The Plant Communities of the Class Isoëto-Nanojuncetea in Sicily

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Abstract: A syntaxonomical revision of the Isoëto-Nanojuncetea class for the Sicilian territory is provided. This syntaxon gathers the ephemeral herbaceous hygrophilous plant communities linked to periodically submerged soils, widely distributed in the European, circum-Mediterranean and Macaronesian territories. Within this class, two orders are recognized, Isoëtetalia, with a prevalently Mediterranean distribution, and Nanocyperetalia chiefly occurring in the central-European and Atlantic territories, with scattered and marginal occurrence in the Mediterranean area. The order Isoëtetalia in Sicily is represented by four alliances, i.e., Isoëtion, Preslion cervinae, Cicendio-Solenopsion laurentiae and Agrostion salmanticae, while within Nanocyperetalia three alliances can be recognized, namely Nanocyperion, Verbenion supinae and Lythrion tribracteati. Overall, 32 plant communities are recognized, 11 of which are described for the first time. Each higher rank syntaxa and related associations are examined from a nomenclatural, floristic, ecological and chorological point of view. In particular, the associations were processed using cluster analysis in order to highlight the correlations between them. Regarding the floristic aspects, a checklist of the species occurring in the phytosociological relevés is provided, as well as a new combination concerning Solenopsis gasparrinii, a critical species of the Sicilian flora, is proposed.

Keywords: Isoëto-Nanojuncetea class; temporary ponds; Sicily; wetlands; Habitat Directive; phytosociology; plant ecology

1. Introduction

Wet temporary submerged habitats are generally featured by very specialized vegetation characterized by the dominance of therophytes, often with a short biological cycle, which is sometimes associated with dwarf geophytes and hemicryptophytes. It is ephemeral vegetation, often with quite high plant diversity, where rare or uncommon hygrophytes, mostly exclusive to these environments, find their optimal growing conditions. Such plant communities occur in the European and circum-Mediterranean territories, ranging from the shoreline to the high-mountain stands, especially in relation to the substrate and microclimatic conditions. From the phytosociological viewpoint, this hygrophilous vegetation is usually included in Isoëto-Nanojuncetea Br.-Bl. & R. Tx. ex Westhoff, Dijk & Passchier 1946, a rather tricky class whose classification is quite controversial, undergoing several nomenclatural and syntaxonomical changes over time. Besides, the floristic set of the plant communities belonging to this class shows considerable variability in relation to the substrate, bioclimatic conditions, elevation, period of submersion and extension of the surfaces.
These wetlands, due to their floristic peculiarities, have always aroused the interest of botanists and especially phytosociologists, who have tried to highlight the geobotanical relevance and the great naturalistic value of these habitats. Their significant ecological role is recognized by the Habitat Directive (43/92 EEC), identifying them as a priority conservation habitat with the cod. 3170* (Mediterranean temporary ponds) [1]. The first investigations regarding the Isoëto-Nanojuncetea communities were carried out by Allorge [2], Koch [3], Braun-Blanquet [4,5], Klika [6], Moor [7,8], Vlieger [9], Tüxen [10], Diemont et al. [11], Zohary & Orshansky [12], Molinier & Tallon [13], Ubriszy [14], who contributed understanding this rare and interesting hygrophilous vegetation occurring both in the Mediterranean and European territories. Later, several other authors studied this vegetation in the whole Euro-Mediterranean area, such as Braun-Blanquet et al. [15], Chevassut & Quezel [16,17], Braun-Blanquet [18], Rivas Goday et al. [19]; Rivas Goday [20–22], Horvatic [23], Barbero [24], Philipp [25], Wojcik [26], Bolös et al. [27], Aubert & Loisel [28], Sunding [29], Pietsch [30], Tüxen & Zevaco [31], de Foucault [32–34], Traxel [35], Bruullo & Furnari [36], Popiel [37,38], Bruullo & Minissale [39], Táuber [40], Taran [41], Deil [42,43], Molina [44], Rivas Goday et al. [45], Rivas Goday [46–48], Horvatic [49], Barbero [50], Philippi [51], Molinier & Tallon [52], Ubriszy [53], who significantly improved the knowledge of this class. As concerns the Italian territory, the plant communities belonging to the Isoëto-Nanojuncetea class are quite investigated. In particular, among the several authors who dealt with this type of ephemeral hygrophilous vegetation in various localities of the Italian peninsula are worth to be mentioned: Pignatti [53–55], Anzalone & Caputo [56], Veri et al. [57], Filipello & Sartori [58], Pedrotti et al. [59], Pedrotti [60–62], Piccoli [63], Biondi et al. [64,65], Foggi & Grigioni [66], Bruullo et al. [67], Biondi & Vagge [68], Foggi et al. [69], Gigante et al. [47,70], Carta [71], Ceschin & Salerno [72], Ernandes et al. [73], Tommaselli et al. [51]. As concerns the Sardina island, this class was examined by De Marco & Mossa [74], Biondi & Bagella [75], Paradis & Finidori [76], Bagella et al. [77], etc., while from Sicily it was studied by Bruullo & Di Martino [78], Bruullo & Marceno [79], Bruullo et al. [80–82], Barbagallo et al. [83], Bruullo & Grillo [84], Marceno & Trapani [85], Raimondo [86], Minissale & Spampinato [87], Bartolo et al. [88], Bruullo & Minissale [39], Bruullo & Sciandrello [89], Sciandrello [90,91], Minissale et al. [92], Minissale & Sciandrello [93]. Based on these data, the Isoëto-Nanojuncetea class is represented throughout the Italian territory by two orders, such as Isoëtalia Br.-Bl. 1936 and Nanocyperetalia Klika 1935. The alliances belonging to the first one are Isoëtion Br.-Bl. 1936, Preslion cervinae Br.-Bl. ex Moor 1937, Cicendio-Solenopsion laurentiae Bruullo & Minissale 1998 and Agrostion salmanticae Rivas Goday 1958, while those ones of the second order are Nanocyperion Koch 1926, Verbenion supinae Slavnic 1951, Lythrion tribracteati Rivas Goday & Rivas-Mart. ex Rivas Goday 1970, Elatino-Eleocharition ovatae Pietsch in Pietsch & Müller-Stoll 1968 and Cicendion (Rivas Goday in Rivas Goday & Borja 1961) Br.-Bl. 1967 (=Radiolion linoidis Pietsch 1973).

In order to increase the knowledge about the Isoëto-Nanojuncetea class in Sicily, a contribution concerning the whole territory, including the small surrounding islets, is provided. Based on literature and several unpublished phytosociological relevés, the results of a deep investigation are given, in which all the syntaxa detected are examined under the floristic, ecological, physiognomical-structural, chorological, and nomenclatural viewpoint.

1.1. Study Area

The research covers the whole of Sicily, including some neighboring Sicilian islands (Favignana, Isola Grande dello Stagnone, Pantelleria, Lampedusa). This island is situated in the central Mediterranean and represents the southernmost part of the Italian territory (Figure 1). It is the largest island among those present in the Mediterranean with an area of 25,832.4 km² (including the smaller islands) and with a coastline 1637 km long, of which 1152 km regard the main island. It is surrounded to the north by the Tyrrhenian Sea, to the south-west by the Sicilian Channel, to the east by the Ionian Sea, and is separated to the north-east by the Italian peninsula by the Strait of Messina.
The territory is mainly hilly-mountainous with about 15% of the flat surface represented for the most part by the plain of Catania and the plain of Gela. The most extensive mountain ranges are located along the northern part of the island and are represented by the Peloritani (highest peak, Montagna Grande 1374 m), Nebrodi chain (highest peak, Monte Soro 1847 m) and Madonie massif (highest peak, Pizzo Carbonara 1979 m). Another particularly significant mountainous area is Mt. Etna on the north-eastern side, with its 3357 m elevation it is the highest active volcano in Europe. Other mountainous reliefs are Mt. Lauro (987 m) in the Hyblean plateau, the Sicani mountains with several peaks (i.e., Rocca Busambra, 1613 m; Mt. Cammarata, 1578 m; Mt. delle Rose, 1436 m; La Pizzuta 1333 m; Mt. Kumeta, 1233 m; etc.), and the Erean mountains (highest peak, Mt. Altesina 1192 m).

Furthermore, of great importance for the investigations concerning this study, are the wetlands, that in Sicily are represented by various natural lakes, as well as by artificial basins and perennial watercourses. In particular, the most important lakes are the Biviere of Cesarò, the ponds of Nebrodi mountains, Biviere of Gela, Lentini lake, Preola and Gorghi Tondi, Gurrida, Pergusa, Pantano Gurna, etc. In addition, there are many artificial basins created in the last century, such as Ogliastro, Pozzillo, Arancio, Scanzano, Piano degli Albanesi, Disueri, Ancipa, etc. Among the several rivers that flow on the island are the Salso, Simeto, Belice, Platani, Verdura, Irminio, Dirillo, Alcantara, Anapo, San Leonardo, Cassibile, Fiumefreddo, Ippari, Ciane, etc.

The Sicilian territory shows a very complex geological history with rocky outcrops dated between the Paleozoic and Quaternary ages [94]. In particular, the oldest substrata belonging to Calabride chain units occurring in the Peloritani area (North-East Sicily) are represented by Paleozoic metamorphic rocks. The Nebrodi chain is characterized mainly by siliceous rocks from the late Mesozoic to Oligocene belonging to Numidian Flysch. In the Madonie massif, the substrata are mainly represented by carbonatic, dolomitic and quartzarenitic rocks from the Mesozoic age mainly belonging to Panormide units. The north-western sector of Sicily and Aegadian Islands are prevalently constituted by Mesozoic carbonatic rocks, as well as the Sicani mountains. The Hyblean territory is characterized by Miocene limestones deeply carved by river valleys (caves), which are covered in the upstate...
by a layer of Plio-Pleistocenic lava. Most of southern and central Sicily is constituted by Plio-Pleistocenic rocks belonging to the Messinian evaporitic series (clays, sandstones, limestones, marls, gypsums, etc.). Finally, Mt. Etna is an active volcanic cone covered by basalt rocks from the Quaternary age, as well as Pantelleria island.

According to Rivas-Martínez [95] classification, two bioclimates can be identified in the Sicilian territory as reported by Bazan et al. [96], such as Mediterranean pluviseasonal oceanic occurring in almost the whole island, including the Aegadian Islands and Aeolian archipelago and Mediterranean xeric oceanic circumscribed exclusively to the coastal belt near Gela, Pantelleria and Pelagie islands. Besides, based on the investigations carried out by Brullo et al. [97] and Bazan et al. [96], 23–25 bioclimatic units can be recognized on the island. Each bioclimatic unit is closely linked to well defined climatophilous associations, that highlight the close correlations between the vegetation and the climatic conditions of a territory. In particular, it is possible to identify several thermotypes and ombrotypes based on the climatic trend regarding the monthly and annual monitoring of the available thermo-pluviometric stations. Among them, along the coastal belt, the lower Thermomediterranean lower dry type is predominant, while in the hilly areas the upper Thermomediterranean lower dry type is very spread out. Another type, quite frequent in Sicily, is the lower Mediterranean upper-lower dry type linked to sub-mountainous places, which in mountainous places is replaced mainly by upper Mesomediterranean at lower altitudes and lower Supramediterranean at upper ones, with upper dry to lower subhumid ombrotypes.

In the context of the Sicilian territory, the wetlands colonized by the plant communities object of this study occur from the coastal belt to the high mountains of the northern ranges, up to 1500–1600 m of elevation. The habitats that usually host this vegetation are represented by surfaces periodically flooded during the winter-spring period, gradually drying up in the summer, as well as the shores of lakes, swamps, reservoirs, and waterways. On the basis of the geological origin, edaphic characteristics, the length of submersion period and physicochemical properties of the waters, these habitats have been classified by Ernandes & Marchiori [98] and Ernandes et al. [73] into four main types, such as:

(a) Cupular pools—Better known as rocky pools, which are usually small catchment depressions on flat outcrops arising from limestone dissolution (Figures 2B,E,F, 3E and 4A–D). The bottom of these ponds is covered by a thin layer of soil, submerged by shallow water, characterized by associations regarding the *Isoëtion* or *Preslion cervinae*.

(b) Dolines—They are broad depressed surfaces periodically flooded by rainwater with deep and poorly permeable soils, created by karst phenomena or by subsidence (Figure 3A). Usually, in these habitats, there are communities of the *Preslion crevinae*, *Agrostion salmanticae* and *Verbenion supinae*.

(c) Waterlogged soils—They correspond to more or less large hollows with impermeable surfaces often localized in the wood clearing and covered by a thick layer of clay-silt soil often abundant in the sandy component (Figures 2A and 4G). These stands are submerged by shallow rainwater for short periods, and the plant communities belong mainly to *Cicendio-Solenopsion laurentiae*.

(d) Temporary streams—They are tiny and shallow watercourses, already dried up in late spring but with soils that remain moist for a long time (Figures 2C, 3B–F and 4E,F,H). In this category, the shores of lakes and artificial basins that dry up during the summer can be included. These habitats are colonized by sub-nitrophilous vegetation of *Verbenion supinae* or *Lythrion tribracteati*. 
Figure 2. Sicilian habitats colonized by plant communities belonging to *Isoëto-Nanojuncetea*: (A) Waterlogged soils from Isola Lunga dello Stagnone with *Solenopsietum mothianae*; (B) Cupular pools from Isola Lunga dello Stagnone with vegetation of *Isoëtion*; (C) Temporary streams from Anguillara (Catalafimi) with *Isoetes longissima* population; (D) Drainage ditches from Cozzo Ogliastri (Sortino) with *Junco pygmaei-Pilularietum minutae*; (E) Cupular pools from Hyblean Plateau (Modica) with *Lythro hyssopifoliae-Elatinetum macropodae*; (F) Cupular pools from Lampedusa Island with *Crassulo vaillantii-Elatinetum gussonei* (Photos of the Authors).
Figure 3. Sicilian habitats colonized by plant communities belonging to Isoëto-Nanojuncetea: (A) Doline from Piano Battaglia (Madonie) with *Myosuro minimi-Ranunculetum lateriflori*; (B) Large wetlands from Ficuzza with *Trifolio micheliani-Agrostidetum pourretii*; (C) Temporary streams from Gurrida Lake (Randazzo) with *Coronopo squamati-Sisymbrelletum dentatae*; (D) Temporary streams from Piana del Signore (Gela) with *Damasonio bourgaei-Crpsisetum aculeatæ*; (E) Cupular pools from Cozzo Ogliastri (Sortino) with *Archidio phascoïdis-Isoetetum velatae*; (F) Artificial basin from Piana degli Albanesi (Palermo) with *Glino lotoidis-Verbenetum supinae*. (Photos of the Authors).
Figure 4. Sicilian habitats colonized by plant communities belonging to Isoëto-Nanojuncetea: (A) Calcarenitic rocky pools from Isola Lunga dello Stagnone with Buillardio vaillantii-Elatinetum campyllospermach; (B) Calcareous rocky pools from Syracuse with Lythro hyssopifolii-Elatinetum macropodaec; (C,D) Basaltic rocky pools from Cozzo Ogliasti (Sortino) with Archidio phasoidis-Isoetetum velataec; (E) Temporary streams from Piana del Signore (Gela) with Damasonio bourgaeii-Crypsietum aculataae; (F) Siliceous temporary streams from Fiumedinisi with Plantago intermediae-Cyperetum fusce; (G) Drainage ditches from Cozzo Ogliasti (Sortino) with junco pygmaci-Pilularietum minutae; (H) Shore of the artificial basin from Poma Lake (Partinico) with Heliotropio supini-Helechloetum schoenoidis. (Photos of the Authors).
1.2. Floristic Considerations

The Sicilian wetlands colonized by the plant communities belonging to the *Isoëto-Nanojuncetea* host a well specialized flora, which is very rich in species usually having a remarkable taxonomical and phytogeographical role (Appendix A, Table A1). Such flora is represented by small sized hygrophytes with a prevalently therophytic and cryptophytic life form. In particular, some rare Sicilian endemics are worth to be mentioned, such as *Elatine gussonei*, *Myosotis tineoi*, *Ranunculus angulatus*, *Sisymbrella dentata* (Figure 5N), *Solenopsis laurentia* subsp. *hyblaea* (see Brullo et al. [99]) (Figure 5B), *Solenopsis mothiana*, and *Spergularia madoniana*. Among this group of endemic species, must be added *Solenopsis gasparrinii* (Tineo) Brullo comb. et stat. nov. (Bas.: *Lobelia gasparrinii* Tineo, Cat. Pl. Hort. Panorm. 279, 1827), must be added (Figure 5A). Besides, other rare Mediterranean species are also represented, such as *Agrostis pourretii*, *Barbarea bracteosa*, *Gnaphalium uliginosum* var. *prostratum*, *Isoëtes sicula*, *I. todaroana*, *Lotus conimbricensis*, *Molineriella minuta*, *Myosotis sicula*, *Pilularia minuta* (Figure 5C), *Ranunculus pratensis*, *Teucrium campanulatum*, *Trifolium michelianum*. Several species with a wider Mediterranean, Mediterranean-Atlantic and Euro-Mediterranean distribution are frequent in these habitats, such as *Anagallis parviflora*, *Antinoria insularis* (Figure 5K), *Bulliarda vaillantii*, *Callitriche brutia* (Figure 5G), *Centaurium maritimum*, *Cicendia filiformis* (Figure 5D), *Corrigiola litoralis*, *Damasonium bourgaei* (Figure 5M), *D. polyspermum*, *Elatine campylodesperma* (Figure 5E), *E. macropoda* (Figure 5F), *Eryngium pusillum*, *Isoëtes durieui*, *Juncus capitatus*, *J. pygmaeus*, *Kickxia cirrhosa*, *Lotus angustissimus*, *L. parviflorus*, *Lythrum tribracteatum* (Figure 5L), *Middendorfia borysthenica*, *Polypogon subspathaceus*, *Pullaria sicula*, *P. vulgaris*, *Ranunculus ophioglossifolius* (Figure 5H), *R. parviflorus*, *R. saniculifolius* (Figure 5G), *R. trilobus*. Finally, many species with a wide range are rather common, chiefly represented by paleotemperate, circumboreal, paleotropical, subcosmopolitan and cosmopolitan taxa, e.g., *Anagallis minima*, *Briza minor*, *Coronopus squamatus*, *Sporobolus aculeatus*, *S. alopecuroides*, *S. schoenoides*, *Cyperus flavescent*, *C. fuscus*, *C. michelianus*, *Gaudinia fragilis*, *Glinus lotoides*, *Heliotropium supinum*, *Isolepis cernua*, *Juncus bufonius*, *Laphangium luteo-album*, *Lythrum hyssopifolia*, *Mentha pulegium*, *Myosurus minimus* (Figure 5I), *Ophioglossum untianicum*, *Plantago intermedia*, *Poa inermis*, *Radiola linoides*, *Ranunculus lateriflorus* (Figure 5J), *Trifolium micranthum*, *Verbena supina*. 
Figure 5. Hygrophilous species occurring in the plant communities of Isoëto-Nanojuncetea: (A) *Solenopsis gasparrinii* from Anguillara (Catalafimi); (B) *Solenopsis laurentia* subsp. *hyblaea* from Cozzo Ogliastri (Sortino); (C) *Pilularia minuta* from Cozzo Ogliastri (Sortino); (D) *Cicendia filiformis* from Isola Lunga dello Stagno; (E) *Elatine campylaspera* from Castelvetrano; (F) *Elatine macropoda* from Syracuse; (G) *Ranunculus saniculifolius* and *Callitrichie brutia* from Hyblean Plateau; (H) *Ranunculus ophioglossifolius* from Cozzo Ogliastri (Sortino); (I) *Myosurus minimus* from Madonie; (J) *Ranunculus lateriflorus* from Cozzo Ogliastri (Sortino); (K) *Anthinoria insularis* from Monte Lauro (Hyblean Plateau); (L) *Lythrum tribracteatum* from Piana del Signore (Gela); (M) *Damasoium bourgaei* from Piana del Signore (Gela); (N) *Sisymbrella dentata* from Gurrida lake (Randazzo). (Photos of the Authors).
1.3. History of the Syntaxonomic Treatment of the Isoëto-Nanojuncetea Class

Among the phytosociologists who proposed a first syntaxonomic framework on the ephemeral vegetation of these wetlands, Koch must be mentioned [3], who included the Central-European plant communities in the Nanocyperon flavescentis alliance, referring it to the order Nanocypero-Polygonetalia, an arrangement followed also by Libbert [100]. The first results of investigations on the Mediterranean communities were provided by Braun-Blanquet [4], who published as nomina nudata a list of syntaxa concerning the Languedoc region (S France), including the vegetation of the temporary ponds subject to short periods of submerison within the Isoëtoetalia order represented by the only one alliance, i.e., Isoëtum. Conversely, the communities linked to more prolonged submersions were attributed to Preslion cervinae, an alliance of the Phragmitetalia order. Later, the same author [5] published a detailed study on the vegetation belonging to Isoëtum from some Mediterranean localities with the description of several new associations, while a more comprehensive treatment was provided by Moor [7,8], who recognized a single order Isoëtoetalia, within which the Central European association of the Nanocyperon flavescentis was placed, along with the Mediterranean ones of the Isoëtum and Preslion cervinae. Besides, other data about the Nanocyperon are given by Braun-Blanquet & Moor [101].

The arrangement of this vegetation in a new autonomous class (Isoëto-Nanojuncetea class) was revised and updated by Brullo & Minissale [39], who within the order Nanocyperon flavescentis alliance, referring it to the order Nanocypero-Polygonetalia, an arrangement followed also by Libbert [100]. The first results of investigations on the Mediterranean communities were provided by Braun-Blanquet [4], who published as nomina nudata a list of syntaxa concerning the Languedoc region (S France), including the vegetation of the temporary ponds subject to short periods of submerison within the Isoëtoetalia order represented by the only one alliance, i.e., Isoëtum. Conversely, the communities linked to more prolonged submersions were attributed to Preslion cervinae, an alliance of the Phragmitetalia order. Later, the same author [5] published a detailed study on the vegetation belonging to Isoëtum from some Mediterranean localities with the description of several new associations, while a more comprehensive treatment was provided by Moor [7,8], who recognized a single order Isoëtoetalia, within which the Central European association of the Nanocyperon flavescentis was placed, along with the Mediterranean ones of the Isoëtum and Preslion cervinae. Besides, other data about the Nanocyperon are given by Braun-Blanquet & Moor [101].

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& Minissale [39] emphasized that from the nomenclature viewpoint the correct name is *Nanocyperion* Klika 1935, and proposed to keep within it the alliance *Radiolion linoidis* Pietsch 1973, whose name, however, must be considered illegitimate and replaced by *Cicendion filiformis* (Rivas Goday in Rivas Goday & Borja 1961) Braun-Blanquet 1967.

Another revision of this class, that is more complex and articulated, was carried out by de Foucault [32], who identified two distinct classes, *Isoëtetalia velatae*, including mainly the perennial plant communities distributed prevalently in the EU-Mediterranean territories, and *Juncetalia bufonii*, regarding the annual aspects occurring in the Europe and Mediterranean. Within these two classes, he identified various orders, alliances, and sub-alliances which in most cases are not clearly distinct, neither from the floristic viewpoint nor from the ecological one. Subsequently, this arrangement was partly taken up by Gehu [108], who recognized only one class, such as *Isoëto-Nanojuncetea*, including within it all the orders already identified by de Foucault [32], and by adding a new one, the *Cicendetalia filiformis*; while regarding the alliances mentioned by the last author, making only a few changes.

Furthermore, for the Iberian Peninsula, a syntaxonomic scheme is provided by several authors [95,109–111], in which only the *Isoëto-Nanojuncetea* class is recognized with two orders *Isoëtalia* and *Nanocyperetalia*. Of these the first one includes four alliances *Isoëtion*, *Preslion cervinae (=Menthexion cervinae)*, *Agrostion pourretii* and *Cicendion*, while the second one is represented by the *Nanocyperion flavescentis*, *Verbenion supinae (=Helechochloion schoenoidis)* and *Lythriion tribacteati*. It should be noted that from a nomenclatural point of view these authors mystified the *Cicendion* (Rivas Goday & Borja 1961) Braun-Blanquet 1967 with the *Cicendio filiformis-Solenopsion laurentiae* Brullo & Minissale 1998. In fact, the *Cicendion* alliance groups together plant communities with a prevalently summer cycle, widespread mainly in the Atlantic coastal places and Central Europe, which are characterized by microphytes with Euro-Mediterranean distribution mixed with mesophilous hygrophytes of *Nanocyperetalia*, while the associations of the *Cicendio filiformis-Solenopsion laurentiae* are distributed exclusively in the Mediterranean areas, where they are localized in markedly thermophilous ponds, with an early spring cycle and mainly linked to humid sandy soils, where the species of *Nanocyperetalia* are completely absent. In particular, *Cicendion* was recorded also in the Italian peninsula from the Aspromonte massif [67], where this alliance is represented by only one association (*Barbareo-Corrigioletum litoralis*) localized in the mountain belt at 1100–1300 m a.s.l.

Another syntaxonomic framework for *Isoëto-Nanojuncetea* was proposed by Biondi & Blasi [112] and Biondi et al. [113] from the Italian territory, in which the syntaxa belonging to this class, known for the peninsula and islands, are listed, and commented. In particular, the two orders are recognized, such as *Isoëtalia durieui* and *Nanocyperetalia flavescentis*; within the first one they included *Isoëtion durieui, Menthexion cervinae*, *Agrostion pourretii, Cicendion filiformis, Cicendio filiformis-Solenopsion laurentiae*, while in the second one only the *Nanocyperion flavescentis* and *Verbenion supinae* were attributed. However, it should be noted that in this arrangement there are some incoherences since the alliance *Cicendio filiformis* should not be included in the *Isoëtalia* because, as proposed by these authors, this is a mere synonym of *Cicendio filiformis-Solenopsion laurentiae*, and it must be referred to the *Nanocyperetalia*. Furthermore, in the latter order, the alliance *Elatino-Eleocharition ovatae* Pietsch in Pietsch & Müller-Stoll 1968 was not listed by the aforesaid authors, while it was previously mentioned from Italy by Pietsch [30] and Brullo & Minissale [39], on the basis of three associations described for the Po Valley by Pignatti [54,55].

More recently, the last arrangement has been proposed by Mucina et al. [114] who, while recognizing the two classic orders, *Isoëtalia* and *Nanocyperetalia*, within *Isoëto-Nanojuncetea*, reworked the alliances sometimes in an inappropriate way, deviating from the schemes proposed by the previous authors. In particular, they included in *Isoëtalia* two alliances belonging to the *Nanocyperetalia*, which are *Lythriion tribacteati* and *Cicendion*. Besides, they treated the *Cicendio-Solenopsion laurentiae* as a synonym of the last alliance, but this is an evident mistake since as highlighted before, they are two syntaxa distinct from a floristic, ecological and phenological viewpoint. In fact, *Cicendion* is a priority name
over *Radiolion linoidis* that, therefore, must be treated as a nomenclatural synonym. On the other hand, they consider correctly the *Elatino-Eleocharition ovate* Pietsch 1973 as a synonym of the *Eleocharition soloniensis* Philippi 1968 for priority reasons.

