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The rare smut fungus *Urocystis fischeri* (Urocystidales, Ustilaginomycotina) from the Outer Hebrides, Scotland, with notes on its systematic position

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Urocystis fischeri Körn. is a smut fungus that forms blisters in the leaves of several species of sedges *Carex* spp. Vánky (2012) gives 28 species and one hybrid as hosts. Vánky (1994) has 23 and one of these respectively in Europe (Fig. 1), but most of these are not known as hosts in the British Isles. There are fewer than 30 distinct records of *U. fischeri* from the British Isles according to FRDBI (www.fieldmycology.net/FRDBI), mainly from *Carex flacca* Schreb. (glaucous sedge), with a few records from *C. panicea* L. (carnation sedge) and one from *C. nigra* (L.) Reichard (common sedge).

Fig. 1. *Urocystis fischeri* on the leaves of the sedge *Carex rostrata*, Berchtesgaden National Park, Bavaria (Courtesy of Julia Kruse).

A specimen of *Carex demissa* Hornem. (common yellow-sedge) from Traigh Mheilen, N. Harris, Outer Hebrides, Scotland (NA9914) infected with a leaf smut was collected on 15 July 2012 and determined by P.A.S. as *U. fischeri*; M.L. confirmed the determination. The morphology of *U. fischeri* observed with a light microscope differed only slightly compared with the species description given by Vanky (1994): sori were light to dark reddish-brown (not lead-coloured); spore balls globose to ovoid (not irregular),
18 - 37 µm (not 20 - 40 µm), composed of 1 - 3 spores (not 4); spores 12 - 15 x 14 - 17 µm (not 11 - 16 x 14. 5 - 19 µm); sterile cells 5 - 11 µm (not 5 - 15 µm).

Carex demissa appears to be a new host species in Britain for this smut. The locality is an area of damp machair grassland, close to the sea (Fig. 2), which is heavily sheep-grazed. There were a few infected shoots together in one spot, but no other infections were seen. However, the heavily-grazed sward would have made other specimens easy to overlook, it was necessary to be on hands and knees to see the smut at all! There are three other records from the Outer Hebrides for *Urocystis fischeri*:

- Barra, July 1935, on *C. flacca* (Campbell 1936).
- Baleshare Island, North Uist, 10 Sep 1968, D.M. Henderson, on *C. flacca*, specimen in E.
- Butt of Lewis, [NB56], Lewis, 5 Aug 1973, R.W.G. Dennis, on *C. nigra* (Dennis, 1975).

R.W.G. Dennis undertook extensive investigations of microfungi in the Hebrides over many years (Dennis, 1986), but detected rather few specimens. Otherwise there are not many smut recorders, so it is likely that the scarcity of records reflects considerable under-recording. However, the host plants are common, and if infections were frequent, more reports would be expected, so only a tiny proportion of shoots is apparently infected.

Fig. 2. Machair habitat where *Urocystis fischeri* was collected on *Carex demissa* (in a damp area towards the right of the picture).

The internal transcribed spacer (ITS) and large subunit (LSU) rDNA sequences for this specimen have been determined (for methods see Lutz *et al.*, 2004, primers used: ITS1f/LR5), and added to GenBank (accession no. KF668284) where they were the first sequences for *U. fischeri*. The voucher

specimen was deposited in Kew (accession no. K(M)188731).

To elucidate the relationship of the *U. fischeri* specimen within the genus *Urocystis* its ITS and LSU sequences, respectively, were analysed within datasets covering all the *Urocystis* species available in GenBank (for methods see Lutz *et al*., 2012b). The phylogenetic hypothesis derived from both the ITS and LSU analyses (data not shown) revealed no clear pattern of phylogeny. Most relations between species were not resolved. According to the ITS analyses *U. fischeri* may be closely related to *U. muscaridis*, but more distantly related to some other *Urocystis* species. The taxonomic position of *U. fischeri* within the genus *Urocystis* is therefore apparently confirmed, although the wider relationships within this large genus await further clarification.

Strict host specificity at the species level was demonstrated recently for several smuts (e.g., Kemler *et al*., 2009; Lutz *et al*., 2008, 2012a; Piatek *et al*., 2012, 2013a, b; Savchenko *et al*., 2013), and it is possible that there will be variations within *U. fischeri* on its range of host species. The collection of further specimens on various hosts and molecular phylogenetic analyses are needed to assess this.

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