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Grasslands of the Arieş Valley and the Comana Natural Park, Romania

A Stapledon Travelling Fellowship Report

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Acknowledgements

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Overview

Broadly, the aims of this Stapledon Memorial Trust Travelling Fellowship were to learn about and investigate the grasslands of two areas of Romania, with a particular focus on the impacts of non-native species where these were present. The two areas visited during this trip were the Arieş and Ampoi river systems in north-west Romania, and the Comana Natural Park, a large area of wetlands and associated habitats south of Bucharest. The approaches taken to learning about these areas, their habitats, and any impacts of invasive non-native species (INNS) included site walkovers and species listings and quadrat-based recording. In the Arieş area, our quadrats often took the form of paired recordings, with one quadrat within, and one immediately without, an invaded stand. In the Comana Natural Park fewer significant invasions were observed, and quadrat recording took the form of baseline inventories of the grasslands visited. An additional element of our visit was the opportunity to exchange knowledge with both locals and Romanian scientists, and we were able to both talk to local people in the Arieş valley about plant invasions in their area, and also interact with and support park rangers in the Comana Natural Park. In particular, we were able to include a set of the Natural Park's long term monitoring plots in our quadrat recording, supporting the botanical learning of the rangers there.

The following report takes the form of a photo diary, with a particular focus on plants, habitats, and incidents that represent the highlights of both my learning and the trip. The report of my CEH co-fundee, Jodey Peyton, contains species lists and quadrat data that we collected during our trip, and so these are not duplicated here; these data have already been shared with key stakeholders (e.g. the rangers of the Comana Natural Park), and have also been presented by Dr Marilena Onete at the 2018 East and South European Network for Invasive Alien Species (ESENIAS) 8th Scientific Conference and Workshop in Bucharest (see page 43 **here** in the conference book of abstracts). We hope to make our quadrat data available through the Global Biodiversity Information Facility (www.gbif.org), or another appropriate open access data repository, in the near future. The botanical nomenclature in this report follows that of *Plante vasculare din România* (Sârbu *et al.*, 2013).

Day 1 – An introduction to Comana Natural Park

On our first full day in Romania, we travelled south from Bucharest to the Comana Natural Park with Owen Mountford and Dr Marilena Onete for our first introduction to one of our study sites, albeit one that we would be focusing on in the second week of our visit. During our drive south, a number of non-native species were noticed along roadsides, particularly along the Bucharest ring-road, including the well-known invasive aliens *Ailanthus altissima*, *Ambrosia artemisiifolia*, *Acer negundo* and *Robinia pseudoacacia*.

On arriving in Comana, we parked next to the Neajlov River (around 44.1778, 26.1402) and walked west along the riverbank noting the plant species found, looking not only at grasslands, but also at aquatic vegetation and at various transitions between emergent wetland vegetation, seasonally flooded grasslands, and drier types (Figs 1-4). Typical species seen in the seasonally flooded grassland habitat (Figs 3-4) included *Rumex crispus*, *Glycyrrhiza echinata*, *Potentilla reptans*, *Eragrostis minor*, *Trifolium fragiferum*, *Daucus carota*, and *Mentha pulegium*. In addition to the wealth of native species seen on this walk, we also noted the presence of non-native species, such as *Ambrosia artemisiifolia* and *Xanthium strumarium* (Fig. 4).

Figure 1. *Potamogeton nodosus*, *Ceratophyllum demersum*, *Lemna* spp. etc. in the Neajlov River.

Figure 2. The European Red Data Book and EU Habitats Directive protected species *Salvinia natans* in the Neajlov River.

Figure 3. Dr Mari Onete in seasonally inundated "drawdown" grassland around the Neajlov River. This grassland is apparently used by local people for communal grazing.

Figure 4. The team viewing an invasion of *Xanthium strumarium* within the seasonally flooded grassland adjacent to the Neajlov River. Note also the sprawling yellow stems of *Cuscuta campestris* parasitising the *Xanthium*.

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Day 2 – Through Transylvania

On our second day we travelled north from Bucharest to Turda, via Sinaia, Braşov, Rupea and Sighişoara. Turda was our base for the first full week of surveying along the Arieş river valley. Along the way we stopped for botanical training on a small road south of Buneşti (around 46.08533, 25.0750), in order to examine the exceptional diversity of grassland species on the "moviles" in this region. The grasslands here are renowned within Romania and were the subject of an international conference of the European Dry Grassland Group in 2016, as well as being part of the Târnava Mare EU Site of Community Importance, and a focus of action for conservation and sustainable rural development.