Based on these arrangements proposed by the aforesaid authors, it is considered more appropriate that the plant communities of this class occurring in the Italian territory can be framed in the following syntaxonomic scheme:

*Isoëto-Nanocyperetalia*

*Isoëtalia*

- *Isoëtion*
  - *Preslion cervinae*
  - *Cicendio-Solenopsion laurentiae*
  - *Agrostion salmanticae*

*Nanocyperetalia*

- *Nanocyperion flavescentis*
- *Eleocharition soloniensis*
- *Cicendion*
- *Verbenion supinae*
- *Lythriion tribracteati*

2. Results and Discussion

2.1. Vegetation Analysis

The Optimclass diagram shows a peak of faithful species at 30 partitions of the dataset. Additionally, compared with the Optimclass diagrams obtained by other clustering methods (e.g., flexible beta, Euclidean distance; UPGMA, Bray-Curtis; UPGMA, Euclidean), the optimal partitions turn out to range from 28 to 34. The Crispness of Classification indicates the clearest separations between two and seven clusters: at two clusters the two orders *Isoëtalia* and *Nanocyperetalia* result separated (except for *Agrostion salmanticae*), while the partition at seven groups identifies the seven alliances. According to the Optimclass analysis, the dendrogram was pruned at the level of 32 clusters of relevés. The groups thus identified correspond to the surveyed associations, wholly autonomous from a floristic and ecological point of view and quite well differentiated from each other. Overall, 32 associations, seven alliances and two orders were recognized. On the whole, from the multivariate analysis, the associations identified were well differentiated from each other and were arranged in distinct clusters. Indeed, as shown in Figure 6, two main clusters can be detected, which are separated into ecological groups.

The first to disjoin is cluster A, including the associations referred to as *Isoëtalia*, with a winter-spring cycle, linked to periodically flooded surfaces drying up from late spring to early autumn. This cluster splits into two main sub-clusters; of these, the first to separate is that one corresponding to A1, which includes communities subject to shorter periods of flooding, while the second is A2, concerning associations with soils submerged for longer periods, often until late spring, including exclusively those of *Preslion cervinae*. In the case of sub-cluster A1, the associations of two different alliances are here arranged, such as the *Isoëtion* (group C) and the *Cicendio-Solenopsion laurentiae* (group D), which differ mainly in the type of habitat in which they are localized. As regards cluster B, also within it there are two main sub-clusters, both corresponding to communities with a summer-autumn cycle. The most isolated one is indicated with B1, which concerns the associations of *Lythriion tribracteati* linked to loamy-clayey and nutrient-rich soils, while in B2 there are the associations of *Verbenion supinae*, typical of more or less nitrified soils and those of the *Nanocyperion* limited to hyper-humid and nutrient-poor soils. Unfortunately, the vegetation of the *Agrostion salmanticae* falls within the sub-cluster B2, together with that of the *Nanocyperion*. This arrangement is totally in contrast with the syntaxonomical framing since from the floristic and ecological point of view it belongs to the *Isoëtalia*. This is probably due to the quite floristic poor set of this community, which does not allow
clustering analysis to find a correct place in the dendrogram. Concerning the ecology of this vegetation, it is localized in large hollows, mainly represented by dolines, usually used as pastures, with well nitrified soils. Results of the DCA (Detrended Correspondence Analysis) ordination approximately confirm the general pattern highlighted by the cluster analysis. The eigenvalues decrease progressively from the first to the third axis (0.82, 0.49 and 0.36, respectively; higher eigenvalues are related to higher beta diversities).

Figure 7 shows the ordination results along axis 1 and 2. On the left side of the DCA graph, the Isoëtetalia alliances (Agrostion pourretii included), are well separated from those ones of Nanocyperetalia that are distributed on the right side. Moreover, Figure 8 displays the relevés distributed based on the orders.

Figure 6. Dendrogram resulting from the cluster analysis of the data set; different colours correspond to different alliances: 1. Isëtion; 2. Preslion cervinae; 3. Cicendio-Solenopsion laurentiae; 4. Lythrion tribracteati; 5. Verbenion supinae; 6. Nanocyperion flavescentis; 7. Agrostion salmanticae.

Figure 7. DCA ordination (axis 1 and 2) plot of the data set, with single relevés marked according to different alliances: 1. Isëtion; 2. Preslion cervinae; 3. Cicendio-Solenopsion laurentiae; 4. Lythrion tribracteati; 5. Verbenion supinae; 6. Nanocyperion flavescentis; 7. Agrostion salmanticae.
Figure 8. DCA ordination (axis 1 and 2) plot of the data set, with single relevés marked according to orders: 1. Isoëtalia; 2. Nanocyperetalia.

2.2. Syntaxonomical Scheme of Isoëto-Nanojuncetea in Sicily

According to the multivariate analysis based on the phytosociological relevés used for this investigation, and considering of the arrangements proposed from the aforesaid authors, the plant communities occurring in the study area can be framed in the following syntaxonomical scheme:

**ISOËTO-NANOJUNCETEA** Br.-Bl. & R. Tx. ex Westhoff, Dijk & Passchier 1946

**ISOËTETALIA** Br.-Bl. 1936 nom. conserv. propos.

**ISOËTION** Br.-Bl. 1936

- *Isoëtetum durieui* Br.-Bl. 1936
- *Pulicario-Scirpetum savii* Brullo & Di Martino 1974
- *Isoëto-Ranunculetum parviflori* Brullo, Di Martino & Marcenò 1977
  - subass. *isoëtetosum durieui* Brullo, Di Martino & Marcenò 1977
  - subass. *callitrichetosum brutiae* Brullo, Di Martino & Marcenò 1977
- *Crassulo-Elatinetum gussonei* Bartolo, Brullo, Minissale & Spampinato 1990
- *Lythro hyssopifoliae-Elatinetum macropodae* Brullo, Sciandrello, Tavilla & Minissale

**PRESLION CERVINAE** Br.-Bl. ex Moor 1937

- *Isoëto velatae-Crassuletum vaillantii* Poiron & Barbero 1965
  - subass. *typicum*
  - subass. *ranunculetosum ophioglossifolii* Brullo, Minissale, Sciandrello & Tavilla

**Ranunculo lateriflori-Antinorietum insularis** Brullo, Grillo & Terrasi 1976

**Myosuro minimi-Ranunculetum lateriflori** Raimondo 1980

**Ranunculetum pratensi-lateriflori** Brullo, C. Brullo & Giusso ass. nov.
For each of these syntaxa the nomenclatural, floristic, ecological and chorological characteristics are analyzed, as can be deduced from the literature data and unpublished field observations.

2.3. Description of the Vegetation

**ISOËTO-NANOJUNCETEA** Br.-Bl. & R. Tx. ex Westhoff, Dijk & Passchier 1946, Overz. Plantegem. Neder. 2:39.

**Syn.:** *Isoëto-Nanojuncetea* Br.-Bl. & R. Tx. 1943, Comm. S.I.G.M.A. 84: 7, nom. inval. (art. 2b, 8); *Isoëto-Nanojuncetea* Br.-Bl. & R. Tx. in Br.-Bl. et al. 1952, Group. Vég. Fr. Médit.: 80, nom. illeg. (art. 31); *Isoëtetea velatae* de Foucault 1988, Dissert. Bot. 121: 73; *Juncetea bufonii* de Foucault 1988, Dissert. Bot. 121: 78.

**Lectotypus:** *Isoëtalia* Br.-Bl. 1936 nom. cons. propos.

**Characteristic species:** *Damasonium bourgaei*, *Eryngium pusillum*, *Gaudinia fragilis*, *Juncus bufonius*, *J. capitatus*, *J. hybridus*, *J. pygmaeus*, *Lythrum hyssopifolia*, *Mentha pulegium*, *Myosurus minimus*, *Poa infirma*, *Polypogon subspathaceus*, *Pulicaria vulgaris* var. *vulgaris*, *Ranunculus sardous*, *Veronica anagallis-aquatica*.

**Structure and ecology:** Ephemeral amphibious vegetation occurring in temporary wetlands with soils periodically flooded by oligotrophic, mesotrophic, eutrophic, or sometimes brackish waters [39,113,114]. Floristically, these plant communities are dominated by hygrophilous therophytes often mixed with small hemicyriptophytes and geophytes. These phytocoenoses correspond to a type of ephemeral vegetation, linked to very peculiar habitats characterized by a temporary submersion alternating with marked aridity, which
in the absence of environmental alterations do not tend to evolve; therefore, they can be considered as communities representing ‘permaseries’ of vegetation. The associations of this class usually fall in the habitat of Community interest 3170*, which is considered of priority importance [115].

Geographical distribution: The associations of this class are widespread in Europe and all Mediterranean territories, including the Macaronesian islands.

ISOÉTETALIA Br.-Bl. 1936, Bull. Soc. Et. Sci. Nat. Nimes, 47: 47 nom. cons. propos [116].

Syn.: Isoëtetalia Br.-Bl. 1931, Comm. S.I.G.M.A. 9: 38, nom. nud. (art. 2b); Isoëtetalia velatae de Foucault 1988, Dissert. Bot. 121: 73.

Type: Isoëtion Br.-Bl. 1936 conserved type proposed [116]

Characteristic species: Archidium alternifolium, Briza minor, Bulliarda vaillantii, Catabrosa aquatica, Centaureum maritimum, Damasonium polyispernum, Elatine macropoda, Isoëtes longissima, L. sicula, Isolepis cernua, Lotus angustissimus, L. hispidus, L. parvisflorus, Middendorfia boryshtenica, Molineriella minuta, Myosotis sicula, Ranunculus muricatus, Romulea rambliflora, Trifolium micranthum, Triglochin laxiflora.

Structure and ecology: Pioneer ephemeral vegetation with thermophilous or subthermophilous requirements linked mainly to oligotrophic soils submerged up to early spring, sometimes flooded until early summer [39,113]. Usually, it is characterized by hygrophytic microphytes having an early spring blooming.

Geographical distribution: This order shows a Mediterranean and South Atlantic-European distribution.

Note: According to Fernández-González et al. [116] Isoëtetalia Br-Bl. 1936 is a superfluous name (Art. 29c), and homotypic of Nanocyperetalia Klika 1935, having a nomenclature type Nanocyperion flavescentis Koch 1926 (Art. 18b). The authors, to avoid publishing a new name for Isoëtetalia, propose to use Art. 53 of the new ICPN [117], which allows the preservation of its common use, proposing it as nomen conservandum having the Isoëtion Br.-Bl. 1936 as conserved type.

ISOÉTION Br.-Bl. 1936, Bull. Soc. Et. Sci. Nat. Nimes 47: 141.

Syn.: Isoëtion Br.-Bl. 1931, Comm. S.I.G.M.A. 9: 38, nom. nud. (art. 2b); Antinorio agrostideae- Isoëtion velatae de Foucault 1988 Dissert. Bot. 121: 73, p.p.; Ophioglosso lusitanici-Isoëtion histricis de Foucault 1988, Dissert. Bot. 121: 74; Elatino-Damasonion alismae de Foucault 1988, Dissert. Bot. 121: 86, p.p.; Crassulo-Lythron boryshtenici de Foucault 1988, Dissert. Bot. 121: 90 p.p.;

Lectotypus: Isoëtum duriei Br.-Bl. 1936

Characteristic species: Isoëtes durieui, L. histrix, Lotus coninbricensis, Ranunculus trilobus.

Structure and ecology: Pioneer and fleeting vegetation localized mainly in small ponds with shallow waters, rich in quillworts and microphytes, showing an early spring blooming, linked to warm Mediterranean climates. It colonizes small surfaces represented by rocky pools with very thin silty soils that dry up very early.

Geographical distribution: This alliance has a Mediterranean distribution and in Sicily, it occurs in the several localities of the Islands, as well as Pantelleria Island, Lampedusa Island, Favignana Island and Isola Grande dello Stagnone (Figure 9).
Figure 9. Geographical distribution of the Isoëtion associations in Sicily.

1. *Isoëtetum durieui* Br.-Bl. 1936, Bull. Soc. Étude Sci. Nat. Nîmes 47: 144 (Appendix B, Table A2)

   Syn.: Ass. à *Juncus capitatus* - *Isoëtes duriaeui* Br.-Bl. 1931, Comm. SIGMA 9 : 38 nom. nud. (art. 2b).

   Lectotypus: rel. 3 Tab. « *Isoëtetum duriaeui*, Braun-Blanquet [5]

   Characteristic species: *Isoëtes durieui*, *Juncus capitatus*, *Trifolium micranthum*.

   Structure and ecology: This association was described in southern France by Braun-Blanquet [5] on siliceous substrata where it is localized on small rocky hollows submerged in the winter season. Floristically it is characterized by the dominance of *Juncus capitatus* and *Isoëtes durieui*, which grow together with other hygrophilous microphytes. In Sicily, the association occurs in the slightly depressed soils rich in silt and clay on siliceous substrata, where it is characterized by a very poor floristic set.

   Geographical distribution: Previously, the *Isoëtetum durieui* was recorded from southern France [5,8,15], Catalonia in Spain [118–122] and Corse [123]. In Sicily, the plant communities referable to this association are very rare. In particular, *Isoëtetum durieui* was quoted by Marcenò & Trapani [85] from Piana degli Albanesi (Palermo); it occurs also in the Hyblean plateau near Carlentini.

2. *Pulicario graecae-Scirpetum savii* Brullo & Di Martino 1974, Boll. Ist. Bot. Giard. Coll. Palermo 26: 49 (Appendix B, Table A3)

   Lectotypus: rel. 10, Tab. 17, Brullo and Di Martino [78], hoc loco.

   Characteristic species: *Isolepis cernua* (= *Scirpus savii*), *Pulicaria vulgaris* var. *graeca*, *Damasonium polyspermum*, *Damasonium bourgaei* (sub *D. stellatum*).

   Structure and ecology: The association was surveyed in the rocky ponds of the arenaceous outcrops submerged by rainwater during the winter. At the bottom of these small depressions, a thin layer of silt is deposited, where peculiar amphibious hygrophilous vegetation grows. In this habitat, the occurrence of some hygrophytes, such as *Isolepis cernua*, *Pulicaria vulgaris* var. *graeca*, *Damasonium polyspermum*, *Damasonium bourgaei* is quite significant. These species, proposed as characteristic, are usually mixed with several other hygrophytes of *Isoëto-Nanojuncetea*. The association colonizes small surfaces within the perennial vegetation belonging to *Sarcocornio fruticosae-Limonietum ferulacei juncetosum subulati*, a hyper-halophilous association of *Salicornietea fruticosae* [78].

   Geographical distribution: Currently, it is known only in the Isola Grande dello Stagnone (Trapani).
3. *Isoëto durieu-Ranunculetum parviflori* Brullo, Di Martino & Marcenò 1977, Veg. Pantelleria: 82 (Appendix B, Table A4)

- **Holotypus**: rel. 8. Tab. 12, Brullo et al. [81].
- **Characteristic species**: *Isoëtes durieu, Ranunculus parviflorus*.

Structure and ecology: The small, periodically flooded hollows on basaltic rocks, localized at about 600 m a.s.l., are colonized by hygrophilous vegetation dominated by *Isoëtes durieu* and *Ranunculus parviflorus*, which were proposed as characteristic species of a peculiar association named *Isoëto-Ranunculetum parviflori* [81]. In this vegetation, several species of *Isoëto-Nanojuncetea* are frequent, such as *Ranunculus trilobus, R. muricatus, Juncus bufonius, Lythrum hyssopifolia, Lotus angustissimus, Mentha pulegium*, etc. Besides, two sub-associations can be identified within it: *isoëtetosum durieu* corresponding to the typical aspect and *callitrichetosum brutiae*, linked to conditions of greater edaphic humidity occurring in the central part of the depressions.

Geographical distribution: It is a very rare association exclusive of Pantelleria Island, where it is localized at Monte Gibele on the bottom of a volcanic crater.

4. *Crassulo vaillantii-Elatinetum gussonei* Bartolo, Brullo, Minissale & Spampinato 1990, Boll. Acc. Gioenia Sci. Nat. Catania 21 (334): 205 (Appendix B, Table A5)

- **Holotypus**: rel 6, Tab. 25 Bartolo et al. [88].
- **Characteristic species**: *Elatine gussonei*.

Structure and ecology: The association occurs in the rocky ponds circumscribed to the carbonatic outcrops submerged by freshwater during the autumn-winter period. These peculiar habitats are characterized by a thin layer of soil covered by 5–10 cm of water at the time of maximum flooding. Floristically, this vegetation is differentiated by the dominance of *Elatine gussonei*, endemic to Lampedusa and Maltese islands [124,125], which is related to *Elatine macropoda*. It usually grows together with *Buillardia vaillantii* and other hygrophytes of *Isoëto-Nanojuncetea*. As concerns its bioclimatic requirements, this plant community grows within the upper Infra-Mediterranean belt, with lower semiarid homotype [96]. The climatophilous vegetation where it falls is represented by the thermo-xeric maquis belonging to the *Periplocion angustifoliae* Rivas-Martinez 1975 [88].

Geographical distribution: According to Bartolo et al. [88] and Brullo et al. [126], the *Crassulo vaillantii-Elatinetum gussonei* is distributed in Lampedusa (Pelagie Islands) and Maltese Islands (Figure 2F).

5. *Lythro hyssopifoliae-Elatinetum macropodae* Brullo, Sciandrello, Tavilla & Minissale ass. nova hoc loco (Appendix B, Table A6)

- **Holotypus**: rel 10, hoc loco.
- **Characteristic species**: *Elatine macropoda*.

Structure and ecology: This vegetation grows in small and not very deep wet hollows, represented by cupular pools, occurring in limestone plateaus, which start to dry up at the beginning of spring. The relevant occurrence in this phytocoenosis of *Elatine macropoda*, species widespread in the Mediterranean territories, often shows high coverage values. The set of *Isoëto-Nanojuncetea* microphytes is well represented, such as *Juncus bufonius, Buillardia vaillantii, Lythrum hyssopifolia, Mentha pulegium, Poa inferma*, etc. This community, due to the dominance of *Elatine macropoda*, shows some relationship with associations described for other Mediterranean territories, for instance, *Elatinetum macropodae* Br.-Bl. 1936 from south France and *Junco pygmaei-Elatinetum macropodae* Silva et al., 2021 from the Iberian Peninsula. However, the vegetation is floristically and ecologically well differentiated from these two associations. In particular, *Elatinetum macropodae* colonizes the basaltic rocky pools and is characterized, apart from *Elatine macropoda*, by *Damasonium polyspermum, Herniaria glabra, Pulicaria vulgaris* and *Lythrum tribracteatum*, which are species fully absent in the Sicilian community, while *Junco pygmaei-Elatinetum macropodae* is localized along the edge of streams or temporary ponds with muddy-sandy substrates and is differentiated by the occurrences of *Juncus pygmaeus* and *Middendorfia borysthenica* growing together with *Elatine macropoda*. As a whole, both these associations show marked differences in comparison...
with the vegetation surveyed in Sicily. In fact, the latter is floristically differentiated by the occurrence of *Buillardia vaillantii*, showing high cover values, which is lacking in the other two aforesaid associations. Therefore, this Sicilian plant community is here proposed as a new association, named *Lythro hyssopifoliae-Elatinetum macropodae*. It should be noted that this new association is quite similar to *Crassulo vaillantii-Elatinetum gussonei* from Lampedusa, mainly for the habitat where it grows and also for the occurrence of *Buillardia vaillantii*, while *Elatine macropoda* is replaced by *Elatine gussonei*. Within this association three subassociations can be distinguished, namely: (a) subass. *typicum* (rel. 10–20) differentiated by the dominance of *Elatine macropoda*, linked to cupular pools flooded by shallow waters; (b) subass. *buillardietosum vaillantii* subass. nov. (rel. 1–9, holotypus rel. 8, hoc loco) localized in the stands with quite deep waters; (c) subass. *callitrichetosum brutiae* subass. nov. (rel. 21–25, holotypus rel. 24, hoc loco) occurring exclusively on stands with very deep waters.

Geographical distribution: This association to the best of current knowledge is exclusive of the Hyblean basaltic plateau in southern Sicily (Figures 2E and 4B).

6. *Buillardio vaillantii-Elatinetum campylospermae* Brullo, Sciandrello, Minissale, Cambria, Ilardi & Giusso ass. nov., hoc loco (Appendix B, Table A7)

Syn.: *Elatinetum macropodae* Pasta et al. 2008, Nat. Sicil. ser. 4, 32 (1–2): 41, non Br.-Bl. 1936, Bull. Soc. Et. Sci. Nat. Nimes 47:154.

Holotypus: rel 14, hoc loco.
Characteristic species: *Elatine campylosperma*.

Structure and ecology: The small pools between limestone outcrops, both of natural and anthropogenic origin, usually named rocky pools, flooded in the autumn-winter period, and host highly specialized amphibious plant communities. In these stands, *Buillarda vaillantii* seems to have here its optimum, growing together with various other ephemeral hygrophytes, such as *Lythrum hyssopifolia, Juncus bufonius, Poa infirma, Juncus capitatus, Juncus hybridus, Polypogon subspathaceus*, etc. The occurrence of a very peculiar species of *Elatine*, was quite significant; according to current knowledge of this genus, it can be attributed to *E. campylosperma*, a Mediterranean species with a very scattered distribution [127]. From the phytosociological point of view, this vegetation shows a close relationship with other Sicilian associations dominated by *Elatine* sp. and *Buillarda vaillantii*, such as *Lythro hyssopifoliae-Elatinetum macropodae* and *Crassulo vaillantii-Elatinetum gussonei*, occurring in quite similar habitat, but differing among them from the floristic point of view, since characterized by other species of *Elatine*. Therefore, the plant community at issue is proposed as a new association named *Buillardio vaillantii-Elatinetum campylospermae*. Previously, this vegetation was wrongly attributed by Pasta et al. [128] to *Elatinetum macropodae* Br. Bl. 1936.

Geographical distribution: The association is localized in the North-western Sicily, where it occurs in some localities of the Trapani territory, such as Castello della Pietra (Castelvetrano), Isola Lunga dello Stagnone (Marsala) and Favignana island (Aegadian islands) (Figures 2B, 4A and 5E).

7. *Isoëtetum todaroanae* Brullo & Ilardi ass. nova hoc loco (Appendix B, Table A8)

Holotypus: rel. 1, hoc loco.

Characteristic species: *Isoëtes todaroana*.

Structure and ecology: A rather rare and very peculiar community has been surveyed in small hollows on calcarenitic outcrops, submerged especially during the winter period. In this habitat *Isoëtes todaroana*, a peculiar species described by Troia & Raimondo [129], is localized. It grows on a thin layer of clay soil together with other hygrophytes of the *Isoëto-Nanojuncetea* including, in particular: *Triglochin laxiflora, Romulea ramiflora, Isolepis cernua, Mentha pulegium, Lythrum hyssopifolia, Juncus bufonius*. The temporary wetland where this vegetation currently occurs is a remaining fragment of a larger marsh that has been reclaimed in a cultivated area, and therefore, it takes on a relict meaning. Hence,
this phytocoenosis for its floristic and ecological features is proposed as a new association named *Isoëtetum todaroanae*.

Geographical distribution: Currently, this association seems to have a punctiform distribution localizing in a small area near Mazara del Vallo (Trapani).

*PRESLION CERVINAE* Br.-Bl. ex Moor 1937, Prodr. Group. Veg. 4: 22.

Syn.: *Preslion* Br.-Bl. 1931, Comm. S.I.G.M.A.: 38, nom. nud. (art. 2b); *Menthion cervinae* Br.-Bl. ex Moor 1936, nom. mut. propos. by Rivas-Martínez et al. (2002); *Elatino-Damasonion alismae* de Foucault 1988, Dissert. Bot. 121: 86, p.p.

Holotypus: *Preslietum cervinae* Br.-Bl. ex Moor 1937.

Characteristic species: *Antinoria insularis*, *Callitriche brutia*, *Juncus foliosus*, *Pilularia minuta*, *Ranunculus lateriflorus*, *R. ophioglossifolius*, *R. pratensis*, *R. saniculifolius*, *Veronica serpyllifolia*.

Structure and ecology: Thermophilous plant communities localized in cupular pools, temporary marshes and dolines with deep stagnant waters or in stands with deep-water runoff flooded for most of the spring. This vegetation is rich in creeping amphibian species mixed with hygrophilous microphytes.

Geographical distribution: This alliance shows a Mediterranean range and in Sicily, it occurs in some localities of the northern and southern parts of the Island (Figure 10).

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8. *Isoëto velatae-Crassuletum vaillantii* Poiron & Barbero 1965, Bull. Soc. Bot. Fr., 112: 437 (Appendix B, Table A9)

Syn.: Association à *Isoëtes velata* et *Crassula vaillantii* Poiron & Barbero 1965, Bull. Soc. Bot. Fr. 112: 437

Lectotypus: rel. 9, Tab. pag. 439, Poiron & Barbero [130], hoc loco.

Characteristic species: *Crassula vaillantii*, *Isoëtes velata*, *Warnstorfia fluitans* (= *Drepanocladius fluitans*).

Structure and ecology: The small rocky pools occurring on the basaltic plateau submerged in the rainy periods with very shallow waters persisting until the early spring, host a hygrophilous vegetation characterized by the dominance of *Isoëtes velata* and *Crassula vaillantii*, to which *Warnstorfia fluitans*, a rare moss recently recorded from Sicily [131], is often associated. It is a silicilous community localized at 230–360 m a.s.l., that, according
to Minissale et al. [132], can be referred to as *Isoëto velatae-Crassuletum vaillantii*, an association described in southern France by Poiron & Barbero [130]. The Sicilian vegetation shows a floristic set and ecological requirements quite similar to the one surveyed in France. Apart from the subass. *typicum* (rel. 1–12), in Sicily, is possible to distinguish a subass. *ranunculetosum ophioglossifolii* Brullo, Minissale, Sciandrello & Tavilla subass. nov. (rel. 13–16, holotypus rel. 13, hoc loco) occurring in the stands with a longer flooding period, floristically differentiated by *Ranunculus ophioglossifolius* and *Warnstorfia fluitans*.

Geographical distribution: According to literature data, this association considered circumscribed to France and Italy [51,77,130], occurs also in the Hyblean Plateau (southern Sicily), as already mentioned by Minissale et al. [132].

9. *Ranunculo lateriflori-Antinorietum insularis* Brullo, Grillo & Terrasi 1976, Boll. Acc. Gioenia Sci. Nat. Catania, 12: 92 (Appendix B, Table A10).

