas others are binary or multistate, Gower's general similarity coefficient can be used to combine these data. These coefficients can then be analyzed using PCO, whereas this data matrix would not be able to be analyzed by other ordination methods without recoding the data so that they are all in the same form.

### Results and Discussion

The analyses were performed at different levels of investigation and comparison, determining both involucre shapes and morphometric measurements.

A first analysis was concerned with the single gamodemes ascribable to *C. tenorei* (Pignatti & Lausi 1982), identified as follows:

**a:** *C. tenorei* locality "Mt. S. Angelo"

**b:** *C. tenorei* locality "Scala"

**c:** *C. tenorei* f. *montaltensis* Lacaita

**d:** *C. tenorei* f. *maritima* Lacaita

As can be seen from figure 1, forms **a** and **b** coincide completely, whereas form **d** tends to have a regular distribution on the axes. Form **c** is completely concentrated on the middle of the axes, demonstrating a marked uniformity of the characters measured. On the whole, the projection shows a common center for all the plotted species and the general structure is that of a common cluster.

Therefore, the variability of the species is related to the different environmental conditions. In fact, *C. tenorei* f. *maritima* shows a more procumbent habit and a cobweblike

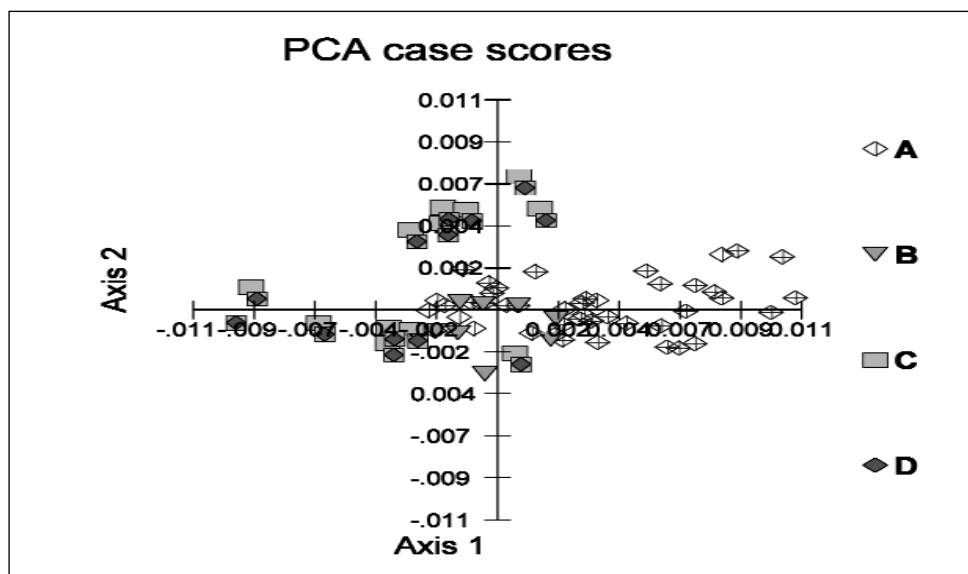


Fig. 1. Graphical results of the PCA. The analysis was performed on 138 samples. Letters denote the different forms : **A**, *C. tenorei* f. *maritima*; **B**, *C. tenorei* f. *montaltensis*; **C**, *C. tenorei* population “Scala”; **D**, *C. tenorei* population “Mt.S. Angelo”.