Movile are essentially small hills caused by minor landslips. According to Akeroyd *et al.* (2013), "the dominant geology of marls, the lime-rich clay layers interspersed with thin bands of sand, limestone, volcanic ash and loess [in the area], tends to instability", with the result that "widespread slumping on slopes has created both patches of unstable open ground and a hummocky topography, notably steep-sided hillocks". The moviles support a unique community of plants, including sub-steppic rarities such as *Crambe tataria*, a species extending to Kazakhstan, with the eastern edge of Europe as a western outlier of its global distribution. Although we were not recording quadrats, we recorded over 80 species of plant within an area of much less than 2 hectares, an incredible diversity given the short time we were at this site (less than 2 hours).

Figure 5. Owen Mountford, walking through grassland developed over former arable towards a movile in the distance. Secondary grassland on ex-arable was frequent along the road to Viscri. Although this was less rich than the movile proper, it still contained a high diversity of species, including *Rhinanthus rumelicus* agg., *Asperula cynanchica*, *Stachys betonica*, *Dorycnium pentaphyllum*, *Senecio erucifolius*, *Prunella vulgaris*, *P. laciniata* and *Veronica spicata* (Fig. 6).

Figure 6. Flowering spikes of *Veronica spicata* in the dry secondary grassland between the Viscri movile and the 104L road.

Figure 7. Jodey photographing plant species in the hyper-diverse movile grasslands. The yellow spike by her arm is the locally frequent species *Lembotropis (Cytisus) nigricans.*

Figure 8. Jodey and Owen further up a movile. The purple of *Salvia verticillata* is present in the foreground, whilst the yellows of *Lembrotropis nigricans* and *Inula ensifolia* dot the sward elsewhere. Owen sits next to a small specimen of *Prunus fruticosa*.

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Figure 9. ***Asyneuma canescens*** **(Campanulaceae) on a movile.**

Figure 10. ***Teucrium chamaedrys*****. A locally abundant plant of dry open patches on the movile.**

Figure 11. A view across the movile, with a stand of *Inula ensifolia* in the middle distance. The branched inflorescences of *Campanula sibirica* are scattered throughout the sward.

Figure 12. Open parched movile habitat of *Teucrium chamaedrys*.

Figure 13. The landscape around Viscri. Open grasslands and scrub dominate the open plan, whilst denser woodland remains on the higher ground. The silvery leaves of a willow pick out a stream in the middle distance.

Figure 14. Owen and Jodey admire the dead inflorescence of the sub-steppic species *Crambe tatarica*, found at the base of a movile.

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Figure 15. Looking towards Viscri. The dense lighter green tufts in this photo are stems of *Adonis vernalis*, a beautiful yellow-flowered species when in bloom.

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Days 3-4 – Exploring the Arieş valley

From our base in Turda, the next two days were spent familiarising ourselves with the flora and geography of the Arieş river valley, one of our two focal sites. The Arieş river is situated in Transylvania, north and west of the main range of the Carpathians, and within the Apuseni mountains. The Arieş river is itself a tributary of the Mureș which, together with the Olt, is the most important river in Transylvania. Rising near Mihoești (close to Câmpeni), the river runs approximately eastward, passing through Turda before turning southward to its confluence with the Mureş in the Lunca Mureșului commune. The steep-sided valley within the Apuseni portion of the Arieș is about 70 km in length. Historically mining has been an important industry in the area, resulting in both heavy metal pollution to soil and water in the area, and in various bits of built heritage in the area, such as old mine railways. It is possible that this mining activity may also have led to the introduction of some of the invasive alien species that we were intending to study, perhaps for soil or bank stabilisation along railways or the river itself.

After an hour and a quarter travelling from Turda along the Arieş river, we arrived at the proposed field site (46.384289, 23.23610) on the outskirts of the village of Muncelu. In terms of invasive plant species, the roadside and river margins along most of the valley were dominated by *Fallopia japonica*, with abundant *Impatiens glandulifera*, *Helianthus tuberosus*, *Erigeron annuus* and *Robinia pseudoacacia.* However, once out of the car and exploring around Muncelu, the native plant diversity was also spectacular, particularly in and around the meadows, pastures, and small woodlots of Muncelu village.

