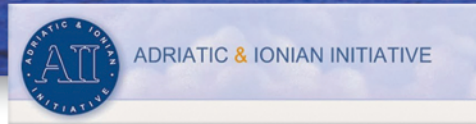


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Contribution to the knowledge of the coastal vegetation of Abruzzo (central Adriatic)

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Abstract

We report here on very rare associations (7) of the Abruzzo coast that are unusual for this Region (16). Moreover, we propose a new association of the alliance *Crucianellion maritimae*.

Key words: Abruzzo coast, Central Italy, vegetation.

Introduction

The rocky, halo-hygrophilous, halophilic and psamphylic aspects of the vegetation of the coast of Abruzzo are well known and have been documented in several studies (Pirone, 1983, 1985, 1988, 1995, 1997, 2005; Géhu *et al.*, 1984; Stanisci & Conti, 1990; Pirone *et al.*, 2001, 2003; Ciaschetti *et al.*, 2004). This section of the Adriatic coast has also been discussed in terms of the environmental quality and degradation (Tammaro & Pirone, 1979, 1981; Pirone, 1982, 1997; Acosta *et al.*, 2007; Frattaroli *et al.*, 2007), which have shown the state of heightened disturbance suffered by various stretches of this coast.

Over the last few years, especially in the context of a recent monitoring of the presence of plant communities along the Abruzzo coast (Pirone *et al.*, 2014), several phytocoenosis have been reported, including:

- a) those already known for Abruzzo, but very rare and now found in new localities;
- b) those not yet known for Abruzzo;
- c) those here proposed for the first time.

Given their importance in phytogeographic and conservation terms, together with their role in integrating the cognitive framework of the coastal vegetation, we provide here a brief overview.

New localities of rare plant communities already reported for Abruzzo

SPOROBOLETUM ARENARII (Arènes 1924) Géhu & Biondi 1994

Syntaxonomy: *Ammophiletea australis* Br.-Bl. & Tüxen ex Westhoff, Dijk & Passchier 1946, *Ammophiletalia australis* Br.-Bl. 1933, *Ammophilion australis* Br.-Bl. 1921 corr. Rivas-Martínez, Costa & Izco in

Rivas-Martínez, Lousã, T.E. Díaz, Fernández-González & J.C. Costa 1990, *Sporobolion arenarii* Géhu 1988.

This association had only been reported for Vasto Marina (Pirone *et al.*, 2001), and has now been recorded near Torre di Cerrano (Pineto - TE).

Relevé: Locality: Torre di Cerrano; date: 22 April 2006; vegetation cover: 35%; surface area: 20 m². *Sporobolus virginicus* (3), *Elymus farctus* ssp. *farctus* (1), *Medicago marina* (1), *Echinophora spinosa* (+), *Eryngium maritimum* (+), *Ambrosia coronopifolia* (1), *Silene colorata* (+), *Vulpia fasciculata* (+), *Salsola tragus* (+), *Xanthium orientale* ssp. *italicum* (+).

ECHINOPHORO SPINOSAE - *AMMOPHILETUM ARUNDINACEAE*

Syntaxonomy: *Ammophiletea australis* Br.-Bl. & Tüxen ex Westhoff, Dijk & Passchier 1946, *Ammophiletalia australis* Br.-Bl. 1933, *Ammophilion australis* Br.-Bl. 1921 corr. Rivas-Martínez, Costa & Izco in Rivas-Martínez, Lousã, T.E. Díaz, Fernández-González & J.C. Costa 1990, *Ammophilenion australis* Br.-Bl. (1931) 1932 em. J.M. & J. Géhu 1988.

This association was known for Torre di Cerrano, the mouth of the River Osento (Torino di Sangro), and for Punta Penna and Vasto Marina (Pirone, 1985, 1997; Stanisci & Conti, 1990; Pirone *et al.*, 2001). It has now also been recorded for Casalbordino and San Salvo.

Relevé: Location: coast of San Salvo; date: 29 March 2014; vegetation cover: 70%; surface area: 40 m². *Ammophila arenaria* ssp. *australis* (4), *Elymus farctus* ssp. *farctus* (2), *Echinophora spinosa* (1), *Eryngium maritimum* (+), *Anthemis maritima* (1), *Lotus creticus* (3), *Silene colorata* (1), *Rostraria litorea* (2), *Artemisia campestris* subsp. *glutinosa* (+), *Xanthium orienta-*

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le ssp. *italicum* (2), *Cynodon dactylon* (1), *Oenothera suaveolens* (+), *Cenchrus incertus* (2).

ROMULEA ROLLII community

Syntaxonomy: *Tuberarietea guttatae* (Br.-Bl. in Br.-Bl., Roussine & Nègre 1952) Rivas Goday & Rivas-Martínez 1963 nom. mut. propos. in Rivas-Martínez et al. 2002, *Trachynetalia distachyae* Rivas-Martínez 1978, *Trachynion distachyae* Rivas-Martínez 1978].

