

THE FLORA AND VEGETATION OF GÖDI LÁPRÉT NEAR GÖD, PEST COUNTY, HUNGARY

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The present study is an overview of the vegetation of the Gödi Láprét (meaning the “Fen at Göd”) over the years from 1992 to date. The introduction contains a brief account on the tortuous conservation history of the area in context of the subsequent commercialisation of certain parts of the land. The main botanical merits of the area are the fens and their transition to the adjacent sandy vegetation. Conservationally, the fens are of national significance; the sandy areas are nearly intact in two small patches but otherwise rather degraded. The whole area harbours 33 protected and 2 strictly protected plant species, part of the presently recorded flora of 325.

Key words: flora, Gödi Láprét, nature conservation, protected plant species, vegetation map

INTRODUCTION

The Gödi Láprét came into the frontline of interest in 1986, when a staff member at the Danube Research Station in Göd, Tamásné Ráth, has first drawn attention to the botanical values of the area. In the following year several other botanists surveyed the area and found it botanically outstanding. A local voluntary conservationist organisation in Göd initiated the preservation of the area in a proposal submitted to the Budapest Office of the National Bureau for Environment and Nature. During the negotiation process it was found that the local authorities approved a general development plan of the town and its environs before light came on the remarkable natural values. Meanwhile (in 1987–1988) the Danubial Agricultural Collective Farm ploughed parts of the area’s higher altitudes, despite warning from the National Bureau for Environment and Nature that the preservation process has begun. The leaders of the Collective Farm reckoned well: the National Bureau for Environment and Nature left the case in abeyance. In spite all the happenings Kálmán Ábrahám, under-secretary of

the Ministry of Environment in 1989, declared that “the process of preservation is in good progress” while no further steps were taken. In 1990 Tibor Seregélyes and Ágnes S. Csomós called for a national level protection of the area in a submission that was left unanswered. Again in 1990 and 1991 additional areas were ploughed. In January 1992 Pál Mödlinger advocated local protection that was approved by the council of the local government (decree no. 10/1992. (III. 25.)), which finally meant declaring 24 ha of land under local protection on 25th March 1992 (and 1st April 1992).

Organised by the local Natural Sciences Foundation, Göd, with financial help from the Göncöl Foundation and the local government, the first detailed studies were carried out in 1992 (vegetation mapping, distribution of the protected species with the estimates of their population size, and assessment of the area's geomorphology and hydrology) (SEREGÉLYES 1992). The “*Maintenance and development (action) plan for the Gödi Láprét*” contained all prescribed administrative, treatment and development tasks that would have ensured the future of the area, but as these plans were never put into practice, the chances for preservation remained small.

The proposal for national level protection was submitted by the Natural Sciences Foundation, Göd to the Budapest Office of the National Bureau of Environmental and Nature Protection. In May 1995 the local level protection was extended to include the ploughed areas, which resulted in an enlarged protected land of 53.5 ha. The positive development meant that the whole area was treated as one unit with no part allowed to be privatised. In June 1996 the status of the area accessioned as No. 2052 next to the railway line was changed by the town to permit housing development. (In the years 1996 and 1997 the local government produced two different development plans for the township including the area No. 2052 without asking any permission neither from the Nature Conservation Directory, Budapest, predecessor of the Duna–Ipoly National Park, nor the National Park Directory). 1997 saw the establishment of the Duna–Ipoly National Park with the Gödi Láprét left out. Based on the new act on nature protection which came into force in January 1997 (1996. LIII. Law 23. § 2.) the fen was protected “*ex lege*” on national level thus falling into the competence of the Directorate of the Duna–Ipoly National Park.

About 70 ha of land including the Gödi Láprét was acquired in 1997 by an investor to establish a golf course. The transaction was, seemingly,

in accordance with the existing general development plans of the town that contained areas set aside for sport and leisure activities. The plans of the landowner, however, included the construction of a hotel that expressed a very different conception. As it turned out later the conservation status of the area was not even assigned in the property register. When in March 1998 the excavation machinery begun working in the area the Natural Sciences Foundation, Göd has warned the Directorate of the Duna–Ipoly National Park that major protected natural values were at risk. Following an immediate inspection by the director of the Duna–Ipoly National Park it was declared that the case must be taken to court, after which the land owner closed down the work. It turned out that the works were started on the basis of a completely superficial and not well considered plan which if implemented would have meant the complete destruction of the area.

However, the construction of the golf course was not only supported by the council of the local government of Göd, but also by the majority of inhabitants of the township. The director of the Duna–Ipoly National Park was thus approached by the main architect of the Mayor's Office. This resulted in an agreement that tied the fate of the golf course to the preparation of an environmental impact study as required by law.

In the impact study Tibor Seregélyes (SEREGÉLYES and S. CSOMÓS 1998) worked out a scenario that builds on compromise between the interests of the landowner and the nature conservation with a prospect of sacrificing 5–10% loss of natural values during the construction of the golf course but keeping the rest of the area well protected. The plan separated three categories of land based on the significance of natural merits: the most valuable, so called “taboo” areas had to remain intact; the “medium category” or “compromise” parts; and the least valuable (*e.g.* ploughed) areas that were readily usable for the #18 section of the golf course. (Finally, the sections #1 to #17 are found on locally protected “compromise” land, while the #18 partly falls on “taboo” land protected at national level because of the relatively small total area available for the golf course). These plans also required rendering habitat reconstruction which would include, among others, keeping back *Phragmites australis* from the fens by regular scything and the creation of new habitat types for the enhancement of biodiversity (*e.g.* lake, lakeside paddle surface). According to the agreement scheme the costs of the conservation management would fall upon the

owner – and later the owner signed a statement in which he undertook the implementation of the conservation treatments.

In 1998 and 1999 botanical and conservational investigations were resumed in the area (SZOLLÁT 1999). The Mid-Danubial-valley Environmental Agency issued the environmental licence for the owner, the Pólus-Palace Ltd. in November 1998 to construct the golf course at Göd. In December the separation of the nationally protected fens became possible through the division of the topographical numbers. At the same time, the first instance resolution of the Mid-Danubial-valley Environmental Agency was appealed against by the Göncöl Foundation thereby moving the case to the Inspectorate. The landowner, as well as the local government, intended to release the areas having significant natural values, but not protected at national level (non-fen areas) from local protection. These included “taboo” areas such as a sand-mound in the southern part (top. no. 025/6–7) and part of “compromise” lands in the northwestern area (top. no. 6607/2). The parties started negotiating with the Directorate of the Duna-Ipoly National Park. (These areas remained under local protection to present day. Theoretically, the status of local protection has no significance since according to the law the owner has to preserve the occurring protected species).

The construction of the golf course was continued in 1999. In June the National Inspectorate for Environment and Nature, after the personal interview of Tibor Seregélyes by assistant under-secretary János Tardy about the impact study's assessment, licensed the construction of the golf course. The constructions went on in 2000 and the first conservation treatments (*e.g.* meadow mowing) were also performed that year.

In 2001 the Göncöl Foundation had called for the re-examination of the owner's conservation licence. The Directorate of the Duna-Ipoly National Park did not intervene as the territories under national level protection in its competency were not affected; the proposal thus failed. On the part of the owner the idea of a “panorama lake”, instead of a small one, as part of the habitat reconstruction, as well as the modification of the plans for the golf course section #18 have came up (that is, changes that would have affected more than twice the area in the “taboo” category as was filed in the agreement). However, based on an expert report the Directorate of the Duna-Ipoly National Park has issued licence for the construction of

the “panorama lake”, and the extension of the golf course section #18. The continued construction of the golf course between 2002 and 2005 caused damages in about 5% of the protected area due to inadvertence, the lack of proper inspection by the works management and checking up with the appropriate, mainly conservation, authorities. To isolate the fen from the golf course, several hundreds metre long plastic sheet was laid as prescribed in the agreement, a step crucial in the long-term preservation of the fen. Trenches, as ordered by the plan, had to be about 1.5 m deep and 30–40 cm wide and the laid-in plastic were filled with local cleaned soil, to form a hydrological barrier between the protected land and the fertilised golf course. (As revealed by subsequent inspections the costly laid-in plastic reached only 80 cm deep meaning that it cannot function as planned ...). This same year saw the completion of the hotel and the start of the golf course operations.