Figure 16. The stunning *Melampyrum bihariense* (a close relative, possibly even a sibling species, of *M. nemorosum*) observed in a roadside margin in Muncelu.

Figure 17. Owen and Jodey puzzle over an umbellifer on a wooded track around Mucelu. The final answer was *Chaerophyllum aromaticum*, a plant which was subsequently found to be common in shaded habitats in the area.

Figure 18. Jodey talks to local Mucelu children about biodiversity. These kids stayed with us for an hour or two, and showed themselves to be excellent botanists, with a good knowledge of the local flora and the local names of species. The eldest was also interested in insects, and we gifted her a hand lens to further her knowledge!

Figure 19. A half-scythed hay meadow in Muncelu. Adjacent to the field studied by Onete *et al.* (2015). The grassland was a fine-leaved sward dominated by *Agrostis*, *Festuca* and *Poa* species.

Figure 20. A closer look at the half-scythed meadow. Amongst the grasses a colourful display of forbs was omnipresent. Here *Achillea millefolium*, *Dianthus carthusianorum*, *Rhinanthus rumelicus* agg. (seed head) and *Lotus corniculatus* all vie for dominance.

Figure 21. Further down the track from Muncelu to the Arieş river. Here the canopy was largely of the invasive woody plant *Robinia pseudoacacia*, with an understory of other non-natives, mainly *Helianthus tuberosus*, *Impatiens glandulifera* and *Fallopia japonica*.

Figure 22. A common sight in the Arieş valley and elsewhere during our stay: hay stooks in a recently scythed meadow.

Figure 23. Day 4 was spent mainly avoiding the rain, and although we managed some intensive surveying of the Muncelu site, very few photos were taken! This is us, completely sodden at the end of our morning, retreating to the car by Muncelu monastery. Given that there were serious landslips elsewhere in Romania during this week, we played safe and retreated back to Turda to revise our botanical learning to date.

Day 5 – An excursion to the Turda Gorge

On this day we needed to take Owen back to the airport in Cluj-Napoca, and poor weather conditions continued in the Arieş vally, so we decided to walk the Turda gorge, a locally significant site for plant biodiversity. We parked the car (46.571196, 23.666889) and set off south the gorge, recording plant species of note along the way. The Turda gorge is a highly significant site in the context of both Romania and the EU, the presence of relict species from different climatic periods with very restricted distributions in Romania, e.g. *Allium obliquum* and *Ferula sadleriana*, is particularly noteworthy (Cocean & Cocean, 2017). We saw well over 100 species this day, with a highlight for both Jodey and myself being the beautiful *Centaurea atropurpurea* (see Fig. 29 below), which is a speciality of Romania and the Balkan peninsula. This knapweed is, perhaps unsurprisingly, becoming popular with gardeners, and has even been recorded as self-sown in the Chelsea Physic Garden in the UK (Botanical Society of Britain and Ireland data).

Figure 24. Approaching the Turda gorge.

Figure 25. *Melica ciliata* growing on rocky outcrops in the gorge. *Asplenium viride*, *A. ruta-muraria* and *A. trichomanes* were also common on such outcrops, as were *Minuartia setacea* and *Sedum hispanicum*.

Figure 26. ***Leonurus cardiaca*****, an occasional forb of woodland margins or other shady habitats in Romania. This is a rare species in the UK, and so it was a nice addition to our list for the Turda gorge.**

Figure 27. ***Symphytum officinale*** **in the gorge. A common species in the UK, although I have never seen this beautiful deep-pink colour form in Britain.**

Figure 28. What was to become one of our most commonly observed non-native species during the week, *Helianthus tuberosus*, established along the Turda gorge.

Figure 29. The stunning *Centaurea atropurpurea*, Turda gorge.

Figure 30. At the end of our walk along the gorge, some ash trees, *Fraxinus excelsior*, were observed that appeared to have been infected with the ash dieback fungus (*Hymenoscyphus fraxineus*).