Phytocoenosis dominated by *Romulea rollii* were reported for the Pineta D'Annunziana in Pescara (Pirone et al., 2001). This community has now also been recorded along the coast of Pineto, near the locality named Corfù.

Relevé: Location: coast of Pineto near Corfù; date: 31 March 2006; vegetation cover: 60%; surface area: 9 m². *Romulea rollii* (3), *Vulpia fasciculata* (2), *Cerastium pumilum* (2), *Silene colorata* (1), *Bromus diandrus* ssp. *maximus* (1), *Salvia verbenaca* (+), *Lagurus ovatus* (1), *Lotus creticus* (1), *Sonchus bulbosus* ssp. *bulbosus* (1), *Erodium laciniatum* (+), *Euphorbia terracina* (+).

SCHOENO NIGRICANTIS - PLANTAGINETUM CRASSIFOLIAE Br.-Bl. (1931) 1952

Syntaxonomy: *Juncetea maritimi* Br.-Bl. in Br.-Bl., Roussine & Nègre 1952, *Juncetalia maritimi* Br.-Bl. ex Horvatic 1934, *Plantaginion crassifoliae* Br.-Bl. in Br.-Bl., Roussine & Nègre 1952.

This association was reported for the coast of Vasto (Pirone, 1995). It has now also been recorded for San Salvo.

Relevé: Location: coast of San Salvo; date: 7 February 2014; vegetation cover: 80%; surface area: 20 m². *Plantago crassifolia* (4), *Schoenus nigricans* (2), *Aster tripolium* (+), *Juncus littoralis* (+), *Asparagus tenuifolius* (+), *Blackstonia perfoliata* ssp. *perfoliata* (+), *Dittrichia viscosa* (1), *Centaurium pulchellum* ssp. *pulchellum* (1), *Scirpoides holoschoenus* (1), *Agrostis stolonifera* (+), *Juncus articulatus* (+), *Rostraria litorrea* (+).

PLANTAGINI CRASSIFOLIAE-CARICETUM EXTENSAE Géhu & Biondi 1988

Syntaxonomy: *Juncetea maritimi* Br.-Bl. in Br.-Bl., Roussine & Nègre 1952, *Juncetalia maritimi* Br.-Bl. ex Horvatic 1934, *Juncion maritimi* Br.-Bl. ex Horvatic 1934, *Puccinellio festuciformis-Caricenion extensae* Géhu & Biondi 1995).

It was reported for Vasto Marina, Faro di Vasto, Villa Rosa di Martinsicuro, and between Pineto and Scerne (Pirone, 1995). It is no longer present at Faro di Vasto and Villa Rosa di Martinsicuro. The association was also recorded in San Salvo in March 2014, but a subsequent clearing of the area resulted in its disappearance. **SCHOENO NIGRICANTIS-ERIANTHETUM RAVEN-**

NAE (Pign. 1953)

Syntaxonomy: Géhu 1984 (*Molinio-Arrhenatheretea* Tüxen 1937, *Saccharetalia ravennae* Biondi, Blasi & Casavecchia in Biondi et al. 2014, *Imperato cylindricae-Saccharion ravennae* Br.-Bl. & O.Bolòs 1958).

The association was known for Montesilvano, San Silvestro and Pineta D'Annunziana in Pescara, and Vasto Marina (Stanisci & Conti, 1990; Pirone, 1995). It is now no longer present in Montesilvano and San Silvestro, but it has now been recorded for San Salvo.

Relevé: Location: coast of San Salvo; date: 7 February 2014; vegetation cover: 95%; surface area: 50 m². *Schoenus nigricans* (4), *Erianthus ravennae* (2), *Juncus littoralis* (+), *Dittrichia viscosa* (1), *Pulicaria dysenterica* (1), *Holcus lanatus* (1), *Agrostis stolonifera* (1), *Elymus athericus* (1), *Scirpoides holoschoenus* (+), *Potentilla reptans* (+), *Centaurium pulchellum* (+), *Phragmites australis* ssp. *australis* (1), *Equisetum ramosissimum* (+).

SCIRPETUM COMPACTO-LITTORALIS (Br.-Bl. (1931) 1952 em. Rivas-Martínez et al. 1980

Syntaxonomy: *Phragmito australis-Magnocaricetea elatae* Klika in Klika & Novak 1941; *Scirpetalia compacti* Hejny in Holub, Hejny, Moravec & Neuhäusl 1967 corr. Rivas-Martínez, Costa, Castroviejo & E.Valdés 1980, *Scirpion compacti* Dahl & Hadač 1941 corr. Rivas-Martínez, Costa, Castroviejo & E.Valdés 1980.

