

Bryophytes of the Pindus Mountains in Greece

Fig. 1. Montane grassland on Mt Peristeri, June 2019. All photos by T.L. Blockeel.

Tom Blockeel describes the bryophytes of one of the lesser-known montane areas in Europe

The Pindus mountains form the backbone of mainland Greece, oriented roughly on a NW–SE axis from Mt Grammos on the border with Albania to Mt Parnassos near Delphi on the Gulf of Corinth (Figs 1, 2). There are two shorter, secondary ranges that run parallel to and east of the main Pindus chain. The easternmost of these includes Mt Olympus and terminates at Mt Pelion on the east coast. However this account is concerned only with the main Pindus chain and therefore excludes Mt Olympus, the highest mountain in Greece at 2917 m. There are many summits exceeding 2000 m in the Pindus, and the highest point is on Mt Smolikas at 2637 m, second only to Mt Olympus. It is important to remember that there are many other mountains in Greece, and along the northern borders the geology is more varied and the climate somewhat more continental

than in the Pindus. These northern mountains generally have a rather more diverse and richer flora than the Pindus, but they are outside the scope of this account.

Nomenclature in this account follows the forthcoming British and Irish Checklist (Blockeel *et al.*, 2021). The names of taxa not known in Britain and Ireland follow Hodgetts *et al.* (2020).

History

When Greece achieved independence in 1832 only the southern part of the Pindus mountains fell within Greek territory, in the area known as Sterea Ellas, the boundary running a little to the north of Karpenisi. The rest of the Pindus remained under Ottoman control, and access was both difficult and dangerous. In 1881 the Convention of Constantinople ceded most of Thessaly to Greece, which opened up the



△ Fig. 2. Map of North-West Greece, showing some of the places mentioned in the text.

mountains northwards to the Metsovo area. The present border with Albania was established in 1913. Many of the mountain villages in the Pindus are of Aromanian (Vlach) ethnic origin. Historically, the economy of the mountains included the summer grazing of sheep on the high pastures, and this still continues (Fig.

▽ Fig. 3. Sheep on their way to mountain pastures, Mt Peristeri, June 2019.



3). The traditional Molossian sheepdogs are ferocious animals and are one of the hazards of botanising on the mountains.

Access

Access to the Pindus mountains has become much easier in recent decades. Several good roads cross the range and many rough roads penetrate the mountains and forests and can often be negotiated with a four-wheel-drive vehicle.



△Fig. 4. Towering limestone rocks on Mt Timfi, June 2008.

▽Fig. 5. Mt Timfi, with light brown exposures of flysch in the foreground, and limestone behind, June 2019.

Walking is a much more enjoyable means of exploring the mountains, and indeed long walks are necessary to reach some of the summit areas. The traditional route across the north Pindus is the Katara Pass, which passes the town of Metsovo, the centre of Aromanian life in Greece and now the main tourist hub for the area. The old road has recently been supplanted by the Egnatian Highway (Egnatia Odos), which runs under the mountains east of Metsovo through a series of tunnels. In the south a good road runs west from Lamia to the town of Karpenisi and beyond. However many parts of the Pindus are still relatively remote, especially the Agrafa ('Uncharted') region north of Karpenisi.

Geology

Many of the Pindus mountains are dominated by hard limestones, but there are also significant areas of ophiolitic rocks, especially in the north Pindus, and beds of flysch occur widely in the limestone (Figs 4–6). The hard limestones, which





△Fig. 6. Mt Iti, outcrops of flysch in the form of sandstone rocks, June 2015.

are sometimes metamorphosed into marble, are exposed on many of the summits of the Pindus, forming crags and screes, and some mountains have extensive moonscapes of bare rock. Ophiolitic rocks, which include serpentinite, constitute much of Mt Smolikas (Figs 7–8) and there is another large expanse north of Metsovo. These rocks weather to produce large areas of stony ground and screes, and their chemical composition is inhospitable for many plant

species, although there are some interesting endemic vascular plants. The term flysch refers to a sequence of sedimentary strata deposited under certain marine conditions. Its physical nature varies, and includes sandstones and shales that are typically mildly acidic. It rarely forms massive outcrops, more often occurring as easily eroded shale that may form badlands, especially near Grevena.

▽Fig. 7. Mt Smolikas, high-level stony fields of ophiolitic rocks, June 2018.



▽Fig. 8. Mt Smolikas, closer view of ophiolitic rocks, with *Fritillaria epirotica*, June 2018.





△Fig. 9. Mt Peristeri, visited by von Halácsy in 1893. The village of Chaliki is just visible in the lower left of the photo.

History of bryological exploration

John Sibthorp (1758–1796) was the first botanist to record bryophytes in Greece. During the first of his journeys he visited Mt Parnassos in 1787, though his two localised bryophytes from there were the rather mundane *Homalothecium sericeum* and *Hypnum cupressiforme* (Sibthorp & Smith, 1813). Theodor von Heldreich (1822–1902), born in Dresden but resident in Greece for much of his life, was one of the pioneering botanical explorers of Greece in the 19th century. He was mainly concerned with vascular plants and he collected only a small number of bryophytes. After the incorporation of Thessaly into Greece in 1881, several botanists explored the Pindus as far north as Mt Peristeri and the Metsovo area. They included Heinrich Haussknecht in 1885, whose itinerary took in Mt Zygos and Mt Peristeri, where he collected a few mosses (Haussknecht, 1899). He was soon followed by Eugen von Halácsy (1842–1913),

an Austrian botanist whose expedition to Epirus in 1893 was accompanied by a ten-man infantry given by the Greek government for his protection (von Halácsy, 1894), a reminder that expeditions at the time were hazardous. His route took in Mt Peristeri, where he spent four days on the summit plateau (Fig. 9). His bryophytes were identified by Johann Breidler.

In 1906 a French expedition by René Maire & Marcel Petitmengin visited Mt Parnassos in the south as well as Mts Zygos and Peristeri to the north. René Maire had already made an earlier expedition in 1904, but almost all of his bryophyte collections from that first trip were destroyed in a fire. Their bryophytes were reported by Amédée Coppey, who used the opportunity to compile the first consolidated list of Greek bryophytes (Coppey, 1907).

For much of the remainder of the 20th century there was little bryological exploration in the Pindus, partly explained by the difficulties of

access in the early decades of the century, and the world war and the Greek civil war in the middle of the century. The Austrian botanist Karl Rechinger made numerous expeditions to Greece between 1927 and 1971 and on some of them he made collections of bryophytes; however, these have remained largely unpublished. They included sites in the Pindus. Frölich (1963) described a new species *Anoetangium crustatum* (now regarded as a synonym of *Gymnostomum viridulum*) from material collected by Rechinger on Mt Mitsikeli near Ioannina. Rechinger's collections are a potentially rich source of records and require further study. In 1976 Jacques Gamisans & Jean-Pierre Hébrard studied bryophyte communities in the forests of Epirus and West Macedonia, taking numerous relevés at sites in the forest zone of the North Pindus (Gamisans & Hébrard, 1979). The first comprehensive report for an individual mountain in the Pindus was published by Michael Lüth (2003), based on collections made in 2000 in the Vikos Gorge and Mt Timfi.

Much of the Pindus is, therefore, little known bryologically. My own first acquaintance with these mountains began on family holidays in 1988 and 1990, which included visits to Mt Parnassos and the Katara Pass. More intensive bryological surveys began in 2003 with an ascent of Mt Timfi accompanied by Marko Sabovljević. Subsequent visits included Mt Timfi again in 2008 and 2019, Mt Smolikas in 2008 and 2018, Mt Peristeri in 2019 and Mt Velouchi (or Timfristos), Mt Chelidon and Mt Iti in 2015. A small number of records from these visits have been published (Blockeel, 1991, 2010, 2020) but many are still pending. Other bryologists have visited the Pindus mountains in the past few decades, but only occasional records have appeared in print.

