Mountains and islands: in search of bryophytes in Greece

This account by Tom Blockeel is based on a presentation given at the BBS Autumn meeting in 2012.

Greece is situated at the southern tip of the Balkan Peninsula in the central Mediterranean region. It is well-known for its numerous islands, especially in the Aegean Sea, some of them close to the coast of Turkey in Asia Minor. But it is also a mountainous country with numerous peaks on the mainland exceeding 2000m. Its highest and most celebrated mountain, Olympus, falls a little short of 3000m.

The lowlands of Greece have a typical Mediterranean climate, with hot summers and cool moist winters. The west coast generally has higher rainfall than the east. The climate may be strongly modified in the mountains, which often generate summer storms. The northern interior has a sub-continental climate, and snow may persist until June (Fig. 1). The Rhodope mountains in the north-east have a more strongly continental climate and flora, with some boreal elements.

History of recording

The first records of bryophytes in Greece were made by John Sibthorp and James Edward Smith (Sibthorp & Smith, 1813) in the *Prodromus* to their magnificent *Flora Graeca*, one of the great botanical works of European literature. However because of the difficulties of travelling in Greece in much of the nineteenth century, only a few papers were published during those years, and these by visiting naturalists. The French botanist Amédée Coppey (1874-1913) published the first consolidated account of Greek bryophytes in two papers in 1907 and 1909, following expeditions by René Maire and Marcel Petitmengin in 1906 and Maire again in 1908 (Coppey, 1907; 1909). In the 20th century, although most collections were still made by visiting bryologists, the first bryological publications by Greek botanists appeared. Important collections before 1980 were made by Karl Rechinger (Crete), Alfred Ade and Fritz Koppe (the mainland and Aegean islands), Patricia Geissler (northern mainland), Jacques Gamisans and Jean-Pierre Hébrard (northern forests) and Ruprecht Düll (Crete and elsewhere). The early 1980s saw the important publication of updated checklists compiled

◁Fig. 1: Snow-lie on Mt Timfi in June 2008. T. Blockeel

▷Fig. 2: Evi Tsakiri on Mt Lailias. T. Blockeel

▷Fig. 3: Habitat of *Asterella africana* (green patches in the upper central part of the photograph); the moss on the left is *Thamnobryum alopecurum*, and bottom right *Plagiomnium undulatum*. Crete. T. Blockeel

▽Fig. 4: Habitat of *Oncophorus dendrophilus* on very ancient, fallen cypress trunk, Crete. *Oncophorus* forms green tufts and cushions in the centre of the photograph; the brown mat (top centre) is mainly *Pterogonium gracile*. T. Blockeel

by Chris Preston (1981, 1984). Prof. Düll continued to work on Greek bryophytes into the present century and in addition to his work in Crete he produced a new checklist of Greek mosses along with lists from various islands and parts of the mainland (Duell, 1995). Papers continue to appear with increasing frequency, and have included contributions by the Greek botanist Evi Tsakiri (Fig. 2), whose doctoral thesis had a bryological theme (Tsakiri, 2009).

My own interest in Greek bryophytes began on visits to archaeological sites in Greece, and subsequently on family holidays. However during the past decade I have been able to do more intensive collecting, especially in the northern mountains and on some of the islands. Not all these collections have been fully worked yet, but some results have been published.

Islands

The island of Crete has great botanical interest. Its bryological flora has been studied by Prof. Düll

△Fig. 5: Mt Kerkis on the island of Samos, habitat of *Syntrichia papillosissima* and *S. handelii*. T. Blockeel