This association was reported for the mouth of River Vomano, Martinsicuro, the mouth of River Saline, and Punta Aderci and Vasto Marina (Pirone, 1995), and it is now confirmed for Punta Aderci and Vasto Marina. Moreover, it has now also been recorded between Pineto and Scerne, Ortona (CH) between the mouths of Rivers Foro and Arielli, south of the mouth of River Sangro, the mouth of River Sinello, and the coast of San Salvo.

Relevé: Location: coast of San Salvo; date: 7 February 2014; vegetation cover: 100%; surface area: 25 m². *Bolboschoenus maritimus* (5), *Phragmites australis* ssp. *australis* (1), *Lythrum salicaria* (+), *Lycopus europaeus* ssp. *europaeus* (+), *Samolus valerandi* (1), *Schoenoplectus tabernaemontani* (+), *Juncus littoralis* (+), *Tripolium pannonicum* (+), *Rumex crispus* (+).

New plant communities for Abruzzo

VERBASCO GARGANICI - EUPHORBIETUM TERRACINAE Biondi, Casavecchia & Biscotti 2007

Syntaxonomy: *Stellarietea mediae* Tüxen, Lohmeyer & Preising ex von Rochow 1951; *Thero-Brometalia* (Rivas.Godday & Rivas-Martínez ex Esteve 1973) O.Bolòs 1975; *Echio Plantaginei-Galactition tomentosae* O. Bolòs & Molinier 1969.

It is a vegetation of the interdunal and retrodunal are-

as that have been disturbed, abandoned and sometimes profoundly altered by human activities, which was described for Puglia by Biondi *et al.* (2007). In Abruzzo, it has now been recorded for several coastal areas.

Relevé: Location: Torre di Cerrano; date: 7 April 2014; vegetation cover: 85%; surface area: 25 m². *Euphorbia terracina* (3), *Verbascum niveum* ssp. *garganicum* (2), *Bromus diandrus* ssp. *diandrus* (2), *Bromus diandrus* ssp. *maximus* (1), *Ambrosia coronopifolia* (2), *Lagurus ovatus* (2), *Vulpia fasciculata* (1), *Silene colorata* (1), *Reseda alba* (+), *Erodium laciniatum* (1), *Lotus creticus* (1), *Echinophora spinosa* (+), *Rostraria litorea* (1), *Coniza bonariensis* (+), *Cynodon dactylon* (+), *Avena barbata* (1), *Raphanus raphanistrum* ssp. *landra* (+), *Cenchrus incertus* (+), *Elymus farctus* ssp. *farctus* (+), *Cyperus capitatus* (+).

XANTHIO ITALICI-CENCHRETUM INCERTI Biondi, Brugiapaglia, Allegrezza & Ballelli 1992

Syntaxonomy: *Tuberarietea guttatae* Br.-Bl. in Br.-Bl., Roussine & Nègre 1952) Rivas Goday & Rivas-Martínez 1963 nom. mut. propos. in Rivas-Martínez *et al.* 2002; *Malcolmietalia* Rivas-Goday 1958; *Laguro ovati-Vulpion membranaceae* Géhu & Biondi 1994.

Plant communities dominated by *Cenchrus incertus*, which is exotic and invasive, and is a native to tropical and subtropical America. These coenosis substitute the typical vegetation following alterations to the dune systems. It was described for the Marche coast (Biondi *et al.*, 1992), and it has now been found in many places along the coast of Abruzzo. It is included in the *Laguro ovati-Vulpion membranaceae* alliance.

Relevé: Location: Torre di Cerrano; date: 7 April 2014; vegetation cover: 70%; surface area: 25 m². *Cenchrus incertus* (4), *Xanthium orientale* ssp. *italicum* (+), *Rostraria litorea* (1), *Ambrosia coronopifolia* (1), *Silene colorata* (+), *Vulpia fasciculata* (1), *Lagurus ovatus* (1), *Erodium laciniatum* (+), *Pseudorlaya pumila* (1), *Lotus creticus* (1), *Bromus rigidus* ssp. *maximus* (1), *Echinophora spinosa* (+), *Cynodon dactylon* (+), *Elymus farctus* ssp. *farctus* (+), *Medicago marina* (+).

RAPHANO MARITIMI-GLAUCIETUM FLAVI Biondi, Brugiapaglia, Allegrezza & Ballelli 1992

Syntaxonomy: *Cakiletea maritimae* Tüxen & Preising ex Br.-Bl. & Tüxen 1952, *Euphorbietalia peplis* Tüxen 1950, *Euphorbion peplis* Tüxen 1950.