Lectotypus: rel. 11, Tab. 3, Brullo et al. [80], hoc loco.

Characteristic species: *Bulliarda vaillantii, Isoëtes sicula, Myosotis tineoi*.

Structure and ecology: In the small wetlands and rocky pools occurring on the basaltic plateau at about 900 m of altitude, peculiar vegetation linked to habitats flooded until the early summer, when deep freshwater occurs. It is characterized by *Antinoria insularis* and *Ranunculus lateriflorus*, usually growing with *Bulliarda vaillantii, Isoëtes sicula* and *Myosotis tineoi*. This community was described by Brullo et al. [80] as *Ranunculo lateriflori-Antinorietum insularis* and attributed, even if doubtfully, to *Isoëtion*. Effectively, due to the high frequency of *Antinoria insularis, Ranunculus lateriflorus* and *Callitrichetum brutiae* this association is to be included within *Preslion cervinae*. Regarding its bioclimatic requirements, the association falls within the meso-Mediterranean subhumid belt. At first, two subassociations were recognized in this plant community, named *isoëtetosum* and *ranunculetosum*, differentiated, respectively, by *Isoëtes sicula*, formerly identified as *I. durieui*, linked to stands subject to a shorter submersion period, while the other one is dominated by *Callitrichetum brutiae*, localizing on longer flooded surfaces. According to Brullo & Minissale [39], they must be considered as two distinct associations. The first one coincides with the association at issue, while the second one was named by Brullo & Minissale [39] *Ranunculo lateriflori-Callitrichetum brutiae*, which will be treated later.

Geographical distribution: This association occurs exclusively on the top of Monte Lauro in the Hyblean Plateau.

10. *Myosuro minimi-Ranunculetum lateriflori* Raimondo 1980, Quaderni C.N.R., AQ/1/89: 15 (Appendix B, Table A11).

Holotypus: rel. 1, Tab. 2, Raimondo [86].

Characteristic species: *Myosurus minimus, Spergularia madoniaca, Sagina subulata, Ranunculus marginatus*.

Structure and ecology: The association is localized in mountain stands, at altitudes between 1400 and 1600 m a.s.l., especially on the bottom of large dolines, limitedly to the small depressions where water, resulting from the melting of snow, is stagnant for a long time. The soil is represented by clayey-silty deposits, resulting from the erosion of the surrounding carbonatic rocks, with an acidic pH, usually drying up towards the end of spring. These wet surfaces are colonized by dense vegetation with hygrophilous microphytes, where some of them play a relevant physiognomic role. In particular, *Myosurus minimus, Spergularia madoniaca, Antinoria insularis, Ranunculus lateriflorus*, are the most frequent, which are associated with several other hygrophytes of the *Isoëto-Nanojuncetalia*. The association, described by Raimondo [86] as *Myosuro minimi-Ranunculetum lateriflori*, was included in the *Isoëtion*, while Brullo & Minissale [39] put it in synonymy with *Ranunculo lateriflori-Antinorietum insularis*. Based on the current knowledge this vegetation is more advisable to be kept as an autonomous association, closely related to the latter. As previously emphasized by Brullo et al. [84], both for their localization in the mountain belt and for the floristic set, mainly due to the occurrence of *Ranunculus lateriflorus, Myosuro-Ranunculetum lateriflori* and also *Ranunculo-Antinorietum insularis* can be considered as geographical vi-
cariants of other allied associations, such as *Sedo nevadensis-Juncetum pygmaeis* Quezel 1957 from Atlas range (North Africa), *Junco-Isóëtetum velatae* Rivas Goday 1955 from Spain, and *Veronicco-Ranunculetum lateriflori* Quezel 1973 from Tauro massif (Turkey).

Geographical distribution: The association is localized in the Madonie massif (North Sicily) (Figure 3A).

11. **Ranunculetum pratensi-lateriflori** Brullo, C. Brullo & Giusso ass. nova hoc loco (Appendix B, Table A12).

Syn.: *Ranunculo-Antinorietum insularis veronicetosum* Brullo & Grillo 1978, Not. Soc. Ital. Fitosociol. 13: 45.

Holotypus: rel. 5, Tab. 7, Brullo & Grillo [84], hoc loco.

Characteristic species: *Ranunculus pratensis*, *Barbarea bracteosa*, *Veronica serpyllifolia*.

Structure and ecology: In the mountain range of northern Sicily, at altitudes between 1300 and 1700 m a.s.l., in correspondence with wetlands periodically flooded by shallow waters; ephemeral hygrophilous vegetation with a typical spring cycle. The substrates consist of siliceous rocks, mainly represented by flysch and schists, covered by silty-clayey deposits. The vegetation colonizing these places is characterized by quite specialized hygrophytes, where a relevant physiognomic role is played by *Antinoria insularis* and *Ranunculus lateriflorus*, as well as by *R. pratensis*, *Veronica serpyllifolia*, *Barbarea bracteosa*, which allow differentiating a new association, closely related to the *Ranunculo-Antinorietum insularis*. Previously Brullo & Grillo [84], treated this plant community as a subass. *veronicetosum* of the last association. Nevertheless, apart from the different floristic sets, it is well diversified also from the ecological point of view, since it is distributed at higher altitudes, well over 1000 m a.s.l., and on different substrates. Therefore, it is proposed as *Ranunculetum pratensi-lateriflori*, which is spread mainly in the supra-Mediterranean humid belt.

Geographical distribution: The association is recorded from the Nebrodi chain (northern Sicily).

12. **Ranunculo lateriflori-Callitrichetum brutiae** Brullo & Minissale 1998, Itinera Geobot. 11: 281 (Appendix B, Table A13).

Syn.: *Ranunculo-antinorietum insularis subass. ranunculetosum* Brullo, Grillo & Terrasi 1976, Boll. Acc. Gioenia Sci. Nat. Catania, 12: 93.

Holotypus: rel. 21, Tab. 3, Brullo et al. [80]

Characteristic species: *Callitriche brutia*.

Structure and ecology: This vegetation occurs in the pools with more or less deep waters, limited to the basaltic substrates covered by a thin clayey-loamy soil layer. From a floristic point of view, this vegetation is characterized by the dominance of *Callitriche brutia*, *Ranunculus lateriflorus* and *Bulliarda vaillantii*. This association, described by Brullo & Minissale [39], was treated by Brullo et al. [80] as subass. *ranunculetosum* of the *Ranunculo-Antinorietum insularis*, and by Brullo et al. [83] as subass. *ranunculetosum lateriflori* of the *Callitricho-Crassuletum vaillantii*; in either case, it represents a more hygrophilous variant of these associations.

Geographical distribution: The association is currently recorded only from Monte Lauro (Hyblean plateau).

13. **Callitricho brutiae-Crassuletum vaillantii** Brullo, Scelsi, Siracusa & Tomaselli 1998, Boll. Acc. Gioenia Sci. Nat. Catania 29: 172 (Appendix B, Table A14).

Holotypus: rel. 1, Tab. 2, Brullo et al. [83]

Characteristic species: *Callitriche brutia*.

Structure and ecology: In the deeper depressions of the basaltic substrata, often submerged until the end of springtime, *Anagallido parviflorae-Molinerielletum minutae* is replaced by *Callitricho brutiae-Crassuletum vaillantii*, an association with more hygrophilous requirements. Floristically, this vegetation is characterized by the dominance of *Callitriche brutia* and *Bulliarda vaillantii*, which grows together with other hygrophilous species of the *Isoëto-Nanojuncetea*. It shows some relations with *Ranunculo lateriflori-Callitrichetum brutiae*,...
from which it differs in lower hygrophily and absence of *Ranunculus lateriflorus*, while *Coleoscyphus myconis* occurs, which emphasizes the more xericity of the stands.

Geographical distribution: The association is currently recorded only from Bosco Pisano (Hyblean plateau).

14. *Junco pygmaei-Pilularietum minutae* Minissale, Molina & Sciandrello 2017, *Botany Letters* 164: 200 (Appendix B, Table A15).

Holotypus: rel. 8, Tab. 1, Minissale et al. [132])

Characteristic species: *Pilularia minuta*

Structure and ecology: This is a very rare association localized on basaltic substrata, where it grows on ponds and drainage ditches, mainly on flat or slightly sloping surfaces with a superficial clayey or clayey-silty soil layer. This vegetation is distributed at 360-400 m a.s.l., within the thermo-Mediterranean bioclimatic belt. Floristically, it is characterized by the occurrence of *Pilularia minuta*, usually growing with some hygrophilous species of *Isoëto-Nanojuncetum*, among them, such as *Juncus pygmaeus*, *Isoëtes longissima*, *Lotus angustissimus*, *Lythrum hyssopifolia*, *M. borysthenica*, *Callitriche brutia*, *Buillardia vaillantii*, *Mentha pulegium*, etc. Within this association, two subassociation can be distinguished: the *typicum* (rel. 10–14) localized in the natural ponds and differentiated by *Solenopsis laurentia* subsp. *hyblaea* and *Cicendia filiformis*, while the *tillaetosum vaillantii* Minissale, Molina & Sciandrello (rel. 1–9, holotypus rel. 4, hoc loco) grows in the drainage ditches and is characterized by the occurrence of *Buillardia vaillantii* [132]. This association shows some relations with other plant communities rich in *Pilularia minuta* described from other Mediterranean territories, which were quoted by Tomaselli et al. [51] too. In particular, among them *Isoetetum setacei* Br-Bl. 1936 from southern France and the Iberian Peninsula can be mentioned, along with *Pilulario minutae-Isoetetum longissimae* Tomaselli et al. 2020 from Apulia, *Eryngio corniculati-Isoetetum velatae* Paradis & Finidori 2005 from Sardinia. On the whole, all these associations are floristically and ecologically well differentiated from *Junco pygmaei-Pilularietum minutae*.

Geographical distribution: Based on the current knowledge, this association is exclusive of a small area of the Hyblean Plateau near Sortino and Carlentini (Figures 2D, 4G and 5C).

15. *Pilulario minutae-Myosotidetum siculae* Brullo, Cambria, Ilardi & Minissale ass. nova hoc loco (Appendix B, Table A16).

Holotypus: rel. 1, hoc loco

Characteristic species: *Pilularia minuta* and *Myosotis sicula*.

Structure and ecology: The association was surveyed in wide temporary wetlands flooded during the winter-spring period, localized on clayey-siliceous substrates covered by deep muddy soils. This vegetation is distributed about 200 m a.s.l., within the thermo-Mediterranean bioclimatic belt. It is characterized by the occurrence of *Pilularia minuta*, a rare and inconspicuous fern, which was recently rediscovered in Sicily by Troia & Lansdown [133]. This hygrophyte usually grows with other species of the *Isoëto-Nanojuncetum*, such as *Myosotis sicula*, *Ranunculus ophioglossifolius*, *Isoëtes longissima*, *Lotus parviflorus*, *Elatine macropoda*, etc. For its ecology and floristic set, it is well differentiated from the *Junco pygmaei-Pilularietum minutae*, as well as from the *Pilulario minutae-Isoetetum longissimae*.

Geographical distribution: This association seems localized in Contrada Anguillara near Calatafimi (western Sicily).
soils remaining humid for long periods. They are localized on waterlogged soils of large hollows with waterproof surfaces, sometimes represented by a wood clearing, covered by a thick layer of clay-silt soil, usually rich in a sandy component. It can be observed also in rocky ponds with sandy soils. In these stands, the hygrophilous microphytes are submerged by shallow rainwater often until late spring. Mucina et al. [114] synonymized this alliance with Cicendion (Rivas Goday in Rivas Goday & Borja 1961) Br.-Bl. 1967, and included it within the Isoëtalia. When Rivas Goday & Borja (1961) described this syntaxon, they treated it as Cicendenion (sub Cicendion), considering it as a suballiance of Nanocyperion flavescentis Koch 1926, including within it the Cicendietum filiformis Allorge 1922, which represents, therefore, its nomenclature type. Later, Braun-Blanquet [18] raised this syntaxon to the alliance level, including within it the new association Isoëto velatae-Cicendietum filiformis. In particular, the Cicendietum filiformis, described from northern France is characterized by a floristic set rich in elements of the Nanocyperetalia order, such as Isolepis setacea, Juncus tenuis, Cyperus flavescens, C. fuscus, Lythrum portula, Spergularia rubra, Sagina procumbens, Centaurium pulchellum, Gnaphalium ulginosum, G. luteo-album, while the floristic elements of Isoëtalia are absent. Besides, it should be noted that from the nomenclatural viewpoint, the Radiolion linoidis Pietsch 1973 represents a synonym of the Cicendion as emphasized by Brullo & Minissale [39]. In fact, the two syntaxa are floristically and ecologically perfectly overlapping, since either way the associations referred to them (Cicendietum filiformis included) have the optimum at last spring to early summer, and occur in the territories with temperate bioclimate. Besides, both are characterized by a peculiar pool of species, such as Centunculus minimus, Radiola linoides, Hypericum humifusum, Montia minor, Chaetonychia cymosa, and many other of the Nanocyperetalia order.

Geographical distribution: The alliance is well represented in the western and central Mediterranean area and in Sicily, it occurs in some localities of the western and southern part of the Island (Figure 11).

Figure 11. Geographical distribution of the Cicendio-Solenopsion laurentiae (black dot) and Agrostion salmanticae associations in Sicily (red dot).

16. Archidio phascoidis-Isoetetum velatae Brullo & Minissale 1998, Itinera Geobot. 11: 281 (Appendix B, Table A17).
Holotypus: rel. pg. 281 related to Archidium phascoides-Isoëtum velatae Brullo & Minissale (1998).

Characteristic species: Archidium phascoides, Isoëtes longissima (= Isoëtes velata)

Structure and ecology: Hygrophilous vegetation that prefers small humid depressions, on basaltic substrata covered by a shallow silty soil layer, subject to flooding during the autumn-winter period. From a structural point of view, the vegetation is characterized by a low moss carpet dominated by Archidium phascoides, on which numerous hygrophilous microphytes grow, such as, Solenopsis laurentiae subsp. hyblaea, Juncus bufonius, J. pygmaeus, J. capitatus, Anagallis parviflora, Centaurium maritimum, etc. The occurrence of some Isoëtes, such as I. longissima, I. durieui and I. histrix is significant. The association is quite rare localizing at 230–385 m a.s.l., within the thermo-Mediterranean sub-humid bioclimatic belt.

Geographical distribution: The association occurs on scattered volcanic rocks in the Hyblean Plateau (Figures 3E and 4C,D).

17. Anagallido parviflorae-Molinerielletum minutae Brullo, Scelsi, Siracusa & Tomaselli 1998, Boll. Acc. Gioenia Sci. Nat. Catania 29: 172 (Appendix B, Table A18).

Holotypus: rel. 4, Tab. 1, Brullo et al. [83]

Characteristic species: Molineriella minuta

Structure and ecology: Hygrophilous vegetation linked to flat stands with shallow loamy soils deposited on basaltic substrates, subject to short periods of submersion during the autumn and winter months. It is an ephemeral association with a very early vegetative cycle (late winter-early spring), in which a remarkable floristic set occurs, represented mainly by microphytes of the Isoëto-Nanojuncetea. Among them, Isoëtes durieui, Anagallis parviflora, Lotus comimbricensis, L. angustissimus, Lythrum hyssopifolia, juncus bufonius, J. capitatus, J. pygmaeus, Polygonum subspathaceus, Mentha pulegium, Poa inermis, etc., can be mentioned. Besides, particularly significant is the occurrence of Molineriella minuta, a species very rare in Sicily, which is treated as a characteristic species of the association. Within this community, two sub-associations were identified: typicum, which occupies poorly wet peripheral places subject to a very short period of submersion, and crassuletosum vaillantii, differentiated by the dominance of Buillardia vaillantii, which is localized in the central part of the depressions with deeper waters [83].

Geographical distribution: This association is reported from Bosco Pisano near Buccheri (Hyblean plateau).

18. Kickxio cirrhosae-Solenopsietum gasparrinii Brullo & Minissale 1998, Itinera Geobot. 11: 281, nom. corr. (Appendix B, Table A19).

Syn.: Kickxio cirrhosae-Solenopsietum laurentiae Brullo & Minissale 1998, Itinera Geobot. 11: 281; Laurentio-Juncetum tingitani Brullo, Scelsi & Siracusa 1994, Boll. Acc. Gioenia Sci. Nat. Catania 27:359, non Rivas Goday & Borja in Rivas Goday 1968, Collect. Bot. 7(2): 1022.

Holotypus: rel. 4, Tab. 11, Brullo et al. [134]

Characteristic species: Kickxia cirrhosa.

Structure and ecology: It is a microphytic association growing on muddy-sandy soils, limited to small ponds localized within halophilous meadows belonging to the Limonio dubii-Lygeetum sparti Brullo & Di Martino 1974. In this vegetation several elements of the Cicendio-Solenopson laurentiae occur, such as Kickxia cirrhosa, Solenopsis gasparrinii, Cicendia filiformis, Radiola linoides, Ophioglossum lusitanicum, Centunculus minimum, etc., which highlights its acidophilic and markedly hygrophilous requirement. It has its optimum in the spring period, especially in very rainy years. Previously, this vegetation was referred to by Brullo et al. [134] as the Laurentio-Juncetum tingitani association described in the Iberian Peninsula by Rivas Goday & Borja [105] and later treated by Brullo & Minissale [39] as a new association named Kickxia cirrhosae-Solenopsietum laurentiae. Based on the current knowledge, the name of this association must be corrected in Kickxia cirrhosae-Solenopsietum gasparrinii, since Solenopsis laurentia is here replaced by S. gasparrinii.

Geographical distribution: This association currently is reported only from the Isola Grande dello Stagnone near Marsala.
19. *Solenopsietum mothianae* Brullo, Giusso, Minissale & Sciandrello ass. nova hoc loco (Appendix B, Table A20).

Holotypus: rel. 3, hoc loco

Characteristic species: *Solenopsis mothiana*

Structure and ecology: This association was surveyed on wide wetlands with silty-sandy and slightly brackish soils in stands near the sea. Usually, this vegetation is localized in temporarily flooded surfaces occurring in the large clearings within the maquis and is floristically differentiated by *Solenopsis mothiana*, a rare endemic microphyte described by Brullo et al. [135]. It grows together with *Anagallis parviflora*, *Radiola linoides*, *Cicendia filiformis*, *Centaurium maritimum*, *Briza minor*, *Mentha pulegium*, *Juncus bufonius*, *Lythrum hypsopifolia*, etc. It is very peculiar vegetation floristically and is ecologically well differentiated from the other Sicilian association of the *Cicendio-Solenopsion laurentiae*.

Geographical distribution: This association is exclusive of the Isola Grande dello Stagnone near Marsala, where it is very rare (2A).

20. *Solenopsio gasparrinii-Isoëtetum siculae* Brullo, Cambria, Ilardi & Minissale ass. nova, hoc loco (Appendix B, Table A21).

Holotypus: rel. 2, hoc loco

Characteristic species: *Isoëtes sicula*

Structure and ecology: This association is localized in the wide wetlands that are temporarily flooded, especially in the autumn-winter time, and which tend to dry up since the early spring. It grows on silty-sandy soils which keep the humidity throughout the spring and is differentiated by several small hygrophytes showing a high value of coverage. Floristically, this vegetation is characterized by *Isoëtes sicula*, which grows with *Solenopsis gasparrinii*, *Ophioglossum lusitanicum*, *Anagallis parviflora*, *Anagallis minima*, *Radiola linoides*, *Cicendia filiformis*, *Lotus parviflorus*, *Romulea ramiflora*, *Isolepis cernua*, *Juncus bufonius*, etc. Currently, the *Solenopsio gasparrinii-Isoëtetum siculae*, similarly to most microphytic associations of the *Isoëtalia*, has a very narrow distribution due to human pressure, in particular for the reclamation of wetlands and their use in farming land.

Geographical distribution: This association occurs in western Sicily near Calatafimi and Mazara del Vallo (Trapani) (Figure 5A).

21. *Myosotido congestae-Isoëtetum histricis* Azzaro & Cambria ass. nova, hoc loco (Appendix B, Table A22).

Holotypus: rel. 2, hoc loco

Characteristic species: *Isoëtes histrix*, *Myosotis congesta*, *Aphanes arvensis*.

Structure and ecology: The wide wetlands characterized by sandy soils, which are flooded by rainwaters in the autumn-winter period, are colonized by peculiar hygrophilous vegetation dominated by *Isoëtes histrix*. In this stand, remaining quite wet during the springtime, some rare microphytes, such as *Myosotis congesta* and *Aphanes arvensis*, occur too. In particular, *Myosotis congesta* was recently quoted as a new record from Italy by Azzaro et al. [136] and subsequently typified by Tavilla et al. [137], which provides some information on its morphological, ecological and chorological features. This vegetation, for its floristic and ecological peculiarities, is proposed as a new association, named *Myosotido congestae-Isoëtetum histricis*, which shows a quite poor floristic set and can be referred to as *Cicendio-Solenopsion laurentiae* for its ecological requirements and the occurrence of *Anagallis parviflora*. The association is localized within the clearings of thermophilous Quercus suber woodlands.

Geographical distribution: This association is very rare and was observed only inside the nature reserve “Bosco di Santo Pietro” near Caltagirone (southern Sicily).

*AGROSTION SALMANTICAE* Rivas Goday 1958 Anal. Inst. Bot. Cavanilles 15: 612

Syn.: *Pre-Isoëtion* Rivas Goday 1955, Anal. Inst. Bot. Cavanilles 8: 385 nom. inval. (art. 3b); *Agrostion salmanticae* Rivas Goday 1956, Anal. Insit. Bot. Cavanilles 8: 387, nom.
nud. (art. 2b); *Agrostion pourretii* Rivas Goday 1958, nom. mutand. propos. by Rivas Martinez et al. (2002: 248).

Lectotypus: As. *Pulicaria uliginosa* et *Agrostis salmantica* Rivas Goday 1956, Anal. Inst. Bot. Cavanilles 8: 386.

Characteristic species: *Agrostis pourretii*, *Chamaemelum fuscatum*, *Trifolium michelianum*.

Structure and ecology: Spring blooming communities, which are linked to humid depressions with long-lasting waters in winter and spring and with predominantly arenaceous soils. Physiognomically, they are dominated by graminoid therophytes and show their optimum in the late spring.

Geographical distribution: The associations of this syntaxon are frequent in the Iberian-Atlantic and West Mediterranean area (Spain, France, Corse, Sardinia, Sicily, and southern Italy). In Sicily, it is localized in the North-West part of the Island (Figure 11).

22. *Trifolio micheliani-Agrostidetum pourretii* Cambria & Brullo ass. nova hoc loco (Appendix B, Table A23).

Syn.: *Trifolio micheliani-Glycerietum spicati* Caldarella, La Rosa, Cusimano, Romano & Gianguzzi 2013, Plant Biosyst. 147(4): 7, p.p.

Holotypus: rel. 3, hoc loco.

Characteristic species: *Trifolium michelianum*.

Structure and ecology: In the wide wetlands characterized by silty-sandy soils deposited on flyschoid clays, dense vegetation dominated by *Agrostis pourretii* and *Trifolium michelianum* occurs. In particular, the plant community characterized by these species colonizes small stands localized within clearings of deciduous oak woods, where it is mixed with perennial hygrophyllous vegetation linked to surfaces submerged by deeper waters. Previously, Caldarella et al. [138] described a very heterogeneous association including both the perennial vegetation of *Phragmito-Magnocariceta* and the annual phytocoenosis with *Agrostis pourretii* belonging to *Isoëto-Nanojunceta*, which was proposed as *Trifolio micheliani-Glycerietum spicati*. Indeed, this association represents very complex vegetation including two well distinct communities belonging to different phytosociological classes. In fact, these authors carried out their relevés on very large surfaces (70–100 m²) without respecting the criterion of the floristic-ecological homogeneity of the surveyed vegetation. This is evident in the floristic set of the relevés, including species of various phytosociological typologies (*Phragmito-Magnocariceta*, *Molinio-Arrhenatheretea* and *Isoëto-Nanojunceta*). In particular, within these wide wetlands, the plant communities belonging to *Isoëto-Nanojunceta* are localized on small surfaces (at most 10–20 m²), with soils that are already emerged in early spring compared to the surrounding surfaces still inundated. In fact, the floristic set in these stands consists almost exclusively of hygrophyllous therophytes belonging to the *Isoëto-Nanojunceta* class. This vegetation is, therefore, proposed as a new association named *Trifolio micheliani-Agrostidetum pourretii*, which for its floristic and ecological peculiarities must be referred to as *Agrostion salmanticae*. Previously, associations referring to this alliance were described in the Italian territory from North Sardinia by Biondi & Bagella [75] and Bagella et al. [77] and Apulia by Tomaselli et al. [51], represented, respectively, by *Anthoxantho aristati-Agrostidetum salmanticae* and *Phalarido minoris-Agrostidetum pourretii*.

Geographical distribution: This vegetation was surveyed near Ficuzza (North Sicily) (Figure 27).

**NANOCYPERETALIA** Klika 1935, Beih. Bot. Cent.bl. 53: 292, nom. cons. propos. [116]

Syn.: *Nanocypero-Polygonetalia* W. Koch 1926, Jb. St. Gall. Naturviss. Ges. 61:20, nom. rejic. propos.; *Cyperetalia fusci* Müller-Stoll & Pietsch in Lohmeyer et al. 1962, Melhoramento, 15:20; *Cyperetalia fusci* Pietsch 1963, Abh. u. Ber. Naturkundemus 38:3, nom. illeg. (art. 29); *Cicendietalia filiformis* Géhu 1992, Ann. Bot. (Roma) 50: 139, nom. nud. (2b); *Elatino triandrae-Cyperetalia fusci* de Foucault 1988, Dissert. Bot. 121: 78.

Holotypus: *Nanocyperion flavescentis* W. Koch 1926.

Characteristic species: *Centaurium pulchellum*, *Corrigiola litoralis*, *Cyperus fuscus*, *C. michelianus*, *Hordeum marinum*, *Laphangium luteoalbum*, *Lythrum portula*, *Plantago intermedia*, *Spergularia rubra*. 
Structure and ecology: This syntaxon group’s ephemeral vegetation localized in wide wet hollows usually flooded until early summer, with soils being mostly eutrophic or sub-eutrophic, often hypertrophic, and usually well nitrified since they are used as pastures, or more rarely oligo-mesotrophic. Floristically, it is differentiated by the occurrence of species with summer-autumn blooming, showing a prostrate and creeping habit.

Geographical distribution: This order is distributed in the Atlantic and central European territories, extending also to the Mediterranean ones with Temperate bioclimate, such as mountain stands or in artificial basins and along the coastal places with slightly brackish soils.