◁Fig. 6: *Riccia sommieri* from Lesvos. T. Blockeel

▽Fig. 7: Limestone in the upper zone of Mt Timfi. T. Blockeel

Table 1. Selected bryophyte species and Grimmiaceae from Greece

Limestone summits of the mountains of northern Greece	Forest and ravine zone of the limestone mountains of northern Greece	Grimmiaceae from the schist, granite and serpentinite mountains of northern Greece	Forest flora of the Rhodope mountains
Athalamia hyalina	*Metzgeria pubescens* (Mt Vermio)	*Schistidium pruinosum*	*Lophozia incisa*
Barbilophozia lycopodioides	*Preissia quadrata*	*Schistidium flaccidum*	*Lophozia obtusa*
Scapania aspera/aequiloba/calcicola complex	*Pedinophyllum interruptum*	*Schistidium confertum*	*Amphidium mougeotii*
Jungermannia cf. *polaris*	*Cololejeunea calcarea*	*Coscinodon cribrosus* (Mt Kerkini)	*Anomodon attenuatus*
Timmia austriaca	*Cololejeunea rossettiana*	*Grimmia incurva*	*Bartramia halleriana*
Encalypta affinis (Mt Timfi)	*Timmia bavarica*	*Grimmia unicolor* (Mt Varnous; Mt Lailias)	*Blindia acuta*
Distichium capillaceum	*Seligeria trifaria sensu lato*	*Grimmia torquata*	*Brachythecium geheebii*
Syntrichia norvegica	*Barbula crocea*	*Grimmia alpestris*	*Cirriphyllum piliferum*
Meesia uliginosa (Mt Falakro)	*Plagiopus oederianus*	*Grimmia caespiticia*	*Climacium dendroides*
Ptychodium plicatum	*Pseudoleskeella catenulata*	*Grimmia hartmanii*	*Eurhynchium angustirete*
Pseudoleskea incurvata	*Orthothecium rufescens* (Mt Timfi, Mt Olympus)	*Grimmia anomala*	*Homomallium incurvatum*
Campylophyllum halleri	*Hylocomium splendens*	*Racomitrium aciculare*	*Hylocomium splendens*
Eurhynchium (Eurhynchiastrum) pulchellum	*Neckera menziesii*	*Racomitrium heterostichum*	*Isothecium alopecuroides*
Hypnum revolutum		*Racomitrium canescens*	*Pleurozium schreberi*
Myurella julacea		*Racomitrium elongatum*	*Paraleucobryum longifolium*
			Pohlia cruda
			Rhytidiadelphus triquetrus
			Sanionia uncinata
			Timmia austriaca

(Düll, 1966; Düll & Düll-Hermanns, 1973; Duell, 1979). The schistose valleys of the western part of the island are relatively well-watered, and have a number of micro-sites for wetland species. Three of Europe's rarest bryophytes occur here, *Solenostoma handelii* (*Jungermannia handelii*), *Rhamphidium purpuratum* and *Trematodon longicollis*, as well a very disjunct population of *Sphagnum denticulatum*. The classic locality for the first three of these species is in the Fasas Valley south of Skines, but recent road improvements have damaged the habitat of the *Solenostoma* and *Rhamphidium*. During a visit in early March 2011 I made a special search for these species and was able to confirm their presence in additional localities in neighbouring valleys. An unexpected outcome of this visit was the discovery of *Asterella africana* new to Greece (Fig. 3). It is a western Mediterranean and Macaronesian species, and its presence in Crete is comparable to that of *Rhamphidium purpuratum*, otherwise known only in Portugal and Macaronesia, and to the

fern *Woodwardia radicans*, which has a similar western Mediterranean and Macaronesian distribution.

The surprising presence of an *Oncophorus* in Crete was first noted by Gradstein (1970), and its identity has proved controversial. I saw it plentifully in the Samaria Gorge in 2004, in very dry habitats mainly on old, hard cypress wood (Fig. 4), very different from the habitat of the genus in northern Europe. In the previous year I had seen similar plants in Cyprus, where it had been collected independently by Terry Hedderson in 1991. We described these populations as a new species, *O. dendrophilus*, partly on the basis of their bistratose leaf laminae (Hedderson & Blockeel, 2006), but the status and relationships of the species needs to be tested by molecular analysis.

In 2009 and 2012 I visited the eastern Aegean islands of Lesvos (Lesbos) and Samos respectively. These islands have large hills (Mt Kerkis on Samos reaches 1440m) and varied geology (Fig. 5). At present these collections are only partly worked. Initial results from Lesvos include new localities for *Grimmia nutans* and *Riccia sommieri* (Fig. 6). *G. nutans*, which favours seasonally wet rock faces, has a curiously wide but very scattered and disjunct occurrence across the Mediterranean region, from the Canary Islands in the west to Cyprus in the east. The localities on Lesvos are geographically close to the type locality on mainland Turkey. Samos proved to be rich in *Syntrichia* species, of which *S. latifolia* was a big surprise, growing as an epiphyte on poplar trees on a north-facing hillside. It has not previously been recorded from Greece or the Aegean region.