This is a nitrophilous association of the coastal deposits of gravel, which was described for Marche by Biondi *et al.* (1992). It has now been recorded for some areas along the Chieti and Teramo coasts of Abruzzo, and also as the variant with *Crithmum maritimum*, as in the relevé reported here.

Relevé: Location: coast of Torino di Sangro; date: 19 May 2014; vegetation cover: 40%; surface area: 100 m². *Glaucium flavum* (2), *Raphanus raphanistrum* ssp.

landra (1), *Beta vulgaris* ssp. *maritima* (+), *Crithmum maritimum* (3), *Anthemis maritima* (2), *Dittrichia viscosa* (2), *Bromus diandrus* ssp. *maximus* (1), *Lotus corniculatus* ssp. *corniculatus* (+), *Catapodium rigidum* ssp. *rigidum* (1), *Sonchus oleraceus* (+), *Echinophora spinosa* (+), *Parapholis incurva* (1), *Elymus farctus* ssp. *farctus* (+), *Xanthium orientale* ssp. *italicum* (+), *Reichardia picroides* (1), *Avena barbata* (+), *Lagurus ovatus* (+), *Crepis sancta* (+), *Cynodon dactylon* (+), *Verbascum sinuatum* (+), *Lotus creticus* (1), *Hainardia cylindrica* (+).

CALAMAGROSTIO EPIGEJOTIS-ERIANTHETUM RAVENNAE Taffetani & Biondi 1992

Syntaxonomy: *Molinio-Arrhenatheretea* Tuxen 1937, *Saccharetalia ravennae* Biondi, Blasi & Casavecchia in Biondi *et al.* 2014, *Imperato cylindricae-Saccharion ravennae* Br.-Bl. & O.Bolòs 1958.

This association can be found in the dune depressions that are periodically flooded. It was described for Molise (Taffetani & Biondi, 1992), and it has now also been recorded in Abruzzo, along the coast of San Salvo.

Relevé: Location: coast of San Salvo; date: 7 February 2014; vegetation cover: 100%; surface area: 40 m². *Calamagrostis epigejos* (5), *Erianthus ravennae* (1), *Phragmites australis* ssp. *australis* (2), *Imperata cylindrica* (1), *Scirpoides holoschoenus* (+), *Schoenus nigricans* (1), *Dorycnium rectum* (1), *Asparagus tenuifolius* (1), *Agrostis stolonifera* (+), *Holcus lanatus* (2), *Carex extensa* (+), *Lotus tenuis* (+), *Elytrigia atherica* (+), *Oenothera suaveolens* (+), *Rumex crispus* (+), and *Dittrichia viscosa* (+).

IMPERATO CYLINDRICAЕ-SCHOENETUM NIGRICANTIS Arrigoni 1996

Syntaxonomy: *Molinio-Arrhenatheretea* Tuxen 1937, *Saccharetalia ravennae* Biondi, Blasi & Casavecchia in Biondi *et al.* 2014, *Imperato cylindricae-Saccharion ravennae* Br.-Bl. & O.Bolòs 1958.

This is a hygrophilous vegetation on sandy substrates that has been reported in the damp depressions with groundwater. It was described for Sardinia (Arrigoni, 1996), and has now also been recorded in Abruzzo along the coast of San Salvo and for Vasto Marina.

Relevé: Location: coast of San Salvo; date: 7 February 2014; vegetation cover: 90%; surface area: 30 m². *Imperata cylindrica* (4), *Schoenus nigricans* (2), *Phragmites australis* ssp. *australis* (2), *Erianthus ravennae* (+), *Holcus lanatus* (+), *Pulicaria dysenterica* (+), *Equisetum ramosissimum* (+), *Juncus littoralis* (+), *Dittrichia viscosa* (1), *Rostraria litorea* (1), *Xanthium orientale* ssp. *italicum* (1), *Linum bienne* (+), *Briza maxima* (+), *Mentha aquatica* (+), *Daucus carota* (+), *Blackstonia perfoliata* ssp. *perfoliata* (+), *Epilobium hirsutum* (+).

JUNCO MARITIMI-CLADIETUM MARISCI Géhu & Biondi 1988

Syntaxonomy: *Phragmiti-Magnocaricetea* Klika 1941; *Scirpetalia compacti* Hejny in Holub, Hejny, Morav. & Neuh. 1967 em. Rivas-Martinez 1980, *Scirpion compacto-littoralis* Rivas-Martinez 1980).

The salt-marsh sedges association was described for the Alimini Lakes in Puglia, and also reported for Portonovo in Marche (Géhu & Biondi, 1988, 1996). In Abruzzo, it has now only been recorded for the retrodunal environments of San Salvo.