Days 6-8 – Recording grassland invasions in the Arieş

From this point forward, we focused on recording paired quadrats in adjacent invaded and uninvaded grassland stands along the Arieş river, putting into practice all of the excellent botanical tuition received from Owen and Mari over the previous 5 days. In the first instance we drove a large part of the valley from Turda to Câmpeni, marking potential sites for survey with a handheld GPS unit from our car. The idea was then to work back along the valley, stopping at the most promising and accessible sites for more detailed survey.

After stopping in Câmpeni for lunch, we headed back northeast in the direction of Turda, first stopping at an invaded grassland site along the river near Bistra. The grassland at 46.376594, 23.152261 (Fig. 33) was dominated by *Anthoxanthum odoratum* and *Dactylis glomerata*, with *Carex hirta* and *Achillea millefolium* also being found at higher cover values. There were 46 species recorded in this grassland quadrat. The area of *Fallopia japonica* invaded grassland adjacent was under a canopy of *Alnus incana* and had a higher cover of *Elytrigia repens* and *Equisetum arvense,* although the overall species richness was very similar.

The next day, we headed back along the river to continue our exploration of invaded grasslands recorded on our GPS. This task was harder than first anticipated the previous day, due to the nature of the ownership of fields, and the fact that the grasslands had yet to be cut for hay in many places. We did not want to risk damaging the hay crop, and so limited our surveys to fields that had already been cut for hay, looked to be either abandoned, or stuck to the edge of fields to minimise any damage as a result of our activity. This meant we were unable to survey the full set of 30 possible locations we identified on day 6, but has generated a dataset of locations should this be required by Romanian ecologists. The stop-start nature of these attempts to survey did however mean that we got to really appreciate the diversity of the vegetation along the valley, as well as the extent of the invasion of *Fallopia* in particular, but of *Robinia* also and other species such as *Impatiens glandulifera* and *Helianthus tuberosus*.

At the end of day 8, we also explored a small side road off the main Aries valley to a monastery, taking in a wonderful array of plants on route. *Melampyrum bihariense* (known in Romanian as *sor-cu-frate* – literally “sister with brother”)

was abundant along roadside banks, and then up into some higher altitude meadows (Figs 49-52) we were lucky enough to see *Trifolium pannonicum*, *Trifolium montanum* and *Centaurea phrygia*, as well as more familiar grassland species such as *Galium verum*, *Trifolium medium*, *Leucanthemum vulgare* and *Lotus corniculatus*.

Figure 31. A typical view of a *Fallopia japonica* invasion sandwiched between the Arieş river (the nearest tree line) and agricultural land.

Figure 32. Another typical view of *Fallopia japonica* invasions along the Arieş river.

Figure 33. A view of the first grassland surveyed using our paired quadrat method for documenting grassland invasions along the Arieş. These are quadrats 6 and 7 in the dataset presented in the appendix to the report of Jodey Peyton.

Figure 34. The common grassland *Centaurea*, *C. phrygia*, present in our first invaded grassland stop.

Figure 35. A diverse grassland with *Scabiosa ochroleuca* in the Arieş valley.

Figure 36. The intense pink of *Dianthus carthusianorum* lights up many meadows and pastures along the Arieş.

Figure 37. A typical mixed agricultural landscape in the Arieş.

Figure 38. A potentially abandoned grassland along the Arieş. *Melilotus alba* and the invasive *Erigeron annuus* were both abundant in the sward.

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Figure 39. A maize crop near the river. *Fallopia japonica* abuts the field, having spread along the river Aries and in from the riverbank.

Figure 40. Near Muncelu, *Fallopia japonica* fringes another meadow, albeit one already heavily invaded by *Erigeron annuus* (the white-flowered forb in the middle distance).

Figure 41. Another set of agricultural habitats fringed by *F. japonica*: uncut and cut meadows, and a recently cut field of Lucerne (*Medicago sativa*).

Figure 42. Surveying another potentially abandoned, but highly diverse, grassland along the Arieş. This field was unusual amongst the ones we saw, in that *F. japonica* had clearly spread from the adjacent riverbank some distance into the field. This site was also topographically varied, with drier banks hosting species such as *Teucrium chamaedrys*.

Figure 43. A different view of the field pictured in Fig. 42, but looking north away from the river, the spreading outposts of *F. japonica* clearly visible.