Details of some previously unpublished records

from the Pindus mountains, including many species mentioned in the following account, are listed in Appendix 1.

The bryophyte flora: two zones

This account is concerned with the montane flora, roughly above the 1000 m contour. Much of the land between 1000–1800 m lies in the forest zone, above which are the upper and summit zones, largely treeless, rising to peaks that exceed 2400 m on some mountains and a little higher on Mt Smolikas. Of course these are approximations. Not all the land in the forest zone is forested, and the forests ascend locally to 2000 m or higher. It is impossible to describe such a large area in detail, and this account is necessarily selective. In addition, our knowledge remains very fragmentary.

The upper zone

The environment at higher altitudes can be harsh, especially on the limestone. The ground dries very rapidly after snow-melt and is exposed to strong summer insolation. These are not Alpine mountains. It is possible to cross large tracts of ground and see few bryophytes. This is particularly true of montane turf, which is very dry in summer and generally rather coarse (Fig. 1). Several pleurocarps have been noted in areas of thin turf, including *Brachythecium glareosum*, *Brachytheciastrum collinum*, *Eurhynchiastrum diversifolium* and, on Mt Timfi, *Sciuro-hypnum glaciale*. Broken ground in turf may have *Polytrichum juniperinum* and various forms of *Syntrichia ruralis* s. lat., and *Polytrichastrum alpinum* occurs at higher levels. *Sanionia uncinata* is frequent in sheltered turf at the base of crags and on rock ledges, and plants of the *Racomitrium canescens* group are occasional on open or lightly shaded ground at various levels. The latter are rather problematic to identify. Most

specimens match *R. elongatum* in the presence of quadrate supra-alar cells and in the length of the costa (usually extending to the upper part of the leaf), but differ in the strong, often tall leaf papillae.

In rupestral habitats there is a strong contrast between limestone and the non-calcareous rocks (ophiolite and flysch), as might be expected. However some species are common to both. *Barbilophozia barbata* occurs on humus and among rocks, often in turf, on all these formations. *Pohlia cruda* is likewise indifferent to rock type, and it descends into the forest zone.

On limestone, the richest habitats are found on north-facing crags (Fig. 10) and in sink-holes. The flora includes some of the widespread calcicoles of the temperate zone in Europe, many of which are also found in the forest zone, e.g. *Mesoptychia (Leiocolea) collaris*, *Plagiochila porelloides*, *Porella cordaeana*, *Reboulia hemisphaerica*, *Scapania*

aequiloba, *Ctenidium molluscum*, *Distichium capillaceum*, *Flexitrichum flexicaule*, *F. gracile (Ditrichum flexicaule, D. gracile)*, *Encalypta streptocarpa*, *E. vulgaris*, *Tortella tortuosa*, *Tortula subulata* and *Trichostomum crispulum*. Particularly characteristic is *Mnium stellare*, often in a form with fragile leaves, as described by Hugonnot & Celle (2012) in France. *Seligeria acutifolia* has a wide altitudinal range in Greece, but ascends to over 2000 m on Mt Peristeri. *Lophocolea minor* is sometimes found on turfy rock ledges at high levels, appearing very different from the closely related *L. heterophylla*.

Some species of more markedly montane distribution in Europe are frequent (or at least widely distributed) on the limestone. *Scapania calcicola*, *Bryum elegans*, *Lescuraea incurvata (Pseudoleskea incurvata)*, *L. plicata (Ptychodium plicatum)*, *Mnium thomsonii*, *Plagiopus oederianus*, *Syntrichia norvegica* and *Timmia austriaca* are all known from both the north and the south Pindus. *Barbilophozia lycopodioides* is more restricted, currently known from Mt Timfi

▽ Fig. 10. Bryophyte turf on north-facing limestone rocks on Mt Peristeri, June 2019, with *Lescuraea incurvata* and *Timmia austriaca* in centre of photo.





△Fig. 11. *Clevea hyalina* from the island of Kefalonia, March 2020.

and Mt Peristeri.

Several *Schistidium* species occur on the high limestones, but identification can be difficult and some specimens remain unidentified. *S. atrofuscum* is present, though some older records of this species could be mis-identifications of *S. helveticum*, which is frequent in the Mediterranean region. *S. brunnescens* is known from Mt Timfi, but the recently described *S. memnonium* is very similar morphologically and has been collected at a lower altitude in the North Pindus by Michael Lüth, between Konitsa and Elefthero (Guerra *et al.*, 2020).

Syntrichia handelii is one of a small number of bryophytes that are restricted in Europe to the Mediterranean mountains. It is a species of dry calcareous rocks, known in the Pindus from Mt Parnassos. *Homalothecium philippeanum* has a wider distribution, extending north to the Alps, but is absent from northern Europe. It is not rare in Greece, but little known in the Pindus, though probably widespread. It was found on Mt Chelidon and Mt Velouchi in 2015 and on Mt Peristeri in 2019.

Several species on the limestone are known only from one or two sites, or in small quantity, but some may prove to be more widespread with

further exploration. *Clevea hyalina* is known from Mt Timfi and Mt Velouchi, but on the exposed summits it is usually tucked away in sheltered crevices in small quantity, although fertile plants occur. Its ecology is interesting; it is usually described as an Arctic-montane species, but I have seen it flourishing at only 860 m on the island of Kefalonia (Fig. 11). *Encalypta affinis* is a distinctive species known from Mt Timfi and Mt Peristeri. It has strikingly long capsules with a long peristome, and it is unusual in the genus in having branched papillae on the marginal cells of the leaf base. *Jungermannia polaris* was found on Mt Peristeri in 2019 on semi-bare soil among north-facing limestone rocks at *c.* 2020 m. There is only one previous report from Greece (and that doubtful). *Platydictya jungermanniioides* was found at the same site as *J. polaris* on Mt Peristeri in 2019, in a recess on a rocky limestone bank. Other apparently scarce species of the limestone include *Lophozia excisa* (on humus), *Grimmia anodon*, *Seligeria trifaria* s. lat., *Myurella julacea* and *Orthothecium intricatum*. Many of the historical records of *Entosthodon mühlenbergii* can only be interpreted in an aggregate sense,



△Fig. 12. Flysch outcrop dominated by Grimmiaceae, Mt Chelidon, June 2015.

but as currently defined it is known from recent records on Mt Timfi and Mt Peristeri.

An oddity is the presence of *Dichodontium pellucidum* on summer-dry soil pockets on limestone rock ledges with calcicolous associates (e.g. *Ctenidium molluscum*, *Distichium capillaceum*, *Flexitrichum flexicaule*). I have seen it twice in this habitat on Mt Timfi. Morphologically the plants are not obviously different from *D. pellucidum* s. str.

Non-calcareous rocks (ophiolite and flysch) often have strong populations of Grimmiaceae,

notably *Grimmia alpestris*, *G. anomala*, *G. caespiticia*, *G. hartmanii*, *G. montana*, *Schistidium confertum*, *S. flaccidum* and *S. pruinosum* (Figs 12–14). A moss of particular interest is *Lewinskya laevigata* (*Orthotrichum laevigatum*), which occurs on Mt Smolikas. The known localities for this moss (Fig. 15) in southern Europe are few and highly disjunct, but it is more widely distributed in northern Europe. *Hymenoloma crispulum* (*Dicranoweisia crispula*) occurs widely on non-calcareous rocks at high levels in northern Greece and is known from the Pindus on Mt Smolikas. *Mesoptychia* (*Leiocolea heterocolpos*) is also unexpectedly frequent in rock

▽Fig. 13. *Grimmia alpestris* on ophiolitic rock, head of Valia Kalda, June 2019.