The above described efforts, conflicts and the numerous plans which built on compromises around which the professional community was seriously divided in the late 90s, have finally proven successful for the Gödi Láprét. We must be clear about the pressures coming from the location, from the position of this small remnant of semi-natural vegetation surrounded by the residential sections of Göd. Simply the location makes it a luring territory for investors in real estate. It should be remembered: in 1996 after part of a formerly protected area was exempted with a stroke of the pen, a new row of houses was added to the town on the cost of the northernmost part of the fen extending to the brook-side of “Ilka”. Also, around the year 2000 the construction of a new housing estate was started near the area. Based on these events it is almost sure that the fate of the fen would have been sealed very soon. As it seems today, paradox though it may appear, the establishment of the golf course saved the Gödi Láprét from perishing. As the protected area serves well for the golf course as part of the overall landscape, the owner (apart from his obligation to preserve habitats and protected species) does not intend to expand its activity any further.

Study area

The Gödi Láprét is found on the Gödi-lapály (a wet lowland), adjacent to the Pesti-ártér (an inundation plain), within the borders of the larger Pesti-hordaléksík (an alluvial plain). The bedrock is mainly sand-drift originating from river-gravel and redeposited

later. Various semi-consolidated forms of sand dunes, like blowouts, yardangs, longitudinal dunes, characteristic of the Duna-Tisza köze (Danube-Tisza Interfluvium region) and also of the Szentendre Island, can also be recognised in the survey area, although to a lesser extent (PÉCSI *et al.* 1958, KARÁTSZON 1997, Botanikus Bt. *et al.* 1998).

The deeper parts of the Gödi Láprét developed most likely by filling-up with alluvial deposits to the former riverbed or dead-arm of the Danube. The different soil types have developed in correlation of the local geomorphological features. In deeper areas where the water-table is close to the surface, fen soils, meadow soils have developed while different sandy soils are characteristic in the dryer areas (MOLNÁR and SZABÓ 1998). The Ilka stream and a thermal water ditch cross the northern part of the survey area, both running in controlled channels. Their water, as well as the runoff and the undersurface water move westward to the Danube.

The study area is part of the Great Hungarian Plain not only geographically, but also in terms of its phytogeography: it belongs to the *Praematrix* (Duna-Tisza köze) floristical district of the *Eupannonicum* (Great Hungarian Plain) floristical region (SOÓ 1964, PÓCS 1981).

METHODS OF SURVEY

As it was mentioned in the Introduction, the systematic investigation of the area began in 1992. Some of the botanical values of the area have already been known previously, but we could not find previously recorded data on the vegetation of the surveyed area. The vegetation map and the species list were completed during many days of fieldwork in 1992, and the vegetation types have been characterised by general descriptions in a report by SZOLLÁT *et al.* (1992). In 1998 all distinct patches of vegetation (marked by serial numbers) were individually characterised, with special emphasis on the changes that occurred in the composition of the flora and the vegetation since 1992. The descriptions of the vegetation patches are completed with their respective species lists, and with the estimated population size of the protected plants (SZOLLÁT 1999, 2000). (The data of the estimated population size of *Carex davalliana*, *Iris sibirica*, *Schoenus nigricans*, *Stipa borysthena* refers to the clumps of these species). The relative number of the protected plants occurring in the entire area have increased several times since 1992 – with one reason being the legislative revisions and adjustments that occurred for nature conservation in 1993 and 2001. Also, as a result of new findings realised within the area, partly by Ádám Selmeczi Kovács in 1997 (*ex verb.*) a number of protected plants have been added to the already existing lists. While some of these newly recorded species have simply escaped our notice before, others could have appeared in the area while the research period, or their population have gone up from a few specimens in 1992 to a more noticeable number later on. Subsequent changes in the naturalness of the vegetation have been monitored by regular observations since 1998.

In the nomenclature of the species we used FLÓRA database 1.2 (HORVÁTH *et al.* 1995), except in a few cases when we followed SIMON (2000). Other exceptions include the spelling of *sadleriana*, or the taxa of *Molinia*: for these we accept the taxonomy of

TUTIN *et al.* (1980). The nomenclature of phytosociological units follows BORHIDI (2003) and that of the vegetation units DEVILLERS *et al.* (2000). The phytosociological assessment of species follows the works of Soó and Borhidi published in FLÓRA database 1.2 (HORVÁTH *et al.* 1995), while the data in BORHIDI (1993) and of KOVÁCS (1962) were also taken into consideration. To assess the naturalness/degradation status of vegetation we used the revised scale devised by Németh and Seregélyes (BÖLÖNI *et al.* 2003).

RESULTS

Of the *Praematricum* (Duna-Tisza köze) floristical district's natural closed and open sandy grassland vegetation developed on calcareous, loose sandy soils on the low sand hills, our survey area possesses closed (or disturbed, thus open) sandy grasslands, and patches of edaphic vegetation of inter-dune depressions.

The vegetation types of the Gödi Láprét in details are as follows: 1) closed sand meadow-steppe, 2) fragments of open calciphilous sand steppes, 3) more or less degraded sandy grasslands (like open sand steppes, sandy pastures in response to disturbance, and a certain variety of sand steppes with *Centaurea sadleriana*, not recognised and described as a plant community yet). At lower elevations there are 4) reed beds, 5) large sedge beds, 6) rich fens, 7) purple moorgrass meadows and 8) fragments of grey willow scrub. In the border zone of the purple moorgrass meadows and sand meadow-steppes a transitional vegetation type evolved containing various plant compositions of wider or narrower extension depending on the surface gradient. Similar zones with transitional vegetation do also occur on flat places with sinking water table and quickly drying soil.

Among the most remarkable botanical values of the Gödi Láprét nature conservation area are, even at national level, the black bog-rush and blunt-flowered rush fens (including fragments of the davall sedge and tawny sedge fen fragments), and the purple moorgrass meadows. Beds of these plant communities are diminishing in the whole country, while such habitats are also rather rare in Middle Europe. These vegetation units in our survey area are apparently undisturbed and seem especially valuable for their relatively high species diversity. The number of protected species in the fens is relatively low (12 spp.), but of most species the population size is rather large. Of all protected species (35 spp.) occurring in the area (including

the strictly protected *Ophrys sphecodes* and *Colchicum arenarium*), 23 are present in the dry and semi-dry steppes, which is even more remarkable, because these steppe fragments are small and mostly degraded.

Figure 1 is the vegetation map of the surveyed area. In Table 1 the protected species are listed along with their estimated population sizes followed by the full plant record of the Gödi Lápér in the Appendix.

Reed beds and reed invaded fens

Permanently inundated reed beds (*Phragmitetum communis* Soó emend. Schmale) are found in the ponds and drainage ditches. The ditch banks are covered by narrow non-inundated reed beds, occupying the embankments formed by the soil dredged out from the canal beds. In these "terrestrial" reed beds of relatively small extension usually the most common species of marshes (or of wet habitats in general), like *Eupatorium cannabinum*, *Lythrum salicaria*, *Lysimachia vulgaris*, *Carex acutiformis*, *Calystegia sepium*, *Humulus lupulus*, *Solidago canadensis*, etc. associated with the reed.

The overall appearance of another type of the reed beds in the surveyed area at first sight seems to be identical with the "real" ones, but the species composition differs from the reed marshes. In fact, these reed beds formerly were rich fens, which later became invaded and occupied by reed. Most of these plant communities are located on both sides of the thermal water ditch crossing the area, north of the industrial railway track. Both common and rare plant species of the fens can be found in these sites, but too often in vegetative stages and even these show a very poor growth. There are two locally abundant competitor species in terms of social behaviour (BORHIDI 1993) which are more or less resistant to the expansion stress of the reed: *Molinia coerulea* and *Juncus subnodulosus*.

