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The Natural Vegetation of Residual Wetlands in the Hinterland of Western Sicily (Italy)

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Abstract: An overview of the wetland vegetation of the hinterland of western Sicily, between the hills located south of the Palermo Mts. and the Sicani Mts., is presented herein. This study was conducted according to Braun-Blanquet's phytosociological method, through a survey carried out mainly within six important biotopes: (1) Gorgo Lungo ("Bosco Ficuzza"; municipality of Godrano); (2) Gorgo Marosa (on the southern side of Rocca Busambra; municipality of Godrano); (3) Gorgo di Piano Scala (on the northern side of Mt. Cardellia; municipality of Corleone); (4) and (5) Gorgo Carcaci and Gorgo Carcaciotto (both on the south-eastern slope of Mt. Carcaci; municipality of Castronovo di Sicilia); and (6) Gorgo S. Andrea (municipality of Castronovo di Sicilia). A vegetation analysis was carried out on the basis of 107 field relevés, together with other data taken from scientific literature. A total of 28 plant communities were identified, between hydrophytics of the classes *Lemnetea minoris* (3 associations) and *Potamogetonetea pectinati* (6 associations), helophytics of the *Phragmito-Magnocaricetea* class (14 associations and 1 community), ephemeral of the *Isöeto-Nanojuncetea* class (2 communities) and perennial herbaceous vegetation of the *Molinio-Arrhenatheretea* class (1 association and 1 community). A new syntaxon is also described (*Callitricho obtusangulae-Glycerietum notatae* ass. nova), as an endemic association of the hinterland of western Sicily, referred to as the *Alopecuro-Glycerion spicatae* alliance. For all surveyed communities, new insights into syntaxonomy and diagnostic taxa are provided, as well as for the floristic composition, synecology, syndynamism and synchorology of the aquatic vegetation of western Sicily.

Keywords: aquatic vegetation; habitat conservation; Hygrophilous plants; plant community classification; *Lemnetea minoris*; *Potamogetonetea*; *Phragmito-Magnocaricetea*; Sicily

Citation: Gianguzzi, L.; Caldarella, O.; Sciandrello, S. The Natural Vegetation of Residual Wetlands in the Hinterland of Western Sicily (Italy). *Land* **2024**, *13*, 2009. https://doi.org/10.3390/land13122009

Academic Editor: Eva Papastergiadou

Received: 29 September 2024
Revised: 14 November 2024
Accepted: 14 November 2024
Published: 26 November 2024

1. Introduction

The natural freshwater environments of the Mediterranean region are true biodiversity hotspots, vital sites of primary importance for both floristic and faunal richness. These ecosystems are quite fragile, increasingly rare and primarily threatened by human exploitation, as well as by related natural phenomena such as global warming. They sometimes face extreme emergencies, especially in areas characterized by greater environmental aridity and especially on islands. This is the case in Sicily, where various studies of the plant biodiversity of these residual biotopes have been carried out over the past few years, also of a phytosociological nature, in environments including wetlands, marshes and lakes [1–9], as well as rivers and streams [10–12].

This current study builds on this body of research with the objective of contributing floristic and phytosociological knowledge of the hygro-hydrophilic vegetation of the hilly-mountainous belt in the hinterland of western Sicily. This study examines the wetland vegetation, with particular reference to the following residual natural ponds distributed in

this area, locally called "gurghi" or "vurghi": (1) Gorgo Lungo; (2) Gorgo Marosa; (3) Gorgo Piano Scala; (4) Gorgo Carcaci; (5) Gorgo Carcaciotto; and (6) Gorgo S. Andrea (Figure 1 and Table 1). All of them are located within the province of Palermo (the first two in the municipality of Godrano, the third in the municipality of Corleone and the last three in the municipality of Castronovo di Sicilia). The six biotopes are among the last examples of temporary Mediterranean pools found within this wide area; they are semi-permanent wet environments characterized by surfaces submerged in stagnant water for a long part of the year, covered with unique hygro-hydrophilic vegetation which has been little known up until now. In fact, the only previously published phytosociological data comes from an old study concerning the Gorgo Carcaci and Gorgo Carcaciotto [13], along with some surveys focusing on the aquatic communities of the *Lemnetea* and *Potamogetonetea* class, published in a recent monograph [8]. This study aims to provide a comprehensive overview of lake and marsh vegetation, taking into account floristic, chorologic and ecological features, in order to promote the naturalistic conservation of these vulnerable biotopes.

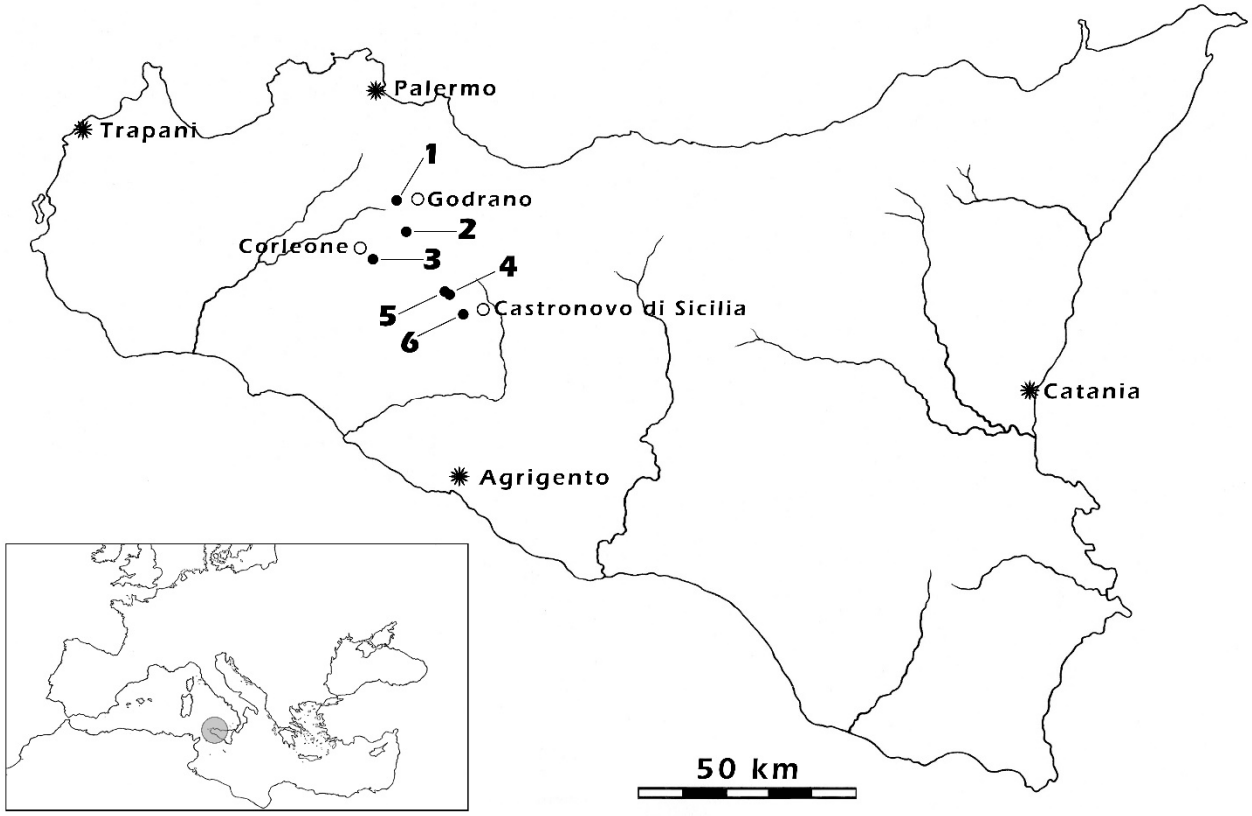

Figure 1. Study area with the biotopes investigated: (1) Gorgo Lungo; (2) Gorgo Marosa; (3) Gorgo Piano Scala; (4) Gorgo Carcaci; (5) Gorgo Carcaciotto; and (6) Gorgo Sant'Andrea.

Table 1. Location and physical features of the freshwater habitats investigated.

ID	Locality Municipality	Geografic Coordinates	Geografic District Altitude Drainage Basin	Measures Shape Depth	Hydroperiod Origin	Natura 2000 Site
1	Gorgo Lungo Godrano (PA)	37°54.06′ N 13°24.51′ E	Rocca Busambra area 890 m a.s.l. San Leonardo River	110 × 30 m strictly ellipsoidal 150 cm	Permanent Natural	ZSC ITA020007 ZPS ITA020048
2	Gorgo Marosa Godrano (PA)	37°50.22′ N 13°25.09′ E	Rocca Busambra area 859 m a.s.l. San Leonardo River	15 × 25 m ±reptangular 100 cm	Temporary Semi-natural	ZSC ITA020008 ZPS ITA020048

Table 1. *Cont.*

ID	Locality Municipality	Geografic Coordinates	Geografic District Altitude Drainage Basin	Measures Shape Depth	Hydroperiod Origin	Natura 2000 Site
3	Gorgo Piano Scala Corleone (PA)	37°47.43′ N 13°20,07′ E	Sicani Mts. 772 m a.s.l. San Leonardo River	290 × 170 m triangular 150 cm	Permanent Natural	ZSC ITA020037 ZPS ITA020048
4	Gorgo Carcaci Castronovo di S. (PA)	37°42.06′ N 13°32.44′ E	Sicani Mts. 863 m a.s.l. Platani River	85 × 85 m ±square 200 cm	Permanent Natural	ZSC ITA020034 ZPS ITA020048
5	Gorgo Carcaciotto Castronovo di S. (PA)	37°42.28′ N 13°32.03′ E	Sicani Mts. 894 m a.s.l. Platani River	120 × 60 m irregular 200 cm	Permanent Natural	ZSC ITA020034 ZPS ITA020048
6	Gorgo S. Andrea Castronovo di S. (PA)	37°40.24′ N 13°34.14′ E	Sicani Mts. 578 m a.s.l. Platani River	90 × 25 m ±reptangular 300 cm	Temporary Natural	ZSC ITA020011

2. Materials and Methods

2.1. Study Area

Figures 1 and 2 shows the locations of the main lake environments under investigation, with corresponding details (name, municipality, geographic coordinates, altitude, drainage basin, Natura 2000 sites they fall within, measure, shape and maximum depth, with reference to the early summer period) summarized in Table 1.

At present, five of the six biotopes investigated are included in the protected area ZPS ITA020048 "Monti Sicani, Rocca Busambra e Bosco Ficuzza", while only Gorgo S. Andrea is included within the ZSC ITA020011 "Rocche di Castronovo, Pizzo Lupo e Gurghi di Sant'Andrea".

From a biogeographical point of view, this area is part of the Italo-Tyrrhenian Province and the Sicilian Subprovince [14], encompassing the "Drepano-Panormitano" district (Trapani, Palermo and Sicani Mts.). From a geological perspective, the area belongs to the Mesozoic-Cenozoic Appennine-Maghrebian chain [15]. Its evolution is characterized by a combination of compressive phases with variable directions, resulting in overlapping tectonic slices covered unconformably by Oligo-Miocene clay and arenaceous successions [16]. Carbonate and silico-carbonate formations of the Sicane Units prevail, along with glauconitic calcarenites ranging from the Upper Triassic to the Lower Miocene [17].

The climatic data for the region are summarized in Tables 2 and 3 [18,19]. According to Rivas-Martinez [20], the study area predominantly falls within the "mesomediterranean" (upper and lower) bioclimatic zone (mean annual temperatures of 16–13 °C), with an ombrotype between "upper dry" and "upper subhumid" (Table 4).

Table 2. Monthly and annual median precipitation (mm) and number of rainy days (r.d.) registered in the stations located around the area object of the research: Ficuzza, Corleone, Lercara Friddi, Castronovo di Sicilia, Pian del Leone, Carcaciotto and Prizzi [19].

Station		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Year
Ficuzza (317 m a.s.l.)	mm	144	113	92	67.7	38.1	13.3	7.8	18.7	41.8	80.5	108	130	852.3
	r.d.	14	11	11	7	5	2	1	2	4	8	10	13	88
Corleone (594 m a.s.l.)	mm	114	92.2	80.1	55.8	38.2	11.9	6.6	15.3	43.1	79.9	98.6	112	747.2
	r.d.	13	11	10	7	5	2	1	2	5	8	10	13	87
Lercara Friddi (658 m a.s.l.)	mm	89.9	74	69.7	46.2	28	9.2	6.8	14.8	31.4	73.3	79.9	89	612.2
	r.d.	12	10	9	6	4	2	1	2	4	8	9	12	79

Table 2. *Cont.*

Station		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Year
Castronovo di Sicilia	mm	115	90.4	83	54.5	31.5	12.9	6.8	20.2	36.9	83.5	101	122	757.2
(682 m a.s.l.)	r.d.	13	10	10	7	5	2	1	2	4	8	9	13	84
Piano del Leone	mm	140	92.9	90.1	62.2	30	11.7	9.3	17.8	33.6	91	114	134	826.7
(831 m a.s.l.)	r.d.	13	11	10	8	4	2	1	2	4	8	10	13	86
Carcaciotto	mm	93	76	78.9	60.7	31.5	12.1	12.3	21	37.1	81	81.9	107	692
(930 m a.s.l.)	r.d.	13	10	11	9	4	2	1	2	4	8	10	13	87
Prizzi	mm	109	91.9	74.4	54.9	37.4	10.7	9.6	18.6	46.1	84.7	100	120	758.2
(1.035 m a.s.l.)	r.d.	11	10	8	6	4	2	1	2	4	7	8	11	74

Table 3. Annual temperature (in °C): average temperature (maximum and minimum), daily average, daily excursions, absolute maximum and minimum registered at the same stations (period 1926–1985) [19].

Station	Maximum	Minimum	Daytime	Excursion	Max. Abs.	Min. Abs.
Ficuzza	19.6	9.4	14.5	10.2	41.8	−10.5
Corleone	20.9	10.7	15.8	10.1	45	−6.8
Lercara Friddi	20.0	9.9	14.9	10.1	40.6	−7.0
Pian del Leone	17.9	8.8	13.4	9.1	39.6	−8.5

Table 4. Bioclimatical indices and bioclimates calculated for the thermopluviometric stations present in the study area.

Station	Ic	It	Io	Ios2	Ios3	Ios4	Termotype	Ombrotype
Ficuzza	17.1	272	4.875	0.501	0.547	0.902	Upper Mediterranean	Upper subhumid
Corleone	17.1	312	3.938	0.442	0.462	0.802	Upper Mediterranean	Upper subhumid
Lercara Friddi	17.2	286	3.408	0.405	0.477	0.690	Lower Mesomediterranean	Upper dry
Pian del Leone	16	252	5.710	0.620	0.616	0.883	Upper Mediterranean	Upper subhumid

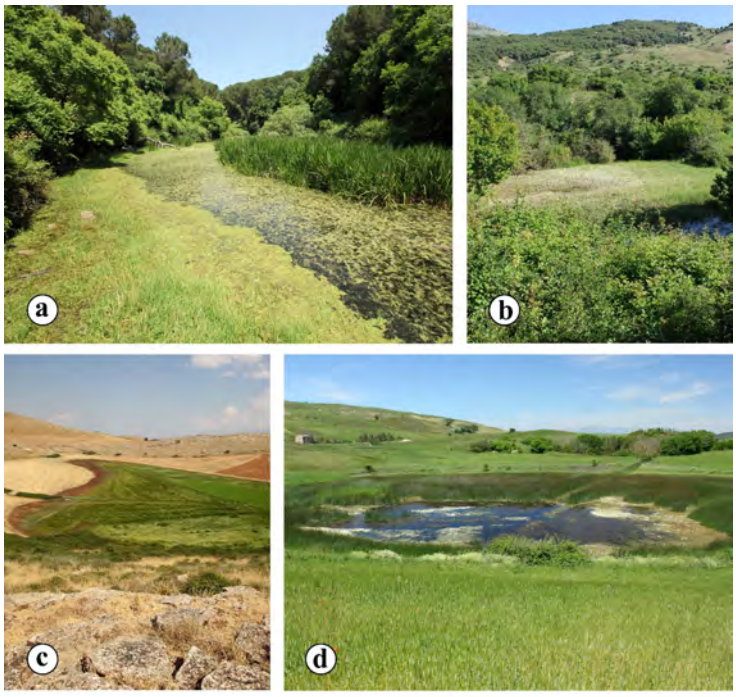

Figure 2. *Cont.*

Figure 2. (**a**) Gorgo Lungo (Godrano); (**b**) Gorgo Marosa (Godrano); (**c**) Gorgo Piano Scala (Corleone); (**d**) Gorgo Carcaci (Castronovo di Sicilia); (**e**) Gorgo Carcaciotto (Castronovo di S.); (**f**) Gorgo S. Andrea (Castronovo di S.).

2.2. Phytosociological Data and Statistical Analysis

Based on data from the literature and in numerous previously unpublished findings, a syntaxonomical framework of the lake and marsh associations observed in the same wetland areas that characterize the hinterland of this part of Sicily is outlined.

The vegetation was studied using the phytosociological method of the Zurich–Montpellier school [21]. The original Braun-Blanquet sampling scale was transformed into an ordinal scale, according to Van der Maarel [22]. For the study of the communities, data were analyzed from 107 previously unpublished phytosociological relevés conducted between 2013 and 2021, of which only five date back to July 1995, in addition to data from relevés already available in the scientific literature—18 relevés published in Caldarella et al. [8]—which are summarized in synoptic tables prepared for this study. Vascular species identification and biological form of plant species follows the second edition of the "Flora d'Italia" [23], while the nomenclature refers to the "Portal of the Flora of Italy" [24].

