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Taxonomic and phytogeographical considerations on *Hyoseris taurina* (*Compositae*), a S. Tyrrhenian element

Abstract

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Hyoseris taurina is a chasmophyte occurring on the siliceous coastal cliffs of S.W. Sardinia, N.E. Sicily, S. Calabria, the Aeolian islands, N.W. Tunisia, and the island of La Galite. It is a typical S. Tyrrhenian element, a remnant of the Tertiary flora, morphologically well separated from the other *Hyoseris* species. Phytosociologically it characterizes a new association of the *Crithmo-Limonietea*, the *Hyoseridetum taurinae*, with several vicarious, floristically and phytogeographically distinct subassociations.

Introduction

Hyoseris taurina Martinoli (1953) is a critical member of the genus *Hyoseris* L., which had first been described as *Robertia taraxacoides* var. *taurina* Pamp. (Pampanini 1948) on the basis of specimens from the cliffs of the island of Toro (S. Sardinia).

In the past, many populations belonging to this taxon had been attributed by mistake to either *Hyoseris radiata* L., or *H. baetica* (Kunze) Font Quer, or *H. lucida* L. However, according to Brullo & Pavone (1988) *Hyoseris taurina* is well differentiated from other species of its genus, in particular by the shape of its leaves, which are always fleshy, and by some features of the bracts and cypselas. Fleshy leaves are also a constant feature of *H. frutescens* Brullo & Pavone, while in *H. radiata*, when they are occasionally found in plants growing in rocky places close to the sea, they are not maintained in cultivation.

As regards distribution, *Hyoseris taurina* was recorded by Arrigoni (1981) from various coastal localities of S.W. Sardinia outside the island of Toro, and by Bocchieri & Mossa (1985) from the island of La Galite (Tunisia). More recently, Brullo & Pavone (1988) and Brullo & al. (1990) have recorded it from the N.E. Sicilian shoreline, the Tyrrhenian slope of S.W. Calabria, some Aeolian islands, and the coast of N.W. Tunisia. Therefore, *H. taurina* can be considered as a typical S. Tyrrhenian element of old origin, with a remarkably disjunct present area.



Fig. 1. *Hyoseris taurina*, general habit.