Common species of the rich fens (and partly the purple moorgrass meadows) include *Carex flacca*, *Carex panicea*, *Cirsium canum*, *Serratula tinctoria*, *Succisa pratensis*, *Potentilla erecta*, *Ranunculus acris*, *Sanguisorba officinalis*, *Briza media*, *Mentha aquatica*, *Selinum carvifolia*, *Angelica sylvestris*, *Tetragonolobus maritimus* subsp. *siliquosus*, etc. Beside these some specialist (steno-ecological stress tolerant, BORHIDI 1993) and other environment-sensitive species of the rich fens also occur sporadically, such as *Carex davalliana*, *Carex hostiana*, *Parnassia palustris* and *Schoenus nigricans* as well as *Valeriana dioica* of the purple moorgrass meadows, while *Carex elata* indicates better water supply in the past. (Some parts of the earliest reed-invaded fen beds, now rather densely occupied by reed along the thermal water ditch, can already be considered as real reed beds).

As shown by the species composition and the abundance of the species (SZOLLÁT 1999, 2000), this community is not a real phytosociological reed association, so the rich fen vegetation could be recovered by proper nature conservation treatment. A small patch of blunt-flowered rush fen near the northern border of the area was a good model of such treatment: it had been regularly scythed for hay for a long time, and this prevented

or repressed the expansion of the reed – unfortunately the site was destroyed while constructing the golf course.

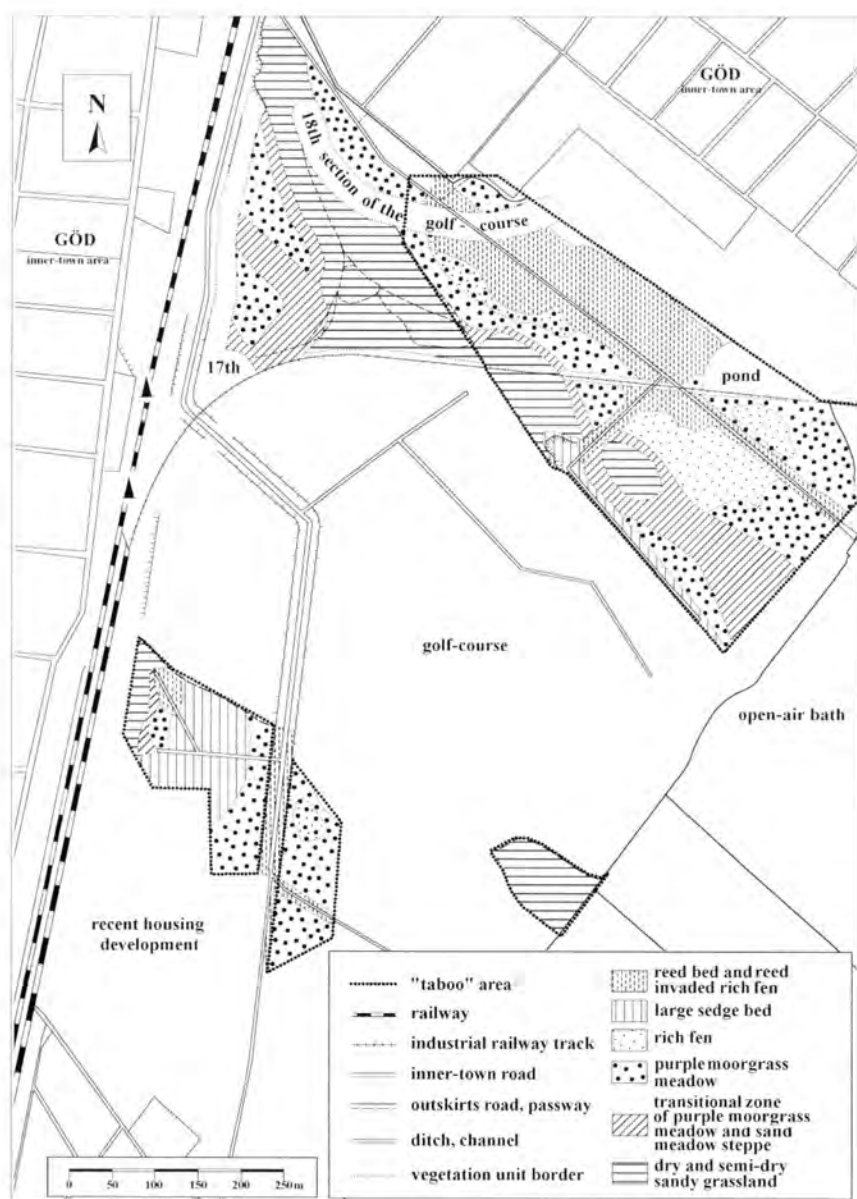


Fig. 1. The vegetation map of the Gödi Láprét.

Large sedge beds

In the most waterlogged areas of the Gödi-láprét 0.6–0.8 m high stands of *Carex acutiformis* and *C. elata* dominate the landscape. Formerly, this large sedge bed was probably purely occupied by tufted sedge tussocks (*Caricetum elatae*), maintained by more affluent and steady water supply in the past, but the tussocks of *Carex elata* more or less decayed by now. Thus, the present state of the community can be identified as a lesser pond sedge community (*Caricetum acutiformis* Eggler 1933); however, the presence of certain species of the rich fens, first of all *Juncus subnodulosus*, which is really abundant in some parts of these sites, as well as *Carex davalliana*, *Carex hostiana* and *Eriophorum angustifolium*, give the large sedge bed the character of rich fens. The most abundant associates in this community are the common (phytosociologically more or less indifferent) marsh- and mesophilous meadow species such as *Lythrum salicaria*, *Lysimachia vulgaris*, *Calystegia sepium*, *Potentilla reptans*, *Juncus articulatus*, *Lycopus europaeus*, *Mentha aquatica* as well as *Juncus inflexus* and *Centaurea pannonica*. *Serratula tinctoria* of the purple moorgrass meadows and *Equisetum ramosissimum* of the sandy grasslands are also frequent here. Some parts of the site are invaded by *Calamagrostis epigeios* as a result, perhaps, of a formerly dryer period in the area. *Phragmites australis* spreading from the direction of the ditches is also alarming, although the site has been scythed occasionally in the past. The shallower drainage ditches, recently mostly dry, are occupied by large sedge community dominated by *Carex acutiformis* but gradually intruded by reed, shrubby *Salix cinerea* and *Solidago canadensis*.

Rich fens

The most valuable communities of the study area are the blunt-flowered rush fens (*Juncetum subnodulosi* Koch 1926) and the black bog-rush fens (*Orchio-Schoenetum nigricantis* (Allorge 1921) Oberd. 1957). These have become extremely rare in the Carpathian basin as a consequence of centuries-long efforts to drain the Great Hungarian Plain by the canalisation of riverways and by digging thousands of drainage ditches. In our area of survey it is often difficult to draw a line between the beds of the two associations, since the two dominant species, *Juncus subnodulosus* and *Schoenus nigricans* not only form smaller or larger patches of their own, but mostly they are mixed as codominants. Of the rich fen species *Carex hostiana* is abundant, *Carex davalliana* and *Epipactis palustris* are frequent, while *Eriophorum angustifolium* and *E. latifolium* are occasional. *Parnassia palustris*, a protected rarity of the rich fens (or according to Soó's phytosociological system (HORVÁTH *et al.* 1995) a common species with the purple moorgrass meadows), very abundant on certain sites in 1992, has by now almost disappeared: its population of thousands order decreased with unexpected rapidity to the order of hundreds, and later of tens. *Molinia coerulea*, as the most important representative of purple moorgrass meadows is almost constant, but not abundant species in the rich fen beds. Additional characteristic

species of the purple moorgrass meadows, like *Carex panicea*, *Serratula tinctoria* and *Valeriana dioica* are abundant, however, *Orchis laxiflora* subsp. *palustris*, *Sanguisorba officinalis*, at some sites *Selinum carvifolia* and *Succisa pratensis* are also not rare, but less abundant. Of the common species of mesophilous habitats *Potentilla erecta*, *Centaurea pannonica*, *Carex flacca*, *Mentha aquatica*, *Lysimachia vulgaris*, *Lythrum salicaria* and *Tetragonolobus maritimus* subsp. *siliquosus* are frequent. Occurrence of *Carex buekii*, a Ponto-Pannonian rarity of the country, and *Carex appropinquata* (a few shoots, not forming tussock), having a boreal distribution character, are worth mentioning. *Carex elata* is also represented by a few shoots as remnants of some decayed tussocks. The dense moss layer is typical for these rich fen beds.