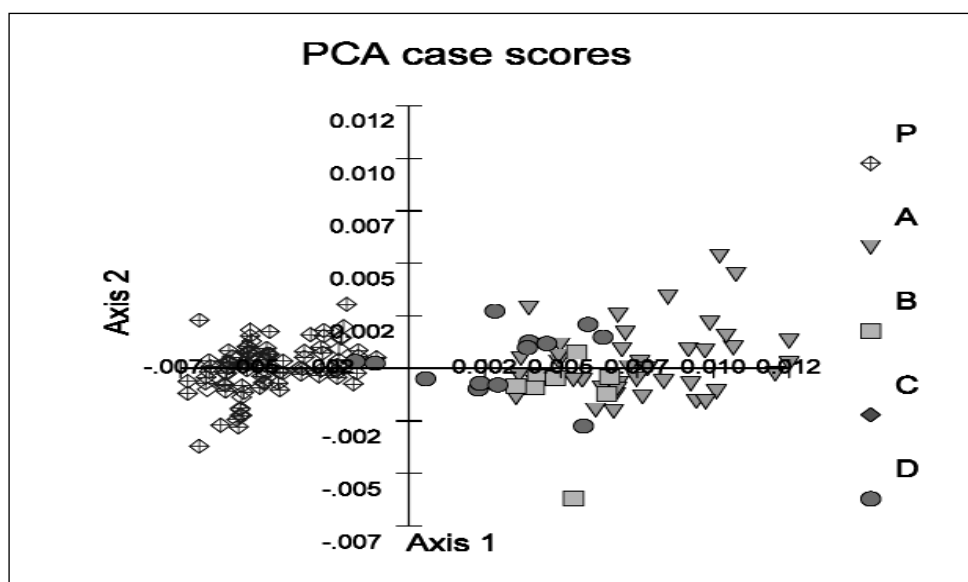


Fig. 2. Graphical results of the PCA. The analysis was performed on 287 samples. Letters denote the different forms: **A**, *C. tenorei* f. *maritima*; **B**, *C. tenorei* f. *montaltensis*; **C**, *C. tenorei* population “Scala”; **D**, *C. tenorei* population “Mt.S. Angelo”; **P**, *C. parlatoris*.

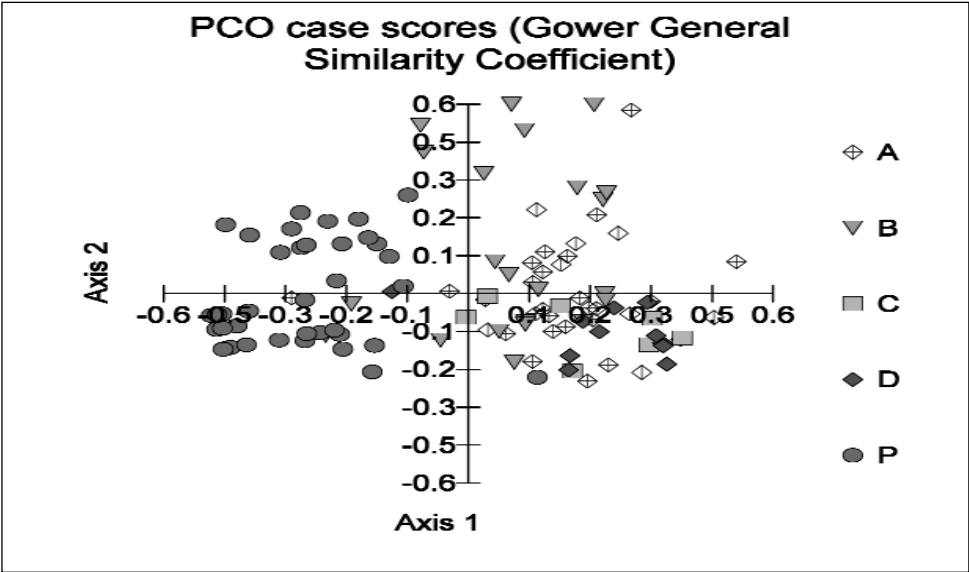


Fig. 3. Graphical results of the PCO. The analysis was performed on 287 samples. Letters denote the different forms: **A**, *C. tenorei* f. *maritima*; **B**, *C. tenorei* f. *montaltensis*; **C**, *C. tenorei* population “Scala”; **D**, *C. tenorei* population “Mt. S. Angelo”; **P**, *C. parlatoris*.