The phytosociological relevés concern the hygro-hydrophilic communities established within the aforementioned lake areas, extending to their periodically flooded shores. These communities are arranged in a nearly concentric manner, based on the depth of the lakebeds and their gradual drying during summer. The surveys specifically focus on aspects of vegetation that are physiognomically homogeneous and intact, with a coverage level of 75–100% and estimated values for dominant species typically ranging between 4 and 5.

The unpublished phytosociological relevés have been included in 7 distinct tables [1 table and 2 relevés for the *Lemnetea* class (Table 5), 5 tables and 94 relevés for the *Phragmito-Magnocaricetea* class, and 1 table and 11 relevés for the *Isöeto-Nanojuncetea* and *Molinio-Arrhenatheretea* classes], while those already known in the literature and belonging to classes *Lemnetea* and *Potamogetonetea* have been included in 2 synoptic tables (Tables 6 and 7). The five tables of the *Phragmito-Magnocaricetea* class are distinguished by alliance (*Phragmition communis*, *Scirpion maritime*, *Magnocaricion elatae*, *Glycerio-Sparganion*, *Alopecuro-Glycerion spicatae*).

Within Tables 8–13, the cluster analysis line indicates the number of the phytosociological relevés (i.e., P91, P92, etc.) as shown in Figure 3.

The dates and locations of the relevés are reported in Appendix B.

Due to the high diversity of vegetation, a hierarchical separation of relevés was conducted using a multivariate analysis (linkage method: Ward's, distance measure: Euclidean) was applied. Cluster analyses were performed using PC-ORD 6 software Version 6 [25]. The relevés of the *Phragmito-Magnocaricetea*, *Isöeto-Nanojuncetea* and *Molinio-Arrhenatheretea* classes were analyzed using classification methods (Figure 3).

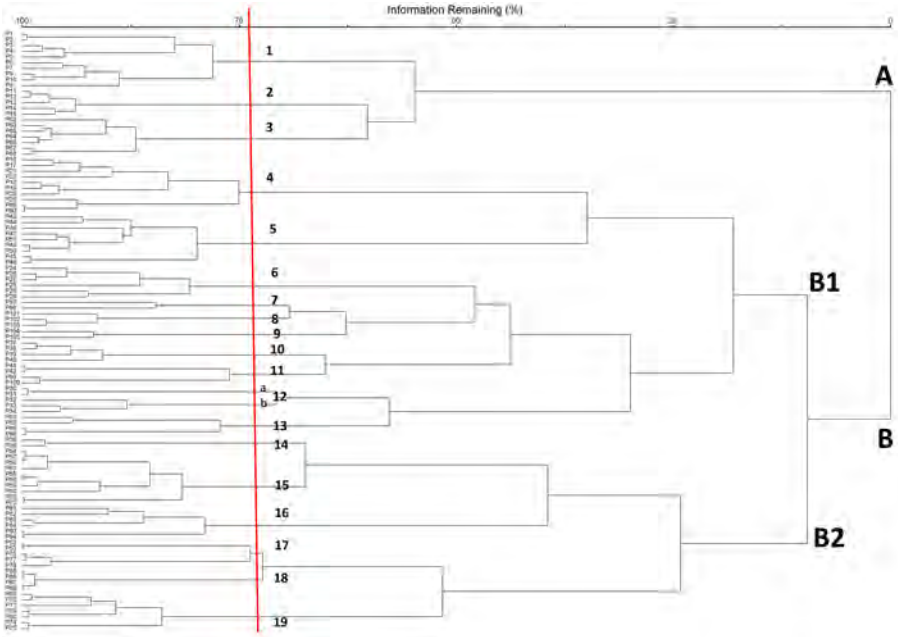

Figure 3. Cluster analysis of vegetation. Plant communities: 1. *Schoenoplectetum lacustris*; 2. *Phragmitetum communis*; 3. *Sparganietum erecti*; 4. *Bolboschoeno maritimi-Alismetum lanceolate*; 5. *Eleocharido palustris-Alismetum lanceolate*; 6. *Caricetum hispidae*; 7. *Mentha pulegium* comm.; 8. *Potentilla reptans* comm.; 9. *Gaudinia fragilis* comm.; 10. *Iridetum pseudacori*; 11. *Mentha aquatica* comm.; 12. *Caricetum otrubae*; 13. *Phalarido coerulescentis-Agropyretum repentis*; 14. *Cyperetum longi*; 15. *Potamo natantis-Polygonetum natantis*; 16. *Helosciadietum nodiflori*; 17. *Callitricho obtusangulae-Glycerietum notatae* ass. nov.; 18. *Alopecurus aequalis* comm.; 19. *Apio nodiflorae-Glycerietum plicatae*.

The arrangement of homogenous relevés in phytosociological tables facilitated the identification of the plant communities and the definition of the syntaxonomical framework. The classification of syntaxa above the association rank (alliances, orders and classes) was carried out according to Mucina et al. [26], as well as Biondi et al. [27]. The names of syntaxa comply with the International Code of Phytosociological Nomenclature (ICPN) [28], except for some cases specified in the text.

The synecological analysis was carried out according to the methodological principles of synphytosociology [29]. The references to the sigmeta also refer to the "Carta delle serie di vegetazione d'Italia" [30], with a few exceptions whose references are reported in the text.

For each of the identified communities, profiles have been created that report the data pertaining to the relevant parameters [diagnostic species (% constancy), syntaxonomical note, short description, syndynamism, synchorology, local distribution, Natura 2000 code].

3. Results and Discussions

3.1. Cluster Analysis of Wetland Vegetation

Classification of the relevés of the *Phragmito-Magnocaricetea* class, supported by cluster analysis (Figure 3), showed five main vegetation groups, respectively referred to the alliances *Phragmition communis*, *Scirpion maritimi*, *Magnocaricion*, *Glycerio-Sparganion*, and *Alopecuro-Glycerion spicatae*.

Moreover, three floristically impoverished communities dominated by annual amphibian species (*Mentha pulegium* comm., *Gaudinia fragilis* comm.) and hygrophytic entities (*Potentilla reptans* comm.) with another tall-herb temporarily flooded association (*Phalarido coerulescentis-Agropyretum repentis*), have been separated from the *Phragmito-Magnocaricetea* class and referred to the classes *Isöeto-Nanojuncetea* and *Molinio-Arrhenatheretea* respectively.

3.2. Vegetation Classification and Descriptions

In the study area, a total of 28 plant communities, reported in the Syntaxonomical Scheme (Appendix A, Table A1), were identified. In particular, 3 communities are referred to the *Lemnetea minoris* (annual pleustophytic vegetation of still and nutrientrich freshwater bodies), 6 to the *Potamogetonetea pectinati* (perennial macrophytic associations of stagnant mesotrophic, eutrophic and brackish freshwater bodies), and 15 to the *Phragmito-Magnocaricetea* (perennial helophyte that colonize marsh, fen and lacustrine environments as well as fluvial areas, on eutrophic to meso-oligotrophic soils of brackish and fresh waters). Furthermore, 2 other communities belonging to the *Isöeto-Nanojuncetea* class (ephemeral herbaceous hygrophilous aspects linked to periodically submerged soils) and 2 to the *Molinio-Arrhenatheretea* class (perennial herbaceous communities dominated by hemicryptophytes and geophytes) were monitored.

The floristic composition, ecology, syndynamic relationships and chorology of each examined plant community are critically described below:

1. *Lemnetum minoris* von Soó 1927

Phytosociological data: Table 5, rels. 1–2; Table 6 col. Lm

Table 5. *Lemnetum minoris* von Soó 1927.

	Community	**Lm**	**Lm**
Life form	Relevé number	1	2
	Altitude (m a.s.l.)	890	890
	Plot size (mq)	1	1
	Total cover (%)	90	100
	Height of vegetation (cm)	5	5
	N° species for relevé	6	6
	Localities (see Table 1)	1	1
	Char. association		
I nat	*Lemna minor* L.	5	5
I rad	*Ceratophyllum submersum* L.	1	1
	Potamogetonetea units		
I rad	*Ranunculus aquatilis* L.	2	1
I rad	*Callitriche obtusangula* Le Gall	1	1
	Other species		
H caesp	*Alopecurus aequalis* Sobol.	1	1
G rhiz	*Glyceria notata* Chevall	+	1

Table 6. Synoptic table of the communities of the *Lemnetea* class in the study area; Lm: *Lemnetum minoris*; Lg: *Lemnetum gibbae*; PC: *Potamogetono-Ceratophylletum submersi*. (*) guide/dominant species.

Life Form	**Community**	**Lm**	**Lg**	**PC**
	Number of Relevés	**2**	**2**	**4**
	Localities (see Table 1)	**1**	**1**	**1**
	Char. association and *Lemnetea* units			
I nat	*Lemna minor* L.	2 *	2	4
I nat	*Lemna gibba* L.	.	2 *	4
I rad	*Ceratophyllum submersum* L.	2	.	4 *
	Potamogetonetea units			
I rad	*Ranunculus aquatilis* L.	2	2	4
I rad	*Callitriche obtusangula* Le Gall	2	2	4
	Other species			
H caesp	*Alopecurus aequalis* Sobol.	2	2	3
G rhiz	*Glyceria notata* Chevall	2	.	1

Diagnostic taxa: *Lemna minor*.

Short description: Acropleustophytic aquatic community dominated by *L. minor*, typical of sunny, stagnant water bodies, sheltered from the wind, and tends to interpenetrate with other aquatic coenoses. Its growth optimum is in late spring, whereas it tends to regress in the presence of summer drying events, and stationing of livestock [8].

Catenal contacts: At Gorgo Lungo, this vegetation is in contact with the association *Potamogetono-Ceratophylletum submersi*.

Synchorology: *Lemna minor* is a subcosmopolitan species, distributed in Europe, Africa, western Asia and North America [31]. The *Lemnetum minoris* is rather common in Europe including the Mediterranean area [32–36]. The dominant species develops in several habitat types, often forming monopaucispecific stands [37–40]. *Lemna minor* communities have a wide distribution and are quite widespread in continental Italy [37] and large islands [41]. In Sicily, they have been reported in the Nebrodi Mts. and Sicani Mts. [2,42], Trapani [43], Bosco Granza and Bosco Ficuzza [44].

Local distribution: Gorgo Lungo.

2. *Lemnetum gibbae* Miyawaki et J. Tüxen 1960

Phytosociological data: Table 6, col. Lg

Diagnostic taxa: *Lemna gibba*.

Short description: Acropleustophytic community dominated by *Lemna gibba*, typical of weakly flowing environments, artificial basins and ditches, up to 150 cm deep, sunny and/or partially shaded. Its optimal growth is in late spring and it tolerates summer water stress conditions [8].

Catenal contacts: This pioneer community is, in some cases, also invasive, due to the progressive eutrophication of the waters as the season progresses, in correlation with the increase in the summer temperature of the waters; they tend to locally replace the *Lemnetum minoris*, due to which it can be considered a vicariant seasonal.

Synchorology: The association was largely reported in the Italian territory and the Mediterranean regions [37,38,45–48]. In Sicily it is common [49,50], with records for the Etnean areas [47], Sicani Mts. [42] and provinces of Caltanissetta [13], Trapani [51], Palermo [8,52] and Agrigento [44].

Local distribution: Gorgo Lungo (Figure 4a).

Notes: *Lemnetum gibbae* is typical of stagnating eutrophic to hypertrophic waters, often subjected to direct anthropic disturbance [52–54].

3. *Potamogetono-Ceratophylletum submersi* Pop 1962

Phytosociological data: Table 6, col. PC

Diagnostic taxa: *Ceratophyllum submersum*.

Short description: Submerged community dominated by *C. submersum*, typical of shallow ponds, where it tends to occupy the entire water body. Its growth optimum is in late spring. The association tolerates some degree of shading and can be favored by progressive seasonal eutrophication of the water and high summer temperatures [8].

Catenal contacts: In the Gorgo Lungo pond, the community tends to spread among the helophytic bands dominated by *Sparganium erectum* and *Schoenoplectus lacustris*.

Synchorology: C. *submersum* is a very rare species in Italy [55], with communities reported mainly for the northern part of the peninsula [56–58]. According to Šumberová [59], this vegetation can be referred to the *Potamogetono-Ceratophylletum submersi* Pop 1962 association, typical of shallow and warm in summer ponds, with remarkable water level variations [60].

Local distribution: Gorgo Lungo (Figure 4b).

4. *Potamogetonetum pectinati* Carstensen 1955

Phytosociological data: Table 7, col. Pp

Table 7. Synoptic table of the communities of the *Potamogetonetea pectinati* class in the study area: Pp: Potamogetometum pectinati; Ra: *Ranunculetum aquatilis*; Rr: *Ranunculetum rionii*; Rpr: *Ranunculetum peltati* subass. *ranunculetosum rionii*; LC: *Lemno-Callitrichetum obtusangulae*. (*) guide/dominant species.

Life form	Community	Pp	Gd	Ra	Rr	Rpr	LC
	Number of Relevés	**2**	**1**	**2**	**1**	**4**	**2**
	Localities (see Table 1)	**6**	**4**	**1**	**4**	**4**	**5**
	Char. association and *Potamogetonetea* units						
I rad	*Potamogeton natans* L.	1	.	.	.	.	.
I rad	*Potamogeton pectinatus* L.	2 *	.	.	.	.	.
I rad	*Groenlandia densa*	.	2 *	.	.	.	.
I rad	*Ranunculus aquatilis* L.	.	.	2 *	.	.	1
I rad	*Ranunculus rionii* Lagger	.	.	.	1 *	4	.
I rad	*Ranunculus peltatus* Schrank	.	.	.	.	4 *	.
I rad	*Callitriche obtusangula* Le Gall	.	.	2	.	.	2 *
	Other species						
	Chara sp.	1	.	.	1	.	.
G rhiz	*Persicaria amphibia* (L.) Delarbre	1	.	.	1	.	.
I nat	*Lemna minor* L.	.	.	2	.	.	2
I rad	*Ceratophyllum submersum* L.	.	.	2	.	.	2
G rhiz	*Glyceria notata* Chevall	.	.	2	.	4	.
G rhiz	*Juncus subulatus* Forssk.	.	2	.	.	1	.
H scap	*Nasturtium officinalis* L.	.	2	.	.	1	.
I rad	*Alisma lanceolatum* With.	.	.	.	.	4	.
H scap	*Oenanthe fistulosa* L.	.	.	.	.	4	.
He	*Schoenoplectus lacustris* (L.) Palla	1	.	.	.	.	.
H scap	*Veronica anagallis-aquatica* L.	.	1	.	.	.	.
H caesp	*Alopecurus aequalis* Sobol.	.	.	2	.	.	.
G rhiz	*Eleocharis palustris* (L.) Roem. Et Schult.	.	.	.	.	2	.
H scap	*Mentha aquatica* L.	.	.	.	.	1	.

Diagnostic taxa: *Stuckenia pectinata* (=*Potamogeton pectinatus* L.)

Short description: Rhizophytic community dominated by *Stuckenia pectinata*, tending to form dense populations (>80% coverage). It is typical of deep-water reservoirs (even over 3 m of depth) and semi-permanent, natural habitats. The growth optimum is in the spring–summer period [8].

Catenal contacts: The community colonizes the deeper sectors of water bodies, coming into contact with other associations of the *Potamogetonetea* and *Phragmito-Magnocaricetea* classes.

Synchorology: The *Potamogetonetum pectinati* has been reported in various European countries [61,62], including some Mediterranean areas [32,36,43,63–66] and large Italian islands [41]. It is often mono- or paucispecific, typical of freshwater and brackish habitats, from eutrophic to hypertrophic, polluted waters, with high turbidity and anoxic conditions [67–70]. In Sicily, it is widespread in coastal areas, in low salinity aquatic habitats, but also in inland areas. It has been reported in some river mouths, and lentic habitats in the Hyblean sector [64], Trapani [1], Biviere and Piana di Gela [5,64], Rocca Busambra, Sicani Mts. and Agrigento [8].

Local distribution: Gorgo S. Andrea (Figure 4c).

5. *Groenlandietum densae* Segal ex Schipper et al. in Schaminée et al. 1995

Phytosociological data: Table 7, col. Gd

Diagnostic taxa: *Groenlandia densa*.

Short description: Rhizophytic aquatic vegetation dominated by *G. densa*, only sporadically associated with other hydrophytes. It occurs predominantly in sunny, permanent water habitats, where develops medium coverage stands. This vegetation prefers both flyschioid and carbonate sediments waterproofed by silt-clayey deposits.

Catenal contacts: Is associated to several aquatic plant communities colonizing the permanent sectors of water bodies (*Potamogetonetea* class), as well as algal assemblages (*Chara* ssp.), as recorded in the Nebrodi Mts. [71], and helophytic belts (*Phragmito-Magnocaricetea* class).

Synchorology: Community of oligo-mesotrophic water bodies, and limestone substrates [65], distributed in central and southern Europe [2,30]. *G. densa* is reported in Sicily for the Nebrodi Mts. [2,72–75], Sicani Mts. [76] and Bosco Granza [8].

Local distribution: small pool near Gorgo Carcaciotto.

Notes: Several *G. densa*-associations have been described for the Iberian Peninsula [77], both for flowing waters [*Ranunculo trichophylli-Groenlandietum densae* (Kohler et al. 1974) Passarge 1994], and lentic habitats (*Groenlandio densae-Zannichellietum peltatae* Velayos, Carrasco et Cirujano 1989).

6. *Ranunculetum aquatilis* Géhu 1961

Phytosociological data: Table 7, col. Ra

Diagnostic taxa: *Ranunculus aquatilis*.