▽Fig. 14. *Schistidium confertum* on flysch, Mt Timfi, June 2019.





◁Fig. 15. *Lewinskya laevigata*, photographed on granite on Mt Varnous in northern Greece, June 2018.

Encalypta microstoma, *Blindiadelphus recurvatus* (*Seligeria recurvata*) and *Tortula hoppeana*.

The upper zone: montane wetlands

Wetlands are mostly small in extent, in the form of springs and seepages. A few larger marshes and rivulets are found where flysch impedes drainage. On Mt Smolikias seepages support some interesting higher plants including *Pinguicula balcanica* and *Soldanella pindicola* (Fig. 16), but the bryophytes are usually few, and mostly limited to *Aneura pinguis*, *Palustriella falcata*, *Campylium protensum* and *Philonotis* spp. In addition to these species, calcareous marshes on Mt Timfi have *Marchantia polymorpha* subsp. *montivagans* and *Palustriella decipiens*. A striking but sterile pink *Bryum* occurs in springheads

crevices and soil-covered rocks, both above and below the treeline. Other species reflecting the continental affinities of the high mountain flora are *Heteroclaadiella dimorpha* (*Heterocladium dimorphum*) and *Lescuraea* (*Pseudoleskea*) *patens*. Non-calcareous rocks at high levels also support *Barbilophozia hatcheri*, *Bartramia ithyphylla*,

▽Fig. 16. Seepage with *Pinguicula balcanica* and *Soldanella pindicola* (inset), Mt Smolikias, June 2018.





◀ Fig. 17. Limestone spring with beds of purplish-pink *Bryum*, Mt Peristeri, June 2019.

(Fig. 17); it is perhaps *Bryum turbinatum*.

The forest zone

The montane forests of the Pindus are dominated by three types:

1. Beech forest (*Fagus sylvatica*)
2. Pine forest (Black pine *Pinus nigra* and Balkan

pine *Pinus heldreichii*)

3. Fir forest (Greek fir *Abies cephalonica* and King Boris' Fir *Abies borisii-regis*).

Stands of these forest types are sometimes almost pure, but more often mixed or in mosaic patches (Figs 18–20). Many other trees also occur, of course, including Sycamore (*Acer pseudoplatanus*)



Fig. 18. Mixed forest on Mt Smolikas, June 2018. Note concentration of Beech in more humid site in ravine on left.

Fig. 19. Fir forest (*Abies*) on Mt Peristeri, June 2019.



and junipers, and at lower altitudes the forests intergrade with Mediterranean woodlands.

Pseudoscleropodium purum is a characteristic and often abundant species in the ground flora, and *Homalothecium lutescens* is locally frequent. Striking is the absence (or near absence) of some of the familiar woodland mosses of NW Europe (e.g. *Mnium hornum*, *Thuidium tamariscinum*, *Eurhynchium striatum*). The

robust forest mosses *Hylocomium splendens* and *Hylocomiadelphus* (*Rhytidiadelphus*) *triquetrus* are found only occasionally in moister niches. *Lescuraea incurvata* and *L. saviana* (*Pseudoleskea incurvata* and *P. saviana*) are widespread among rocks and tree roots in the forests, and *Antitrichia curtispindula* is occasional. *Brachytheciastrum velutinum* is common, often on old logs, but also on tree roots and small boulders. There

▷ Fig. 20. Forest of *Pinus heldreichii* on Mt Smolikas, with plentiful *Moneses uniflora* (inset), June 2018.





◁Fig. 21. *Grimmia bartmanii* covering a boulder in the Soudziata valley, June 2019.

are several records of *Saelania glaucescens* in the forests in rock crevices and on humus, both on ophiolite and limestone.

Limestone rocks in forested areas harbour many of the bryophytes that extend above the treeline (e.g. *Ctenidium molluscum*, *Plagiopus oederianus*, *Tortella tortuosa* and *Trichostomum crispulum*), as well as other common calcicoles (*Cirriphyllum crassinervium*, *Fissidens dubius*). Both *Cololejeunea calcarea* (Mt Timfi) and *C. rossettiana* (Mt Parnassos) occur and are likely to be more widespread. *Mnium marginatum* is frequent, and *Pseudoleskeella catenulata* occurs on lightly shaded rocks. Most specimens of *Campylophyllopsis calcarea* (*Campylophyllum calcareum*) are from calcareous rocks but one from decaying wood on Mt Timfi also appears to belong to this species, although its separation from *C. sommerfeltii* is not easy. *Grimmia torquata* has been recorded from a massive boulder in Pine/Fir forest on the Katara Pass, its sole Pindus locality thus far. Non-British species include *Brachythecium tommasinii*, the very fine *Neckera menziesii*, and *Timmia bavarica*, closely related to *T. megapolitana* and often growing at the base of limestone rocks. Wet limestone rocks tend to be more common in the forest zone

than on the high ground, especially where water seeps on steep north-facing slopes. *Orthothecium rufescens* and *Hydrogonium croceum* (*Barbula crocea*) have been recorded in this habitat on Mt Timfi. *Marchantia* (*Preissia*) *quadrata* occurs there too, but has also been recorded on the high ground on Mt Smolikas.

Grimmia hartmanii is a highly characteristic forest species on non-calcareous rocks (Fig. 21). Interestingly it occasionally produces sporophytes in the Greek mountains, although it is sometimes stated to be exceptionally rare in fruit. *G. decipiens* also occurs in the forest zone, but is more widespread in the lower Mediterranean hills. Other widespread species on non-calcareous rocks are *Frullania tamarisci*, *Amphidium mougeotii*, *Dicranum scoparium*, *Isothecium alopecuroides* and *Schistidium papillosum*. *Barbilophozia hatcheri* descends into the forest zone. There is a single record of *Isopterygiopsis pulchella*, found on moist humus on a steep slope at the forest edge on Mt Smolikas, associated with *Lophocolea minor*, *Barbilophozia hatcheri* and *Plagiochila porelloides*. The forested valley of Kirakalis Rema, west of Krania, recently produced the first Pindus records of *Encalypta ciliata* and *Tritomaria*

▷ Fig. 22. Habitat of *Frullania fragilifolia* in the Kirakalis valley, June 2019.



quinquedentata. This valley, which is underlain by ophiolite and has a large population of *Erica carnea* on the forest floor, is also notable for the presence of *Frullania fragilifolia*, found there on lightly shaded boulders in 2019 (Fig. 22). This *Frullania* was reported previously in Greece by Ade & Rechinger (1938) from a 1933 collection on the island of Samothraki (Samothrace), and it is now confirmed for the country.

The tuber-bearing species of *Bryum* are poorly recorded in Greece. It was interesting, therefore, when *B. klinggraeffii* was detected in material collected from ground disturbed by animals in pine forest near Samarina in 2018. Its Greek records are very few and scattered, but it is clearly a successful opportunistic moss.