Rich fens in general are severely threatened by a number of factors. In our area one is the decreasing water supply caused by the drainage effects of the extensive housing developments, resulting in successive changes in species composition eventually shifting towards the purple moorgrass meadows. The range of the rich fen beds phytosociologically belonging to this vegetation unit has suffered sincere reduction since 1992. The other reason is the expansion of certain species for the lack of any conservation management in the area. In 1992 we found only one relatively small population of *Cladium mariscus*, which has been expanding greatly from the bank of the thermal water ditch. It is easy to recognise the direction of expansion as the youngest shoots, forming the advancing frontline of the population, are the shortest and surely of vegetative character, while the older parts of the stand are composed of fertile shoots of almost a man's height. The monodominant *Cladium mariscus* beds are so closed that practically all other plant populations are excluded from the invaded area, and this can be fatal for the future of the species-rich fen if not dealt with the problem properly. The expansion of *Cladium mariscus* may be correlated with increasing amounts of nutrients or the accumulation of minerals in the soil probably originating from the thermal water ditch. *Phragmites australis* is also invading the area from the thermal water ditch, though not threatening the most waterlogged parts of the site yet.

The relatively small areas of rich fens are surrounded by purple moorgrass meadows, so the representation of *Molinia coerulea* in the rich fen sites is significant: it can be abundant, even codominant mainly in the transitional zone of the two vegetation units. However, *Molinia coerulea* in this zone form short and vegetative or poorly flowering shoots, while in the adjacent beds of purple moorgrass meadows they are 1.5 metres tall and flourishing. The same can be recognised in respect of two other characteristic species of purple moorgrass meadows, *Sanguisorba officinalis* and *Succisa pratensis*, as their individuals are getting shorter and shorter, gradually growing closer and closer to the rich fen beds, finally dwindling away, and making a visual outline at the border of the two associations in the autumn. As in other similar habitats, this border is not particularly sharp, but still has a considerable extension at the Gödi Láprét. Similar transitional association types have been analysed in KOVÁCS (1962) as *Juncetum molinosum* and *Schoenetum molinietosum*.

Table 1. Protected plant species at the Gödi Láprét and their population sizes.

Species name	Estimated population size		
	1992	1998	2005
STRICTLY PROTECTED SPECIES			
<i>Colchicum arenarium</i>	many hundreds	many thousands	many hundreds
<i>Ophrys sphecodes</i>	10–15	10–30	10–15
PROTECTED SPECIES			
<i>Achillea ochroleuca</i>	–	200–300	200–300
<i>Alkanna tinctoria</i>	–	5–10	5–10
<i>Allium sphaerocephalon</i>	–	5–10	5–10
<i>Anacamptis pyramidalis</i>	few specimens	few specimens	few specimens
<i>Astragalus exscapus</i>	few tens	40–60	40–60
<i>Carex appropinquata</i>	1–5	?	?
<i>Carex buekii</i>	1–5	?	?
<i>Carex davalliana</i>	–	500–1,000	500–1,000
<i>Centaurea arenaria</i>	–	10–20	10–20
<i>Centaurea sadleriana</i>	–	1,000–2,000	1,000–2,000
<i>Corispermum nitidum</i>	few tens	few tens	few tens
<i>Echinops ruthenicus</i>	–	100–150	100–150
<i>Epipactis palustris</i>	many thousands	800–1,000	many hundreds
<i>Eriophorum angustifolium</i>	several thousands	1,000–2,000	1,000–1,500
<i>Eriophorum latifolium</i>	several hundreds	200–300	200–300
<i>Festuca x wagneri</i>	–	–	10–20
<i>Gentiana pneumonanthe</i>	several hundreds	300–400	300–400
<i>Gypsophila fastigata</i> ssp. <i>arenaria</i>	–	few specimens	10–20
<i>Iris arenaria</i>	several hundreds	200–300	200–300
<i>Iris sibirica</i>	–	50–60	50–60
<i>Iris spuria</i>	–	15–20	?
<i>Orchis coriophora</i>	50–60	3,000–4,000	1,500–2,000
<i>Orchis laxiflora</i> ssp. <i>palustris</i>	many hundreds	200–300	200–300
<i>Orchis militaris</i>	–	1	?
<i>Orchis morio</i>	5–10	200–250	150–200
<i>Orchis ustulata</i>	few tens	600–700	500–600
<i>Parnassia palustris</i>	many thousands	few hundreds	50–100
<i>Ranunculus illyricus</i>	50–100	40–60	40–60
<i>Schoenus nigricans</i>	–	300–400	300–400
<i>Stipa borysthena</i>	100–200	30–50	30–50
<i>Taraxacum serotinum</i>	–	–	1–5
<i>Veratrum album</i>	–	50–100	50–100
<i>Vinca herbacea</i>	–	30	30

Purple moorgrass meadows

The most widespread plant community at the Gödi Láprét, is the calcareous purple moorgrass meadow (*Succiso-molinietum hungaricae* (Komlódi 1958) Soó 1969 corr. Borhidi 2001). Beside the dominant *Molinia coerulea* subsp. *arundinacea*, *Deschampsia*

caespitosa is an abundant and constant component of the purple moorgrass meadow beds too, becoming more frequent or even dominant in the disturbed or dryer parts of the meadows. On waterlogged soils certain sedge species – *Carex acutiformis*, *Carex flacca* and *Carex panicea* – are abundant or even dominant with the subdominance of *Molinia coerulea* subsp. *arundinacea*. Of the typical purple moorgrass meadow species *Succisa pratensis* and *Sanguisorba officinalis* are abundant, *Selinum carvifolia* and *Valeriana dioica* are relatively frequent, as well as *Gentiana pneumonanthe*, *Veratrum album*, *Iris sibirica* of the generally rare species, while *Allium angulosum* occurs at one site. Of the rich fen species *Juncus subnodulosus* is one of the most abundant (subdominant or codominant in some sites) components of the purple moorgrass meadows in the survey area, with *Epipactis palustris* (frequent), *Carex davalliana* and *Carex hostiana* (occasional), *Eriophorum angustifolium* and *E. latifolium* (sporadic). Shown by earlier records (SZOLLÁT *et al.* 1992) *Parnassia palustris* used to be frequent before 1992. Some species of the mesophilous meadows, like *Cirsium canum*, *Genista tinctoria* and *Serratula tinctoria* are common in this vegetation type together with *Briza media* and *Pulicaria dysentherica* in certain sites. Phytosociologically more or less indifferent accompanying species, characteristic to the purple moorgrass meadows in the area, are as follows: *Juncus articulatus*, *Lysimachia vulgaris*, *Tetragonolobus maritimus* subsp. *siliquosus*, *Potentilla erecta*, *Angelica sylvestris*, *Mentha aquatica*, *Vicia cracca*, *Centaurea pannonica*, *Lythrum salicaria*, *Eupatorium cannabinum* and *Agrostis stolonifera*. In the wettest sites *Potentilla erecta*, *Carex acutiformis* and *Juncus inflexus* are common, as well as *Carex elata* at some spots. In the dryer parts of the purple moorgrass meadows, usually on the border with the steppes, *Galium verum*, *Leontodon hispidus* and *Plantago media* are common among other less specialised species together with *Ononis spinosa* as a consequence of grazing in the past.