Relevé: Location: coast of San Salvo; date: 7 February 2014; vegetation cover: 100%; surface area: 30 m². *Cladium mariscus* (5), *Juncus maritimus* (2), *Juncus acutus* ssp. *acutus* (1), *Sonchus maritimus* ssp. *maritimus* (+), *Schoenus nigricans* (+), *Juncus subnodulosus* (1), *Phragmites australis* (1), *Mentha aquatica* (1), *Agrostis stolonifera* (+), *Juncus articulatus* (+), *Calystegia sepium* ssp. *sepium* (1), *Xanthium orientale* ssp. *italicum* (+).

CARICETUM DIVISAE Br.-Bl. in Br.-Bl., Roussin & Nègre 1952

Syntaxonomy: *Juncetea maritimi* Br.-Bl. in Br.-Bl., Roussin & Nègre 1952, *Juncetalia maritimi* Br.-Bl. ex Horvatic 1934, *Juncion maritimi* Br.-Bl. ex Horvatic 1934, *Juncenion maritimi* Géhu & Biondi 1995.

It is a vegetation of few species reported for small depressions, on weakly saline soils that are flooded in winter. In Italy, it has been reported for Sardinia and Sicily (Valsecchi & Diana Corrias, 1973; Biondi, 1999; Biondi & Bagella, 2005), and this association has now also been recorded for the retrodunal areas of San Salvo.

Relevé: Location: coast of San Salvo; Date: 7 February 2014; vegetation cover: 100%; surface area: 25 m². *Carex divisa* (5), *Juncus maritimus* (1), *Sonchus maritimus* ssp. *maritimus* (+), *Schoenus nigricans* (+), *Agrostis stolonifera* (1), *Dittrichia viscosa* (+), *Holcus lanatus* (1), *Equisetum ramosissimum* (1), *Phragmites australis* ssp. *australis* (+), *Rumex crispus* (+), and *Juncus articulatus* (+).

JUNCETUM MARITIMI-ACUTI Horvatic 1934

Syntaxonomy: *Juncetea maritimi* Br.-Bl. in Br.-Bl., Roussin & Nègre 1952, *Juncetalia maritimi* Br.-Bl. ex Horvatic 1934, *Juncion maritimi* Br.-Bl. ex Horvatic 1934, *Juncenion maritimi* Géhu & Biondi 1995.

This is an association living on sandy or sandy-clay soils that are periodically flooded by stagnant brackish water. In Italy, it was reported for different localities. In Abruzzo, it has now been recorded for San Nicola at Vasto and for San Salvo Marina.

Relevé: Location: San Salvo Marina; date: 7 February 2014; vegetation coverage 100%; surface area: 30 m². *Juncus maritimus* (5), *Juncus acutus* (1), *Juncus lit-*

toralis (2), *Carex extensa* (+), *Elytrigia atherica* (1), *Tripolium pannonicum* (+), *Bolboschoenus maritimus* (+), *Schoenoplectus tabernaemontani* (+), *Agrostis stolonifera* (1), *Phragmites australis* ssp. *australis* (1), *Asparagus tenuifolius* (+), *Epilobium hirsutum* (+), *Cyperus longus* (+).

JUNCO MARITIMI-SPARTINETUM JUNCEAE Biondi 1992

Syntaxonomy: *Juncetea maritimi* Br.-Bl. in Br.-Bl., Roussin & Nègre 1952, *Juncetalia maritimi* Br.-Bl. ex Horvatic 1934, *Juncion maritimi* Br.-Bl. ex Horvatic 1934, *Puccinellio festuciformis-Caricenion extensae* Géhu & Biondi 1995.

Halophilic association that develops along the edges of brackish depressions. It was described for Sardinia (Biondi, 1992), and in Abruzzo it has now been recorded for San Salvo, near the mouth of the seasonal Buonanotte stream.

Relevé: Location: near the mouth of Buonanotte stream, San Salvo Marina; date: 7 February 2014; vegetation cover: 100%; surface area: 50 m². *Spartina versicolor* (4), *Juncus maritimus* (1), *Carex extensa* (2), *Sonchus maritimus* ssp. *maritimus* (1), *Elytrigia atherica* (2), *Juncus acutus* (1), *Tripolium pannonicum* (1), *Juncus littoralis* (1), *Dittrichia viscosa* (1), *Lotus tenuis* (+), *Epilobium hirsutum* (+), *Phragmites australis* ssp. *australis* (1), *Agrostis stolonifera* (+), *Carex otrubae* (+), *Euphorbia hirsuta* (+), *Artemisia campestris* ssp. *glutinosa* (+), *Glycyrrhiza glabra* (+), *Amorpha fruticosa* (1), *Calystegia sepium* ssp. *sepium* (+).