Logs and tree stumps are of course frequent in the forests, but on many of the slopes they are too dry to support specialist lignicolous bryophytes. *Dicranum tauricum*, often with sporophytes (Fig. 23), and *Herzogiella seligeri* are the commonest bryophytes on old logs. Richer communities are mostly confined to humid niches in stream gullies and valley floors, where species may include *Aulacomnium androgynum* and various liverworts, notably *Blepharostoma trichophyllum*, *Cephalozia (Nowellia) curvifolia*, *C. lunulifolia*, *Lophozia guttulata*, *Lophocolea heterophylla* and *Riccardia palmata*. However, some of these have been recorded hitherto only at single sites in the Pindus (though known elsewhere in other parts of northern Greece). Of special note is *Lophozia*

▽ Fig. 23. *Dicranum tauricum* with capsules, Kirakalis Valley, June 2019.





△Fig. 24. *Neckera pumila* festooning twigs in a valley near Domiani, June 2015.

ascendens, which was found new to Greece in 2018 on the cut end of a well-rotted log on a north-facing forest slope at 1720 m on Mt Smolikas. The high-profile *Buxbaumia viridis* has been known for some time on Mt Smolikas and Mt Timfi, and was found on Mt Peristeri in 2019.

There are some rich epiphytic communities, although pine and fir trees on exposed slopes are often unproductive. Some species of the Mediterranean hills reach the lower montane zone, e.g. *Neckera smithii* (*Leptodon smithii*),

Habrodon perpusillus, *Neckera pumila* (Fig. 24) and *Lewinskya acuminata* (*Orthotrichum acuminatum*). Many of the widespread epiphytes of the European temperate zone are also present. *Frullania dilatata*, *Radula complanata*, *Lewinskya affinis* (*Orthotrichum affine*), *L. speciosa* (*O. speciosum*), *Orthotrichum pallens*, *Pulvigerella lyellii* (*Orthotrichum lyellii*) and *Pseudoleskeella nervosa* all occur widely. Two common pleurocarps are *Leucodon sciuroides* and *Pterigynandrum filiforme*, the latter being one of the most frequently encountered montane epiphytes. Also common and very characteristic on Beech trees are *Lewinskya striata* (*Orthotrichum striatum*)



Fig. 25. *Lewinskya shawii*, Soudziata Valley, June 2019 (note absence of inner peristome segments).

▷Fig. 26. *Pohlia elongata* var. *greenii*, specimen from Mt Tzena, June 2017 (Blockeel 46/384).

and *Orthotrichum stramineum*, very rarely supplemented by *O. alpestre*.

The montane forest zone is the optimum habitat for several *Orthotrichum* and *Lewinskya* species that have their centre of distribution in the Mediterranean-montane zone. *Lewinskya shawii* (*Orthotrichum shawii*) is characteristic of Beech trees and is widespread in the north Pindus (Fig. 25). *Orthotrichum scanicum* is frequent and very widely distributed on both coniferous and broad-leaved trees. Less common is *O. hispanicum*, which is similar to *O. pallens*, but its outer peristome teeth split at maturity and tend to twist irregularly. Many of its records are from Box (*Buxus sempervirens*), but it is also recorded from Kermes Oak (*Quercus coccifera*) and Juniper. Another species with irregularly twisted exostome teeth is *Lewinskya tortidontia* (*Orthotrichum tortidontium*), which is further distinguished by the corrugated (star-shaped) profile of the capsule mouth when viewed from above. It is recorded from Junipers on Mt Timfi and Mt Peristeri, and is likely to be under-recorded in the Pindus. Finally, *Lewinskya breviseta*, originally described as *Orthotrichum speciosum* var. *brevisetum*, has been recorded on *Abies* on Mt Peristeri and will probably prove to be widespread. It is close to *L. speciosa*, but has more strongly ribbed capsules and a seta that is usually shorter than the capsule (Draper *et al.*, 2003).

Taxonomic puzzles

Not all bryophytes encountered in the Greek mountains are straightforward to identify. In 2008 I collected a small *Bryum*-like moss on Mt Smolikas, and subsequently found it at two sites outside the Pindus on the Voras range in 2017. It was distinctive in having horizontal to suberect



capsules and a very reduced inner peristome consisting of a low basal membrane, linear processes and no cilia. I wondered if it might be the little-known *Brachymenium paradoxum* (*Mielichhoferia paradoxa*), a moss collected at three sites in the Republic of North Macedonia in 1917 and nowhere since. But it soon became apparent that the Greek moss was a different taxon. After further investigation I eventually concluded that the Greek plants are an extreme form of *Pohlia elongata* var. *greenii* (Fig. 26). They are discussed in more detail in Blockeel (2020).

Another puzzle, still unsolved, concerns an

▽Fig. 27. Three shoots of the unidentified *Entosthodon* from Mt Timfi.



Entosthodon found in 2003 on a limestone rock ledge on Mt Timfi (Fig. 27). It has slightly asymmetric narrow capsules, and completely lacks a peristome. The latter character immediately eliminates *E. muhlenbergii*, which also occurs on Mt Timfi and has a well-developed double peristome. The exothecial cells of the unidentified species are wedge-shaped in cross-section, as in *E. obtusus* and *E. attenuatus*, and this eliminates subgenus *Murcia*, to which *E. fascicularis* belongs. It does not match any of the known European species, but is perhaps close to *E. handelii* of the Caucasus. Further collections might help to establish its status, but a search in 2019 on Mt Timfi and Mt Peristeri revealed no

further useful material.

Concluding comments

The Pindus mountains may be less rich than the mountains of Central Europe, but they have plenty of bryological interest, as well as a spectacular vascular flora. They deserve further exploration. There are the added pleasures of exploring little-known areas, with the prospect of unexpected surprises. Bears and wolves inhabit the mountains, but are usually seen only on road-signs!

Acknowledgements

This is a revised and updated version of a presentation by the author during the AGM of the British Bryological Society at

▽Fig. 28. Road-sign in northern Greece



Leicester on 5 October 2019. I'm very grateful to David Long for help in identifying liverwort samples, and to Michael Lüth for information on his collections.

