SM14

Halimione portulacoides salt-marsh community *Halimionetum portulacoidis* (Kuhnholtz-Lordat 1927) Des Abbayes et Corillion 1949

Synonymy
Obionetum and *Halimionetum auct. angl.*

Constant species
Halimione portulacoides, *Puccinellia maritima*.

Rare species
Arthrocnemum perenne, *Frankenia laevis*, *Inula crithmoides*, *Limonium bellidifolium*, *Suaeda vera*.

Physiognomy
This is a closed, species-poor association in which *Halimione portulacoides* is constant and physiognomically conspicuous as a bushy canopy up to 50 cm high or as a virtually prostrate carpet. *Puccinellia maritima* is also constant and there is frequently a little *Suaeda maritima* and sparse records for a variety of species from both low and upper marsh. Epiphytic algae are often abundant on the lower stems of the *H. portulacoides* and at some sites small patches of fucoids are present beneath canopy gaps.

Sub-communities
Géhu & Delzenne (1975) allocated samples of *Halimione portulacoides* vegetation with the red alga *Bostrychia scorpioides* to the separate association *Bostrychio-Halimionetum portulacoidis* (Corillion 1953) R.Tx. 1963. Although *B. scorpioides* was recorded occasionally here, there is no substantial floristic reason for distinguishing samples containing this species as even a sub-community within the *Halimionetum*. The three following sub-communities are, however, quite distinct.

Sub-community with *Halimione portulacoides* dominant. In this most species-poor sub-community, *H. portulacoides* always has high cover values (usually >90%) and there is usually a sparse undercover of *Puccinellia maritima* and some *Suaeda maritima*. The *H. portulacoides* may be present as a low or tall even-topped canopy or as discrete hemispherical bushes 1–2 m diameter and up to 50 cm high. Though this last form is developed on sandy substrates, there is no floristic basis for distinguishing a Sandy *Obionetum* (*sensu* Chapman 1934) within this sub-community.

***Juncus maritimus* sub-community:** *Halimione-Juncus maritimus* nodum Adam 1976. Here *H. portulacoides* is somewhat reduced in cover and varying amounts of *J. maritimus* are present as scattered shoots emerging through the shrubby canopy or as small dense patches, presumably of clonal origin. *Puccinellia maritima* remains constant with low cover but here *Plantago maritima*, *Limonium vulgare* and *Triglochin maritima* are also frequent. *Elymus pycnanthus* is an uncommon but distinctive associate.

***Puccinellia maritima* sub-community:** *Puccinellio-Halimionetum portulacoidis* Sea Meadow Chapman 1934; *Puccinellietum maritimae typicum*, terminal phase with *H. portulacoides* Beeftink 1962. *H. portulacoides* and *P. maritima* are co-dominant in an intimate mixture with the shoots of the former making a diffuse open network (cf. mosaics with discrete patches of *Halimionetum* and *Puccinellietum*). *Suaeda maritima*, *Triglochin maritima*, *Plantago maritima* and *Limonium vulgare* are frequent and sometimes abundant and, at high levels on the marsh, *Festuca rubra* may be common.

Habitat
The association occurs on a variety of substrates including clays, sands, shingle and occasionally soils of high organic content (Chapman 1950, O'Reilly & Pantin 1957, Adam 1976). Most commonly, it is developed on silty clay of low organic content, with some free calcium carbonate and a pH in the range 7.0–8.0. It appears tolerant of a range of submersion regimes: at Scolt Head, Norfolk, the *Halimionetum* extends from about 100 to 400 submergences/year (Chapman 1950, 1960*a*; cf. O'Reilly & Pantin 1957). Proctor (1980) has shown that, in the Exe salt-marshes, Devon, *H. portulacoides*