Short description: Batrachid community dominated by *R. aquatilis*, with the presence of various other aquatic species of the *Potamogetonetea* class (*Callitriche stagnalis*, *C. brutia* and *C. obtusangula*). It is found in sunny ponds characterized by strong seasonal water variations, typical of flyscoid substrates, but in some cases also on calcareous substrates. The association's growth optimum is in late spring. The vegetation contributes to form a continuous belt along the external edges of colonized water bodies, at depths between about 50 cm and shores. In fact, it is well adapted to the rapid drying of temporary Mediterranean ponds [8].

Catenal contacts: This association is in close contact with submerged algal assemblages (*Chara* spp.) or with coenoses of the *Potamogetonetea* and *Lemnetea* classes. Often, the association forms actual transitional communities towards deeper vegetation belts. Along the outer edges of the colonized water bodies, this association is progressively replaced by helophytic belts of the *Phragmito-Magnocaricetea* class, and sometimes it spreads into the *Isoëto-Nanojuncetea* communities in habitats subjected to rapid seasonal water variations and the progressive drying of sediments.

Synchorology: *R. aquatilis* is a subcosmopolitan species, with a wide Euro-Asian distribution, as well as in North Africa and North America. This aquatic vegetation was reported in Central Italy [78]. In Sicily, this vegetation is known from the Trapani area [79], Hyblaean territory [80], the foothills north of the Rocca Busambra at altitudes between 738 and 890 m a.s.l. (e.g., Gorgo Glaviano and Gorgo Cerro), Trabia Mts. (Gorgo di Pizzo Selva a Mare) and Palermo Mts. (Gorgo di Rebuttone) [8].

Local distribution: Gorgo Lungo.

7. *Ranunculetum rionii* Hejný et Husák in Dykyjová et Květ 1978

Phytosociological data: Table 7, col. Rr

Diagnostic taxa: *Ranunculus rionii*.

Short description: Paucispecific aquatic community dominated by *R. rionii*, typical of shallow, eutrophic, and often salt-rich, warm ponds [59]. It tends to form continuous belts along the outer edges of small ponds, independent of strong seasonal variations in water level. The association is typical of semi-permanent or temporary ponds, located on flyshoid substrates waterproofed by subalkaline clay deposits, but also on limestones. The optimal growth of the community is in late spring [8].

Catenal contacts: The association is often in contact with other *Potamogetonetea* and algal assemblages (*Chara* spp.), whereas along littorals it spreads into helophytic belts.

Synchorology: The distribution of *R. rionii* includes North Africa, Europe and central-western Asia [81–85]. This species was reported in Italy for the first time from Lago Acquato, in Tuscany [86] and was recently registered as a new species also in Sicily [87]. In the island area, it has been recognized in numerous small ponds (both natural and artificial) distributed in the Sicani Mts., Rocca Busambra area, Palermo Mts. and further east on the limestone platforms of Mazara del Vallo [8].

Local distribution: Gorgo Carcaci.

Notes: The populations of *R. rionii* of western Sicily show a certain morphological affinity with *R. trichophyllus* Chaix, from which they differ for the presence of smaller and hairless achenes, and smaller petals [8].

8. *Ranunculetum peltati* Horst, Krausch et Müller-Stoll 1966 em. Weber-Oldecop 1969

subass. *ranunculetosum rionii* Caldarella, Lastrucci Bolpagni et Gianguzzi 2021

Phytosociological data: Table 7, col. Rpr

Diagnostic taxa: *Ranunculus peltatus*, *R. rionii*, *Oenanthe fistulosa*.

Short description: Batrachid community with a clear predominance of *R. peltatus*, only occasionally associated with other hydrophytes. This subassociation is characterized by presence of *R. rionii* and *O. fistulosa*, sometimes associated with *Alisma lanceolatum*. This community differs from the subass. *typicum* mainly because it colonizes littorals (with depths up to 50–60 cm) and muddy sediments [8]. Its optimal growth is late spring, but it regresses with the progressive lowering of the water level.

Catenal contacts: The community is often in contact with other *Potamogetonetea* and algal assemblages (*Chara* spp.); along the coasts, it tends to be replaced by amphibian vegetation often dominated by *Glyceria notata*.

Synchorology: This subassociation has been described as endemic to the the hinterland of western Sicily, in the area between the Sicani Mts. and Rocca Busambra [8].

Local distribution: Gorgo Marosa, Gorgo Carcaci (Figure 4d) and Gorgo Carcaciotto (Figure 4e).

9. *Lemno-Callitrichetum obtusangulae* (Philippi 1978) Passarge 1992

Phytosociological data: Table 7, col. LC

Diagnostic taxa: *Callitriche obtusangula*, *Lemna minor*.

Short description: *Lemno-Callitrichetum obtusangulae* is typical of summer-warm waters, rich in nutrient, tolerating drying periods, eutrophication, and slight salinity, but fearing cold winters and anthropogenic pollution [88]. The community is dominated by *Callitriche obtusangula* and *Lemna minor*. It is typical of small, semi-permanent water bodies on quartzarenitic substrates, with high levels of clay or sometimes with sandy sediments. It prefers muddy bottoms, and conditions of partial sunshine, growing at depths not exceeding 60 cm, and tolerating slightly eutrophic conditions. The association's growth optimum is in late spring.

Catenal contacts: It finds catenal contacts with aspects of the classes *Potamogetonetea* and *Lemnetea*, towards the deepest part of the water body, and with helophytic communities of the class *Phragmito-Magnocaricetea*, towards the banks.

Synchorology: The association has been reported in the temperate-subatlantic regions of Europe [88], while in Italy it is indicated in Veneto [70] and in this sector of Sicily. In particular, it is known for numerous small ponds (both natural and artificial) near Rocca Busambra, in the Bosco Granza area (Lake Bomes, Sclafani Bagni) and in the Madonie. (Pietra Giordano, Geraci Siculo) [8].

Local distribution: Gorgo Lungo.

10. *Schoenoplectetum lacustris* Chouard 1924

Phytosociological data: Table 8, col. Sl, rell. 1–10

Table 8. Relevés of *Phragmito-Magnocaricetea* class, Phragmitetalia australis order, *Phragmition communis* alliance; Sl: *Schoenoplectetum lacustris*; Pa: *Phragmitetum communis*; Se: *Sparganietum erecti*.

	Association	**Sl**	**Sl**	**Sl**	**Sl**	**Sl**	**Sl**	**Sl**	**Sl**	**Sl**	**Sl**	**Pc**	**Pc**	**Pc**	**Pc**	**Pc**	**Se**	**Se**	**Se**	**Se**	**Se**	**Se**	**Se**	
	Relevé number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	
	Cluster analysis relevé (see Figure 3)	P1	P2	P3	P4	P5	P6	P7	P9	P10	P8	P11	P13	P12	P14	P15	P62	P63	P65	P64	P66	P67	P68	
	Altitude (m a.s.l.)	578	578	864	864	864	866	895	890	890	895	895	895	895	895	895	864	864	895	895	895	890	890	Presence
Life	Plot size (mq)	8	8	24	24	10	16	16	4	4	10	30	30	30	20	15	40	40	16	16	10	8	10	
form	Total cover (%)	90	100	100	100	100	100	100	100	100	100	100	95	100	100	100	100	100	100	100	100	100	100	
	Height of vegetation (cm)	200	240	20	170	210	170	180	180	180	250	350	250	300	400	400	120	150	130	130	150	120	120	
	N° species for relevé	7	5	9	7	10	7	9	5	9	6	6	6	6	6	6	9	6	7	5	6	5	6	
	Localities (see Table 1)	6	6	4	4	4	4	5	1	1	5	5	5	5	5	5	4	4	5	5	5	1	1	
	Char. and diff. species of Association																							
G rhiz	*Schoenoplectus lacustris* (L.) Palla	5	5	4	5	5	5	5	5	5	5	2	1	2	1	+	3	2	1	.	+	1	1	20
G rhiz	*Phragmites australis* (Cav.) Trin. ex Steud.	.	.	1	.	.	.	+	.	.	1	5	5	5	5	5	+	.	1	.	+	.	.	11
I rad	*Sparganium erectum* L.	.	.	1	+	1	2	+	1	2	1	+	.	2	1	+	5	5	4	5	5	5	5	19
	Char. species of *Phrgamito-Magnocaricetea* units																							
H scap	*Mentha aquatica* L.	1	1	1	+	1	.	+	.	+	3	1	+	1	+	+	1	2	1	2	2	+	.	19
G rhiz	*Persicaria amphibia* (L.) Delarbre	3	3	2	+	2	1	.	.	.	.	.	.	.	.	.	2	+	.	.	.	.	.	8
I rad	*Alisma lanceolatum* With.	.	.	1	+	1	.	1	.	.	.	+	.	.	.	.	+	.	.	+	.	.	.	7
H scap	*Oenanthe fistulosa* L.	.	.	3	3	2	1	+	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	6
P caesp	*Solanum dulcamara* L.	.	.	.	.	.	.	+	+	+	.	.	.	.	1	+	.	.	.	+	.	.	.	6
G rhiz	*Eleocharis palustris* (L.) Roem. et Schult.	.	.	.	.	1	.	+	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	3
G rhiz	*Bolboschoenus maritimus* (L.) Palla	1	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	+	.	.	2
H scap	*Teucrium scordium* L. subsp. *scordioides* (Schreb.) Arcang.	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2
H scap	*Oenanthe aquatica* (L.) Poir.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	1	2
G rhiz	*Glyceria notata* Chevall	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
G rhiz	*Iris pseudoacorus* L.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	1
	Other species																							
H scap	*Galium debile* Desv.	1	+	+	.	2	.	.	.	+	.	.	+	1	.	.	1	.	1	+	.	.	.	10
H scap	*Rumex conglomeratus* Murray	.	.	.	.	+	.	.	.	.	.	+	+	.	.	.	.	+	+	.	.	.	.	5
I rad	*Ranunculus rionii* Lagger	.	.	.	.	.	+	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	3
I nat	*Lemna minor* L.	.	.	.	.	.	.	.	1	1	.	.	.	.	.	.	.	.	.	.	.	.	+	3
	Chara sp.	2	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2
T scap	*Veronica anagalloides* Guss.	.	.	.	.	+	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	2
I rad	*Ceratophyllum submersum* L.	.	.	.	.	.	.	.	1	1	.	.	.	.	.	.	.	.	.	.	.	.	.	2
P scap	*Salix alba* L.	.	.	.	.	.	.	.	.	1	.	.	.	.	2	.	.	.	.	.	.	.	.	2

Table 8. *Cont.*

	Association	**Sl**	**Sl**	**Sl**	**Sl**	**Sl**	**Sl**	**Sl**	**Sl**	**Sl**	**Sl**	**Pc**	**Pc**	**Pc**	**Pc**	**Pc**	**Se**	**Se**	**Se**	**Se**	**Se**	**Se**	**Se**	
I rad	*Callitriche obtusangula* Le Gall	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	1	2
H ros	*Potentilla reptans* L.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
G rhiz	*Convolvulus arvensis* L.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
P Scap	*Sambucus nigra* L.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	.	.	.	.	.	.	.	1
H caesp	*Schedonorus arundinaceus* (Schreb.) Dumort.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	1
H rept	*Ranunculus repens* L.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	1
H rept	*Ranunculus angulatus* C. Presl	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	1
G rhiz	*Elymus repens* (L.) Gould	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	1
H scap	*Epilobium hirsutum* L.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	1

Diagnostic taxa: *Schoenoplectus lacustris*.

Short description: Monospecific or species-poor vegetation occur along shores of mesotrophic to eutrophic lakes, and ponds, usually in deeper water than other types of reed vegetation, in some cases forming a wide zone between reeds and open water. *Schoenoplectus lacustris* sometimes is associated with some species of the *Phragmito-Magnocaricetea* class, such as *Phragmites australis*, *Typha* sp. pl., *Eleocharis palustris* and *Sparganium erectum*. This vegetation type grows on muddy or sandy bottoms, generally without much organic sediment [89].

Catenal contacts: It often grows in contact with aquatic vegetation of the *Potamogetonetea* and *Lemnetea* classes, in deeper water, and with other communities of the *Phragmito-Magnocaricetea* class, at the shores (e.g., *Oenantho fistulosae-Glycerietum spicatae*, *Typhetum angustifoliae* and *Typhetum latifoliae*).

Synchorology: This vegetation, with a wide distribution in temperate Eurasia, is rather frequent in Italy [65,90–95]. In Sicily, the syntaxon is known only for the Nebrodi Mts. [2].

Local distribution: Gorgo Lungo, Gorgo Carcaci, Gorgo Carcaciotto (Figure 4d,e) and Gorgo S. Andrea.

11. *Phragmitetum communis* Savič 1926

Phytosociological data: Table 8, col. Pc, rell. 11–15

Diagnostic taxa: *Phragmites australis*.

Short description: Species-poor vegetation often dominated by *Phragmites australis*, linked to eutrophic soils permanently flooded by fresh or brackish waters. Only in the early stages of growth, this helophytic vegetation is associated with other hygrophilous species of the *Phragmito-Magnocaricetea* class. This community colonizes the marshy areas of streams and rivers, preferring the places with calm or stagnant waters on silty-clayey or muddy soils [64].

Catenal contacts: Towards the internal wetlands areas the vegetation comes into contact with the coenoses of the *Potamogetonetea* class, while along the banks it tends to interpenetrate with the communities of the *Phragmito-Magnocaricetea* class, as well as with riparial vegetation of the *Saliceta purpureae* or *Nerio-Tamaricetea* classes.

Synchorology: The association shows a cosmopolitan distribution, it is widespread in the temperate zones of Europe, Asia and America [96]. This perennial helophytic vegetation is also common in Italy [38,41,89,91,97–100]. Furthermore, it is very widespread in Sicily, both in humid freshwater and brackish environments [2,4,5,10,64,101–104].

Local distribution: Gorgo Carcaciotto.

12. *Sparganietum erecti* Philippi 1973

Phytosociological data: Table 8, col. Se, rell. 16–22

Diagnostic taxa: *Sparganium erectum*.

Short description: Amphibious vegetation usually characterized by the dominance of *Sparganium erectum*, sometimes associated with some species of the *Phragmito-Magnocaricetea* class, such as *Schoenoplectus lacustris*, *Mentha aquatica*, *Persicaria amphibia*, etc. This community is typical of lake shores and swampy areas with shallow waters (from mesotrophic to eutrophic), with organic sediments on the bottom, sometimes subjected to superficial drying in summer. It is also found along watercourses with cold and limpid waters, calm or slowly flowing, in particular in well-sunny stations with permanently submerged substrate.

Catenal contacts: Towards the internal wetlands areas the vegetation comes into contact with the coenoses of the *Potamogetonetea* class, and alon the same helophytic belts with *Iridetum pseudacori* or *Phragmitetum communis* [2].

Synchorology: This vegetation, with a central Europe distribution, is rare in the Mediterranean area [105]. In Sicily, it is recorded from Fiume Fiumefreddo [10], Nebrodi Mts. [2] and Sicani Mts. [76].

Local distribution: Gorgo Lungo, Gorgo Carcaci and Gorgo Carcaciotto.

13. *Bolboschoeno maritimi-Alismetum lanceolati* Sciandrello et al. 2024

Phytosociological data: Table 9, col. BA, rell. 1–10

Diagnostic species: *Bolboschoenus maritimus*, *Alisma lanceolatum*.

Short description: Helophytic vegetation dominated by *Bolboschoenus maritimus* and *Alisma lanceolata*, linked to ponds shores and muddy marshes with shallow water, subject to summer drying. Other few species of the *Phragmito-Magnocaricetea* and *Molinio-Arrhenatheretea* classes are associated with this association.

Catenal contacts: *Bolboschoeno maritimi-Alismetum lanceolati* comes into contact mainly with the marsh communities of the *Phragmito-Magnocaricetea* class.

Synchorology: This vegetation was described for the Saline di Priolo, in south-eastern Sicily [106].

Local distribution: Gorgo Piano Scala, Gorgo Carcaciotto (Figure 4e,f) and Gorgo S. Andrea.

Notes: In Italy, the vegetation dominated by *Bolboschoenus maritimus* has been highlighted by many authors [69,107–109].

14. *Eleocharido palustris-Alismetum lanceolati* Minissale et Spampinato 1987

Phytosociological data: Table 9, col. EA, rell. 11–19

Diagnostic species: *Eleocharis palustris*, *Alisma lanceolatum*, *Oenanthe fistulosa*, *Galium debile*, *Barbarea vulgaris*.

Short description: Hygrophilous perennial vegetation dominated by *Elaeocharis palustris* and *Alisma lanceolata*, often associated to *Oenanthe fistulosa*, *Galium debile*, *Barbarea vulgaris*, *Mentha aquatica*, etc. It is linked to muddy depressions permanently flooded with shallow water, sometimes subject to a short period of summer drying [2]. It often forms floristically poor communities.

Catenal contacts: This vegetation comes into contact with several communities of the *Phragmito-Magnocaricetea* and *Potamogetonetea* classes.

Synchorology: Vegetation dominated by *Eleocharis palustris* has been widely reported in Europe and also in Italy [65,95,108,110–113]. This association was described for Gurrida lake, near Etna Mts. [6] and then reported in the ponds of the Nebrodi Mts. [2].

Local distribution: Gorgo Marosa, Gorgo Piano Scala, Gorgo Carcaci, Gorgo Carcaciotto (Figure 5a) and Gorgo S. Andrea.

15. *Caricetum hispidae* Brullo et Ronsisvalle 1975

Phytosociological data: Table 10, col. Ch, rell. 1–6

Diagnostic species: *Carex hispida*.

Short description: Helophytic community dominated by *Carex hispida*, often associated with *Mentha aquatica*, *Rumex conglomeratus*, *Cirsium creticum* subsp. *triumfetti*, *Apium nodiflorum*, *Cyperus longus*, etc. This vegetation is linked to marshes or lake stands with fresh and brackish waters [1] and prefers moist, rarely submerged soils. Sometimes this community is present near streams and springs and along the edges of watercourses, in stretches with calm and shallow waters.