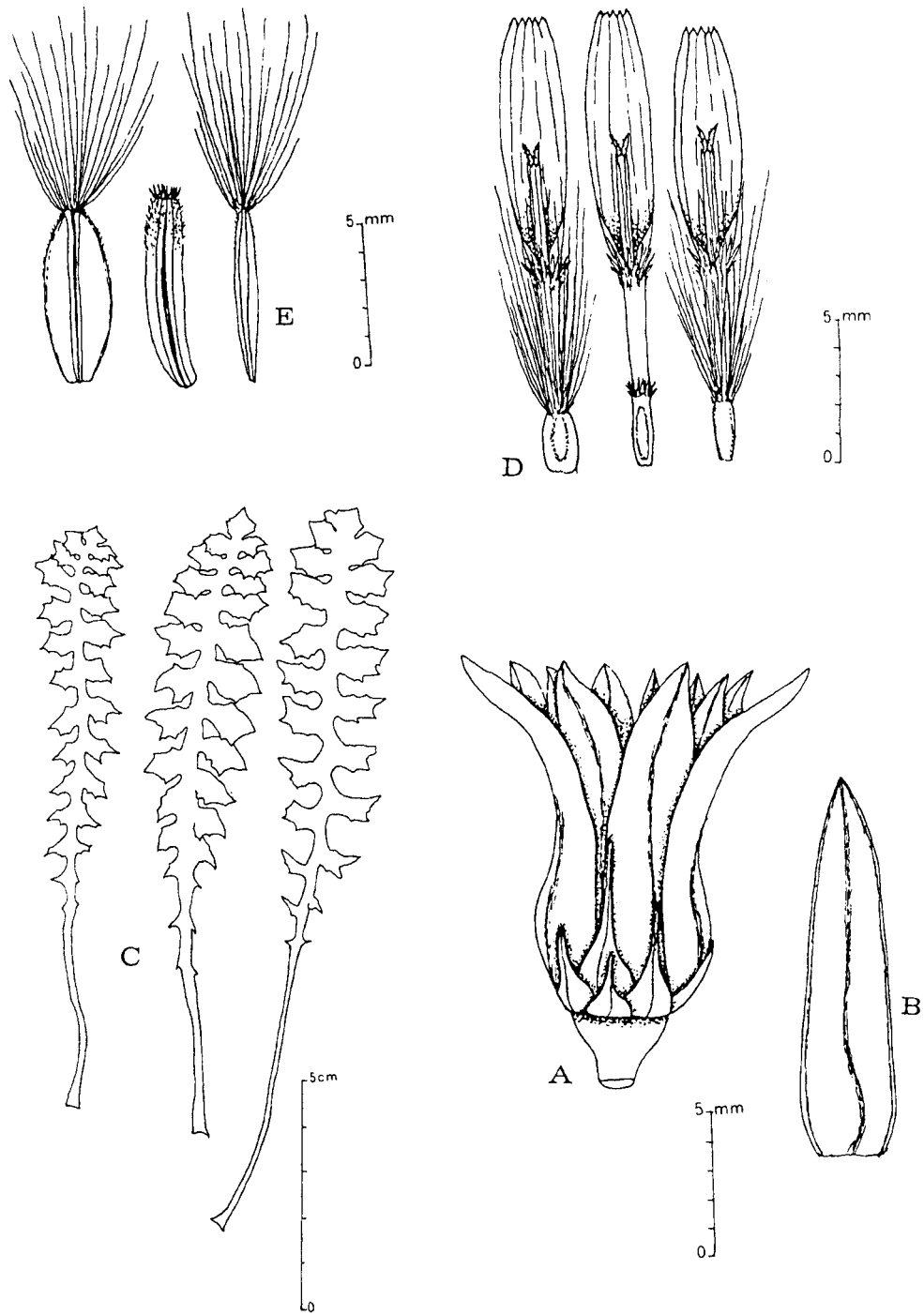


Fig. 2. *Hyoseris taurina*, characteristic details. – A, involucre; B, inner involucre bract; C, leaves; D, florets; E, cypselas (in D and E, from the left: intermediate, marginal, inner).

Taxonomic considerations

For our study we used live material originating from Buggerru (Sardinia), Tabarka and La Galite (Tunisia), Brolo and Capo Milazzo (Sicily), Stromboli and Strombolicchio (Aeolian islands), and Briatico (Calabria), all cultivated in the Botanical Garden of Catania. Numerous herbarium specimens (CAG, CAT, FI, ROM) were also examined.

Hyoseris taurina Martinoli in *Caryologia* 5: 257. 1953. – Type: “Isolotto de Il Toro (Golfo di Palmas, Sardegna Merid.-Occ.)”, 7 Apr. 1952, *Martinoli* (FI). – Fig. 1-2.
= *Robertia taraxacoides* var. *taurina* Pamp. in *Rendiconti Seminario Fac. Sci. Univ. Cagliari* 16: 138. 1948.

Chamaephyte with a woody, thickened, fibrous, branched root 2-3 cm in diameter and a robust, woody, branched stock up to 6 cm long, bearing dense rosettes of leaves at the tip. Leaves fleshy, thick, glabrous, shining, spreading to erect, oblanceolate, runcinate with ovate-triangular lobes which are acute at the apex, angulate-dentate at the margin, and well spaced except for the distal ones which are contiguous. Scapes numerous, 10-40 cm long, erect, glabrous, fistulose, more or less thickened at the tip. Capitula solitary, 2.5-5(-6) cm in diameter. Involucral bracts in two rows, the outer 3-5 mm long, narrowly ovate, gradually narrowed to a long point, the inner narrowly ovate-triangular to lanceolate, 10-15 mm long, 3-3.5 mm wide, with a wide hyaline margin. Florets c. 15 mm long, with dense, up to 1 mm long hairs in the upper part of the corolla tube. Cypselas 5-7(-8) mm long, puberulent in the distal part, the marginal ones compressed and slightly winged, the intermediate winged and compressed, linear-elliptical in outline and manifestly retuse at the base, the inner narrowly cylindrical, sulcate, 0.5-0.6 mm wide.

