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A Lichen Survey of the Teifi Gorge, with Special Reference to Three Section 7 Species

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1. Crynodeb Gweithredol

Mae Adran 7 Deddf yr Amgylchedd (Cymru) 2016 yn darparu rhestr o organebau sy'n cael eu hystyried yn allweddol bwysig wrth gynnal bioamrywiaeth. Mae'r cennau ar y rhestr hon yn cael eu hadolygu. Mae tair o'r rhywogaethau wedi'u nodi yn ardal isaf Ceunant Teifi yn Safle o Ddiddordeb Gwyddonol Arbennig (SoDdGA) Coedydd a Chorsydd Aberteifi, ac ystyriwyd y byddai gwybodaeth ynghylch niferoedd a statws ecolegol y rhywogaethau hyn o fewn y SoDdGA yn helpu i lywio gwaith yr adolygiad o rywogaethau Adran 7.

Ymwelwyd â'r SoDdGA ar bum diwrnod rhwng mis Ionawr a mis Mai 2017. Cynhaliwyd ail ymweliadau â rhai ardaloedd o'r Warchodfa Natur Genedlaethol y gwyddys eu bod yn cynnwys y rhywogaethau targed yn 1996, ac arolygwyd hefyd rhai rhannau ychwanegol o'r SoDdGA lle nad oedd unrhyw gofnodion hysbys ar gael. Yn ogystal â'r rhywogaethau targed, manteisiwyd ar y cyfle i chwilio am gennau nodedig eraill.

Ymhlith y rhywogaethau Adran 7, canfuwyd fod *Arthonia atlantica* yn gymharol gyffredin ar frigiadau craig wedi'u goleuo'n dda – creigiau naturiol heb eu cloddio gan mwyaf. Fodd bynnag, ystyriwyd ei fod yn cael ei gyfyngu gan ormod o gysgod a phrinder brigiadau craig addas. Yng Nghymru yn gyffredinol, mae'n rhywogaeth brin (chwe hectad) ac yn cael ei rhoi mewn perygl gan ormod o gysgod coed, mieri ac iorwg, weithiau o ganlyniad i roi'r gorau i bori mewn coedwigoedd. Argymhellir ei bod yn parhau ar y rhestr o rywogaethau Adran 7.

Canfuwyd *Lecania chlorotiza* ar risgl dan gysgod. Ystyriwyd ei bod yn rhywogaeth cymharol gyffredin nad yw'n cael ei bygwth gan amodau cysgodol, ac awgrymir ei bod yn cael ei dileu oddi ar y rhestr o rywogaethau Adran 7.

Adleolwyd *Porina effilata* ar wyneb y graig lle cafodd ei ganfod yn wreiddiol yn newydd i Gymru yn 1996. Mae hon yn graig naturiol sy'n fangre i nifer o rywogaethau cennau pwysig. Mae'r arwyneb yn fwy ac o ansawdd gwell nag wynebau creigiau naturiol eraill a welwyd yn ystod yr arolwg, ac ni chanfuwyd P. effilata yn unman arall; mae'n debygol bod nifer o arwynebau naturiol wedi cael eu dinistrio gan waith chwarela. Mae'r rhywogaeth hon yn hysbys ar un safle arall yn unig yng Nghymru. O ganlyniad i'w phrinder ac am fod angen amodau arbennig arni (creigiau silicaidd, braidd yn galchaidd, yn serth ond nid yn rhy sych mewn coedtir hynafol), argymhellir ei bod yn aros ar y rhestr o rywogaethau Adran 7.

Mae'r SoDdGA wedi cael ei gadarnhau fel safle pwysig ar gyfer cennau, y mae'n hysbys bod nifer ohonynt yn gysylltiedig â choetir hynafol gyda pharhad ecolegol. Fodd bynnag, mae nifer o'r rhywogaethau nodedig i'w canfod mewn niferoedd bychain, oherwydd hanes o ecsbloetio'r coetir a chwarela ar y safle. Mae natur mymryn yn galchaidd y graig yn amlwg wedi caniatáu i rywfaint o gennau'r hen goedwig, sydd fel arfer i'w gweld ar goed, i barhau i fyw ar y graig yn ystod cyfnodau pan oedd coed yn cael eu cwympo.

2. Executive Summary

Section 7 of the The Environment (Wales) Act 2016 provides a list of organsims considered to be of key significance in maintaining biodiversity. The lichens on this list are under review. Three of the species are reported from the lower Teifi Gorge in Coedydd a Corsydd Aberteifi SSSI, and it was considered that a knowledge of the abundance and ecological status of these species within the SSSI would help to inform the review of Section 7 species.