References

- Ade, A. & Rechinger, K.H. (1938).** Samothrake. *Repertorium specierum novarum regni vegetabilis, Beihefte Band C* 100: 106–146.
- Blockeel, T.L. (1991).** The bryophytes of Greece: new records and observations. *Journal of Bryology* 16: 629–640.
- Blockeel, T.L. (2010).** The bryophytes of Greece: new records and observations, 2. *Nova Hedwigia, Beiheft* 138: 129–146.
- Blockeel, T.L. (2020).** Bryophytes from four mountains in northern Greece, including *Mammia gracilis* and eight other species new to Greece, and a note on an extreme form of *Pohlia elongata* var. *greenii*. *Journal of Bryology* 42: 258–267.
- Blockeel, T.L., Bell, N.E., Hill, M.O., Hodgetts, N.G., Long, D.G., Pilkington, S.L. & Rothero, G.P. (2021).** A new checklist of the bryophytes of Britain and Ireland, 2020. *Journal of Bryology* (in press).
- Coppey, A. (1907).** Matériaux por servir a l'étude de la flora et la géographie botanique de l'Orient. Troisième fascicule. Contribution a l'étude des muscinées de la Grèce. *Bulletin des Séances de la Société des Sciences de Nancy, Série 3*, 8(3): 293–360.
- Dimopoulos, P., Raus, Th., Bergmeier, E., Constantinidis, Th., Iatrou, G., Kokkini, S., Strid, A. & Tzanoudakis, D. (2013).** *Vascular plants of Greece: an annotated checklist*. Botanic Garden and Botanical Museum Berlin-Dahlem, Berlin.
- Draper, I., Lara, F., Albertos, B., Garilleti, R. & Mazimpaka, V. (2003).** The epiphytic bryoflora of the Jbel Bouhalla (Rif, Morocco), including a new variety of moss, *Orthotrichum speciosum* var. *brevisetum*. *Journal of Bryology* 25: 271–280.
- Fröhlich, J. (1963).** Zwei neu Laubmoose aus Nordgriechenland. *Annalen des Naturhistorischen Museums in Wien* 66: 35–36.
- Gamisans, J. & Hébrard, J.P. (1979).** A propos de la végétation des forêts d'Épire et de Macédoine grecque occidentale. *Documents Phytosociologiques*, n.s. 4: 289–341.
- Guerra, J., Martínez, M., Jiménez, J.A., Cano, M.J. & Gallego, M.T. (2020).** A new species of moss emerges from molecular and morphological data: *Schistidium memnonium* sp. nov. (Grimmiaceae, Bryophyta). *Plant Biosystems*. DOI: 10.1080/11263504.2020.1762789.
- Hausknecht, C. (1899).** Symbolae ad floram Graecam. Aufzählung der im Sommer 1885 in Griechenland gesammelten Pflanzen (Ulmaceae-Fungi). *Mitteilungen des Thüringischen Botanischen Vereins, Neue Folge* 13/14: 18–77.
- Hodgetts, N.G. et al. (2020).** An annotated checklist of bryophytes of Europe, Macaronesia and Cyprus. *Journal of Bryology* 42: 1–116.
- Hugonnot, V. & Celle, J. (2012).** Asexual reproduction by leaf fragmentation in *Mnium stellare* Hedw. *Journal of Bryology* 34: 67–70.
- Lüth, M. (2003).** Moose in der Umgebung des Dorfes Vikos, im Vikos-Aoos Nationalpark (NW Griechenland). *Archive for Bryology* 2: 1–25.
- Sibthorp, J. & Smith, J.E. (1813).** *Florae Graecae Prodrromus*. Vol. II. Richard Taylor, London.
- von Halácsy, E. (1894).** Botanische Ergebnisse einer in Auftrage der hohen kaiserl. Akademie der Wissenschaften unternommenen Forschungsreise in Griechenland. I. Beitrag zur Flora von Epirus. *Denkschriften der Mathematisch-Naturwissenschaftlichen Classe der kaiserlichen Akademie der Wissenschaften* 61: 217–268.

Appendix 1

The opportunity is taken here to document selected and previously unpublished records from the Pindus mountains, in localities that are believed to be new for the species. The abbreviations NPI, SPI and STE refer respectively to the floristic regions of North Pindus, South Pindus and Sterea Ellas, as used by botanists in Greece (see Dimopoulos *et al.*, 2013).

- Aneura pinguis*. NPI:** Mt Smolikas, in cirque on east side of Mosia peak 40°05'48"N, 20°57'24"E, in stone seepage below crag, c. 2200 m alt., 9 June 2018, Blockeel 47/236;
- SPI:** Goudouvaka Rema, on northern slopes of Peristeri, SE of Anthochori 39°42'28"N, 21°09'05"E, on wet limestone cliff in gully, 1500 m alt., 17 June 2019, Blockeel 48/266.
- Barbilophozia barbata*. NPI:** La Soudziata Rema, west of Milia 39°51'29"N, 21°11'22"E, on small boulder in Beech (*Fagus*) forest,

1630 m alt., 16 June 2019, Blockeel 48/220; **SPI**: Goudouvaka Rema, on northern slopes of Peristeri, SE of Anthochori 39°43'14"N, 21°08'30"E, in humus on limestone boulder by forest road in *Abies* forest, 1190 m alt., 17 June 2019, Blockeel 48/246; **STE**: Mt Chelidon: northern slopes west of Mikro Chorio 38°49'39"N, 21°41'29"E, in turf at base of low crag, c. 1660 m alt., 11 June 2015, Blockeel 44/689, 44/691; **STE**: Mt Velouchi: northern slopes above Aghia Triada 38°57'59"N, 21°48'20"E, in turf on sheltered

rock ledge, c. 1550 m alt., 9 June 2015, Blockeel 44/625, and northern slopes below Petsalouda 38°57'43"N, 21°50'02"E, among rocks on open stony bank, c. 1330 m alt., 7 June 2015, Blockeel 44/543, and upper slopes east of the ski centre 38°57'01"N, 21°49'41"E, on turfy ledge on north-facing slope, c. 2090 m alt., 9 June 2015, Blockeel 44/618.

Barbilophozia hatcheri. **STE**: Mt Chelidon: northern slopes west of Mikro Chorio 38°49'29"N, 21°41'21"E, crevice on base-poor crag, c. 1800 m alt., 11 June 2015, Blockeel 44/702; **STE**: Mt Iti: northern end of Livadies plateau 38°49'33"N, 22°16'26"E, thin soil on outcrop of base-poor rock above bank of small stream, c. 1790 m alt., 10 June 2015, Blockeel 44/663.

Barbilophozia lycopodioides. **SPI**: northern slopes of Peristeri, above Goudouvaka Rema, S of Anthochori 39°41'57"N, 21°08'54"E, on earthy rock ledge on north-facing crags, 1870 m alt., 17 June 2019, Blockeel 48/273.

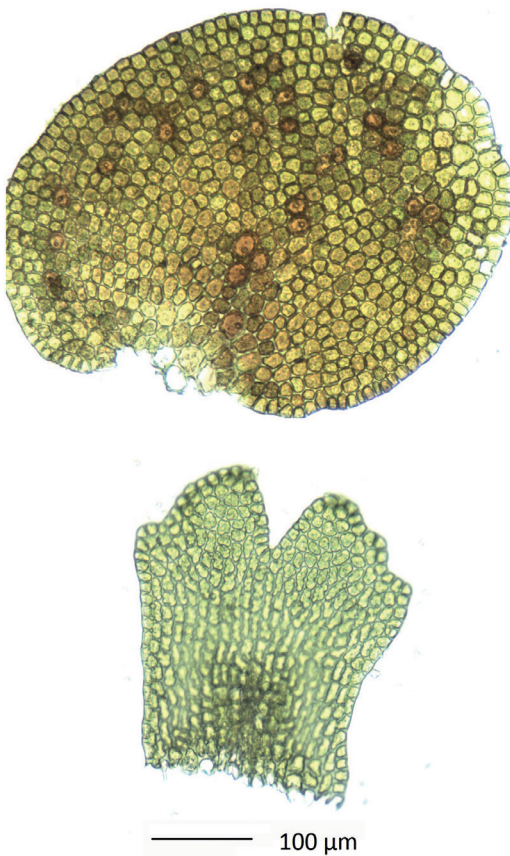
Blepharostoma trichophyllum. **SPI**: valley of Kirakalis Rema, west of Krania 39°53'44"N, 21°13'10"E, on well-rotted log in Beech/Fir forest, 1230 m alt., 19 June 2019, Blockeel 48/325.

Cephalozia curvifolia. **NPI**: c. 6 km NE of Samarina, by road to Chelimodi 40°07'54"N, 21°04'13"E, on rotting log in Pine forest, c. 1300 m alt., 8 June 2018, Blockeel 47/224; **NPI**: La Soudziata Rema, west of Milia 39°51'36"N, 21°11'35"E, on rotten log in Beech (*Fagus*) forest, 1480 m alt., 16 June 2019, Blockeel 48/245.

Cephalozia lunulifolia. **NPI**: La Soudziata Rema, west of Milia 39°51'40"N, 21°10'34"E, on fallen Pine log in forest, 1750 m alt., 16 June 2019, Blockeel 48/233.

Clevea hyalina. **STE**: Mt Velouchi: northern slopes above Aghia Triada 38°57'59"N,

▽Fig. 29. Leaf lobe and underleaf of *Frullania fragilifolia* from the Kirakalis valley, June 2019.



