

## CAREX EXTENSA (CYPERACEAE) REDISCOVERED IN POLAND

BEATA BOSIACKA & HELENA WIĘCŁAW

**Abstract.** The only known station of *Carex extensa* Good. in Poland, formerly considered extinct, was confirmed in the city of Kołobrzeg in the Parsęta River Valley, NW Poland, during a search in 2009. *Carex extensa* was growing in a transitional phytocoenosis between salt-meadow *Juncetum gerardi* and subhalophilous rush *Scirpetum maritimi* on salt marshes supplied with brine ca 3 km from the Baltic coast. The *C. extensa* population is small: only two clumps were observed in 2009–2011, and five more clumps were found in 2012.

**Key words:** *Carex extensa*, salt marshes, Kołobrzeg vicinity, NW Poland

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### INTRODUCTION

The halophyte flora of Europe is becoming impoverished due to adverse changes in agriculture, drainage of wetlands and the development of infrastructure. In Poland, the naturally limited range of occurrence of coastal salt marshes is an additional factor increasing the threat to halophilous vegetation. This is the result of the geomorphology of the Polish seacoast, the low salinity of the Baltic Sea, and the short reach of high tides as compared to those of the North Sea and Atlantic coasts. In view of the factors limiting the occurrence of halophytes on the Polish coast, salt marshes supplied with saline subterranean waters play an important role in the diversity of this group of species. They occur in northern Poland as well as inland (Nienartowicz & Piernik 2004; Bosiacka *et al.* 2011).

An assessment of the degree of regression of halophytes on the Polish seacoast showed that ca 10 of the 38 halophilous species recorded in this region in the second half of the nineteenth century have disappeared in the last hundred years. *Carex extensa* was counted as one of those extinct species (Piotrowska 1976; Sobisz & Truchan 2009).

*Carex extensa* has an Atlanto-Mediterranean range, occurring along the coasts of Madeira, the Azores, the Mediterranean, the Atlantic, Black Sea and North Sea, and along the western and northern Baltic coasts (Hulten & Fries 1986b).

Along the southern Baltic coast it is still quite numerous on Rugen Island, while in the northwest part of Uznam Island it has only scattered localities (Benkert *et al.* 1996). The number of *C. extensa* stands decreases toward the east; in Poland it is known from only one locality in the northwest. It was also recorded at several marginal stands on the Baltic islands of Estonia and near Tallinn (Egorova 1999). The northeast limit of its range runs near 60° N latitude on a line running through Gavle (Sweden), the Aland Islands and Tallinn (Hulten & Fries 1986a).

Within its natural range, *C. extensa* grows in saline, wet habitats in areas influenced by marine climate. It is a component of halophilous meadow and low rush vegetation; it grows mostly in patches of the *Juncetum gerardi*, *Junco-Caricetum extensae* and *Carex extensa-Samolus valerandi* communities (Schultze-Motel 1977) as well as in phytocoenoses of *Halo-Bolboschoenetum*, *Plantagini salsae-Juncetum maritimi* and *Tripolio pannonici-Caricetum extensae* (Dubyna & Neuhäuslová 2000).

### MATERIALS AND METHODS

A relevé was taken by Braun-Blanquet's method in a patch of halophilous vegetation including *C. extensa*; the coordinates of the center of the patch were deter-

mined with a GPS receiver. Three soil samples were collected from the root zone (0–25 cm) and the following soil parameters were estimated: organic matter content by loss on ignition, pH by the potentiometric method, and the electrical conductivity of saturated extracts ( $EC_e$ ) with a conductivity meter.

Because there were only a few individuals in the observed *C. extensa* population, only five shoots of the sedge were collected to confirm the designation. The collected specimens were compared with herbarium materials of *C. extensa* received from POZ and from the private collection of Jacob Koopman. Voucher specimens are deposited in the Herbarium of the Department of Plant Taxonomy and Phytogeography, University of Szczecin.

## RESULTS AND DISCUSSION

*Carex extensa* was found in 2009 in one of the driest and least saline patches of halophilous vegetation on the east bank of the Parsęta River (54°09'59.1"N, 15°35'07.9"E) in the city of Kołobrzeg, ca 3 km from the Baltic coast (Fig. 1). The mean values of the soil parameters were 9.04 mS/cm electrical conductivity of saturated extracts ( $EC_e$ ), 56.17% soil moisture and pH 5.8. The phytocoenosis developed in such conditions was transitional between salt meadow *Juncetum gerardi* (overgrown by *Phragmites australis*) and subhalophilous rush *Scirpetum maritimi* (with *Schoenoplectus tabernaemontani*).

Relevé 7 July 2009. Relevé area 25 m<sup>2</sup>, herb layer coverage 95%

*Agrostis stolonifera* 2; *Carex cuprina* 2; *Carex distans* 1; *Carex disticha* 1; *Carex extensa* +; *Festuca arundinacea* 1; *Glaux maritima* 2; *Juncus gerardi* 2; *Lychnis flos-cucculi* +; *Phragmites australis* 2; *Plantago maritima* 1; *Potentilla anserina* 1; *Schoenoplectus tabernaemontani* 2; *Triglochin maritima* 1.

