NOBANIS – Invasive Alien Species Fact Sheet

Mimulus guttatus

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Species description

Scientific names: *Mimulus guttatus* DC. 1813, Phrymaceae (Scrophulariaceae)
Synonyms: *M. luteus* auct. - non L. 1763; *M. arvensis* Greene; *M. bakeri* Gandog.; *M. brachystylis* Edwin; *M. clementinus* Greene; *M. cordatus* Greene; *M. cuspidata* Greene; *M. decorus* (A.L. Grant) Suksdorf; *M. equinnus* Greene; *M. glabratus* Kunth var. *ascendens* Gray; *M. glareosus* Greene; *M. grandiflorus* J.T. Howell; *M. grandis* (Greene) Heller; *M. guttatus* ssp. *arenicola* Pennell; *M. guttatus* ssp. *arvensis* (Greene) Munz; *M. guttatus* ssp. *haidensis* Calder & Taylor; *M. guttatus* ssp. *litoralis* Pennell; *M. guttatus* ssp. *micranthus* (Heller) Munz; *M. guttatus* ssp. *scouleri* (Hook.) Pennell; *M. guttatus* var. *arvensis* (Greene) A.L. Grant; *M. guttatus* var. *decorus* A.L. Grant; *M. guttatus* var. *depauperatus* (Gray) A.L. Grant; *M. guttatus* var. *gracilis* (Gray) Campbell; *M. guttatus* var. *grandis* Greene; *M. guttatus* var. *hallii* (Greene) A.L. Grant; *M. guttatus* var. *insignis* Greene; *M. guttatus* var. *laxus* (Pennell ex M.E. Peck) M.E. Peck; *M. guttatus* var. *lyratus* (Benth.) Pennell ex M.E. Peck; *M. guttatus* var. *microphyllus* (Benth.) Pennell ex M.E. Peck; *M. guttatus* var. *nasutus* (Greene) Jepson; *M. guttatus* var. *puberulus* (Greene ex Rydb.) A.L. Grant; *M. hallii* Greene; *M. hirsutus* J.T. Howell; *M. langsdorfii* Donn ex Greene; *M. langsdorfii* var. *argutus* Greene; *M. langsdorfii* var. *arvensis* (Greene) Jepson; *M. langsdorfii* var. *californicus* Jepson; *M. langsdorfii* var. *grandis* (Greene) Greene; *M. langsdorfii* var. *guttatus* (Fisch. ex DC.) Jepson; *M. langsdorfii* var. *insignis* (Greene) A.L. Grant; *M. langsdorfii* var. *microphyllus* (Benth.) A. Nels. & J.F. Macbr.; *M. langsdorfii* var. *minimus* Henry; *M. langsdorfii* var. *nasutus* (Greene) Jepson; *M. langsdorfii* var. *platyphyllus* Greene; *M. laxus* Pennell ex M.E. Peck; *M. longulus* Greene; *M. luteus* L. var. *depauperatus* Gray; *M. luteus* var. *gracilis* Gray; *M. lyratus* Benth.; *M. maguirei* Pennell; *M. marmoratus* Greene; *M. micranthus* Heller; *M. microphyllus* Benth.; *M. nasutus* Greene; *M. nasutus* var. *micranthus* (Heller) A.L. Grant; *M. paniculatus* Greene; *M. pardalis* Pennell; *M. parishii* Gandog. - non Greene; *M. petiolaris* Greene; *M. prionophyllus* Greene; *M. procerus* Greene; *M. puberulus* Greene ex Rydb.; *M. puncticalyx* Gandog.; *M. rivularis* Nutt.; *M. scouleri* Hook.; *M. subreniformis* Greene; *M. tenellus* Nutt. ex Gray; *M. thermalis* A. Nels.; *M. unimaculatus* Pennell.

Common names: Monkeyflower (GB), Seep monkeyflower (USA), Gelbe Gauklerblume, Gefleckte Gauklerblume (DE), åben abeblomst (DK), kollane pärdiklill (EE), täpläapinankukka (FI), Apablóm (IS), rasotasis puikūnas, geldonžiedis puikūnas (LT), Lāsainā pērtiķmutīte (LV), Gele maskerbloem (NL), gjøglerblom (NO), kroplik żółty (PL), губастик крапчатый (RU), gyckelblomma (SE).

Fig. 1 and 2. *Mimulus guttatus*, photos by Barbara Tokarska-Guzik and Zygmunt Dajdok.

Fig. 3. *Mimulus guttatus*, photo by Barbara Tokarska-Guzik.

