

Typification of some perennial halophilous associations described by J. Braun-Blanquet from the salt marshes of Mediterranean France

Salvatore Brullo

Department of Biological Geological and Environmental Science, University of Catania, via A. Longo 19, 95125 Catania, Italy. ✉

Gianpietro Giusso del Galdo

Department of Biological Geological and Environmental Science, University of Catania, via A. Longo 19, 95125 Catania, Italy. ✉

Pietro Minissale

Department of Biological Geological and Environmental Science, University of Catania, via A. Longo 19, 95125 Catania, Italy. ✉

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Abstract. Nomenclatural and syntaxonomical remarks on the halophilous plant communities of the class *Salicornietea fruticosae* described by J. Braun-Blanquet from the salt marshes occurring in the Mediterranean France are provided. The examined associations are: *Salicornietum fruticosae*, *Agropyro elongati-Inuletum crithmoidis*, *Salicornietum radicans*, *Arthrocnemetum glauci*, *Limoniastro-Staticetum lychnidifoliae* and *Artemisia gallica-Staticetum virgatae*. Based on literature and according to ICPN, the names of these syntaxa are updated and typified, as well as their current arrangement.

Keywords: Coastal salt marshes, Phytosociology, *Salicornietea fruticosae*, Syntaxonomical nomenclature, Typification, South France.

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Introduction

Within the framework of syntaxonomical research focused on the halophilous vegetation of the class *Salicornietea fruticosae* occurring in the Mediterranean territories, some of the earliest described associations within this class are examined. Based on literature, the first plant communities featuring the salt marshes were reported from the Mediterranean coasts of France by Kühnholtz-Lordat (1923), Braun-Blanquet (1928, 1931, 1933), Molinier (1948), and Braun-Blanquet *et al.* (1952). In particular, Braun-Blanquet (1928) in his “Pflanzensoziologie” provided for the first time a physiognomical and ecological description of some halophilous associations observed by himself in the brackish lagoons close to Montpellier (southern France). Actually, Braun-Blanquet mentioned several halophilous plant communities represented by *Salicornietum radicans*, *Salicornietum fruticosae* and *Salicornietum macrostachyae*, which are included in a special alliance named *Salicornion fruticosae*, belonging to the *Salicornietalia*. However, he did not provide any phytosociological tables regarding these associations, therefore they are *nomina nuda*, as well as the higher rank syntaxa proposed in this context. Later, the same author (Braun-Blanquet 1931) published a syntaxonomical outline, listing the associations together with the alliances and orders to which they belong, with some considerations on their ecological features. Even in this case the syntaxa proposed must be considered as *nomina nuda*, since he did not refer

to any phytosociological table or to any effectively published relevé (Art. 2b). Furthermore, the author reported some new syntaxa, such as: *Salicornietum fruticosae inuletosum*, Ass. à *Limoniastrum* et *Stalice lychnidifolia* and Ass. à *Stalice virgata* et *Artemisia gallica*, in addition to the previous ones. The last two associations, together with *Salicornia macrostachya-Sphenopus*-Ass., were included in the new alliance *Stacion galloprovincialis*, while all the others were referred to the *Salicornion*, both attributed to the *Salicornietalia* order.

Materials and methods

All these syntaxa were validated by Braun-Blanquet (1933) with synoptic tables for each investigated association, using the values of constancy classes (I-V) for each listed species, just adding for some of them also the cover values. According to Arts. 2b and 7 of the ICPN (Theurillat *et al.*, 2021), also the higher rank syntaxa were validated. All these syntaxa were republished in Braun-Blanquet *et al.* (1952), with the addition of other new syntaxa, such as *Agropyro-Inuletum crithmoidis* and *Salicornietum fruticosae juncetosum subulati*. However, it is not possible to neotypify these associations, since the original relevés of Braun-Blanquet are not available. In fact, this author never published tables with at least one vegetation relevé in detail. Therefore, the only alternative is to apply Art. 21 of the Code, establishing a neotype, except when before Braun-Blanquet (1933) described these