The SSSI was visited on five days in January to May 2017. Some areas of the National Nature Reserve known to support the target species in 1996 were revisited, and in addition some other parts of the SSSI, for which there were no known records, were surveyed. As well as the target species, the opportunity was taken to look for other notable lichens.

Of the Section 7 species, *Arthonia atlantica* was found to be relatively widespread on well-lit, mostly natural and unquarried, rock outcrops. However, it was considered to be limited by excessive shade and scarcity of suitable outcrops. In Wales as a whole, it is rare (six hectads), and at risk from excessive shading by trees, brambles and ivy, sometimes as a result of withdrawal of grazing from woodlands. It is recommended that it remain on the Section 7 list.

Lecania chlorotiza was found on shaded bark. It is considered that it is a relatively widespread species which is not threatened by shaded conditions, and it is suggested that it be removed from the Section 7 list.

Porina effilata was relocated on the rock-face where it was originally found new to Wales in 1996. This is a natural rock-face supporting several important lichen species. The face is larger and of better quality than other natural rock faces seen during the survey, and *P. effilata* was not found elsewhere; it is likely that many natural faces have been destroyed by quarrying. The species is known only from one other site in Wales. Due to its rarity and requirement for special conditions (slightly calcareous, steep but not excessively dry, siliceous rocks in ancient woodland), it is suggested that it remain on the Section 7 list.

The SSSI is confirmed as an important site for lichens, many of which are known to be species associated with ancient woodland with ecological continuity. However, many of the notable species are found in small quantity, due to a history of woodland exploitation and quarrying at the site. The slightly calcareous nature of the rock has evidently allowed some of the old-forest lichens, normally found on trees, to persist on rock during periods of tree-felling.

3. Introduction

The woodlands in the Teifi Gorge support a rich lichen flora. The site has been visited by a number of lichenologists. A survey was carried out by Orange & Wolseley (1996), who also established a number of quadrats on trees and rocks in order to monitor some of the notable species.

Section 7 of the The Environment (Wales) Act 2016 provides a list of organisms which 'The Welsh Ministers consider are of key significance to sustain and improve biodiversity in relation to Wales. The Welsh Ministers must also take all reasonable steps to maintain and enhance the living organisms and types of habitat included in any list published under this section, and encourage others to take such steps'.

At present the list is identical to an earlier 'Section 42' list, but is under review. Three of the lichen species on the list are found in the lower Teifi Gorge, within the Coedydd a Corsydd Aberteifi SSSI, which includes Coedmor NNR. The present report reviews the status of these species within the SSI and within Wales, to inform revision of the Section 7 list.

4. Methods

The Teifi Gorge runs for approximately 4 km near the mouth of the Afon Teifi (Fig. 21). The north side is in the botanical vice-county of Cardiganshire (V.C. 46), and the southern bank in Pembrokeshire (V.C. 45). The site was visited by Alan Orange on 17-19 January and 4 May 2017, and by Alan Orange and Steve Chambers on 20 January 2017, in dry weather. Potentially all substrates and species were examined, but with special reference to *Arthonia atlantica*, *Lecania chlorotiza* and *Porina effilata*. Some attempt was made to relocate other notable species recorded in 1996.

Lichen species were regarded as 'notable' if they belonged to one or more of the following categories:

- Section 42 species (http://biodiversitywales.org.uk/Environment-Wales-Bill).
- Section 42 Lobarion assemblage (http://biodiversitywales.org.uk/Environment-Wales-Bill).
- Nationally Rare species.
- Nationally Scarce species.
- Wales Red List species (Critically Endangered, Near Threatened and Data Deficient, if practicable) (Woods 2010).
- Old-forest indicator species, used in the calculation of the New Index of Ecological Continuity (NIEC) (Coppins & Coppins 2002); this category includes the species of the Section 42 Lobarion assemblage.

Lichen nomenclature follows Smith et al. (2009). Temporary field locality numbers/target notes are indicated by a number such as '6/3' and are listed in Table 4. The first figure of the number indicates the compartments of the National Nature Reserve used in the 1996 report; numbers 14, 15 and 16 refer to areas outside the NNR on the south side of the river.