Species identification

Mimulus guttatus is described as an annual to perennial herb inside its natural range, about 30-60 (90) cm high, with leafy stolons. The plant consists of an erect to ascending stem with opposite leaves, glabrous below, densely glandular-pubescent above (Fig. 1, 3). Flowers are with well-defined upper and lower lips, corolla 2.5-4.5 cm, brightly yellow with red spots on throat and

densely glandular-pubescent (Fig. 2). The throat of the corolla is closed by 2 boss-like swellings on lower lip (Stace 1997, Rutkowski 1998).

The species was described on the basis of a plant specimen grown from a seed collection from the Aleutian Islands (Unalaska). An isotype of *M. guttatus* is preserved in the Herbarium of the Komarov Botanical Institute. The description of the species was published for the first time by Fischer in 1812 without mentioning its locality. In the same year a drawing of the species was published in London as *M. luteus* L. together with a note that seeds of the plant were collected by Langsdorff in the Unalaska Island. Apparently, Langsdorff collected seeds of this plant during his voyage in 1805 to the Marguis Island (1804-1808). In 1813 De Candolle published the description of this species and acknowledged Fischer's authority without citing his reference nor mentioning the source of the seeds from which the plant was raised (Fedorov 2001).

Native range
The species is native to the western North America from Alaska to northern Mexico, with an eastern limit in Montana and South Dakota (Hegi 1965, Meusel *et al*. 1978, Hultén and Fries 1986). For distribution see also USDAs Natural Resources Conservation Service "Plants Source and Reference Profile".

Alien distribution

History of introduction and geographical spread
In Europe, especially Western Europe, a number of species from the *Mimulus* genus were grown, including *M. guttatus* (Stace 1997, Tokarska-Guzik 2005). It is prone to straying into the 'wild'. In some areas of Europe it has become naturalised and forms a part of natural communities (Piękoś 1972, Stace 1997, Kwiatkowski 2003). The first 'wild' populations in Europe were recorded in 1824 (Lohmeyer and Sukopp 1992, Preston et al. 2002), 1847 (Balogh *et al*. 2001) and in 1853 (Pyšek *et al.* 2002). In recent years, it has first been recorded on the Raba River and Dubai in the western part of Hungary (Balogh *et al*. 2001).

In Poland this species is also grown in some regions (especially in the west) and it strayed from there into the 'wild' (Tokarska-Guzik 2005). The oldest occurrence was recorded from the Sudeten Mts. This is, at the same time, the oldest registered date of the occurrence of this species in Europe (although it was dispersed in cultivation at that time in other parts of Europe, *e.g.* in the British Isles). In the Sudeten Mts. it started its occupation of new stations in the second half of the 19th century. At the same period it was recorded in Pomerania and Mazovia where it was probably introduced accidentally (or intentionally) from Germany. In Poland, the history of the dispersion of this species was investigated by Piękoś (1972) who recorded the occurrence of this species at 112 stations. At present it occurs most often in Lower Silesia and Pomerania. To date it has been recorded in 326 stations in 128 ATPOL squares – *Distribution Atlas of Vascular Plants in Poland* (Tokarska-Guzik 2001, 2005). The species is gradually increasing the number of stations where it is found, mostly in regions of previous concentrations (Fig. 4). Rapid expansion of this species has been noted particularly in the Karkonosze Mts. (Fabiszewski 1985 a, b, Fabiszewski and Kwiatkowski 2001, Kwiatkowski 2003). In Poland, *M. moschatus* Douglas ex Lindl. also occurs, but as a rare plant and until now it has been recorded only from a few localities (Zając *et al*. 1998, Tokarska-Guzik 2001, 2005; Mirek *et al*. 2002). For a documentation of the spread in Poland see Fig. 4.