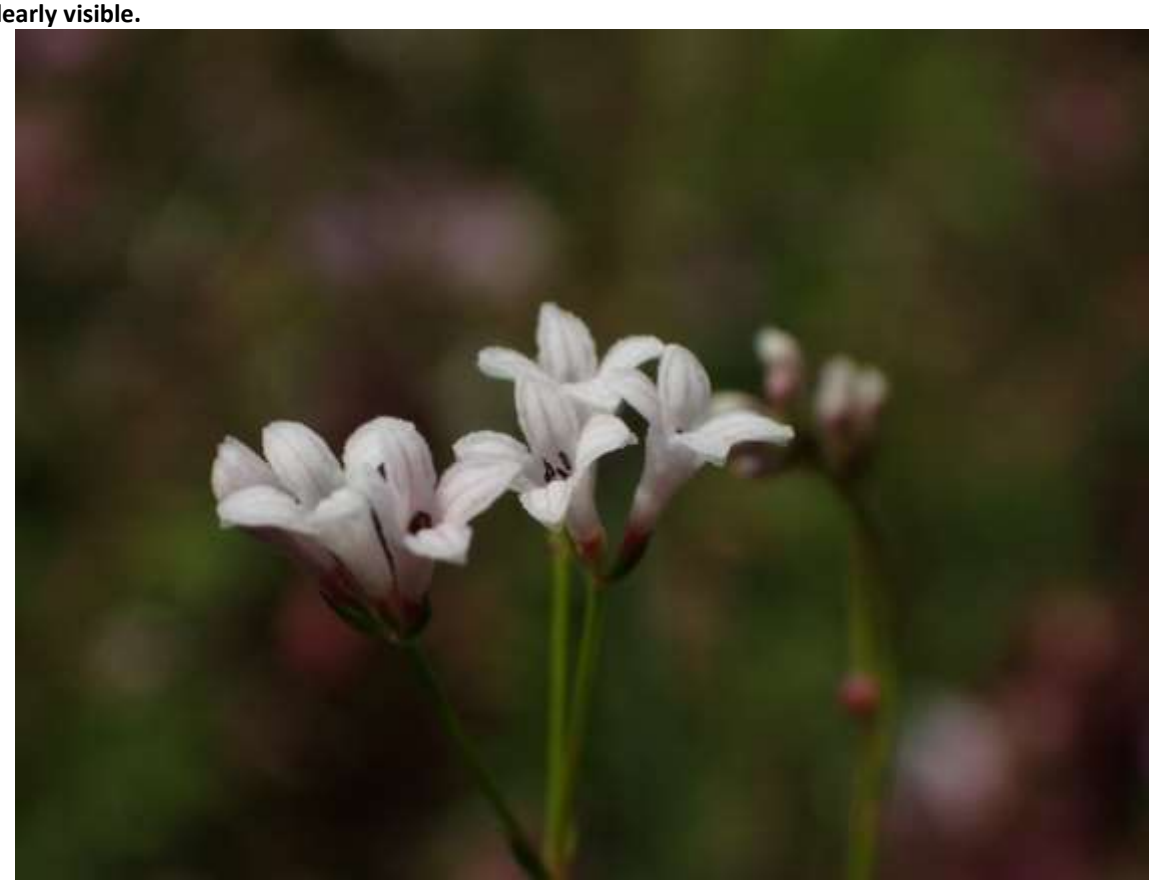

Figure 44. The flowers of *Asperula cynanchica* photographed in the fields pictured above (Figs. 42-43). Although not uncommon in the UK, this continental species was in great abundance in many of the drier grassland sites that we surveyed.

Figure 45. A large stand of *Medicago falcata* in the invaded grassland. This is a rare species of the Brecks in Britain, but was occasional across our sites in the Arieş, and was often quite abundant when found.

Figure 46. *Dianthus carthusianorum* and *Genista* seeds pods entwined by *Cuscuta cf. campestris* at the same site in the Arieş.

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Figure 47. A farmer raking in the hay to build stooks in the Arieş valley.

Figure 48. A recently cut field of Lucerne, with a fringe of *F. japonica* separating the field from the river Arieş.

Figure 49. A drift of *Melampyrum bihariense* along a roadside bank off the main Arieş valley.

Figure 50. The majestic *Trifolium pannonicum* in a hillside meadow off the Arieş valley.

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Figure 51. The superficially similar *Trifolium montanum* in the same meadow. The flower head, however, is comprised of much smaller flowers than *T. pannonicum* (Fig. 50).