Catenal contacts: The coenosis comes into contact with the marsh communities of the *Phragmito-Magnocaricetea* class.

Synchorology: Association described for coastal ponds of the Gorghi Tondi, near Mazara del Vallo [1]. Then recorded for Vendicari and Capo Feto [101]. Also indicated for the Iblean rivers, Fiume Platani [114], some rivers in the southern and central-western part of Sicily [15], Torrente di Marsala and Margi, near Salemi, Scorace and Scopello [115].

Local distribution: Gorgo Marosa, Gorgo Carcaci and Gorgo Carcaciotto.

Table 9. Relevés of *Phragmito-Magnocaricetea* class, Bolboschoenetalia maritimi order, *Scirpion maritimi* alliance; BA: *Bolboschoeno maritimi-Alismetum lanceolati*; EA: *Eleocharido palustris-Alismetum lanceolati*.

	Association	**BA**	**BA**	**BA**	**BA**	**BA**	**BA**	**BA**	**BA**	**BA**	**BA**	**EA**	**EA**	**EA**	**EA**	**EA**	**EA**	**EA**	**EA**	**EA**	
	Relevé number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	
	Cluster analysis relevé (see Figure 3)	P16	P17	P21	P23	P18	P19	P22	P20	P89	P80	P43	P44	P46	P47	P51	P49	P50	P45	P48	
	Altitude (m a.s.l.)	578	578	895	895	772	772	895	772	772	772	578	772	772	772	859	895	895	772	864	
Life	Plot size (mq)	10	10	16	10	20	20	20	20	20	15	4	20	4	8	5	10	10	16	16	
form	Total cover (%)	100	100	100	100	100	100	95	100	100	100	90	90	100	100	80	100	100	90	95	
	Height of vegetation (cm)	65	70	70	120	65	70	80	120	110	110	50	70	70	80	80	75	90	70	70	
	N° species for relevé	8	6	8	10	8	8	11	6	6	5	6	10	9	7	6	6	9	6	7	
	Localities (see Table 1)	6	6	5	5	3	3	5	3	3	3	6	3	3	3	2	5	5	3	4	
	Char. and diff. species of Association																				
G rhiz	*Bolboschoenus maritimus* (L.) Palla	5	5	5	5	5	5	4	5	3	2	.	1	2	1	.	.	.	.	.	13
I rad	*Alisma lanceolatum* With.	.	+	.	2	2	1	1	1	+	1	+	2	.	+	1	2	1	+	1	16
H scap	*Oenanthe fistulosa* L.	.	+	+	.	3	2	2	2	.	.	.	2	+	2	2	+	1	2	1	14
G rhiz	*Eleocharis palustris* (L.) Roem. et Schult.	.	.	.	.	1	+	.	.	1	1	4	4	5	5	5	5	5	4	4	13
H scap	*Galium debile* Desv.	.	.	2	.	1	+	1	.	.	.	.	1	.	.	.	.	.	3	3	7
H scap	*Barbarea vulgaris* R. Br.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	1	2	3
	Char. species of *Phrgamito-Magnocaricetea* units																				
H scap	*Mentha aquatica* L.	1	1	+	2	.	+	1	.	.	.	1	+	+	.	+	.	+	.	.	11
G rhiz	*Persicaria amphibia* (L.) Delarbre	+	+	.	.	1	.	1	.	.	.	2	2	.	.	.	.	.	.	.	6
G rhiz	*Schoenoplectus lacustris* (L.) Palla	+	+	1	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	4
G rhiz	*Glyceria notata* Chevall	.	.	.	.	.	.	.	.	.	.	.	.	.	+	1	.	.	.	.	2
G rhiz	*Phragmites australis* (Cav.) Trin. ex Steud.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	1	.	.	2
	Other species																				
H scap	*Rumex conglomeratus* Murray	+	.	+	1	.	.	1	2	1	2	.	+	+	2	1	+	1	.	+	14
G rhiz	*Elymus repens* (L.) Gould	.	.	+	1	.	.	.	1	5	5	.	.	.	.	.	.	.	.	.	5
T scap	*Veronica anagalloides* Guss.	.	.	.	1	.	.	.	.	+	.	.	.	+	.	.	+	1	.	.	4
G rhiz	*Juncus articulatus* L.	.	.	.	.	1	1	1	.	.	.	.	.	.	.	.	.	.	.	.	3
H rept	*Ranunculus repens* L.	.	.	1	+	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	3
H rept	*Ranunculus angulatus* C. Presl	2	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	2
H scap	*Lythrum junceum* Banks et Sol.	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2
Ch rept	*Trifolium repens* L.	.	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	2
H scap	*Rumex crispus* L.	.	.	.	.	.	1	.	.	.	.	.	+	.	.	.	.	.	.	.	2
G rhiz	*Convolvulus arvensis* L.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	+	.	2
H scap	*Mentha pulegium* L.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1

Presence

Table 9. *Cont.*

	Association	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	EA	EA	EA	EA	EA	EA	EA	EA	
H caesp	*Holchus lanatus* L.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	1
T scap	*Ranunculus arvensis* L.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
G rhiz	*Equisetum ramosissimum* Desf.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	1
H caesp	*Lolium perenne* L.	.	.	.	.	.	.	.	.	.	.	.	.	2	.	.	.	.	.	.	1
T scap	*Gaudinia fragilis* (L.) P. Beauv.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	1
H bienn	*Dipsacus fullonum* L.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	1
I rad	*Ranunculus rionii* Lagger	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	1
I rad	*Ranunculus peltatus* Schrank	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	1
H ros	*Potentilla reptans* L.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	1
H caesp	*Schedonorus arundinaceus* (Schreb.) Dumort.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	1
H rept	*Agrostis stolonifera* L.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	1

Table 10. Relevés of *Phragmito-Magnocaricetea* class, Magnocaricetalia elatae order, *Magnocaricion elatae* alliance; Ch: *Caricetum hispidae*; Ip: *Iridetum pseudoacori*; Ma: *Mentha aquatica* community; Co: *Caricetum otrubae*.

	Association	Ch	Ch	Ch	Ch	Ch	Ch	Ip	Ip	Ip	Ip	Ma	Ma	Ma	Ma	Co	Co	Co	Co	Co	
	Relevé number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	
	Cluster analysis relevé (see Figure 3)	P24	P26	P27	P25	P28	P29	P37	P38	P39	P40	P41	P42	P99	P100	P30	P31	P32	P33	P34	
	Altitude (m a.s.l.)	864	895	895	864	859	859	895	895	895	895	895	895	895	895	772	772	864	859	859	
Life	Plot size (mq)	8	10	10	6	20	15	16	16	20	10	5	4	15	20	40	40	8	4	5	
Form	Total cover (%)	80	65	60	100	70	80	100	95	95	100	90	80	100	100	100	100	100	100	100	
	Height of vegetation (cm)	110	100	100	130	120	120	150	150	150	150	40	40	100	100	45	50	100	80	70	
	N° species for relevé	14	15	11	5	20	12	8	7	10	6	9	8	8	7	12	9	8	8	12	
	Localities (see Table 1)	4	5	5	4	2	2	5	5	5	5	5	5	5	5	3	3	4	2	2	
	Char. and diff. species of Association																				
G rhiz	*Carex hispida* Willd.	5	4	5	5	5	5	.	.	.	.	.	.	.	.	+	.	.	+	1	9
G rhiz	*Iris pseudoacorus* L.	.	1	1	.	.	.	5	5	4	5	.	.	.	.	.	.	.	.	.	6
H scap	*Mentha aquatica* L.	+	1	+	.	.	.	+	1	1	2	5	5	2	3	.	.	.	.	.	11
H scap	*Rumex conglomeratus* Murray	+	+	.	.	+	+	+	.	+	2	1	1	4	5	1	+	1	.	1	14
H caesp	*Carex cuprina* (Sandor ex Heuffel) Nendtwich ex A. Kern.	+	.	.	.	2	1	.	.	.	.	.	.	.	.	5	5	5	5	4	8

Presence

Table 10. *Cont.*

	Association	Ch	Ch	Ch	Ch	Ch	Ch	Ip	Ip	Ip	Ip	Ma	Ma	Ma	Ma	Co	Co	Co	Co	Co	
	Char. species of *Phrgamito-Magnocaricetea* units																				
H scap	*Oenanthe fistulosa* L.	+	.	.	.	.	.	+	1	+	.	.	.	.	.	3	3	.	.	1	7
G rhiz	*Cyperus longus* L.	+	1	1	.	2	+	.	.	+	.	.	.	.	.	.	.	.	.	.	6
I rad	*Alisma lanceolatum* With.	.	.	.	.	.	.	+	+	1	.	1	2	.	.	.	.	.	.	.	5
G rhiz	*Schoenoplectus lacustris* (L.) Palla	.	.	.	.	.	.	.	.	+	.	+	1	.	.	.	.	+	.	.	4
H bienn	*Cirsium creticum* (Lam.) d'Urv. subsp. *triumfetti* (Lacaita) Werner	+	1	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3
H scap	*Mentha spicata* L.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2
I rad	*Sparganium erectum* L.	.	.	.	.	.	.	.	1	.	2	.	.	.	.	.	.	.	.	.	2
G rhiz	*Glyceria notata* Chevall	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	1
G rhiz	*Phragmites australis* (Cav.) Trin. ex Steud.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	1
	Other species																				
H scap	*Galium debile* Desv.	+	+	+	1	+	1	.	.	1	.	1	1	.	.	+	1	2	1	1	14
G rhiz	*Elymus repens* (L.) Gould	.	.	.	2	.	.	.	.	.	.	.	.	.	.	.	.	2	1	1	4
H scap	*Lythrum junceum* Banks et Sol.	+	+	+	.	+	.	.	.	.	.	1	2	.	.	.	.	.	2	1	8
G rhiz	*Juncus inflexus* L.	.	+	+	.	+	1	.	.	.	.	.	.	.	.	2	3	.	.	.	6
H caesp	*Schedonorus arundinaceus* (Schreb.) Dumort.	+	.	.	.	1	2	.	.	.	.	.	.	.	.	2	2	.	.	.	5
G rhiz	*Juncus articulatus* L.	.	+	2	.	.	.	1	2	.	1	.	.	.	.	.	.	.	.	.	5
H scap	*Oenanthe globulosa* L.	.	+	.	.	+	.	.	.	.	.	.	.	.	.	1	1	.	1	.	5
H caesp	*Holchus lanatus* L.	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	4
H scap	*Epilobium tetragonum* L. subsp. *tourneforti* (Michalet) Lèveillè	.	.	.	1	+	.	.	.	.	.	.	.	.	.	.	.	.	1	1	4
H scap	*Pulicaria dysenterica* (L.) Bernh.	.	.	.	.	2	+	.	.	.	.	.	.	.	.	2	2	.	.	.	4
H rept	*Ranunculus angulatus* C. Presl	.	.	.	.	1	.	.	.	.	.	.	.	1	1	.	.	.	.	1	4
T scap	*Veronica anagalloides* Guss.	.	.	.	.	.	.	.	.	.	.	+	1	2	+	.	.	.	.	.	4
H scap	*Verbena officinalis* L.	.	.	.	.	.	.	.	.	.	.	.	.	+	1	+	+	.	.	.	4
H bienn	*Dipsacus fullonum* L.	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3
H ros	*Potentilla reptans* L.	+	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	3
H ros	*Plantago major* L.	.	.	.	.	1	.	.	.	.	.	.	.	1	1	.	.	.	.	.	3
H caesp	*Phalaris coerulescens* Desf.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	+	+	3
H rept	*Trifolium resupinatum* L.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	1	2
H scap	*Lythrum salicaria* L.	.	.	.	.	1	+	.	.	.	.	.	.	.	.	.	.	.	.	.	2
G rhiz	*Equisetum ramosissimum* Desf.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	2
H scap	*Helosciadium nodiflorum* (L.) W.D.J. Koch	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	2
H bienn	*Jacobaea erratica* (Bertol.) Fourr.	.	.	.	.	.	.	.	.	.	.	+	1	.	.	.	.	.	.	.	2
T scap	*Sonchus asper* (L.) Hill	.	.	.	.	.	.	.	.	.	.	.	.	+	2	.	.	.	.	.	2

Table 10. *Cont.*

	Association	**Ch**	**Ch**	**Ch**	**Ch**	**Ch**	**Ch**	**Ip**	**Ip**	**Ip**	**Ip**	**Ma**	**Ma**	**Ma**	**Ma**	**Co**	**Co**	**Co**	**Co**	**Co**	
G rhiz	*Berula erecta* (Huds.) Coville	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
Ch rept	*Trifolium repens* L.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
H scap	*Veronica anagallis-aquatica* L.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
T scap	*Ranunculus ophioglossifolius* Vill.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
H caesp	*Carex divulsa* Stokes	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
H scap	*Nastrutium officinale* R. Br.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	1
H scap	*Rumex crispus* L.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	1
I rad	*Ranunculus rionii* Lagger	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	1
T scap	*Gaudinia fragilis* (L.) P. Beauv.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	1
T scap	*Lathyrus gorgoni* Parl.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	1
H scap	*Ranunculus bulbosus* L. subsp. *aleae* (Willk.) Rouy et Fouc.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	1
T scap	*Persicaria amphibia* (L.) Delarbre	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	.	.	1
H rept	*Ranunculus repens* L.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	1
H caesp	*Poa trivialis* L.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	1

16. *Iridetum pseudacori* Eggler ex Brzeg et Wojterska 2001

Phytosociological data: Table 10, col. Ip., rell. 7–10

Diagnostic species: *Limniris pseudacorus* (=*Iris pseudacorus* L.)

Short description: Species-poor vegetation dominated by the hygrophilous geophyte *Limniris pseudacorus*, often associated with other species of the *Phragmito-Magnocaricetea* class, such as *Mentha aquatica*, *Alisma lanceolata*, *Rumex conglomeratus*, etc. It usually occurs on muddy soil flooded in the winter but subjected to drying out during the summer. This vegetation grows on the banks of rivers and streams, on the shores of lakes and swamps, as well as natural and artificial ponds

Catenal contacts: It can occur in contact with the associations *Phragmitetum australis* and *Glycerio-Sparganietum*; furthermore, along watercourses it can come into contact with the riparian communities of the *Saliceta purpureae*.

Synchorology: This vegetation was originally reported in central Europe [116]. Also widely distributed in Italy [69,107–109,117]. In Sicily it was surveyed by Barbagallo et al. [72] and Brullo et al. [2] in the Nebrodi Mts., Madonie Mts. and Sicani Mts. [76].

Local distribution: Gorgo Carcaci and Gorgo Carcaciotto (Figure 5a).

17. *Mentha aquatica* comm.

Phytosociological data: Table 10, col. Ma, rell. 11–14

Diagnostic taxa: *Mentha aquatica* subsp. *aquatica*

Short description: Vegetation dominated by *Mentha aquatica* occur on disturbed lakeshores on a layer of mud rich in organic matter. From the floristic point of view this vegetation is composed by *Trifolium leucanthum*, *Silene bellidifolia*, *Phalaris coerulescens*, *Geranium dissectum*, *Cynodon dactylon*, *Carex hispida*, *Centaurium erythraea, ect*. Near the submerged banks, *Rumex conglomeratus* characterizes a typical facies and plays the role of dominant species (Table 10, col. Ma, rell. 13–14).

Catenal contacts: Comes into contact with *Iridetum pseudacori* and other plant communities of the *Phragmito-Magnocaricetea* class.

Synchorology: *Mentha aquatica* is common in Europe, North Africa and West Asia. This community is frequent across Italy in disturbed habitats [108].

Local distribution: Gorgo Carcaciotto.

Notes: The vegetation shows affinity with the *Mentho aquaticae-Oenanthetum fistulosae*, association described for the Mali Obrh River, in the Dinaric region [118].

18. *Caricetum otrubae* Mirza 1978

Phytosociological data: Table 10, col. Co, rell. 15–19

Short description: Hygrophylous vegetation dominated by *Carex otrubae*, linked to sandy-loamy soils rich in organic material in more peripheral areas of the ponds, normally subject to short periods of submersion. This vegetation can also colonize the stretches of canals and rivers with shallow stagnant waters dried during the summer. In the study area, as also highlighted by the cluster analysis, it is possible to identify two variants of this vegetation, the first more humid (cluster 12a) characterized by *Juncus inflexus, Oenanthe fistulosa, Schedonorus arundinaceus* and *Pulicaria dysenterica*; while the second less humid (cluster 12b) dominated by *Elymus repens*, *Galium debile*, *Epilobium tetragonum* and *Lythrum junceum*.

Catenal contacts: *Caricetum otrubae* comes into contact with some plant communities of the *Phragmito-Magnocaricetea* class. It forms a narrow zone between open water and humid mesotrophic grasslands, as well as patchy mosaics with other shallow-water swamps, such as the *Sparganietum erecti* and the *Iridetum pseudacori*.

Synchorology: The association is widespread along the Atlantic coasts of Europe, up to the Mediterranean area. In Sicily it is present in the coastal lake of Biviere di Gela.

Local distribution: Gorgo Marosa, Gorgo Piano Scala and Gorgo Carcaci.

19. *Cyperetum longi* Micevski 1963

Phytosociological data: Table 11, col. Cl, rell. 1–2

Table 11. Relevés of *Phragmito-Magnocaricetea* class, Nasturtio-Glycerietalia order, *Glycerio-Sparganion* alliance; Cl: *Cyperetum longi*; PP: *Potamo natantis-Polygonetum natantis*; Hn: *Helosciadietum nodiflori*.

