ACTA MYCOLOGICA
Vol. 40 (1): 19-24
2005

Fungal species new in Poland on *Carex* and *Juncus*

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Adamska I.: *Fungal species new in Poland on Carex and Juncus.* Acta Mycol. 40 (1): 19-24, 2005.

Twelve fungal species colonising plants of the genus *Carex* and six species on plants of the genus *Juncus* were recorded during investigations in the Słowiński National Park. Six species new in Poland were identified (*Leptosphaeria juncina, Lophodermium caricinum, Septoriella junci, Stagonospora innumerosa, S. junciseda* and *S. vitensis*), and new hosts of 5 other species were found.

Key words: parasitic fungi, saprotrophic fungi, Słowiński National Park

INTRODUCTION

112 out of approximately 900 plant species occurring in the Słowiński National Park (SNP) have been recognised as threatened with extinction and red-listed in the Western Pomerania Region (Pomorze Zachodnie). 83 species occurring in the SNP are protected, including 68 fully protected species and 15 partially protected species (Dz. U. nr 168 z 9.07.2004, poz. 1764).

Only *Carex arenaria* out of the 31 plant species of the genus *Carex* occurring in the SNP is partially protected (Dz. U. nr 168, 9.07.2004, poz. 1764). This sedge occurs in the SNP very frequently, and is a pioneer, expansive species belonging to psammophytes of coastal dunes. It colonises white dunes together with tall grasses, and commonly occurs in coastal psammophilous grasslands on grey dunes. *Carex arenaria* is moreover found on inland dunes between crowberry forests and within them (Piotrowska, Żukowski and Jackowiak 1997; Piękoś-Mirkowa, Mirek 2003).

None of the 13 plant species of the genus *Juncus* observed in the SNP (Dz. U. nr 168, 9.07.2004, poz. 1764) is protected. The species commonly colonise damp or wet habitats (Grau et al. 1984).

Plants of the genera *Carex* and *Juncus* became a frequent object of observation during investigations on the occurrence of parasitic and saprotrophic fungi in selected sites in the SNP. They were hosts of many fungal species, including taxa new or rare in

Poland. The aim of this article is to give morphological features of these fungi and to present their occurrence both in the SNP and other areas in Poland and abroad.

MATERIAL AND METHODS

Investigations on the occurrence of parasitic and saprotrophic fungi in the SNP were conducted between 2001 and 2004. Fragments of diseased plants were collected between May and October each year.

Abbreviations:

CaEn – Carici arenariae-Empetretum nigri
EA – Elymo-Ammophiletum
EnP – Emperto nigri-Pinetum
HJl – Helichryso-Jasionetum litoralis
MSa – Myrico-Salicetum auritae
RnA – Ribeso nigri-Alnetum
VuBp – Vaccinio uliginosi-Betuletum pubescentis

Four plant species of the genus *Carex*: *C. arenaria*, *C. acutiformis*, *C. elata* and *C. pseudocyperus*, as well as 2 species of the genus *Jucus*: *J. conglomeratus* and *J. effusus*, were identified among the plants collected.

Carex arenaria was collected in *EA*, *HJl*, *CaEn* and *EnP*; *Carex acutiformis* and *C. pseudocyperus* in *RnA*, and *C. elata* - in *EnP*. *Juncus conglomeratus* was found in *MSa* and *VuBp*, and *J. effusus* – in *RnA*, *EnP*, *VuBp* and *MSa*, respectively.

Parasitic and saprotrophic fungi colonising the material collected were determined in the laboratory. Small tissue fragments were cut out from the plants and cut into small strips with a safety razor. The strips were placed in a drop of lactic acid on a microscopic slide, covered with a cover slip, and observed under the Axiolab Zeiss light microscope. The structures and conidia of the fungi identified were measured with a micrometric eyepiece.

Plant species were determined according to Szafer, Kulczyński and Pawłowski (1969). Nomenclature followed Mirek et al. (1995). Fungal species were determined according to Brandenburger (1985), Ellis and Ellis (1987), and Vánky (1994).