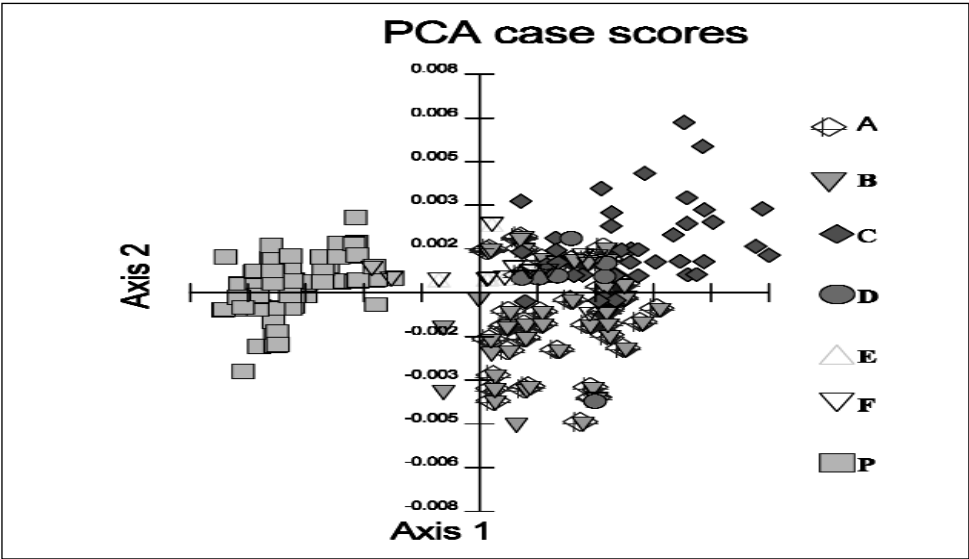


Fig. 4. Graphical results of the PCA. The analysis was performed on 483 samples. Letters denote the different forms: **A**, *C. ambigua* ssp. *nigra*; **B**, *C. scannensis*; **C**, *C. tenorei* population “Scala”; **D**, *C. tenorei* f. *montaltensis*; **E**, *C. tenorei* f. *maritima*; **F**, *C. tenorei* population ‘Mt. S. Angelo’; **P**, *C. parlatoris*.

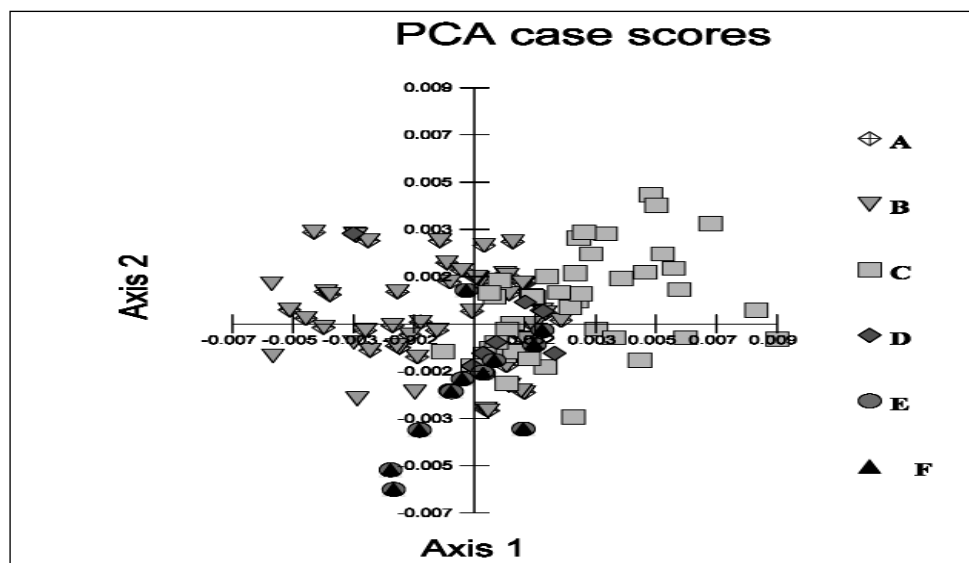


Fig. 5. Graphical results of the PCA. The analysis was performed on 324 samples. Letters denote the different forms: **A**, *C. ambigua* ssp. *nigra*; **B**, *C. scannensis*; **C**, *C. tenorei* f. *maritima*; **D**, *C. tenorei* f. *montaltensis*; **E**, *C. tenorei* population "Scala"; **F**, *C. tenorei* population "Mt. S. Angelo".

indumentum, since it is exposed on steep slopes overhanging the sea. The *C. tenorei* locality "Scala" and those of the *locus classicus* are less tomentose and more erect in habit to demonstrate that they are forms living at altitudes of 350-720 m. Conversely, the *C. tenorei* f. *montaltensis* is slender and longer, which is probably related to the substrate type (dolomitic rocks).