Specimens seen. – SARDINIA: “Nebida”, s.d., *s.coll.* (FI); *ibid.*, 21 Mar. 1983, *Bocchieri & Marchioni* (CAG); *ibid.*, 24 Apr. 1989, *Brullo & al.* (CAT); “Iglesiente, rocce a monte di Masua (Nebida)”, 29 May 1966, *Moggi & Ricceri* (FI); “Masua”, 26 Apr. 1989, *Brullo & al.* (CAT); “prope Iglesias”, May 1876 *Biondi* (FI); *ibid.*, Sep. 1875, *Biondi* (FI); *ibid.*, Jun. 1880, *Biondi* (FI); “Isolotto de Il Toro (Golfo di Palmas)”, 7 Apr. 1952 *Martinoli* (FI); “Isola del Toro”, 3 May 1894, *Martelli* (FI); *ibid.*, 8 Jul. 1983, *Bocchieri* (CAG); “litorale roccioso tra S. Nicolao e Buggerru”, 15 May 1967, *Arrigoni & Ricceri* (FI); *ibid.*, 27 Apr. 1989, *Brullo & al.* (CAT); “Buggerru”, 3 May 1988, *Scrugli & al.* (CAG); “Iglesiente, spiaggia sabbiosa di Funtanamare”, 29 May 1966, *Moggi & Ricceri* (FI); “in collibus aridis maritimis Capo Spartivento”, 24 Apr. 1894, *Martelli* (FI); “Capo Teulada, lungo la costa tra P.to Zafferano e P.to Scudo”, 10 Oct. 1981, *Bocchieri & Ballero* (CAG); “Capo Pecora, Fluminimaggiore”, 10 May 1980, *Manunze* (CAG). – Calabria: “in rupestribus maritimis al Pizzo in Calabria”, May, *Pedicino* (ROM); “Pizzo Calabro”, 15 May 1989, *Brullo & al.* (CAT); “Stazione Zambrone”, 31 Oct. 1980, *Brullo* (CAT); “Briatico”, 15 May 1989, *Brullo & al.* (CAT); “Capo Vaticano”, 31 Oct. 1980, *Brullo* (CAT). – SICILY: “rupi tra Gliaca e Gioiosa Marea”, 20 Apr. 1988, *Minissale* (CAT); “Capo d’Orlando”, 15 May 1988, *Minissale* (CAT); “Brolo”, 20 Apr. 1988, *Brullo & Minissale* (CAT); “tra Piraino e C. Calavà”, 25 Apr. 1986, *Signorello* (CAT); “Capo Calavà”, 20 Apr. 1988, *Brullo & Minissale* (CAT); “Capo Milazzo”, 10 Apr. 1990, *Brullo & Minissale* (CAT); “Milazzo”, 23 Apr. 1991, *Pavone & Spampinato* (CAT); “Filicudi”, 30 Apr. 1980, *Brullo* (CAT); “Stromboli, versante nord-ovest”, 7 May 1990 *Brullo & al.*

(CAT); “Strombolicchio”, 8 May 1990, *Brullo & al.* (CAT). – TUNISIA: “Isola di La Galite, anfratti presso il vecchio faro del Sommet”, Apr. 1983, *Bocchieri & Mossa* (CAG); “Il Galitone”, 29 May 1988, *Bocchieri & Mossa* (CAG).

According to *Brullo & Pavone* (1988), *Hyoseris taurina* shows close relationships with *H. frutescens* from Malta. Both species are characterized by a robust habit with a woody, normally branched and pulvinate stock, a strong, root and very fleshy, glabrous and shining leaves; but numerous differences in leaf shape, involucre bract and cypselas features allow to easily distinguish the two species. Other species of the genus differ in numerous morphological characters and also in habit, which is herbaceous and either therophytic (*H. scabra* L.), or hemicryptophytic (*H. radiata*, *H. lucida*).

Phytogeographical and evolutionary considerations

Judging from its distribution (Fig. 3), *Hyoseris taurina* is a typical S. Tyrrhenian element which agrees with the model of Tyrrhenian micro-plates emphasized by *La Greca* (1983), *La Greca's* hypothesis assumes that the Ilesiente micro-plate had a geographical connection with the Sardinian, Calabrian, Sicilian and Numidian plates lasting throughout the



Fig. 3. The total known geographical distribution of *Hyoseris taurina*.

Miocene (Fig. 4). All populations of *H. taurina* are indeed localized on coastal cliffs that belong to the above-mentioned plates, except those of the Aeolian archipelago, which probably established themselves later, during the Quaternary period.

From an evolutionary point of view, *Hyoseris taurina* as well as *H. frutescens* can be considered as Tertiary relict taxa: both are chasmophytes inhabiting sea cliffs and characterized by a more or less strongly developed woody stock, but they differ in their ecological requirements: *H. frutescens* is a calcicolous and rather thermophilous plant, while *H. taurina* is confined to siliceous rocks and has more mesophilous requirements.