RESULTS

Twelve species of parasitic and saprotrophic fungi were identified on plants of the genus *Carex*. Anamorphic fungi (7 species) dominated in their group. Three species represented the Basidiomycota, and 2 - Ascomycota.

Five of the fungal species found occur commonly in Poland (*Alternaria alternata*, *Cladosporium cladosporioides*, *Puccinia caricina*, *P. dioicae* and *Schizonella melanogramma*) while *Lophodermium caricinum* and *Stagonospora vitensis* had not been recorded before. 5 other species, found rarely so far, were observed on new hosts.

Six fungal species colonised plants of the genus *Juncus*. Anamorphic species dominated in this group (5 species), and one species belonged to the Ascomycota. Two of the diagnosed species occur commonly (*Alternaria alternata* and *Cladosporium cladosporioides*) while 4 species (*Leptosphaeria juncina*, *Septoriella junci*, *Stagonospora innumerosa* and *S. junciseda*) had been recorded in Poland for the first time.

Fungal species colonising leaves of plants belonging to the genus *Carex* and *Juncus* collected in the SNP new and rare in Poland (reported from 1-2 localities) are listed be-

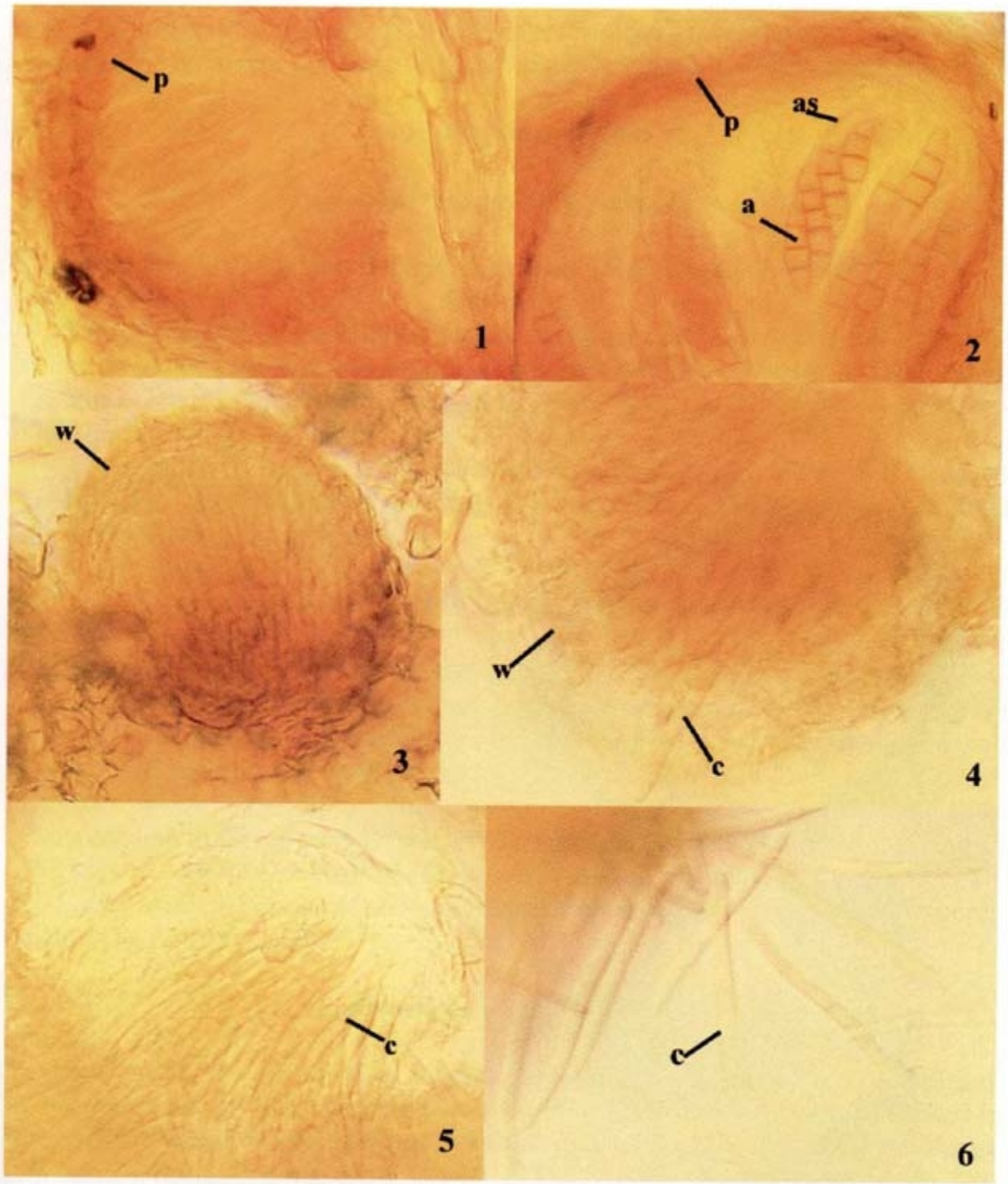

Fig. 1. *Leptosphaeria juncina*: pseudothecium (1), asci with ascospores (2); *Septoriella junci*: pycnidium and conidia (3-5), conidia (6); a - ascospore, as - ascus, c - conidia, p -pseudothecium, w - wall of pycnidium.