Pignatti's proposal to distinguish four forms of this species is acceptable, though extremely fragmentary. However, it appears more acceptable to distinguish three forms, considering *C. tenorei* locality "Scala" and f. of *locus classicus* as a single form.

In a second analysis, the species *C. parlatoris* was added to the forms described above (Pignatti & Lausi 1982). Figure 2, analyzing the morphometric measures by PCA, shows a clear distinction between the four forms mentioned above and *C. parlatoris*, indicated with **P**. The first axis accounts for over 90% of the variance, suggesting that we are analyzing very distinct groups of data. This difference, though slighter, can also be seen in figure 3 analyzing envelope shapes by PCO.

It can be concluded that *C. parlatoris* shows a clear specific identity and is independent of *C. tenorei*. Therefore, Dostál's proposal in Flora Europea that identifies *C. tenorei* as a subspecies of *C. parlatoris* should be rejected. Conversely, we suggest that *C. parlatoris* Heldr. subsp. *tenorei* (Guss. ex Lacaita) Dostál is worth specific status, as suggested by Pignatti & Lausi (1982).

A further more exhaustive investigation analyzed two additional taxa belonging to this group according to Pignatti & Lausi (1982): *C. ambigua* subsp. *nigra* (Fiori) Pignatti and *C. scannensis* (Anzal.) Pignatti.

Again, figure 4 shows a clear distinction between *C. parlatoris* and the other species analyzed, ruling out that the subspecies *C. parlatoris* subsp. *nigra* (Fiori) Dostál might be referred to this species. Following the Pignatti & Lausi's treatment (1982), *C. scannensis* was also included in the analysis. Its distinctive features allow us to elevate it to the rank of species. Figure 5 reports a PCA analysis of all the plants being investigated except *C. parlatoris*. The distribution of the forms on the axes is homogeneous and well distinguishable, showing a single group including forms with morphological affinities, which are, however, markedly discriminating. As regards *C. ambigua* subsp. *nigra*, morphometric analysis revealed such a clear and unequivocal difference with respect to *C. ambigua* subsp. *ambigua* that the rank of species can be proposed for this subspecies. In fact, scale shape, the shape and colour of the setae, capitulum size the are quite different from those of *C. ambigua* subsp. *ambigua*. According to the ICBN (S. Louis Code Art 53.1). The epithet *nigra* cannot be used since a species *C. nigra* L. already exists. The following new name is proposed here:

***Centaurea delucae* Guarino & Rampone stat. nov. et nom. nov. ≡ *C. dissecta* var. *nigra* Fiori, Fl. Anal. d'Italia, 3(2): 335 (1904) ≡ *C. ambigua* subsp. *nigra* (Fiori) Pignatti & Lausi, Fl. d'Italia 3: 195 (1982) ≡ *C. parlatoris* subsp. *nigra* (Fiori) Dostál, Fl. Europaea, 4: 272 (1976).**

Floccose-tomentose plant with erect and ascending stem (1-4 in height). Undivided or lyrate-pinnatifid leaves, the other leaves 1-2-pinnatifid, with linear lanceolate laciniae. Capitula 15-20 mm in diameter, ovoid. Corollas purple. Phyllary appendages covered by the margins of the adjacent phyllaries so that the green portion of the scales is completely hidden. Pappus shorter than achene, setae completely black (Fig. 6).

Habitat: in glades and calcareous substrates of the Central Apennines at 800-1500 m a.s.l.

Distribution: Italy, Gran Sasso, Mt. Meta, Mt. Amaro, Mt. Velino, Cinquemiglia plain.

*Centaurea delucae* has always been considered a subspecies in the group *C. ambigua*. The question whether it should be elevated to the species rank has always been raised. In fact, all those who have studied this plant have always had difficulty in establishing its precise taxonomic rank. This is not only due to the well-known variability of the group, but also to the restricted area of the species range in which the investigations have been conducted.

In view of the size of the plant and, above all, of its capitulum, which is completely black and almost twice as large as that of the other species of the group, we propose that this taxon is worthy to be treated at the specific rank.

The species is dedicated to Professor Paolo De Luca, Director of the Botanical Gardens of Naples.