ELYMETUM ATHERICAE Pellizzari, Merloni & Piccoli 2004

Syntaxonomy: *Juncetea maritimi* Br.-Bl. in Br.-Bl., Roussin & Nègre 1952, *Juncetalia maritimi* Br.-Bl. ex Horvatic 1934, *Halo-Artemision coerulescentis* Pignatti 1953.

This is an association of the slightly halophilic dense grasslands, as described by Pellizzari et al. (2004), that are dominated by *Elymus athericus* (= *Elytrigia atherica*). It is found on the higher edges of the depressed marshy areas occupied by the phytocoenoses of the alliance *Juncion maritimi*. This kind of grassland is known for a lot of sites along the Adriatic-Ionian coast (Pignatti, 1953, 1966; Caniglia & Salviato, 1983; Pirone, 1983, 1995; Ferrari et al., 1985; Corbetta et al., 1992; Piccoli, 1995; Merloni & Piccoli, 2007; and others) and it was generally reported as *Elytrigia atherica* or, due to incorrect identification, *Elymus pungens* (= *Agropyron pungens*) communities. The association is common along the coast of Abruzzo, both as communities weakly halophilic, and as transitional aspects towards the prairies of the *Molinio-Arrhenatheretea* class.

Relevé: Location: between the mouths of Rivers Sa-

line and Piomba; date: 31 April 2014; vegetation cover: 100%; surface area: 80 m². *Elymus athericus* (5), *Tripolium pannonicum* (1), *Carex extensa* (+), *Juncus acutus* (1), *Phragmites australis* ssp. *australis* (1), *Equisetum ramosissimum* (1), *Scirpoides holoschoenus* (+), *Blackstonia perfoliata* ssp. *perfoliata* (+), *Lotus tenuis* (+), *Glycyrrhiza glabra* (1), *Dittrichia viscosa* (1), *Holcus lanatus* (+), *Pulicaria dysentetica* (+), *Dactylis glomerata* (+), *Daucus carota* (+), *Convolvulus arvensis* (+).

CARICETUM OTRUBAE Pedrotti 1982, halophilic variant

Syntaxonomy: *Phragmito-Magnocaricetea* Klika in Klika & Novak 1941; *Magnocaricetalia* Pignatti 1954; *Magnocaricion elatae* Koch 1926.

This association of large sedges dominated by *Carex otrubae*, has now been reported in retrodunal areas between the mouths of Rivers Saline and Piomba, north of the mouth of River Piomba, and also along the coast of San Salvo, in depressions with slightly salty stagnant water.

Relevé: Location: coast of San Salvo; date: 7 February 2014; vegetation cover: 100%; surface area: 30 m². *Carex otrubae* (4), *Phragmites australis* ssp. *australis* (2), *Schoenoplectus tabernaemontani* (2), *Lythrum salicaria* (+), *Bolboschoenus maritimus* (+), *Juncus maritimus* (1), *Carex extensa* (+), *Sonchus maritimus* ssp. *maritimus* (+), *Juncus acutus* (+), *Agrostis stolonifera* (1), *Dorycnium rectum* (+), *Holcus lanatus* (+), *Equisetum ramosissimum* (1), *Calystegia sepium* ssp. *sepium* (1).

SCIRPETUM TABERNAEMONTANI Pass. 1964, halophilic variant

Syntaxonomy: *Phragmito-Magnocaricetea* Klika in Klika & Novak 1941; *Phragmitetalia* Koch 1926; *Phragmition communis* Koch 1926.

This is a halophilous association dominated by *Schoenoplectus tabernaemontani* now recorded along ditches in retrodunal areas along the coast of San Salvo and Scerne di Pineto, mouth of River Sinello, and south of the mouth of River Sangro.

Relevé: Location: coast of San Salvo; date: 7 February 2014; vegetation cover: 100%; surface area: 20 m². *Schoenoplectus tabernaemontani* (4), *Phragmites australis* ssp. *australis* (2), *Carex otrubae* (+), *Bolboschoenus maritimus* (1), *Cyperus longus* (1), *Lythrum salicaria* (+), *Cladium mariscus* (+), *Juncus maritimus* (1), *Agrostis stolonifera* (+), *Paspalum distichum* (2), *Calystegia sepium* ssp. *sepium* (1).

ULMUS MINOR AND LAURUS NOBILIS COMMUNITY

Syntaxonomy: *Salici purpureae-Populetea nigrae* (Rivas-Martínez & Cantó ex Rivas-Martínez, Básco-

nes, T.E. Díaz, Fernández-González & Loidi 1991) Rivas-Martínez, T.E. Díaz, Fernández-González, Izco, Loidi, Lousa & Penas 2002; *Populetea albae* Br.-Bl. ex Tchou 1948; *Populion albae* Br.-Bl. ex Tchou 1948.

