A6
Ceratophyllum submersum community
Ceratophylletum submersi Den Hartog & Segal 1964

Synonymy
Ceratophyllum submersum societie den Hartog 1963.

Constant species
Ceratophyllum submersum, *Potamogeton pectinatus*, *Ranunculus baudotii*.

Rare species
Ceratophyllum submersum, *Ranunculus baudotii*.

Physiognomy
Ceratophyllum submersum is a softer and fresher green plant than the more widely distributed *C. demersum*, with its finely segmented leaves 3–4 times forked, rather than once or twice divided (Tutin *et al.* 1964). And, although it can form similar dense masses of submerged, unanchored shoots, it seems generally to be found in this distinctive *Ceratophylletum submersi*, with amounts of *Potamogeton pectinatus* and *Ranunculus baudotti*, a rare water-crowfoot with considerable variation in the degree of development of its floating laminate leaves and the finely divided submerged ones (Holmes 1979). *Myriophyllum spicatum* is also frequent, though often quite hard to make out among the *C. submersum*, and there is occasionally some *Zannichellia palustris*, *Callitriche obtusangula* and *Ranunculus trichophyllus*.

Habitat
The *Ceratophylletum submersi* is characteristic of standing or sluggish, eutrophic and generally brackish waters, and is almost entirely confined to the extreme south-east of England where it is a locally common vegetation type of pools and dykes in coastal and estuarine marshes.

C. submersum has a fairly wide distribution throughout Europe, except towards the extreme north (Tutin *et al.* 1964), but in Britain its range is very restricted. It has sometimes been confused with *C. demersum* but, though there are old inland records scattered across the south-eastern part of the country, recently confirmed stations lie mostly on or near the coast and, apart from a few localities in the west, the plant appears to be largely confined to the submaritime fringe from Sussex round to Essex (Perring & Walters 1962). Here, it is typically found in the dykes, usually shallow and fairly narrow, that drain the reclaimed marshes, where it can extend into waters that are quite saline: along the north Kent coast, the community has been found in brackish dykes with a mean conductivity of over 5000 μmho, or a salinity of 2.7% (Charman 1981). Generally, however, there is no tidal movement, the waters being stagnant or very sluggishly draining the surrounding ground.

Zonation and succession
The community has been noted, either alone or with other aquatic vegetation, in distinctive zonations of brackish open-water transitions. It can show a rather sporadic pattern of occurrence from season to season and is eventually succeeded, where pools and dykes are not regularly cleaned, by swamp and fen.

A quite common pattern seems to be for the *Ceratophylletum* to occur amongst the emergent shoots of the *Scirpetum maritimi*, one of the most frequent swamp communities of shallower brackish waters, or the *Scirpetum tabernaemontani*, an under-recorded vegetation type but one also more tolerant of moderately saline conditions. From a marginal zone, the community can extend out beyond such swamps, comprising the only aquatic element of the zonation or occurring with other submerged assemblages tolerant of brackish conditions, notably certain kinds of *Myriophyllum spicatum-Potamogeton pectinatus* vegetation, where the only difference is sometimes the absence of *C. submersum*. Where the waters become less saline, both these communities can maintain an abundant presence, but the surface often becomes covered with a floating mat of the *Lemnetum minoris*, and the marginal swamps can then include the *Phragmitetum* or patches of Glycerio-Sparganion vegetation or *Agrostis-Alopecurus* wet grassland, decumbent shoots of which can trail out into open water. Patterns of these kinds can be clearly seen

among the various ditch types characterised from the North Kent Marshes (Charman 1981).

Distribution

The *Ceratophylletum submersi* is mostly confined to sites on or near the coast of south-eastern England, with scattered localities to the west.

Affinities

Similar vegetation to this has been described from coastal marshes in The Netherlands and placed in a *Ceratophylletum submersi* (den Hartog 1963, den Hartog & Segal 1964, Westhoff & den Held 1969). Traditionally, such assemblages have been grouped within the Parvopotamion with fine-leaved *Potamogeton* communities.

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