On the basis of these observations, the following distinguishing taxonomic features can be proposed for this group :

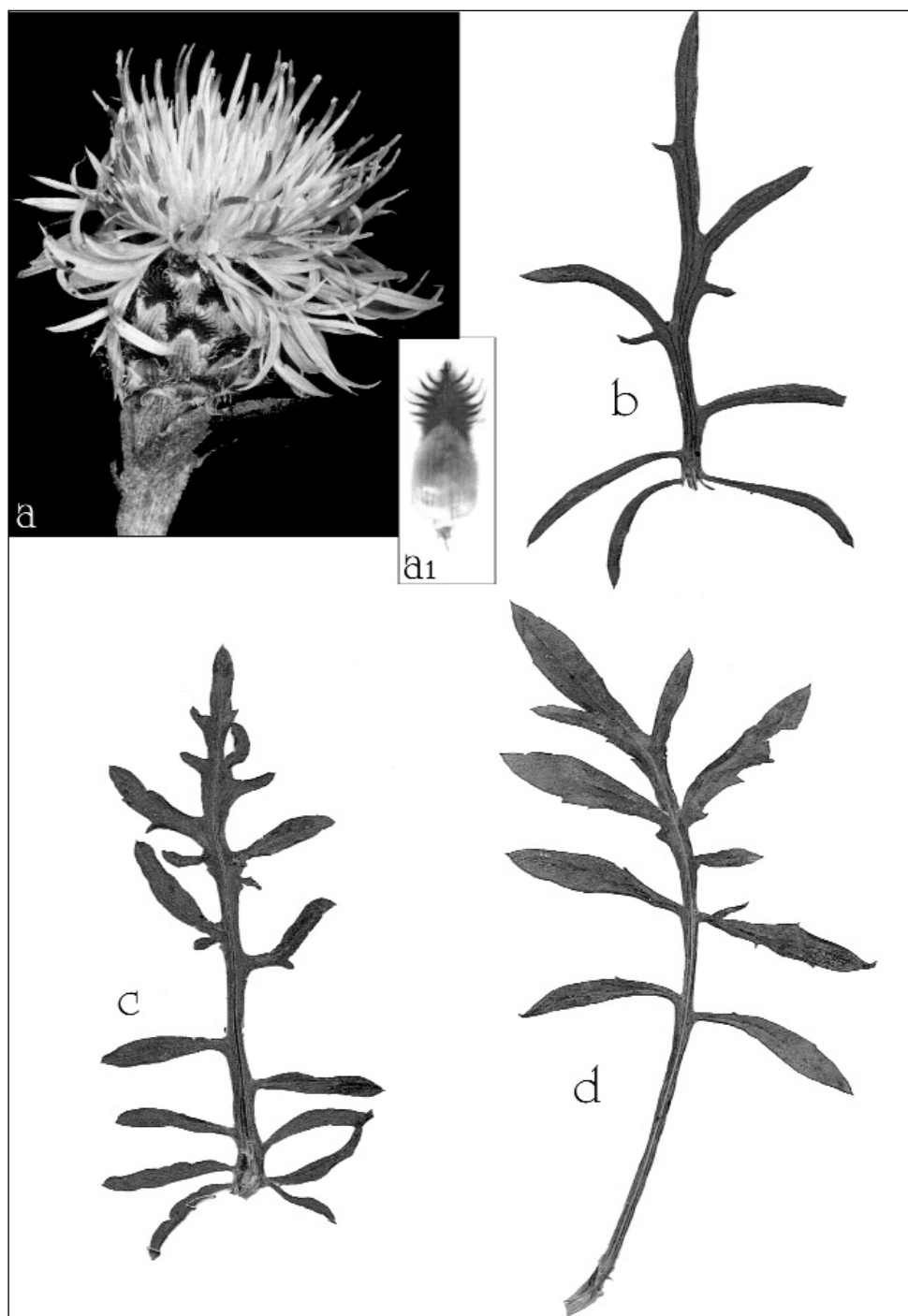


Fig. 6. *Centaurea delucae*. **a.** Capitula; **a1.** Black setae; **b.** Apical leaves; **c.** Medial leaves; **d.** Basal leaves.