Notes: According to Fernández-González et al. [116], the correct name of the order at issue is *Nanocypero-Polygonetalia* Koch 1926 for reasons of priority, as it was validly published (Art. 2b, ICPN). Indeed, Koch [3] within this order included two new alliances, such as *Nanocyperion flavescentis* and *Polygono-Chenopodion polyspermi*, of which the second is invalid according to Art. 3f (ICPN), while the *Nanocyperion flavescentis* is a valid alliance. Indeed, Koch [3] did not provide relevés but unambiguously referred it to an association validly published by Braun-Blanquet [139], namely *Junco compressus-Parvo-Cyperus-Association*. Besides, *Cyperus flavescent L.* occurs in the typical relevé, which, therefore, validates the *Cyperetum flavescentis* proposed by Koch [3]. Unfortunately, this name is a superfluous name for the *Junco compressi-Parvo-Cyperetum* (Art. 29c, ICPN). In conclusion, Fernández-González et al. [116], proposed that, as *Nanocypero-Polygonetalia* is a disused name, *Nanocyperetalia* Klika 1935 should be the nomen conservandum, since the latter has always been the name used in literature.

*NANOCYPERION FLAVESCENTIS* Koch 1926, Jb. St. Gall. Naturwiss. Ges. 61: 20–28

Syn.: *Nanocyperion flavescentis* W. Koch ex Libbert 1932, Verh. Bol. Ver. Prov. Brandenburg 74: 21; *Juncion bufonii* Philippi 1968, Vertiff. Land. Natur. Landsch. Bad.-Würt. 36: 69; *Centaurio-Blackstonion perfoliatae* de Foucault 1988, Dissert. Bot. 121: 84; *Peplidion portulae* Piertch & Müller-Stoll 1974, Verh. Bot. Vereins Prov. Brandenburg 109: 59.

Holotypus: *Junco compressi-Parvo-Cyperetum* Br. Bl. 1922.

Characteristic species: *Blackstonia perfoliata*, *Cyperus flavescentis*.

Structure and ecology: This alliance groups plant communities rich in annual small caespitose sedges linked to wet, sandy-clayey, or organic soils, which are submerged for long period by oligo-mesotrophic, freshwater. This vegetation, showing its maximum vegetative development in the summer-autumn period, in Sicily is very rare and localized in the sub-mountain belt.

Geographical distribution: The associations of this alliance are widespread in the Euro-Siberian region and in particular in the Atlantic and central European territories, while they are less frequent in the Mediterranean ones. As concerns Sicily, it is localized in the North-East part of the Island (Figure 12).

23. *Plantago intermediae-Cyperetum fusci* Sciandrello, D’Agostino & Minissale 2013 (Appendix B, Table A24).

Holotypus: rel. 1, Tab. 7, Sciandrello et al. [140]

Characteristic species: *Plantago intermedia*, *Cyperus fuscus*.

Structure and ecology: The association was surveyed in the small ponds localized on metamorphic substrata with acid soils submerged by freshwater for long period, remaining moist also in the summertime. It seems distributed at an altitude of 600-700 m a.s.l., within the meso-Mediterranean sub-humid belt. Physiognomically, this vegetation is dominated by two caespitose sedges, such as *Cyperus fuscus* and *C. flavescentis*, usually growing with *Plantago intermedia, Mentha pulegium, Juncus hybridus, Lythrum hyssopifolia, Juncus bufonius*, etc. It can be found in sub-mountains stands characterized by climophilous deciduous oak woodlands linked to siliceous substrata.

Geographical distribution: This association is circumscribed to a few localities of the Peloritani chain (NE Sicily) (4F).
Figure 12. Geographical distribution of the Nanocyperion flavescens (black dot), Verbenion supinae (red dot) and Lythriion tribracteati (blue dot) associations in Sicily.

VERBENION SUPINAE Slavnic 1951, Arch. Sci. Mat. Srpska Sci. Nat.1: 146.

Syn.: Heleochloion Br.-Bl. 1952, Group. Vég. Fr. Médit.: 72; Fimbristylion dichotomae Horvatić 1954, Vegetatio 5: 448; Dichostyliion micheliani Horvatić 1963, Acta Biol. 4: 37; Heleochlooo-Cyperion micheliani Pietsch et Müller-Stoll 1968, 1968, Mitt. Flor.-Soz. Arbeitsgem. nf. 13: 28.

Lectotypus: Heliotropio-Verbenetum supinae Slavnić 1951.

Characteristic species: Coronopus squamatus, Sporobolus aculeatus, S. alopecuroides, S. schoenoïdes, Euphorbia chamaesyce, Glinus lotoides, Gnaphalium uliginosum var. prostratum, Heliotropium supinum, Hordeum geniculatum, Paspalum distichum, Pulicaria sicula, P. vulgare var. graeca, Schenkia spicata, Teucrium campanulatum, Verbena supina.

Structure and ecology: Ephemeral vegetation occurring in wide depressions, represented by lagoons, lakes, artificial basins, riverbanks, etc., which are subjected to long periods of submersion, usually until early summer, and often characterized by well nitrified soils. In these habitats, flooded by eutrophic or hypertrophic water, prostrate-creeping species, often of large size, having a summer-autumnal blooming are frequent.

Geographical distribution: The communities of this alliance are spread in western and central-eastern Europe and also in the Mediterranean area. As concerns Sicily, it is localized in several parts of the Island (Figure 12).

24. Gnanphalio lutealbi-Verbenetum supinae Rivas Goday 1970, Anales Inst. Bot. Cavanilles 27:273, nom. invers. propos. (Appendix B, Table A25).

Syn.: Gnaphalium luteo-album-Verbena supina Rivas Goday 1956, comunidad prov., Anales Inst. Bot. Cavanilles 13:370; Verbeno-Gnaphalietum luteo-albi Rivas Goday 1970, Anales Inst. Bot. Cavanilles 27:273.

Lectotypus: rel. 1, Tab. 8, Rivas Goday [22], lectotypus designated by Silva et al. [141].

Characteristic species: Lapangium lutealbium

Structure and ecology: Along the banks of artificial basins, with soils rich in sandy components, maintaining a certain superficial edaphic humidity, even in the summertime, hygrophilous vegetation with sub-nitrophilous requirements occurs. It is dominated by therophytes with prostrate-ascending habits, among them Verbena supina, Paspalum distichum, Schenkia spicata, Juncus hybridus, Euphorbia chamaesyce, etc. Due to the occur-
rence and often dominance of Laphangium luteoalbum, this community was attributed by Sciadrello [91] to Verbeno supinae-Gnaphalietum luteo-albi, association described by Rivas Goday [22] from Iberian Peninsula, previously treated by the same author [19] as Gnaphalium luteo-album-Verbena supina comunidad prov. Recently, Silva & Molina [142] renamed this association as Gnaphalio luteoalbi-Verbenetum supinae nom. invers. prop. (Arts. 10b and 42, Theurillat et al. [117]).

Geographical distribution: Cimia lake, artificial basin near Mazzarino (Caltanissetta).

25. Heliotropio supini-Heleochloetum schoenoidis Rivas Goday 1956, Anales Inst. Bot. Cavanna 13:371. (Appendix B, Table A26).

Syn.: Glino-Heliotropietum supini Brullo & Marcenò 1974 heliotropietosum Brullo & Marcenò 1974, Lav. Ist. Bot. Giard, Col. Palermo 25: 189; Heliotropio supini-Crypsietum schoenoidis Rivas Goday in Rivas Goday et al. 1956 nom. mut. nov., proposed by Silva et al. (2021), Mediterr. Bot. 42:7.

Lectotypus: rel. 6, Tab. 14 Rivas Goday et al. [19], designated by Silva et al. [141]

Characteristic species: Heliotropium supinum, Sporobolus schoenoides.

Structure and ecology: On the rather inclined surfaces of artificial basins, covered only superficially by mud, since the submersion period does not last for a long time, subnitrophilous vegetation with more xerophilous requirements is localized. Floristically, it is dominated by Sporobolus schoenoides (= Helochloa schoenoides) and Heliotropium supinum, large therophytes with a creeping habit. It was described by Brullo & Marcenò [79] as Glino-Heliotropietum supini subass. heliotropietosum, which in late summer and early autumn tends to cover large surfaces. As highlighted by Brullo & Minissale [39] and later also by Sciadrello [91], this vegetation must be attributed to Heliotropio-Heleochloetum schoenoidis Rivas Goday 1956, the association described from the Iberian Peninsula [22]. More recently, Rivas-Martínez et al. [109] and Silva et al. [141] have proposed to change the name of this association to Heliotropio supini-Crypsietum schoenoidis according to Art. 45.

Geographical distribution: Based on literature data of Brullo & Marcenò [79] and Sciadrello [91], this association occurs in some artificial basin of northern, central, and southern Sicily (Scanzano, Prizzi, Pian del Leone, Fanaco, Trinità, Ancipa, Pozzillo, Poma, Comunelli, Disueri) (Figure 4H).

26. Glino lotoidis-Verbenetum supinae Rivas Goday 1964, Veg. fl. Cuenca extr. Guadiana: 187 (Appendix B, Table A27).

Syn.: Glino-Heliotropietum supini Brullo & Marcenò 1974 ginetosum Brullo & Marcenò 1974, Lav. Ist. Bot. Giard, Col. Palermo 25: 190.

Lectotypus: rel. 1, Tab. pg. 188 Rivas Goday [21], designated by Silva et al. [141].

Characteristic species: Glinus lotoides.

Structure and ecology: On the more or less flat surfaces characterized by silty-clayey soils, along the shores of artificial basins, drying out during the summer period, subnitrophilous hygrophilous vegetation is frequent, which is dominated by therophytes with creeping or prostrate-ascending habit, among them Sporobolus schoenoides, Heliotropium supinum, Paspalum disticum, Verbena supina, Euphorbia chamaesyce, etc. It is a very peculiar community having its vegetative optimum in the summer-autumn period when the surfaces emerge but with still more or less humid soils. The occurrence of species belonging to Isoeto-Nanojuncetea and Nanoypertetalia is remarkable since it highlights the hygrophilous requirements of these communities. In particular, the occurrence of Glinus lotoides and Verbena supina allows referring this vegetation to Glino lotoidis-Verbenetum supinae, an association described by Rivas Goday [21] from Spain, recorded by Brullo & Minissale [39] and Sciadrello [91] also from Sicily. Previously, Brullo & Marcenò [79] had attributed this phytocoenosis to Glino-Heliotropietum supini subass. ginetosum, but for reasons of priority, it must be referred to Glino lotoidis-Verbenetum supinae [21,22,109].

Geographical distribution: According to Brullo & Marcenò [79] and Sciadrello [91], this Iberian association is also recorded from the Sicilian artificial basins of Piana degli Albanesi, Scanzano, Arancio, Disueri and Comunelli (Figure 3F).
27. *Coronopo squamati-Sisymbretum dentatae* Minissale & Spampinato 1987 (Appendix B, Table A28).

   Holotypus: rel. 6, Tab. 8, Minissale & Spampinato [87].
   Characteristic species: *Sisymbrella dentata, Anthemis cotula*

   Structure and ecology: The association was described by Minissale & Spampinato [87] in a depressed area characterized by basaltic substrata, subject to seasonal flooding, often prolonged until the beginning of the summertime. The rocky surfaces are covered with silty-clayey deposits, flooded by shallow waters, and are more or less dried up during the summer. Physiognomically, this vegetation is well differentiated for the dominance of *Sisymbrella dentata*, a rare Sicilian endemism, which generally grows together with other hygrophytes, including *Anthemis cotula, Hordeum hystrix, Coronopus squamatus, Mentha pulegium, Teucrium campanulatum, Ranunculus sardous, R. trilobus, Eryngium pusillum*, etc. Currently, the association is rather degraded, since the areas originally occupied by it are subject to cultural activities, due to their transformation into vineyards.

   Geographical distribution: The vegetation is mainly diffused in correspondence with the Gurrida Lake, at the base of the Etna Mount near Randazzo. This association was observed also near Castiglione di Sicilia. Probably, this association in the past was much more frequent in Sicily, since *Sisymbrella dentata*, a characteristic species, was recorded in many places on the island, where it has today, unfortunately, disappeared [143] (Figure 3C).

28. *Helochloo schoenoidis-Chenopodietum botryoidis* Brullo & Sciandrello 2006, Fitosociologia 43(2): 25 (Appendix B, Table A29).

   Holotypus: rel. 9, Tab. 2, Brullo & Sciandrello [89].
   Characteristic species: *Sporobolus schoenoides, Oxybasis chenopodioides (=Chenopodium botryoides)*

   Structure and ecology: This association is localized in natural coastal lakes, in correspondence with the peripheral surfaces subject to summer-autumn drying. These stands are characterized by more or less flat and clayey-loamy soils, with a certain concentration of nitrates, still humid under the superficial crust. From the floristic point of view, it appears as an annual pioneer vegetation with a hygro-subnitrophilous character, dominated by therophytes with creeping habits, such as *Sporobolus schoenoides, Sporobolus aculeatus, Cyperus fuscus*. The differential of the association is *Oxybasis chenopodioides*, a very rare species in Sicily, linked to brackish lake environments, often near the sea, which tends to cover large surfaces along the dried up edges of the basin. As already highlighted by Brullo & Sciandrello [89], due to its floristic and ecological peculiarities, this association shows a remarkable affinity with *Amarantho albi-Chenopodietum botryoidis*, described for the territory of Granada (southern Spain) by Martinez Parras et al. [144].

   Geographical distribution: The association was surveyed at Biviere of Gela, a wide coastal lake in southern Sicily.

29. *Coronopo squamati-Corrigioletum litoralis* Brullo & C. Brullo ass. nova, hoc loco (Appendix B, Table A30).

   Holotypus: rel. 2, hoc loco.
   Characteristic species: *Corrigiola litoralis*.

   Structure and ecology: On the clayey-sandy soils of small ponds, drying out during the summertime, hygrophilous-sub-nitrophilous vegetation, dominated by some therophytes with prostrate-ascending habit, grows. Rather relevant is the occurrence of *Corrigiola litoralis*, which highlights the hygrophilous character of this vegetation, usually growing with *Mentha pulegium, Coronopus squamatus, Laphangium luteoalbum, Lythrum hissopifolia, Polygogon subspathaceus, Juncus bufonius*, etc. This vegetation is localized in sub-mountain stands on siliceous substrata at about 1200 m a.s.l., within the sub-humid meso-terrestrial bioclimatic belt. Due to its floristic and ecological peculiarities, it is proposed as a new association, named *Coronopo squamati-Corrigioletum litoralis*.

   Geographical distribution: This association was surveyed near Argimusco in the Peloritani chain.
LYTHRION TRIBRACTEATI Rivas Goday & Rivas-Martinez ex Rivas Goday 1970, Anales Inst. Bot. Cavanilles 27: 256.
Syn.: Lythron tribracteati Rivas Goday & Rivas-Mart. 1963, Est. Clas. Past. Espan.: 60 (3b).
Holotypus: Isolepido-Lythretum castellani Rivas Goday 1970
Characteristic species: Lythrum tribracteatum.

Structure and ecology: This alliance groups the ephemeral, hygrophilous plant communities occurring in wetlands with a long flooding period, having a summer-autumnal optimum. They are linked to silty-clay soils submerged by eutrophic waters, sometimes weakly brackish.

Geographical distribution: This alliance is distributed in the West Mediterranean territory and in Sicily, it occurs in the southern part of the Island (Figure 12).

30. Damasonio bourgaei-Crypsietum aculeatae Rivas-Martinez & Costa in Rivas-Martinez et al. 1980 corr. V. Silva & J.C. Costa in Costa et al. 2012, Glob. Geobot. 2: 7 (Appendix B, Table A31).
Syn.: Damasonio alismae-Crypsietum aculeatae Rivas-Martinez & Costa in Rivas-Martinez et al. 1980, Lazaroa 2: 31; Cresso creticae-Damasonietum bourgaei Sciandrello 2007, Infor. Bot. Ital., 39 (1): 132.
Holotypus: rel. 3, Tab. 15, Rivas-Martinez et al. [145]
Characteristic species: Cressa cretica, Damasonium bourgaei.

Structure and ecology: This association is localized on flat surfaces with clayey-sandy soils, subject to long periods of submersion. It has its maximum expression in the summer-autumn period, when the soil, which is still quite humid, is no longer submerged. It is a hygrophilous vegetation dominated by therophytes with a prostrate or prostrate-ascending habit, including, in particular, Damasonium bourgaei, Sporobolus aculeatus, Heliotropium supinum, Coronopus squamatus, Euphorbia chamaesyce, Paspalum disticum, etc. The occurrence of Cressa cretica is here even more significant since it highlights the halo-nitrophilous requirements of this association. This association was first described by Rivas-Martinez et al. [145] as Damasonio alismae-Crypsietum aculeatae, whose name was later corrected by Costa et al. [111] since Damasonium bourgaei was misidentified as D. alisma. Among the synonyms of this association the Cresso creticae-Damasonietum bourgaei, described by Sciandrello [90] from southern Sicily, must be mentioned too. Previously this association was included in Helochloion or in the Verbenion supinae.

Geographical distribution: From literature data [90] and unpublished relevés, this association in Sicily is localized in the Gela territory. It is also recorded in the Iberian Peninsula [111,145] and Tunisia [146] (Figures 3D, 4E and 5M).

31. Ranunculo trilobi-Lythretum tribracteati Brullo & Sciandrello ass. nova hoc loco (Appendix B, Table A32).
Holotypus: rel. 3, hoc loco.
Characteristic species: Ranunculus trilobus

Structure and ecology: The association was surveyed on small marshy surfaces within communities dominated by helophytes belonging to the Phragmito-Magnocaricetea. It prefers sandy-loamy soils submerged by slightly salty waters during the winter-spring period while remaining humid during the summer. Floristically this vegetation is characterized by therophytes with erect or prostrate habits, among these can be quoted Ranunculus trilobus, usually associated with Lythrum tribracteatum, which highlights the sub-halophilous character of this vegetation. Other hydrophytes of Isoëto-Nanojuncetea are also frequent, such as Lythrum hyssopifolia, Coronopus squamatus, Damasonium bourgaei, Pulicaria sicula, Hordeum marinum, Schenkia spicata, Mentha pulegium, Polypogon subspathaceus, etc. It is proposed as a new association, named Ranunculo trilobi-Lythretum tribracteati.

Geographical distribution: This association is quite rare and occurs only in some salt marshes near Gela (southern Sicily) (Figure 5L).
32. *Pulicario graecae-Damasonietum bourgaei* Minissale, Santo & Sciandrello 2011, Fitosociologia 48 (2): 81 (Appendix B, Table A33).

- **Holotypus**: rel. 2, Tab. 3, Minissale et al. [92].
- **Characteristic species**: *Pulicaria vulgaris* var. *graeca*

**Structure and ecology:** The association was described by Minissale et al. [92], from a locality near the rocky coast, in correspondence with a small temporary pond, drying up during the summer period. It is limited to a depression within a calcareous outcrop covered by a layer of sandy-clayey soil. Floristically, it is characterized by hygrophilous therophytes with a predominant creeping habit, dominated by *Pulicaria vulgaris* var. *graeca* and *Damasonium bourgaei*. Other species linked to wet habitats, even if rather sporadically, occur, such as *Heliotropium supinum*, *Polypogon subspathaceus*, *Lythrum tribracteatum*, *Coronopus squamatus*, etc. It shows some floristic relationships with *Damasonio bourgaei-Crypsietum aculeatae*, from which it differs substantially in its ecological requirements since the latter association is localized on wide clayey surfaces and shows a more marked halophilous character.

**Geographical distribution:** This association was surveyed on a stand of the calcareous coast of the Maddalena peninsula near Syracuse. Plant communities referable to this association, but floristically impoverished, were observed in other coastal places from Sicily.

### 3. Materials and Methods

#### 3.1. Dataset

The study was carried out over a period of about 50 years with phytosociological investigations in the field and also using the numerous literature data which have been published in the meantime. The present study is based on 394 phytosociological relevés made following the method of Braun Blanquet [147], of which 215 are from literature data and 179 unpublished data (Appendix B). The relevés were carried out in several Sicilian natural areas: the Simeto river (Catania), Capo Murro di Porco and Archeological ruins of Syracuse, Piana del Signore marshes (Gela), Hyblean Plateau, Monte Lauro, the surroundings of Trapani and Palermo, Madonie, Gurrida lake, Nebrodi, Peloritani, etc. The nomenclature of the surveyed syntaxa follows the 4th edition of the International Code of Phytosociological Nomenclature (ICPN, [117]), while the syntaxonomical arrangement follows Brullo and Minissale [39], Rivas Martinez et al. [109], Brullo et al. [148], Biondi et al. [113], and Mucina et al. [114].

#### 3.2. Floristic Nomenclature

As concerns the floristic nomenclature and life-forms, we have followed Pignatti [149–152] and the Portal to the Flora of Italy [153]. The checklist of the species occurring in the phytosociological relevés is reported in Appendix A. Chorological types follow Brullo et al. [154].

#### 3.3. Data Analysis

In order to verify the syntaxonomical relations among the surveyed plant communities, some relevés (up to five based on availability) were selected and the cover-abundance values (following the scale of Braun-Blanquet [147]) were transformed according to the method proposed by van Der Maarel [155]. Thus, a matrix of 143 relevés × 158 species was selected from the original data-set and subjected to multivariate analysis, after removing species with a frequency lower than 1%. Hierarchical clustering on the final matrix was performed by using flexible beta linkage, with the Bray-Curtis coefficient. Beta was set at −0.25 so that flexible beta clustering became a space-conserving method [156]. To determine the optimal number of clusters, we used the “Optimclass 1” method (*p* < 10-6) [157], applying the function “Crispness of Classification” to each data set partition. For the ordination analyses, we carried out a Detrended Correspondence Analysis (DCA) according to the Hill & Gauch [158] approach. Hierarchical clustering and ordination analysis were run by PCOrd version 6.08. Optimclass and Crispness of Classification were performed by the software JUICE [159].
4. Conclusions

Our survey allowed us to highlight the great diversity of the plant communities belonging to the Isoëto Nanojuncetea class occurring in Sicily in many different environments, such as small rocky pools, large ponds, or the banks of artificial basins. In Sicily, they are mainly found on carbonatic, volcanic, siliceous, or clayey substrata. Although we do not have a detailed mapping, on the basis of our expert-based we can affirm that most of the detected plant communities fall into protected areas, such as regional parks, nature reserves and Natura 2000 sites, but this is not enough to guarantee their real protection, because their existence depends above all on good land management and often on a delicate balance between grazing and agro-silvopastoral activities [160]. All the plant communities of Isoëto-Nanojuncetea treated here, due to their attribution to Mediterranean temporary ponds, can be referred to as the habitats of priority interest codified as 3170* according to the Annex II of the Habitat Directive (92/43/EEC), whereby they require rigorous protection by the States of the European Union [1]. The criticality of this type of habitat, being temporary ponds, is above all linked to the fact that in many cases they are limited to small surfaces, apart from having a very fragmented distribution. All this tends to make them not very visible and does not give them sufficient importance, therefore, they are usually neglected. Overall, they are quite vulnerable, even to involuntary destruction [161,162], or to changes in land use, which together can contribute to the disappearance or alteration of these relevant micro-habitats [163]. Another problem with the protection and management of these habitats is that in many cases, covering very small surfaces, they escape the cartographic surveys of vegetation on a regional scale, which happened in Sicily [164,165]. Even in the inventories of wetlands on a regional or national scale, Mediterranean temporary ponds are largely under-represented, thus limiting the possibilities of protection and correct management [166]. It is, therefore, understood that there is a need to intensify regional field surveys in order to have a better awareness of the real distribution of this habitat. It is to be hoped that in the future these results will stimulate adequate research and management policies on these Mediterranean temporary ponds and their conservation. Unfortunately, this cannot be separated from effective and coordinated governance at the national level, based on multiple spatial scales ranging from land-use policies to the management of protected areas, agricultural areas, and so on [167].

Author Contributions: Conceptualization, S.B., S.S.; methodology, S.B., S.S., G.G.d.G., P.M.; investigation, S.B., C.B., S.S., G.T., S.C., V.T., G.G.d.G., P.M.; data curation, C.B., G.T., S.C., V.T.; writing—original draft preparation, S.B., S.S., G.T., V.T.; writing—review and editing, S.B., C.B., S.S., G.T., S.C., V.I., G.G.d.G., P.M. All authors have read and agreed to the published version of the manuscript.

Funding: This research was financially supported by the research programme (PIA.CE.RI. 2020-2022 Line 2 cod. 22722132149 and Line 3 Starting Grant Progetto HAB-VEG cod. 22722132172) funded by the University of Catania and by Convention with PIM in the frame of the project MedIsWet funded by MAVA Foundation.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: Not applicable.