- 21°48'21"E, soil on recessed rock ledge, *c.* 1550 m alt., 9 June 2015, Blockeel 44/624.
- Frullania fragilifolia*. SPI:** valley of Kirakalis Rema, west of Krania 39°54'04"N, 21°12'33"E and 39°54'04"N, 21°12'34"E, on lightly shaded boulders near stream in deep valley, 1230 m alt., 19 June 2019, Blockeel 48/332, 48/338 (Fig. 29).
- Jungermannia polaris*. SPI:** Mt Peristeri, Verlinga area 39°40'16"N, 21°07'52"E, semi-bare soil among limestone rocks, 2020 m alt., 18 June 2019, Blockeel 48/291.
- Lophocolea heterophylla*. SPI:** Goudouvaka Rema, on northern slopes of Peristeri, SE of Anthochori 39°42'49"N, 21°08'43"E, on old log on bank by forest road in *Abies* forest, 1230 m alt., 17 June 2019, Blockeel 48/259.
- Lophozia ascendens*. NPI:** Mt Smolikas, Valia Kirna, upper north-facing slopes *c.* 40°04'46"N, 20°58'36"E, on cut end of well-rotted log on north-facing forest slope, *c.* 1720 m alt., 10 June 2018, Blockeel 47/260, conf. D.G. Long. New for Greece.
- Lophozia guttulata*. NPI:** La Soudziata Rema, west of Milia 39°51'37"N, 21°10'42"E, base of old tree stump in Beech/Pine forest, 1720 m alt., 16 June 2019, Blockeel 48/231.
- Marchantia quadrata*. NPI:** Mt Smolikas, floor of cirque on east side of Mosia peak 40°05'40"N, 20°57'32"E, on moist soil at edge of rock, *c.* 2090 m alt., 9 June 2018, Blockeel 47/244.
- Mesoptychia heterocolpos*. NPI:** eastern spur of Mt Smolikas, above Samarina 40°06'15"N, 20°59'32"E, on soil by serpentine rock in Pine forest, *c.* 1970 m alt., 9 June 2018, Blockeel 47/250; **STE:** Mt Chelidon: northern slopes west of Mikro Chorio 38°49'29"N, 21°41'22"E, crevice on base-poor crag, *c.* 1800 m alt., 11 June 2015, Blockeel 44/696; **STE:** Mt Iti: below northern slopes of Pirgos peak 38°48'21"N, 22°15'19"E, in rock crevice, *c.* 1960 m alt., 10 June 2015, Blockeel 44/651.
- Riccardia palmata*. SPI:** Goudouvaka Rema, on northern slopes of Peristeri, SE of Anthochori 39°42'42"N, 21°08'47"E, on cut end of large log in *Abies* forest, 1280 m alt., 17 June 2019, Blockeel 48/280.
- Scapania calcicola*. STE:** Mt Velouchi: upper slopes east of the ski centre 38°56'58"N, 21°49'35"E, on earthy ledge on north-facing slope, *c.* 2140 m alt., 9 June 2015, Blockeel 44/622.
- Tritomaria quinquentata*. NPI:** La Soudziata Rema, west of Milia 39°51'28"N, 21°11'02"E, shaded boulder in gully in Beech (*Fagus*) forest, 1630 m alt., 16 June 2019, Blockeel 48/228.
- Antitrichia curtispindula*. NPI:** *c.* 6 km NE of Samarina, by road to Chelimodi 40°07'44"N, 21°03'45"E, in thorn scrub at edge of Pine forest, *c.* 1240 m alt., 11 June 2018, Blockeel 47/286; **SPI:** valley of Kirakalis Rema, west of Krania 39°53'51"N, 21°13'32"E, on small boulders in Beech/Fir forest, 1200 m alt., 19 June 2019, Blockeel 48/322.
- Aulacomnium androgynum*. NPI:** *c.* 6 km NE of Samarina, by road to Chelimodi 40°07'53"N, 21°04'13"E, on rotting log in Pine forest, *c.* 1310 m alt., 8 June 2018, Blockeel 47/225; **SPI:** valley of Kirakalis Rema, west of Krania 39°53'59"N, 21°14'11"E, on old tree stump in mixed forest, 1140 m alt., 19 June 2019, Blockeel 48/311.
- Bartramia ithyphylla*. NPI:** Mt Smolikas, floor of cirque on east side of Mosia peak 40°05'40"N, 20°57'37"E, on soil among boulders, *c.* 2070 m alt., 9 June 2018, Blockeel 47/242; **STE:** Mt Chelidon: northern slopes west of Mikro Chorio 38°49'29"N, 21°41'22"E, crevice on base-poor crag, *c.* 1800 m alt., 11 June 2015, Blockeel 44/697.
- Bryum elegans*. SPI:** Mt Peristeri, Verlinga area

- 39°40'16"N, 21°07'54"E, in crevice on rocky limestone bank, 2010 m alt., 18 June 2019, Blockeel 48/297; **STE**: Mt Velouchi: upper slopes east of the ski centre 38°56'59"N, 21°49'39"E, in earthy rock crevice on north-facing slope, c. 2130 m alt., 9 June 2015, Blockeel 44/614.
- Bryum klingraeffii**. **NPI**: c. 6 km NE of Samarina, by road to Chelimodi 40°07'38"N, 21°03'52"E, on moist disturbed soil in Pine forest, c. 1270 m alt., 11 June 2018, Blockeel 47/288.
- Buxbaumia viridis**. **SPI**: valley of Kirakalis Rema, west of Krania 39°53'59"N, 21°14'11"E, on well-rotted log under pines, 1140 m alt., 19 June 2019, Blockeel 48/312.
- Campylophyllopsis calcarea**. **NPI**: c. 6 km NE of Samarina, by road to Chelimodi 40°08'04"N, 21°04'08"E, soil over calcareous boulder in Pine forest, c. 1230 m alt., 8 June 2018, Blockeel 47/217, and 40°07'58"N, 21°03'54"E, closely adhering to small stone on ground in Pine forest, c. 1240 m alt., 11 June 2018, Blockeel 47/293.
- Encalypta affinis**. **SPI**: Mt Peristeri, Verlinga area 39°40'16"N, 21°07'52"E, semi-bare soil among limestone rocks, 2020 m alt., 18 June 2019, Blockeel 48/292.
- Encalypta ciliata**. **SPI**: valley of Kirakalis Rema, west of Krania 39°54'04"N, 21°12'33"E, on soily rock ledge in deep forest valley, 1230 m alt., 19 June 2019, Blockeel 48/336.
- Entosthodon muhlenbergii**. **SPI**: Mt Peristeri, Verlinga area 39°40'16"N, 21°07'51"E, in turf on limestone crag, 2020 m alt., 18 June 2019, Blockeel 48/290.
- Flexitrichum gracile**. **SPI**: lower slopes of Peristeri, Koproau Rema, west of Chaliki 39°40'28"N, 21°10'13"E, on shaded limestone, 1250 m alt., 18 June 2019, Blockeel 48/281; **STE**: Mt Velouchi: upper slopes east of the ski centre 38°56'57"N, 21°49'38"E, on grassy tussock on rock outcrop, c. 2160 m alt., 9 June 2015, Blockeel 44/600.
- Grimmia anomala**. **STE**: Mt Chelidon: northern slopes west of Mikro Chorio 38°49'37"N, 21°41'26"E, on small boulder on rocky slope, c. 1680 m alt., 11 June 2015, Blockeel 44/692; **STE**: Mt Iti: northern end of Livadies plateau 38°49'33"N, 22°16'26"E, on outcrop of base-poor rock above bank of small stream, c. 1790 m alt., 10 June 2015, Blockeel 44/660.
- Grimmia hartmanii**. **NPI**: eastern spur of Mt Smolikias, above Samarina 40°06'15"N, 20°59'32"E, on serpentine rock in Pine forest, c. 1970 m alt., 9 June 2018, Blockeel 47/249; **SPI**: valley of Kirakalis Rema, west of Krania 39°53'44"N, 21°13'10"E, on boulder in Beech/Fir forest, 1230 m alt., 19 June 2019, Blockeel 48/326. Both specimens with sporophytes.
- Grimmia montana**. **STE**: Mt Iti: below eastern side of Alikena peak 38°48'52"N, 22°15'53"E, on lightly shaded low boulder, c. 1860 m alt., 10 June 2015, Blockeel 44/645, and below south-eastern side of Alikena peak 38°48'42"N, 22°15'36"E, on projecting rock on open slope, c. 1940 m alt., 10 June 2015, Blockeel 44/649.
- Heterocladiella dimorpha**. **STE**: Mt Iti: northern end of Livadies plateau 38°49'35"N, 22°16'26"E, thin soil on outcrop of base-poor rock above bank of small stream, c. 1790 m alt., 10 June 2015, Blockeel 44/668; **STE**: Mt Iti: western slopes of Greveno peak 38°49'20"N, 22°17'05"E, on soily bank on slopes with low juniper, c. 1960 m alt., 10 June 2015, Blockeel 44/642.
- Homalothecium philippeanum**. **SPI**: Mt Peristeri, below Verlinga 39°40'44"N, 21°07'59"E, on limestone rock face, 1900 m