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|-------------------------------------------------------------------------------------------------------------------------|-----------------------------|
| 1. Scales with a slender mucro exceeding the lateral setae                                                              | <b>2</b>                    |
| 1. Scales with a slim mucro not longer than the lateral setae                                                           | <b>4</b>                    |
| 2. Florets sparse, involucre oblong 5-8 mm in diameter, mucro elongated, pappus considerably shorter than achene        | <b><i>C. parlatoris</i></b> |
| 2. Florets erect                                                                                                        | <b>3</b>                    |
| 3. Involucre ovoid-oblong 9-15 mm in diameter, pappus from a little shorter to a little longer than achene, mucro stout | <b><i>C. tenorei</i></b>    |
| 3. Plant floccose with a mucro always exceeding the lateral setae, involucre ovoid-oblong 7-10 mm in diameter           | <b><i>C. scannensis</i></b> |
| 4. Plant with yellowish-white involucreal appendages not covering the whole involucre 7-15 mm in diameter               | <b><i>C. ambigua</i></b>    |
| 4. Plant with black involucreal appendages covering up the envelope 15-20 mm. in diameter                               | <b><i>C. delucae</i></b>    |

## References

- Anzalone, B. 1960. Su alcune piante interessanti di Scanno e di altre località d'Abruzzo. — Nuovo Giorn. Bot. Ital **67**: 550-556.
- 1961. Nota preliminare su una nuova centaurea d'Abruzzo del ciclo *C. dissecta* Ten. — Nuovo Giorn. Bot. Ital. **68**: 346-348.
- & Bazzichelli, G. 1959-60: La Flora del Parco Nazionale d'Abruzzo. — Ann. Bot. **26**: 198-295, 335-420.
- Battandier, J. A. & Trabut, L. C. 1902. Flore analytique et synoptique de l'Algerie et de la Tunisie.— Alger.
- Dostál, J. 1976 a: Flora Europaea. Notulae systematicae ad Floram Europaeam spectantes. — Bot. J. Linn. Soc. **71**: 191-210.
- Fiori, A. 1923-1929: Flora analitica d'Italia, **2**. — Firenze.
- & Paoletti, G. 1903-1908: Flora analitica d'Italia, **3-4**. — Padova.
- Gussone, G. 1826: Plantae rariores quas in itinere peroras Jonii ac Adriatici maris et per regiones Sanii as Aprutii. — Neapoli.
- 1843: *Centaurea*. — Pp. 509-521 in Florae Siculae. Synopsis, **2**. — Napoli.
- Heldreich, T. H. 1844: Beschreibung vier neuer Pflanzenarten Siciliens. — Flora **27**: 65-70.
- Lacaita, C. 1922: Pianta italiane critiche o rare. — Nuovo Giorn. Bot. Ital. **29**: 174-179.
- Pearson, K. 1901: On lines and planes of closet fit to systems of points in space. —London Edinburgh Philos. Magazine & J. Sci. **2**: 559-572.
- Pignatti, S. & Lausi D. 1982: *Centaurea* L. — Pp. 173-209 in Pignatti, S. Flora d'Italia, **3**. — Bologna.
- Tenore, M. 1811: Prodromus della Flora Naepolitana. — Napoli.

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## Appendix. Representative specimens seen

### *C. tenorei*

ITALY: Monte S. Angelo a Castellammare, 23. vi. 1833, *Gussone*, GG16 (NAP); monti di Castellammare di Stabia, 15. ix. 1833, *Gussone*, GG10 (NAP); monti di Castellammare di Stabia, 6. vii. 1834, *Gussone*, GG11 (NAP); monti di Castellammare di Stabia, 6. vii. 1834, *Gussone*, GG12 (NAP); monti di Castellammare di Stabia, 6. vii. 1834, *Gussone*, GG14 (NAP); M. San. Michele a Castellammare, 21. vii. 1833, *Gussone*, GG15 (NAP); lungo la costiera di Amalfi fra capo d'orso ed Erchie, 30. vi. 1851, *Gussone*, sub *C. tenorei* var. *maritima* GG37 (NAP); da Vico Equense a Scutolo, 1. vi. 1851, *Gussone*, sub *C. tenorei* var. *maritima*, GG38 (NAP); Ischia a Forio nella costa del bell'omo, 1. vi. 1851, *Gussone*, sub *C. tenorei* var. *maritima*, GG39 (NAP); piano della Cappella di M.S. Angelo sulla strada tra Gragnano e Castellammare, Agosto 1832, *Tenore*, sub *C. dissecta* var. *glabrata* (= *C. maculosa*), H. TEN.540(NAP); Loc. Campania in provincia di Salerno: inter pagum Maiori et capo d'orso in rupibus calcareo-dolomitici alt. 20-100 m. fioritura 10 giugno folia radicalia, 13. xii. 1910, *Rigo*, sub *C. dissecta* var. *maritima*, Coll. RIGO 03 (NAP); sulle roccie nei faggeti a Monte S. Angelo ai tre pizzi-1400 m. su calcareo-Castellammare di Stabia Luglio 1913, *Guadagno*, sub *C. dissecta* var. *glabrata* = *C. tenorei* Coll. RIGO 04 (NAP);