associations, they had already been validly published by other authors. Based on the current knowledge, the associations of *Salicornietea fruticosae* described by Braun-Blanquet in his abovementioned contributions and recognized by the most recent literature are: *Salicornietum radicans*, *Salicornietum fruticosae*, *Arthrocnemetum glauci*, *Agropyro elongati-Inuletum crithmoidis*, *Artemisia gallica-Staticetum virgatae*, and *Limoniastro-Staticetum lychnidifoliae*. Regarding the correct nomenclature of these associations and their typification, the latest edition of the ICPN is followed, in particular the recommendation 21A of the ICPN. In fact, phytosociological relevés were carried out by us from 2 to 5 July 1991 in the salt marshes of the Languedoc near Narbonne (southern France), where Braun-Blanquet carried out most of his investigations on this vegetation. The relevés designated as neotypes are reported in Table 1, while all relevés carried out are reported in Table S1 and Table S2, together with those published by Kühnholtz-Lordat (1923) used for the typification of his associations. In these localities, currently falling within a Natura 2000 (N2K) site, designated since 2007 (Complexe lagunaire de Bages-Sigean, FR9101440), examples of the plant communities detected by Braun-Blanquet were still present. In order to shed light on the syntaxonomical issues concerning the aforesaid associations, each of them is examined, highlighting the different nomenclatural treatments proposed over time and performing their typification.

Results

Syntaxonomical nomenclature

***Salicornietum fruticosae* Br.-Bl. 1933**

Neotypus hoc loco: rel. 1, tab. 1.

Original alternative names: *Salicornietum fruticosae* Br.-Bl. 1933 [Braun-Blanquet 1933: 17]; Ass. à *Salicornia fruticosa* et *Statice bellidifolia* Br.-Bl. 1933 nom. inept. (Art. 44) [Braun-Blanquet 1933: 17]

Syn.: *Salicornietum fruticosae* Br.-Bl. 1928 nom. nud. (Art. 2b) [Braun-Blanquet 1928: 168]; *Salicornietum fruticosae* Br.-Bl. 1931 nom. nud. (Art. 2b) [Braun-Blanquet 1931: 38]; *Limonio bellidifolii-Salicornietum fruticosae* Br.-Bl. 1933 nom. corr. (Art. 44) (alternative name); *Limonio bellidifolii-Sarcocornietum fruticosae* Br.-Bl. 1933 nom. corr. et nom. mut. propos. [Rivas-Martínez *et al.* 2002: 267]; *Puccinellio festuciformis-Arthrocnemetum fruticosi* Géhu 1976 nom. superfl. (Art. 29c) [Géhu 1976: 428].

Characteristic and differential species: *Sarcocornia fruticosa* (L.) A.J. Scott (= *Salicornia fruticosa* L.), *Limonium bellidifolium* (Gouan) Dumort. (= *Statice bellidifolia* Gouan), *Puccinellia festuciformis* (Host) Parl. s.l.

Structure and ecology: This association is localized along the edge of the salt marshes, where it often covers large surfaces, flooded during the rainy season and drying up in summer. The soil is usually silty-clayey and very compact, with a saline concentration between 1.5% and 10%. Physiognomically, this vegetation is characterized by the dominance of *Sarcocornia fruticosa* shrubs, usually showing high coverage values.

Nomenclature notes: The *Salicornietum fruticosae* was described by Braun-Blanquet (1928) and later recorded by the same author (Braun-Blanquet 1931) from Languedoc (southern France), but in both cases it is a *nomen nudum* (Art. 2b). The association was validly published by Braun-Blanquet (1933) with two alternative names (Art. 30), *Salicornietum fruticosae* and Ass. à *Salicornia fruticosa* et *Statice bellidifolia*. The name *Salicornietum fruticosae* was changed by Géhu (1976) to *Puccinellio festuciformis-Arthrocnemetum fruticosi*, but according to Art. 29c it represents an illegitimate superfluous name. Since Braun-Blanquet (1933) described the association based on a synoptic table of 20 relevés, it is not possible to choose a lectotype (Art. 21); a neotype, from the locality where the syntaxon was originally detected, is established here.

***Agropyro elongati-Limbardetum longifoliae* Br.-Bl. in Br.-Bl., Roussine & Nègre 1952 mut. Brullo, Miniss. & Giusso nom. mut. nov.**

Neotypus hoc loco: rel. 2, tab. 1.

Original name: *Agropyro elongati-Inuletum crithmoidis* Br.-Bl. in Br.-Bl., Roussine & Nègre 1952 (Art. 45) [Braun-Blanquet *et al.* 1952: 108].