Conflicts of Interest: The authors declare no conflict of interest.
**Appendix A**

**Table A1.** Checklist of the taxa occurring in the phytosociological relevés with their life forms and chorotypes.

| Taxon                                           | Life Form | Chorotype          |
|------------------------------------------------|-----------|--------------------|
| Agrostis pourretii Willd.                      | T scap    | W Medit.           |
| Agrostis stolonifera L.                        | H rept    | Circumbor.         |
| Ajuga reptans L.                               | T scap    | W Medit.           |
| Allium obtusiflorum Redouté                    | G bulb    | End. Sic.          |
| Allium subhirsutum L.                          | G bulb    | Medit.             |
| Amaranthus deflexus L.                         | T scap    | Avv.               |
| Anagallis arvensis L.                          | T scap    | Paleo-temp.        |
| Anagallis minima (L.) E. H. L. Krause          | T scap    | Paleo-temp.        |
| Anthoxantum odoratum L.                        | T scap    | W Medit.           |
| Anthus arvensis L.                             | T scap    | Euro-Medit.        |
| Anthmis cotula L.                              | T scap    | Euro-Medit.        |
| Anthoxanthum odoratum L.                       | T scap    | Euro-Asiat.        |
| Antinoria insularis Parl.                      | T scap    | W Medit.           |
| Aphanes arvensis L.                            | T scap    | Subcosmop.         |
| Archidium alternifolium (Hedw.) Mitt.          | Bryo.     | Europ.             |
| Asteriscus aquaticus (L.) Less.                 | T scap    | Euro-Medit.        |
| Atriplex patula L.                             | T scap    | Circumbor.         |
| Atriplex prostrata Boucher ex DC.              | T scap    | Circumbor.         |
| Barbearea bracteosa Guss.                      | T scap    | N Medit.           |
| Bellis annua L.                                | T scap    | Medit.             |
| Bellis perennis L.                             | H ros     | Euro-Asiat.        |
| Beta maritima L.                               | H ros     | Euro-Medit.        |
| Biscutella maritima Ten.                       | T scap    | End. Ital.         |
| Blackstonia acuminata (W.D.J. Koch et Ziz)    |           |                    |
| Blackstonia perfoliata (L.) Huds.              | T scap    | Euro-Medit.        |
| Bolboschoenus maritimus (L.) Palla             | G rhiz    | Cosmop.            |
| Briza maxima L.                                | T scap    | Paleotrop.         |
| Briza minor L.                                 | T scap    | Subcosmop.         |
| Bromus hordeaceus L.                           | T scap    | Subcosmop.         |
| Brynum alpinum Huds. ex With.                  | Bryo.     | Europ.             |
| Bulliarda vaillantii (Willd.) DC.              | T scap    | Euro-Medit.        |
| Callitrichia bruta Petagna                     | I rad     | Medit-Atl.         |
| Callitrichia palustris L.                      | I rad     | Circumbor.         |
| Callitrichia stagnalis Scop.                   | I rad     | Euro-Asiat.        |
| Callitrichia truncata Guss.                    | I rad     | Medit-Atl.         |
| Cardamine hirsuta L.                           | T scap    | Paleotrop.         |
| Cardamine occulta Hornem.                      | T scap    | Avv.               |
| Carex distachya Desf.                          | T scap    | C Medit.           |
| Carex divisa Huds.                             | T scap    | Medit.             |
| Carex leporina L.                              | T scap    | Paleotrop.         |
| Carex leporina L.                              | H caesp   | Paleotrop.         |
| Carex leporina L.                              | H caesp   | Euro-Asiat.        |
Table A1. Cont.

| Taxon                                      | Life Form | Chorotype         |
|--------------------------------------------|-----------|-------------------|
| Carex serrulata Biv. ex Spreng.            | H caesp   | Europ.            |
| Calabrosa aquatica (L.) P. Beauv.          | T scap    | Circumbor.        |
| Carex ericoides L.C. E. Hubb.              | T scap    | Medit-Atl.        |
| Centaurea arvensis (L.) Fritsch.           | T scap    | Paleotemp.        |
| Centaurea tenuiflorum (Hoffmanns. & Link)  | T scap    | Medit.            |
| Cerastium glomeratum Thuill.               | T scap    | Paleotemp.        |
| Cerastium semidecandrum L.                 | T scap    | Euro-Medit.       |
| Chamaemelum fuscatum (Brot.) Vasc.         | T scap    | W Medit.          |
| Chenopodium album L.                       | T scap    | Subcosmop.        |
| Chrozophora tinctoria (L.) A. Juss.        | T scap    | Medit-Iran-Turan. |
| Cicendia filiformis (L) Delarbre           | T scap    | Medit-Atl.        |
| Cichorium intybus L.                       | H scap    | Cosmop.           |
| Cichorium pumilum Jacq.                    | T scap    | Medit.            |
| Cirsium italicum DC.                       | T scap    | SE Europ.         |
| Coleocephalus myconiis (L.) Cass. ex Rchb. f. | T scap | Medit.            |
| Convolvulus arvensis L.                    | G rhiz    | Paleotemp.        |
| Convolvulus silvicatus Kit.                | H scap    | SE Europ.         |
| Conyza bonariensis L.                      | T scap    | Avv.              |
| Coronil repanda (Poir.) Guss.              | T scap    | W Medit.          |
| Coronopus squamosus (Forssk.) Asch.        | T rept    | Euro-Medit.       |
| Corrigiola litoralis L.                    | T rept    | Medit-Atl.        |
| Cressa cretica L.                          | T scap    | Subcosmop.        |
| Cynodon dactylon (L.) Pers.                | H rept    | Cosmop.           |
| Cynosurus cristatus L.                     | H caesp   | Europ.            |
| Cyperus distachyos All.                    | G rhiz    | Subcosmop.        |
| Cyperus floccosus L.                       | T caesp   | Subcosmop.        |
| Cyperus fuscus L.                          | T caesp   | Paleotemp.        |
| Cyperus richardii L.                       | T caesp   | Paleotemp.        |
| Cyperus rotundus L.                        | G rhiz    | Subcosmop.        |
| Damasonium bourgaei Coss.                  | I rad     | Medit-Atl.        |
| Damasonium polypermum Coss.                | I rad     | W Medit.          |
| Digitaria ciliaris (Retz.) Koeler          | T scap    | Tropical.         |
| Dittrichia viscosa (L.) Greuter            | H scap    | W Medit.          |
| Dysphania ambrosioides (L.) Mosyakin & Clements | T scap | Avv.              |
| Ecballium elaterium (L.) A. Rich.          | T scap    | Medit.            |
| Echinochloa crus-galli (L.) P. Beauv.      | T scap    | Subcosmop.        |
| Echium postulatum Sm.                      | T scap    | Europ.            |
| Elatine campylasperma Seub.                | I rad     | Medit.            |
| Elatine gussonei (Sommier) Brullo, Lanfr., Pavone & Ronisv. | I rad     | End. Lampedusa-Malta |
| Elatine macropoda Guss.                    | I rad     | Medit.            |
| Eleocharis nebrodensis Parl.               | G rhiz    | End. Sic.         |
| Eleocharis palustris (L.) Roem. et Schult. | G rhiz    | Subcosmop.        |
| Elymus repens (L.) Gould                   | G rhiz    | Circumbor.        |
| Epilobium parviflorum Schreb.              | T scap    | Paleotemp.        |
| Eryngium pusillum L.                       | H bienn   | S Medit.          |
| Euphorbia akenocarpa Guss.                 | T scap    | SW Medit.         |
| Euphorbia chamaesyce L.                    | T rept    | Euro-Medit.       |
| Euphorbia exigua L.                        | T scap    | Euro-Medit.       |
| Euphorbia pterococca Brot.                 | T scap    | Medit.            |
| Festuca geniculata (L.) Lag. & Rodr.       | T scap    | Medit-Atl.        |
| Filago pyramidalis L.                      | T scap    | Euro-.Asiat.      |
| Frankenia hirsuta L.                       | Ch suffr  | Medit.            |
| Galium debile Desv.                        | H scap    | Medit.            |
| Galium elongatum C. Presl.                 | H scap    | Euro-Medit.       |
| Taxon                                                                 | Life Form | Chorotype             |
|----------------------------------------------------------------------|-----------|-----------------------|
| Galium murale (L.) All.                                              | T scap    | Medit.                |
| Gaudinia fragilis (L.) P. Beauv.                                     | T scap    | Euro-Medit.           |
| Geranium dissectum L.                                                | T scap    | Euro-Medit.           |
| Geranium robertianum L.                                              | T scap    | Circumbor.            |
| Glehnia segetum (L.) Fourn.                                          | T scap    | Euro-Medit.           |
| Glirinia lotoides L.                                                 | T scap    | Paleotrop.            |
| Glyceria notata Chevall.                                             | I rad     | Subcosmop.            |
| Glyceria spicata Guss.                                               | I rad     | W Medit.              |
| Gniaphalium uliginosum L. var. prostratum                            |           |                       |
| Huet                                                                | T scap    | End. Ital.            |
| Heliotropium curassavicium L.                                         | Ch suffr  | Avv.                  |
| Heliotropium europaeum L.                                            | T scap    | Medit-Iran-Turan.     |
| Heliotropium supinum L.                                              | T scap    | Paleotrop.            |
| Helminthotheca echioides (L.) Holub                                 | T scap    | Euro-Medit.           |
| Helosciadium inundatum (L.) W.D.J.Koch                               | I rad     | Medit-Atl.            |
| Helosciadium nodiflorum (L.) W.D.J.Koch                              | H scap    | Euro-Medit.           |
| Hordeum geniculatum All.                                             | T scap    | Euro-Medit.           |
| Hordeum marinum Huds.                                                | T scap    | Medit-Atl.            |
| Hypericum hircinum L. subsp. majus (Aiton) N. Robson                 | NP        | Medit.                |
| Hypericum pubescens Boiss.                                           | H scap    | W Medit.              |
| Hypochaeris radicata L.                                              | H ros     | Euro-Medit.           |
| Hypochaeris achyrophorus L.                                          | T scap    | Medit.                |
| Isoëtes durieui Bory                                                | G bulb    | W Medit.              |
| Isoëtes histrix Bory                                                | G bulb    | Medit-Atl.            |
| Isoëtes longissima Bory                                             | G bulb    | W Medit.              |
| Isoëtes sicula Tod.                                                 | G bulb    | CE Medit.             |
| Isoëtes todaroana Troia & Raimondo                                  | G bulb    | Medit.                |
| Isolepis cernua (Vahl) Roem. & Schult.                              | T scap    | Subcosmop.            |
| Juncus articulatus L.                                               | G rhiz    | Circumbor.            |
| Juncus baciflorus L.                                                | T scap    | Cosmop.               |
| Juncus capitatus Weigel                                              | T scap    | Euro-Medit.           |
| Juncus compressus Jacq.                                              | G rhiz    | Euro.-Asiat.          |
| Juncus foetidus Desf.                                               | T scap    | W Medit.              |
| Juncus hybridus Brot.                                               | T scap    | Medit-Atl.            |
| Juncus maritimus Lam.                                                | G rhiz    | Subcosmop.            |
| Juncus pygmaeus Rich.                                               | T scap    | Medit-Atl.            |
| Juncus subulatus Forsk.                                              | G rhiz    | S Medit.              |
| Kickxia cirrhosa (L.) Fritsch.                                      | T scap    | Medit.                |
| Kickxia spuria (L.) Dumort. subsp. integrifolia (Brot.) R. Fern.     | T scap    | Euro.-Asiat.          |
| Laphangium luteo-album (L.) Tzvelev                                  | T scap    | Subcosmop.            |
| Limonium narbonense Mill.                                            | H ros     | Medit.                |
| Linum bienne Mill.                                                  | T scap    | Medit-Atl.            |
| Logfia gallica (L.) Cosson & Germ.                                   | T scap    | Medit.                |
| Lolium perenne L.                                                   | H caesp   | Euro-Medit.           |
| Lotus angustissimus L.                                               | T scap    | Euro-Medit.           |
| Lotus conimbricensis Brot.                                           | T scap    | Medit.                |
| Lotus hispidus DC.                                                  | T scap    | Medit-Atl.            |
| Lotus parviflorus Desf.                                             | T scap    | Medit.                |
| Lotus preslii Ten.                                                  | H scap    | Euro-Medit.           |
| Lotus tetragonolobus L.                                              | T scap    | Medit.                |
| Lythrum hyssopifolia L.                                              | T scap    | Subcosmop.            |
| Lythrum junceum Banks & Sol.                                        | H scap    | Medit.                |
| Lythrum trichogalum Spreng.                                          | T scap    | Euro-Medit.           |
| Malva sylvestris L.                                                 | T scap    | Euro-Medit.           |
| Medicago ciliaris (L.) All.                                          | T scap    | S Medit.              |
| Medicago dolata Carmign.                                            | T scap    | Medit.                |
Table A1. Cont.

| Taxon                                         | Life Form | Chorotype                        |
|-----------------------------------------------|-----------|----------------------------------|
| Medicago intertexta (L.) Mill.                | T scap    | Medit.                           |
| Medicago polymorpha L.                        | T scap    | Medit-Iran-Turan.                |
| Medicago turbinata (L.) All.                  | T scap    | Euro-Medit.                      |
| Mentha pulegium L.                            | H scap    | Euro-Medit.                      |
| Mentha suaveolens Ehrh.                       | H scap    | Euro-Medit.                      |
| Middendorfia borystenica (Schrank) Trautv.    | T scap    | Euro-Medit.                      |
| Moenchia erecta (L.) G. Gaertn., B. Mey. & Scherb. | T scap    | Medit-Atl.                       |
| Malomeriella minuta (L.) Rouy.                | T scap    | Medit.                           |
| Montia arvensis Wallr.                        | I rad     | Medit-Atl.                       |
| Moraea sisyrinchium (L.) Ker Gawl.            | G bulb    | Medit-Iran-Turan.                |
| Myosotis congesta Shuttlew ex Albert & Reyn   | T scap    | Medit.                           |
| Myosotis ramosissima Rochel                   | T scap    | Euro.-Asiat.                     |
| Myosotis sicula Guss.                         | T scap    | N Medit.                         |
| Myosotis tineo C. Brullo & Brullo             | T scap    | End. Sic.                        |
| Myosurus minimus L.                           | T scap    | Subcosmop.                       |
| Nasturtium officinale W.T. Aiton              | H scap    | Cosmop.                          |
| Oenanthe fistulosa L.                         | H scap    | Euro.-Asiat.                     |
| Oenanthe globulosa L.                         | H scap    | Medit.                           |
| Oenanthe pimpinelloides L.                    | H scap    | Medit-Atl.                       |
| Ophioglossum lusitanicum L.                   | T scap    | Paleotemp.                       |
| Ornithogalum gussonei Ten.                    | G bulb    | E Medit.                         |
| Oxypopsis chenopodioides (L.) S.Fuentes, Uotila & Borsch | T scap | Subcosmop.                       |
| Oxypopsis rubra (L.) S. Fuentes, Uotila & Borsch | T scap | Circumbor.                       |
| Parapholis cylindrica (Willd.) Romero Zarco   | T scap    | Euro-Medit.                      |
| Parapholis incurva (L.) C.E.Hubb.             | T scap    | Medit-Atl.                       |
| Parenthecilla latifolia (L.) Caruel           | T scap    | Euro-Medit.                      |
| Paronychia echinulata Chater                  | T scap    | Medit.                           |
| Paspalum distichum L.                         | G rhiz    | Subcosmop.                       |
| Persicaria lapathifolia (L.) Delarbre          | T scap    | Circumbor.                       |
| Persicaria maculosa Gray                      | T scap    | Subcosmop.                       |
| Phalaris minor Retz.                          | T scap    | Paleotrop.                       |
| Phragmites australis (Cav.) Trin. ex Steud.   | G rhiz    | Subcosmop.                       |
| Phyla nodiflora (L.) Greene                   | H rept    | Tropical.                        |
| Pilularia minuta Durieu                       | I rad     | Medit.                           |
| Plantago afa L.                                | T scap    | Medit-Iran-Turan.                |
| Plantago bellardii All.                       | T scap    | Medit.                           |
| Plantago coronopus L.                         | T scap    | Euro-Medit.                      |
| Plantago cupanii Guss.                        | H ros     | SW Medit.                        |
| Plantago intermedia Glib.                    | H ros     | Euro-Medit.                      |
| Plantago laeopus L.                           | T scap    | Medit-Iran-Turan.                |
| Plantago lanceolata L.                        | T scap    | Euro.-Asiat.                     |
| Plantago major L.                             | H ros     | Paleotemp.                       |
| Pleurocheta squarrosa (Brid.) Lindb.          | Bry.      | Medit.-Atl.                      |
| Poa annua L.                                  | T scap    | Cosmop.                          |
| Poa bulbosa L.                                | H caesp   | Paleotemp.                       |
| Poa congesta Kunth                            | T scap    | Euro-Medit.                      |
| Podospermum canum C.A. Mey.                   | H scap    | Euro.-Asiat.                     |
| Polygonum arenasrium Boreu                    | T rept    | Subcosmop.                       |
| Polygonum aviculare L.                        | T rept    | Cosmop.                          |
| Polygonum maritimus Wild.                     | T scap    | Medit-Iran-Turan.                |
| Polygonon monspeliensis (L.) Desf.            | T scap    | Paleotrop.                       |
| Polygonon subspathaceus Req.                  | T scap    | Medit.                           |
| Polygonon viridis (Gouan) Breistr.             | H caesp   | Paleotrop.                       |
| Portulaca oleracea L.                         | T scap    | Subcosmop.                       |
| Taxon                                             | Life Form | Chorotype           |
|--------------------------------------------------|-----------|---------------------|
| Potentilla reptans L.                             | H rept    | Paleotemp.          |
| Prunella vulgaris L.                              | H scap    | Circumbor.          |
| Pulicaria dysenterica (L.) Bernh.                | H scap    | Euro-Medit.         |
| Pulicaria odora (L.) Rchb.                       | H scap    | Euro-Medit.         |
| Pulicaria sicula (L.) Moris                      | T scap    | Medit.              |
| Pulicaria vulgaris Gaertn. var. graeca           | T scap    | S Medit.            |
| Pulicaria vulgaris Gaertn. var. vulgaris         | T scap    | Paleotemp.          |
| Radiola linoides Roth.                           | T scap    | Paleotemp.          |
| Ranunculus angulatus C. Presl                    | H scap    | End. Sic.           |
| Ranunculus lanuginosus L.                        | H scap    | Euro.               |
| Ranunculus lateriflorus DC.                      | T scap    | Paleotrop.          |
| Ranunculus marginatus d’Urv.                     | T scap    | E Medit.            |
| Ranunculus muricatus L.                          | T scap    | Euro-Medit.         |
| Ranunculus ophioglossifolius Vill.               | T scap    | Euro-Medit.         |
| Ranunculus paludosus Poir.                       | H scap    | Medit-Iran-Turan.   |
| Ranunculus parviflorus L.                        | T scap    | Medit-Atl.          |
| Ranunculus peltatus Schrank                      | I rad     | Europ.              |
| Ranunculus pratensis C. Presl                    | H scap    | End. Sard. Sic.     |
| Ranunculus saniculifolius Viv.                   | I rad     | Medit.              |
| Ranunculus sardous Crantz                       | T scap    | Euro-Medit.         |
| Ranunculus trilobus Desf.                        | T scap    | Medit.              |
| Romulea ramiflora Ten.                           | G bulb    | Medit.              |
| Rostraria hispida (Savi) Doğan                   | T scap    | Medit.              |
| Rumex conglomeratus Murray                       | H scap    | Euro.-Asiat.        |
| Rumex pulcher L.                                 | H scap    | Euro-Medit.         |
| Sagina apetala Ard.                              | T scap    | Euro-Medit.         |
| Sagina subulata (Sv.) C. Presl                   | H caesp   | Euro-Medit.         |
| Samolus valerandi L.                             | H scap    | Subcosmop.          |
| Saxifraga tridactylites L.                       | T scap    | Medit-Atl.          |
| Schenkiia spicata (L.) G.Mans.                   | T scap    | Euro-Medit.         |
| Schoenoplectus tabernaemontani (C.C. Gmel.)      | G rhiz    | Euro.-Asiat.        |
| Palla                                            | G rhiz    | Euro-Medit.         |
| Scirpoidea holoschoenus (L.) Sojak                | G rhiz    | Euro-Medit.         |
| Scirpus maculatus L.                             | T scap    | S Medit.            |
| Scirpus muricatus L.                             | T scap    | Euro-Medit.         |
| Scorzoneraeoides muelleri (Sch. Bip.) Greuter & Talavera | T scap    | S Medit.            |
| Sedum caeruleum L.                               | T succ    | SW Medit.           |
| Sedum rubens L.                                  | T succ    | Medit-Atl.          |
| Senecio vulgaris L.                              | T scap    | Cosmop.             |
| Serapis lingua L.                                | G bulb    | Medit.              |
| Sherardia arvensis L.                            | T scap    | Euro-Medit.         |
| Silene gallica L.                                | T scap    | Euro-Medit.         |
| Sisymbrella dentata (L.) O.E. Schulz.            | T scap    | End. Sic.           |
| Solanum nigrum L.                                | T scap    | Euro.-Asiat.        |
| Solanopsis gastroannual (Tineo) Brullo            | T scap    | Medit.              |
| Solanopsis lauren tia C. Presl subsp.            | T scap    | End. Sic.           |
| Styelae Brullo et al.                            | T scap    | S Medit.            |
| Solanopsis mothiana C. Brullo, Brullo & Giusso   | T scap    | End. Sic.           |
| Sonchus asper (L.) Hill                          | T scap    | Euro.-Asiat.        |
| Sonchus oleraceus L.                             | T scap    | Subcosmop.          |
| Spergularia bocconei (Scheele) Graebn.           | T scap    | Subcosmop.          |
| Spergularia madonica (Lojac.                     | T scap    | End. Sic.           |
| Spergularia marina (L.) Besser                   | T scap    | Subcosmop.          |
| Spergularia rubra (L.) J. Presl & C. Presl.      | T scap    | Subcosmop.          |
| Taxon | Life Form | Chorotype     |
|-------|-----------|---------------|
| Sperobolus aculeatus (L.) P.M. Peterson | T scap | Paleotemp.   |
| Sperobolus alopecuroides (Filler & Mitterp.) | T scap | Paleotemp.   |
| P.M. Peterson | T scap | Medit-Iran-Turan. |
| Sperobolus schoenoides (L.) P.M. Peterson | T scap | Paleotemp.   |
| Stellaria media (L.) Vill. | T scap | Cosmop.   |
| Stoechadia spicata (Willd.) Moq. | T succ | Medit.   |
| Salvia coronaria (L.) Medik. | T scap | W Medit.   |
| Symphyotrichum squamatum (Spreng.) G.L. Nesom | H scap | Avv.   |
| Tamarix africana Poir. | P scap | W Medit.   |
| Tamarix gallica L. | P scap | W Medit.   |
| Teucrium campanulatum L. | H scap | W Medit.   |
| Tilaea alata Viv. | T succ | Paleotemp.   |
| Tilaea muscosa L. | T succ | Medit-Atl.   |
| Trifolium campestre Schreb. | T scap | Paleotemp.   |
| Trifolium fragiferum L. | T scap | Paleotemp.   |
| Trifolium grandiflorum Schreb. | T scap | E Medit.   |
| Trifolium lappaceum L. | T scap | Euro-Medit.   |
| Trifolium leucanthemum M. Bieb. | T scap | E Medit.   |
| Trifolium michelianum Savi | T scap | W Medit.   |
| Trifolium micranthum Viv. | T scap | Paleotemp.   |
| Trifolium nigrescens Viv. | T scap | Euro-Medit.   |
| Trifolium pratense L. | H rept | Subcosmop.   |
| Trifolium resupinatum L. | T scap | Paleotemp.   |
| Trifolium scabrum L. | T scap | Euro-Medit.   |
| Trifolium spamosum L. | T scap | Medit.   |
| Trifolium squarrosum L. | T scap | Medit.   |
| Trifolium strictum L. | T scap | Euro-Medit.   |
| Trifolium subtessellatum L. | T rept | Euro-Medit.   |
| Triglochin barrelieri Loisel. | G bulb | Medit.   |
| Triglochin laezflora Guss. | G bulb | W Medit.   |
| Trigonella sicula (Turra) Coulot & Rabaut | T scap | S Medit.   |
| Trigonella sulcata (Desf.) Coulot & Rabaut | T scap | S Medit.   |
| Trisetaria aurea (Ten.) Pignatti ex Kergucléen | T scap | E Medit.   |
| Tussilago farfara L. | G rhiz | Euro.-Asiat.   |
| Typha latifolia L. | G rhiz | Cosmop.   |
| Valantia muralis L. | T scap | Medit.   |
| Valerianella eriocarpa Desv. | T scap | Medit-Atl.   |
| Verbena officinalis L. | H scap | Subcosmop.   |
| Verbena supina L. | T scap | Euro-Medit.   |
| Veronica anagallis-aquatica L. | H scap | Cosmop.   |
| Veronica arvensis L. | T scap | Subcosmop.   |
| Veronica serpyllifolia L. | H scap | Circumbor.   |
| Visnaga daucoides Gaertn. | T scap | Medit-Iran-Turan.   |
| Warnstorflia fluitans (Hedw.) Loeske | Bry. | Cosmop.   |
| Xanthium italicum Moretti | T scap | S Europ.   |
| Xanthium spinosum L. | T scap | Avv.   |
## Appendix B

### Table A2. *Isoëtetum durieui* Br.-Bl. 1936.

| Relevé number | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---------------|---|---|---|---|---|---|---|---|---|----|
| Altitude (m)  | 127 | 127 | 80 | 80 | 80 | 80 | 80 | 35 | 35 | 35 |
| Surface (m²)  | 1 | 0.5 | 3 | 3 | 0.4 | 3 | 2 | 5 | 5 | 5 |
| Coverage (%)   | 80 | 100 | 80 | 80 | 95 | 90 | 90 | 90 | 90 | 80 |

| Char. Association and All. (ISOËTION) | | | | | | | | | | |
|---------------------------------------|---|---|---|---|---|---|---|---|---|---|
| Isoëtes durieui                       | 3 | 4 | 4 | 4 | 4 | 2 | 2 | 3 | 1 | 2 |
| *Lotus conimbricensis*                | . | . | + | + | 1 | . | . | . | . | 3 |
| *Ranunculus trilobus*                 | . | . | . | . | . | . | . | + | + | + |

| Char. Ord. (ISOËTETALIA) | | | | | | | | | | |
|--------------------------|---|---|---|---|---|---|---|---|---|---|
| *Lotus angustissimus*     | 1 | 1 | . | . | . | . | . | + | . | + |
| *Bulliarda vaillantii*    | . | . | . | . | . | . | . | . | 2 | 1 |
| *Ranunculus sanculifolius*| . | . | . | . | . | . | . | 1 | + | + |
| *Ranunculus lateriflorus* | . | . | . | . | . | . | . | . | 2 | 1 |
| *Trifolium micranthum*    | 1 | 1 | . | . | . | . | . | . | . | 2 |
| *Myosotis sicula*         | . | . | . | . | . | . | . | . | . | 1 |
| *Romulea ramiflora*       | . | . | . | . | . | . | . | + | . | 1 |

| Char. Class (ISOËTO-NANOJUNCETEA) | | | | | | | | | | |
|------------------------------------|---|---|---|---|---|---|---|---|---|---|
| *Mentha pulegium*                  | 3 | 2 | . | . | 3 | 3 | 3 | 2 | 1 | + |
| *Juncus capitatus*                 | 1 | . | 1 | + | 1 | 2 | 2 | . | . | 6 |
| *Juncus bufonius*                  | 1 | + | 1 | 1 | . | 1 | + | . | . | 6 |
| *Eryngium pusillum*                | . | . | . | . | . | . | . | . | 2 | 2 |
| *Coronopus squamatus*              | . | . | . | . | . | . | . | 1 | 2 | + |
| *Callitriche brutia*               | . | . | . | . | . | . | . | 1 | + | + |
| *Polygongon subspathaceus*         | . | . | . | . | . | . | . | 3 | 2 | 3 |
| *Pulicaria vulgaris var. vulgaris* | . | . | . | . | . | . | . | 2 | 1 | + |
| *Lythrum hyssopifolia*             | . | . | . | . | . | . | . | + | . | 1 |

| Other species | | | | | | | | | | |
|---------------|---|---|---|---|---|---|---|---|---|---|
| *Aira cupaniana*   | . | . | 1 | 1 | 1 | + | + | . | . | 5 |
| *Bellis perennis* | 2 | + | + | . | 1 | 1 | . | . | . | 5 |
| *Moenchia erecta* | . | . | + | + | . | + | + | . | + | 5 |
| *Prunella vulgaris* | + | + | + | + | . | + | . | . | . | 4 |
| *Carex divisa*     | . | . | . | . | . | . | + | 1 | + | 2 |
| *Hypecoearis radicata* | . | . | 1 | . | + | . | . | . | . | 3 |
| *Trifolium fragiferum* | . | . | . | . | . | . | + | + | + | 3 |
| *Linum bienne*     | . | . | + | + | . | . | . | + | . | 3 |
| *Glyceria notata*  | . | . | . | . | . | . | . | 2 | 3 | 1 |
| *Eleocharis palustris* | . | . | . | . | . | . | + | 1 | 1 | 3 |
| *Ranunculus laginosus* | . | . | . | . | + | + | . | . | . | 2 |
| *Bromus hordeaceus* | + | + | . | . | . | . | . | . | . | 2 |
| *Anagallis arvensis* | + | . | + | . | . | . | . | . | . | 2 |
| *Trifolium campestrae* | + | + | . | . | . | . | . | . | . | 2 |
| *Cynosurus cristatus* | 1 | . | . | + | . | . | . | . | . | 2 |
| *Vulpia geniculata* | + | + | . | . | . | . | . | . | . | 2 |
| *Trifolium scabrum* | 1 | + | . | . | . | . | . | . | . | 2 |
| *Potentilla reptans* | . | + | . | . | . | . | . | . | . | 1 |
| *Dittrichia viscosa* | . | . | + | . | . | . | . | . | . | 1 |
| *Trifolium nigrescens* | . | + | . | . | . | . | . | . | . | 1 |
| *Cerastium glutinatum* | . | + | . | . | . | . | . | . | . | 1 |
| *Pulicaria odora* | . | . | + | . | . | . | . | . | . | 1 |
| *Orchis sp.*         | . | . | + | . | . | . | . | . | . | 1 |
| *Ranunculus paludosus* | . | + | . | . | . | . | . | . | . | 1 |
| *Pulicaria dysenterica* | . | . | . | . | . | + | . | . | . | 1 |

