Oenothera coronifera, a new alien species for the Czech flora, and *Oenothera stricta*, recorded again after nearly two centuries

Oenothera coronifera, nový zavlečený druh české flóry, a první nález *Oenothera stricta* po dvou stoletích

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Two species of the North American genus *Oenothera* are reported as aliens in the Czech Republic. A population of *O. coronifera* consisting of ca. 30 plants at various phenological stages, from rosettes to flowering plants, was found in 2001 at the railway station in the town of Zliv, district of České Budějovice, S Bohemia. The species was probably introduced via the railway and is the first record of this species for the Czech Republic. A single plant of *O. stricta*, previously reported from the bank of the Vltava river in Prague, in 1825, was found as a weed in a private garden in the village of Vroutek, district of Louny, N Bohemia, in 2000. This is the second record of this species from the Czech Republic in 175 years. The seed of *O. stricta* was probably introduced to the site from abroad and the record suggests that the occurrence of casual alien plants is highly unpredictable. It is argued that botanists studying alien plants, given their special interest in sites where these plants occur, may directly contribute to the enrichment of checklists of national alien floras.

K e y w o r d s : Alien plants, casual occurrence, *Oenothera*, *Onagraceae*, new record, Czech Republic

Introduction

Research on alien plants in the Czech Republic started in the 1960s, when the field was put on a solid footing by the founding of a specialized research section devoted to alien plants in the Institute of Botany, Průhonice (Pyšek & Prach 2003). Interest in the taxonomy and distribution of alien plants, as well as their ecology and impact, developed during this period and continues to thrive (Hejný et al. 1973, Jehlík 1998, see Pyšek et al. 2002b and references therein). Modern research in this field has focused on the biology and ecology of major invasive species (see Pyšek & Prach 2003 for an overview of topics and references) and analyses of alien species in various habitats (Pyšek et al. 2002a, 2003a, b). However, the floristic research remains an essential aspect of the field and new species are regularly reported (Chrtek & Skočdopolová 2002, Dančák 2002, Petřík 2003, Šída 2003). Recently, a checklist of the alien plants of the Czech Republic was published, listing 1378 taxa, which make up 33.4% of the total flora (Pyšek et al. 2002b).

The genus *Oenothera* (*Onagraceae*) in Europe is represented by a number of alien species (Jehlík 1997) and as such has a special appeal for both taxonomists and amateur botanists interested in floristics. The genus is native to Central, North and South Americas, with a number of species now naturalized worldwide (Dietrich et al. 1997) and approxi-

mately 70 reported from Europe. The majority of invasive primrose species are biennial (Mihulka & Pyšek 2001). *Oenothera* flowers are insect-pollinated or facultatively self-pollinated. Seeds of some species may remain viable in the soil for up to 80 years (Darlington & Steinbauer 1961). Chromosomes of some *Oenothera* species are arranged in a specific pattern of rings, which are passed from generation to generation without any recombination. These species are complete translocation heterozygotes, which mostly breed true, because of a balanced lethal system, self-pollination and hybridization with a high survival rate (Cleland 1972, Hall et al. 1988). Consequently, there are populations consisting of many different but in fact continuous genotypes, each of which is an inbreeding line (Steiner & Levin 1977). Each of the two sets of chromosomes of these species produces a distinct and contrasting phenotype. This mechanism, called PTH (permanent translocation heterozygosity) syndrome, contributes to the species diversity within the genus, which in turn increases its attractivenes from the floristic point of view.

Recent national literature on this genus includes comparative ecological studies (Mihulka et al. 2003) and reports of new species previously unknown from the Czech Republic (Chrtek & Skočdopolová 2001). The species dealt with in this paper, i.e. *Oenothera coronifera* and *O. stricta*, are listed in the recent Catalogue of alien plants of the Czech Republic (Pyšek et al. 2002b); here we present a more detailed information on their distribution, ecology and occurrence here.

Oenothera coronifera Renner Planta 47: 239, 1956.

Oenothera coronifera (subgen. *Oenothera*) is a biennial with a 0.8–1.8 m tall erect stem. Stem and rhachis with red bulbous-based hairs; leaves wide lanceolate, dark green, with red central vein. Flower buds with red-striped calyx lobes up to 6 mm; calyx tube (30) 35–40 mm. Petals 30–35 mm, yellow, as wide as long or slightly wider. Young capsules with simple pointed hairs and glandular hairs. Capsules on top with obvious, up to 3 mm long teeth, forming a small corona on the top of the fruit (Haeupler & Muer 2000) (Fig. 1).