Figure 52. The same diverse meadow, but with *Centaurea phrygia* and *Salvia pratensis*.

Days 9-14 – The Comana Natural Park: grasslands and wetlands

On day 9 we headed back south to the Comana Natural Park, a Ramsar site, around the Neajlov River, a tributary of the Danube and only around 25 km from that river. This 400 km journey took us across the Carpathians, through the Olt Valley between Sibiu and Râmnicu Vâlcea. This scenic journey followed small fields and a train line through the mountains from Transylvania into Oltenia and ended in Muntenia, on the Danube plain. It was lovely to end up at the Casa Comana hotel, where the decorations proudly focused on two local botanical rarities: Butchers' Broom (*Ruscus aculeatus*) and a Peony (*Paeonia peregrina*; Fig. 53); the latter is a Balkan-Turkish speciality and the subject of a local festival held in May each year.

Figure 53. One of several ornaments in the hotel Casa Comana celebrating two local plant rarities, *Ruscus aculeatus* and *Paeonia peregrina*.

We started day 10 at the Comana Natural Park Administration Headquarters. The park Head, Valentine Grigore, and one of his rangers, Andra David, spent an hour with us going over the digital maps they have on the area, and explaining the types of work that they undertake (Fig. 54). Comana Natural Park covers 1200 ha of wetland, 600 ha of which is in permanent open water. The wetland has been recently extended through the restoration of previously drained arable land. The staff at the centre are working on projects that they hope will lead to the restoration of a further 400 ha of wetland. This ambitious project would need backing from local residents but, if it can be completed, would add more incredible habitat to this region.

Figure 54. Jodey and myself with Valentin and Andra at the local headquarters of the Comana Natural Park.

Later that morning, Andra and another ranger gave us a tour of three grassland sites that we could survey within the Natural Park. This was a very useful orientation exercise, and enabled us get advice on numerous species and habitats found within the park. The second site we visited led the Park Staff to find a new area for *Marsilea quadrifolia* (Fig. 55), which is included in Annex II of the EU Habitats Directive (Council Directive 92/43/EEC), a species whose conservation requires the designation of Special Areas of Conservation. This discovery was a real bonus for the Park, which also contains populations of two other Annex II species: *Himantoglossum caprinum* and *Echium russicum*. *Echium russicum* (syn. *E. maculatum*) also occurs in the sub-steppic grasslands near Viscri that we had visited earlier in our trip. We were mindful to look out for all such designated species during the course of our surveys.

Over the following four days we surveyed many grassland stands around the Comana Natural Park, starting with a visit to a set of long-term monitoring plots (1 x 1 m) established by the park staff. These grassy plots were dominated by *Festuca rubra*, *Cynodon dactylon* and *Poa pratensis* (Fig. 57). After completing these four monitoring plots, we returned to the site at which we had found the new population of *Marsilea* the previous day. We undertook a further five quadrats (all 1 x 1 m) along a gradient of improvement from a football pitch down towards a shallow water body. Again, *C. dactylon* was present (Fig. 58), but with a more diverse mix of species in the sward, including *Bupleurum tenuissimum* (Fig. 59), *Trifolium fragiferum*, *T. pratense* and *T. repens*, with *Eryngium campestre* indicating overgrazing by the sheep seen on site (Fig. 60). On the following day we surveyed fifteen 1 m x 1 m quadrats in various habitats, including permanent grassland, seasonally-inundated grassland and disturbed grassland extensively grazed by a local herd of water buffalo (Fig. 61-62).

Our 13th day included a break from grassland survey to participate in a boat trip led by ranger by Andra David into the Comana wetland system (Figs 63-64). We saw four heron species, a grass snake swimming, a muskrat (non-native) and many egrets, cormorants and numerous Odonata. A number of aquatic plants were seen, including impressive stands of the bladderwort *Utricularia vulgaris*, an uncommon species in Romania, and *Najas marina*.