The majority of the purple moorgrass meadows are of undisturbed structure and are in semi-natural state, where *Molinia coerulea* subsp. *arundinacea* forms 1.5 m high stands at maturity. However, some aggressively spreading species, like *Phragmites australis*, *Cladium mariscus*, *Solidago canadensis* and *Calamagrostis epigeios* have begun invading these areas, partly because of discontinued scything. For the same reasons *Salix rosmarinifolia* (0.5–1 m tall) and *Salix cinerea* (1–2 m tall) started to spread in certain sites, which also demonstrates the trend of succession.

Transitional grasslands between the purple moorgrass meadow and sand meadow-steppe plant communities

Though the species composition of the transitional zones (of varying width) surrounding the purple moorgrass meadow beds is not uniform, the dominant species are present in a more or less constant combination. The transitional environmental conditions are also manifested in the virulence of the plant populations living here, as the majority of the plant individuals are of vegetative stage or even rudimentary, due to the ecological parameters far poorer than optimal. The characteristic and abundant species of this transi-

tional zone, as members of the purple moorgrass and mesophilous meadows, are *Molinia coerulea* (either in vegetative stage or up to 1 m in flower), *Succisa pratensis* (40–50 cm), as well as *Centaurea pannonica*, *Genista tinctoria* and *Serratula tinctoria* (40–50 cm) with *Briza media* and *Festuca arundinacea* in some sites. On the other hand, *Brachypodium pinnatum*, *Bromus erectus*, in some sites *Festuca rupicola*, *Equisetum ramosissimum*, *Seseli annuum* and *Bromus inermis* are the main representatives of the adjacent semi-dry meadow-steppes, together with *Chrysopogon gryllus*, *Centaurea sadleriana* and *Trifolium montanum* on sites of slightly higher elevations. The phytosociologically indifferent *Carex flacca*, *Galium verum* and *Ononis spinosa* are also frequent in the transitional grasslands. Some of the rarities like *Iris spuria*, *Ophrys sphecodes* and *Orchis coriophora* do also occur in these transitional plant communities.

Some sites are of special species composition, as *Brachypodium pinnatum* and *Bromus erectus* are associated by masses of *Carex acutiformis* strictly of vegetative state, accompanied with other sedge species, so that the structure of these sites at first sight resemble a large sedge bed. In the less than 50 cm tall, very dense grassland *Molinia coerulea* is constant, but not abundant, while *Sanguisorba officinalis* is very common, none of them produce flowers here. Additional frequent species include *Colchicum autumnale*, *Galium verum*, *Festuca arundinacea*, *Dactylis glomerata*, as well as *Seseli annuum* and *Ononis spinosa*.

Of the woody species *Salix rosmarinifolia*, *S. cinerea* and *Alnus glutinosa* are coming up spontaneously after the abandonment of traditional land use (e.g. grazing, scything) long ago. In the most degraded parts of the transitional grasslands *Agropyron repens*, *Cynodon dactylon* and *Festuca pseudovina* appear.

Sandy grasslands

Four units of sandy grassland are recognised in the Gödi Lápért, these are a) the moderately dry sand meadow-steppe, b) the calciphilous sand steppe, c) the sandy pasture, and d) sand steppe with *Centaurea sadleriana*. These units are of varying size between ca 300 and 3,000 m².

a) Semi-natural or slightly degraded sites of sand meadow-steppe (*Astragalo austriaci-Festucetum sulcatae* Soó 1957) have in total less than half a hectare in our area of survey. One of the two sites is a small sand dune of NW–SE axis, rising a few metres above its surroundings, situated at the southeastern border of the study area. Besides *Stipa capillata* as the dominant species of the closed grassland of the NE facing slope, *Festuca rupicola*, *Koeleria cristata*, *Carex stenophylla* and *Bothriochloa ischaemum* are the abundant components of the vegetation, with *Bromus inermis*, *Agropyron pectinatum*, *Festuca pseudovina* and *Cynodon dactylon* a few tufts of *Festuca x wagneri*. *Astragalus exscapus*, one of the characteristic species of the association occurs here together with other rarities, such as *Colchicum arenarium* and *Iris arenaria*, which are relatively abundant in the more disturbed, slightly open grassland of the NW part of the slope. The other sand dune (to the north from the above mentioned one), covered with sand meadow-steppe community, is

also rising 1–2 metres higher than its surroundings. This site is slightly more mesophilous than the previous, and the effects of former grazing are more obvious. *Bromus erectus* is the dominant species in this semi-dry grassland, *Chrysopogon gryllus*, *Brachypodium pinnatum* and *Equisetum ramosissimum* are abundant, while the most common associates are *Stipa capillata*, *Festuca rupicola*, *F. pseudovina*, *Koeleria cristata*, *Carex caryophylla*, *Dactylis glomerata* and *Centaurea sadleriana*. Of the protected species *Anacamptis pyramidalis*, *Orchis morio* and *O. ustulata* are worth mentioning, as well as *Astragalus austriacus* as a rare (not protected) species in the region.

b) Calciophilous sand steppe (*Festucetum vaginatae* Rapaics ex Soó 1929 emend. Borhidi 1996) can only be found here as variously degraded vegetation fragments, so it is difficult to recognise and outline the borders of these steppe sites, and distinguish them from the sandy pastures and the slightly disturbed and open sand meadow-steppe patches. *Festuca vaginata* has not been found so far, *Stipa borysthenica* is represented by only a few dozen tufts; coexistence of some perennials, characteristic of the sand steppes – *Alkanna tinctoria*, *Gypsophila fastigiata* subsp. *arenaria* and *Festuca x wagneri* – seem to prove the former existence of the *Festucetum vaginatae* association in the area.

c) The sandy pastures (which include the strongly degraded remnants of calciophilous sandy grasslands and sand meadow-steppes) are the most widespread unit in the study area. The grassland is mainly composed of *Festuca pseudovina*, *Koeleria cristata*, *Cynodon dactylon*, *Bothriochloa ischaemum*, *Poa angustifolia*, *Artemisia campestris* and *Ononis spinosa* with the presence of *Astragalus onobrychis*, *Salvia nemorosa*, *Onobrychis arenaria*, *Calamagrostis epigeios*, *Carex stenophylla*, *Medicago falcata*, *Galium verum* and *Achillea collina* in some sites. Certainly, as a consequence of grazing in the past, a number of natural pioneers of the open sand steppes, as well as disturbance tolerant, phytosociologically indifferent and weed species are also frequent here, like *Aegilops cylindrica*, *Anthemis ruthenica*, *Apera spicaventi*, *Bromus tectorum*, *B. squarrosus*, *Centaurea arenaria*, *Corispermum nitidum*, *Gypsophila paniculata*, *Kochia laniflora*, *Polygonum arenarium*, *Silene conica*, *Vicia angustifolia*, etc. A few protected species also occur (besides *Centaurea arenaria* and *Corispermum nitidum*) in the sandy pastures, for example *Allium sphaerocephalon*, *Centaurea sadleriana*, *Festuca x wagneri*, *Ranunculus illyricus* and *Stipa borysthenica*.

d) Sand steppe with *Centaurea sadleriana* is a characteristic, closed, dry grassland that can be regarded as a long-lasting phase of the secondary succession leading towards the sand meadow-steppe. In our study area the main abundant species are as follows: *Centaurea sadleriana*, *Festuca pseudovina*, *Agropyron repens*, *Festuca rupicola*, *Astragalus onobrychis*, *Achillea collina*, *Ononis spinosa*, *Galium verum*, *Dactylis glomerata* with frequently occurring *Coronilla varia*, *Equisetum ramosissimum*, *Lotus corniculatus*, *Salvia nemorosa*, *Eryngium campestre*, *Astragalus onobrychis*, *Medicago falcata*, *Teucrium chamaedrys*, in some sites *Pimpinella saxifraga*, *Seseli annuum*, *Poa angustifolia*, and in the most closed patches *Brachypodium pinnatum* and *Bromus erectus*. Of the protected species *Iris arenaria*, *Ophrys sphecodes*, *Orchis coriophora* and *Orchis ustulata*, are also present in this vegetation unit.