In mid September 2001, plants of the genus *Oenothera* were found by S. M. in the town of Zliv, district of České Budějovice, S Bohemia (49°03' N, 14°21' E). The locality is along a fence on ruderal site at the periphery of the railway station area close to a walkway to the Zliv town centre. The plants grew on a disturbed sunny site amongst railway rubbish, together with two other *Oenothera* species (*O. isslerii* and *O. biennis*), *Artemisia vulgaris*, *Centaurea stoebe*, *Poa compressa*, and other species. The population covered ca. 5 × 3 m and consisted of about 30 plants in various stages of growth, i.e. rosettes of various sizes and flowering individuals. The plants differed from the other two *Oenothera* species present. Their rosette leaves were markedly longer than those of *O. issleri* and *O. biennis*; flowering individuals were distinctly taller, with longer branches and much larger flowers. The most striking traits of these plants were their size, colour, shape and the compactness of fruit together with an abundance of seed of a slightly different shape. They resembled *O. glazioviana* (= *O. erythrosepala*), but differed from this species in having styles of approximately the same length as the sepals, and in the size and compactness of the fruit. The locality was visited again in mid September 2002 when the *O. coronifera* was still present, covering a larger area (10 × 5 m) and consisting of about 100 plants in various stages of growth.

Fig. 1. – Herbarium specimen of *Oenothera coronifera*. Zliv, S Bohemia, leg. S. Mihulka, IX 2001 (see text for details).

Fig. 2. – Herbarium specimen of *Oenothera stricta*. Vroutek, distr. Louny, N Bohemia. Leg. A. Pyšek & P. Pyšek, 2000 (see text for details).

The plant was determined by V. Tokhtar, Donetsk Botanical Gardens, Ukrainian Academy of Sciences, Ukraine. An herbarium specimen is deposited at PRA.

Oenothera coronifera probably originated in Europe. Previously, it was reported from Germany and Austria (Haeupler & Muer 2000, Essl & Rabitsch 2002).

Oenothera stricta Ledeb. Mém. Acad. Sci. St.-Pétersb. 8: 315, 1822

Oenothera stricta [subgen. *Raimannia* (Rose) Munz] is an erect to ascending annual or biennial, with a 0.35–1.00 m tall, erect or decumbent stem, pubescent bellow, villous and glandular-pubescent above. Leaves lanceolate, acute, flat or slightly undulate at margins. Buds green or reddish with divergent sepal tips. Petals 15–35 mm, broadly obovate, yellow. Capsule 30–50 mm long, shortly villous, enlarged in upper half. Seeds 1.0–3.8 mm (Rostanski 1990, Jehlík 1997; Fig. 2). It does not hybridize with other *Oenothera* species (Preston et al. 2002).

In 2000, a single plant was found by A. P. and P. P. growing as a weed in a garden bed at Husova 342, Vroutek, district of Louny, N Bohemia (50°10' N, 13°22' E). The plant set seed but it was not found in the following years. It was determined by W. L. Wagner, National Museum of Natural History, Washington, D.C., USA. An herbarium specimen is deposited at PRA.

The species is native to temperate South America (Chile, Argentina; Mihulka & Pyšek 2001, Preston et al. 2002) and probably originated as a complex heterozygote hybrid between *O. odorata* and *O. ravenii* (Dietrich 1977). It was never planted in the Czech Republic. It was reported in 1825 growing on the banks of the Vltava river in Prague (Knaf, PR – see Jehlík 1997 and Jehlík & Rostanski 1979: 384 for the distribution map). The present record is the first for the Czech Republic for 175 years.

The species has been introduced to western and central Europe. In Portugal, it is invasive and the most abundant primrose species reported by the end of 1970s from 35 localities (Rostanski 1991). It is reported growing on the banks of streams in Austria, where it was unintentionally introduced and occurs as a casual alien (Essl & Rabitsch 2002). In the United Kingdom, it is as a wool alien and garden escape, and has naturalized and is sometimes abundant on dunes in southern England, Wales and the Channel Islands (Clement & Foster 1994, Rostanski 1982). It was first cultivated in Britain in 1790 and found in the wild in the Channel Islands in 1847 and in Britain in 1852. So far it is reported from 91 mapping squares, 54 of them in 1987–1999. It forms well naturalized colonies near the sea but usually only occurs as a casual plant inland (Preston et al. 2002). In Europe, it is further reported from France, Italy, Madeira, Spain, Germany, and the European part of Russia (Moscow) (Dietrich 1977).

Outside Europe, it has been reported from Mexico (Dietrich 1977) and the United States (see Kartesz & Meacham 1999 for the distribution map) where it is an alien in California (Hickman 1993) and the Hawaiian Islands (Wagner et al. 1990). In South America, it has been introduced to Ecuador and Peru (Dietrich 1977).

It is reported from New Zealand and considered an environmental weed in Victoria, Australia; in Tasmania, it self seeds but is not a weed. In Asia it occurs in Japan, Pakistan, India, Sri Lanka and Java. In South Africa, it invades grasslands, coastal vegetation,

fynbos and semideserts (Frean et al. 1997). It is also recorded from Libya, Egypt, Zimbabwe and Mozambique (Dietrich 1977).