alt., 18 June 2019, Blockeel 48/306; **STE**: Mt Chelidon: northern slopes west of Mikro Chorio 38°49'50"N, 21°41'36"E, over rock in open gully, c. 1520 m alt., 11 June 2015, Blockeel 44/682; **STE**: Mt Velouchi: upper slopes east of the ski centre 38°56'56"N, 21°49'37"E, in rock crevice on grassy slope, c. 2180 m alt., 9 June 2015, Blockeel 44/597.

Hylacomiaadelphus triquetrus. **STE**: Mt Iti: a little south-west of Perdikovrisi 38°50'04"N, 22°15'30"E, on steep irrigated bank by forest road, c. 1580 m alt., 10 June 2015, Blockeel 44/637; **STE**: Mt Velouchi: northern slopes, Skamatorema valley 38°58'39"N, 21°50'26"E, on north-facing bank of forest road, c. 940 m alt., 7 June 2015, Blockeel 44/525.

Hylacomium splendens. **STE**: Mt Chelidon: northern slopes west of Mikro Chorio 38°49'29"N, 21°41'22"E, sparsely in crevice on base-poor crag, c. 1800 m alt., 11 June 2015, Blockeel 44/698; **STE**: Mt Velouchi: northern slopes above Aghia Triada 38°58'16"N, 21°48'25"E, on north-facing bank of forest road, c. 1240 m alt., 9 June 2015, Blockeel 44/636.

Isopterygiopsis pulchella. **NPI**: Mt Smolikias, Valia Kirna, upper north-facing slopes c. 40°04'45"N, 20°58'21"E, on moist soil on steep slope at forest edge, c. 1750 m alt., 10 June 2018, Blockeel 47/261.

Lescuraea patens. **STE**: Mt Iti: below eastern side of Alikena peak 38°48'52"N, 22°15'53"E, on side of lightly shaded low boulder, c. 1860 m alt., 10 June 2015, Blockeel 44/646.

Lescuraea plicata. **SPI**: Mt Peristeri, Verlinga area 39°40'16"N, 21°07'54"E, on turf/stony limestone bank, 2010 m alt., 18 June 2019, Blockeel 48/301; **SPI**: northern slopes of Peristeri, above Goudouvaka Rema, S of Anthochori 39°41'57"N, 21°08'52"E, on damp limestone rocks in small gully on steep

slope, 1830 m alt., 17 June 2019, Blockeel 48/270; **STE**: Mt Velouchi: upper slopes east of the ski centre 38°57'01"N, 21°49'41"E, on grassy ledge on north-facing slope, c. 2090 m alt., 9 June 2015, Blockeel 44/617.

Lescuraea saviana. **NPI**: La Soudziata Rema, west of Milia 39°51'29"N, 21°11'22"E, on small boulder in Beech (*Fagus*) forest, 1630 m alt., 16 June 2019, Blockeel 48/219; **NPI**: Mt Smolikias, Valia Kirna, upper north-facing slopes c. 40°04'45"N, 20°58'40"E, on small boulder under Beech (*Fagus*), c. 1720 m alt., 10 June 2018, Blockeel 47/275.

Lewinskya breviseta. **SPI**: Goudouvaka Rema, on northern slopes of Peristeri, SE of Anthochori 39°43'06"N, 21°08'38"E, on branch of *Abies*, 1210 m alt., 17 June 2019, Blockeel 48/253.

Lewinskya shawii. **NPI**: c. 3 km NE of Samarina, 40°07'10"N, 21°02'43"E, on Beech (*Fagus*), c. 1380 m alt., 11 June 2018, Blockeel 47/294B; **NPI**: La Soudziata Rema, west of Milia 39°51'56"N, 21°10'24"E, on Beech (*Fagus*), 1720 m alt., 16 June 2019, Blockeel 48/234, and 39°51'29"N, 21°11'56"E, on Beech (*Fagus*), 1470 m alt., 16 June 2019, Blockeel 48/243.

Lewinskya tortidontia. **SPI**: Goudouvaka Rema, on northern slopes of Peristeri, SE of Anthochori 39°42'33"N, 21°08'57"E, epiphyte on juniper at upper edge of forest, 1410 m alt., 17 June 2019, Blockeel 48/265.

Mnium thomsonii. **SPI**: Mt Peristeri, Verlinga area 39°40'16"N, 21°07'55"E, on rock ledge on limestone bank, 2000 m alt., 18 June 2019, Blockeel 48/303; **STE**: Mt Velouchi: upper slopes east of the ski centre 38°56'59"N, 21°49'39"E, in earthy rock crevice on north-facing slope, c. 2130 m alt., 9 June 2015, Blockeel 44/613.