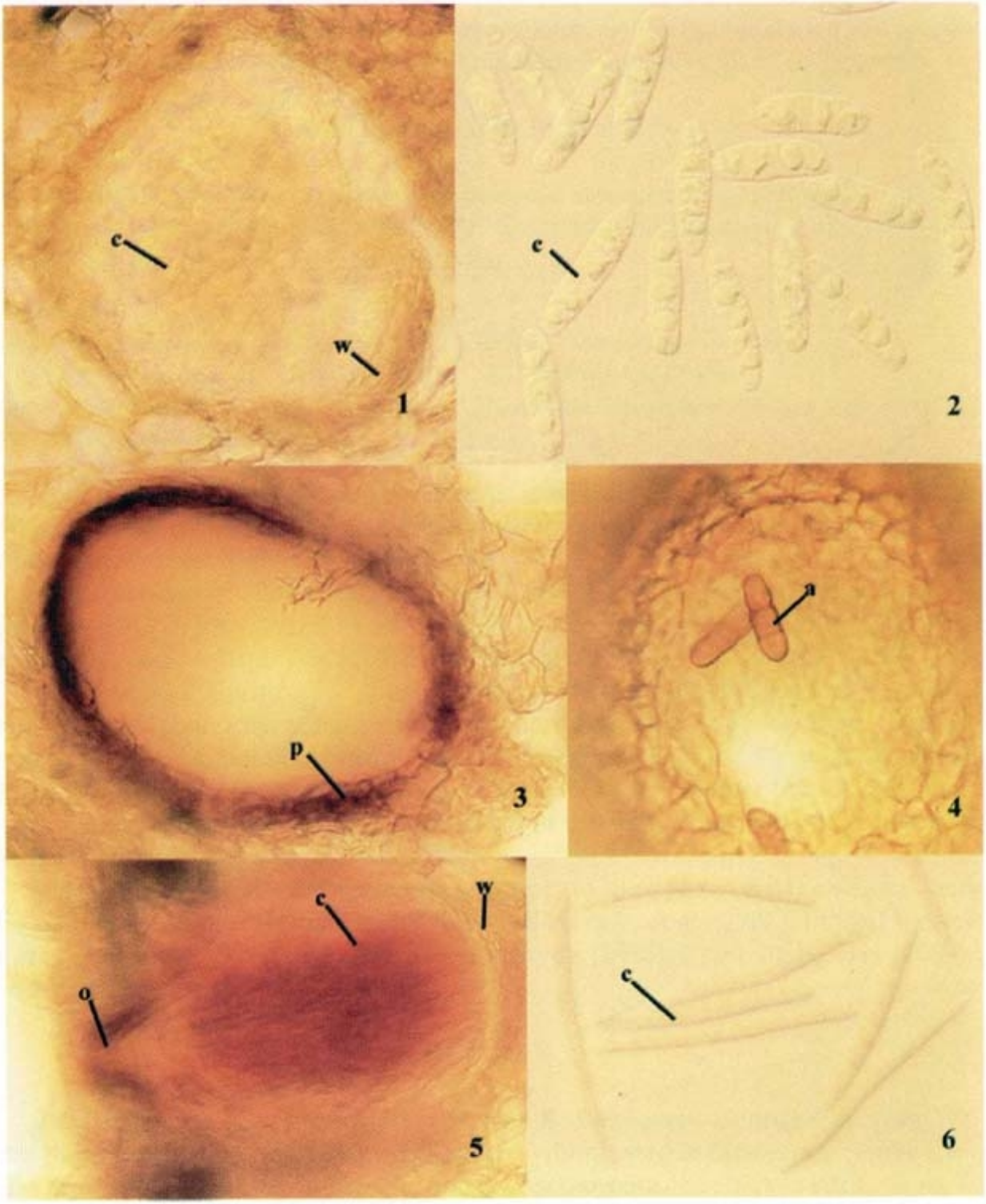

Fig. 2. *Stagonospora innumerosa*: pycnidium and conidia (1), conidia (2); *Paraphaeosphaeria michotii*: pseudothecium (3), ascospore (4); *Stagonospora caricis*: pycnidium and conidia (5), conidia (6); a – ascospore, c – conidia, o – ostiolum, p – pseudothecium, w – wall of pycnidium.

low. The host species, collection site, and collection date follow the description of each species. The occurrence of these fungi in Poland and in the world is also provided.

Species new in Poland

Leptosphaeria juncina (Auersw.) Sacc.

Pseudothecia 75-100 μm in diam. Ascospores light-olive, 33-42 × 5-6 μm, 3-septate.

The dimensions of pseudothecia and ascospores of *L. juncina* in the material collected in the SNP were convergent with those given by Ellis and Ellis (1987); pseudothecia: 0.1 mm in diam., ascospores: 35-45 × 4-6 μm. On *Juncus conglomeratus*: *MSa* IX 2002, IX 2003 (Fig.1.1 – 1.2).

According to Ellis and Ellis (1987), *J. effusus* is also a plant host of *L. jucina* apart from *J. conglomeratus*. According to Farr et al. (1989), *L. juncina* occurs in the USA and Europe.

Lophodermium caricinum (Rob. ex Desm.) Duby

Apothecia black, 800-850 μm in diam. Develops on dead leaves. Ascospores hyaline, 34-48 × 1 μm. The dimensions of apothecia and ascospores of *L. caricinum* in the material collected in the SNP were convergent with those given by Ellis and Ellis (1987; apothecia: 1 mm; ascospores: 35-50 × 1 μm). On *Carex arenaria*: *EnP* X 2002.