Discussion

There are 24 representatives of the genus *Oenothera* in the Czech flora, of which only *O. biennis*[1] is considered invasive and another five species as naturalized (*O. depressa*, *O. fallax*, *O. glazioviana*, *O. pycnocarpa*, *O. rubricaulis*). The remaining 18 species, including the two reported in this paper, occur as casual aliens (Pyšek et al. 2002b). The ability of species of this genus to germinate fast in the light is the main determinant of their success as invasive species (Mihulka et al. 2003).

That *O. coronifera* was introduced via the railway track is a plausible explanation. *Oenothera* species typically occur in this kind of habitat and *O. coronifera* is reported from neighbouring Austria (Essl & Rabitsch 2002) the border of which is 47 km (75 km by railway) from the locality reported in this paper. Although other modes of introduction cannot be excluded, this one seems most probable given that there are no records of this species being planted in the Czech Republic.

O. stricta, a species characteristic of regions with a Mediterranean climate, is rather common in Portugal and the UK (Rostanski 1982, Preston et al. 2002). This species seems to be tolerant of a relatively wide range of ecological conditions and invades coastal countries with a high mean annual temperature and high minimum monthly temperature (Mihulka & Pyšek 2001). In the Czech Republic, the most probable explanation of its isolated occurrence in a little village is that the seed was unintentionally brought to the private residence of A. P. after an excursion to a botanically attractive locality abroad. This hypothesis raises an interesting chorological issue, to our knowledge not previously discussed in floristic literature on alien plants, i.e. how botanists studying these plants could contribute to their spread. In the case of alien plants that occur in disturbed human-made sites (Pyšek et al. 1998) it is obvious that general public visit such places significantly less frequently than botanists with special interest in ruderal plants. As a consequence, the role of botanists in translocating diaspores to distant areas could be important. Moreover, if a diaspore is unintentionally translocated by a botanist and completes its life cycle close to where the person lives there is a much higher chance of it being noticed and identified. These two aspects, i.e. increased probability of introduction and recording, indicate that botanists interested in alien plants might contribute to the enrichment of local species lists more than previously realized. On the other hand, there is evidence in national herbaria that botanists often destroy a single alien plant found in a locality and prevent it from setting seed; it cannot be excluded that this might have prevented some species from becoming established (Pyšek et al. 2002b).

The role of accidental events in the enrichment of alien floras can be demonstrated by another story concerning the Czech flora. In 1967, a number of wool aliens were recorded in wool-processing factory waste used as a garden fertilizer (Dvořák & Kühn 1966). For 29 species, it represented the only record in the Czech Republic and these species probably went extinct immediately after being recorded. This illustrates the high level of uncertainty in the recording of plant invasions. Had the authors (Dvořák & Kühn 1966) not been

[1] See Pyšek et al. (2002b) for authors' names and Jehlík (1997) for nomenclatural details

given a note from an employee of the factory, these species, representing 2.8% of the neophytes reported from the country (Pyšek et al. 2002b), might not have been recorded.

The find reported here, the second after 175 years and also of a a single plant, illustrates the dynamics of casual occurrence of some alien plants. The occurrence of these aliens is highly unpredictable because they are not capable of surviving outside cultivation and are directly dependent on human intervention, be it intentional or not (Richardson et al. 2000). The interval between the finds, spanning almost two centuries, indicates how careful botanists working with alien plants should be when using the term "extinct". In the Czech flora, 231 casual aliens are considered to belong to this category (i.e. if not recorded for a long period) and make up 28.3% of the total number of casual aliens (Pyšek et al. 2002b). In fact, this value is a conservative one because we do not know how many casuals escape from cultivation; what is recorded in checklists of alien floras might be only "the tip of an iceberg". Unfortunately, hard data for estimating how big a tip and how large an iceberg is missing.

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Souhrn

Práce přináší informaci o dvou nálezech druhů rodu *Oenothera* v České republice. *O. coronifera* byla nalezena roku 2001 na nádraží ve Zlivi u Českých Budějovic; populaci tvořilo asi 30 rostlin v různém fenologickém stádiu včetně kvetoucích. O rok později již populaci tvořilo přibližně 100 rostlin. Druh nebyl dosud z území České republiky udáván; pravděpodobně byl zavlečen po železnici ze sousedního Rakouska, kde roste. Druhý nález se týká druhu *O. stricta*, kdysi jedenkrát udávaného z břehu Vltavy v Praze v roce 1825. V roce 2000 byl nalezen jediný exemplář rostoucí jako plevel na záhonu usedlosti v Husově ulici č. 342 ve Vroutku, okr. Louny. V tomto případě není vyloučeno neúmyslné zavlečení semen z ruderálních, botanicky atraktivních lokalit v zahraničí (např. Anglie, Rakousko) kde se tento druh vyskytuje.

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