Location was by means of a hand-held GPS receiver, and was recorded as latitude and longitude. The measurements usually corresponded very well with satellite photographs when entered into the location finder at https://www.itouchmap.com/latlong.html. Some measurements were converted to grid references using the co-ordinate converter at http://bgs.ac.uk/data/webservices/convertForm.cfm#convertToBNG, but these did not always agree well with the location on Ordnance Survey maps.

The area of the SSSI designated as 15 and 16 in Fig. 21 is owned by the Wildlife Trust for South-west Wales. The area designated as 14 is owned by Mr J. Lynch of Fforest Farm, who kindly gave permission to visit, during a phone conversation. The area between 14 and 15 is owned by Mr. S. Martin; permission to visit was not sought as no phone contact was available, although the woodland here is heavily modified and less likely to be of interest than neighbouring areas.

5. Results

5.1 General

Four and a half days were spent in the field. The steep slopes and scarcity of footpaths meant that only selected areas of the site could be visited in the time available. Compartments 2, 4, 6, 8 and 9 were visited within the National Nature Reserve, and areas outside the NNR on the south side of the river were visited (designated as 14, 15 and 16 in locality numbers). Due to shortage of time and the necessity to search for the three target species, a comprehensive survey was not attempted. However, a number of additions to the lichen list for the site was made, including *Bacidia squamosella*, *Llimonaea sorediata*, *Opegrapha areniseda*, *O. lithyrga*, *O. xerica*, *Phlyctis agelaea*, *Pyrenula acutispora*, *Thelopsis rubella* and *Usnea fulvoreagens*. Additional material was found of an apparently undescribed species of *Chaenothecopsis* first found here in 1996, enabling an ITS sequence (the fungal DNA barcode) to be prepared. The locations of some notable species found in 2017 are shown in Figs. 22 and 23.

The additional finds bring the total number of species for the SSSI to 209 (including four non-lichenised species), of which 143 occur on bark or wood. A composite list for all years, including updated taxonomy and nomenclature, is shown in Table 1. The site scores 30 on the NIEC, suggesting a site of high conservation importance. Notable species, with their conservation grading, are shown in Table 2. Location of field numbers used in the text and in Table 1 are listed in Table 3.

Some attempt was made to refind notable species recorded in 1996, although this was not a primary aim of the fieldwork (apart from the three Section 7 species). In Compartment 2 in 1996 there was a concentration of notable lichens on trees around the mouth of an old quarry, and some of these were included in quadrats. In 2017, several of the notable species (*Nephroma laevigatum*, *Peltigera collina*, *Sticta limbata*, *S. sylvatica*) were not refound here. However, the original photographs from 1996 were not available to assist relocation.

The remains of a walled enclosure named Y Gaer in Compartment 8 was revisited to check for the continued presence of *Lobaria pulmonaria*; this was reported in 1996 to occur on 12 trees above head height, and on a fallen ash; presumably the latter is where a quadrat was placed in 1996. In 2017 *L. pulmonaria* was seen only on two trees at Y Gaer, both high above the ground. Although a thorough search was not carried out, *L. pulmonaria* was difficult to detect, and it seems likely that it has decreased here. One of the trees bearing this species was a recently fallen ash, and the colonies have been severely damaged by molluscs and are unlikely to survive, even though the tree is not dead. Shadier conditions seem likely to be responsible for the decline.

However, *Lobaria pulmonaria* was growing well on a very well-lit, very young elm on moist level ground beside the river nearby (Figs. 27, 28). There were good colonies from approximately 1 to 2 m above ground, and no colonies were damaged by molluscs. These demonstrate that ancient trees are not needed for this species to thrive, if other conditions are correct. However, this was an unusual situation.

The single colony of *Lobaria virens* found in Compartment 6 in 1996 could not be relocated as the area is difficult to access due to fallen trees and growth of brambles.

Within the SSSI natural rock exposures are mostly sparse, and they are nearly all small, usually no more than 3 m high, though there is a taller one in Compartment 6 and perhaps elsewhere. Rock outcrops of any kind are absent in some parts of the site. Even some slopes which are too steep to be comfortably accessed on foot seem to have only very low and shady exposures. Even some of the natural exposures have probably been quarried at a very small scale (for instance by a few individuals) for locally used walling material, where the exposures are accessible and adjacent to fields above the woods. The rock of the natural exposures has a more rounded and weathered appearance than quarried faces. It is quite soft and shaly; collection of specimens is difficult as the fragments readily break into thin sheets. On the north side of the river there are several old quarries. It is likely that some of these have obliterated natural exposures which were larger than those currently present. The small quarries on the north side of the river are probably long-disused, and are well-colonised. They contain many but not all of the species found on natural exposures; species not yet found on quarried faces in 1996 or 2017 include *Lobaria virens*, *Nephroma laevigatum*, *Opegrapha multipuncta*, *Porina effilata*, *Rinodina roboris* and probably *Sticta canariensis*, although in 1996 it was not always recorded whether the face was considered to be natural.