### *C. parlatoris*

ITALY: sulle rupi calcaree dei monti, maggio-giugno 49, *Gussone*, GS(NAP); in rupibus a Isnello, nel 1845, *Gussone*, GS(NAP); a Licatia propre Catanam at Nicolosim uique, maggio-settembre 1840, *Tornabene*, GS(NAP); *C. parlatoris* Heldr. loc. monte sopra Palermo, 1859, *Grande*, GS(NAP); *C. parlatoris* Heldr. loc. monte dell'occhio e S. Anna sopra Palermo, sett. 1859, *Grande*, GS(NAP); Heldr. S. Martino sopra Palermo, sett. 1859, *Grande*, GS(NAP); Heldr. Bronte m. Rosso presso Nicolosi, 16. vii. 1859, *Grande*, GS(NAP); Heldr. Linguaglossa, 14. vi. 1859, *Grande*, GS(NAP); Palermo S. Martino, Luglio 1896, *s.n.*, GG(NAP); Palermo a S. Martino, sine die, *Pasquale*, H. PASQ. (NAP);

### *C. ambigua*

ITALY: Molise monte di mezzo, luglio 1824, *Gussone*, sub *C. dissecta* var. *virescens* Ten. GG19(NAP); Capracotta a monte di mezzo, luglio 1824, *Gussone*, sub *C. dissecta* var. *virescens* Ten. GG20(NAP); da monte Corno a monte Peloso, agosto 1838, *Gussone*, sub *C. dissecta* Ten., GG24(NAP); da monte capitone presso l'Aquila, 1823, *Gussone*, sub *C. dissecta* Ten., GG25(NAP); M. dei Fiori, 1823, *Gussone*, sub *C. dissecta* Ten., GG26(NAP); Morrone sopra rocca casale, 9. viii. 1924, *Grande*, sub *C. dissecta* Ten. var. *ascendes* GG30(NAP); monte corno a S. Nicola, 9. viii. 1924, *Grande*, sub *C. dissecta* Ten. var. *ascendes*, GG31(NAP); monte grande a chiarino, sine die, *Tenore*, sub *C. dissecta* H. TEN.421(NAP);

### *C. delucae*

ITALY: loc. Molise a monte Capraio, 20. ix. 1826, *Gussone*, sub *C. dissecta* Ten., GG21(NAP); loc. Molise a monte Capraio, 20. ix. 1826, *Gussone*, sub *C. dissecta* Ten., GG22(NAP); l'Aquila chiarino al canale delle capezze, 1823, *Gussone*, sub *C. dissecta* Ten., GG23(NAP); Aquila chiarino al canale delle capezze, agosto 1824, *s.c.*, sub *C. dissecta* Ten., GG28(NAP); Roccamorice in Abrutti, 1826, *Gussone*, sub *C. ambigua* Guss. GG34(NAP); tra Roccamorice e Santo Spirito nei luoghi calcarei, 20. viii. 1824, *Gussone*, sub *C. ambigua* Guss., GG35(NAP); Roccamorice, 1824, *Gussone*, sub *C. ambigua* Guss., GG36(NAP); caramanico in monte i dirupi delle roccelle, solo calcaree 700-1000 m, 14. viii. 1898, *Rigo*, sub *C. ambigua* Ten., coll. RIGO 552(NAP).