Mountains

The Pindus mountains that form the backbone of mainland Greece are predominantly composed of limestone. However the geology along the northern borders of the country is much more

▽Fig. 8: Mt Smolikas. T. Blockeel

▽Fig. 9: Mt Lailias (with Scots Pine, *Pinus sylvestris*). T. Blockeel

varied. Mt Varnous (2334m) and Mt Lailias (or Vrondous, 1839m) are granite mountains, a rare substrate in Greece (Fig. 9); much of Mt Smolikas (2637m), the second highest mountain in the country, is serpentinite (Fig. 8); Mt Voras (2524m) has mica-schist (Fig. 11), and acid schists are found on other mountains, including Mt Kerkini (or Belles, 2031m). Limestone is there, too, on Mt Pangeo and Mt Falakro. Some of these mountains lie on the borders with other European countries (Albania and the Former Yugoslav Republic of Macedonia). To the east the Rhodope mountains are shared with Bulgaria; only a small part of the Greek sector exceeds 1600m, but it has some unique habitats unknown elsewhere in the country.

Since 2003 I have made short visits to many of these mountains, as well as the northern Pindus and Mt Olympus. There is no space here to describe the bryophytes of these mountains in detail, but I have selected some highlights.

△Fig. 10: Herbarium specimen of *Palamocladium euchloron* from the Enipeas Valley, Mt Olympus. T. Blockeel

Limestone summits

The high ground on the limestone mountains is a very harsh environment for bryophytes. The ground dries rapidly after snow-melt and is exposed to hot sun during the summer. There are large tracts of ground with very few

▽Fig. 11: Mica-schist on Mt Voras. T. Blockeel

▽Fig. 12: Forest of Norway Spruce at Elatia. T. Blockeel

bryophytes, and the richest ground tends to be on north-facing crags and in sink-holes. Some of the bryophytes found in these areas are shown in Table 1.

Forest zone and ravines on limestone mountains

Ravines are typically cooler and more luxuriant than the limestone summits and support many familiar calcicoles that occur also in central and northern Europe (e.g. *Tortella*, *Neckera*, *Ctenidium*, *Homalothecium* spp.). Wet rock faces and seepages are most often found in this zone, and support several hygrophilous montane species (Table 1). A particularly interesting moss of this zone is *Palamocladium euchloron* (Fig. 10), which has its sole European locality west of Crimea and the Caucasus on Mt Olympus. It was first found here by Prof. Düll. The genus is closely related to *Homalothecium* and is separated mainly by its smooth seta.

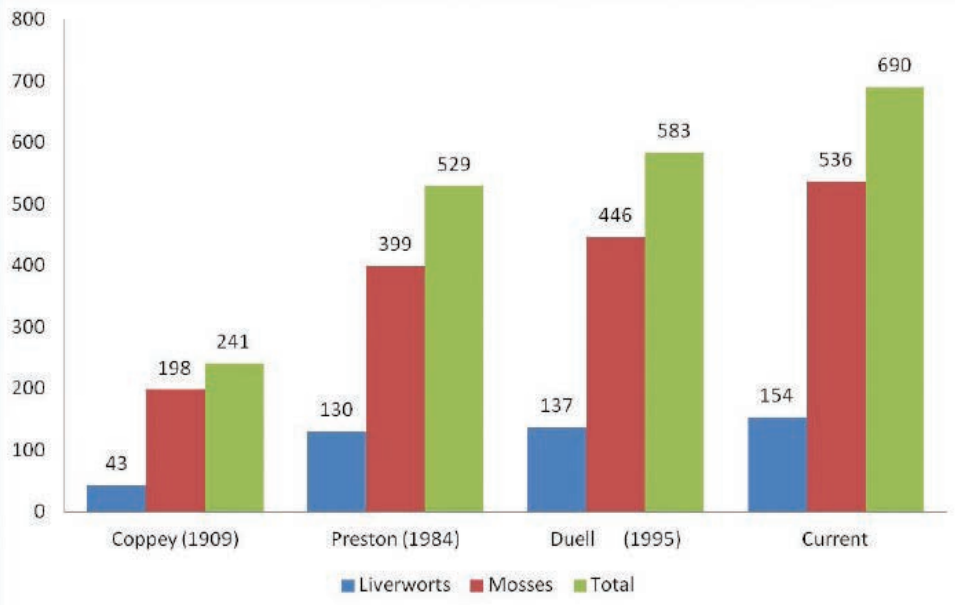
Schists, granite and serpentinite

These mountains are moister and greener than the limestone hills, and generally well-watered with occasional mires (Fig. 15). Among notable species that I have encountered on these strata are:

- *Mannia gracilis* (*Asterella gracilis*): Mt Varnous and Mt Voras
- *Barbilophozia hatcheri*
- *Jungermannia obovata*: Mt Voras
- *Scapania cuspiduligera*: Mt Voras
- *Tritomaria scitula*: Mt Varnous
- *Cynodontium tenellum*: Mt Lailias
- *Dicranoweisia crispula*
- *Heterocladium dimorphum*

The discovery of the rupestral moss *Orthotrichum laevigatum* was of particular interest. This species has a curiously rare and

Table 2. The number of bryophyte species reported from Greece at various intervals.
The counts have been standardised according to current taxonomic concepts, and exclude a number of records that are improbable and/or unconfirmed.