The rock outcrop supporting *Porina effilata* was relocated on 4 May; this is an important outcrop supporting other notable species (see section 5.2.3 below).

Virtually no signs of grazing or browsing were seen, although in Compartment 2 there were signs that a few stray sheep were present. Alien invasive species that need control include *Fallopia japonica* beside the river, and a patch of *Lonicera nitida* in an old quarry.

5.2 Section 7 species

5.2.1 *Arthonia atlantica*

This is a species confined to rock. *Arthonia atlantica* was seen on several apparently natural exposures, and once on a quarried face beside an old track. It appears to require slight shade, but does not tolerate deep shade. It occurs on steep surfaces which are very well-drained, and either rain-sheltered by being slightly overhanging, or by being sheltered by overhanging rock above. In places it occurs with *Enterographa zonata* and *O. gyrocarpa*, two common species; these possibly tolerate more shaded and humid conditions than *A. atlantica* and are frequent on rock faces in the woodlands, including in quarries. Where *A. atlantica* grows, adjacent moister parts of the face can be occupied by *Lecanora gangaleoides* or *Ochrolechia parella*, drier parts by *Arthonia endlicheri*. It seems likely that the slight base-richness of the rock is also important to *A. atlantica*, otherwise one might expect it to be more abundant in Wales.

From the point of view of suitable microhabitat, many low outcrops are excessively shaded by trees, others seem to have excessive run-off and can appear greenish from algal growth. Ivy is a potential threat to small rock faces, as young pioneering stems can grow upwards and shade them, and long flowering stems can hang down from the top of rock faces. Holly also casts a deep shade, and can make faces unsuitable (Figs. 30). The colonies of *A. atlantica* that have been seen are relatively well-lit, and this is apparently due to the presence of steep slopes below, which reduces the effects of shading, and also causes trees to fall occasionally. Without these factors it is likely that all rock faces within the woodland would be unsuitable.

Colonies of Arthonia atlantica found in the SSSI

In 1996 *Arthonia atlantica* was reported as ‘occasional’, and said to occur in Compartments 2, 6, 9, 10 and 11, but details of each colony were not recorded.

The following colonies were seen in 2017:

6/2. Latitude/longitude 52.06534 -04.64066. Grid ref. 22/19088.44066. V.C. 46.

An apparently natural rock face, though parts may have been quarried on a very small scale. *Arthonia atlantica* is on well-drained steep faces with little run-off (sometimes on slightly projecting parts that do not catch much run-off), growing with *Enterographa crassa* and *Opegrapha zonata*. The position at the top of a steep slope helps to maintain relatively well-lit conditions, and a fallen tree has increased light levels. There is a small holly *c*. 3m high, but perhaps a few decades old, in front of the exposure. This has produced a taller new stem since 1996, and if unchecked the holly could lead to excessive shading.

Fig. 1. Exposure 6/2 seen from NE side, note young holly.

Fig. 2. Exposure 6/2 seen from SW side.

Fig. 3. Exposure 6/2, detail of face, with *Arthonia atlantica* near centre.

Fig. 4. Exposure 6/2, detail of last: area within red line: most pale thalli are *Arthonia atlantica*; blue arrows indicate some *Ochrolechia parella*.

Fig. 5. Exposure 6/2, detail towards SW end of rock face; blue square approximately 35 × 35 cm, lichens (with Domin cover-abundance) *Arthonia atlantica* 5, *Opegrapha gyrocarpa* 5, *O. zonata* 5, *Enterographa hutchinsiae* 4, *Opegrapha* sp. 2, rock 2.

6/3. Latitude/longitude: 52.06488 -04.64016. Grid ref.: 22/19121.44013. V.C. 46.

A natural rock face at the top of the slope, well-lit, partly by a tree which has fallen on the steep slope below. The whole outcrop looks slightly damper than the last, and slightly green with algae. There are a few thalli of *Arthonia atlantica* on a steep face. There is abundant ivy.

Fig. 6. Outcrop 6/3.

Fig. 7. Exposure 6/3, detail of last.

Fig. 8. Exposure 6/3, detail of last; white thallus is *Arthonia atlantica*.