Localities and dates of relevés. Rel. 1–2: Petralia, Pollicino Margio—20 June 1975; rel. 3–7: Piana degli Albanesi, Gorgo Dingoli, Marcenò & Trapani [85]—Table 1, rel. 1–3, 6–7; rel. 8–10: Cozzofico (Carlentini)—4 May 2009.
Table A3. *Pulicario graecae*-Isolepidetum cernuae Brullo & Di Martino 1974.

| Relevé number | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | Presences |
|---------------|---|---|---|---|---|---|---|---|---|-----|-----|-----------|
| Altitude (m)  | - | - | - | - | - | - | - | - | - | -   | -   |           |
| Surface (m²)  | 3 | 4 | 1 | 8 | 1 | 0.5| 2 | 3 | 3 | 5   | 2   |           |
| Coverage (%)  | 40| 90| 30| 50| 60| 60 | 70| 80| 70|     |     |           |

**Char. Association**

*Pulicaria vulgaris* var. *graeca* 1 1 1 + 2 1 + 2 1 10

*Damausium polygynum* 2 + 1 + 2 + 3 3 3 3 2 3 11

**Char. All. (ISOËTION) and Ord. (ISOËTETALIA)**

*Islepis cernua* 2 4 1 2 2 3 3 3 3 2 3 11

*Centaurium maritimum* + . + + + 1 + + + + + + + 10

*Middendorfia borystenica* . . . . . . . . . . 2 2 2

*Damausium bourgaei* . . . . . . . . . . + + 2

*Lotus hispidus* 1 . . . . . . + . . . . . 2

**Char. Class (ISOËTO-NANOJUNCETEA)**

*Lythrum hyssopifolia* 2 3 2 + 1 2 1 2 3 + 2 11

*Juncus capitatus* 1 + + + 2 1 + 1 1 + + 11

*Polygogon subspathaceus* 2 2 2 + 1 2 2 2 1 1 2 11

*Mentha pulegium* 1 . + 1 1 + + 2 . 1 + 9

*Spegularia rubra* . . + + 1 1 . . . . . 1 6

*Juncus bufonius* . . + . + . + 1 + . . 4

*Juncus pygmaeus* . . . . . . . . . . + + 1 + 4

*Gaudinia fragilis* + . . . . . + . . . . . 2

**Other species**

*Polypogon maritimus* + + + 2 2 1 + 1 2 2 2 11

*Juncus subulatus* . . . + . . + + . . . 3

*Callitriches palustris* . . . . . . . . . . 3 2 2

*Parapholis incurva* . + . . . . . . + . . 2

*Plantago coronopus* . + . . . . . . 1 . 2

*Bolboschoenus maritimus* . . . . + + . . . . . 2

*Centaurium erythraea* . . . . . . + . . . + 2

*Cressa cretica* . . . + . . + . . . . 2

*Coleostephus myconis* + . . . . . . . . . . 1

*Logia gallica* + . . . . . . . . . . 1

*Anagallis arvensis* + . . . . . . . . . . 1

*Frankenia hirsuta* . . . . . . . . . . . . . . 1

Localities and dates of relevés. Rel. 1–11: Isola Grande dello Stagnone (Marsala), Brullo & Di Martino [78]—Table 17.

Table A4. *Isoëto duriei-Ranunculetum parviflori* Brullo, Di Martino & Marcenò 1977.

| Relevé number | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | Presences |
|---------------|---|---|---|---|---|---|---|---|---|-----------|
| Altitude (dam) | 61| 61| 61| 61| 61| 61| 61| 61| 61|           |
| Surface (m²)  | 1 | 1 | 2 | 1 | 2 | 2 | 0.5| 0.5| 2 |           |
| Coverage (%)  | 100| 100| 80| 100| 70| 60| 90| 100| 100|           |

**Char. Association**

*Ranunculus parviflorus* 4 3 3 2 3 3 2 3 + 9

**Char. Subassociation**

*Callitriches brutia* . . . . . . . . . . . 4 1

**Char. All. (ISOËTION)**

*Isoëtes duriei* 3 2 3 4 2 2 1 3 + 9

*Ranunculus trilebus* 2 2 1 1 1 + + 1 1 9
### Table A4. Cont.

| Char. Ord. (ISOËTETALIA) | Ranunculus muricatus | 1 + 1 2 1 2 3 1 2 9 |
|--------------------------|----------------------|---------------------|
| Lotus angustissimus | . 1 + + + 1 + 1 + 8 |

**Char. Class (ISOËTO-NANOJUNCETEA)**

| Lythrum hyssopifolia | + + . + + + 2 + 1 8 |
|-----------------------|----------------------|
| Juncus bufonius | + + 1 + + . + + 1 8 |

**Mentha pulegium**

| . . . . + + 1 + 2 5 |

**Other species**

| Myosotis ramosissima | 1 1 + 1 + 1 1 + . 8 |
|-----------------------|----------------------|
| Geranium robertianum | + + + + + . + + 7 |
| Coleostephus myconis | . + . + + + 1 1 . 7 |
| Cardamine hirsuta | + + . . + + . + + 6 |
| Galium murale | . . . . 1 1 2 1 2 5 |
| Poa annua | 1 1 + 1 . . . . . 4 |
| Stellaria media | + 1 + + . . . . . 4 |
| Carex distachya | 1 + + 1 . . . . . 4 |
| Sherardia arvensis | + . . . + . + + . 4 |
| Trifolium nigrescens | . . . . + 1 + + . 4 |
| Cerastium semidecandrum | . . . . + 1 + + . 4 |
| Allium subhirsutum | + 1 1 . . . . . 3 |

Localities and dates of relevés. Rel. 1–9: Pantelleria Island, Brullo et al. [81]—Table 12.

### Table A5. Crassulo-Elatinetum gussonei Bartolo, Brullo, Minissale & Spampinato 1990.

| Relevé number | 1 2 3 4 5 6 7 8 9 |
|---------------|-------------------|
| Altitude (m)  | 20 20 25 22 30 20 20 30 30 |
| Surface (m²)  | 0.5 0.5 4 1 2 1 1 0.5 1 |
| Coverage (%)  | 50 20 50 60 70 80 70 80 50 |

**Char. Association**

| Elatine gussonei | 1 + 2 3 + 3 2 4 3 9 |

**Char. All. (ISOËTION) and Ord. (ISOËTETALIA)**

| Bulliarda vaillantii | 2 + 3 1 1 3 3 1 + 9 |

**Char. Class (ISOËTO-NANOJUNCETEA)**

| Lythrum hyssopifolia | 3 2 1 2 3 2 1 1 1 9 |
|-----------------------|----------------------|
| Juncus bufonius | . + + 1 2 1 2 1 . 7 |
| Polypogon subspathaceus | + . + 1 2 2 2 . . 6 |
| Spergularia rubra | . . + + 2 . . . . 3 |
| Poa annua | . . . . . . . . 1 . . 1 |

**Other species**

| Plantago coronopus | + 1 + 2 1 + 1 . . . 7 |
|--------------------|----------------------|
| Cichorium pumilum | . . . 1 + . . . . 2 |
| Bromus hordeaceus | . . . + 1 . . . . 2 |
| Parapholis incurva | 1 . . . . . . . . 1 |
| Asteriscus aquaticus | . . 1 . . . . . 1 |
| Triglochin barrelieri | . . . 1 . . . . 1 |
| Medicago polymorpha | . . . . + . . . . 1 |

Localities and dates of relevés. Rel. 1–9: Lampedusa Island, Bartolo et al. [88]—Table 25.
Table A6. *Lythrum hyssopifoliae-Elatinetum macropodae* Brullo, Sciandrello, Tavilla & Minissale ass. nov.

| Relevé number | Altitude (m) | Surface (m²) | Coverage (%) |
|---------------|-------------|--------------|--------------|
| 1             | 420         | 2            | 100          |
| 2             | 420         | 2            | 100          |
| 3             | 440         | 2            | 100          |
| 4             | 430         | 3            | 90           |
| 5             | 410         | 1            | 100          |
| 6             | 450         | 2            | 80           |
| 7             | 530         | 1            | 80           |
| 8             | 550         | 1            | 80           |
| 9             | 560         | 1            | 70           |
| 10            | 46          | 0.5          | 100          |
| 11            | 45          | 0.3          | 100          |
| 12            | 33          | 0.2          | 100          |
| 13            | 33          | 0.2          | 100          |
| 14            | 32          | 0.5          | 100          |
| 15            | 35          | 0.2          | 100          |
| 16            | 33          | 0.2          | 100          |
| 17            | 34          | 0.2          | 100          |
| 18            | 36          | 0.5          | 100          |
| 19            | 240         | 0.5          | 40           |
| 20            | 240         | 0.5          | 40           |
| 21            | 240         | 0.5          | 40           |
| 22            | 240         | 0.5          | 40           |
| 23            | 240         | 0.5          | 40           |
| 24            | 240         | 0.5          | 40           |
| 25            | 240         | 0.5          | 40           |

**Char. Association**

| Elatine macropoda |
|------------------|
| 1 2 1 + 2 2 5 3 2 | 3 5 5 3 4 4 3 5 5 5 5 |

**Char. Subassociation**

| Callitriche brutia |
|--------------------|
| + + + + + + + + + + + + | 1 1 2 2 1 |

**Char. All. (ISOÊTION) and Ord. (ISOÊTETALIA)**

| Buillardia vaillantii |
|----------------------|
| + + + + + + + + + + + + + + + + | 1 4 3 3 3 4 20 |

| Catabrosa aquatica |
|--------------------|
| + + + + + + + + + + + + + + + + | 1 1 1 1 1 1 1 |

| Romulea rampflora |
|--------------------|
| + + + + + + + + + + + + + + + + | 1 1 1 1 1 1 1 |

| Juncus bufonius |
|-----------------|
| 1 2 1 2 2 1 + 1 1 | 3 2 + 1 |

| Lythrum hyssopifolia |
|----------------------|
| 3 1 2 + 1 + 1 1 3 1 1 1 1 1 2 1 1 1 2 1 2 | 1 1 2 1 |

| Poa infirma |
|-------------|
| 1 + 1 + 1 + 1 2 | 3 9 |

| Mentha pulegium |
|-----------------|
| 2 + 2 2 1 1 | 1 1 1 1 1 1 1 |

| Spergularia rubra |
|-------------------|
| + 1 + 1 + + + + + | 1 1 1 1 1 |

| Polypogon subspathaceus |
|-------------------------|
| 1 + + + + + + + + + + + + + + | 3 1 |

| Gaudinia fragilis |
|-------------------|
| 1 + + 1 1 1 | 1 1 |

| Juncus folosus |
|----------------|
| + + + + + + + + + + + + + + + + | 1 1 1 |

**Char. Class (ISOÊTO-NANOJUNCETEA)**

| Juncus bufonius |
|-----------------|
| 1 2 1 2 2 1 + 1 1 | 3 2 + 1 |

| Lythrum hyssopifolia |
|----------------------|
| 3 1 2 + 1 + 1 1 3 1 1 1 1 1 2 1 1 1 2 1 2 | 1 1 2 1 |

| Poa infirma |
|-------------|
| 1 + 1 + 1 + 1 2 | 3 9 |

| Mentha pulegium |
|-----------------|
| 2 + 2 2 1 1 | 1 1 1 1 1 1 1 1 |

| Spergularia rubra |
|-------------------|
| + 1 + 1 + + + + + | 1 1 1 1 1 |

| Polypogon subspathaceus |
|-------------------------|
| 1 + + + + + + + + + + + + + + | 3 1 |

| Gaudinia fragilis |
|-------------------|
| 1 + + 1 1 1 | 1 1 |

| Juncus folosus |
|----------------|
| + + + + + + + + + + + + + + + + | 1 1 1 |

**Other species**

| Trifolium resupinatum |
|-----------------------|
| + + + + + + + + + + + + + + + + | 1 1 1 |

| Chamaemelum fuscatum |
|----------------------|
| + + + + + + + + + + + + + + + + | 1 1 1 |

| Parapholis cylicandra |
|-----------------------|
| + + + + + + + + + + + + + + + + | 1 1 1 |

| Ceraustium glomeratum |
|-----------------------|
| + + + + + + + + + + + + + | 1 1 1 |

| Persicaria lapathifolia |
|-------------------------|
| + + + + + + + + + + + + + | 1 1 1 |

| Lythrum junceum |
|-----------------|
| 1 + 1 + + + + + + + + + + + + + + | 3 3 3 3 3 3 3 |

| Glyceria spicata |
|-----------------|
| 1 + + + + + + + + + + + + + + + + | 3 3 3 3 3 3 3 |

| Sedum rubens |
|--------------|
| + + + + + + + + + + + + + + + + | 3 3 3 3 3 3 3 |

| Persicaria lapathifolia |
|-------------------------|
| + + + + + + + + + + + + + | 1 1 1 |

| Callitriche truncata |
|----------------------|
| + + + + + + + + + + + + + | 1 1 1 1 1 1 |

| Eleocharis palustris |
|----------------------|
| + + + + + + + + + + + + + | 1 1 1 |

| Eleocharis palustris |
|----------------------|
| + + + + + + + + + + + + + | 1 1 1 |

| Eleocharis palustris |
|----------------------|
| + + + + + + + + + + + + + | 1 1 1 |

| Eleocharis palustris |
|----------------------|
| + + + + + + + + + + + + + | 1 1 1 |

| Eleocharis palustris |
|----------------------|
| + + + + + + + + + + + + + | 1 1 1 |

| Eleocharis palustris |
|----------------------|
| + + + + + + + + + + + + + | 1 1 1 |

| Eleocharis palustris |
|----------------------|
| + + + + + + + + + + + + + | 1 1 1 |

| Eleocharis palustris |
|----------------------|
| + + + + + + + + + + + + + | 1 1 1 |
### Table A6. Cont.

| Species                  | Modica plateau | Ragusa plateau | Syracuse, Minissale & Sciandrello | Cava Grande (Rosolini) |
|--------------------------|----------------|----------------|-----------------------------------|-----------------------|
| Plantago coronopus       |                |                |                                   | 1                     |
| Catapodium rigidum       |                |                |                                   | 1                     |
| Polygonum aviculare      |                |                |                                   | 1                     |
| Symphyotrichum squamatum |                |                |                                   | 1                     |

**Localities and dates of relevés.** Rel. 1–6: Modica plateau—21 April 1984; rel. 7–9: Ragusa plateau—12 May 1977; rel. 10–20: Syracuse, Minissale & Sciandrello [93]—Table S2, rel. 15, 23, 25-28, 32, 36, 43, 45, 50; rel. 21–25: Cava Grande (Rosolini)—28 March 2013.
| Table A7. Bulliardo-Elatinetum campylospermae Brullo, Sciandrello, Minissale, Cambria, Ilardi & Giusso ass. nov. |
|---------------------------------------------------------------|
| **Relevé number** | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| **Altitude (m)**  | 20 | 20 | 25 | 30 | 30 | 25 | 4 | 4 | 92 | 140 | 153 | 4 | 4 | 80 | 80 |
| **Surface (m²)**  | 1 | 1 | 1 | 1 | 1 | 1 | 0.5 | 0.5 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| **Coverage (%)**  | 80 | 90 | 70 | 90 | 40 | 60 | 40 | 30 | 100 | 90 | 70 | 80 | 90 | 60 | 80 |

| **Char. Association** |
|-----------------------|
| *Elatine campylosperma* |

| **Char. All. (ISOËTION) and Ord.** |
|-----------------------------------|
| *Bulliarda vaillantii* |

| **Char. Class** |
|----------------|
| *ISOËTO-NANOJUNCETEA* |

| **Other species** |
|-------------------|
| *Plantago coronopus* |

| Localities and dates of relevés. Rel. 1–6: Favignana (Aegadian Islands)—14 April 1973; rel. 7–8: Isola Grande dello Stagnone (Marsala)—24 April 1994; rel. 9–11: Castello della Pietra (Castelvetrano), Pasta et al. [128]—Table 7; rel. 12–13: Isola Lunga dello Stagnone—28 March 2010; rel. 14–15: Trapani Vallone della Pietra—1 April 2021. |

| Table A8. Isoëtetum todaroanae Brullo & Ilardi ass. nova. |
|----------------------------------------------------------|
| **Relevé number** | 1 | 2 | 3 | 4 | 5 |
| **Altitude (m)**  | 60 | 60 | 60 | 60 | 60 |
| **Surface (m²)**  | 2 | 2 | 3 | 1 | 2 |
| **Coverage (%)**  | 90 | 90 | 80 | 90 | 80 |

| **Char. Association** |
|-----------------------|
| * Isoëtes todaroana |

| **Char. All. (ISOËTION) and Ord. (ISOËTETALIA)** |
|-----------------------------------------------|
| *Triglochin laxiflora* |

| **Char. Class (ISOËTO-NANOJUNCETEA)** |
|--------------------------------------|
| *Plantago coronopus* |
### Table A8. Cont.

Other species

| Species                   | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
|---------------------------|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|
| Carex serrulata           | 1 | 1 | + | 1 | + | 5 |
| Bolboschoenus maritimus   | 1 | 2 | + | 1 | 1 | 5 |
| Blackstonia acuminata     | 1 | 1 | + | 1 | + | 5 |
| Linum bienne              | 2 | 1 | 1 | 2 | 2 | 5 |
| Eleocharis palustris      | + | + | . | . | + | 3 |
| Oenanthe pimpinelloides   | . | + | + | . | . | 2 |

Localities and dates of relevés. Rel. 1–5: Contrada Critazzo (Mazara del Vallo)—4 April 2013.

### Table A9. Isoëto velatae - Crassuletum vaillantii Poiron & Barbero 1965.

| Char. Association | Presence | Char. Subassociation | Presence | Char. All. (PRESLION CERVINAE) | Presence | Char. Ord. (ISOËTETALIA) | Presence | Char. Class (ISOËTO-NANOJUNCETEA) | Presence |
|-------------------|----------|----------------------|----------|-------------------------------|----------|--------------------------|----------|----------------------------------|----------|
| Lythrum hyssopifolia | 1 1 1 1 | + 1 1 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 3 | 1 | 1 | 16 |
| Poa annua         | 1 1 . 1 | 2 1 1 1 | 2 | 2 | 3 | 2 | 2 | 3 | 1 | 14 |
| Juncus hybrida    | 1 1 . + | 2 1 2 1 | 1 | 1 | 1 | 2 | 1 | 1 | 2 | 14 |
| Mentha pulegium   | . . . 1 | 1 1 1 1 | . . | 1 | 2 | 2 | 1 | 2 | 11 |
| Juncus pygmaeus   | . . . . | 1 1 1 1 | . . | 1 | + | + | 1 | 9 |
| Romulea ramiflora | . . . . | 1 1 1 | . . | 1 | 2 | 2 | 1 | 2 | 14 |
| Eryngium pusillum | 1 1 . 1 | 1 | 1 | 1 | 1 | . . . | 6 |
| Archidium alternifolium | . . . . | 2 2 1 | 1 | 1 | 1 | 1 | 1 | 6 |
| Juncus capitatus   | . . . . | 1 | + | + | + + + | 6 |
| Lotus parviflorus  | . . . . | 1 | 2 | 1 | 1 | . | 4 |
| Pulicaria vulgaris var. vulgaris | . . . . | 1 + | + | . . . | 3 |
| Isolepis cernua    | . . . . | + | + | . . . | 1 | 2 |
| Briza minor        | . . . . | . | . | . | . | 1 | 1 |

Other species

| Species                    | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Presence |Present
Table A9. Cont.

| Plant                  | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence |
|------------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| Montia arvensis        | 2        | 1        | 1        | 3        |          |          |          |          |          |          |          |          |          |
| Carex sp.              |          |          |          |          | +        | 1        |          |          |          |          |          |          |          |
| Cardamine occulta      |          |          |          |          | 3        | 2        |          |          |          |          |          |          |          |
| Plantago lagopus       |          |          | +        |          |          |          |          |          |          |          |          |          |          |
| Cerastium glomeratum   |          |          |          |          |          |          |          |          |          |          |          |          | 1        |
| Vulpia sp.             |          |          |          |          |          |          |          |          |          |          |          |          | 2        |
| Anagallis arvensis     |          |          |          |          |          |          |          |          |          |          |          |          | 1        |
| Ornithogalum gussonei  |          |          |          |          |          |          |          |          |          |          |          |          | +        |
| Cyperus sp.            |          |          |          |          |          |          |          |          |          |          |          |          | 2        |

Localities and dates of relevés. Rel. 1–4: Cozzo Fico (Carlentini), Minissale et al. [132]—Table 1, rel. 14,16–18; rel. 5: Cozzo Ogliastri (Sortino), Minissale et al. [132]—Table 1; rel. 6–8: Cozzo Fico (Carlentini)—5 May 2021; rel. 9–15: Curcuraggi (Melilli)—1 April 2021; rel. 16: Curcuraggi (Melilli), 5 May 2021.

Table A10. Ranunculo laterifloro-Antinorietum insularis Brullo, Grillo & Terrasi 1976.

| Relevé number | Altitude (dam) | Surface (m²) | Coverage (%) | Presences |
|---------------|----------------|--------------|--------------|-----------|
| 1             | 93             | 2            | 90           | 1         |
| 2             | 92             | 2            | 100          | 2         |
| 3             | 92             | 2            | 90           | 3         |
| 4             | 95             | 2            | 90           | 4         |
| 5             | 93             | 2            | 90           | 5         |
| 6             | 92             | 2            | 70           | 6         |
| 7             | 92             | 2            | 70           | 7         |
| 8             | 92             | 2            | 70           | 8         |
| 9             | 96             | 2            | 70           | 9         |

Char. Association

| Bulliarda caillantii  | +  | +  | +  | 2  | +  | 2  | 1  | 2  | 7  |
| Isotetes sicula      | +  | 2  | 1  | 1  | +  | .  | 1  | 1  | 7  |

Char. All. (PRESLION CERVINAE)

| Antinoria insularis  | 3  | +  | 1  | 1  | 2  | 1  | 2  | 3  | 2  | 9  |
| Ranunculus lateriflorus | +  | 1  | +  | 1  | 2  | +  | 1  | 1  | 3  | 8  |

Char. Ord. (ISOËTETALIA)

| Lotus angustissimus  | +  | +  | 1  | 1  | 1  | 1  | 1  | 1  | +  | 7  |
| Trifolium micranthum | 1  | +  | .  | +  | .  | 1  | +  | +  | .  | 6  |
| Ranunculus muricatus | +  | .  | 1  | +  | 2  | .  | .  | .  | +  | 5  |
| Isoëtes longissima   | .  | +  | 1  | .  | 1  | 2  | 2  | 1  | 5  | 4  |
| Ranunculus trilobus  | .  | 2  | .  | .  | .  | .  | .  | .  | +  | 3  |
| Lotus coimbricensis  | .  | 1  | +  | .  | +  | .  | .  | .  | .  | 3  |

Char. Class (ISOËTO-NANOJUNCETEA)

| Mentha pulegium      | 2  | 3  | 2  | 2  | 2  | 3  | 2  | 3  | 9  |
| Lythrum hyssopifolia | 2  | +  | 1  | 1  | 2  | +  | 1  | 1  | 9  |
| Gaudinia fragilis    | 1  | 1  | 2  | 3  | .  | .  | 1  | +  | 1  |
| Eryngium pusillum    | 1  | .  | .  | 1  | 1  | 2  | 2  | 1  | 6  |
| Poa inferna          | .  | 1  | 2  | 2  | 2  | 1  | .  | .  | 5  |
| Juncus bufonius      | +  | .  | .  | .  | .  | .  | +  | .  | 5  |
| Juncus pygmaeus      | 3  | .  | .  | .  | .  | .  | +  | +  | 4  |
| Juncus capitatus     | 1  | .  | .  | .  | +  | .  | +  | +  | 4  |
| Polypogon subspathaceus | .  | .  | 1  | 1  | .  | .  | .  | .  | 2  |

Other species

| Trifolium tomentosum | +  | .  | .  | .  | .  | .  | .  | +  | 3  |
| Trifolium squarrosum | .  | +  | +  | 1  | .  | .  | .  | .  | 3  |
| Trifolium leucaanthum | +  | .  | +  | .  | .  | .  | .  | .  | 2  |
| Anagallis arvensis   | .  | +  | .  | .  | .  | .  | .  | .  | 1  |
| Myosotis ramosissima | .  | .  | .  | .  | +  | .  | .  | .  | 1  |

Localities and dates of relevés. Rel. 1–9: Monte Lauro, Brullo et al. [80]—Table 3.
Table A11. Myosuro minimi-Ranunculetum lateriflori Raimondo 1980.

| Relevé number | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|---------------|---|---|---|---|---|---|---|---|---|----|----|
| Altitude (dam) | 160 | 160 | 160 | 160 | 160 | 160 | 150 | 160 | 140 | 160 | 160 |
| Surface (m²)   | 4  | 9  | 2  | 4  | 2  | 3  | 1  | 1  | 2  | 3  | 5  |
| Coverage (%)    | 90 | 90 | 60 | 80 | 60 | 80 | 80 | 80 | 75 | 70 | 80 |

| Char. Association       |   |   |   |   |   |   |   |   |   |   |   |
|-------------------------|---|---|---|---|---|---|---|---|---|---|---|
| Myosurus minimus        | 1 | 1 | 3 | 2 | 2 | 2 | 1 | + | 3 | 2 | 1 |
| Spergularia madoniaca   | 3 | 4 | 2 | 2 | + | 1 | + | + | + | . | 4 |
| Sagina subulata         | + | + |   |   |   |   |   |   |   |   | 6 |
| Ranunculus marginatus   |   |   |   |   |   |   |   |   |   | 1 | + |

Char. All. (PRESLION CERVINAE)

| Antinoria insularis     | + | + | 2 | 1 | + | 2 | 2 | + | 1 | 1 | . |
| Ranunculus lateriflorus | 3 | 2 | 3 | 3 | 1 | 3 | 3 | + | 1 | 1 | 4 |

Char. Ord. (ISOËTETALIA)

| Trifolium micranthum    |   |   |   | + |   |   |   |   | 1 |   | . |
| Middendorfia boryschenica | . | . |   |   |   |   |   |   |   |   | 2 |
| Lotus angustissimus      | . | . |   |   |   |   |   |   |   | 1 |   |

Char. Class (ISOËTO-NANOJUNCETAE)

| Poa infirma             | 1 | . |   |   |   |   |   |   | 1 | + | 1 |
| Juncus bufonius         |   | . | 1 | + | + | + | + | 1 | 1 | 1 | 8 |

Mentha pulegium

| Char. All. (PRESLION CERVINAE) |   |   |   |   |   |   |   |   |   |
| Antinoria insularis         | 3 | 4 | 1 | 2 | 3 | 1 | 1 | 1 | 1 | + | 1 |
| Ranunculus lateriflorus     | 3 | 2 | 3 | 3 | 2 | 3 | 2 | 1 | 1 | 2 | + |

Char. Ord. (ISOËTETALIA)

| Lotus angustissimus        | + | + | 1 | 1 | 1 | 1 | + |   | 1 | 1 | 9 |
| Trifolium micranthum       | 1 | . | 1 | + | 1 | 1 | 1 |   |   |   | 6 |
| Middendorfia boryschenica  | 4 | 3 | 2 | 3 | 2 | 3 |   |   |   |   | 6 |
| Myosotis sicula            | + | 1 | 1 | + | 1 |   |   |   |   |   | 6 |

Localities and dates of relevés. Rel. 1–2: Piano della Battaglietta (Madonie)—20 June 1975; rel. 3–7: Piano Gallo (Geraci)—13 June 1975; rel. 8: Piano Catarineci (Madonie)—13 June 1975; rel. 9–10: Madonie, Raimondo [86]—Table 2; rel. 11: Piano della Battaglia (Madonie)—20 June 1975.