tolerates chloride levels at 10–24 g l^{-1} (salinity 16–36 g l^{-1}). Within these rather wide limits, the association occurs in two distinct situations, as an extensive belt of variable position in the general zonation or as narrow ribbons on creek levees (the 'Great *Obione* Fringe' of Chapman 1934) and low ridges on the marsh surface (Proctor 1980). The occurrences may reflect a need in *H. portulacoides* for a well-drained aerobic soil environment, at least for seed germination (Chapman 1950). Creek levees offer such conditions and, even in intervening basins where soils may be strongly reduced a few centimetres below the surface, the shallow adventitious roots of *H. portulacoides* may avoid the more severe effects of waterlogging (see Figure 28 in Chapman 1960*b*). Alternatively, levee occurrences may reflect a preference for a good supply of soil nutrients, particularly nitrogen and phosphate.

The *Juncus maritimus* and *Puccinellia maritima* subcommunities occur throughout the habitat range of the association but the bushy form of the *H. portulacoides*-dominated sub-community is confined to sandy substrates where salt-marsh abuts dunes or, less frequently, on the lower marsh.

Halimionetum is generally absent from sheep-grazed marshes (e.g. Yapp & Johns 1917) except for those creeksides which are inaccessible to the stock. It is, however, found on a number of cattle-grazed marshes, notably around The Wash, and it will tolerate a certain amount of rabbit grazing (Chapman 1950). Brent geese do not graze extensively on *H. portulacoides* when feeding on saltings (Charman & Macey 1978).

Zonation and succession

Where *Halimionetum* occurs within the marsh zonation, its position is variable. It can be either above or below the *Puccinellietum maritimae* and boundaries between the two associations can be marked by mosaics (see Corillion 1953). At some sites, *Halimionetum* may run right from the upper limit of the pioneer zone to the sea wall. Where it does extend far down the marsh there is sometimes an open mosaic of *H. portulacoides* and *Arthrocnemum perenne* at its lower limit.

The association can occur on creek levees whether or not there is a nearby inter-creek zone of *Halimionetum*. Where it occurs in both situations on the same marsh, the creek *Halimionetum* may be above or below the inter-creek zone. Usually the creek *Halimionetum* cuts across the boundaries of a number of marsh communities.

On the high marsh, *Halimionetum* in both situations may give way to a zone of *Atriplici-Elymetum pycnanthi*, sometimes with an intervening but patchy zone of *Artemisietum maritimae*. This zonation may indicate a successional sequence consequent upon sediment accretion.

The origin and successional status of the *Puccinellia maritima* sub-community is obscure. Its distinctive physiognomy may arise by invasion of the *H. portulacoides*-dominated sub-community by *P. maritima* when the canopy opens with ageing of the bushes or as a result of grazing or by invasion of *Puccinellietum* by *H. portulacoides*. Alternatively the co-dominants may simultaneously invade some other salt-marsh community. Only long-term observation can elucidate the process(es) involved here.

Other changes can occur within *Halimionetum* as a result of frost or human disturbance (Beeftink 1977*a*, *b*; Beeftink *et al.* 1978). Killing of *H. portulacoides* on creek levees by frost can result in the temporary replacement of the association by *Artemisietum maritimae* for 4–5 years. Disturbance in inter-creek basins produces a phase characterised by *Suaeda maritima* and *Aster tripolium*.

Distribution

The *Halimionetum* is most widespread and extensive in south-east England: it is estimated that the association covers 30% of the salt-marshes of The Wash (Anon. 1976). It reaches its northern limit in south Scotland and this may be related to the incidence of severe frosts rather than to any effect of low mean summer temperatures (Ranwell 1972, Beeftink 1977*a*, *b*; cf. Chapman 1950). Sensitivity to grazing restricts its occurrences on the west coast. There is evidence of a recent expansion of the community within Europe (Beeftink 1959, 1977*a*).

Affinities

Some authorities (e.g. Beeftink 1962) expand the *Halimionetum* to take in the *Artemisia maritima*-dominated vegetation of the high marsh and there may also be a case for considering some *Arthrocnemum perenne* stands as part of the association. Whatever its precise limits, the *Halimionetum* is a distinctive community of widespread occurrence on European coasts. It is usually placed alongside the *Puccinellietum maritimae* in the Asteretea but Géhu (1975) has erected an alliance Halimionion within the Arthrocnemetea to emphasise its affinities with the dwarf chenopod communities best developed around the Mediterranean.