6/4. Latitude/longitude: 52.06474 -04.63982. Grid ref.: 22/19144.43997. V.C. 46.

A small outcrop *c*. 3 m high, possibly partly natural, but quarried on a small scale. *Arthonia atlantica* on a steep face, with *Ochrolechia parella*, and other poorly developed crustose lichens. The *Arthonia* looks dull and slightly greenish with free-living algae.

Fig 9. Quarried outcrop, 6/4.

Fig. 10. Outcrop 6/4, location of small amount of *Arthonia atlantica*.

6/9. Latitude/longitude 52.06443 -04.63987. Grid ref. 22/19139.43962. V.C. 46.

A natural rock face, well-lit following the falling of a tree, which has also exposed (or re-exposed) some fresh rock. A few thalli of *Arthonia atlantica* on small steep faces in full sun, with *Enterographa zonata*.

Fig. 11. Outcrop 6/9.

6/11. Latitude/longitude 52.06419 -04.639455. Grid ref. 22/19166.43935. V.C. 46.

A rock face quarried to build a track leading to old quarry nearby. *Arthonia atlantica* on steep shaded face with *Enterographa zonata*.

6/12. Latitude/longitude 52.06416 -04.63946. Grid ref. 22/19166.43931. V.C. 46.

A natural rock face west of a house, with good colonies of *Sticta canariensis*. There is a small amount of *Arthonia atlantica*, without associated species, in moderate shade.

16/1. Latitude/longitude 52.06787 -04.63988. Grid ref. 22/19152.44345. V.C. 45.

A natural outcrop near the top of the wood, beside a footpath. The outcrop is well-lit due in part to the steep slope below. Good colonies of *Arthonia atlantica*, growing with *Lecanora gangaleoides* (which, however, likes slightly moister conditions) and *Opegrapha zonata*. Ivy is a potential threat, and a few strands were removed by the surveyor.