Present state and recent changes in the flora and vegetation of the Gödi Láprét

A wide range of degrading effects have been observed in the surveyed area, which further contribute to the serious alteration of the (semi-)natural vegetation.

On the calciphilous sand steppes the effect of former grazing is obvious, but the most severe problem was the plantation of black pine (*Pinus nigra*) decades ago on several places in the area. Introduction of alien species in more or less natural vegetation often means the establishment of invasive species; here, the regenerating pine offspring occupies valuable space from less competitive native (including protected) species. Digging drainage ditches also had an unfavourable effect on the wet sites: this, and the discontinued scything earlier practiced by the local population, allowed the expansion of reed. As an effect of the drainage, the rich fens were taken over by purple moorgrass meadows. In some sites on the other hand, a positive effect of constant water supply can also be observed in the area.

The purple moorgrass meadows were partly ploughed between 1987 and 1991, but then abandoned (some parts were even subsequently cultivated). Regeneration was rather fast; the effects of the disturbance on the first ploughed sites could only hardly be registered in 1992: on these slightly degraded patches *Ononis spinosa*, *Pulicaria dysenterica*, in some sites *Colchicum autumnale* and *Potentilla anserina* were rather abundant indicating the former disturbance. Elsewhere, the uneven soil surface and the expansion of *Phragmites australis* and *Solidago canadensis* showed the signs of ploughing. (These regenerating purple moorgrass meadows were utterly destroyed during the construction of the golf course).

During the 14 years of the survey period we have not noticed a significant dramatic change in the vegetation of the Gödi Láprét – the general state of the sandy grasslands, the rich fens and the purple moorgrass meadows has not changed essentially. Merely the sand meadow-steppe became slightly more mesophilous, so the width of the surrounding zone of the vegetation considered as transition between the meadow-steppe and purple moorgrass meadow associations, has visibly increased. In the stands of the aggressively spreading plants and in the population sizes of some protected species though, we have registered considerable changes between 1992 and 2005. The population of *Epipactis palustris* decreased from several thousands to about one thousand and then to a few hundred individuals, partly because of the expansion of reed. Several thousand plants of *Eriophorum angustifolium* disappeared from a certain site (which does not exist any more) by the year 1998, presumably because of burning in that area in the previous year, while in some other sites its existing populations became stronger, or new populations containing hundreds of individuals have subsequently appeared. In 1992 there were altogether about 100 specimens of *Orchis coriophora* at some sites, while in 1998 we estimated its population around 4,000. A possible reason for this is the discontinued disturbance, since grazing was stopped from the middle of the nineties. In 1992 many thousand individuals of *Parnassia palustris* were detected (which might have been the biggest known population in Hungary at the time). In 1997 though, we registered (by estimation) only a hundred flowering specimens, and even less in 2005. This clearly exceeds the degree of “natural” fluctuation:

the retreat of the species might be related to draught, which has become much worse recently, or perhaps to the increasing quantities of nitrates oozed into the soil of the surrounding areas reached the Gödi Láprét through the underground water. Fluctuation is very visible in the population of *Orchis morio*: in 1992 only 5–10 flowering specimens were seen, while in 1997 nearly 500, and in 1998 only a few specimens flowered again. There is a similar case with the *Orchis ustulata*. In 1992 a few dozens of specimens were counted, in 1997 there were 500–700 flowering individuals, but 1998 we could hardly see any. Ten to fifteen specimens of *Ophrys sphecodes* occurred on two sites in 1992, but one of these localities disappeared in 1997 because of burning, and on the other place there were still a few flowering specimens in 1998. The populations of *Iris sibirica* and *Veratrum album* became stronger year by year.

We noticed little change in the reed expansion in the rich fen sites, but the process goes on undoubtedly. The aggressive and striking spread of *Cladium mariscus* seems to be highly dangerous for the fen vegetation. In 1992, it occurred only on a few sites each covering a few square metres, but by now it has taken over large areas in the purple moorgrass meadows and is even more abundant on the rich fens, occupying a rather large proportion of their area.

CONCLUSIONS

Monitoring of the Gödi Láprét has been continuing for 14 years. During this period of time two detailed surveys have been made, and the completed studies include vegetation maps and maps showing the occurrence of the protected plant species. The Gödi Láprét is one of the most valuable sites of the Pesti-hordaléksíkság with a vegetation of mostly semi-natural state. The presence of 325 plant species – including 35 protected taxa, some of them having significant populations – on a rather small area of 15–18 hectares well illustrates the floristical richness. Habitat diversity also supports this colourful vegetation: both dry sandy grasslands of the sand dunes, and the adjacent fen and wet grassland of the dune slacks are found in a relatively small area.

Among the huge problems for the flora and vegetation is the decreasing water supply for the water demanding of wetland plant communities due to the housing development in the adjacent area (and partly the golf course and some potential, illegal intervention of the landowners around). The fens and meadows are also threatened by the process of “natural” degradation, that is, the aggressive spread of certain plant species. The planned conservation management against this is scything or mowing, but this was

randomly made only for 2–3 years, so the results cannot be clearly seen yet. The vegetation of sandy grasslands is regenerating since grazing was stopped; however, from the viewpoint of plant conservation unfavourable changes are also expected in the structure and composition of the steppes in the absence of grazing and disturbance.

* * *

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REFERENCES

- BORHIDI, A. (1993): *A magyar flóra szociális magatartás típusai, természetességi és relatív ökológiai értékszámai.* (Social plant behaviour types of the Hungarian flora, its naturalness and relative ecological indicator values.) – KTM, TvH and Janus Pannonius Tudományegyetem, Pécs, 95 pp.
- BORHIDI, A. (2003): *Magyarország növénytársulásai.* [Plant associations of Hungary.] – Akadémiai Kiadó, Budapest, 610 pp.
- Botanikus Bt., Geoökoterv and MTA SZTAKI (eds) (1998): *A Budapesti Golf és Country Klub golfpálya előzetes környezeti hatásvizsgálata.* [Preliminary environmental impact assessment of the Budapest Golf and Country Club.] – Budapest, 62 pp. (mscr.).
- BÖLÖNI, J., KUN, A. and MOLNÁR, ZS. (eds) (2003): *Élőhelyismereti útmutató.* [Guide to habitats and associations in Hungary.] – MTA ÖBKI, Vácrátót, 166 pp.
- DEVILLERS, P., RÉDEL, T., ZIMÁNYI, ZS., BARABÁS, S. and HORVÁTH, F. (2000): *Magyarországi élőhelyek angol–magyar „értelmező szótára”.* [English–Hungarian dictionary of Hungarian habitats.] – MTA Ökológiai és Botanikai Kutatóintézete, Vácrátót, URL: <http://www.botanika.hu/habhun>.
- HORVÁTH, F., DOBOLYI, Z. K., MORSCHAUER, T., LÖKÖS, L., KARAS, L. and SZERDAHELYI, T. (1995): *FLÓRA adatbázis 1.2.* [FLORA Database 1.2.] – MTA Ökológiai és Botanikai Kutatóintézete, Vácrátót, 268 pp.
- KARÁTSÓN, D. (ed.) (1997): *Magyarország földje.* [The land of Hungary.] – Pannon Enciklopédia sorozat, Kertek 2000 Kiadó, Budapest, 508 pp.