Neckera menziesii. **NPI**: c. 6 km NE of

- Samarina, by road to Chelimodi 40°08'04"N, 21°04'08"E, on calcareous crag in Pine forest, c. 1240 m alt., 8 June 2018, Blockeel 47/219.
- Orthothecium intricatum***. **SPI**: Mt Peristeri, Verlinga area 39°40'17"N, 21°07'54"E, in recess on rocky limestone bank, 2000 m alt., 18 June 2019, Blockeel 48/302.
- Orthotrichum hispanicum***. **SPI**: valley of Kirakalis Rema, west of Krania 39°53'43"N, 21°13'10"E, on Box (*Buxus*) twigs in Beech/Fir forest, 1240 m alt., 19 June 2019, Blockeel 48/330.
- Platydictya jungermannioides***. **SPI**: Mt Peristeri, Verlinga area 39°40'16"N, 21°07'53"E, in recess on rocky limestone bank, 2020 m alt., 18 June 2019, Blockeel 48/296.
- Poblia cruda***. **NPI**: La Soudziata Rema, west of Milia 39°51'33"N, 21°11'14"E, on overhanging turf at top of roadside bank in Beech (*Fagus*) forest, 1625 m alt., 16 June 2019, Blockeel 48/223; **NPI**: Mt Smolikias, Valia Kirna, upper north-facing slopes c. 40°04'45"N, 20°58'21"E, on ledge of mildly basic rock on steep slope at forest edge, c. 1750 m alt., 10 June 2018, Blockeel 47/266; **STE**: Mt Velouchi: upper slopes east of the ski centre 38°56'56"N, 21°49'36"E, in rock crevice on grassy slope, c. 2190 m alt., 9 June 2015, Blockeel 44/595.
- Polytrichastrum alpinum***. **NPI**: eastern spur of Mt Smolikias on slopes of Gorgoulas 40°06'17"N, 20°59'13"E, in turf in area of late snow-lie, c. 2120 m alt., 9 June 2018, Blockeel 47/230; **NPI**: Mt Smolikias, floor of cirque on east side of Mosia peak 40°05'40"N, 20°57'37"E, on soil among boulders, c. 2070 m alt., 9 June 2018, Blockeel 47/243; **STE**: Mt Chelidon: northern slopes west of Mikro Chorio 38°49'49"N, 21°41'35"E, among rocks on steep bank, c. 1530 m alt., 11 June 2015, Blockeel 44/686; **STE**: Mt Velouchi: upper slopes east of the ski centre 38°56'59"N, 21°49'39"E, on tussock on rock ledge on north-facing slope, c. 2130 m alt., 9 June 2015, Blockeel 44/612, and 38°56'59"N, 21°49'39"E, on turfy ledge on north-facing slope, c. 2130 m alt., 9 June 2015, Blockeel 44/615.
- Pseudoleskeella nervosa***. **NPI**: La Soudziata Rema, west of Milia 39°51'56"N, 21°10'24"E, on Beech (*Fagus*), 1720 m alt., 16 June 2019, Blockeel 48/238; **NPI**: Mt Smolikias, Valia Kirna, upper north-facing slopes c. 40°04'45"N, 20°58'40"E, on small stone under Beech (*Fagus*), c. 1720 m alt., 10 June 2018, Blockeel 47/277.
- Saelania glaucescens***. **NPI**: eastern spur of Mt Smolikias, above Samarina 40°06'25"N, 21°00'27"E, on soil on bank in Pine forest, c. 1630 m alt., 9 June 2018, Blockeel 47/255; **SPI**: valley of Kirakalis Rema, west of Krania 39°54'02"N, 21°13'58"E, in rock crevice on bank of forest road, 1130 m alt., 19 June 2019, Blockeel 48/315.
- Sanionia uncinata***. **STE**: Mt Velouchi: upper slopes east of the ski centre 38°56'57"N, 21°49'37"E, in turf on rock ledge on north-facing slope, c. 2160 m alt., 9 June 2015, Blockeel 44/606.
- Schistidium atrofusum***. **STE**: Mt Velouchi: northern slopes, below Petsalouda 38°57'44"N, 21°50'02"E, on calcareous rocky outcrop, c. 1320 m alt., 7 June 2015, Blockeel 44/546.
- Schistidium confertum***. **STE**: Mt Iti: western slopes of Greveno peak 38°49'21"N, 22°17'02"E, crevices of low rock on ground on slopes with low juniper, c. 1920 m alt., 10 June 2015, Blockeel 44/639; **STE**: Mt Iti: southern end of Livadies plateau 38°49'10"N, 22°16'06"E, in schisty rock crevices, c. 1820

m alt., 10 June 2015, Blockeel 44/644; **STE**: Mt Iti: northern end of Livadies plateau 38°49'33"N, 22°16'26"E, in crevices on outcrop of base-poor rock above bank of small stream, c. 1790 m alt., 10 June 2015, Blockeel 44/665.

Schistidium papillosum. **NPI**: La Soudziata Rema, west of Milia 39°51'31"N, 21°11'07"E, on boulder on bank by forest road, 1630 m alt., 16 June 2019, Blockeel 48/224; **SPI**: valley of Kirakalis Rema, west of Krania 39°54'00"N, 21°13'46"E, on rocks exposed on bank of forest road, 1130 m alt., 19 June 2019, Blockeel 48/319; **NPI**: head of Valia Kalda, west of Milia 39°52'05"N, 21°10'00"E, on serpentine boulder in light shade, 1710 m alt., 16 June 2019, Blockeel 48/240.

Schistidium pruinatum. **NPI**: Mt Smolikas, Valia Kirna, upper north-facing slopes c. 40°04'45"N, 20°58'21"E, in crevice of mildly basic rock on steep slope at forest edge, c. 1750 m alt., 10 June 2018, Blockeel 47/271; **STE**: Mt Chelidon: northern slopes west of Mikro Chorio 38°49'29"N, 21°41'21"E, crevice on base-poor crag, c. 1800 m alt., 11 June 2015, Blockeel 44/703; **STE**: Mt Iti: southern end of Livadies plateau 38°49'10"N, 22°16'06"E, in schisty rock crevices, c. 1820 m alt., 10 June 2015, Blockeel 44/643.

Seligeria acutifolia. **SPI**: Mt Peristeri, Verlinga area 39°40'16"N, 21°07'54"E, in crevice on rocky limestone bank, 2010 m alt., 18 June 2019, Blockeel 48/300; **STE**: Mt Chelidon: northern slopes west of Mikro Chorio 38°50'09"N, 21°41'50"E, on moist rock face in forest gully, c. 1220 m alt., 11 June 2015, Blockeel 44/672.

Syntrichia norvegica. **SPI**: northern slopes of Peristeri, above Goudouvaka Rema, S of Anthochori 39°41'55"N, 21°08'54"E, in recess at foot of limestone crag on north-facing

slope, 1890 m alt., 17 June 2019, Blockeel 48/279; **STE**: Mt Iti: below northern slopes of Pirgos peak 38°48'21"N, 22°15'19"E, in crevice on north-facing crag, c. 1960 m alt., 10 June 2015, Blockeel 44/654; **STE**: Mt Iti: southern end of Livadies plateau 38°49'06"N, 22°16'09"E, on the ground under *Abies*, c. 1820 m alt., 10 June 2015, Blockeel 44/658; **STE**: Mt Velouchi: upper slopes east of the ski centre 38°56'58"N, 21°49'37"E, in rock crevice on north-facing slope, c. 2150 m alt., 9 June 2015, Blockeel 44/608.

Timmia austriaca. **SPI**: northern slopes of Peristeri, above Goudouvaka Rema, S of Anthochori 39°41'54"N, 21°08'53"E, in turf over limestone rocks on north-facing slope, 1890 m alt., 17 June 2019, Blockeel 48/278; **STE**: Mt Chelidon: northern slopes west of Mikro Chorio 38°49'29"N, 21°41'22"E, in crevice on base-poor crag, c. 1800 m alt., 11 June 2015, Blockeel 44/700; **STE**: Mt Iti: below northern slopes of Pirgos peak 38°48'20"N, 22°15'19"E, at base of rocky outcrop, c. 1960 m alt., 10 June 2015, Blockeel 44/650; **STE**: Mt Velouchi: upper slopes east of the ski centre 38°56'56"N, 21°49'36"E, in rock crevice on grassy slope, c. 2190 m alt., 9 June 2015, Blockeel 44/594.

Tortula hoppeana. **NPI**: eastern spur of Mt Smolikas between Bogdani and Gorgoulos 40°06'23"N, 20°58'49"E, in turf on open stony ground, c. 2140 m alt., 9 June 2018, Blockeel 47/231.

Tom L. Blockeel
e TBlockeel@aol.com