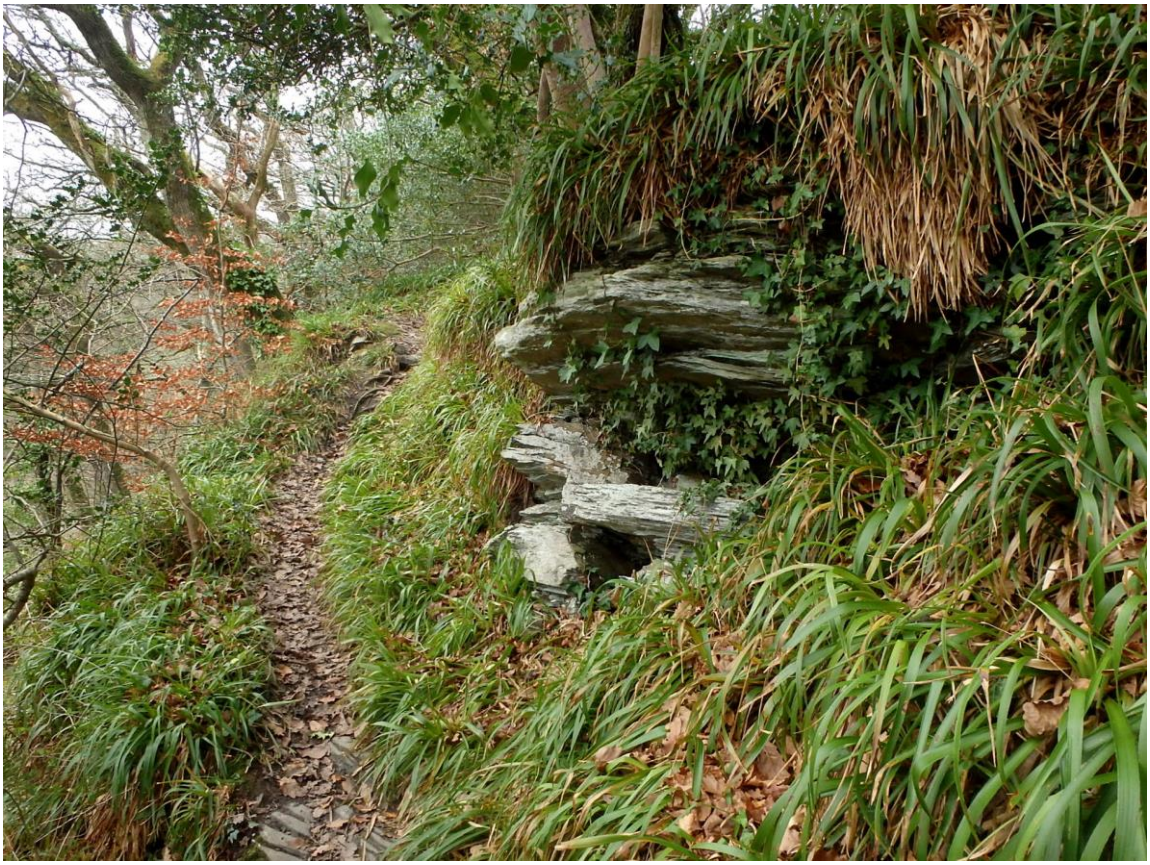

Fig. 12. Outcrop 16/1.

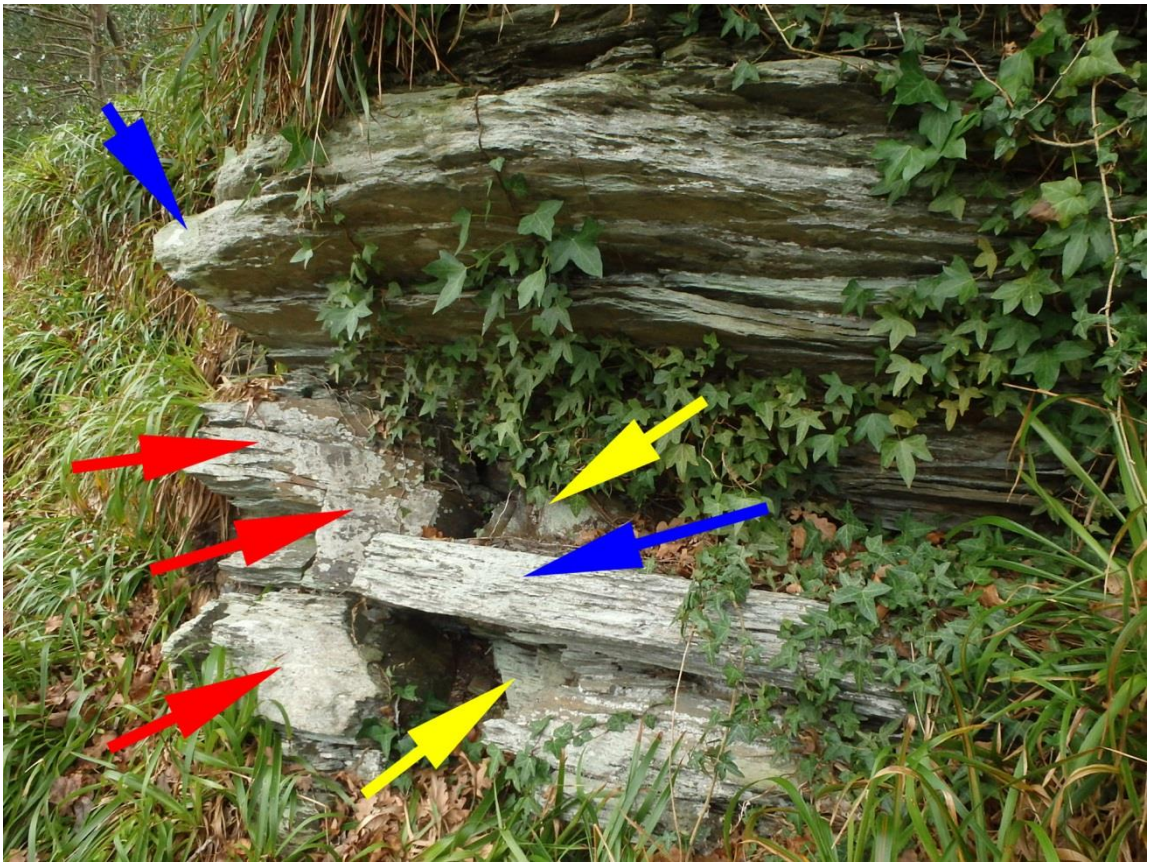

Fig. 13. Outcrop 16/1, detail of last. Red arrows: *Arthonia atlantica*, blue arrows: *Lecanora gangaleoides*, yellow arrows: *Lecanora ecorticata*.

16/2. Latitude/longitude 52.06789 -04.63973. Grid ref. 22/19162.44347. V.C. 45.

A few metres from last. *Arthonia atlantica* local on a rather shady face, on a slightly projecting part of the rock, with rain-shelter from overhanging rock above. Ivy is a threat here as it is climbing over the rock face, and flowering sprays are beginning to hang over the face from above.