Syn.: *Salicornietum fruticosae* subass. *inuletosum* Br.-Bl. 1931 nom. nud. (Art. 2b) [Braun-Blanquet 1931: 38]; *Salicornietum fruticosae* subass. à *Inula crithmoides* Br.-Bl. 1933 nom. nud. (Art. 2b) [Braun-Blanquet 1933: 18]; *Salicornietum* sous-ass. à *Inula crithmoides* et *Agropyrum elongatum* Br.-Bl. *et al.* 1936 nom. nud. (Art. 3b) [Braun-Blanquet 1936: 98]; *Agropyro elongati-Inuletum longifoliae* Br.-Bl. in Br.-Bl., Roussine & Nègre 1952 corr. Brullo *et al.* 2020 [Brullo *et al.* 2020: 93].

Characteristic and differential species: *Limbarda crithmoides* (L.) Dumort subsp. *longifolia* (Arcang.) Greuter and *Thinopyrum elongatum* (Host) D.R. Dewey [= *Elytrigia elongata* (Host) Nevski; *Agropyrum elongatum* (Host) P. Beauv.]

Structure and ecology: This association usually replaces the *Salicornietum fruticosae* on more raised surfaces, which are rarely flooded and characterized by soil with lower salinity. Physiognomically, it is differentiated by the dominance of *Limbarda crithmoides* subsp. *longifolia* and *Thinopyrum elongatum*.

Notes: This association was initially proposed by Braun-Blanquet (1931) as *Salicornietum fruticosae* subass. *inuletosum*, by Braun-Blanquet (1933) as *Salicornietum fruticosae* subass. à *Inula crithmoides* and by Braun-Blanquet *et al.* (1936) as *Salicornietum* sous-ass. à *Inula crithmoides* et *Agropyrum elongatum*, all of them being nomina nuda (Art. 2b). Finally, it was validly described at the association rank by Braun-Blanquet in Braun-Blanquet *et al.* (1952), namely *Agropyro elongati-Inuletum crithmoidis*. Since *Inula crithmoides* is represented in the Mediterranean territories by the subsp. *longifolia*, while the subsp. *crithmoides* has an Atlantic distribution (Greuter, 2003, 2006; Dimopoulos *et al.*, 2013; Bartolucci *et al.*, 2018), the association name was corrected by Brullo *et al.* (2020); here we also propose the mutation of the genus name (*Limbarda* in place of *Inula*) according to Art. 45. Since this association is based on a synoptic table, a neotype must be established (Art. 21); the selected neotype

comes from the same geographical area as the relevés of the synoptic table.

Salicornietum alpini Kühnholtz-Lordat 1923 nom. corr.

Holotypus: relevé on p. 128, Kühnholtz-Lordat (1923). Original name: *Salicornietum sarmentosum* Kühnholtz-Lordat 1923 nom. inept. (Art. 44) [Kühnholtz-Lordat 1923: 129].

Syn.: *Salicornietum radicans* Br.-Bl. 1928 nom. nud. (Art. 2b) [Braun-Blanquet 1928: 168]; *Salicornietum radicans* Br.-Bl. 1931 nom. nud. (Art. 2b, 7) [Braun-Blanquet 1931: 38]; Ass. à *Salicornia radicans* Br.-Bl. 1933 [Braun-Blanquet 1933: 16]; *Salicornietum radicans* Br.-Bl. 1933 (Art. 43) [Braun-Blanquet 1933: 16]; *Puccinellio festuciformis-Arthrocnemum perennis* Géhu 1976 (Art. 29c) [Géhu 1976: 428]; "*Sarcocornietum alpini* Br.-Bl. 1931 corr." (Art. 2b, 7) [Rivas-Martínez et al. 1990: 93]; Group. à *Arthrocnemum fruticosum* var. *deflexa* Lorenzoni, Géhu, Lahondère & Paradis 1993 (Art. 3c) [Lorenzoni et al. 1993: 148]; *Sarcocornietum deflexae* (Br.-Bl. 1933) Lahondère et al. ex Géhu & Biondi 1994 (Art. 29c) [Géhu & Biondi 1994: 64]; *Puccinellio festuciformis-Arthrocnemum perennis* Géhu et al. 1984 subass. *typicum* (Art. 29c) [Géhu et al. 1984: 434]; *Puccinellio festuciformis-Sarcocornietum alpini* (Br.-Bl. 1933) Barbagallo, Brullo & Furnari 1990 (Art. 29c) [Barbagallo et al. 1990: 586].