As regards the other *Hyoseris* species, *H. radiata*, *H. lucida* and *H. scabra*, they probably arose more recently, during the Quaternary period. *H. radiata* is a hemicryptophyte adapted to man-made habitats, while *H. lucida* is a psammophyte of coastal dunes, also with a hemicryptophytic habit; *H. scabra* is a small therophyte growing in ephemeral grassland. One may therefore assume, in agreement with Pignatti (1979), that within *Hyoseris* microevolutionary processes resulted in a reduction of the vegetative apparatus and life-cycle in adaptation to new, mainly man-made habitats.

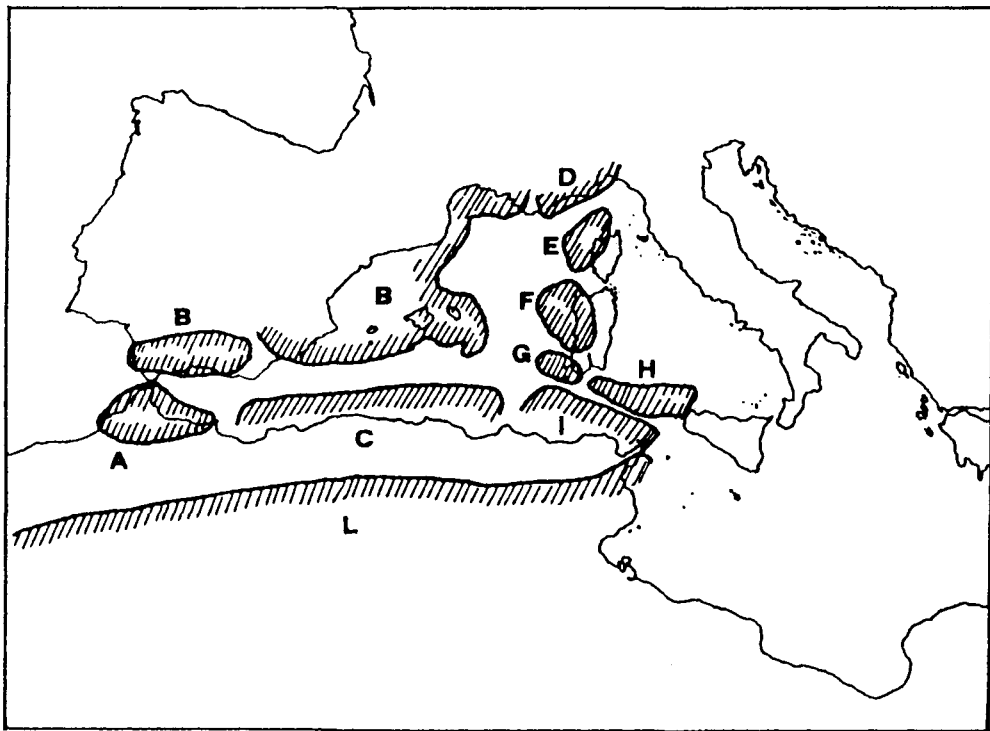


Fig. 4. Coast lines of the Tyrrhenian Sea, during the lower and middle Miocene (modified from La Greca 1983): A - Rifan plate; B - Baetic plate; C - Kabilian plate; D - Provençal plate; E - Corsican plate; F - Sardinian plate; G - Iglesias plate; H - Calabro-Peloritan plate; I - Numidian plate; L - African plate.

Phytosociological considerations

Hyoseris taurina is a chamaephyte of rocky places, mostly sea cliffs exposed to salt spray. On the whole, in view of its peculiar ecological demands, it may be considered as a sub-halophilous chasmophyte. This explains the fact that, even though its cypselas are provided with a pappus, it has a limited distribution. In its natural habitat, *H. taurina* is associated with several perennial halophytes typical of rocky coasts of the Mediterranean, such as *Lotus cytisoides* L., *Crithmum maritimum* L., *Daucus gingidium* L., *Reichardia picroides* var. *maritima* (Boiss.) Fiori, and *Senecio bicolor* (Willd.) Tod. From a phytosociological point of view, the community characterized by *H. taurina*, both floristically and ecologically, clearly belongs to the class *Crithmo-Limonietea* Br.-Bl. 1947 and to the alliance *Crithmo-Limonion* Molinier 1934.