Fig. 14. Outcrop 16/2 to left of tree.

Fig. 15. Outcrop 16/2, detail of last, outcrop becoming shaded by ivy.

Fig. 16. Outcrop 16/2, *Arthonia atlantica* indicated by arrow.

Distribution of Arthonia atlantica elsewhere in Ceredigion

(i) Ynys-hir (RSPB Reserve)

Arthonia atlantica was recorded for the first time in VC 46 on a sheltered W-facing rockface in open old-growth Atlantic Oakwood on the rocky spine of Coed Penrhyn-mawr at Ynys-hir, SN679958 (SN69 Tetrad S), alt 50m, on 21 iii 1991, by S.P. Chambers. A specimen (voucher in hb. SPC) was confirmed by A.Orange.

Bill Condry described Coed Penrhyn-mawr as 'one of the largest surviving fragments of the medieval Boskus de Lissecoed'. The wood supports many notable 'ancient woodland' indicator lichens, including *Arthonia anombrophila, A.vinosa, Arthothelium ruanum, Bacidia biatorina, Cetrelia olivetorum* (UV+ chemotype)*, Eopyrenula grandicula, Gyalecta* (*Pachyphiale*) *carneola, Gyalideopsis muscicola, Hypotrachyna taylorensis, Loxospora elatina, Megalaria pulverea, Micarea adnata, M.viridileprosa, Mycoblastus caesius, Parmelinopsis horrescens, Parmotrema crinitum, Phaeographis inusta, Phyllopsora rosei, Punctelia reddenda* & *Thelopsis rubella.*

Associates of *A.atlantica* on the rockface included *Enterographa hutchinsiae* & *Opegrapha lithyrga*. The rockface and lichen were seen again on 15 iv 1993 (SPC & A.M. Fryday). In the early 1990s the woodland was grazed by sheep to encourage open ground/shrub-layer conditions for the benefit of Pied Flycatchers. Sometime in the late 1990s the RSPB decided to remove grazing from the wood. The site was next visited on 24 ix 2010 when SPC attempted to refind the rockface to show the lichen to the new RSPB warden. The woodland floor by then had become an impenetrable thigh-high tangle of Bramble. After lengthy searching what was thought to be the original face was located but found to be overgrown with Bramble and moss. An Oak trunk had also fallen across the face. A small amount of *E.hutchinsiae* was present but no *A.atlantica*. Vegetation was judiciously cleared from the rockface and RSPB staff later returned to remove the tree trunk using a chainsaw. It was feared that *A.atlantica* had fallen victim to grazing cessation.

On 7 viii 2011 SPC carried out a careful search of Coed Penrhyn-mawr. There was no sign of any *A.atlantica* on the original rockface and vegetation had begun to re-colonise. However, a more extensive outcrop just W of the main woodland path at (GPS) SN67874.95719, alt c.35m, was found with *A.atlantica*. The thin, poorly-defined thalli impeded accurate census, but the face supported a total of c. 11 patches, c. 1-4cm across, down the E-edge of the central c. 3 × 2ft part of the main face under dappled shade. Closest associates included *Enterographa zonata* & *Ochrolechia parella.* The surfaces of most *A.atlantica* thalli were heavily 'radulated'/scraped by the activity of grazing molluscs. The outcrop comprised a face of horizontal 'end-on' finely bedded mudstone, the crustose lichens on it growing perpendicular to the bedding plane rather than parallel to the surface. The layer configuration likely provides capillary moisture supply through the finely bedded strata making the surface moister than it would be for the S-aspect if the rock was vertically bedded. The outcrop continued westward, extending farther away from the path, and a few more thin *A.atlantica* patches were present on a slightly recessed sheltered underhang c. 4m W of the main face. Due to its extent and conformation the exposure appeared to have a degree of natural resilience to smothering from

Hedera. A few more grazed thalli of *A.atlantica* were located on a sheltered, recessed face on a second outcrop on top of the ynys woodland at (GPS) SN67960.95913, alt 40m.

In total *A. atlantica* has been found on three rockfaces at Ynys-hir and is extant on two, and was last seen on 20 xi 2016.