Floristic table SM14

	a	b	c	14
Halimione portulacoides	V (7–10)	V (6–9)	V (5–9)	V (5–10)
Puccinellia maritima	IV (2–5)	IV (3–6)	V (2–8)	V (2–8)
Juncus maritimus		V (4–8)	I (2)	I (2–8)
Plantago maritima	I (1–5)	IV (2–5)	III (1–7)	II (1–7)
Limonium cf. *L. vulgare*	I (1–4)	IV (2–5)	III (1–7)	II (1–7)
Suaeda maritima	III (2–4)	I (2–3)	III (1–6)	III (1–6)
Triglochin maritima	I (1–4)	III (2–6)	III (1–6)	II (1–6)
Algal mat	I (5–8)	II (4–6)	I (3–8)	I (3–8)
Aster tripolium (rayed)	I (2–3)	II (2–3)	II (2–5)	I (2–5)
Salicornia agg.	I (1–5)	I (2–3)	III (2–5)	II (1–5)
Aster tripolium	I (1–3)	I (2–3)	II (1–4)	I (1–4)
Armeria maritima	I (5)	I (3)	I (2–4)	I (2–5)
Artemisia maritima	I (2)	I (2–5)	I (1–5)	I (1–5)
Arthrocnemum perenne	I (1–5)	I (1–2)	I (1–4)	I (1–5)
Spartina anglica	I (1–3)	I (2)	I (1–3)	I (1–3)
Spergularia media	I (1–5)	I (2)	I (1–4)	I (1–5)
Inula crithmoides	I (2–5)			I (2–5)
Elymus pycnanthus		II (1–6)		I (1–6)
Aster tripolium var. *discoideus*	I (1–3)		II (1–6)	I (1–6)
Number of samples	91	19	64	174
Mean number of species/sample	4 (1–10)	7 (4–11)	6 (4–10)	6 (1–10)
Mean vegetation height (cm)	24 (4–40)	46 (35–70)	25 (8–45)	27 (4–70)
Mean total cover (%)	97 (50–100)	95 (80–100)	97 (80–100)	97 (50–100)

a Sub-community with *Halimione portulacoides* dominant
b *Juncus maritimus* sub-community
c *Puccinellia maritima* sub-community
14 *Halimionetum portulacoidis* (total)

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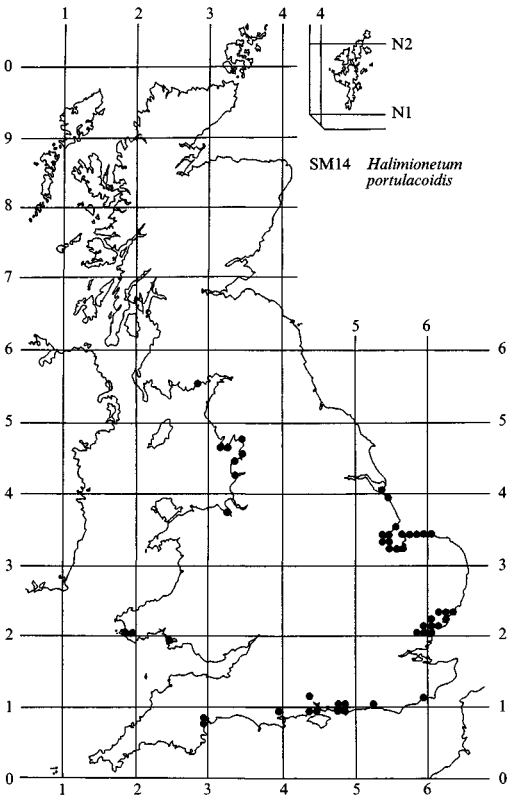

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