The presence of *Hyoseris taurina*, and concomitant environmental peculiarities, allow to define a new association, to be named *Hyoseridetum taurinae*, whose distribution coincides with that of its characteristic species (holotype: Tab. 1, rel. 3). This association is restricted to coastal areas with a thermomediterranean subhumid climate (as can be deduced from the ombro-thermic diagrams of nearby localities: Fig. 5) and a prevalently siliceous substratum (granite, vulcanite, sandstone, gneiss). It is best developed on north-facing cliffs directly exposed to the sea.

Within this community it is possible to distinguish four subassociations, well differentiated from a floristic and phytogeographical point of view. They are:

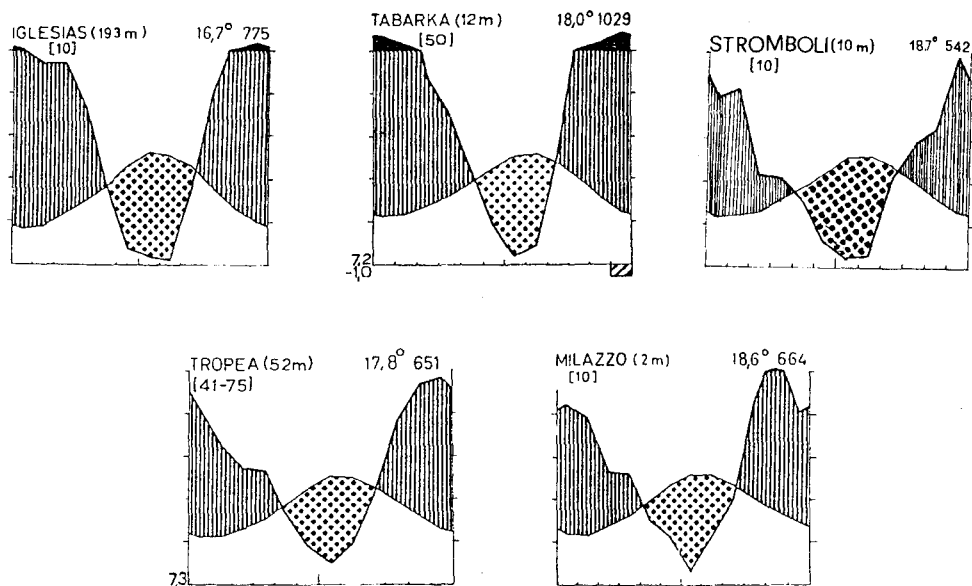


Fig. 5. Ombro-thermic diagrams of relevant localities, drawn in conformity with Walter & Lieth (1960).

Table 1. Relevés of the *Hyoseridetum taurinae* from Sicily (1-9) and Calabria (10-20). -1-3, Brolo, 20 Apr. 1988; 4, Capo d'Orlando, 15 May 1988; 6-7, Bivio Romatta Salici, 13 Sep. 1988; 8-9, Capo Milazzo, 19 Apr. 1990; 10-13, Pizzo Marina, 15 May 1989; 14-17, Briatico, 15 May 1989; 18-20, Zambrone, 15 May 1989.