	Association	**Cl**	**Cl**	**PP**	**PP**	**PP**	**PP**	**PP**	**PP**	**PP**	**PP**	**PP**	**PP**	**Hn**	**Hn**	**Hn**	**Hn**	**Hn**	**Hn**	
	Relevé number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	
	Cluster analysis relevé (see Figure 3)	P35	P36	P54	P57	P58	P61	P55	P56	P59	P60	P72	P73	P81	P82	P83	P84	P93	P94	
	Altitude (m a.s.l.)	864	864	864	578	578	772	864	864	772	772	772	772	859	772	865	865	865	865	Presence
Life	Plot size (mq)	20	30	20	25	20	20	30	30	30	10	10	10	6	8	8	5	10	8	
form	Total cover (%)	100	95	85	95	85	100	95	90	95	100	100	100	100	100	100	100	100	100	
	Height of vegetation (cm)	60	60	50	60	50	80	60	50	50	60	80	90	60	50	50	50	100	110	
	N° species for relevé	12	14	3	3	4	5	3	3	4	7	6	6	11	6	7	7	7	7	
	Localities (see Table 1)	5	5	4	6	6	3	4	4	3	3	3	3	2	3	4	4	4	4	
	Char. and diff. species of association																			
G rhiz	*Cyperus longus* L.	5	4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2
G rhiz	*Persicaria amphibia* (L.) Delarbre	2	1	4	5	4	5	5	5	5	5	2	3	.	.	1	2	2	2	16
H scap	*Helosciadium nodiflorum* (L.) W.D.J. Koch	.	.	.	.	.	.	.	.	.	.	.	.	4	5	5	5	2	1	6
H scap	*Nastrutium officinale* R. Br.	.	.	.	.	.	.	.	.	.	.	.	.	2	3	1	2	5	5	6
	Char. species of *Phrgamito-Magnocaricetea* units																			
G rhiz	*Glyceria notata* Chevall	1	+	1	1	+	2	.	.	.	1	5	5	2	.	.	+	2	1	13
I rad	*Alisma lanceolatum* With.	1	+	.	.	.	+	1	1	3	1	1	2	.	.	1	.	1	1	12
H scap	*Oenanthe fistulosa* L.	1	2	+	.	.	1	2	2	3	2	2	2	.	.	.	.	.	.	10
H scap	*Mentha aquatica* L.	+	2	.	.	.	.	.	.	.	+	1	+	.	.	.	.	.	.	5
G rhiz	*Bolboschoenus maritimus* (L.) Palla	.	.	.	.	.	1	.	.	+	2	+	1	.	.	.	.	.	.	5
I rad	*Sparganium erectum* L.	.	.	.	1	+	.	.	.	.	.	.	.	.	.	.	.	.	.	2
H scap	*Galium debile* Desv.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	2
H caesp	*Carex cuprina* (Sandor ex Heuffel) Nendtwich ex A. Kern.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	+	.	.	2
G rhiz	*Phragmites australis* (Cav.) Trin. ex Steud.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
G rhiz	*Schoenoplectus lacustris* (L.) Palla	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	1
G rhiz	*Carex hispida* Willd.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	1
	Other species																			
H scap	*Rumex conglomeratus* Murray	+	1	.	.	.	.	.	.	.	.	.	.	.	.	1	+	2	2	6
G rhiz	*Elymus repens* (L.) Gould	+	+	.	.	.	.	.	.	.	.	.	.	.	.	+	1	.	.	4
H rept	*Ranunculus angulatus* C. Presl	1	2	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	3
H scap	*Veronica anagalloides* Guss.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	.	.	1	+	3
H scap	*Galium debile* Desv.	1	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2
H caesp	*Holchus lanatus* L.	1	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2
H scap	*Galium debile* Desv.	1	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2

Table 11. *Cont.*

	Association	**Cl**	**Cl**	**PP**	**PP**	**PP**	**PP**	**PP**	**PP**	**PP**	**PP**	**PP**	**PP**	**Hn**	**Hn**	**Hn**	**Hn**	**Hn**	**Hn**	
I rad	*Ranunculus rionii* Lagger	.	.	.	.	.	.	.	.	.	2	.	.	+	.	.	.	.	.	2
H scap	*Lythrum junceum* Banks et Sol.	.	.	.	.	.	.	.	.	.	.	.	.	2	1	.	.	.	.	2
H rept	*Trifolium resupinatum* L.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	2
Ch rept	*Trifolium repens* L.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
I rad	*Ranunculus aquatilis* L.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	1
T scap	*Ranunculus ophioglossifolius* Vill.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	1

Diagnostic taxa: *Cyperus longus*.

Short description: Helophytic vegetation dominated by *Cyperus longus*. This community prefers the most elevated shores, subject to short periods of submersion, but always humid, often in correspondence of the river widenings in the shade of the riparian wood. The *Cyperetum longi* includes several taxa, such as *Alisma lanceolatum*, *Galium debile*, *Glyceria notata*, *Mentha aquatica*, *Oenanthe fistulosa*, *Persicaria amphibia*, *Ranunculus angulatus*, *Rumex conglomeratus*, etc.

Catenal contacts: This community comes into contact with other vegetation types of the *Phragmito-Magnocaricetea* and *Molinio-Arrhenatheretea* classes.

Synchorology: Vegetation distributed mainly in eastern Europe [119,120]. In Sicily is common in the Hyblaean rivers [10], in wetlands of Nebrodi Mts. [2], and Trapani territory [115].

Local distribution: Gorgo Carcaciotto and Gorgo S. Andrea.

20. *Potamo natantis-Polygonetum natantis* Knapp et Stoffers 1962

Phytosociological data: Table 11, col. PP, rell. 3–12

Diagnostic species: *Persicaria amphibia* [=*Polygonum amphibium* L.; *Polygonum natans* (Michaux) Eaton]

Short description: Aquatic vegetation linked to the deepest part of mountain lakes or ponds, where *Persicaria amphibia* tends to constitute a more or less dense vegetation, often associated with *Potamogeton natans* [2]. This acquatic vegetation prefers calm waters with a limited content of organic substance (oligo-mesotrophic) and clayey seabeds. The community we studied falls into the subass. *polygonetosum* Soó 1964, who colonizes the shallow waters near the banks.

Catenal contacts: In the Gorgo Carcaci the comnunity it comes into contact with aspects of the *Eleocharido palustris-Alismetum lanceolati* and *Apio nodiflorae-Glycerietum plicatae*.

Synchorology: Aquatic vegetation distributed mainly in central and eastern Europe and in the Atlantic area [121]. In Sicily it is quite rare, being known only for the Biviere di Cesarò, Nebrodi Mts. [2] and Sicani Mts. [76].

Local distribution: Gorgo Piano Scala, Gorgo Carcaci and Gorgo S. Andrea (Figure 5c).

21. *Helosciadietum nodiflori* Maire 1924

Phytosociological data: Table 11, col. Hn, rell. 13–18

Diagnostic species: *Helosciadium nodiflorum* subsp. *nodiflorum*.

Short description: The banks of the waterways, with shallow, clear and well oxygenated waters, are colonized by an amphibious vegetation with a summer development, dominated by *Helosciadium nodiflorum*. This vegetation prefers slightly flowing running waters, oligotrophic to mesotrophic, with a high concentration of carbonates. The structure of this vegetation is characterized by *Helosciadium nodiflorum*, as well as by other amphibious species, such as *Veronica anagallis-aquatica*, *Rumex conglomeratus*, *Glyceria notata*, *Nasturtium officinale*, etc. Near the submerged banks, in presence of a more nitrophilic condition, this latter entity characterizes a typical facies and plays the role of dominant species (Table 11, col. Hn, rell. 17–18).

Catenal contacts: This community can show catenal contacts with the helophytic vegetation of the *Phragmition communis* or *Magnocaricion* and sometimes also with the *Salicetalia purpureae*.

Synchorology: This vegetation, widespread in the Mediterranean area [32], is quite common in Italy [63,68,122,123]. In Sicily it has been reported in the Platani River [114], Sosio River [10], near Trapani [115], Hyblaean area [124] and Etna territory [4].

Local distribution: Gorgo Marosa, Gorgo Piano Scala and Gorgo Carcaci.

22. *Callitricho obtusangulae-Glycerietum notatae* ass. nov. hoc loco

Diagnostic species: *Glyceria notata* [=*Glyceria plicata* (Fr.) Fr.], *Callitriche obtusangula*.

Phytosociological data: Table 12, col. CG, rell. 1–5

Table 12. Relevés of *Phragmito-Magnocaricetea* class, *Oenanthetalia aquaticae* order, *Alopecuro-Glycerion spicatae* alliance; **CG**: *Callitricho-Glycerietum notatae*; **AG**: *Apio nodiflorae-Glycerietum plicatae*; **Aa**: *Alopecurus aequalis* community. (*) Holotypus of the *Callitricho obtusangulae-Glycerietum notatae* ass. nov. hoc loco.

	Association/Community	**CG**	**CG**	**CG**	**CG**	**CG**	**AG**	**AG**	**AG**	**AG**	**AG**	**AG**	**AG**	**Aa**	**Aa**	**Aa**	**Aa**	
	Relevé number	1	2	3 *	4	5	6	7	8	9	10	11	12	13	14	15	16	
	Cluster analysis relevé (see Figure 3)	P52	P53	P76	P77	P78	P69	P70	P71	P79	P80	P74	P75	P85	P86	P87	P88	
	Altitude (m a.s.l.)	890	890	890	890	890	578	578	772	864	864	859	859	890	890	738	738	Presence
Life	Plot size (mq)	8	10	6	6	6	20	20	20	20	20	10	10	5	5	5	5	
form	Total cover (%)	90	90	95	90	100	100	100	100	95	100	90	90	100	100	100	100	
	Height of vegetation (cm)	100	100	30	30	35	35	35	30	25	25	35	30	35	35	40	35	
	N° species for relevé	7	7	8	8	8	8	4	5	10	9	9	7	7	6	5	5	
	Localities (see Table 1)	1	1	1	1	1	6	6	3	4	4	2	2	1	1	-	-	
	Char. and diff. species of Association/Community																	
I rad	*Callitriche obtusangula* Le Gall	3	4	2	3	1	.	.	.	.	.	.	.	1	1	1	1	9
G rhiz	*Glyceria notata* Chevall	+	+	5	5	5	5	5	5	4	5	4	5	2	1	1	2	16
H scap	*Helosciadium nodiflorum* (L.) W.D.J. Koch	.	.	.	.	.	.	.	.	2	2	.	.	.	.	.	.	2
H caesp	*Alopecurus aequalis* Sobol.	1	+	+	+	1	.	.	.	.	.	.	.	4	5	5	4	9
	Char. species of *Phrgamito-Magnocaricetea* units																	
I rad	*Sparganium erectum* L.	.	.	+	+	.	.	+	.	1	2	.	.	+	.	.	.	6
I rad	*Alisma lanceolatum* With.	.	.	.	.	.	+	.	1	+	+	+	+	.	.	.	.	6
H scap	*Oenanthe fistulosa* L.	.	.	.	.	.	.	.	2	2	1	1	1	.	.	.	.	5
G rhiz	*Phragmites australis* (Cav.) Trin. ex Steud.	.	.	.	.	.	+	1	.	.	.	.	.	.	.	.	.	2
H scap	*Oenanthe aquatica* (L.) Poir.	4	4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2
H scap	*Galium debile* Desv.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	1
G rhiz	*Eleocharis palustris* (L.) Roem. et Schult.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	1
	Other species																	
I rad	*Ranunculus aquatilis* L.	1	1	1	2	1	.	.	.	.	.	.	.	+	+	1	+	9
I nat	*Lemna minor* L.	2	2	2	2	2	.	.	.	.	.	.	.	+	+	.	.	7
H scap	*Mentha pulegium* L.	.	.	1	+	2	.	.	.	.	.	+	+	.	.	.	.	5
H rept	*Veronica anagalloides* Guss.	.	.	.	.	.	+	+	1	2	1	.	.	.	.	.	.	5
H scap	*Rumex conglomeratus* Murray	.	.	.	.	.	+	.	.	1	+	+	1	.	.	.	.	5
I rad	*Ceratophyllum submersum* L.	1	1	.	+	.	.	.	.	.	.	.	.	.	.	.	.	3
I rad	*Callitriche brutia* Petagna	.	.	.	.	1	.	.	.	.	.	.	.	+	+	.	.	3
T scap	*Ranunculus ophioglossifolius* Vill.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	2
I rad	*Lemna gibba* L.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	2
H caesp	*Phalaris coerulescens* Desf.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	2

Table 12. *Cont.*

	Association/Community	**CG**	**CG**	**CG**	**CG**	**CG**	**AG**	**AG**	**AG**	**AG**	**AG**	**AG**	**AG**	**Aa**	**Aa**	**Aa**	**Aa**	
T scap	*Helminthotheca echioides* (L.) Holub	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	2
I rad	*Ranunculus peltatus* Schrank	.	.	.	.	.	.	.	.	.	.	2	1	.	.	.	.	2
H scap	*Veronica anagallis-aquatica* L.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	2
G rhiz	*Juncus articulatus* L.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	1
H scap	*Lythrum junceum* Banks et Sol.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	1
G rhiz	*Convolvulus arvensis* L.	.	.	.	.	.	.	.	2	.	.	.	.	.	.	.	.	1
H caesp	*Lolium perenne* L.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	1
I rad	*Ranunculus rionii* Lagger	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	1

Holotypus: Table 12, col. CG, rel. 3

Short description: This hygro-hydrophilous vegetation grows along the muddy and shallow shores of eutrophic ponds, often subjected to partial drying during the summer. This vegetation is dominated by submerged and amphibious hydrophytes, as *Glyceria notata*, *Callitriche obtusangula*, *C. brutia*, *Oenanthe aquatica*, *Ranunculus aquatilis*, etc. This community is spread in the mountain ponds, occurring at altitudes between 700 and 900 m. Due to its ecological and floristic characteristics it can be referred to a new association, of the *Alopecuro-Glycerion spicatae* alliance, with the name *Callitricho obtusangulae-Glycerietum notatae*, characterized by the dominance of *Glyceria spicata* and *Callitriche obtusangula*. This vegetation, can be considered as a vicariant of western Sicily of the *Glycerio-Callitrichetum obtusangulae*, association described by Brullo et al. [2] for the wetlands of the Nebrodi Mts.

Catenal contacts: The *Callitricho obtusangulae-Glycerietum notatae* ass. nov. is localized between the helophytic vegetation of *Phragmito-Magnocaricetea* class and the associations of the *Potamogetonetea* class.

Synchorology: Hilly wetlands of western Sicily; known for Gurgo Lungo (Figure 5d) and Gurgo Cerro (in the Bosco Ficuzza Natura Reserve).

Local distribution: Gorgo Lungo.

Notes: At a national level, the *Callitricho obtusangulae-Glycerietum notatae* ass. nov. can be considered the southern vicariant of *Glycerietum notatae* Kulczyński 1928 nom. corr. [125]. The latter association is rather common in Italy [89].

23. *Apio nodiflorae-Glycerietum plicatae* Brullo et Spampinato 1990

Phytosociological data: Table 12, col. AG, rell. 6–12

Diagnostic species: *Glyceria notata* [=*Glyceria plicata* (Fr.) Fr.], *Helosciadium nodiflorum*.

Short description: Amphibious vegetation characterized by prostrate helophytes, in which *Glyceria notata* assumes a relevant role from the structural point of view [10]. This vegetation, of the silty-clayey banks of watercourses or ponds, is characterized by other hygrophylous species, as *Helosciadium nodiflorum*, *Alisma lanceolatum*, *Sparganium erectum*, *Oenanthe fistulosa*, *Rumex conglomeratus*, *Veronica beccabunga*, etc.

Catenal contacts: This plant community comes into contact mainly with associations of the *Glycerio-Sparganion* alliance.

Synchorology: In Italy, *Glyceria notata* vegetation is widespread [68,78,110,111,122,126–128]. This association, described for the water courses of central Sicily [10], is also present in the Settefrati area near Cefalù and Aspromonte Massif [129].

Local distribution: Gorgo Marosa, Gorgo Piano Scala, Gorgo Carcaci and Gorgo S. Andrea.

Notes: The name *Apio nodoflorae-Glycerietum plicatae* is maintained because *Glyceria plicata* is synonymous with *G. notata*.

24. *Alopecurus aequalis* community

Phytosociological data: Table 12, col. Aa, rell. 13–16.

Diagnostic species: *Alopecurus aequalis*.

Short description: This community prefer the low-sloped sites and often represent the most marginal belt of the lacustrine surface. This hygrophilous vegetation, floristically impoverished, is dominated by submerged and amphibious hydrophytes, as *Alopecurus aequalis* and *Glyceria notata*, which is linked to the muddy surfaces of lacustrine environments often subject to a partial or total drying during the summer.

Catenal contacts: This plant community comes into contact with the *Callitricho obtusangulae-Glycerietum notatae* ass. nov. is and the associations of the *Potamogetonetea* and *Lemnetea* classes.

Sychorology: *Alopecurus aequalis* is a characteristic species of *Alopecuro-Glycerion spicatae* alliance that groups the hygrophilous vegetation of shallow montane ponds with meso-eutrophic waters, often dry during the summer. In the sector of western Sicily this species is very rare [50] (sub. *A. geniculatus*).

Local distribution: Gorgo Lungo and Gorgo Cerro, the latter in Bosco Ficuzza Nature Reserve too. It has also been reported in Gurgo Carcaci [50], where it probably became extinct.

Notes: Further studies are needed to understand the dynamics and syntaxonomy of this community.

25. *Gaudinia fragilis* community

Phytosociological data: Table 13, col. Gf, rell. 1–2

Diagnostic taxa: *Gaudinia fragilis*.