Characteristic and differential species: *Sarcocornia alpini* (Lag.) Rivas-Mart. and *Limonium bellidifolium* (Gouan) Dumort.

Structure and ecology: This association is localized in depressions flooded by brackish water along the outer edge of the salt marshes on surfaces with silty and humid soil until the summertime. Physiognomically, it is differentiated by the dominance of *Sarcocornia alpini* and the occurrence of *Limonium bellidifolium*.

Geographical distribution: This association is widely spread in the Mediterranean territories.

Nomenclatural notes: This vegetation was initially described by Kühnholtz-Lordat (1923) as *Salicornietum sarmentosum*, since this author proposed as characteristic species *Salicornia sarmentosa*, a taxon described by Duval-Jouve (1869: 174) from the Mediterranean coasts of France and correctly considered by de La Fuente et al. (2013) as a later synonym of *S. alpini* Lag. Being *Salicornia sarmentosa* an illegitimate name, the association name must be corrected to *Salicornietum alpini* nom. corr. (Art. 44). Previously Rivas-Martínez et al. (1993) used the name *Sarcocornietum alpini* to replace the *Salicornietum radicans* Br.-Bl. 1931, an association described from the Mediterranean France, since this latter name was based on *Salicornia radicans* Sm., a species with an Atlantic distribution and a later synonym of *S. perennis* Miller (de La Fuente et al. 2013). As the *Salicornietum radicans* Br.-Bl. 1931 is a *nomen nudum* (Art. 2b), its correction to *Sarcocornietum alpini* is invalid too. Furthermore, according to Art. 29c, also the names proposed later for this syntaxon by other authors, such as *Puccinellio festuciformis-Arthrocnemum perennis* Géhu 1976, *Sarcocornietum deflexae* (Br.-Bl. 1933) Lahondère et al. ex Géhu & Biondi 1994, *Puccinellio festuciformis-Arthrocnemum perennis* Géhu et al. 1984 subass.

typicum, *Puccinellio festuciformis-Sarcocornietum alpini* (Br.-Bl. 1933) Barbagallo, Brullo & Furnari 1990, must be considered superfluous names and, therefore, illegitimate. In the original diagnosis of the association Kühnholtz-Lordat (1923) published a single relevé that must be accepted as holotype (Art. 18).

Sphenopodo divaricati-Arthrocnemum macrostachyi Br.-Bl. 1933 nom. corr.

Neotypus hoc loco: rel. 3, tab. 1.

Original alternative names: Ass. à *Arthrocnemum glaucum* et *Sphenopus divaricatus* Br.-Bl. 1933 nom. inept. (Art. 44) [Braun-Blanquet 1933: 21]; *Arthrocnemum glauci* Br.-Bl. 1933 nom. inept. (Art. 44) et illeg. (Art. 31) [Braun-Blanquet 1933: 21].

Syn.: *Salicornietum macrostachyae* Kühnholtz-Lordat 1923 nom. dub. propos. (Art. 37) [Kühnholtz-Lordat 1923: 129]; *Salicornietum macrostachyae* Br.-Bl. 1928 nom. nud. (Art. 2b) [Braun-Blanquet 1928: 193]; *Salicornia macrostachya-Sphenopus*-ass. Br.-Bl. 1931 nom. nud. (Art. 2b) [Braun-Blanquet 1931: 38]; *Arthrocnemum* Molinier 1948 [Molinier 1948: 34]; *Arthrocnemum* Br.-Bl., Roussine & Nègre 1952 [Braun-Blanquet et al. 1952: 112]; *Puccinellio convolutae-Arthrocnemum glauci* Géhu et al. 1984 (Art. 29c) [Géhu et al. 1984: 438]; *Sphenopodo divaricati-Arthrocnemum macrostachyi* Br.-Bl. 1933 nom. corr. (Art. 44) (alternative name) [Rivas-Martínez et al. 2002: 281].