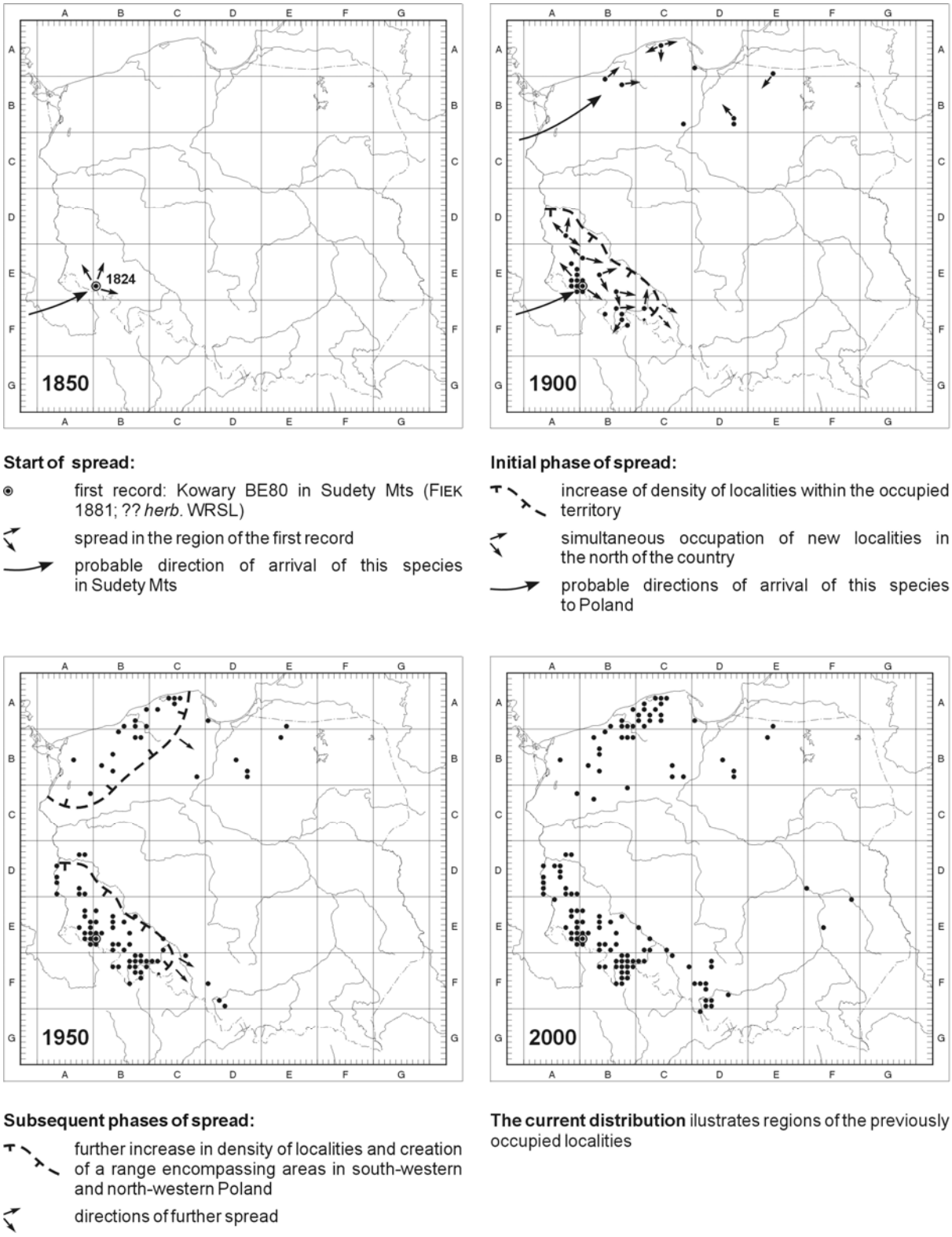

Fig. 4. Recorded history of the spread of *Mimulus guttatus* in Poland (1850, 1900, 1950, and 2000) after Tokarska-Guzik 2005.

In neighbouring Lithuania it has been recorded since 1900 (Kuusk *et al.* 1996, Latvijas daba). It is currently spreading along the Neris and Nemunas Rivers (Gudžinskas 1998).
In Estonia the species escaped from Tartu Botanical Garden, where it was introduced in 1814 (http://eelis.ic.envir.ee/voorliigid). The species was observed as escaped for the first time in Estonia

in 1901, and in Latvia in 1900. The species is recognised as naturalised and grows mainly on river banks (Malle Leht, pers. comm.).
In Germany it has been introduced as an ornamental plant and the first records from the wild date from 1830. Today, it is common in many parts of the country (see distribution map) and it seems to spread continuously.
In Sweden *M. guttatus* was first recorded as growing in the wild in 1846 (Hylander 1971). Today it is found scattered throughout the entire country from Skåne in the south to Norrbotten in the north (Naturhistoriska Riksmuseet 2005).
The species was first recorded in Denmark at Viborg in 1855. The main Danish distribution area is in central Jutland and there are only a few records on the islands (Pedersen 1963).
Mimulus guttatus (or probably rather *Mimulus* (*cupreus* x *nummularius*) x *guttatus*) has been in cultivation as an ornamental plant in Iceland, at least since early in the 20th century. It has escaped from cultivation and is growing wild along streams in about 10 locations in different regions of the country, where it was first noticed in 1961 (Davíðsson 1967).
In Norway three *Mimulus* species (*M. guttatus, M. luteus* L. and *M. moschatus* Douglas ex Lindl.), as well as hybrid complexes between these three species (including *M.* x *robertsii* Silverside), have been used as garden ornamentals. *M. guttatus* has been naturalised along watercourses and in ditches in a few localities, ranging from SE Norway, with scattered localities along the west coast, and with northern outliers up to Tromsø and Kautokeino. The herbarium material indicates that *M. luteus* in Norway has more naturalised localities than *M. guttatus*, while *M. moschatus* has only been recorded in a ruderal place once. *M. luteus* (or hybrids) has been recorded as naturalised up to 700 m a.s.l. in Central Norway (Lid and Lid 2005).