Short description: This hygrophilous community, dominated by *Gaudinia fragilis*, develops on surfaces affected by long periods of submersion, often located at the margins of large wetlands characterized by clay substrata. From the floristic point of view, it appears as a vegetation with a hygro-subnitrophilous character.

Catenal contacts: Finds contacts with associations of the *Phragmito-Magnocaricetea* class, towards the interior of the pools, and with communities typical of the banks.

Synchorology: *Gaudinia fragilis* is a euri-Mediterranean species, also frequent in Italy and Sicily, often as a typical element of the *Isöeto-Nanojuncetea* class [4].

Local distribution: Gorgo di S. Andrea.

Notes: The small number of phytosociological relevés, with mixed presences of elements of different classes (*Isöeto-Nanojuncetea*, *Molinio-Arrhenatheretea*, etc.), did not allow the cluster analysis to separate the *Gaudinia fragilis*-vegetation from the rest of the plant communities. This vegetation should be investigated more deeply.

26. *Mentha pulegium* community

Phytosociological data: Table 13, col. Mp, rell. 3–4

Diagnostic taxa: *Mentha pulegium* subsp. *pulegium*.

Short description: Physiognomically, this vegetation is dominated by *Mentha pulegium*, which generally grows together with a few other annual hygrophytes of the *Isöeto-Nanojuncetea* class, sometimes mixed with some perennial species of *Phragmito-Magnocaricetea* class. It is a late spring-summer community, typical of shallow wetlands, subject to fluctuations in the water level and to drying out in the summer. Where grazing disturbance conditions are intense, it often forms monophytic communities.

Catenal contacts: Finds contacts with associations of the the *Phragmito-Magnocaricetea* class, towards the interior of the pools, and with communities typical of the banks.

Synchorology: *Mentha pulegium* is an element of the *Isöeto-Nanojuncetea* class. It has a wide distribution in Europe, Asia and North Africa and is also common in Italy and Sicily [23].

Local distribution: Gorgo Lungo, Gorgo Marosa, Gorgo Piano Scala, Gorgo Carcaciotto. In Sicily aspects of similar vegetation are reported in Gurrida Lake [91].

Notes: The small number of phytosociological relevés, with mixed presence of elements of different classes, did not allow the cluster analysis to separate the vegetation from the rest of the plant communities. The floristic composition, together with the dominant species, leads us to include the community in the *Isöeto-Nanojuncetea* class. This vegetation should be investigated more deeply.

27. *Phalarido coerulescentis-Agropyretum repentis* Brullo et Spampinato 1990

Phytosociological data: Table 13, col. PA, rell. 5–8

Diagnostic taxa: *Elymus repens* subsp. *repens*, *Phalaris coerulescens*.

Short description: The silty-clayey soils subject to short periods of submersion during the winter are colonized by sub-hygrophilous herbaceous vegetation dominated by *Elymus repens*. From the structural point of view, in addition to *Elymus repens*, some species of the *Molinio-Arrhenatheretea* play an important role, such as *Rumex conglomeratus*, *Carex cuprina*, *Schedonorus arundinaceus*, *Persicaria amphibia*, *Ranunculus repens*, etc. Near the submerged banks, in presence of little inlet streams, this latter entity characterizes a typical facies and plays the role of dominant species (Table 13, col. PA, rell. 7–8).

Table 13. Relevés of *Isöeto-Nanojuncetea* (Rel. 1–4) and *Molinio-Arrhenatheretea* (Rel. 5–11) classes; Gf: *Gaudinia fragilis* community; Mp: *Mentha pulegium* community; PA: *Phalarido coerulescentis-Agropyretum repentis*; Pr: *Potentilla reptans* comm.

	Association/Community	**Gf**	**Gf**	**Mp**	**Mp**	**PA**	**PA**	**PA**	**PA**	**Pr**	**Pr**	**Pr**	
	Relevé number	1	2	3	4	5	6	7	8	9	10	11	
	Cluster analysis relevé (see Figure 3)	P104	P105	P97	P98	P91	P92	P95	P96	P101	P102	P103	
	Altitude (m a.s.l.)	578	578	895	772	864	864	867	867	578	578	578	
Life	Plot size (mq)	10	15	8	10	10	12	8	10	10	10	10	Presence
Form	Total cover (%)	90	100	90	100	100	100	100	100	100	95	95	
	Height of vegetation (cm)	40	45	35	30	60	55	35	40	25	25	25	
	N° species for relevé	19	20	10	5	11	11	7	8	11	11	6	
	Localities (see Table 1)	6	6	5	3	4	4	4	4	6	6	6	
	Char. and diff. species of Association/Community and sup. units												
T scap	*Gaudinia fragilis* (L.) P. Beauv.	5	5	1	.	.	.	.	.	+	.	.	4
H scap	*Mentha pulegium* L.	1	1	5	5	.	.	.	.	3	+	+	7
G rhiz	*Elymus repens* (L.) Gould	.	.	.	.	5	5	4	3	.	.	.	4
H caesp	*Phalaris coerulescens* Desf.	.	1	.	.	1	+	1	1	1	.	.	6
H rept	*Ranunculus repens* L.	.	.	.	.	1	1	4	5	.	.	.	4
H ros	*Potentilla reptans* L.	.	.	.	.	.	.	.	.	4	5	5	3
	Char. species of *Molinio-Arrhenatheretea* units												
H scap	*Rumex conglomeratus* Murray	.	.	.	.	+	2	2	2	.	+	.	5
H caesp	*Carex cuprina* (Sandor ex Heuffel) Nendtwich ex A. Kern.	.	.	.	.	1	2	1	+	.	.	.	4
H caesp	*Schedonorus arundinaceus* (Schreb.) Dumort.	.	.	.	.	2	+	.	1	.	.	.	3
H scap	*Galium debile* Desv.	.	.	.	.	.	.	2	1	.	1	.	3
H scap	*Lythrum junceum* Banks et Sol.	.	.	2	.	.	.	.	.	.	.	.	1
H scap	*Oenanthe fistulosa* L.	.	.	.	2	.	.	.	.	.	.	.	1
	Char. species of *Phrgamito-Magnocaricetea* units												
G rhiz	*Bolboschoenus maritimus* (L.) Palla	.	+	.	2	.	.	.	.	1	1	+	5
G rhiz	*Carex hispida* Willd.	1	2	.	.	.	.	.	.	.	.	.	2
H bienn	*Cirsium creticum* (Lam.) d'Urv. subsp. *triumfetti* (Lacaita) Werner	.	.	.	.	.	.	.	.	.	+	.	1
	Other species												
G rhiz	*Convolvulus arvensis* L.	+	.	.	.	+	1	.	.	1	+	1	6
H rept	*Cynodon dactylon* (L.) Pers.	+	+	.	.	.	.	.	.	2	+	1	5
H bienn	*Centaurium erythraea* Rafn.	+	1	.	.	.	.	.	.	+	.	.	3
T scap	*Geranium dissectum* L.	+	1	.	.	.	.	.	.	.	+	.	3
T scap	*Xanthium orientale* L. subsp. *italicum* L.	.	.	.	.	+	1	.	.	+	.	.	3

Table 13. *Cont.*

	Association/Community	**Gf**	**Gf**	**Mp**	**Mp**	**PA**	**PA**	**PA**	**PA**	**Pr**	**Pr**	**Pr**	
T scap	*Silene bellidifolia* Jacq.	1	3	.	.	.	.	.	.	.	.	.	2
T scap	*Trifolium leucanthum* M. Bieb.	1	1	.	.	.	.	.	.	.	.	.	2
T scap	*Coronilla scorpioides* (L.) Koch	1	+	.	.	.	.	.	.	.	.	.	2
T scap	*Avena fatua* L.	+	1	.	.	.	.	.	.	.	.	.	2
T scap	*Bartsia trixago* L.	+	1	.	.	.	.	.	.	.	.	.	2
T scap	*Helminthotheca echioides* (L.) Holub	+	1	.	.	.	.	.	.	.	.	.	2
T scap	*Bromus hordeaceus* L.	+	1	.	.	.	.	.	.	.	.	.	2
T scap	*Scorpiurus muricatus* L.	+	+	.	.	.	.	.	.	.	.	.	2
T scap	*Sherardia arvensis* L.	+	+	.	.	.	.	.	.	.	.	.	2
T scap	*Galium aparine* L.	.	.	.	.	+	2	.	.	.	.	.	2
H scap	*Rumex crispus* L.	.	.	.	.	1	1	.	.	.	.	.	2
T scap	*Persicaria amphibia* (L.) Delarbre	.	.	.	.	.	.	2	2	.	.	.	2
H scap	*Pulicaria dysenterica* (L.) Bernh.	.	.	.	.	.	.	.	.	1	+	.	2
H bienn	*Dipsacus fullonum* L.	.	.	.	.	.	.	.	.	+	+	.	2
T scap	*Trifolium campestre* Schreb.	1	.	.	.	.	.	.	.	.	.	.	1
H bienn	*Centaurea sicula* L.	1	.	.	.	.	.	.	.	.	.	.	1
T scap	*Lolium multiflorum* Lam.	+	.	.	.	.	.	.	.	.	.	.	1
T scap	*Trifolium angustifolium* L.	.	1	.	.	.	.	.	.	.	.	.	1
H scap	*Cichorium intybus* L.	.	1	.	.	.	.	.	.	.	.	.	1
T scap	*Linum corymbulosum* Rchb.	.	+	.	.	.	.	.	.	.	.	.	1
T scap	*Melilotus sulcatus* Desf.	.	.	2	.	.	.	.	.	.	.	.	1
H scap	*Verbena officinalis* L.	.	.	1	.	.	.	.	.	.	.	.	1
T scap	*Ranunculus muricatus* L.	.	.	1	.	.	.	.	.	.	.	.	1
T scap	*Sonchus asper* (L.) Hill	.	.	+	.	.	.	.	.	.	.	.	1
T rept	*Anagallis foemina* Mill.	.	.	+	.	.	.	.	.	.	.	.	1
T scap	*Medicago orbicularis* (L.) Bartal.	.	.	+	.	.	.	.	.	.	.	.	1
T scap	*Raphanus raphanistrum* L.	.	.	+	.	.	.	.	.	.	.	.	1
H rept	*Trifolium resupinatum* L.	.	.	.	2	.	.	.	.	.	.	.	1
H rept	*Ranunculus angulatus* C. Presl	.	.	.	1	.	.	.	.	.	.	.	1
H scap	*Galium verum* L.	.	.	.	.	2	.	.	.	.	.	.	1
Ch rept	*Trifolium repens* L.	.	.	.	.	.	1	.	.	.	.	.	1
T scap	*Polypogon monspeliensis* (L.) Desf.	.	.	.	.	.	.	.	.	.	.	1	1

Catenal contacts: Finds contacts with associations of the the *Phragmito-Magnocaricetea* class, towards the interior of the pools, and with communities typical of the banks.

Synchorology: Sub-hygrophilous vegetation occurs in central Sicily [10].

Local distribution: Gorgo Piano Scala and Gorgo Carcaci (Figure 5).

Notes: This vegetation shows affinities with *Loto tenuis-Agropyretum repentis*, association described for the Tarno River in Emilia-Romagna [112].

28. *Potentilla reptans* comm.

Phytosociological data: Table 13, col. Pr, rell. 9–11

Diagnostic taxa: *Potentilla reptans*.

Short description: Mesohygrophilous meadows, linked to humid deep soils with silty-clayey texture and and rich in organic matter. Usually, this vegetation is found in wet depressions, as well as in humid uncultivated lands. Its structure is given by some rosulate and reptant hemicryptophytes with sub-nitrophilous requirements. This community is dominated by *Potentilla reptans*, and sometimes associated with some hygro-nitrophylous species, as *Mentha pulegium*, *Gaudinia fragilis*, *Agrostis stolonifera*, *Pulicaria dysenterica*, *Lolium perenne*, etc. It is a plant community subjected to strong pressure linked to animal trampling.

Catenal contacts: Comes into contact with plant communities of the *Isöeto-Nanojuncetea* class and locally with the aspect of *Molinio-Arrhenatheretea*.

Synchorology: *Potentilla reptans* is a species of the paleotemperate element, common in Italy and in Sicily. This community shows some floristic affinities with *Potentillo-Menthetum rotundifolii* Oberd. 1952 and from *Potentillo-Deschampsietum mediae* Oberd. 1957 described for Germany [130], from *Prunello vulgaris-Potentilletum reptantis* Eliaš 1978 reported in France [131] and from *Potentillo-Festucetum arundinaceae* reported in Poland [132], and from *Rorippo amphibiae-Potentilletum reptantis*, association of the *Plantaginetalia majoris* order, described for the wetlands of central Italy [108].

Local distribution: Gorgo S. Andrea.

4. Vegetation Zonation

The vegetation of lake surfaces is typically distributed in more or less concentric bands, directly correlated with seasonal variations in water levels, the slope of the lakebeds, as well as the extent of the surface area. This spatial distribution forms a distinct plant zonation, distinguishable from both a physiognomic-structural and floristic point of view, linked to the chemical and physical characteristics of the waters, flooding time, and their evolutionary state, influenced by potential human interventions (expansions, infilling, etc.).

While fitting into a dynamic model similar to other environments in the island territory [2], the zonation of the aquatic vegetation in the investigated lake areas, exhibits some notable differences. These variations can be attributed to several factors, such as: site location; extent of the lake environment; depth and slope of the lakebeds; trophic characteristics of the waters; seasonal water fluctuations; etc. Below, the transects of vegetation in the humid environments under investigation are described, referring to conditions at the beginning of summer when optimum vegetative growth is reached.

4.1. Gorgo Lungo (Figures 2a and 6A)

This very interesting semipermanent natural pool is located north of Rocca Busambra, in the municipality of Godrano, at 907 m a.s.l., on substrates of quartz-arenitic matrix. It falls within a large, forested area that is part of the Ficuzza forest, predominantly dominated by *Quercus suber* L. and marginally reforested with *Pinus pinea* L. The site features aspects of hygrophilous vegetation characterized by some peculiar and rare entities, in particular the following: (a) *Ceratophyllum submersum*, which maintains the only known station for this western sector of Sicily in this biotope [55]; (b) *Alopeurus aequalis*, of which only one other station is known in the western Sicily located in Gurgo Cerro [8]. Vegetation aspects from the classes *Lemnetea* (*Lementum gibbae*, *Lemnetum minoris* and *Potamogetono-Ceratophylletum submersi*), *Potamogetonetea* (*Lemno-Callitrichetum obtusangulae* and *Ranunculetum aquatilis*), *Phragmito-Magnocaricetea* (*Schoenoplecteum lacustris*; *Sparganietum erecti*, *Alopecurus aequalis*

community) and *Isöeto-Nanojuncetea* (*Mentha pulegium* comm.) are present. The new association *Callitricho-Glycerietum notatae* belonging to *Alopecuro-Glycerion spicatae* alliance has been described here.

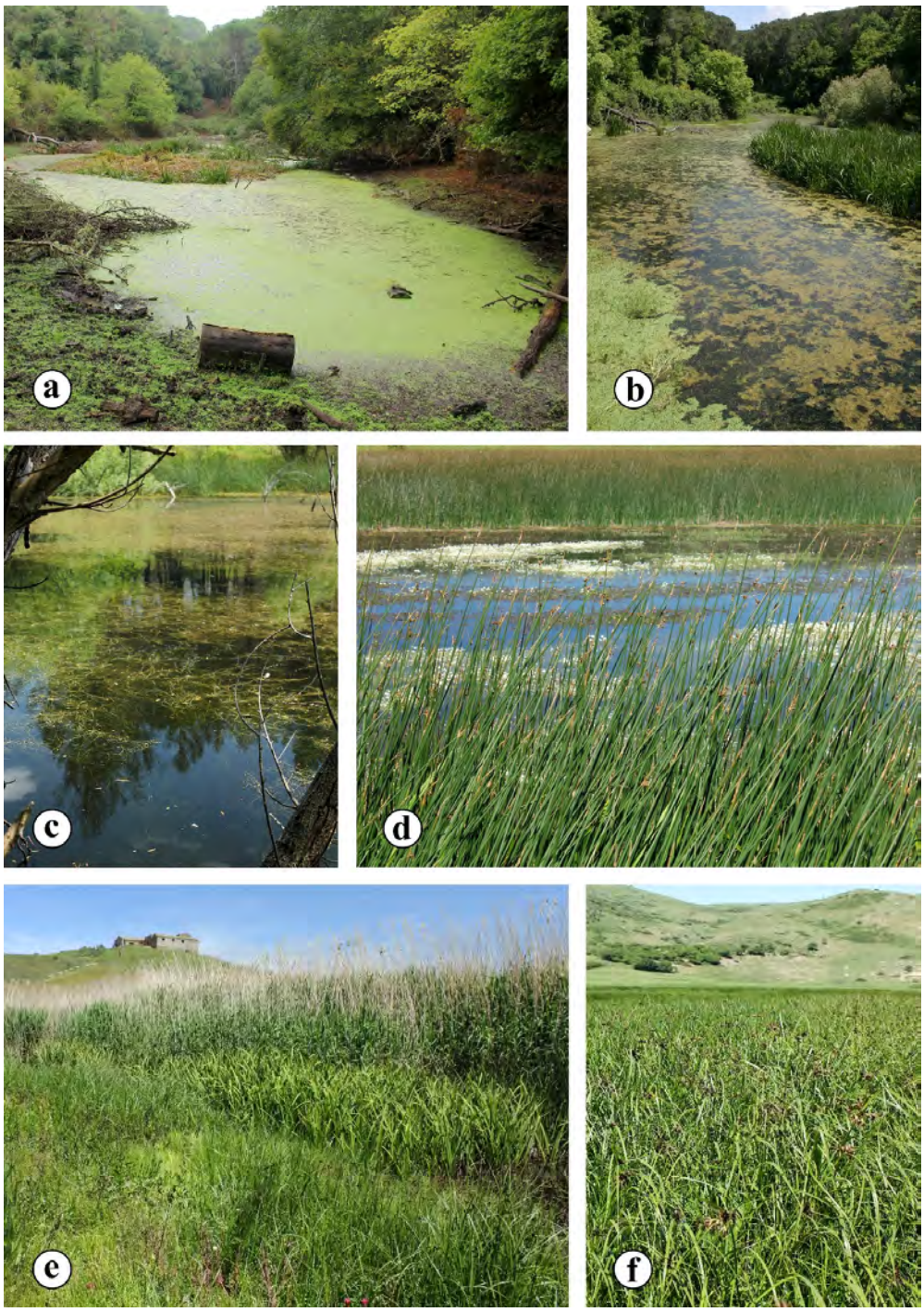

Figure 4. (**a**) Summer aspects of *Lemnetum gibbae* at Gorgo Lungo; (**b**) Submerged vegetation of *Potamogetono-Ceratophylletum submersi* at Gorgo Lungo; (**c**) *Potamogetonetum pectinati* at Gorgo S. Andrea; (**d**) Hydrophytic vegetation of *Ranunculetum peltati* subass. *ranunculetosum rionii* in the center of Gorgo Carcaci, surrounded by a belt of *Schoenoplectus lacustris*; (**e**) Typical structure of the helophytic belt at Gorgo Carcaciotto with *Bolboschoeno maritimi-Alismetum lanceolati* near the bank and following the *Sparganietum erecti* and then the *Phragmitetum communis*; (**f**) *Bolboschoeno maritimi-Alismetum lanceolati* at Gorgo Piano Scala.