- KOVÁCS, M. (1962): *Die Moorziesen Ungarns*. (Magyarország láprétjei.) – Akadémiai Kiadó, Budapest, 214 pp.
- MOLNÁR, E. and SZABÓ, M. (Terra-Planta Bt.) (1998): *Talajtani és agrokémiiai szempontok a gödi láprét természeti értékei védelmének megalapozásához és a terület tájvédelmi szempontú hasznosításához*. [Pedological and agrochemical considerations in the protection of the natural values of the Gödi Láprét and the utilisation of the area from the viewpoint of landscape protection.] – Budapest, 10 pp. (mscr.).
- PÉCSI, M., MAROSI, S. and SZILÁRD, J. (eds) (1958): *Budapest természeti képe*. [Natural history of Budapest.] – Akadémiai Kiadó, Budapest, 744 pp.
- PÓCS, T. (1981): *Növényföldrajz*. [Plant geography.] – In: HORTOBÁGYI, T. and SIMON, T. (eds): *Növényföldrajz, társulástan és ökológia*. [Plant geography, phytosociology and ecology.] – Tankönyvkiadó, Budapest, pp. 27–166.
- SEREGÉLYES, T. (1992): *A Göd környéki természetvédelmi területek fenntartási és fejlesztési terve*. [The maintenance and development (action) plan for the protected areas near Göd.] – Budapest, 115 pp. (mscr.).
- SEREGÉLYES, T. and S. CSOMÓS, Á. (Botanikus Bt.) (1998): *A Gödi Lápréten készülő golf-pálya környezeti hatástanulmánya*. [Environmental impact assessment of the planned golf course in Gödi Láprét.] – In: Botanikus Bt., Geoökoterv and MTA SZTAKI (eds): *A Budapesti Golf és Country Klub golfpálya előzetes környezeti hatásvizsgálata*. [Preliminary environmental impact assessment of the Budapest Golf and Country Club.] Budapest, 38 pp. (mscr.).
- SIMON, T. (2000): *A magyarországi edényes flóra határozója*. [Identification handbook of the Hungarian vascular plants.] – Tankönyvkiadó, Budapest, 976 pp.
- SOÓ, R. (1964): *A magyar flóra és vegetáció rendszertani-növényföldrajzi kézikönyve I.* (Synopsis systematico-geobotanica florum vegetationsque Hungariae I). – Akadémiai Kiadó, Budapest, 589 pp.
- SZOLLÁT, GY. (1999): *A Gödi Láprét megismételt állapotfelvétele. (A vegetációtérkép revíziója, a vegetációtípusok és élőhelyfoltok részletes leírása)*. [Updated state of the vegetation at Gödi Láprét. Revision of the vegetation map and description of the vegetation types and the sites.] – Budapest, 25 pp. (mscr.).
- SZOLLÁT, GY. (2000): *A Gödi Láprét megismételt állapotfelvétele 2000-ben*. [Updated state of the vegetation at Gödi Láprét in 2000.] – Budapest, 19 pp. (mscr.).
- SZOLLÁT, GY., SEREGÉLYES, T., S. CSOMÓS, Á. and STANDOVÁR, T. (1992): *Természetvédelmi célú botanikai feltáró vizsgálatok Göd környékén*. [Botanical surveys for conservation purposes in the vicinity of Göd.] – In: SEREGÉLYES, T. (ed.) (1992): *A Göd környéki természetvédelmi területek fenntartási és fejlesztési terve*. [The maintenance and development (action) plan for the protected areas in the vicinity of Göd.] Budapest, 18 pp. (mscr.).
- TUTIN, T. G., HEYWOOD, V. H., BURGESS, N. A., MOORE, D. M., VALENTINE, D. H., WALTERS, S. M., WEBB, D. A., CHATER, A. O. and RICHARDSON, I. B. K. (1980): *Flora Europaea*. Vol. 5. – Cambridge, 254 pp.

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Appendix. Record of plant species of the Gödi Lápér

- Achillea asplenifolia* Vent.
Achillea collina J. Becker in Rchb.
Achillea ochroleuca Ehrh.
Achillea pannonica Scheele
Achillea setacea W. et K.
Aegilops cylindrica Host
Agropyron intermedium Host P. B. (incl.
 subsp. *intermedium* var. *intermedium* f.
 aristatum (Sadl.) Deg., sf. *pellitum* Podp.,
 et subsp. *trichophorum* (Link.) Soó)
Agropyron pectinatum (M. B.) R. et Sch.
Agropyron repens (L.) P. B.
Agrostis stolonifera L.
Agrostis stolonifera L. subsp. *gigantea* (Roth)
 Soó
Alkanna tinctoria (L.) Tausch
Allium angulosum L.
Allium scorodoprasum L.
Allium sphaerocephalon L.
Alnus glutinosa (L.) Gaertn.
Alopecurus pratensis L.
Alyssum montanum L.
Alyssum tortuosum W. et K.
Ambrosia artemisiifolia L.
Anacamptis pyramidalis (L.) Rchb.
Anagallis arvensis L.
Anchusa officinalis L.
Angelica sylvestris L.
Anthemis ruthenica M. B.
Anthyllis vulneraria L.
Apera spica-venti (L.) P. B.
Arenaria serpyllifolia L.
Artemisia campestris L.
Artemisia vulgaris L.
Asparagus officinalis L.
Asperula cynanchica L.
Aster x lanceolatus Willd.
Aster novi-belgii L.
Aster tradescantii L.
Aster x versicolor Willd.
Astragalus austriacus Jacq.
Astragalus exscapus L.
Astragalus onobrychis L.
Berteroa incana (L.) DC.
Bidens tripartita L.
Bothriochloa ischaemum (L.) Keng
Brachypodium pinnatum (L.) P. B.
Briza media L.
Bromus erectus Huds.
Bromus inermis Leyss.
Bromus mollis L.
Bromus squarrosus L.
Bromus tectorum L.
Butomus umbellatus L.
Calamagrostis epigeios (L.) Roth
Calystegia sepium (L.) R. Br.
Camelina microcarpa Andr.
Campanula sibirica L.
Carduus nutans L.
Carex acutiformis Ehrh.
Carex appropinquata Schumacher
Carex buekii Wimm.
Carex caryophyllea Latour.
Carex cuprina (Sándor) Nendtvich
Carex davalliana Sm.
Carex distans L.
Carex elata All.
Carex flacca Schreb.
Carex gracilis Curt. subsp. *intermedia*
 (Čelak.) Schultze
Carex hirta L.
Carex hostiana DC.
Carex lepidocarpa Tausch
Carex liparicarpus Gaud.
Carex oederi Retz.
Carex panicea L.
Carex praecox Schreb.
Carex riparia Curt.

- Carex spicata* Huds.
Carex stenophylla Wahlbg.
Carex tomentosa L.
Carlina vulgaris L.
Celtis occidentalis L.
Centaurea arenaria M. B. ex Willd. (incl. subsp. *tauscheri* (Kern.) Soó)
Centaurea micranthos S. G. Gmel.
Centaurea pannonica (Heuff.) Simk.
Centaurea sadleriana Janka
Centaureum littorale (Turn.) Gilmour
 subsp. *uliginosum* (W. et K.) Rothm.
Cerastium fontanum Baumg.
Chenopodium album L.
Chenopodium aristatum L.
Chenopodium hybridum L.
Chondrilla juncea L.
Chrysanthemum leucanthemum L.
Chrysopogon gryllus (L.) Trin.
Cichorium intybus L.
Cirsium arvense (L.) Scop.
Cirsium canum (L.) All.
Cirsium vulgare (Savi) Ten.
Cladium mariscus (L.) Pohl
Colchicum arenarium W. et K.
Colchicum autumnale L.
Convolvulus arvensis L.
Corispermum nitidum Kit.
Coronilla varia L.
Crataegus monogyna Jacq.
Crepis rheadifolia M. B.
Cynodon dactylon (L.) Pers.
Cynoglossum hungaricum Simk.
Cyperus fuscus L.
Dactylis glomerata L.
Daucus carota L.
Deschampsia cespitosa (L.) P. B.
Dianthus pottederae Kern.
Dorycnium germanicum (Gremli) Rikli
Echinops ruthenicus (Fisch.) M. B.
Echium vulgare L.
Eleocharis uniglumis (Link) Schult.
Epilobium hirsutum L.
Epipactis palustris (Mill.) Cr.
Equisetum arvense L.
Equisetum fluviatile L.
Equisetum x moorei Newman
Equisetum palustre L.
Equisetum ramosissimum Desf.
Eragrostis minor Host
Erigeron canadensis L.
Eriophorum angustifolium Honckeny
Eriophorum latifolium Hoppe
Eryngium campestre L.
Erysimum diffusum Ehrh.
Eupatorium cannabinum L.
Euphorbia cyparissias L.
Euphorbia seguieriana Necker
Euphorbia villosa W. et K.
Festuca arundinacea Schreb.
Festuca pratensis Huds.
Festuca pseudovina Hack.
Festuca rubra L.
Festuca rupicola Heuff.
Festuca valesiaca Schleich.
Festuca x wagneri Deg., Thaisz et Flatt
Filipendula vulgaris Moench
Frangula alnus Mill.
Galium aparine L.
Galium mollugo L.
Galium palustre L.
Galium rubioides L.
Galium uliginosum L.
Galium verum L.
Genista tinctoria L.
Gentiana pneumonanthe L.
Gypsophila fastigiata L. subsp. *arenaria* (W. et K.) Dom.
Gypsophila paniculata L.
Helictotrichon praecustum (Rehb.) Tzvelev
Helictotrichon pubescens (Huds.) Pilger
 (incl. var. *glabrescens* Rchb.)
Hieracium echinoides Lumn.
Hieracium umbellatum L.