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On our final day of quadrat surveying, we visited a steep grassland near the site surveyed on day 12 with the water buffalo. This site was dominated by *Botriochloa ischaemum* (also seen earlier in the trip at the Turda Gorge; Fig. 65)*, C. dactylon* and *Poa pratensis*. The attractive yellow thistle *Scolymus hispanicus* was also present (Fig. 67). After quadrating, we walked over an area adjacent to our plots where *Crataegus monogyna* was invading the grassland. Other than the *Crataegus*, which presumably indicated a reduction in sheep grazing, the species encountered were broadly the same, with thistles being more prevalent and the sward being generally taller; however, the British Red Data Book species *Stachys germanica* was present in some abundance (Figs 68-69). After the storm, we finished our Comana surveys at a grassland near an abandoned military site (*Centaurea diffusa* being one attractive new species seen here; Fig. 70). This site was again showing signs of overgrazing, with *Eryngium campestre* being prevalent, and a reduced forb count, with *Bromus hordeaceus*/*commutatus* (the precise species was difficult to identify due to the desiccated nature of the specimens) and *Lolium perenne* being present in high numbers.

Figure 55. The new *Marsilea* population discovered during our tour with the Comana Natural Park rangers.

Figure 56. Cattle and water buffalo grazing seasonally inundated grassland around a channel with populations of *Marsilea*.

Figure 57. One of the Comana Natural Park long-term monitoring plots near to the Park headquarters. These plots were in a slightly brackish grassland, with *Carex divisa* present in one.

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Figure 58. *Cynodon dactylon* dominates one of our quadrats at the new *Marsilea* site. Note also a fruiting inflorescence of *Trifolium fragiferum*.

Figure 59. *Bupleurum tenuissimum* in a quadrat at the new *Marsilea* site. Although very hard to spot (and photograph!), this species was eventually recognised to be occasional throughout this grassland.

Figure 60. Abundant *Eryngium campestre* in overgrazed grassland at the new *Marsilea* site.

Figure 61. Grassland surveyed at the water buffalo site. A gradient from wetland habitat, through seasonally inundated grassland, to a drier, more grazer-disturbed sward, was clearly evident at this site.

Figure 62. ***Centaurea calcitrapa*****, a common species in drier, grazer-disturbed swards at the water buffalo site.**

Figure 63. ***Schoenoplectus lacustris*** **seen from the boat during our tour of the Comana wetlands.**

Figure 64. With Andra and Jodey on the boat tour of the Comana wetlands.

Figure 65. Back near the water buffalo grasslands, on a drier hillside grassland. This sward contained the sub-steppic grass *Botriochloa ischaemum*.

Figure 66. Surveying the dry hillside grassland. A local abundance of *Eryngium campestre* again indicated that overgrazing may have been an issue in the past.

Figure 67. Further along the dry hillside, *Scolymus hispanicus* was locally abundant, particularly where the hillside began to become more tussocky and scrubby.

Figure 68. A very rare species in the UK, *Stachys germanica* was seen occasionally throughout our Romanian trip. Here, in the scubby area of our dry hillside grassland site, it was locally abundant amongst *Crataegus*.

Figure 69. *Stachys germanica* abundant amongst *Botriochloa*/*Festuca* grassland.

Figure 70. The delicate inflorescence of *Centaurea diffusa*. A weedy species seen only at our last grassland survey site, near to the old Comana railway station and military base.

Although non-native invasions were not a particular feature of the grasslands surveyed around the Comana Natural Park, a large range of variation was encountered, being of largely hydrological and grazer-mediated origin. In this respect the area was an instructive contrast to the more mesic, scythe-and-grazer managed grasslands of the Arieş; the opportunity to contribute to long-term monitoring efforts in the area was also a nice opportunity to make our efforts useful locally to the rangers of the Natural Park.

Conclusions

Our work throughout Romania has given us an incredible insight into the plant diversity of this hyper-diverse country, both in terms of its grasslands and its wider landscape. Our approach of site walk-overs coupled with more detailed quadrat work (see the report of Jodey Peyton for full datasets), meant that we captured a large swathe of Romania's plant diversity, whilst also becoming knowledgeable about the commonest, most abundant species of the landscape. Our work at Arieş has fed into ongoing work on invasive plants in that river valley led by Dr Marilena Onete (see the ESENIAS abstract linked from the Overview section above), whilst our surveys of the Comana Natural Park have supported ongoing long-term monitoring in that area. Our work in Comana led both to the discovery of new populations of significant plant species, and to the documentation of plant communities across the Park's grasslands. Both Jodey and myself look forward to using our newly gained knowledge of Romania's grasslands and botanical diversity to further ecological research and conservation in that country, and in our own.

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