◁Fig.13. *Batramia halleriana* (and *B. pomiformis*, extreme left), Mt Lailias. T. Blockeel

◁Fig.14: Seasonal lake at Xerolimni, Mt Timfi. T. Blockeel

◁Fig.15. Flush with *Eriophorum*, Mt Kerkini. T. Blockeel

disjointed distribution in Europe, occurring in Iceland and a few localities in Scandinavia and the French Alps, and on Sardinia. It is perhaps overlooked, appearing superficially similar to *O. speciosum* because of its exserted, unribbed capsules. I have seen it twice in Greece, on Mt Varnous and Mt Smolikas.

The schist and granite mountains are also notable for their rich flora of Grimmiaceae (Table 1).

Forest flora

The richest forest flora in Greece is probably that of the Rhodope mountains. There is an extensive forest of Norway spruce at Elatia (Fig. 12). It is unique within Greece for the richness of the liverwort flora found on rotting logs. This flora includes *Anastrophyllum hellerianum*, *Blepharostoma trichophyllum*, *Calypogeia suecica*, *Cephalozia catenulata*, *Nowellia curvifolia*, *Jungermannia leiantha* (*Liochlaena lanceolata*), *Lepidozia reptans*, *Lophozia longiflora*, *Riccardia latifrons*, *R. palmata* and *Scapania umbrosa*. The commonest mosses on logs are *Dicranum tauricum* and *Herzogiella seligeri*. Some of these species occur in other mountainous regions of Greece, but several are confined to the central Rhodope. *Buxbaumia viridis* is also recorded from Elatia and I have seen it at several other localities in northern Greece, including Mt Olympus. It is evidently not uncommon in old forests.

A wide range of other species familiar from the forests of central and northern Europe also occurs at Elatia and in adjacent areas (Table 1),

◁Fig.16: *Muscari macrocarpum* on Samos. T. Blockeel

◁Fig.17: *Fritillaria epirotica* on serpentinite, Mt Smolikas. T. Blockeel

◁Fig.18. *Ramonda serbica*, Mt Timfi. T. Blockeel

and of course some of them are found elsewhere in the Greek mountains (Fig. 13).

Wetlands and mires

Not surprisingly, there are few wetlands on the limestone mountains. Mt Timfi has some small lakes, the one at Xerolimni supporting a population of *Palustriella decipiens* (Fig. 14). Mires are more widespread on the granite and schistose mountains and in the Rhodope, but are mostly small in extent. Among species that I have observed are *Pellia neesiana*, *Sphagnum contortum, S. platyphyllum, S. subsecundum, S. teres, S. palustre* var. *centrale, Aulacomnium palustre, Climacium dendroides, Dicranum bonjeanii, Straminergon stramineum* and *Warnstorfia exannulata*. Further species have been reported recently by Papp *et al.* (2011).

Conclusions

Bryology in Greece makes an excellent contrast to bryology in Britain. Of course it is exciting to find rare and unfamiliar Mediterranean and continental species, but it is just as fascinating to search for and find common British species that are rare in Greece. My collections have included numerous first records for Greece, as well as some puzzling plants. Published results can be found in a number of papers (Blockeel, 1991; 2007; 2010; 2012; Blockeel *et al.*, 2002; Hedderson & Blockeel, 2006; Lara *et al.*, 2003; Orgaz Alvarez & Blockeel, 2010).

Table 2 shows how knowledge of Greek bryophytes is steadily accumulating, at least as measured by the number of recorded species.

However much work remains to be done. There is a need for a critical updated checklist that is more than just a compilation of published records, and a need to document species of special conservation value.

Finally, I can't resist including a few images of higher plants that I have found on my bryological trips (Fig. 16-18). Indeed one of the special pleasures of bryologising in Greece is the opportunity to see some of the spectacular flowers for which the country is justly famous. There are many of them.

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