According to Ellis and Ellis (1987), *C. elata*, *C. flacca*, *C. paniculata* and *C. silvatica* are hosts of *L. caricinum*. *Carex arenaria* is its new host.

Lophodermium caricinum occurs in the temperate climate of the northern hemisphere (Farr et al. 1989).

Septoriella junci (Desm.) Sutton

Pycnidia 50-150 μm in diam. Conidia light-olive to olive, 50-75 × 2-4(5) μm, 3-7-septate (mostly 4). Conidial dimensions of *S. junci* in the material collected in the SNP are within the range given by Ellis and Ellis (1987; 50-80 × 2.5-3 μm). On *Juncus conglomeratus*: *MSa* VI, VIII, IX 2003; on *J. effusus*: *MSa* VI 2001 (Fig. 1.3 – 1.6).

According to Ellis and Ellis (1987), *J. maritimus* is a plant host of *S. junci* apart from *J. conglomeratus* and *J. effusus*.

Stagonospora innumerosa (Desm.) Sacc.

Pycnidia 75-100 μm in diam. Conidia 17.5-30 × 7.5-8 μm, 2-5-septate (mostly 4). The pycnidium diameter of *S. innumerosa* in the material collected in the SNP is convergent with that given by Ellis and Ellis (1987); conidial dimensions, however, are slightly greater than those given by these authors (19-23 × 5-7 μm). The number of septa in the conidia is identical to that given by Ellis and Ellis (1987). On *Juncus effusus*: *EnP* VI 2003; on *J. conglomeratus*: *VuBp* VI 2003 (Fig.2.1 – 2.2).