Relevé number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Surface (m ²)	50	100	100	40	20	20	30	10	10	20	50	10	20	40	40	30	50	50	30	40
Cover (%)	50	50	60	40	60	50	30	60	40	40	60	80	60	70	70	50	60	70	80	60
Inclination (°)	90	90	90	90	90	90	90	70	70	90	90	80	90	80	90	80	90	80	90	90
Exposure	N	N	N	N	N	NW	N	NW	NE	NE	N	N	NW	N	N	NE	N	NO	N	N
Char. Association																				
<i>Hyoseris taurina</i> Martinoli	2	2	3	2	2	2	2	2	2	1	2	3	3	2	3	2	3	2	2	2
Diff. Subassociation																				
<i>Inula crithmoides</i> L.	2	3	2	3	1	1	1	3	2	3	2	2	1	1	1	1	2	3	3	2
<i>Matthiola incana</i> (L.) R. Br.	1	1	.	.	.	.	+	.	.	1	1	2	1	.	.	1	1	.	.	.
<i>Centaurea deusta</i> Ten. s.l.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	1	1	1	2	2
<i>Dianthus aelicus</i> Lojac.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Matthiola rupestris</i> Raf.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Kochia saxicola</i> Guss.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Dianthus longicaulis</i> Ten.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Limonium sulcitanum</i> Arrigoni	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Seseli praecox</i> (Gamisans) Gamisans	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Bellium crassifolium</i> Moris	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Psolarea morisiana</i> Pign. & Metlesics	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Pancratium illyricum</i> L.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Telephium imperati</i> L.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Calendula suffruticosa</i> Vahl.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Char. Crithmo-Limonion and Crithmo-Limonieta																				
<i>Reichardia picroides</i> var. <i>maritima</i> (Boiss.) Fiori	1	1	1	+	1	1	1	.	+	+	1	1	+	1	1	1	+	+	+	+
<i>Lotus cytisoides</i> L.	2	2	1	+	+	2	2	2	1	1	2	3	2	3	3	2	3	1	1	1
<i>Daucus gingidium</i> L.	.	.	1	.	+	.	.	.	.	1	2	2	1	2	1	+	1	1	2	1
<i>Allium commutatum</i> Guss.	+	+	2	+	.	+	.	+	1	1	+	2	2	1	1	+	1	+	+	+
<i>Crithmum maritimum</i> L.	.	.	+	+	.	.	.	+	1	.	.	.	.	1	2	1	2	2	2	2
<i>Senecio bicolor</i> (Willd.) Tod.	.	1	1	.	.	.	1	.	.	.	.	.	1	.	.	.	.	.	.	.
<i>Plantago macrorrhiza</i> Poir.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Limonium minutiflorum</i> (Guss.) Kuntze	.	.	.	.	.	.	.	2	2	.	.	.	.	.	.	.	.	.	.	.
Other species																				
<i>Silene vulgaris</i> subsp. <i>angustifolia</i> (Mill.) Hayek	1	1	2	1	3	1	1	.	.	.	+	1	.	2	1	1	2	.	.	2
<i>Dactylis hispanica</i> Roth	.	.	.	.	.	.	.	.	.	1	2	2	1	2	1	2	+	2	2	2
<i>Euphorbia dendroides</i> L.	.	1	+	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	1
<i>Sonchus asper</i> (L.) Hill	.	.	.	.	.	.	.	.	+	+	1	+	+	+	+	+	+	.	.	.
<i>Anthemis maritima</i> L.	.	.	.	.	.	.	.	.	2	.	1	.	1	.	1	+	.	1	1	.
<i>Helichrysum microphyllum</i> Willd.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Dittrichia viscosa</i> (L.) Greuter	+	+	+	.	.	+	.	.	.	1	+	.	.	.	.	.	.	.	.	.
Sporadic species	1	1	2	1	5	5	4	2	1	1	1	-	-	-	-	-	-	1	2	1

Table 1 (continued). Relevés of the *Hyoseridetum taurinae* from the Aeolian Islands (21-28), Sardinia (29-35), and Tunisia (36-40). – 21-23, Ficogrande (Stromboli), 7 May 1990; 24, Schicciolo (Stromboli), 8. May 1990; 25-28, Strombolicchio, 8 May 1990; 29-32, Buggerru, 16 Apr 1989; 33, Masua, 26 Apr. 1989; 34-35, Nebida, 26 Apr. 1989; 36-40, Tabarka, 8 Sep. 1990.

