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***Tortula grandiretis* Broth. in the Netherlands and in Turkey**

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Abstract. *Tortula grandiretis* Broth., differing from *T. muralis* Hedw. mainly in the larger, quite smooth lamina cells, is reported from three localities in the SW-Netherlands, where it occurred on open, sandy or clayey, brackish soil on recently enclosed mud flats or salt-marshes. It is also reported from one locality in Turkey. It was formerly known only from Turkestan (U.S.S.R.).

Резюме. О *Tortula grandiretis* Broth., отличающейся от *T. muralis* Hedw. главным образом более крупными, совершенно гладкими пластинчатыми клетками, сообщается в трех местах в юго-западной Голландии, где она встречается на открытой, песчаной или глинистой солоноватой почве в недавно огороженных грязевых низинах или солонцеватых маршах. Она также обнаружена в одном месте в Турции. Ранее она была известна лишь в Средней Азии (СССР).

The Lake Veere between the islands of Walcheren, N-Beveland, and S-Beveland (SW-Netherlands) was one of the first sea arms to be enclosed during the Delta-project. In 1961 the closing of the western dam in the Veerse Gat excluded the direct influence of the sea from the area. A large part of the former tidal mud flats and sand flats has remained above the water line since then. In the first years after closing, the vegetation on these flats changed drastically (Beeftink et al. 1971), but now the situation is more or less stabilised and succession goes at a much slower rate (Van Noordwijk-Puijk, Beeftink & Hogeweg, in press). The water of the former sea arm became brackish within a year as a consequence of rain and drainage of the polders alongside.

In 1975 two of us (H. J. D. and B. P. K.) paid a visit to some former tidal flats in the middle of this area (the »Middelplaten«), with J. Beijersbergen and H. J. M. Sipman, in order to study bryophyte and lichen development on these flats, attracted by among other things terrestrial *Usnea* species (Koutstaal & Sipman 1977). On moist, brackish clay at the margin of the »Small Island« we collected a *Tortula*

specimen which we were unable to identify. From *Tortula muralis* Hedw., which occurred in similar situations in the Lauwerszee area (N-Netherlands; Joenje & During 1977), the specimen differed in having large, smooth cells. The recurved leaf margins and rather narrow leaves with long-excurrent hairs excluded *T. cuneifolia* (With.) Turn. Comparison with the type specimen in Brotherus' herbarium confirmed its identification as *Tortula grandiretis* Broth., a species from Turkestan.

On the same day the third author found the species also on the »Large Island« in the same area, which came out some years later. We discovered *T. grandiretis* also in the bryophyte material of a vegetation record made by Dr. Ir. W. G. Beeftink in 1972 in a tidal marsh along the south coast of the island of Flakkee (prov. of S-Holland). This area, called »Bat-tenoord«, lies along the former sea-arm Grevelingen, which was enclosed in 1971. The clayey soil here had borne salt-marsh vegetation for many years; in 1971 the regular inundations with salt water ceased, and 1972 appeared to be the first year in which bryophytes occurred in this vegetation. An impression of the vegetation at that time is given by the rec-

Record Beeftink 72620			
Herb layer: coverage 65%, height 2-5(-10) cm			
Bryophyte layer: coverage 1%			
<i>Glaux maritima</i>	3.5 v	<i>Sagina maritima</i>	2.2 f
<i>Plantago coronopus</i>	3.1 f	<i>Cerastium holosteoides</i> ssp. triv.	r.1 v
<i>Puccinellia distans</i>	+1 v	<i>Elytrigia repens</i>	+1 v
<i>Spergularia salina</i>	+1 f	<i>Triglochin maritima</i>	r.1 v
<i>Plantago major</i>	r.1 v	<i>Poa trivialis</i>	r.1 v
<i>Rumex crispus</i>	+1 v	<i>Poa annua</i>	r.1 v
<i>Agrostis stolonifera</i>	1.2 v	<i>Lolium perenne</i>	r.1f
<i>Taraxacum spec.</i>	r.1 v		
<i>Juncus bufonius</i> ssp.		<i>Bryum bicolor</i>	+
<i>ambiguus</i>	+1 f	<i>Ceratodon purpureus</i>	+
<i>Juncus gerardii</i>	2.1 v	<i>Bryum argenteum</i>	+
<i>Trifolium fragiferum</i>	+2 v	<i>Leptodictyum kochii</i>	+
<i>Matricaria</i> cf. <i>maritima</i>			
ssp. <i>inodora</i>	r.1 v	<i>Tortula grandiretis</i>	+

Table 1. Vegetation record from salt-marsh on Battenoord, SW-Netherlands, made by Dr. Ir. W. G. Beeftink no 72620 on 19 September 1972. Area: 0.65 × 1.30 m.

ord (Table 1). On the Middelplaten localities we-searched for more material rather intensively on 4 October 1976, and the third author checked the bryophytes of the vegetation records made on Battenoord in several years, but in vain.