According to Ellis and Ellis (1987), *J. maritimus* is a plant host of *S. innumerosa* apart from *J. effusus*. *Juncus conglomeratus* is a new host of this fungus.

Stagonospora junciseda Sacc.

Pycnidia 120-150 μm in diam. Conidia 20-32.5 × 2-3 μm, 3-septate.The pycnidium diameter of *S. junciseda* was smaller than that given by Ellis and Ellis (1987; diam. ca. 0.2 mm). Small pycnidium dimensions were probably caused by an early developmental phase of the fungus. Conidial dimensions were within the range given by Ellis and Ellis (1987; 21-30 × 3-3.5 μm). The number of septa in the conidia was also consistent. On *Juncus effusus*: *MSa* VIII, IX 2001.

According to Ellis and Ellis (1987) *J. subnodolus* is the plant host of *S. junciseda*. *Juncus effusus* is a new host of this fungus.

Stagonospora vitensis Unam.

Pycnidia ca. 200 μm in diam. Conidia hyaline, 28-30 × 5-6 μm, 3-septate (rarely 4 or 5).

Conidial dimensions were within the range given by Ellis and Ellis (1987; 18-32 × 4-6 μm). The number of septa was the same as that given by Ellis and Ellis (1987; 2-3 septa, rarely 4), although sometimes it was greater (5 septa). On *Carex arenaria*: *HJl* VIII 2003.

According to Ellis and Ellis (1987), *C. disticha*, *C. hirta*, *C. ortubae*, *C. ovalis* and *C. riparia* are plant hosts of *S. vitensis*. *Carex arenaria* is its new host.

Species rare in Poland

Paraphaeosphaeria michotii (Westend.) O. Eriksson ex Shoemakre & Eriksson

Pseudothecia up to 180 μm in diam. Ascospores golden-brown to light-brown, 12.5-18 × 4-6 μm, 2-septate. The pseudothecium diameter of *P. michotii* was slightly smaller than that given by Ellis and Ellis (1987; ca. 0.2 mm in diam.); ascospore dimensions, however, were convergent (14-22 × 4-6 μm). On *Carex arenaria*: *EnP* X 2002, VIII, X 2003 (Fig. 2.3 – 2.4).

According to Ellis and Ellis (1987), species of the genera *Agropyron*, *Cladium*, *Dactylis*, *Deschampsia*, *Festuca, Nardus* and *Carex* are plant hosts of *P. michotii*.

The fungus occurred on *Carex* sp. in the Łęczyńsko-Włodawskie Lake District (Pojezierze Łęczyńsko-Włodawskie) in Poland (Mułenko 1988). *Carex arenaria* is its new host in Poland.

Phyllosticta caricis (Fckl.) Sacc.

Pycnidia 50-75 μm in diam., ostolium – 15 μm in diam. Conidia 3.5-5 × 2 μm. The pycnidium diameter and conidial dimensions of *P. caricis* are convergent with those given by Brandenburger (1985; pycnidia ca. 65 μm in diam., conidia 4 × 1.5 μm). On *Carex arenaria*: *EA* V 2001, *HJl* VI-VIII 2001; on *C. acutiformis*: *RnA* X 2001; on *C. pseudocyperus*: *RnA* X 2001.

Phyllosticta caricis was observed only in the Białowieża National Park on *C. pilosa* in Poland (Mułenko 1996; Mułenko and Chlebicki 1992). *Carex arenaria*, *C. acutiformis* and *C. pseudocyperus* are its new hosts in Poland.

Septoria caricicola Sacc.

Pycnidia 150 μm in diam. Conidia 37.5-40 × 4-4.5 μm, 4-6-septate. Conidial dimensions of *S. caricicola* are within the range given by Ellis and Ellis (1987; 35-55 × 4 μm) and by Brandenburger [1985; (20) 26-50 (65) × (2) 3-4(4.5)]. The number of septa in the conidia differed from that given by Ellis and Ellis (1987; 6-8 septa (mostly 7) but was within the range given by Brandenburger (1987; 4-9 cells). On *Carex arenaria HJl* IX 2001; on *C. acutiformis*: meadow IX 2001.