Table A12. Ranunculetum pratensis-lateriflori Brullo, C. Brullo & Giusso ass. nov.

| Relevé number | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|---------------|---|---|---|---|---|---|---|---|---|----|----|
| Altitude (dam) | 146 | 146 | 146 | 146 | 146 | 146 | 170 | 170 | 134 | 134 | 165 |
| Surface (m²)   | 1  | 0.6 | 0.6 | 0.6 | 0.3 | 0.2 | 0.5 | 0.8 | 0.5 | 1.5 | 2  |
| Coverage (%)    | 100 | 100 | 100 | 100 | 100 | 100 | 80  | 80  | 80  | 90  | 80  |

| Char. Association      |   |   |   |   |   |   |   |   |   |   |   |
|------------------------|---|---|---|---|---|---|---|---|---|---|---|
| Ranunculus pratensis   | 1 | + | 1 | 2 | 1 | 1 | + | + | + | 1 | 1 |
| Barbarea bracteosa     | + | 1 | + | + | + | + | 1 | 1 |   |   | 8 |

Veronica serpyllifolia

| Char. All. (PRESLION CERVINAE) |   |   |   |   |   |   |   |   |   |
| Antinoria insularis         | 3 | 4 | 1 | 2 | 3 | 1 | 1 | 1 | 1 | + | 1 |
| Ranunculus lateriflorus     | 3 | 2 | 3 | 3 | 2 | 3 | 2 | 1 | 1 | 2 | + |

Char. Ord. (ISOËTETALIA)

| Lotus angustissimus        | + | + | 1 | 1 | 1 | 1 | + |   | 1 | 1 | 9 |
| Trifolium micranthum       | 1 | . | 1 | + | 1 | 1 | 1 |   |   |   | 6 |
| Middendorfia boryschenica  | 4 | 3 | 2 | 3 | 2 | 3 |   |   |   |   | 6 |
| Myosotis sicula            | + | 1 | 1 | + | 1 |   |   |   |   |   | 6 |
### Table A12. Cont.

| Char. Class (ISOËTO-NANOJUNCETEA) | Mentha pulegium | Poa infirma | Juncus bufonius | Other species |
|-----------------------------------|-----------------|-------------|-----------------|--------------|
|                                   | 1 + . . + 1 + 1 | 2 1 1 2 + 2 1 | . . . . + + + | Spergularia bocconei + 2 1 2 1 3 . + + . . + 8 |
|                                   |                 |             |                 | Oenanthe fistulosa 1 + + 1 1 + . . . . . 6 |
|                                   |                 |             |                 | Polygonum aviculare + . . + + . . + + . . . 4 |
|                                   |                 |             |                 | Potentilla reptans + . . . + 1 . + . . . . 4 |
|                                   |                 |             |                 | Helosciadium inundatum . + + . . 1 . . . . . 3 |
|                                   |                 |             |                 | Lythrum junceum . . . . . . 1 + + . . . . 3 |
|                                   |                 |             |                 | Cytonurus cristatus . . . . . . . . . . + + . . 2 |
|                                   |                 |             |                 | Trifolium pratense . . . . . . . . 1 + . . . . 2 |
|                                   |                 |             |                 | Oenanthe globulosa . . . . . . . . . . + . . . 1 |

Localities and dates of relevés. Rel. 1–11: Nebrodi mounts, Brullo & Grillo [84]—Table 7.

### Table A13. Ranunculo lateriflori-Callitrichetum brutiae Brullo & Minissale 1998.

| Relevé number | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---------------|---|---|---|---|---|---|---|
| Altitude (m)  | 980| 960| 960| 960| 960| 980| 980|
| Surface (m²)  | 1.5| 1 | 1 | 2 | 1 | 3 | 2 |
| Coverage (%)  | 100| 90| 95| 100| 90| 100| 100|

Char. Association and All. (PRESLION CERVINAE)
- Callitriche brutia: 4 3 3 4 3 1 1 7
- Ranunculus lateriflorus + 1 2 3 2 3 4 7

Char. Ord. (ISOËTETALIA)
- Bulliarda vaillantii: 3 3 4 2 2 3 2 7
- Middendorfia borysthenica: 1 + + + . + . 5
- Ranunculus trileius: . + + 1 1 + + . 5

### Table A14. Callitricho brutiae- Crassuletum vaillantii Brullo, Scelsi, Siracusa & Tomaselli 1998.

| Relevé number | 1 | 2 | 3 | 4 | 5 |
|---------------|---|---|---|---|---|
| Altitude (dam)| 52| 52| 52| 51| 51|
| Surface (m²)  | 2 | 2 | 3 | 2 | 1 |
| Coverage (%)  | 90| 100| 90| 90| 90|

Char. Association and All. (PRESLION CERVINAE)
- Callitricho brutiae: 5 5 3 3 3 5

Char. Ord. (ISOËTETALIA)
- Bulliarda vaillantii: 4 3 3 3 3 3 5
- Lotus angustissimus: + 1 1 + . . 4
- Isoëtes durieui: 1 1 3 2 . 4
Table A14. Cont.

| Char. Class (ISOÉTO-NANOJUNCETEA) | Mentha pulegium | Juncus bufonius | Lythrum hyssopifolia | Polygogon subspathaceus | Pop | Juncus capitatus | Juncus pygmaeus | Other species |
|-----------------------------------|-----------------|-----------------|----------------------|------------------------|-----|-----------------|-----------------|---------------|
| Isoëtes longissima                | 3               | 1               | 2                    | 3                      | 2   | 5               | 5               | 11            |
| Romulea ramiflora                 |                 |                 |                      |                        |     |                 |                 |               |

Localities and dates of relevés. Rel. 1–5: Bosco Pisano (Buccheri), Brullo et al. [83]—Table 2.

Table A15. Junco pygmaei-Pilularietum minutae Minissale, Molina & Sciandrello 2017.

| Relevé number | 1 2 3 4 5 6 7 8 9 10 11 12 13 14 |
|---------------|----------------------------------|
| Altitude (m)  | 384 384 384 384 386 386 360 360 360 386 386 386 386 386 |
| Surface (m²)  | 1.6 1.6 1.6 1.6 1.6 1.6 1.6 1.6 1.6 1.6 1.6 1.6 1.6 1.6 |
| Coverage (%)  | 70 50 85 90 85 90 80 70 80 60 80 80 85 90 |

| Char. Association |
|-------------------|
| Pilularia minutae |
| Char. Subassociation |
| Solenopsis laurentia subsp. lyblaca |
| Cicendia filiformis |
| Char. All. (PRESLION CERVINAE) |
| Callitriche brutia |
| Ranunculus lateriflorus |
| Char. Ord. (ISOÉTETALIA) |
| Juncus pygmaeus |
| Juncus hybridus |
| Poa infirma |
| Erigeron pusillus |
| Polygogon subspathaceus |
| Pulicaria vulgaris var. vulgaris |

| Other species |
|---------------|
| Polygonum anemonastrum |
| Anthemis cotula |
| Eleocharis palustris |
| Spergularia sp. |
| Tribulus resupinatum |
| Plantago lagopus |
| Cerastium glomeratum |

Localities and dates of relevés. Rel. 1–6: Cozzo Ogliastri (Sortino), Minissale et al. [132]—Table 1, rel. 1–4, 22-23; rel. 7–9: Cozzo Fico (Carlentini)—5 May 2021; rel. 10–14: Cozzo Ogliastri (Sortino), Minissale et al. [132]—Table 1, rel. 6, 8, 10, 12, 20.

Table A16. Pilulario minutae-Myosotidetum siculae Brullo, Cambria, Ilardi & Minissale ass. nov.

| Relevé number | 1 2 |
|---------------|-----|
| Altitude (m)  | 205 |
| Surface (m²)  | 5 |
| Coverage (%)  | 100 100 |

| Presences |
|-----------|-----|
|           |     |
Table A16. Cont.

| Char. Association       | Pilularia minuta | Myosotis sicula | Ranunculus palustris | Char. All. (PRESLION CERVINAE) | Char. All. (ISOËTETALIA) | Char. Class (ISOËTO-NANOJUNCETEA) | Char. Other species |
|-------------------------|-----------------|-----------------|---------------------|-------------------------------|------------------------|-----------------------------------|---------------------|
|                         | 1               | 1               | 2                   |                               | 2                      | 3                                 | 2                   |
| Altitude (m)            | 385             | 385             | 385                 | 385                           | 230                    | 230                               | 230                 |
| Surface (m²)            | 1               | 2               | 1                   | 1                             | 1                      | 3                                 | 1                   |
| Coverage (%)            | 100             | 100             | 100                 | 100                           | 90                     | 90                                | 70                  |

Localities and dates of relevés. Rel. 1–2: Contrada Anguillara (Calatafimi)—28 April 2017.

Table A17. Archidio phascoidis-ISOëtetum velatae Brullo & Minissale 1998.

| Relevé number | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---------------|---|---|---|---|---|---|---|---|
| Altitude (m)  | 385 | 385 | 385 | 385 | 230 | 230 | 230 | 230 |
| Surface (m²)  | 1 | 2 | 1 | 1 | 3 | 1 | 1 | 1 |
| Coverage (%)  | 100 | 100 | 100 | 100 | 90 | 90 | 70 | 70 |

Char. Association

Archidium alternifolium

Char. All. (CICENDIO-SOLENOPSION LAURENTIAE)

Solenopsis laurentia subsp. hyblaea

Anagallis parviflora

Char. Ord. (ISOËTETALIA)

Isóetes longissima

Triglochin laxiflora

Isóetes duriei

Isóetes histrix

Centaurium maritimum

Bulliarda vaillantii

Char. Class (ISOËTO-NANOJUNCETEA)

Juncus bufonius

Lythrum hyssopifólia

Juncus pygmeus

Juncus capitatus

Mentha pulegium

Poa infirma

Romulea ramiflora

Lotus parviflorus

Callitriche brutia

Lotus angustissimus

Ranunculus ophioglossífolius

Ranunculus sardous

Other species

Oenanthe pimpinelloides

Ranunculus paludosus

Bellis annua

Bryum sp.

Aira cupaniana

Centaurium tenuiflorum

Pleurochaete squarrosa

Polygonum aviculare

Linum bienne

Cardamine occulta

Blackstonia perfoliata

Coleostephus myconis

Localities and dates of relevés. Rel. 1–4: Cozzo Ogliastri (Sortino)—29 April 1992; rel. 5: Cozzo Ogliastri (Sortino), Brullo & Minissale [39], rel. pg. 283; rel. 6–8: Curcuraggi (Melilli)—1 April 2021.
Table A18. *Anagallido parviflorae-Molinerielletum minutae* Brullo, Scelsi, Siracusa & Tomaselli 1998.

| Relevé number | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |
|---------------|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| Altitude (m)  | 530| 530| 500| 500| 500| 510| 510| 510| 520| 520| 520| 520| 520| 530| 530| 530| 530| 510| 510| 500| 500| 500| 500| 500|
| Surface (m²)  | 2 | 2 | 2 | 2 | 3 | 2 | 1 | 2 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 2 | 1 | 1 | 2 | 1 |
| Coverage (%)  | 70| 70| 70| 80| 40| 80| 70| 80| 80| 60| 50| 80| 80| 90| 90| 90| 70| 90| 90| 80| 80| 80| 90| 50|

**Char. Association**

*Anagallido parviflorae-Molinerielletum minutae* Brullo, Scelsi, Siracusa & Tomaselli 1998.

| Altitude (m) | Surface (m²) | Coverage (%) | Char. Association |
|--------------|--------------|--------------|------------------|
| 530          | 2            | 70           | *Molineriella minuta* |
| 530          | 2            | 70           | *Anagallis parviflora* |

**Char. All. (CICENDIO-SOLENOPSION LAURENTIAE)**

| Altitude (m) | Surface (m²) | Coverage (%) | Char. All. (CICENDIO-SOLENOPSION LAURENTIAE) |
|--------------|--------------|--------------|-----------------------------------------------|
| 530          | 2            | 70           | *Anagallis parviflora* |

**Char. Ord. (ISOËTETALIA)**

| Altitude (m) | Surface (m²) | Coverage (%) | Char. Ord. (ISOËTETALIA) |
|--------------|--------------|--------------|---------------------------|
| 530          | 2            | 70           | *Anagallis parviflora* |

**Char. Class (ISOËTO-NANOJUNCETEA)**

| Altitude (m) | Surface (m²) | Coverage (%) | Char. Class (ISOËTO-NANOJUNCETEA) |
|--------------|--------------|--------------|-----------------------------------|
| 530          | 2            | 70           | *Anagallis parviflora* |

**Other species**

| Altitude (m) | Surface (m²) | Coverage (%) | Other species |
|--------------|--------------|--------------|---------------|
| 530          | 2            | 70           | *Anagallis parviflora* |
Table A18. Cont.

| Localities and dates of relevés. Rel. 1–24: Bosco Pisano (Buccheri), Brullo et al. [83]—Table 1. |
|--------------------------------------------------|
| Biscutella maritima                              |
| Parentucellia latifolia                         |
| Saxifraga tridactylites                         |
| Silene gallica                                  |

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Table A19. Kickxia cirrhosa-Solenopsioetum gasparrinii Brullo & Minissale 1998 corr.

| Relevé number | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---------------|---|---|---|---|---|---|---|---|---|----|----|----|
| Altitude (m)  | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2  | 2  | 2  |
| Surface (m²)  | 1 | 1 | 0.6| 0.6| 0.5| 1  | 2  | 2  | 2  | 0.5 | 5  | 2  |
| Coverage (%)   | 50| 70| 70| 70| 90| 90| 90| 80| 100| 90 | 80 | 90 |

**Char. Association**

- **Kickxia cirrhosa**
- **Solenopsis gasparrinii**
- **Radiola linoides**
- **Anagallis minima**
- **Anagallis parviflora**
- **Ophioglossum lusitanicum**

**Char. All. (CICENDIO-SOLENOPSION LAURENTIAE)**

- **Char. All. (CICENDIO-SOLENOPSION LAURENTIAE)**
- **Lotus parviflorus**
- **Centaurium maritimum**
- **Briza minor**
- **Isötes histrix**

**Char. Class (ISOËTO-NANOJUNCETEA)**

- **Juncus capitatus**
- **Lythrum hyssopifolia**
- **Polypogon subspathaceus**
- **Juncus bufonius**
- **Gaulinia fragilis**
- **Other species**

**Localities and dates of relevés.** Rel. 1–10: Isola Grande dello Stagnone (Marsala), Brullo et al. [134]—Tab.11; rel. 11–12: Isola Grande dello Stagnone (Marsala)—28 March 2010.

Table A20. Solenopsietum mothianae Brullo, Giusso, Minissale & Sciandrello ass. nov.

| Relevé number | 1 | 2 | 3 | 4 | 5 |
|---------------|---|---|---|---|---|
| Altitude (m)  | 1 | 1 | 1 | 1 | 1 |
| Surface (m²)  | 2 | 2 | 1 | 1 | 2 |
| Coverage (%)   | 40| 50| 30| 30| 40|

**Char. Association**

- **Solenopsis mothiana**
- **Anagallis parviflora**
- **Radiola linoides**
- **Cicendia filiformis**
- **Gaulinia fragilis**

**Char. All. (CICENDIO-SOLENOPSION LAURENTIAE)**

- **Anagallis parviflora**
- **Radiola linoides**
- **Polypogon subspathaceus**
- **Juncus capitatus**
- **Gaulinia fragilis**

**Char. Ord. (ISOËTETALIA)**

- **Centaurium maritimum**
- **Briza minor**

**Char. Class (ISOËTO-NANOJUNCETEA)**

- **Mentha pulegium**
- **Juncus capitatus**
- **Lythrum hyssopifolia**
- **Polypogon subspathaceus**

**Localities and dates of relevés.** Rel. 1–5: Isola Grande dello Stagnone (Marsala)—19 April 2010.
Table A21. Solenopsgasparrinii-Isoëtetum siculae Brullo, Cambria, Ilardi & Minissale ass. nova.

| Relevé number | Altitude (m) | Surface (m²) | Coverage (%) | Char. Association |
|---------------|--------------|--------------|--------------|------------------|
| 1             | 205          | 4            | 100          | Isoëtes sicula    |
| 2             | 205          | 5            | 100          | Anagallis parviflora |
| 3             | 205          | 4            | 100          | Ophioglossum lusitanicum |
| 4             | 205          | 2            | 50           | Radiola linoides |
| 5             | 80           | 1            | 100          | Char. All. (CICENDIO-SOLENOPSION LAURENTIAE) |
| 6             | 80           | 0.5          | 90           | Char. Association |
| 7             | 80           | 1            | 40           | Solenopsis gasparrinii |
| 8             | 80           | 1            | 70           | Anagallis minima |
| 9             | 80           | 0.5          | 60           | Char. Class (ISOËTO-NANOJUNCETEA) |
| 10            | 80           | 1            | 80           | Polypogon subspathaceus |
| 11            | 80           | 1            | 80           | Juncus bufonius |
| 12            | 80           | 1            | 80           | Mentha pulegium |
| 13            | 80           | 1            | 70           | Lythrum hyssopifolia |
| 14            | 80           | 1            | 85           | Gaudinia fragilis |
| 15            | 80           | 1            | 80           | Juncus pygmaeus |
| 16            | 80           | 1            | 80           | Other species |
| 17            | 80           | 1            | 80           | Linum bienne |
| 18            | 80           | 1            | 80           | Centaurium tenuiflorum |
| 19            | 80           | 1            | 80           | Coleostephus myconis |
| 20            | 80           | 1            | 80           | Blackstonia perfoliata |
| 21            | 80           | 1            | 80           | Trifolium squarrosum |
| 22            | 80           | 1            | 80           | Carex divulsa |
| 23            | 80           | 1            | 80           | Euphorbia akenocarpa |
| Species                          | 1 | 2 | 3 | 4 | 5 | 6 |
|---------------------------------|---|---|---|---|---|---|
| *Bellis annua*                  | 2 | 1 | 2 | 1 | 1 | 2 |
| *Serapias lingua*              | 1 | 1 | 1 | + | 1 | 1 |
| *Trifolium grandiflorum*        | 2 | 1 | 1 | 1 | 1 | 1 |
| *Ranunculus paludosus*          | 2 | 1 | 1 | 1 | 1 | 1 |
| *Trifolium resupinatum*         | . | . | . | . | . | . |
| *Briza maxima*                  | . | . | . | . | . | . |
| *Anagallis arvensis*            | . | . | . | . | . | . |
| *Veronica anagalloides*         | . | . | . | . | . | . |
| *Logfia gallica*                | . | . | . | . | . | . |
| *Aira cupaniana*                | . | . | . | . | . | . |
| *Trifolium spumosum*            | . | . | . | . | . | . |
| *Trifolium subterraneum*        | . | . | . | . | . | . |
| *Parapholis incurve*            | . | . | . | . | . | . |
| *Trifolium lappaceum*           | . | . | . | . | . | . |
| *Lotus tetragonolobus*          | . | . | . | . | . | . |

**Localities and dates of relevés.** Rel. 1–6: Contrada Anguillara (Calatafimi)—28 April 2017; Rel. 7–15: Mazara del Vallo (Poggiallegro)—17 June 1978; rel. 16–21: Mazara del Vallo (Poggiallegro)—3 May 1979.
| Relevé number | 1 | 2 | 3 | 4 | 5 | 6 | Presences |
|--------------|---|---|---|---|---|---|----------|
| Altitude (m) | 529 | 529 | 664 | 664 | 664 | 664 |          |
| Surface (m²) | 10 | 10 | 10 | 10 | 20 | 20 |          |
| Coverage (%) | 60 | 60 | 80 | 90 | 90 | 80 |          |

**Char. Association**

Trifolium michelianum 3 3 2 3 1 1 6

Agrostis pourretii + 1 3 2 4 4 6

**Char. Ord. (ISOËTETALIA)**

Ranunculus aphyllus 1 + + . + + 5

**Char. Class (ISOËTO-NANOJUNCETEAE)**

Mentha pulegium 2 2 1 + . + 5

Juncus bufonius + + + + . . 4

Poa infirma . + + . + . 3

Ranunculus angulatus . . 1 + + . 3

**Other species**

Lythrum juncceum 1 + + . . . 4

Trifolium resupinatum + + + + . . 2

Callitricha stagnalis . . . + + + 2

Trifolium nigrescens . . . + . . 1

Rumex pulcher . + . . . . 1

Localities and dates of relevés. Rel. 1–2: Margiazzo di Vallone Arcera (Ficuzza)—10 June 2020; rel. 3–6: Gorgo di Gaetanello (Ficuzza)—13 June 2020.