Apart from the original localities in Samarkand the only other one known for this species is near Egridir, south-west Turkey, where it has been collected by one of us (A.C.C.), in very small quantity on the trunk of a tree by a stream, associated with *Tortula inermis* (Brid.) Mont., *T. handelii* Schiffn., *Orthotrichum stramineum* Hornsch. ex Brid. and *O. diaphanum* Schrad. ex Brid.

In the following short description the sporophyte characters are taken from the type material, as the Dutch and Turkish specimens are sterile. For the drawing Dutch material has been used (Fig. 1). Plants gregarious or in small tufts. Stems hardly reaching 5 mm length, in cross section with distinct central strand. Leaves when dry somewhat crisped, when moist spreading, narrowly ovate with rounded, obtuse apex, 2-3 mm long; margin broadly recurved throughout, on some leaves only partially recurved, entire or near apex

very slightly crenulate; nerve strong, excurrent in a long, smooth, yellow hair, hyaline at the apex; lamina cells irregularly quadrate or rectangular, 12-25 by 12-15 μ m, all smooth.

Autoicous. Capsule erect, ca. 3 mm long.

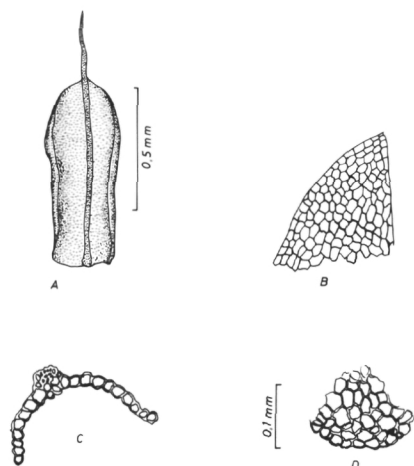


Fig. 1. *Tortula grandiretis* Broth. a: leaf; b: areolation near leaf apex; c: cross section of nerve; d: part of cross section of stem. The standard of 0.1 mm holds for b, c and d.

Peristome strongly contorted, basal membrane ca. 1/4 of the length of the peristome. Spores smooth, 12–15 μm .

As Brotherus (1929) remarked, the species seems to be related to *Tortula muralis* Hedw. and *T. canescens* Mont.; from both it differs in the larger, quite smooth lamina cells. *Tortula ampliretis* Crundw. & Long (Crundwell et al. 1978) is another species of the same group and is also large-celled, but in this the cells are papillose.

Although the Turkish locality is in a rather arid regaion, where the lakes have no outflowing rivers or streams and must therefore be somewhat brackish, there is no reason to suppose that the *Tortula grandiretis* habitat was at all influenced by salt; nor are the associated species particularly salt-tolerant. Brotherus (1929) quotes two of the Samarkand specimens as growing »in declivi humidiusculo umbroso horti« and »ad truncos Salicum«.

There is no reason to doubt that *T. grandiretis* is native in Turkey. Though the localities in the Netherlands are nearer to Egridir than is Egridir to Samarkand, it seems likely that in the Netherlands *T. grandiretis* is an introduction, for it has been found only on soil that has recently become available for bryophyte colonization, where it has apparently not persisted. How it reached the Netherlands remains a mystery.

We are grateful to the curator of the herbarium in Helsinki (H, H-BR) for the loan of the type specimens of *Tortula grandiretis*. Mr. T. Schipper and Mr. M. Groeneveld ably drew the figure.

Specimens examined

Turkestan. Samarkand: Brotherus s.n., 5–5–1896 (H-BR, lectotype); inter Tschinas et Staroj Taschkent: Brotherus s.n.; 12–5–1896 (H, H-BR); idem, 18–5–1896 (H); inter Dschambia et Kamennimost ad viam publicam inter Samarkand et Taschkent: Brotherus s.n., 9–5–1896 (H). — Turkey. Isparta Prov., ca. 4 km west of Egridir, 1060 m alt.: E. Nyholm & A. C. Crundwell 1084a, 31–3–1972 (GL). Netherlands. Prov. of S-Holland, Flakkee, Battenoord: Beeftink veg. rec. no 72620, 19–9–1972 (U, herb. Yerseke); prov. of Zeeland, Lake Veere, Middelplaten, Large Island: Koutstaal s.n., 3–7–1975 (Yerseke); idem, Small Island: Beijersbergen, During, Koutstaal & Sipman s.n., 3–7–1975 (U).

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