According to Ellis and Ellis (1987), *C. riparia* is a plant host of *S. caricicola* apart from *C. acutiformis*. *Carex arenaria* is its new host.

Septoria caricicola occurs in Europe, the US and Asia (Farr et al. 1989). In Poland, it was recorded only in the Mazurian Lake District (Pojezierze Mazurskie; on *C. riparia*; Durska 1974) and in meadows between the towns of Nakło and Ujście (on *C. gracilis*; Michalski 1982). *Carex arenaria* and *C. acutiformis* are new hosts of *S. caricicola*.

Septoria caricis Pass.

Pycnidia 80-100 μm in diam. Conidia 30-42.5 × 2.5 μm, 1-septate. Conidial dimensions of *S. caricis* in the material collected in the SNP were greater than those given by Ellis and Ellis (1987; 20-35 × 2.5-3 μm) but were within the range given by Brandenburger (1985; 22-40(45) × 2-3 μm). The number of septa was consistent with that given by both authors. on *Carex acutiformis*: meadow VII 2001; on *C. arenaria*: *EnP* X 2002, *HJl* VI 2003; on *C. elata*: *EnP* VII 2001; on *C. pseudocyperus*: *RnA* VII 2001.

According to Ellis and Ellis (1987), *C. paniculata* and *C. pendula* may also be hosts of *S. caricis* apart from *C. arenaria*. *Carex acutiformis*, *C. elata* and *C. pseudocyperus* are new hosts of this fungus.

Septoria caricis was recorded in the US, Europe and Asia (Farr et al. 1989). It was observed only on *C. pilosa* in the Białowieża National Park in Poland (Mułenko 1996; Mułenko and Chlebicki 1992). *Carex acutiformis*, *C. arenaria*, *C. elata* and *C. pseudocyperus* are its new hosts.

Stagonospora caricis (Oud.) Sacc.

Pycnidia 150-160 μm in diam. Conidia 37-50 × 5 μm, 5-7-septate (mostly 7). The conidial length of *S. caricis* in the material collected in the SNP was slightly greater than that given by Ellis and Ellis (1987; 25-45 × 5-7 μm) and by Sutton (1980; 25-45 × 4-8 μm). The number of septa was within the range given by both authors; conidia 7-septate, and not 5-septate, as given by both authors, dominated in the material collected in the SNP. It is most probably caused by the variability of the fungus or it may suggest that the fungus found in the SNP belongs to a different species. Molecular examinations, however, should be conducted to confirm this. On *C.*

acutiformis: meadow IX-X 2001, *RnA* X 2001; on *Carex arenaria*: *EnP* VI 2001 (Fig. 2.5 – 2.6).

According to Ellis and Ellis (1987), *C. otrubae* and *C. pseudocyperus* are also plant hosts of *S. caricis*.

Stagonospora caricis occurs in the US and Europe (Farr et al. 1989). It was observed only in the Białowieża National Park on *C. pilosa* and *C. remota* in Poland (Mułenko 1996). *Carex acutiformis* and *C. arenaria* are new hosts of *S. caricis* found in Poland.

Acknowledgement: The article was completed as part of studies financed by the State Committee for Scientific Research, grant nº 3 PO4 017 23.

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Nowe dla Polski gatunki grzybów na roślinach z rodzajów *Carex* i *Juncus*

Streszczenie

W trakcie badań prowadzonych na terenie Słowińskiego Parku Narodowego znaleziono 12 gatunków grzybów zasiedlających rośliny z rodzaju *Carex* i 6 na roślinach z rodzaju *Juncus*. Zidentyfikowano 6 gatunków nowych dla Polski (*Leptosphaeria juncina, Lophodermium caricinum*, *Septoriella junci*, *Stagonospora innumerosa*, *S. junciseda* i *S. vitensis*), a 5 innych gatunków znaleziono na nowych roślinach żywicielskich.