Pathways of introduction
Mimulus guttatus has been introduced as an ornamental plant (intended introduction). Therefore, garden shops can be considered to have favoured the invasion of *Mimulus guttatus* in some parts of Europe. The species is now spreading along streams and water courses.

Alien status in region
The species now occurs in western and central Europe; mainly the British Isles, northern France, the Netherlands, Germany, Switzerland, Poland, and in some areas of northern and eastern Europe; Iceland, Scandinavia, Estonia, Latvia, Lithuania and the European part of Russia. For the alien status in different countries of the NOBANIS region see Table 1.

Country	Not found	Not established	Rare	Local	Common	Very common	Not known
Austria					X		
Belgium				X			
Czech republic				X			
Denmark				X			
Estonia			X				
Finland			X				
Faroe Islands			X				
Germany					X		
Greenland							X
Iceland			X				
Ireland				X			
Latvia			X				
Lithuania				X			
Netherlands				X			
Norway				X			
Poland				X			
Sweden			X				

Table 1. The frequency and establishment of *Mimulus guttatus*, please refer also to the information provided for this species at www.nobanis.org/search.asp. Legend for this table: **Not found** - The species is not found in the country; **Not established** - The species has not formed self-reproducing populations (but is found as a casual or incidental species); **Rare** - Few sites where it is found in the country; **Local** - Locally abundant, many individuals in some areas of the country; **Common** - Many sites in the country; **Very common** - Many sites and many individuals; **Not known** - No information was available.

Ecology

Habitat description

In its native region *Mimulus guttatus* colonises stream banks and other wet places from the Pacific Coast and up to alpine meadows. It is known to tolerate a wide range of substrates, including barren serpentine and even toxic soils contaminated by copper mines.

In its alien range in Central Europe (*e.g.* Poland and Germany) and also locally in North Europe (*e.g.* Sweden and Denmark) *M. guttatus* grows on banks of streams, rivers and lakes, as well as along ditches and roads, and also in wet pastures; rarely in ruderal habitats.

In Poland it is considered as a characteristic species of the association *Sparganio-Glycerietum fluitantis* (Matuszkiewicz 2001). Kwiatkowski (2003) described for the first time for Poland the association *Veronico beccabungae-Mimuletum guttati* as a member of the alliance *Sparganio-Glycerion fluitantis*.

Fig. 5 and 6. In Poland *Mimulus guttatus* occurs sporadically in pastures (*e.g.* Słowiński National Park), whereas on riverbanks it can dominate and compete with other invasive species *e.g. Impatiens glandulifera* (Sudeten Mts.). Photos by Zygmunt Dajdok.

Sometimes the species occurs in phytocoenoses of other communities of the classes *Phragmitetea* and *Isoëto-Nanojuncetea* (Kucharski 1992). In some parts of Sudeten Mts. (e.g. in Kamienne Mts.) *M. guttaus* can be found in the neighborhood of springs (Fig. 7) poor in calcium carbonate, in vegetation of the class *Montio-Cardaminetea* (Zygmunt Dajdok and Zygmunt Kącki, pers. comm.). It has also been observed in pasture communities of the alliance *Cynosurion* but only, as in Germany, in wet places/spots.

Fig. 7. *Mimulus guttatus* in patches of vegetation surrounding springs in Kamienne Mts., photo by Zygmunt Dajdok

Reproduction and life cycle
Mimulus guttatus flowers from June to October according to reports from Poland (Rutkowski 1998, also *personal observation*). This is comparable to the recorded flowering period in Norway (Lid and Lid 2005) and Denmark (P. Wind, pres. comm.). In Estonia, Latvia and Lithuania it flowers from June to August, sometimes also in September (Malle Leht, pers. comm.). For Sweden and Iceland its flowering period is from July to August.
The plant reproduces generatively by a large quantity of minute seeds dispersed by wind and water and also vegetatively by clonal reproduction (Stace 1997, Tokarska-Guzik 2005, Truscott et al. 2006).