- Holoschoenus romanus* (L.) Fritsch emend.
 Becherer
Humulus lupulus L.
Hypericum perforatum L.
Hypericum tetrapterum Fr.
Inula britannica L. (incl. var. *viridis*
 Wahlbg.)
Inula ensifolia L.
Inula salicina L.
Iris arenaria W. et K.
Iris pseudacorus L.
Iris sibirica L.
Iris spuria L.
Juncus articulatus L.
Juncus inflexus L.
Juncus subnodulosus Schrank
Knautia arvensis (L.) Coult.
Kochia laniflora (S. G. Gmel.) Borb.
Koeleria cristata (L.) Pers.
Lactuca serriola L.
Laserpitium prutenicum L.
Lathyrus pratensis L.
Lavathera thuringiaca L.
Leontodon hispidus L.
Linaria genistifolia (L.) Mill.
Linaria vulgaris Mill.
Linum austriacum L.
Linum catharticum L.
Lotus corniculatus L.
Lotus tenuis W. et K.
Luzula campestris (L.) Lam. et DC.
Lycopus europaeus L.
Lysimachia vulgaris L.
Lythrum salicaria L.
Marrubium peregrinum L.
Marrubium vulgare L.
Matricaria maritima L. subsp. *inodora* (L.) Soó
Medicago falcata L.
Medicago lupulina L.
Medicago minima (L.) Grufbg.
Melandrium viscosum (L.) Čelak.
Melica transsilvanica Schur
Melilotus albus Desr. ex Lam.
Mentha aquatica L.
Molinia coerulea (L.) Moench subsp. *arundinacea* (Schrank) H. Paul
Muscari comosum (L.) Mill.
Muscari neglectum Guss. ex Ten.
Nonea pulla (L.) Lam. et DC.
Odontites rubra (Baumg.) Opiz
Onobrychis arenaria (Kit.) Ser.
Ononis arvensis L.
Ononis spinosa L.
Ophrys sphecodes Mill.
Orchis coriophora L.
Orchis laxiflora Lam. subsp. *palustris*
 (Jacq.) Bonnier et Layens
Orchis militaris L.
Orchis morio L.
Orchis ustulata L.
Parnassia palustris L.
Pastinaca sativa L.
Peucedanum oreoselinum (L.) Moench
Phalaroides arundinacea (L.) Rauschert
Phleum phleoides (L.) Karsten
Phleum pratense L.
Phragmites australis (Cav.) Trin.
Pimpinella saxifraga L.
Plantago lanceolata L.
Plantago major L.
Plantago maritima L.
Plantago media L.
Plantago stepposa Kuprianova
Poa angustifolia L.
Poa bulbosa L.
Poa pratensis L.
Poa trivialis L.
Podospermum canum C. A. Mey.
Polygala comosa Schkuhr
Polygonum arenarium W. et K.
Polygonum lapathifolium L.
Polygonum patulum M. B. var. *kitaibelianum*
 (Sadl.) Jáv.
Polygonum persicaria L.

- Populus canescens* (Ait.) Sm.
Potentilla anserina L.
Potentilla arenaria Borkh.
Potentilla erecta (L.) Räuschel
Potentilla heptaphylla L.
Potentilla impolita Wahlbg.
Potentilla reptans L.
Prunella vulgaris L.
Pulicaria dysenterica (L.) Bernh.
Ranunculus acris L.
Ranunculus illyricus L.
Ranunculus polyanthemus L.
Ranunculus repens L.
Reseda lutea L.
Rhinanthus minor L.
Rhinanthus serotinus (Schönheit) Oborny
 emend. Hyl.
Rubus caesius L.
Rumex acetosa L.
Rumex acetosella L.
Salix alba L.
Salix cinerea L.
Salix rosmarinifolia L.
Salsola kali L.
Salvia nemorosa L.
Salvia pratensis L.
Sambucus nigra L.
Sanguisorba minor Scop.
Sanguisorba officinalis L.
Scabiosa ochroleuca L.
Schoenoplectus lacustris (L.) Palla
Schoenoplectus tabernaemontani (C. C.
 Gmel.) Palla
Schoenus nigricans L.
Sedum acre L.
Sedum sexangulare L.
Selinum carvifolia L.
Senecio erucifolius L. subsp. *tenuifolius*
 (Jacq.) Jáv.
Senecio integrifolius (L.) Clairv.
Senecio jacobaea L.
Serratula tinctoria L.
Seseli annuum L.
Seseli varium Trev.
Silene conica L.
Silene multiflora (Ehrh.) Pers.
Silene otites (L.) Wibel
Silene vulgaris (Moench) Garcke
Sium erectum Huds.
Solanum dulcamara L.
Solidago canadensis L.
Solidago gigantea Ait.
Sonchus arvensis L.
Stachys palustris L.
Stachys recta L.
Stenactis annua (L.) Nees
Stipa borysthénica Klokov
Stipa capillata L.
Succisa pratensis Moench
Taraxacum serotinum (W. et K.) Poir.
Tetragonolobus maritimus (L.) Roth subsp.
 siliquosus (L.) Murb.
Teucrium chamaedrys L.
Teucrium scordium L.
Thalictrum minus L. (incl. subsp. *minus*
 var. *minus* f. *ambigens* (Jord.) Nyár.)
Thalictrum simplex L. subsp. *galiioides*
 (Nestler) Borza
Thesium arvense Horvátovszky
Thymus glabrescens Willd.
Thymus marschallianus Willd.
Thymus pannonicus All.
Tragopogon dubius Scop.
Tribulus terrestris L.
Trifolium campestre Schreb.
Trifolium medium L.
Trifolium montanum L.
Trifolium pratense L.
Triglochin palustre L.
Trinia glauca (L.) Dum.
Tussilago farfara L.
Typha angustifolia L.
Typha latifolia L.
Urtica dioica L.

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| <i>Valeriana dioica</i> L. | <i>Vicia angustifolia</i> Grufbg. |
| <i>Veratrum album</i> L. | <i>Vicia cracca</i> L. |
| <i>Verbascum austriacum</i> Schott ex R. et Sch. | <i>Vicia hirsuta</i> (L.) S. F. Gray |
| <i>Verbascum phlomoides</i> L. | <i>Vicia tenuifolia</i> Roth |
| <i>Verbascum phoeniceum</i> L. | <i>Vicia villosa</i> Roth |
| <i>Verbena officinalis</i> L. | <i>Vinca herbacea</i> W. et K. |
| <i>Veronica arvensis</i> L. | <i>Vincetoxicum hirundinaria</i> Medik. |
| <i>Veronica spicata</i> L. (incl. subsp. <i>spicata</i> var.
<i>lancifolia</i> Koch) | |