This comprises the subcoastal and hilly coastal woods of *Ulmus minor* subsp. *minor* and *Laurus nobilis*, in the mesoMediterranean bioclimate, on pelitic-arenaceous substrates. This is the vicariant of the association *Symphyto bulbosi-Ulmetum minoris* Biondi & Allegrezza 1996 of Temperate climates. It has now been recorded in Abruzzo, and it is likely to be distributed in other areas of central-southern Italy. This community is under study.

Relevé: Location: Ditch between Torre Mucchia and Ripari di Giobbe (Ortona a Mare); date: 4 April 2014; altitude: 50 m a.s.l.; surface area: 200 m²; tree layer: 90% cover, 12 m average height; shrub layer: 60% cover, 2.4 m average height; herbaceous layer: 60% cover. *Ulmus minor* ssp. *minor* (3), *Laurus nobilis* (3), *Quercus pubescens* ssp. *pubescens* (1), *Prunus spinosa* ssp. *spinosa* (2), *Euonymus europaeus* (1), *Cornus sanguinea* ssp. *hungarica* (+), *Sambucus nigra* (+), *Rubus ulmifolius* (2), *Robinia pseudoacacia* (+), *Hedera helix* (3), *Bryonia dioica* (+), *Symphytum bulbosum* (3), *Arum italicum* ssp. *italicum* (1), *Stachys sylvatica* (1), *Carex pendula* (1), *Melissa officinalis* (2), *Iris foetidissima* (1), *Galium mollugo* (+), *Brachypodium sylvaticum* ssp. *sylvaticum* (+), *Allium neapolitanum* (1).

LAURO NOBILIS-ALNETUM GLUTINOSAE Brullo & Guarino 1998

Syntaxonomy: *Salici purpureae-Populetea nigrae* (Rivas-Martínez & Cantó ex Rivas-Martínez, Báscones, T.E. Díaz, Fernández-González & Loidi 1991) Rivas-Martínez, T.E. Díaz, Fernández-González, Izco, Loidi, Lousa & Penas 2002, *Populetea albae* Br.-Bl. ex Tchou 1948, *Carici remotae-Fraxinion oxycarpae* Pedrotti ex Pedrotti, Biondi, Allegrezza & Casavecchia in Biondi *et al.* 2014.

This is a phytocoenosis of *Alnus glutinosa* and *Laurus nobilis* that is generally located along the bottoms of deep valleys and gorges. It is a sub-Mediterranean vicariant of the association *Aro italicum-Alnetum glutinosae*. It was described around Lake Garda by Brullo & Guarino (1998) and for the Province of Ascoli Piceno (Manzi, 2001), and the association has now also been reported for retrodunal areas along the coast of Ortona between the mouths of Rivers Foro and Arielli, in subcoastal valleys in the Province of Chieti (Manzi, 2001; unpublished data), along River Pescara (Pirone, 1981; unpublished data), and in the Regional Natural Reserve 'Pineta D'Annunziata' (unpublished data).

Relevé: Location: Ortona coast between Tollo railway station and the mouth of River Arielli; date: 19 May 2014; surface area: 100 m²; tree layer: 90% cover, 8 m average height; shrub layer: 20% cover, 1.5 m average

height; herbaceous layer: 70% cover. *Alnus glutinosa* (4), *Populus alba* (2), *Salix alba* (2), *Laurus nobilis* (+), *Salix purpurea* ssp. *purpurea* (+), *Robinia pseudo-acacia* (1), *Amorpha fruticosa* (+), *Rubus caesius* (1), *Phragmites australis* ssp. *australis* (+), *Carex pendula* (2), *Humulus lupulus* (2), *Bryonia dioica* (2), *Calystegia sepium* ssp. *sepium* (1), *Symphytum bulbosum* (1), *Arum italicum* ssp. *italicum* (1), *Mentha aquatica* (1), *Hedera helix* (1), *Lycopus europaeus* ssp. *europaeus* (+), *Epilobium hirsutum* (+), *Lythrum salicaria* (+), *Potentilla reptans* (+), *Eupatorium cannabinum* ssp. *cannabinum* (1), *Urtica dioica* (1), *Equisetum* cfr. *arvense* (+), *Lactuca serriola* (+), *Lolium perenne* (1), *Poa trivialis* (1), *Apium nodiflorum* (+), *Dactylis glomerata* ssp. *glomerata* (+), *Rumex crispus* (+), *Galium aparine* (+), *Bidens tripartita* (+), *Daucus carota* (+), *Persicaria lapathifolia* (+).

PHYLLITIDO SCOLOPENDRI-LAURETUM NOBILIS Biondi, Casavecchia & Biscotti (2008)

Syntaxonomy: *Quercus roboris-Fagetia sylvaticae* Br.-Bl. & Vlieger in Vlieger 1937, *Fagetalia sylvaticae* Pawlowski in Pawlowski, Sokolowski & Wallisch 1928, *Lauro nobilis-Tilion platyphylli* Biondi et al. ex Biondi, Casavecchia & Biscotti in Biondi et al. 2013.