Characteristic and differential species: *Arthrocnemum macrostachyum* (Moric.) K. Koch [= *Arthrocnemum glaucum* (Delile) Ung.-Sternb; *Arthrocaulon macrostachyum* (Moric.) Piirainen & G. Kadereit].

Structure and ecology: This association is differentiated from the other perennial halophilous plant communities described by Braun-Blanquet (1933) for the dominance of *Arthrocnemum macrostachyum*, which often constitutes a monospecific vegetation. This species was transferred to the genus *Arthrocaulon* by Piirainen et al. (2017), but later this new genus was not recognized by de La Fuente et al. (2021), who treat it as a synonym of *Arthrocnemum*. Few other perennial halophilous species grow together with this species, usually showing low cover values. In this vegetation small therophytes are very frequent and colonize mainly the clearings among the *A. macrostachyum* shrubs. These species (e.g., *Sphenopus divaricatus*, *Hornungia procumbens*, *Frankenia pulverulenta*, *Parapholis incurva*, *Parapholis filiformis*, *Sagina maritima*, *Plantago coronopus*, etc.) were considered by Braun-Blanquet (1933) and Braun-Blanquet et al. (1952) as characteristics of this association, but they must be treated as differential species of an annual plant community belonging to the *Saginetea maritimae*. This association often covers huge areas of salt marshes periodically submerged for a long time; the ephemeral meadows of the *Saginetea maritimae* develop when soils dry up.

Geographical distribution: This association occurs in many countries of southern Europe, while in the southern Mediterranean territories it is usually replaced by other associations physiognomically characterized by *Arthrocnemum meridionalis*

(Ramírez *et al.*) de la Fuente *et al.* (Ramírez *et al.* 2019, 2022; de La Fuente 2021).

Nomenclatural notes: This plant community was first described by Kühnholtz-Lordat (1923) for the dunes of the Gulf of Lyon (South France) sub *Salicornietum macrostachyae*, but according to Art. 37 it should be considered a *nomen dubium*, since it is based on two very unclear relevés, one grouping the halophilous vegetation with *Salicornia macrostachya* and the psammophilous communities of the *Ammophiletea arundinaceae* Br.-Bl. & Tx. ex Westhoff *et al.* 1946, and another one quite heterogeneous mixing the vegetation dominated by *Salicornia macrostachya* with that one of the *Cakiletea maritima* Tx. & Preising ex Br.-Bl. & Tx. 1952. Later, this vegetation was identified with the same name by Braun-Blanquet (1928) and under *Salicornia macrostachya-Sphenopus*-ass. by Braun-Blanquet (1931), but both names are invalid *nomina nuda* (Art. 2b). Two alternative (Arts. 22, 30), valid names for this association were proposed by Braun-Blanquet (1933): *Arthrocnemetum (glauci)* and “ass. à *Arthrocnemum glaucum* et *Sphenopus divaricatus*”. The former name is a later homonym of the *Salicornietum macrostachyae* Kühnholtz-Lordat 1923; even if Kühnholtz-Lordat's name is rejected as a dubious name, it is a valid name and thereby generates homonymy (Art. 31). In this way, the legitimate name for this association is the second alternative name introduced by Braun-Blanquet (1933), that must be corrected according to Art. 44 because the correct name-giving taxon is *Arthrocnemum macrostachyum* (Castroviejo 1990; Pignatti 2017). As the name is based on a synoptic table of 18 relevés, a neotype must also be established. The relevé chosen for the neotypification was performed by us in the same geographical area of the relevés of the synoptic table.

Limonio auriculae-ursifolii-Limoniasretum monopetali Br.-Bl. 1933 nom. corr. et invers.

Neotypus, hoc loco: rel. 4, tab. 1.

Original name: Ass. à *Limoniastrum* et *Statice lychnidifolia* Br.-Bl. 1933 nom. inept. (Art 44) [Braun-Blanquet 1933: 22].