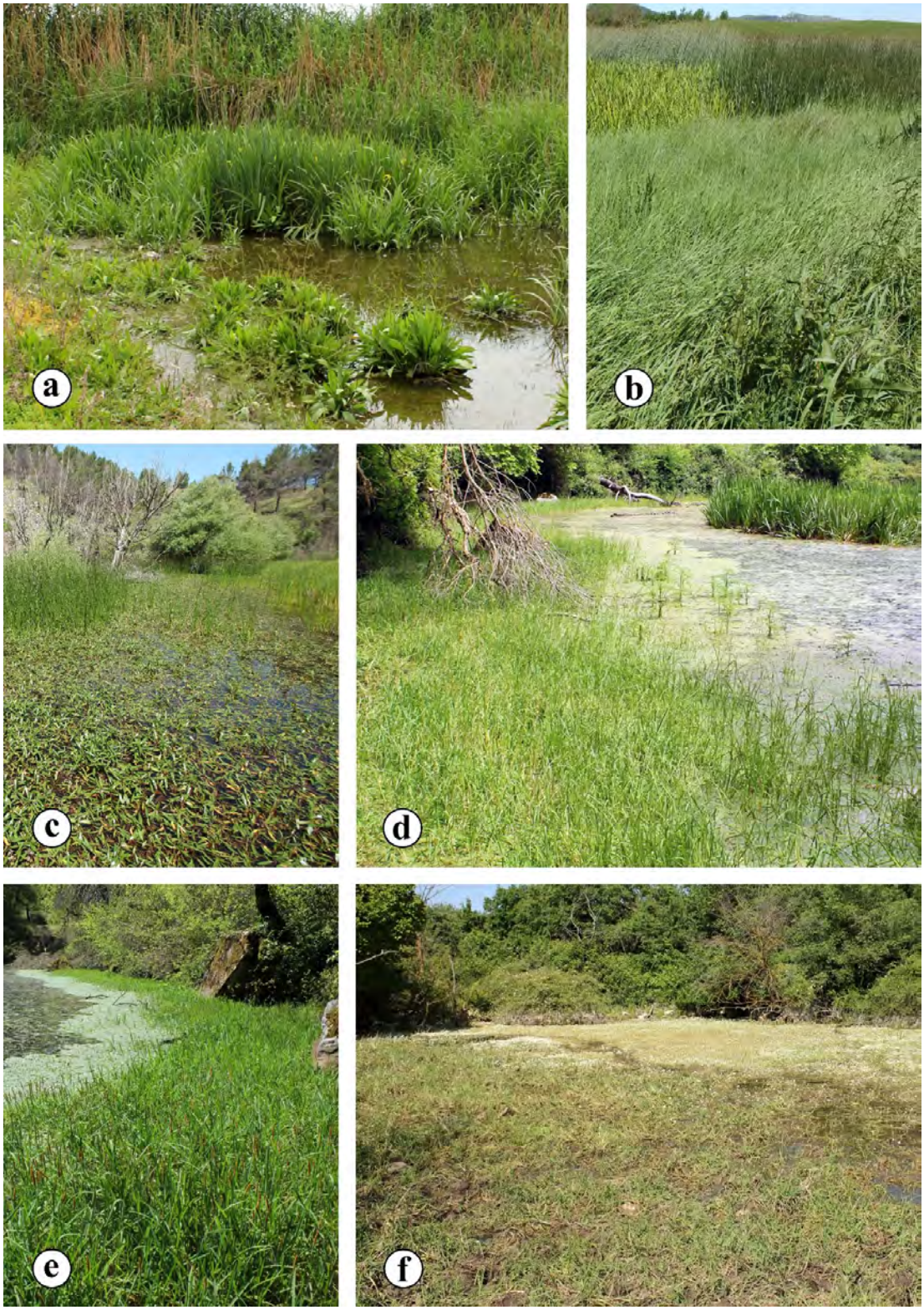

Figure 5. (**a**) Aspects of the *Eleocharido palustris-Alismetum lanceolati* with *Iridetum pseudacori* and *Phragmitetum communis* at Gorgo Carcaciotto; (**b**) *Phalarido coerulescentis-Agropyretum repentis* on the bank of Gorgo Carcaci; (**c**) *Potamo natantis-Polygonetum natantis* at Gorgo S. Andrea; (**d**) Aspect of the *Callitricho-Glycerietum notatae* ass. nov. at Gorgo Lungo; (**e**) *Alopecurus aequalis* community at Gorgo Lungo; (**f**) *Apio nodiflorae-Glycerietum plicatae* on the bank followed by *Ranunculetum peltati* subass. *ranunculetosum rionii* toward the center of Gorgo Marosa.

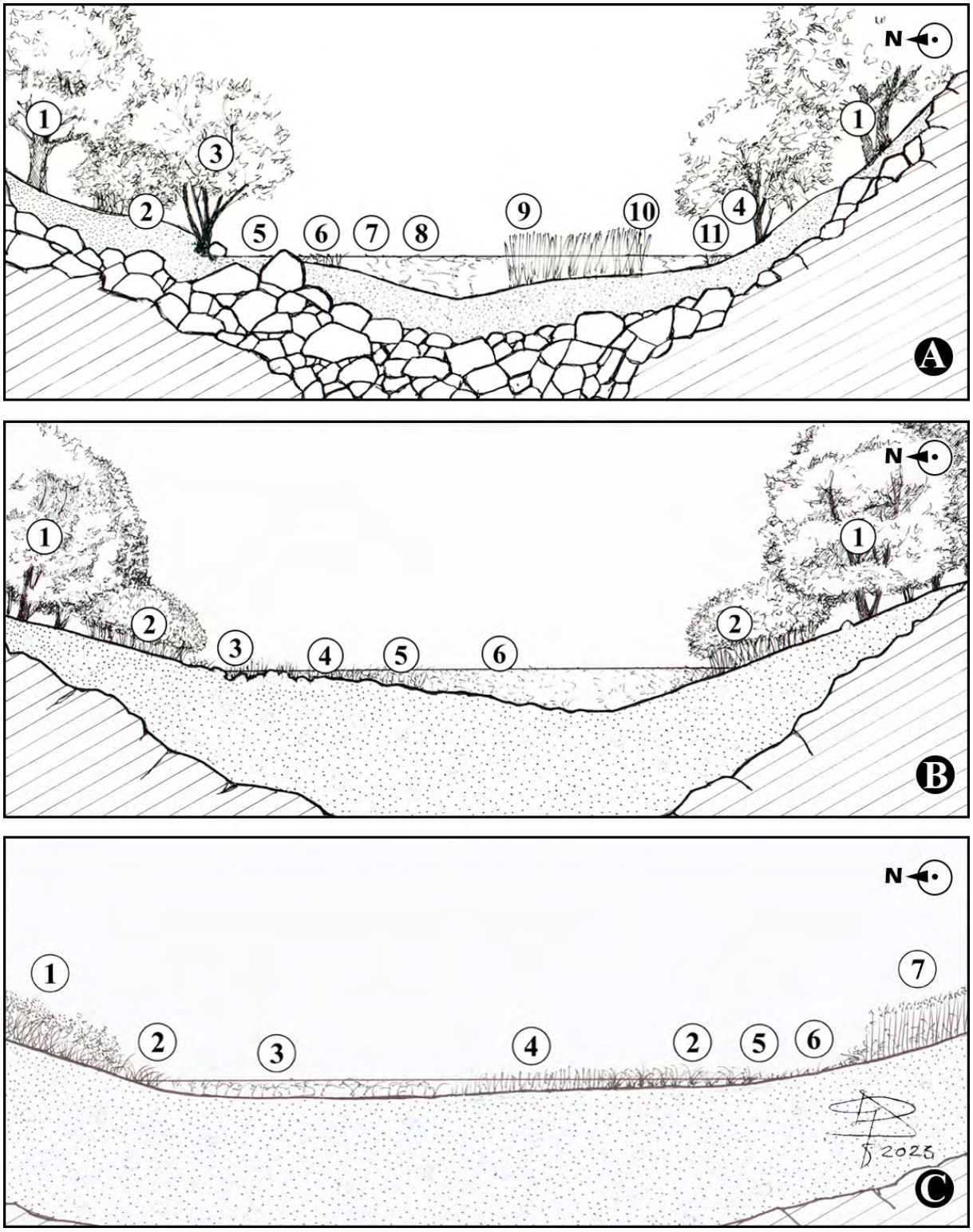

Figure 6. (**A**) Gorgo Lungo: (1) *Quercus suber* wood; (2) Rubus ulmifolius and *Prunus spinosa* scrubland; (3) *Salix pedicellata* riparian wood; (4) *Ulmus minor* microwood; (5) *Mentha pulegium* community; (6) *Alopecurus aequalis* community; (7) *Lemno-Callitrichetum obtusangulae* interpenetrated with *Ranunculetum aquatilis*; (8) Hydrophitic vegetation of *Lemnetun gibbae* and *Lemnetum minoris* (two different seasonal facies) linked by submerged community of *Potamogetono-Ceratophylletum submersi*; (9) *Sparganietum erecti*; (10) *Schoenoplecteum lacustris*; (11) *Callitricho-Glycerietum notatae*.; (**B**) Gorgo Marosa: (1) Ulmus minor microwood; (2) Rubus ulmifolius and Prunus spinosa scrubland;

(3) *Mentha pulegium* community; (4) *Apio nodiflorae-Glycerietum plicatae*; (5) *Eleocharido palustris-Alismetum lanceolati*; (6) *Ranunculetum peltati* subass. *ranunculetosum rionii*; (**C**) Gorgo Piano Scala: (1) *Phalarido coerulescentis-Agropyretum repentis*; (2) *Bolboschoeno maritimi-Alismetum lanceolati*; (3) *Potamo natantis-Polygonetum natantis*; (4) *Apio nodiflorae-Glycerietum plicatae*; (5) *Eleocharido palustris-Alismetum lanceolati*; (6) *Mentha pulegium* vegetation; (7) Cereal crops.

At the margins, riparian vegetation is found with *Ulmus minor* Mill. and *Salix pedicellate* Desf.

4.2. Gorgo Marosa (Figures 2b and 6B)

This is a small pool located on the southern slope of Rocca Busambra, in the municipality of Godrano, at 859 m a.s.l., on carbonate substrates, extensively dominated by pasture lands. This biotope develops in a karstic valley strongly influenced by the presence of livestock. Hygrophilous vegetation aspects attributed to *Ranunculetum peltati* subass. *ranunculetosum rionii* (*Potamogetonetea* class) occur in the deeper parts, differentiated by the presence of *Ranunculus rionii*, a rare species in Sicily that has been recently identified [8]. At the outer edges of the pool, vegetation includes *Helosciadietum nodiflori* with *Caricetum hispidae* and *Caricetum otrubae* (found in inlet streams). Vegetation aspects from the classes *Lemnetea Potamogetonetea* (*Ranunculetum peltati* subass. *ranunculetosum rionii*), *Phragmito-Magnocaricetea* (*Apio nodiflorae-Glycerietum plicatae* and *Eleocharido palustris-Alismetum lanceolate*) associated with muddy areas with lower water levels and *Isöeto-Nanojuncetea* (*Mentha pulegium* comm.) are present. Surrounding the moist margins of the lake environment, additional aspects from the class *Molinio-Arrhenatheretea* can be observed, alongside shrublands of *Prunus spinosa* L. (*Rhamno-Prunetea*) and groves of *Ulmus minor*.

4.3. Gorgo Piano Scala (Figures 2c and 6C)

Located on the northern slope of Mt. Cardellia (1266 m), at an altitude of 838 m a.s.l., this pool is situated within a depression among layers of Oligo-Miocene arenaceous limestone. It spans a wide stretch within a flat region characterized by clays, partly covered by erosive deposits and closed in the front by marly layers. The uniform morphology and anthropogenic disturbance from grazing livestock promote the extensive development of formations belonging to the class *Phragmitetea* (*Apio nodiflorae-Glycerietum plicatae*, *Bolboschoeno maritimi-Alismetum lanceolate*, *Eleocharido palustris-Alismetum lanceolate* and *Potamo natantis-Polygonetum natantis*) and other hygrophilous vegetation aspects of the classes *Molinio-Arrhenatheretea* (*Phalarido coerulescentis-Agropyretum repentis*) and *Isöeto-Nanojuncetea* (*Mentha pulegium* community). In inlet streams *Caricetum otrubae* and *Helosciadietum nodiflori* are present. Surrounding the lake environment, there are shrublands of *Prunus spinosa* and *Rubus ulmifolius* (*Rhamno-Prunetea*), as well as pasture and arable land aspects.

4.4. Gorgo Carcaci (Figures 2d and 7A)

This pool is located at an altitude of 858 m a.s.l., on clay deposits at the base of the northern slope of Mt. Carcaci (1196 m), structurally characterized by limestone, calcareous, and silico-calcareous formations of the Sicane Units. This semi-permanent wetland environment develops within a large, marginally cultivated depression used partially for arable farming. Despite being influenced by anthropogenic disturbance and livestock grazing, it hosts a variety of hygro-hydrophilic communities, some of which are unique, forming expressive belts of vegetation that vary with ecological gradients. The deepest part is occupied by communities dominated by *Ranunculus* sp. pl. (*Ranunculetum peltati* subass. *ranunculetosum rionii* and *Ranunculetum rionii*), surrounded by a thick belt of *Schoenoplectus palustris* (*Scoenoplectetum lacustri*). At the outer margin, helophytic formations belonging to the class *Phragmito-Magnocaricetea* (*Apio nodiflorae-Glycerietum plicatae*, *Eleocharido palustris-Alismetum lanceolate*, *Potamo natantis-Polygonetum natantis* and *Sparganietum erecti*) develop. Along the inflow channels, aspects of *Caricetum hispidae*, *Caricetum otrubae*, *Helosciadietum*

nodiflori and *Iridetum pseudacori* are also represented. Surrounding the moist margins of the lake environment, additional aspects of the class *Molinio-Arrhenatheretea* (*Phalarido coerulescentis-Agropyretum repentis*) can be observed. In the outer marginal areas, riparian patches with *Ulmus minor* and *Prunus spinosa* are found, giving way to cereal crops.