The first report of the occurrence of *C. extensa* in the city of Kołobrzeg (Kolberg in German) comes from a floristic note by Römer (1906); the original herbarium material is located in SLTC (Sobisz & Truchan 2009). Römer found *C. extensa* in fresh low-sward halophilous meadows stretching between the east bank of the Parsęta River and the exit road from Kołobrzeg in the direction to Karlino; this description matches

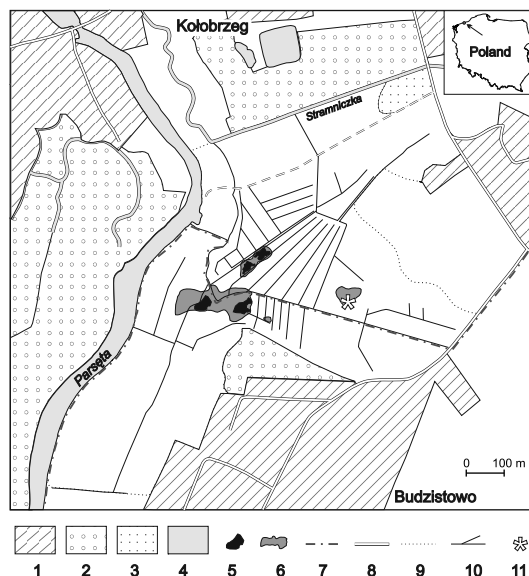


Fig. 1. Salt marshes supplied with brine on the east bank of the Parsęta River. 1 – built-up areas, 2 – gardens, 3 – salt marsh covered by rubble, 4 – surface waters, 5 – *Salicornia europaea* colonizing muds, 6 – patches of halophilous meadow and rushes, 7 – Kołobrzeg city limits, 8 – roads, 9 – reedland borders, 10 – drainage ditches, 11 – stand of *Carex extensa* Good. (after Bosiacka & Stachowiak 2007, modified).

the area where we recently found this species again.

In the first Polish study in which *C. extensa* was mentioned, its position is marked on the appended map on the west bank of the Parsęta River (Czubiński 1950). A subsequent search for *C. extensa* in that area did not produce any results (Piotrowska 1961). Due to the complete disappearance of salt meadows in the west part of town, it was concluded that there was no chance of finding *C. extensa* and the species was declared extinct in Poland (Piotrowska 1976, 2001; Zarzycki & Szelaąg 2006). The reason for this misunderstanding was the reference to studies by Preuss (1911, 1912) citing only the original report by Römer (1906) and giving an imprecise location for *C. extensa*, southwest of Kołobrzeg, whereas on the map appended to the first part of the study (Preuss 1911) the position is marked on the east bank of the Parsęta. The division of salt marshes in the Kołobrzeg area into east and west parts was mentioned in the second edition of

the *Polish Red Data Book of Plants* (Piotrowska 2001), but this division applied to the area of occurrence of halophilous vegetation on the west bank of the Parsęta River only, on both sides of the road from Kołobrzeg to Zieleniewo.

Until recently there was no reference in the Polish literature to salt marshes on the east bank of the Parsęta River between Kołobrzeg and Budzistowo. They were rediscovered and explored only in the last ten years or so (Bosiacka & Stępień 2001; Bosiacka & Stachowiak 2007; Bosiacka *et al.* 2011). From Römer's (1906) report it can be inferred that halophilous vegetation patches in this part of the Parsęta River Valley have persisted despite the adverse changes connected with cessation of traditional grassland management, and thus that *C. extensa* has been present there continuously.

On the east bank of the Parsęta River between Budzistowo and Kołobrzeg there is now a *ca* 50 ha complex of rushes and wet meadows, and halophilous vegetation forms some small scattered patches around the outflows of saline subterranean waters. The halophilous phytocoenoses present there are *Puccinellio distantis-Salicornietum brachystachyae*, *Puccinellio-Spergularietum salinae* and *Juncetum gerardi* (Bosiacka & Stachowiak 2007).

Halophilous vegetation in the vicinity of Kołobrzeg covered a large area on both sides of the Parsęta River as late as the turn of 19th/20th centuries. As a result of expansion of urban infrastructure and changes in agricultural practices, halophytes disappeared completely on the west bank of the river. On the opposite bank, between Kołobrzeg and Budzistowo, low-sward halophilous vegetation dependent on brine outflows began to retreat in the 1980s after extensive use of meadows ceased. Halophytes were reduced to a few hectares as common reed gradually expanded. Until recently, meadows and rushes were mowed occasionally (only in the driest years) and fragmentarily. In 2010 the owner of the land acceded to an agri-environmental program and began regular mowing. This has created an opportunity to restore a *C. extensa* population now on the edge of extinction. In June 2012 we found five more



Fig. 2. *Carex extensa* Good. on salt marshes supplied with brine in the Parsęta River Valley in Kołobrzeg (21 June 2012; photo B. Bosiacka).

clumps of *C. extensa* a few meters from those found in 2009.

A new threat is posed by plans to construct a ring road for Kołobrzeg. Its proposed route is a few tens of meters from the location of the sedge. Modernization of the drainage network is also planned. Since the salt marshes in the Parsęta River Valley are within Natura 2000 special areas of habitat protection, the prospective projects require environmental impact assessments; such procedures favor efforts to protect the salt marshes. Since the halophilous vegetation patches are so close to the planned route, however, it is difficult to predict whether the outflow and spread of the brine will be disturbed during construction and operation of the projects even if the conservation guidelines are followed. If some parts of the halophilous vegetation patches are threatened, a nature compensation program can be prepared

and implemented to actively protect and restore the hydrological regime and the physiognomy of *Salicornia europaea* colonizing muds and saline meadows with stands of many rare and endangered species such as *Carex extensa*, *Aster tripolium* and *Plantago maritima*. Regardless of the progress of the proposed projects, the entire area occupied by halophytes is covered by annual monitoring (Bosiacka, unpublished).

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