Syn.: Ass. à *Limoniastrum* et *Statice lychnidifolia* Br.-Bl. 1931 nom. nud. (Art. 2b) [Braun-Blanquet 1931: 38]; *Limoniasretum monopetali* Br.-Bl. 1933 (alternative name; Art. 30a) [Braun-Blanquet 1933: 22]; *Limoniasretum-Staticetum lychnidifoliae* Br.-Bl. in Br.-Bl., Roussine & Nègre 1952 nom. inept. (Art. 44) [Braun-Blanquet *et al.* 1952: 113]; Group. à *Limoniastrum monopetalum* et *Lepturus filiformis* Baudière, Rouzaud & Simonneau 1976 (Art. 3c) [Baudière *et al.* 1976: 53]; Group. à *Limoniastrum monopetalum* et *Limonium diffusum* Baudière, Rouzaud & Simonneau 1976 (Art. 3c) [Baudière *et al.* 1976: 56]; *Artemisio gallicae-Limoniasretum monopetali* Baudière, Rouzaud & Simonneau ex de Foucault 2021 nom. superfl. (Art. 18b, 29c) [de Foucault 2021: 10]; *Limoniastro monopetali-Limonietum auriculifolii* Br.-Bl. 1933 mut. de Foucault 2021 mut. inval. (Art. 45) [de Foucault 2021: 10]; *Limoniastro monopetali-Myriolimonetum diffusum* Baudière, Rouzaud & Simonneau ex de Foucault 2021 nom. superfl. (Art. 18b, 29c) [de Foucault 2021: 10].

Characteristic and differential species: *Limonium auriculae-ursifolium* (Pourr.) Druce [= *L. lychnidifolium* (Girard) Kuntze] and *Limoniastrum monopetalum* (L.) Boiss.

Structure and ecology: This association grows in raised surfaces with dry silty or stony soils, sometimes rich in shellfish debris. Physiognomically, it is characterized by the dominance of *Limoniastrum monopetalum* growing together with some species of *Limonium*, such as *Limonium auriculae-ursifolium*, which is the name-giving species of the association, *L. virgatum*, *L. confusum*, *L. bellidifolium*, *L. girardianum*, *L. cuspidatum*, as well as of *Myriolimon diffusum* and *M. ferulaceum*. Géhu (1994) highlighted the rarity of this plant community, indicating its highly threatened status.

Geographical distribution: This association is distributed in southern France (Braun-Blanquet 1933; Baudière *et al.* 1976; Julve 1993; Géhu 1994).

Nomenclatural notes: This plant community was described for the first time by Braun-Blanquet (1931) and named Ass. à *Limoniastrum* et *Statice lychnidifolia*, but according to Art. 2b it is a “*nomen nudum*”. It was validated with a synoptic table by Braun-Blanquet (1933), who proposed it with two alternative names: ass. à *Limoniastrum* et *Statice lychnidifolia* and *Limoniasretum monopetali*. The first name was used by Braun-Blanquet *et al.* (1952) as *Limoniastro-Staticetum lychnidifoliae*, but it is to be considered a *nomen ineptum* (Art. 44), since *Statice lychnidifolia* is an illegitimate name, whose correct name is *Limonium auriculae-ursifolium* (Erben 1978, 1993; Domina 2011). The name must be inverted according to Arts. 10b and 42. This association also requires a neotypification, since its description is based on a synoptic table. A relevé carried out in one of the original localities of the association is here established as neotype.

Artemisietum gallicae Kühnholtz-Lordat 1923

[Dun. Golfe Lion Essai Géogr. Bot.: 134].

Lectotypus hoc loco: Tab. p. 134, first relevé coming

from Beauduc, Kühnholtz-Lordat (1923).

Syn.: Ass. à *Statice virgata* et *Artemisia gallica* Br.-Bl. 1931 nom. nud. (Art. 2b) [Braun-Blanquet 1931: 38]; Ass. à *Statice virgata* et *Artemisia gallica* Br.-Bl. 1933 nom. inept. (Art. 44) [Braun-Blanquet 1933: 19]; *Artemisieto-Staticetum virgatae* Br.-Bl. in Br.-Bl., Roussine & Nègre 1952 nom. inept. (Art. 44) [Braun-Blanquet *et al.* 1952: 110]; *Artemisio gallicae-Limonietum virgati* Br.-Bl. 1933 nom. corr. [Rivas-Martínez & coauthors 2011: 207].

Characteristic and differential species: *Artemisia gallica* Willd.

Structure and ecology: This association grows along coastal depressions with dry and sometimes stony soils, with shellfish debris or rocky substrata. This vegetation tolerates less salty soils than the *Arthrocnemetum macrostachyi*. It is characterized by the dominance of *Artemisia gallica* growing together with *Limonium virgatum* and *L. girardianum*; the latter is an endangered species with small populations occurring in France and Spain.