Relevé number	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
Surface (m ²)	10	10	10	10	20	20	20	20	30	20	30	20	20	30	20	10	10	10	10	10
Cover (%)	60	50	50	30	50	50	30	30	40	50	50	40	50	60	50	60	50	40	50	60
Inclination (°)	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90
Exposure	N	N	N	N	W	W	W	NE	W	W	W	W	E	N	N	N	N	N	N	N
Char. Association																				
<i>Hyoseris taurina</i> Martinoli	3	2	2	1	3	2	3	1	2	3	1	1	2	3	3	3	2	2	3	3
Diff. Subassociation																				
<i>Inula crithmoides</i> L.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Matthiola incana</i> (L.) R. Br.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Centaurea deusta</i> Ten. s.l.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Dianthus aeolicus</i> Lojac.	2	2	1	1	3	3	2	2	.	.	.	.	.	.	.	.	.	.	.	.
<i>Matthiola rupestris</i> Raf.	1	+	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Kochia saxicola</i> Guss.	.	.	.	.	1	.	+	1	.	.	.	.	.	.	.	.	.	.	.	.
<i>Dianthus longicaulis</i> Ten.	.	.	.	.	.	.	.	.	2	1	1	2	1	1	1	.	.	.	.	.
<i>Limonium sulcitanum</i> Arrigoni	.	.	.	.	.	.	.	.	2	1	1	1	.	2	1	.	.	.	.	.
<i>Seseli praecox</i> (Gamisans) Gamisans	.	.	.	.	.	.	.	.	1	2	2	2	2	.	.	.	.	.	.	.
<i>Bellium crassifolium</i> Moris	.	.	.	.	.	.	.	.	+	1	2	1	2	.	.	.	.	.	.	.
<i>Psolarea morisiana</i> Pign. & Metlesics	.	.	.	.	.	.	.	.	.	1	+	.	1	1	.	.	.	.	.	.
<i>Pancratium illyricum</i> L.	.	.	.	.	.	.	.	.	.	1	2	1	.	.	.	.	.	.	.	.
<i>Telephium imperati</i> L.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Calendula suffruticosa</i> Vahl.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Char. Crithmo-Limonion and Crithmo-Limonietea																				
<i>Reichardia picroides</i> var. <i>maritima</i> (Boiss.) Fiori	+	2	+	.	.	.	.	.	1	1	2	+	1	.	.	2	1	1	.	+
<i>Lotus cytisoides</i> L.	.	.	.	.	.	.	.	.	.	+	1	1	.	.	.	2	1	1	+	1
<i>Daucus gingidium</i> L.	2	1	1	1	1	2	2	1	+	.	1	1	.	1	1	.	.	.	.	.
<i>Allium commutatum</i> Guss.	.	.	.	.	.	.	.	.	.	1	1	1	.	.	1	.	.	.	.	.
<i>Crithmum maritimum</i> L.	+	1	+	.	.	.	.	.	.	2	1	1	2	.	.	.	.	.	.	.
<i>Senecio bicolor</i> (Willd.) Tod.	2	1	2	1	.	.	1	1	.	.	.	.	.	.	.	.	.	.	.	.
<i>Plantago macrorrhiza</i> Poir.	.	.	.	.	.	.	.	.	.	+	+	.	.	+	.	2	2	1	2	2
<i>Limonium minutiflorum</i> (Guss.) Kuntze	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Other species																				
<i>Silene vulgaris</i> subsp. <i>angustifolia</i> (Mill.) Hayek	1	+	.	.	.	.	.	.	+	+	1	+	1	+	1	.	.	.	.	.
<i>Dactylis hispanica</i> Roth	1	+	+	1	.	1	1	+	+	+	1	1	.	+	+	.	.	.	.	.
<i>Euphorbia dendroides</i> L.	.	.	.	.	.	.	1	.	.	1	+	1	1	.	.	.	.	.	.	.
<i>Sonchus asper</i> (L.) Hill	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Anthemis maritima</i> L.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Helichrysum microphyllum</i> Willd.	.	.	.	.	.	.	.	.	+	1	2	2	.	2	1	.	.	.	.	.
<i>Dittrichia viscosa</i> (L.) Greuter	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Sporadic species	3	1	2	2	1	1	-	-	2	1	-	-	3	1	-	-	-	-	-	-

- *inuletosum crithmoidis*, subass. nov. (holotype: rel. 3), occurring in N.E. Sicily and S.W. Calabria, which is characterized by the presence of *Inula crithmoides* L., *Matthiola incana* (L.) R. Br., and *Centaurea deusta* Ten. s.l.
- *dianthetosum aeolici*, subass. nov. (holotype: rel. 27), limited to the Aeolian islands, and in particular to Stromboli and Strombolicchio where it colonizes volcanic rocks and characterized by *Dianthus aeolicus* Lojac., *Matthiola rupestris* Raf., and *Kochia saxicola* Guss.
- *seseletosum praecocis*, subass. nov. (holotype: rel. 30), exclusive of S.W. Sardinia, mostly limited to granitic rocks and having as differential species *Seseli praecox* (Gamisans) Gamisans, *Dianthus longicaulis* Ten., *Limonium sulcitanum* Arrigoni, *Bellium crassifolium* Moris, *Pancratium illyricum* L., and *Psoralea morisiana* Pignatti & Metlesics.
- *telephietosum imperati*, subass. nov. (holotype: rel. 37), found in N. Tunisia near Tabarka on sandstones, with *Telephium imperati* L. and *Calendula suffruticosa* Vahl as differential species.

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