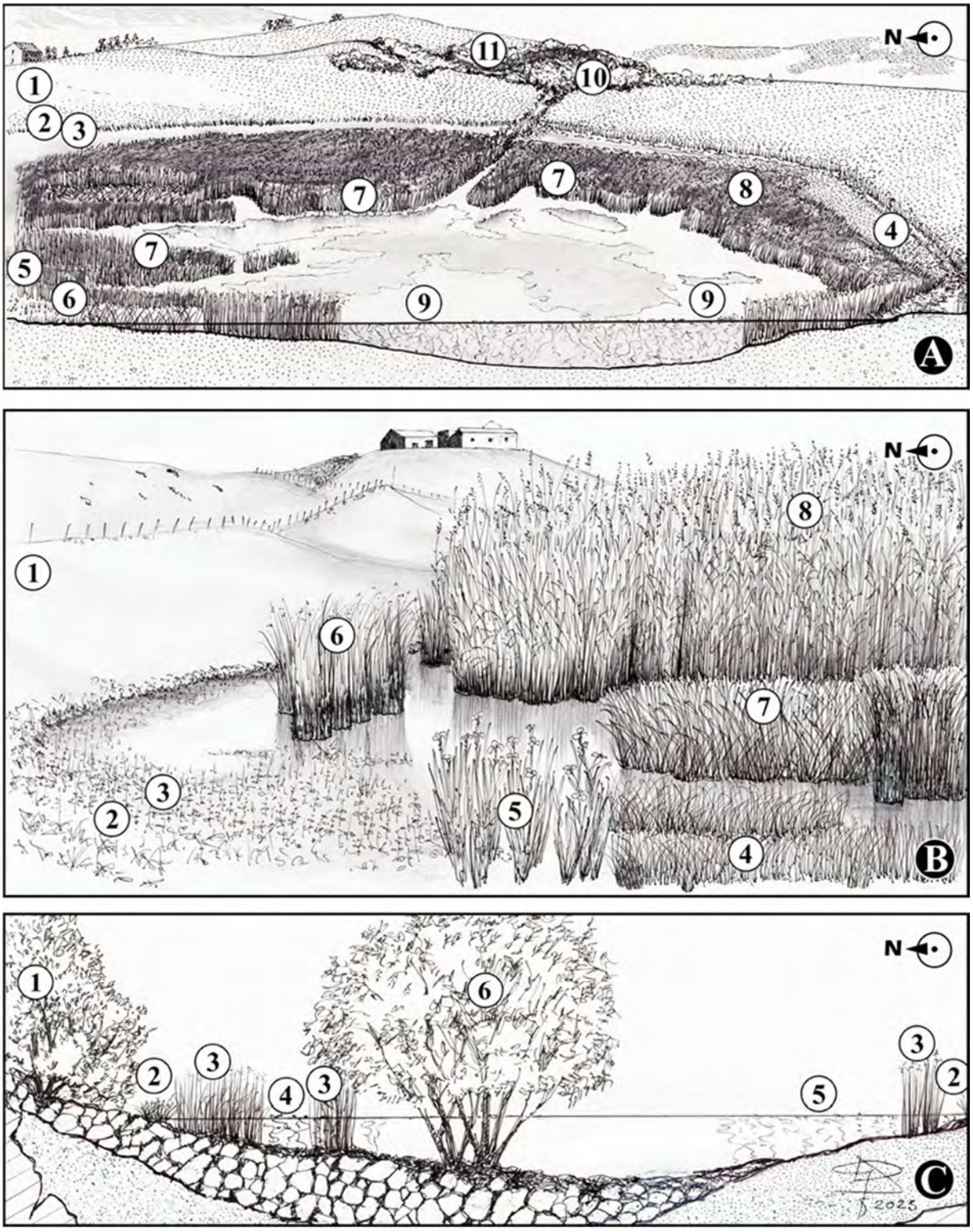

Figure 7. (**A**) Gorgo Carcaci: (1) Cereal crops; (2) *Caricetum otrubae*; (3) *Helosciadietum nodiflori* (small inlet stream); (4) *Potamo natantis-Polygonetum natantis* interpenetrated with *Eleocharido palustris-Alismetum*

lanceolati and *Apio nodiflorae-Glycerietum plicatae*; (5) *Phalarido coerulescentis-Agropyretum repentis*; (6) *Caricetum hispidae*; (7) *Schoenoplecteum lacustris*; (8) *Sparganietum erecti* interpenetrated with *Iridetum pseudacori*; (9) *Ranunculetum peltatum subass. ranunculetosum rionii*; (10) *Prunus spinosa* scrubland; (11) *Ulmus minor* microwood.; (**B**) Gorgo Carcaciotto: (1) Pasture lands; (2) *Mentha pulegium* community; (3) *Eleocharido palustris-Alismetum lanceolati* interpenetrated with *Mentha aquatica* community; (4) *Bolboschoeno maritimi-Alismetum lanceolati*; (5) *Iridetum pseudoacori*; (6) Schoenoplecteum lacustris; (7) *Sparganietum erecti*; (8) *Phragmitetum australis*; (**C**) Gorgo Sant'Andrea: (1) *Ulmus minor* microwood; (2) *Bolboschoeno maritimi-Alismetum lanceolati* interpenetrated with *Cyperetum longi* and *Eleocharido palustris-Alismetum lanceolati*; (3) *Schoenoplecteum lacustris*; (4) *Potamo natantis-Polygonetum natantis*; (5) *Potamogetonetum pectinati*; (6) *Salix alba* hygrophilous wood.

4.5. Gorgo Carcaciotto (Figures 2e and 7B)

Like the previous site, this pool is located on the northern slope of Mt. Carcaci, at an altitude of 869 m a.s.l., near the homonymous Masseria Carcaciotto. It is part of the same system of multiple wetland environments fed by emerging springs slightly upstream. The deepest part of this permanent humid environment descends more than 2 m during peak inundation periods. It is largely occupied by lush vegetation dominated by *Phragmites australis* (*Phragmitetum communis*), leaving limited space outside for other hydrophytic aspect of the *Potamogetonetea* (*Ranunculetum peltati* subass. *ranunculetosum rionii*) and helophytic vegetation of the *Phragmito-Magnocaricetea* class (*Bolboschoeno maritimi-Alismetum lanceolate*, *Eleocharido palustris-Alismetum lanceolate*, *Iridetum pseudoacori*, *Schoenoplecteum lacustris*, *Sparganietum erecti* and *Mentha aquatica* community) arranged in somewhat discontinuous bands. Along the inflow channels, aspects of *Caricetum hispidae*, *Caricetum otrubae* and *Helosciadietum nodiflori*, are also represented, while in the banks subject to prolonged emergence, *Mentha pulegium* community (class *Isöeto-Nanojuncetea*) develop. This arrangement is due to the irregularity of the lake shores, subjected to anthropogenic disturbance and sedimentation phenomena. The latter are fueled by erosive processes from the slopes above, often plowed and cultivated for arable farming, and amended with inert materials and organic matter.

4.6. Gorgo S. Andrea (Figures 2f and 7C)

This other interesting pool, located in the municipality of Castronovo di Sicilia, at an altitude of 578 m a.s.l. at the base of the carbonate relief of Pizzo Lupo (1081 m). It falls within the valley of the Platani River, surrounded by a large, reforested area dominated by conifers. Despite being influenced by various anthropogenic disturbances (water extraction for irrigation, fires, etc.), it still preserves a variety of hygro-hydrophilic communities arranged in expressive belts. The deepest part is occupied by aquatic vegetation dominated by *Potamogeton pectinatus* (*Potamogetonetum pectinati*), while at the outer margin, there are helophytic formations belonging to the *Phragmito-Magnocaricetea* class (*Apio nodiflorae-Glycerietum plicatae*, *Bolboschoeno maritimi-Alismetum lanceolate*, *Cyperetum longi*, *Eleocharidetum palustris*, *Potamo natantis-Polygonetum natantis*, *Schoenoplectetum lacustris*). Along the banks subject to prolonged emergence *Mentha pulegium* community and *Gaudinia fragilis* community (class *Isöeto-Nanojuncetea*) with *Potentilla reptans* community in the little inlet streams, are present (class *Molinio-Arrhenatheretea*).

The marginal part surrounding the lake environment is characterized by riparian vegetation with *Salix alba* L., shrublands of *Ulmus minor*, and thickets of *Prunus spinosa*.

5. Conclusions

This study conducted on the hilly wetlands of western Sicily, within six representative biotopes, monitored the presence of 28 plant communities, referred to the classes *Lemnetea minoris* (3 associations), *Potamogetonetea pectinate* (7 associations), *Phragmito-Magnocaricetea* (14 associations), *Isöeto-Nanojuncetea* (2 communities) and *Molinio-Arrhenatheretea* (1 community and 1 association). The dominant vegetation belongs to the *Phragmito-Magnocaricetea* class, with five alliances (*Phragmition communis*, *Scirpion maritimi*, *Magnocaricion gracilis*,

Glycerio-Sparganion, *Alopecuro-Glycerion spicatae*). Furthermore, a new association of the *Alopecuro-Glycerion spicatae* alliance, *Callitricho obtusangulae-Glycerietum notatae* for the wetlands of western Sicily, is proposed. These communities are located within the latter residual wetlands located in the hinterland of western Sicily, where they perform a very important function as a refuge habitat of high naturalistic value. They have a rare and fragmented distribution, as well as being strongly threatened by anthropic pressures and climate changes [133]. For these reasons, and also in light of the results of this study, more concrete conservation measures would be desirable to avoid further rarefaction or extinction, even in the short term.

Author Contributions: Conceptualization, L.G.; methodology, L.G., O.C. and S.S.; investigation, L.G. and O.C.; data curation, L.G., O.C. and S.S.; data elaboration, L.G., O.C. and S.S.; writing—original draft preparation, L.G. and O.C.; writing—review and editing, L.G., O.C. and S.S.; drawings, L.G. All authors have read and agreed to the published version of the manuscript.

Funding: This research is supported by NBFC to University of Palermo, funded by the Italian Ministry of University and Research, PNRR, Missione 4 Componente 2, "Dalla ricerca all'impresa", Investimento 1.4, Project CN00000033.

Data Availability Statement: The data are contained within the article.

Acknowledgments: We would like to dedicate this paper to the memory of Edoardo Biondi, our dear friend, master of phytosociology and plant landscape studies.

Conflicts of Interest: The authors declare no conflicts of interest.

Appendix A. Syntaxonomical Scheme of the Vegetation Units Recorded

Table A1. Syntaxonomical Scheme.

LEMNETEA MINORIS O. Bolòs et Masclans 1955
- LEMNETALIA MINORIS O. Bolòs et Masclans 1955
  - LEMINION MINORIS O. Bolòs et Masclans 1955
    - *Lemnetum minoris* von Soó 1927
    - *Lemnetum gibbae* Miyawaki et J. Tx. 1960
  - CERATOPHYLLION DEMERSI Den Hartog et Segal 1964
    - *Potamogetono-Ceratophylletum submersi* Pop 1962

POTAMOGETONETEA PECTINATI Klika in Klika et Novák 1941
- POTAMOGETONETALIA PECTINATI Koch 1926
  - POTAMOGETONION Libbert 1931
    - *Potamogetonetum pectinati* Carstensen 1955
    - *Groenlandietum densae* Segal ex Schipper et al. in Schaminée et al. 1995
- CALLITRICHO HAMULATAE-RANUNCULETALIA AQUATILIS Passarge ex Theur. in Theur. et al. 2015
  - RANUNCULION AQUATILIS Passarge 1964 ex Theurillat in Theurillat et al. 2015
    - *Ranunculetum aquatilis* Géhu 1961
    - *Ranunculetum rionii* Hejný et Husák in Dykyjová et Květ 1978
    - *Ranunculetum peltati* Horst, Krausch et Müller-Stoll 1966 em. Weber-Oldecop 1969 subass. *ranunculetosum rionii* Caldarella, Bolpagni, Lastrucci et Gianguzzi 2021
    - *Lemno-Callitrichetum obtusangulae* (Philippi 1978) Passarge 1992

PHRAGMITO-MAGNOCARICETEA Klika in Klika et Novák 1941
- PHRAGMITETALIA Koch 1926
  - PHRAGMITION COMMUNIS Koch 1926
    - *Schoenoplectetum lacustris* Chouard 1924
    - *Phragmitetum communis* Savič 1926
    - *Sparganietum erecti* Philippi 1973

Table A1. *Cont.*

BOLBOSCHOENETALIA MARITIMI Hejný in Holub et al. 1967
SCIRPION MARITIMI Dahl et Hadač 1941
Bolboschoeno maritimi-Alismetum lanceolati Sciandrello, Ranno et Tomaselli 2024
Eleocharido palustris-Alismetum lanceolati Minissale et Spampinato 1987
MAGNOCARICETALIA Pignatti 1953
MAGNOCARICION ELATAE Koch 1926
Caricetum hispidae Brullo et Ronsisvalle 1975
Iridetum pseudacori Eggler ex Brzeg et Wojterska 2001
Mentha aquatica comm.
Caricetum otrubae Mirza 1978
NASTURTIO-GLYCERIETALIA Pignatti 1953
GLYCERIO-SPARGANION Br.-Bl. et Sissingh in Boer 1942
Cyperetum longi Micevski 1963
Potamo natantis-Polygonetum natantis Knapp et Stoffers 1962
Helosciadietum nodiflori Maire 1924
OENANTHETALIA AQUATICAE Hejný ex Balátová-Tuláčková et al. in Mucina et al. 1993
ALOPECURO-GLYCERION SPICATAE Brullo, Minissale et Spampinato 1994
Callitricho-Glycerietum notatae ass. nov. hoc loco
Apio nodiflorae-Glycerietum plicatae Brullo et Spampinato 1990
Alopecurus aequalis community

ISöETO-NANOJUNCETEA Br.-Bl. et R. Tx. ex Westoff, Dijk et Passarge 1946
ISÖETALIA Br.-Bl. 1935
ISÖETION Br.-Bl. 1935
Gaudinia fragilis community
NANOCYPERETALIA Klika 1935
VERBENION SUPINAE Slavnic 1951
Mentha pulegium community

MOLINIO-ARRHENATHERETEA R.Tx.1937
POTENTILLO-POLYGONETALIA AVICULARIS R. Tx. 1947
MENTHO LONGIFOLIAE-JUNCION INFLEXI T. Müller et Görs ex de Foucault 2009
Phalarido coerulescentis-Agropyretum repentis Brullo et Spampinato 1990
POTENTILLION ANSERINAE R. Tx. 1947
Potentilla reptans community

Appendix B. Localities and Date of Relevés

Table 5. rell. 1–2: Gorgo Lungo, 15 May 2021.

Table 6. Lm: Gorgo Lungo (from Table 5, rell. 1–2); Lg: Gorgo Lungo (from Table 2 rell. 8–9, in [8]); PC: Gorgo Lungo (from Table 4, in [8]).

Table 7. Pp: Gorgo S. Andrea (from Table 7 rel. 5, in Caldarella et al. [8]); Gd: Monte Carcaci (Castronovo di S.) (from Table 8 rell. 3–4, in [8]); Ra: Gorgo Lungo (from Table 10 rell. 13–14, in [8]); Rr: Gorgo Carcaci (from Table 9 rel. 1, in [8]); Rpr: Gorgo Carcaciotto and Gorgo Marosa (from Table 11 rel. 11–14, in [8]); LC: Gorgo Lungo (from Table 12 rel. 16–17, in [8]).

Table 8. Sl: rell. 1–2: Gorgo S. Andrea, 3 June 2019; 3–4: Gorgo Carcaci, 12 July 1995; 5: Gorgo Carcaci, 17 July 2021; 6: Gorgo Carcaci, 2 June 2018; 7: Gorgo Carcaciotto, 2 June 2018; 8–9: Gorgo Lungo, 16 May 2013; 10: Gorgo Carcaciotto, 17 May 2021. Pc: 11–13: Gorgo Carcaciotto, 20 July 2016; 14–15: Gorgo Carcaciotto,17 May 2021. Se: 16–17: Gorgo Carcaci, 2 June 2018; 18–19: Gorgo Carcaciotto, 3 June 2019; 20: Gorgo Carcaciotto, 17 May 2021; 21–22: Gorgo Lungo, 16.5.2013.

Table 9. BA: rell. 1–2: Gorgo S. Andrea, 3 June 2019; 3: Gorgo Carcaciotto, 20 July 2016; 4: Gorgo Carcaciotto, 17 May 2021; 5–6: Gorgo Piano Scala, 8 July 2013; 7: Gorgo Carcaciotto, 20 July 2019; 8: Gorgo Piano Scala, 17 May 2021; 9–10: Gorgo Piano Scala, 17 May 2021. EA: 11: Gorgo S. Andrea, 3 June 2019; 12: Gorgo Piano Scala, 4 June 2013; 13–14: Gorgo Piano Scala, 17 May 2021; 15: Gorgo Marosa, 17 May 2013; 16–17: Gorgo Carcaciotto, 2 June 2018; 18: Gorgo Piano Scala, 4 June 2013; 19: Gorgo Carcaci, 2 June 2018.

Table 10. Ch: rel. 1: Gorgo Carcaci, 2 June 2018; 2–3: Gorgo Carcaciotto, 02 June 2018; 4: Gorgo Carcaci, 17 May 2021; 5–6: Gorgo Marosa, 17 May 2013. Ip: 7–8: Gorgo Carcaciotto, 20 May 2016; 9–10: Gorgo Carcaciotto, 17 May 2021. Ma: 11–14: Gorgo Carcaciotto, 17 May 2021. Co: 15–16: Gorgo Piano Scala, 4 June 2013; 17: Gorgo Carcaci, 17 May 2021; 18–19: Gorgo Marosa, 17 May 2013.

Table 11. Cl: rell. 1–2: Gorgo Carcaciotto, 20 July 1995. PP: 3: Gorgo Carcaci, 12 July 1995; 4–5: Gorgo S. Andrea, 3 June 2019; 6: Gorgo Piano Scala, 17 May 2021; 7–8: Gorgo Carcaci, 2 June 2018; 9: Gorgo Piano Scala, 4 June 2013; 10: Gorgo Piano Scala, 17 May 2021; 11–12: Gorgo Piano Scala, 17 May 2021. Hn: 13: Gorgo Marosa, 17 May 2013; 14: Gorgo Piano Scala, 4 June 2013; 15–16: Gorgo Carcaci, 17 May 2021; 17–18: Gorgo Carcaci, 17 May 2021.

Table 12. CG: rell. 1–2: Gorgo Lungo, 28 May 2017; 3–5: Gorgo Lungo, 16 May 2013. AG: 6–7: Gorgo S. Andrea, 3 June 2019; 8: Gorgo Piano Scala, 4 June 2013; 9–10: Gorgo Carcaci, 3 June 2018; 11–12: Gorgo Marosa, 16 May 2013. Aa: 13–14: Gorgo Lungo, 16 May 2013; 15–16: Gorgo Cerro (in Bosco Ficuzza Nature Reserve—Monreale) 9 May 2013.

Table 13. Gf: rell. 1–2: Gorgo S. Andrea, 3 June 2019. Mp: 3: Gorgo Carcaciotto, 17 May 2021; 4: Gorgo Piano Scala, 17 May 2021. PA: 5–6: Gorgo Carcaci, 17 May 2021; 7–8: Gorgo Carcaci, 17 May 2021. Pr: 9–11: Gorgo S. Andrea, 3 June 2019.

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