Geographical distribution: This association has been surveyed along the coastal salt marshes of France (Kühnholtz-Lordat 1923; Braun-Blanquet 1933;

Table 1. Neotypes of the revised *Salicornietea fruticosae* associations

Relevé number	1	2	3	4
Surfaces (m ²)	100	100	100	100
Cover (%)	100	100	100	100
Characteristics of associations				
<i>Limonium bellidifolium</i> (Gouan) Dumort.	2	+	.	.
<i>Puccinellia festuciformis</i> (Host) Parl. subsp. <i>festuciformis</i>	2	3	.	1
<i>Thinopyrum elongatum</i> (Host) D.R.Dewey	.	3	.	1
<i>Limbarda crithmoides</i> (L.) Dumort. subsp. <i>longifolia</i> (Arcang.) Greuter	1	3	.	2
<i>Arthrocnemum macrostachyum</i> (Moric.) K.Koch	+	1	5	1
<i>Sphenopus divaricatus</i> (Gouan) Rchb.	.	.	+	.
<i>Limoniastrum monopetalum</i> (L.) Boiss.	.	+	.	4
<i>Limonium auriculae-ursifolium</i> (Pourr.) Druce	.	.	.	2
Characteristics of <i>Limonion confusi</i> and <i>Limonieta lia</i>				
<i>Limonium virgatum</i> (Willd.) Fourr.	.	.	.	2
<i>Limonium cuspidatum</i> (Billot) Erben	.	.	.	+
<i>Limonium confusum</i> (Gren. & Godr.) Fourr.	.	.	.	2
<i>Myriolimon diffusum</i> (Pourr.) Lledó et al.	.	.	.	1
<i>Limonium girardianum</i> (Guss.) Fourr.	2	1	.	1
Characteristics of <i>Salicornieta lia</i>				
<i>Sarcocornia fruticosa</i> (L.) A.J.Scott	4	2	1	2
<i>Aeluropus littoralis</i> (Gouan) Parl.	+	.	.	.
<i>Triglochin barrelieri</i> Loisel.	+	.	.	.
<i>Puccinellia festuciformis</i> (Host) Parl. subsp. <i>lagascana</i> M.A.Juliá & J.M.Monts.	1	.	.	+
<i>Juncus subulatus</i> Forssk.	.	.	2	.
Characteristics of <i>Salicornietea fruticosae</i>				
<i>Limonium narbonense</i> Mill.	1	+	+	.
<i>Spergularia maritima</i> (All.) Chiov.	1	+	.	.
<i>Halimione portulacoides</i> (L.) Aellen	.	1	.	2
<i>Puccinellia festuciformis</i> (Host) Parl. subsp. <i>festuciformis</i>	.	.	.	1
Other species				
<i>Parapholis filiformis</i> (Roth) C.E.Hubb.	.	2	.	.
<i>Juncus maritimus</i> Lam.	+	.	.	.
<i>Suaeda vera</i> Forssk. ex J.F.Gmel.	.	.	.	1
<i>Plantago crassifolia</i> Forssk.	.	.	.	1

Localities: 1: *Salicornietum fruticosae*. France, Port La Nouvelle, 2-7-1991, 43° 2' 38.57"N, 3° 2' 56.72" E (rel. 9, Table S1); 2: *Agropyro elongati-Limbardetum longifoliae*. France, Gruissan, 2-7-1991, 43° 4' 21.69" N, 3° 4' 54.72" E (rel. 17, Table S1); 3: *Arthrocnemum macrostachyi*. France, Gruissan, 2-7-1991, 43° 4' 21.69" N, 3° 4' 54.72" E (rel. 21, Table S1); 4: *Limoniastrum auriculae-ursifolii-Limoniastrum monopetalum*. France, Port La Nouvelle, 5-7-1991, 43° 2' 38.57" N, 3° 2' 56.72" E (rel.8, Table S1).

Molinier 1948; Braun-Blanquet *et al.* 1952; Molinier & Tallon 1965, 1970; Géhu 1994, 1998; Julve 1993), and Spain (Bolòs & Bolòs 1950; Bolòs 1967; Pignatti 1953; Rivas-Martínez & Costa 1984; Rivas-Martínez & coaut. 2011).