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| Relevé number | 1 | 2 | 3 | 4 | 5 | 6 | Presences |
|--------------|---|---|---|---|---|---|----------|
| Altitude (m) | 323 | 323 | 323 | 10 | 10 | 10 |          |
| Surface (m²) | 10 | 10 | 10 | 10 | 20 | 20 |          |
| Coverage (%) | 70 | 80 | 70 |   |   |   |          |

**Char. Association**

Isoetes histrix 3 4 1 3

Myosotis congesta + + + 3

Aphanes arvensis 1 + + 3

**Char. Subassociation**

Callitriche bratia . . 3 1

**Char. All. (CICENDIO-SOLENOPSION LAURENTIAE)**

Anagallis parviola + + + 3

**Char. Ord. (ISOËTETALIA) and Class (ISOËTO-NANOJUNCETEAE)**

Mentha pulegium 1 + 1 3

Poa infirma + + + 3

Juncus bufonius 2 2 1 3

Juncus capitatus . + . 1

Lotus angustissimus + . . 1

**Other species**

Tillaea alata 1 + + 3

Sagina apetala 1 1 + 3

Trifolium suffecatum . + 1 + 3

Aira cupaniana + + . 2

Ranunculus paludosus + + . 2

Veronica arvensis + + . 2

Glebionis segetum . + + 2

Cerastium glomeratum . . . 1

Filio pyramidalata . + . 1

Galium murale + . . 1

Plantago bellardii . + . 1

Valerianella eriocarpa + . . 1

Localities and dates of relevés. Rel. 1–3: Bosco di Santo Pietro (Callagirone)—8 April 2021.
### Table A24. Plantagini intermediae-Cyperetum fusci Sciandrello, D’Agostino & Minissale 2013.

| Relevé number | Altitude (m) | Surface (m²) | Coverage (%) | Char. Association and All. (NANOCYPERION FLAVESCENTIS) | Other species |
|--------------|--------------|--------------|--------------|------------------------------------------------------|---------------|
| 1–8          | 679, 668, 679 | 1           | 90           | Cyperus flavescens                                      | Helosciadium nodiflorum |
| 9–12         | 677, 654, 654 | 1           | 90           | Plantago intermedia                                     | Veronica anagallis-aquatica |
| 13–17        | 620, 620, 620 | 1           | 90           | Sanolus valerandi                                       | Mentha pulegium |
| 18–29        | 630, 620, 620 | 1           | 90           | Char. Ord. (NANOCYPERETALIA)                            | Juncus bufonius |
|              | 620, 620, 620 | 1           | 90           | Cyperus fusus                                           | Trifolium resupinatum |
|              | 589, 620, 620 | 1           | 90           | Isolepis cernua                                         | Trifolium sp. |
|              | 615, 615, 615 | 1           | 90           | Euphorbia chamaesyce                                     | Rumex pulcher |
|              | 615, 615, 615 | 1           | 90           | Laphangium luteoalbum                                    | Juncus articulatus |
|              | 615, 615, 615 | 1           | 90           | Char. Class (ISOËTO-NANOJUNCETEA)                        | Helosciadium nodiflorum |
|              | 615, 615, 615 | 1           | 90           | Mentha pulegium                                         | Hypericum hircinum subsp. majus |
|              | 615, 615, 615 | 1           | 90           | Juncus bufonius                                         | Agrostis sp. |
|              | 615, 615, 615 | 1           | 90           | Lotus angustissimus                                      | Callitriche stagnalis |
|              | 615, 615, 615 | 1           | 90           | Polypogon viridis                                       | Chara sp. |
|              | 615, 615, 615 | 1           | 90           | Polypogon arenstrum                                     | Epilobium parviflorum |
|              | 615, 615, 615 | 1           | 90           | Polypogon maritimus                                     | Persicaria lapathifolia |
|              | 615, 615, 615 | 1           | 90           | Persicaria lapathifolia                                 | Nasturtium officinale |
|              | 615, 615, 615 | 1           | 90           | Verbena officinalis                                     | Agrostis sp. |
|              | 615, 615, 615 | 1           | 90           | Verbena officinalis                                     | Callitriche stagnalis |
|              | 615, 615, 615 | 1           | 90           | Chara sp.                                              | Chara sp. |
|              | 615, 615, 615 | 1           | 90           | Hypericum hircinum subsp. majus                         | Spergularia sp. |

Localities and dates of relevés. Rel. 1–8: Castelmola, Sciandrello et al. [140]—Table 7; rel. 9–12: Torrente Vacco (Fiumedinisi)—7 November 2019; rel. 13–17: Torrente Vacco (Fiumedinisi)—16 November 2019; rel. 18–29: Gole Santissima (Fiumedinisi)—4 October 2020.
Table A25. Gnaphalio luteoalbi-Verbenetum supinae Rivas Goday 1970.

| Relevé number | 1  | 2  | Presences |
|---------------|----|----|-----------|
| Altitude (m)  | 140| 140|           |
| Surface (m²)  | 10 | 10 |           |
| Coverage (%)  | 70 | 100|           |

**Char. Association**

| Laphangium luteoalbum | 2  | 2  | 2  |

**Char. All. (VERBENION SUPINAE)**

| and Ord. (NANOCYPERETALIA) |
|-----------------------------|
| Verbena supina | 3 | 1 | 2 |
| Paspalum distichum | 2 | 1 | 2 |
| Schenkia spicata | 1 | 1 | 2 |
| Sporobolus schoenoides | 1 | . | 1 |

**Char. Class (ISOËTO-NANOJUNCETEA)**

| Juncus hybridus | + | 1 | 2 |

**Other species**

| Xanthium italicum | 1 | 2 | 2 |
| Symphyotrichum squamatum | + | 1 | 2 |
| Medicago intertexta | 3 | 3 | 2 |
| Sonchus oleraceus | + | + | 2 |
| Phragmites australis | + | . | 1 |
| Polygonon monspeliensis | . | + | 1 |
| Polygonum aviculare | 1 | . | 1 |
| Rumex pulcher | . | 1 | 1 |
| Medicago polymorpha | . | + | 1 |

**Localities and dates of relevés.** Rel. 1–2: Cimia dam, Sciandrello [91]—Tab. 3 rel. 16–17.
| Relevé number | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 |
|--------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| Altitude (m) | 50 | 366| 50 | 50 | 680| 680| 680| 835| 835| 680| 680| 680| 680| 835| 680| 680| 950| 950| 835| 90 | 90 | 90 | 90 | 90 | 140| 140| 90 |
| Surface (m²) | 100| 100| 100| 100| 100| 100| 100| 100| 100| 100| 100| 100| 100| 100| 100| 100| 100| 100| 100| 100| 100| 100| 5  | 10 | 30 | 20 | 25 | 20 | 10 |
| Coverage (%)  | 20 | 40 | 50 | 20 | 20 | 30 | 40 | 40 | 50 | 50 | 80 | 70 | 80 | 60 | 90 | 90 | 90 | 50 | 60 | 40 | 60 | 70 | 60 | 70 | 90 | 85 | 80 | 80 | 90 |

**Char. Association**

**Heliotropium supinum**

Sporobolus schoenoides

**Char. All. (VERBENION SUPINAE)**

Euphorbia chamaesyce

Paspalum distichum

Pulicaria sicula

Coronopus squamatus

Verbenae supinae

Sporobolus aculeatus

Schenkia spicata

**Char. Ord.**

(NANOCYPERETALIA)

Cyperus fuscus

Plantago intermedia

**Char. Class**

(ISOËTO-NANOJUNCETEA)

Mentha pulegium

Lythrum hyssopifolia

Mentha pulegium

Other species

Xanthium spinosum

Helminthotheca echoides

Cenocloclites arvensis

Verbena officinalis

Xanthium italicum

Trifolium fragiferum

Solanum niger

Cynodon dactylon

Kickxia spuria subsp. integrifolia

Tamarix gallica

Symphyotrichum squamatum

Atriplex prostrata

Rumex pulcher

Persicaria laphatifolia

Phragmites australis

Polygonum aviculare

Polypogon monspeliensis

Table A26. Heliotropio supini-Heleochloetum schoenoidis Rivas Goday 1956.
Table A26. Cont.

| Species                  | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence |
|--------------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| Sonchus oleraceus        |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |
| Sulla coronaria          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |
| Dipsacus ambrosioides    |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |
| Oxalis rubra             |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |
| Echium latarium          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |
| Scopularia maculata      |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |
| Medicago doliata         |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |
| Heliotropium supinum     |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |
| Lythrum supinum          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |
| Chrozophora tinctoria    |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |
| Medicago polymorpha      |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |

Localities and dates of relevés. Rel. 1–21: Brullo & Marcenò [79]—Tab 1 rel. 1–8, 10–13, 15–17, 21–23, 25–26, 33; rel. 22–29: Comunelli and Cimia dams (Butera), Sciandrello [91]—Tab 3 rel. 8–15.

Table A27. Glinio lotoidis-Verbenetum supinae Rivas Goday 1964.

| Relevé number | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence | Presence |
|---------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| Altitude (m)  | 195      | 195      | 195      | 195      | 195      | 195      | 195      | 195      | 195      | 520      | 520      | 520      | 520      | 160      | 160      | 610      | 610      | 610      | 610      | 610      | 610      | 610      | 610      | 610      | 160      | 160      | 160      | 160      | 160      | 160      |
| Surface (m²)  | 100      | 100      | 100      | 100      | 100      | 100      | 100      | 100      | 100      | 200      | 100      | 100      | 100      | 100      | 50       | 50       | 70       | 70       | 70       | 70       | 50       | 50       | 70       | 70       | 70       | 80       | 80       | 80       | 80       | 80       | 80       |
| Coverage (%)  | 80       | 80       | 80       | 80       | 90       | 90       | 90       | 90       | 80       | 15       | 10       | 10       | 10       | 10       | 15       | 15       | 15       | 15       | 15       | 15       | 15       | 15       | 15       | 15       | 15       | 15       | 15       | 15       | 15       | 15       | 15       | 15       | 15       |

Char. Association

Glinus lotoides

Char. All. (VERBENION SUPINAE)

Paspalum distichum

Sporobolus schoenoides

Heliotropium supinum

Verbena supina

Euphorbia chamaesyce

Coronopus squamatus

Pulicaria sicula

Char. Ord. (NANOCYPERETALIA)

Plantago intermedia

Corrigiola litoralis

Gnaphalium uliginosum var. prostratum

Cyperus fuscus

Cyperus michelianus

Char. Class (ISOËTO-NANOJUNCETEA)

Lythrum hyssopifolia

Mentha pulegium

Eryngium pusillum

Char. Class (ISOËTO-NANOJUNCETEA)

Sporobolus alopecuroides
### Table A27. Cont.

| Plant Name                          | Number |
|-------------------------------------|--------|
| *Juncus hybridus*                   | 1      |
| *Veronica anagalloides*             |        |
| **Other species**                   |        |
| *Persicaria lapathifolia*           | +      |
| *Xanthium spinosum*                 | +      |
| *Trifolium fragiferum*              | +      |
| *Amaranthus deflexus*               | +      |
| *Xanthium italicum*                | +      |
| *Helminthotheca echinoides*         | +      |
| *Oxybasis rubra*                    | +      |
| *Rumex pulcher*                     | +      |
| *Atriplex prostrata*                | +      |
| *Symphyotrichum squamatum*          | +      |
| *Atriplex cruc-galli*               | +      |
| *Portulaca oleracea*                | +      |
| *Cyperus rotundus*                  | +      |
| *Polygono aviculare*                | +      |
| *Verbena officinalis*               | +      |
| *Malva sylvestris*                  | +      |
| *Sonchus asper*                     | +      |
| *Cynodon dactylon*                  | +      |
| *Mentha suaveolens*                 | +      |
| *Tamarix gallica*                   | +      |
| *Kickxia spuria*                    | +      |
| *integriflora*                      | +      |
| *Chenopodium album*                 | +      |
| *Potentilla reptans*                | +      |
| *Ajuga reptans*                     | +      |
| *Beta maritima*                     | +      |
| *Visnaga daucoids*                  | +      |
| *Anagallis arvensis*                | +      |
| *Scolymus maculates*                | +      |
| *Convolvulus arvensis*              | +      |
| *Lythrum junceum*                   | +      |
| *Pulicaria dysenterica*             | +      |
| *Chrozophora tinctoria*             | +      |
| *Polypogon monspeliensis*           | +      |

**Localities and dates of relevés.** Rel. 1–27: Brullo & Marcenò [79]—Table 1, rel. 36–62; rel. 28–34: Disueri dam (Gela), Sciandrello [91]—Table 3 rel. 1–7.
Table A28. Coronopo squamati-Sisymbrelletum dentatae Minissale & Spampinato 1987.

| Relevé number | 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 |
| Altitude (m) | 850 850 850 850 850 850 850 850 850 850 850 850 850 850 850 700 |
| Surface (m²) | 40 50 50 50 6 2 2 10 30 50 50 50 2 20 10 70 |
| Coverage (%) | 70 90 50 90 60 60 70 70 80 60 70 70 60 60 90 |

**Char. Association**

| Species | 3 4 2 3 2 2 2 2 2 3 3 4 2 1 1 16 |
| Sisymbrella dentata | 2 2 3 1 2 2 + 1 1 2 2 1 2 2 2 2 |

**Char. All. (VERBENION SUPINAE) and Ord. (NANOCYPERETALIA)**

| Hordeum geniculatum | 2 1 + + 2 1 2 . 2 1 + . 1 3 1 16 |
| Coronopus squamatus | . . . . . 1 2 2 2 3 2 3 2 1 2 2 11 |
| Ranunculus sardous | . . . . . . + + 1 1 + . 2 6 |
| Teucrium campanulatum | 2 2 2 2 . . . . . . . . . . . . 4 |

**Char. Class (ISOËTO-NANOJUNCETEA)**

| Eryngium pusillum | 4 2 1 2 5 + 2 3 3 1 1 2 + 1 3 1 16 |
| Mentha pulegium | 1 3 2 3 4 1 1 3 3 3 3 3 2 2 2 . 15 |
| Gaudinia fragilis | + + 1 + . . . . . . . . . . . . 4 |
| Poa infirma | . . . . . . + 1 + . + 4 |
| Lythrum hyssopifolia | . . . . . . . . + . . . . . . 1 |
| Pulicaria vulgaris var. vulgaris | . . . . . . . . . . . . . . . . 1 |

**Other species**

| Convolvulus arvensis | 1 1 2 2 1 2 2 3 1 1 1 1 2 1 2 1 16 |
| Plantago lanceolata | . . . . + + + + + . . + . 1 1 |
| Potentilla reptans | + 2 1 + 1 . . . + . . . . . + 1 8 |
| Rumex conglomerartus | + + 1 1 + . . . . . . . . . . . 5 |
| Polygonum aviculare | . . . . . + + + + + . . . . . 2 5 |
| Elymus repens | . . . . . . . . . . . . . . . . . . 5 |
| Xanthium italicum | . . . . . . . . 1 1 + 1 . . . . . . . . . . 4 |
| Cichorium intybus | . . . . . . . . . . . . . . . . . . 5 |
| Helminthotheca echioides | . . . . . . . . . . . . . . . . . . 4 |
| Galium debile | . . . . . . . . . . . . . . . . . . 5 |
| Galium spinosum | . . . . . . . . . . + 2 . + . . . . 3 |
| Calendula elongatum | + + + . . . . . . . . . . . . 3 |
| Anagallis arvensis | + + 1 + . . . . . . . . . . . . 3 |
| Rostraria hispida | . . . . . . . . . . . . . . . . . . 2 |
| Beta maritima | + . . + . . . . . . . . . . . . 2 |
| Cirsium italicum | . . . . . . . . . . . . . . . . . . 2 |
| Echium pustulatum | . . + . . . . . . . . . . . . . . . . 1 |
| Plantago major | . . . . . . . . . . . . . . . . . . 1 |

Localities and dates of relevés. Rel. 1–5: Gurrida lake (Etna)—4 July 2008; rel. 6–15: Gurrida lake (Etna), Minissale & Spampinato [87]—Table 8; rel. 16: Castiglione di Sicilia—11 June 1986.

Table A29. Heleochloo schoenidis-Chenopodietum botryoidis Brullo & Sciandrello 2006.

| Relevé number | 1 2 3 4 5 6 7 8 9 10 |
| Altitude (m) | 5 5 5 5 5 5 5 5 5 5 |
| Surface (m²) | 50 50 10 20 20 100 100 100 100 50 |
| Coverage (%) | 70 60 70 25 70 40 50 50 70 80 |

**Char. Association**

| Oxynaxis chenopodioides | 4 3 3 1 2 3 3 4 2 2 10 |

**Char. All. (VERBENION SUPINAE) and Ord. (NANOCYPERETALIA)**

| Sporobolus schoenoides | 1 1 3 + 1 1 2 2 3 4 10 |
| Cyperus fuscus | . . . . . . 2 1 + + 1 + . 6 |
| Sporobolus aculeatus | . . . . . . . . . . . . . . . . . . 3 |

**Char. Class (ISOËTO-NANOJUNCETEA)**

| Juncus hybridus | . . . . . . 2 . . 1 1 + 4 |

**Other species**

| Atriplex prostrata | 1 1 1 + + 1 + 1 2 + 10 |
| Tamarix africana | 3 2 + 2 2 2 3 3 2 3 10 |
| Symphyotrichum squamatum | + + + + . + 1 + 1 2 9 |
Table A29. Cont.

| Species                        | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|-------------------------------|---|---|---|---|---|---|---|---|---|
| Sonchus asper                 |   | + | + | . | + | 1 | 1 | 2 | 2 |
| Persicaria lapathifolia       | 2 | 2 | 2 | + | + | . | 1 | + | + |
| Juncus maritimus              | 1 | + | . | 3 | + | + | + | 7 | |
| Phragmites australis          |   | + | . | . | . | + | . | + | 1 |
| Chenopodium album             |   | + | + | . | . | + | 1 | 1 | + |
| Polypogon monspeliensis       | . | . | . | . | . | + | 1 | 2 | 1 |
| Typha latifolia               |   | . | . | . | . | . | 1 | + | 1 |
| Bolboschoenus maritimus       | . | . | . | . | . | 1 | 1 | + | 4 |
| Medicago polymorpha           | . | . | . | . | . | + | + | + | 4 |
| Dysphania ambrosioides        |   | + | . | . | . | + | 1 | + | 4 |
| Conyza bonariensis            | + | . | . | . | . | + | + | + | 4 |
| Phylla nodiflora              |   | . | . | . | 1 | + | 1 | . | 3 |
| Cynodon dactylon              |   | . | . | . | 1 | + | + | . | 3 |
| Polypogon viridis             | . | . | . | . | . | + | 1 | + | 3 |
| Senecio vulgaris              | . | . | . | . | . | + | + | + | 3 |
| Lythrum junceum               | . | . | . | . | . | + | 1 | + | 3 |
| Dittrichia viscosa            | + | . | . | . | . | + | + | + | 2 |
| Xanthium italicum             |   | . | . | . | . | 1 | + | . | 2 |
| Helosciadium nodiflorum       | . | . | . | . | . | + | + | . | 2 |
| Schoenoplectus tabernaemontani|   | . | . | . | . | 1 | + | . | 2 |
| Rumex conglomeratus           | . | . | . | . | . | + | + | . | 2 |
| Cyperus distachyos            | . | . | . | . | . | + | + | . | 2 |
| Convolvulus arvensis          |   | + | . | . | . | + | + | . | 2 |
| Tussilago farfara             |   | + | . | . | . | + | + | . | 2 |
| Convolvulus silvaticus        | . | . | . | . | . | + | + | . | 1 |
| Scirpoideae holoschoenus      | . | . | . | . | . | + | + | . | 1 |
| Samolus valerandi             | . | . | . | . | . | + | + | . | 1 |
| Lotus pretii                  | + | . | . | . | . | . | . | . | 1 |
| Persicaria maculosa           |   | . | . | . | . | . | + | . | 1 |
| Trigonella sulcata            | . | . | . | . | . | . | + | . | 1 |
| Hyperchoeris achyrophorus     | . | . | . | . | . | . | + | . | 1 |
| Cornillia repanda             | . | . | . | . | . | . | + | . | 1 |
| Spergularia marina            | . | . | . | . | . | . | + | . | 1 |

Localities and dates of relevés. Rel. 1–10: Biviere di Gela, Brullo & Sciandrello [89]—Table 2.

Table A30. Coronopo squamati-Corrigioletum litoralis Brullo & C. Brullo ass. nov.

| Relevé number | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | Presence |
|---------------|---|---|---|---|---|---|---|---|---|----------|
| Altitude (dam) | 120 120 120 120 120 | 120 120 120 120 120 | |
| Surface (m²)   | 2 1 3 2 2 | 2 1 3 2 2 | |
| Coverage (%)    | 60 60 50 30 30 | 30 30 30 30 30 | |

| Char. Association       | 2 | 3 | 2 | 1 | 1 | 5 |
| Char. All. (VERBENION SUPINAE ) and Ord. (NANOCYPERETALIA) | | | | | | |
| Coronopus squamatus     | + | + | 1 | 1 | + | 5 |
| Spergularia rubra       | 2 | + | 1 | 1 | + | 5 |
| Laphangium luteolium    | . | . | + | + | . | 2 |

| Char. Class (ISOÊTO-NANOJUNCETEA) |
| Mentha pulegium         | 2 | 2 | 3 | 2 | 1 | 5 |
| Juncus bufonius         | 1 | 2 | + | 1 | + | 5 |
| Lythrum hyssopifolia    | + | . | + | + | 1 | 4 |
| Polypogon subspathaceus | + | . | + | + | 4 | |

| Other species          |
| Polygonum aviculare    | 1 | 1 | 2 | + | 1 | 5 |
| Polygonum viridis      | 2 | 1 | 1 | . | + | 4 |
| Lolium perenne         | 1 | . | 1 | + | + | 4 |
| Plantago major         | + | 1 | . | . | + | 3 |

Localities and dates of relevés. Rel. 1–5: Argimusco (Bosco di Malabotta)—29 July 1992.
Table A31. Damasonio bourgaei-Crypsietum aculeatae Rivas-Martínez & Costa in Rivas-Martínez et al. 1980.

| Relevé number | Altitude (m) | Surface (m²) | Coverage (%) | Char. Association | Presences |
|---------------|--------------|---------------|--------------|-------------------|-----------|
| 1             |              | 50            | 70           | Cressa cretica    | +         |
| 2             | 11           | 50            | 70           | Damasonium bourgaei| 1         |
| 3             | 9            | 50            | 70           | +                  |           |
| 4             | 11           | 50            | 70           | +                  | 1         |
| 5             | 9            | 50            | 70           | +                  |           |
| 6             | 11           | 50            | 70           | +                  |           |
| 7             | 9            | 50            | 70           | +                  | 1         |
| 8             | 11           | 50            | 70           | +                  |           |
| 9             | 9            | 50            | 70           | +                  |           |
| 10            | 11           | 50            | 70           | +                  | 1         |
| 11            | 9            | 50            | 70           | +                  |           |
| 12            | 11           | 50            | 70           | +                  |           |
| 13            | 9            | 50            | 70           | +                  |           |
| 14            | 11           | 50            | 70           | +                  | 1         |
| 15            | 9            | 50            | 70           | +                  |           |
| 16            | 11           | 50            | 70           | +                  |           |
| 17            | 9            | 50            | 70           | +                  | 1         |
| 18            | 11           | 50            | 70           | +                  |           |
| 19            | 9            | 50            | 70           | +                  |           |
| 20            | 11           | 50            | 70           | +                  |           |
| 21            | 9            | 50            | 70           | +                  | 1         |
| 22            | 11           | 50            | 70           | +                  |           |
| 23            | 9            | 50            | 70           | +                  | 1         |
| 24            | 11           | 50            | 70           | +                  |           |
| 25            | 9            | 50            | 70           | +                  |           |
| 26            | 11           | 50            | 70           | +                  |           |
| 27            | 9            | 50            | 70           | +                  | 1         |
| 28            | 11           | 50            | 70           | +                  |           |
| 29            | 9            | 50            | 70           | +                  |           |
| 30            | 11           | 50            | 70           | +                  |           |
| 31            | 9            | 50            | 70           | +                  |           |

Localities and dates of relevés. Rel. 1–9: Piana del Signore (Gela)—8 September 1973; rel. 10–14: Piana del Signore (Gela)—20 August 1978; rel. 15: Piana del Signore (Gela)—1 August 2003; rel. 16–17: Piana del Signore (Gela), 19 August 2003; rel. 18–21: Piana del Signore (Gela)—12 June 2005; rel. 22: Piana del Signore (Gela)—19 June 2005; rel. 23—Piana del Signore (Gela)—6 August 2005; rel. 24–26: Contrada Margi (Gela)—1 August 2005; rel. 27–29: Macchitella (Gela)—20 August 2005; rel. 30–31: Contrada Bucrazi (Gela)—10 September 2005.
### Table A32. Ranunculo trilobi-Lythretum tribracteati Brullo & Sciandrello ass. nov.

| Relevé number | 1 | 2 | 3 | 4 | 5 | 6 |
|---------------|---|---|---|---|---|---|
| Altitude (m)  | 9 | 9 | 9 | 9 | 9 | 9 |
| Surface (m²)  | 3 | 5 | 5 | 5 | 10 | 20 |
| Coverage (%)  | 60| 80| 90| 90| 100| 100|

**Char. Association**

| Ranunculus trilobus | + | 2 | 1 | + | 1 | 1 | 6 |

**Char. All. (LYTHRON TRIBRACTEATI)**

| Lythrum tribracteatum | 2 | 2 | 3 | 4 | 5 | 5 | 6 |

**Char. Ord. (NANOCYPERETALIA)**

| Pulicaria sicula | 1 | + | 1 | 2 | 3 | 1 | 6 |
| Hordeum marinum | . | + | + | 1 | 1 | + | 5 |
| Schenckia spicata | . | 1 | 1 | 2 | + | + | 5 |
| Coronopus squamatus | . | 1 | 1 | . | . | . | 2 |

**Char. Class (ISOÈTO-NANOJUNCETEA)**

| Mentha pulegium | 2 | 4 | 5 | 1 | 1 | 2 | 6 |
| Polygongon subspathaceus | 3 | + | 1 | + | 1 | + | 6 |
| Lythrum hyssopifolia | 3 | 3 | 2 | . | . | . | 3 |
| Juncus hybridos | 3 | + | 1 | . | . | . | 3 |
| Damsonium bourgaei | + | . | . | + | + | . | 3 |
| Galudinia fragilis | . | 1 | + | . | . | . | 2 |
| Juncus bufonius | 1 | . | . | . | . | . | 1 |

**Other species**

| Trifolium resupitanum | 2 | 1 | 1 | . | . | . | 3 |
| Centaurnium tenuiflorum | + | + | + | . | . | . | 3 |
| Anagallis arvensis | + | 1 | 1 | . | . | . | 3 |
| Trigonella sicula | . | + | . | + | + | . | 3 |
| Chamaemelum fuscatum | 2 | + | + | . | . | . | 3 |
| Bromus hordeaceus | 1 | + | + | . | . | . | 3 |
| Atriplex patula | . | . | 1 | + | + | . | 3 |
| Symphyotrichum squamatum | . | . | + | + | . | + | 3 |
| Anagallis arvensis | . | 1 | 1 | . | . | . | 2 |
| Polygonum aviculare | . | + | + | . | . | . | 2 |
| Plantago coronopus | . | + | 1 | . | . | . | 2 |
| Podospermum canum | . | + | + | . | . | . | 2 |
| Cressa cretica | . | + | 1 | . | . | . | 2 |
| Medicago ciliaris | 1 | + | . | . | . | . | 2 |
| Visnaga daucoides | . | . | + | . | . | . | 1 |
| Phalaris minor | . | . | + | . | . | . | 1 |
| Carditus argyroa | . | . | + | . | . | . | 1 |
| Scorzoneraoides muelleri | 1 | . | . | . | . | . | 1 |

Localities and dates of relevés. Rel. 1: Piana del Signore (Gela)—15 May 2003; rel. 2: Piana del Signore (Gela)—30 May 2004; rel. 3: Piana del Signore (Gela)—20 June 2004; rel. 4–6: Contrada S. Oliva (Gela)—3 September 2005.

### Table A33. Pulicario graecae-Damasonietum bourgaei Minissale, Santo & Sciandrello 2011.

| Relevé number | 1 | 2 | 3 | 4 | 5 | 6 |
|---------------|---|---|---|---|---|---|
| Altitude (m)  | 18| 18| 18| 18| 18| 18 |
| Surface (m²)  | 5 | 5 | 10| 1 | 20| 30 |
| Coverage (%)  | 70| 70| 70| 50| 70| 60 |

**Char. Association**

| Pulicaria vulgaris var. graeca | 3 | 3 | 1 | 2 | 3 | + | 6 |
### Table A33. Cont.

| Char. All. (LYTHRION TRIBRACTEATI) and Ord. (NANOCYPERETALIA) | Heliotropium supinum | Lythrum tribracteatum | Pulicaria sicula | Coronopus squamatus | Hordeum marinum | Schenckia spicata |  |
|---|---|---|---|---|---|---|---|
| + | + | + | . | + | 4 |  |
| Lythrum tribracteatum | - | 2 | . | 1 | . | . | 2 |
| Pulicaria sicula | - | . | + | . | + | . | 2 |
| Coronopus squamatus | . | . | - | + | + | . | 2 |
| Hordeum marinum | . | . | + | . | . | . | 1 |
| Schenckia spicata | . | . | . | . | 1 | . | 1 |

| Char. Class (ISOËTO-NANOJUNCETEA) | Damasonium bourgaei | Polypogon subspathaceus |  |
|---|---|---|---|
| 4 | 3 | 4 | 3 | 1 | 3 | 6 |
| Polypogon subspathaceus | + | + | + | . | 1 | . | 4 |

**Other species**

| Bolboschoenus maritimus | Limonium narbonense | Polypogon maritimus | Trifolium resupinatum | Juncus subulatus | Dittrichia viscosa |  |
|---|---|---|---|---|---|---|
| 2 | 1 | 2 | + | 2 | 3 | 6 |
| 1 | + | + | + | 2 | . | 5 |
| 1 | 1 | + | . | + | . | 4 |
| . | . | + | + | . | . | 2 |
| + | . | . | . | . | . | 1 |
| . | . | . | . | + | . | 1 |

Localities and dates of relevés. Rel. 1–6: Capo Murro di Porco, Maddalena Peninsula (Syracuse), Minissale et al. [92]—Table 3.

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