

Two overlooked Northern European species with a peculiar distribution correlated to the area of the Bölling-interstadial

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Two monomorphic species of *Salix* with a predominantly coastal distribution in Northern Europe have apparently been overlooked until now. Formerly, both species have occurred also in mires rich in lime, a habitat which is, however, rapidly vanishing.

A species from the *Hastatae*-group, usually classified as *Salix hastata* 'danica' Lange or *S. hastata* 'var. *vegeta*' And., is both morphologically and ecologically distinct from the arctic or alpine populations of the usually polymorphic *Salix hastata* L. Our taxon occurs exclusively in habitats rich in lime with a pH 7.2–7.9. It grows to 1.2 m high but otherwise resembles the East-European–Asian *Salix pyrolifolia* Ledeb. as to bark, leaves, buds and catkins. Seedlings raised are remarkably uniform, and hybridisation experiments have produced only monomorphic progeny, so it might be possible that apomixis is operating. Büchler has shown that the chromosomes are $2N = 36$. The area of this species extends from Southern Sweden to the island of Amrum. There is a possibility that it may occur in the British Isles, perhaps classified under *Salix malifolia* Sm. It is remarkable that H. Winslow, who collected in Sweden in the last century, applied this name to collections he made.

Material from Sweden, Denmark and Northern Germany has been revised in 1988 to 1990, but the nomenclature remains unresolved. If this species really proves to be hitherto undescribed, the provisional name of *Salix boellingiana* Mang nom. prov. is here proposed in order to acknowledge the fact that the area coincides with that of the Bölling-interstadial, even if it still has to be ascertained how far the area of this species indicates such an ancient distribution pattern.

Another species with a similar area extending even further south to Hamburg is *Salix* × *maritima* Camus (Class. Saul. Europe (1904): 343 and *Bull. Soc. Bot. France* 1 (1903): 385). This taxon is close to *Salix arenaria* (L.) And. (= *S. repens* subsp. *argentea* Sm.) but is distinct because of its stalked and leafed catkins, more crispate leaves with glands, larger stipules and distinct ridges on the wood. Because of the scarce material available to him, Camus classified it as a hybrid. The analysis of the progeny however produced only monomorphic forms. Probably this is a good species, but more information is needed.

Habitat diversity and an unusually high hybrid frequency in willows at a Hamburg locality

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On clay terraces at Boberg near Hamburg, most willows found belong to hybrid complexes such as

- Salix repens* × *S. aurita* = *S.* × *ambigua* Ehrh.
S. repens × *S. purpurea* = *S.* × *doniana* Sm.
S. repens × *S. viminalis* = *S.* × *friesiana* Anderss.
S. alba × *S. pentandra* ssp. *angustifolia* = *S.* × *ehrhartiana*
S. caprea × *S. daphnoides* = *S.* × *erdingeri* Kern. (rare!)

And there is an interesting intersectional hybrid between the *Caprisalix* and the *Amerina* group

S. triandra × *S. viminalis* = *S.* × *mollissima* Ehrh. (= *S. hippophaefolia* Thuill.)
 'Pure' species of willows at this place are to be found only in the *S. repens*-aggregate and the *S. purpurea*-aggregate.

The diversity of willows is matched by the diversity of the habitat: viz. the recently exposed terraces with clay soils of pH = 8 and cool spring areas, rich in orchids, with *Pyrola*, are nearly free of trees except for the willow hybrids. Close to it, eutrophic marshland, peat bogs, sand dunes, moist forests etc. provide habitats for a wide range of parent species for these hybrids. Apparently, the anthropogenic soils on the terraces are unsuitable for most willow species, but provide a 'test area' for various willow hybrids.

Possible postglacial introgressions in the *Salix repens* complex

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The *Salix repens* aggregate is extremely variable: the growth forms include plants with creeping or even subterranean stems as well as shrubs up to 3 m high: the leaves may be glabrous and glanduliferous, or densely tomentose, and the number of nerves may vary between 5 and 17 (to 21); the catkins may be stalked or sessile; the style may be short, elongated or bifid; the capsules may be glabrous or tomentose.

Might it not be possible, that in the genus *Salix*, as in *Betula*, where these phenomena have been studied intensively, postglacial introgressions between the different subgroups have played an important role in its diversity?

The following species could be hypothesised as contributing certain characters into the *Salix repens* aggregate:

- Salix herbacea* L. – red capsules, bifid style
S. arbuscula L. – catkins with long stalks
S. livida Wahl. – long and narrow capsules, large stipules
S. bicolor Ehrh. – leaves with glands, leaves pale (glaucous) beneath, long linear stipules
S. lapponum L. – leaves tomentose, few lateral nerves
S. myrtilloides L. – glabrous and glaucous leaves with glands

Male and female clones of *Salix* 'arbuscula' found at Boberg near Hamburg suggest that they have originated from the *Salix repens* L. group by recombination within a complex which had formerly received *Salix arbuscula* characters by introgression.