Nomenclatural notes: The association was initially described by Braun Blanquet (1931) as *nomen nudum* (Art. 2b), namely "Ass. à *Statice virgata* et *Artemisia gallica*", and validated later (Braun-Blanquet, 1933) with a synoptic table of more than 20 relevés. The author mentioned the *Artemisietum gallicae* Kühnholtz-Lordat 1923 as "synonym *pro parte*". Actually, Kühnholtz-Lordat (1923) described this association with a table of three unnumbered relevés all referred to the *Artemisietum gallicae*. Of these three relevés only the first one coincides quite well from the floristical and ecological viewpoint with the characteristics highlighted by the author for the association, defining it as a semi-dry prairie. It should be noted that this finding is very similar to those reported by Braun Blanquet in his synoptic table of the Ass. à *Statice virgata* et *Artemisia gallica*. The other two relevés are floristically less typical and they are clearly linked to more humid soils, as testified

by the occurrence of many hygrophilous species of the class *Juncetea maritimi*, many of which having high cover values. In particular, the second relevé is dominated by *Imperata cylindrica*, which can be referred to the *Imperato cylindricae-Erianthetum ravennae* Molinier & Tallon 1965 (see de Foucault 2021), association belonging to the *Juncetea maritimi*. As concerns the third relevé, due to the dominance of *Plantago crassifolia* and *Schoenus nigricans* it can be attributed to *Schoeno nigricantis-Plantaginetum crassifoliae* Br.-Bl. in Br.-Bl., Roussine & Nègre 1952, association of *Juncetea maritimi* too. According to Art. 19, for the lectotypification of the name of the association proposed by Kühnholtz-Lordat (1923) one of these three relevés must be chosen, which, as already highlighted, must be the first of them as the more representative one. The occurrence of this association in Camargue, where Kühnholtz-Lordat (1923) detected it, was confirmed also by Molinier and Tallon (1965: 54) who referred it to the *Artemisio-Staticetum virgatae* Braun-Blanquet 1933. Therefore, the "Ass. à *Statice virgata* et *Artemisia gallica*" described by Braun-Blanquet (1933), must be considered a later synonym of the

Artemisietum gallicae Kühnholtz-Lordat 1923. If the association proposed by Braun-Blanquet is neotypified on the same relevé indicated as lectotype of the *Artemisietum gallicae*, both associations would be nomenclatural synonyms.

Syntaxonomical scheme

Salicornietea fruticosae Br.-Bl. & Tx. ex A. & O. de Bolòs 1950

Salicornietalia fruticosae Br.-Bl. 1933

Salicornion fruticosae Br.-Bl. 1933

A) *Salicornietum fruticosae* Br.-Bl. 1933

Inulion longifoliae Brullo & Furnari 1990 mut.

Brullo, C. Brullo, Cambria & Giusso 2020

B) *Agropyro elongati-Limbardetum longifoliae*

Br.-Bl. in Br.-Bl., Roussine & Nègre 1952 mut.

Brullo, Miniss. & Giusso nom. mut. nov.

Sarcocornion alpini (Rivas-Martínez et al. 1990)

Brullo et al. 2002

C) *Salicornietum alpini* Kühnholtz -Lordat 1923 nom. corr.

Arthrocnemion macrostachyi (Rivas-Martínez

in Rivas-Martínez et al. 1980) Rivas-Martínez & Costa 1984 nom. corr.

D) *Sphenopodo divaricati-Arthrocnemetum macrostachyi* Br.-Bl. 1933 nom. corr.

Limonietaalia Br.-Bl. & O. de Bolòs 1958

Limonion confusi (Br.-Bl. 1933) Rivas-Martínez & Costa 1984

E) *Limonio auriculae-ursifolii-Limoniastretum monopetali* Br.-Bl. 1933 nom. corr. et invers.

F) *Artemisietum gallicae* Kühnholtz-Lordat 1923

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Authorship

All authors have contributed significantly to the conception, design, analysis and interpretation of the data of the study that resulted in the article. They have also contributed to the writing or the revision of it. All authors have approved the final version of the text submitted.

Conflict of interest

None

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Supplementary material

Table S1. Associations of *Limonetalia*.

Table S2. Associations of *Salicornetalia fruticosae*.