Dispersal and spread
Wind and water seem to be major vectors for dispersal. In some cases seeds can be dispersed by wading water birds, because some isolated populations in Lithuania occur in springs, surrounded by forests (Zigmantas Gudžinskas, pers. obs.).

Impact

Affected habitats and indigenous organisms
Mimulus guttatus invades banks of streams, rivers and lakes, and it is able to colonize wet roadsides and adjacent areas. Within borders of protected areas in Poland, the biggest population is known from Karkonoski National Park, where it is common along streams and ditches. The area of the species occupancy has increased due to forest cutting and formation of meadows (Fabiszewski 1985a). A much smaller population has been noticed in Słowiński National Park, where *M. guttatus* grows on the banks of Łupawa River and in rushes and pastures along that river (Zygmunt Dajdok and Zygmunt Kącki, pers. comm.). Negative effects on native plants can be caused by dense patches of *M. guttatus*. First of all they can affect species composition and structure of phytocoenoses that belong to alliance *Sparganio-Glycerion fluitantis* and class *Bidentetea tripartiti*. Vegetation of the class *Montio-Caradmientea* may be also negatively affected, especially communities with *Montia fontana*, which in Poland is classified as a taxon in direct danger of extinction (Sotek *et al*. 2003). That influence may be different from year to year and strongly depends on fluvial processes and abundance of *Mimulus guttatus* individals.

Genetic effects
M. guttatus hybridizes with *Mimulus luteus.* This hybrid is sterile and does not develop seeds (Naturhistoriska Riksmuseet 2005). In Iceland the *Mimulus* that has escaped from cultivation is a hybrid rather than pure *Mimulus guttatus*, probably *Mimulus* (*cupreus* × *nummularius*) × *guttatus* (see also http://www.ni.is/efst/tigurblom.phtml).

Human health effects
No effects have been detected until now.

Economic and societal effects (positive/negative)
The species is used in some parts of Europe as an ornamental plant (mainly in gardens and parks close to the water). No economic effects are reported from Central or Northern Europe (*e.g.* Poland, Germany, Denmark and Norway).
Sometimes *M. guttatus* invades drainage ditches and can cause economic problems (Zigmantas Gudžinskas, pers. obs.).

Management approaches

Prevention methods
As *Mimulus guttatus* is already present in the region and is spread with wind and water (also by humans), prevention of its further dispersal might be partly possible, mainly in regions where it is still not found. Therefore, trading this species as ornamental should be banned.

Eradication, control and monitoring efforts
There is no experience with species-specific control measures. There are so far no monitoring programs for this species in the region (as reported from Denmark, Germany, Iceland, and Poland).

Information and awareness
The species is on the list of alien plant species in Poland (Zając *et al*. 1998; Tokarska-Guzik 2005). It is considered as invasive (but not harmful - according to terminology by Pyšek *et al*. 2004) in some regions of the country, and it has the potential for further spread. Also in Norway the genus *Mimulus* seems to be slowly spreading, although it has not so far been considered as a problematic invasive here. In Germany and in Denmark it is not recognised as invasive, although it has the status as an established plant. *Mimulus guttatus* is on the list of aliens in Estonia, but not invasive (Malle Leht, pers. comm.). In Iceland the species (or a *Mimulus* hybrid) is invasive along ditches and streams.

Knowledge and research
Most of the reports are records of floristic finds or descriptions of extensions in range. The number of detailed ecological case studies in the alien range of its distribution is small. The interesting results of experimental studies on dispersal characteristics of the *M. guttatus* were addressed by Truscott *et al*. (2006). They confirmed that the species exhibits several traits thought to characterize a successful invasive species: a high seed production and high vegetative regeneration ability therefore it is well adapted to the uncertainty of high-flow events. Moreover *M. guttatus* exhibits similar regenerative growth and survival rates compared with another highly successful invasive species.

Recommendations or comments from experts and local communities
A monitoring program is advisable in those parts of the range of *M. guttatus* where the species has begun to exert massive colonisation pressure and especially in protected areas. A monitoring program should focus particularly on competition between *M. guttatus* and native species with a poor competitive capacity.

References and other resources

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Links

Latvijas daba (Nature of Latvia)
Latvian database – on *Mimulus guttatus*
Plant database (United States Department of Agriculture) - on *Mimulus guttatus*
The virtual Flora - on *Mimulus guttatus* (in Swedish)

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