Woods dominated by *Laurus nobilis* along the edges of the deep valleys of seasonal rivers in southern Italy. This was described by Biondi et al. (2008) for Gargano, and has now been recorded for some subcoastal valleys in the Province of Chieti.

Relevé: Location: confluence of Fosso delle Farfalle and Fosso San Tommaso (CH); altitude: 40 m a.s.l.; surface area: 150 m². *Laurus nobilis* (4), *Phyllitis scolopendrium* ssp. *scolopendrium* (1), *Acer campestre* (3), *Fraxinus ornus* ssp. *ornus* (1), *Quercus cerris* (1), *Acer opalus* ssp. *obtusatum* (+), *Carpinus betulus* (+), *Populus nigra* (+), *Ruscus aculeatus* (2), *Rubia peregrina* (1), *Corylus avellana* (+), *Cornus sanguinea* ssp. *hungarica* (1), *Clematis vitalba* (+), *Euonymus europaeus* (1), *Ligustrum vulgare* (1), *Crataegus monogyna* (+), *Smilax aspera* (+), *Lonicera etrusca* (+), *Rubus hirtus* (1), *Rubus ulmifolius* (2), *Hedera helix* (4).

CYMODOCETUM NODOSAE Br.-Bl 1952

Syntaxonomy: *Zosteretea marinae* Pignatti 1953; *Zosteretalia marinae* Béguinot 1941; *Zosterion marinae* Christiansen 1934.

Submerged grassland, with temporary emersion during low tide, and seen also for altered and polluted environments. It has now been reported for various locations along the Chieti coast.

Newly proposed plant communities

LOTO CRETICI-SIXALICETUM GRANDIFLORAE Pirone, Ciaschetti, Di Martino, Frattaroli, Cianfaglione

ne & Giallonardo

ass. nova hoc loco **SIXALICETOSUM GRANDIFLORAE** Pirone, Ciaschetti, Di Martino, Frattaroli, Cianfaglione & Giallonardo subass. nova hoc loco

Diagnostic taxa: *Sixalix atropurpurea* ssp. *grandiflora* and *Lotus creticus*.

Description: Community of the retrodunal areas in relatively stationary sand, in a mesoMediterranean climate. Recorded for Abruzzo, it is likely to be distributed in other areas of central-southern Italy. The floristic and structural features leads us to put it into the alliance *Crucianellion maritimae* Rivas-Goday & Rivas-Martinez 1958 [*Helichryso staechadis-Crucianelletalia maritimae* (Sissingh 1974) Géhu, Rivas-Martinez & R.Tx. in Géhu 1975, *Helichryso staechadis-Crucianelletea maritimae* (Sissingh 1974) Géhu, Rivas-Martinez & R.Tüxen in Géhu 1975 em. Biondi & Géhu 1994].

Holotypus ass. and subass. *sixalictosum*

Relevé: Location: Coast of San Salvo; date: 7 February 2014; vegetation cover: 75%; surface area: 40 m². *Sixalix atropurpurea* ssp. *grandiflora* (4), *Lotus creticus* (2), *Artemisia campestris* ssp. *glutinosa* (1), *Euphorbia terracina* (1), *Anthemis maritima* (+), *Rostraria litorea* (2), *Silene colorata* (+), *Ononis variegata* (+), *Oenothera suaveolens* (+), *Lagurus ovatus* (+), *Blackstonia perfoliata* ssp. *perfoliata* (+), *Centaurium pulchellum* ssp. *pulchellum* (+).

ANTHEMIDETOSUM MARITIMAE Pirone, Ciaschetti, Di Martino, Frattaroli, Cianfaglione & Giallonardo subass. nova hoc loco,

Differential taxon of the subassociation: *Anthemis maritima*.

Description: The subassociation anthemidetosum maritimae is associated with aspects on looser sands, with elements of *Ammophilon* and a greater presence of those of *Malcolmietalia*.

Holotypus: subass. *anthemidetosum*.

Relevé: Location: Coast of San Salvo; date: 29 March 2014; vegetation cover: 70%; surface area: 45 m². *Sixalix atropurpurea* ssp. *grandiflora* (2), *Lotus creticus* (2), *Anthemis maritima* (4), *Rostraria litorea* (2), *Silene colorata* (1), *Ononis variegata* (+), *Oenothera suaveolens* (+), *Vulpia fasciculata* (1), *Elymus farctus* ssp. *farctus* (+), *Pancratium maritimum* (+), *Cenchrus incertus* (1), *Salsola tragus* (+), *Silene vulgaris* ssp. *tenoreana* (+).

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