Fig. 17. *Arthonia atlantica* visible as faint mauve-tinged patch down the E (right edge in image) edge of rockface in oakwood at Ynys-hir, SN6787.9571, 20 November 2016, © S.P. Chambers

(ii) Sea-cliff in rocky cove W of Trwyn Crou

On 19 v 2014 *Arthonia atlantica* was found in a rock underhang on a sea-cliff on the W side of a rocky cove c. ½ km SW of Trwyn Crou, E of Ynys-lochtyn, at SN327552 (SN35 Tetrad H), alt c. 30m, on the SW Cardiganshire coast. Voucher in hb. SPC. The find was reported in 'New, Rare or Interesting' in British Lichen Society Bulletin No.116, Summer 2015.

Approximately 12 small (c.1-3cm across) thalli were counted in a sheltered E-facing, but open and quite well-lit, c. 30 degrees inclined sloping flat face in a substantial overhung recess at the base of a cliff. Thalli were thin and fragmentary and in poor condition with surfaces abraded by molluscs and/or other invertebrates. In addition, numerous small dispersed 'smudges' occurred along the edge of a rock fissure on the same face. All thalli were bounded by an area no bigger than c. 30 ×

20cm. The closest associate lichen was *Opegrapha cesareensis*. An adjacent underhang had *O.lithyrga*.

The presence of *A.atlantica* here opens up the possibility of it occurring on similar sheltered hard rock underhangs on sea-cliffs elsewhere along the Cards coast.

Conclusion

Arthonia atlantica is Nationally Rare (in Britain), mainly near the coast, and is rare in Wales (6 hectads). In its known sites in Wales it requires fairly well-lit conditions, and is often threatened by excessive growth of trees and other vegetation in the absence of grazing or other factors to keep habitats open. It is recommended that it remain on the Section 7 list.

5.2.2 *Lecania chlorotiza*

In 1996 this was reported as occasional on the shaded dry bark of oaks in compartments 1, 2, 7, and 10. In 2017 it was detected on the underside of a leaning elm in Compartment 6. This is a rather inconspicuous species, and there is no suggestion that there has been a decline. The species tends to be found on shaded trunks, and is probably much less sensitive to over-shading than some of the *Lobarion* species. It is not considered threatened at the site.

This is a Nationally Scarce but rather widespread species. It is suggested that there is no particular reason for it to remain on the Section 7.

5.2.3 *Porina effilata*

This is a species of south-western distribution, which is very rare in Britain; outside Wales, it is only reported from North Devon. Outside Britain it is reported from W. Ireland, Portugal and Macaronesia. It is said to grow on base-rich bark in old woodlands, and on rock. Material from Coedmor is shown in Fig. 36.

Colonies of Porina effilata found in the SSSI

In 1996 *Porina effilata* was detected on a single well-lit rock-face in Compartment 9, on steep slopes which were accessed from the adjacent fields at the top of the wood.

In 2017 the same rock face was relocated. The area is best accessed via an old track running SSW to a quarry (Fig. 23), and continuing beyond the quarry. This is a natural rock face, and the richest in the reserve. The lower part of the face is near-vertical, and is clearly calcareous. *Porina effilata* was present mainly on the lower part of the face, on slightly overhanging rock, mostly overgrowing the hepatic *Marchesinia mackaii* as a thin grey thallus with an orange tinge, but locally on weakly grown *Neckera complanata* and *Thamnobryum alopecurum*. It also grew directly on

rock, forming a pale orangey brown thallus with pale fruiting bodoes. Some colonies were shaded and somewhat rain-sheltered by stems of ivy hanging down over the rock face.

Elsewhere on the face there were good colonies of the old-forest lichens *Nephroma laevigatum* and *Sticta canariensis*, mainly on areas where bryophytes were not dominant, due to the face being well-lit and exposed, or due to the steepness of the face. Other notable species included *Biatora epixanthoides*, *Collema subflaccidum*, *Mycobilimbia pilularis* and *Porina rosei.*

The rock face is well-lit, due to the absence of trees just above it, and the fact that some trees nearby have partly fallen in the past due to the steep slope. Ivy is not currently a problem on the main face, and ivy stems growing up the face are currently few. If young ivy were to begin growing up the face in quantity then it should be removed. In front of the face there are a number of ash and sycamore saplings. Although conditions are suitable at the moment, it might be beneficial to remove the sycamore saplings before they become large.

Upper parts of the outcrop are more gently sloping, and partly hidden by ivy and plants growing on ledges; *Sticta canariensis* occurred here, although the rocks could not be examined closely.

Photographic monitoring of *Porina effilata* would be difficult here, due to the small size of the lichen, and the scarcity of landmarks on much of the rock face.

Fig. 18. Exposure 9/7; note green circular tag on leaning oak to left.

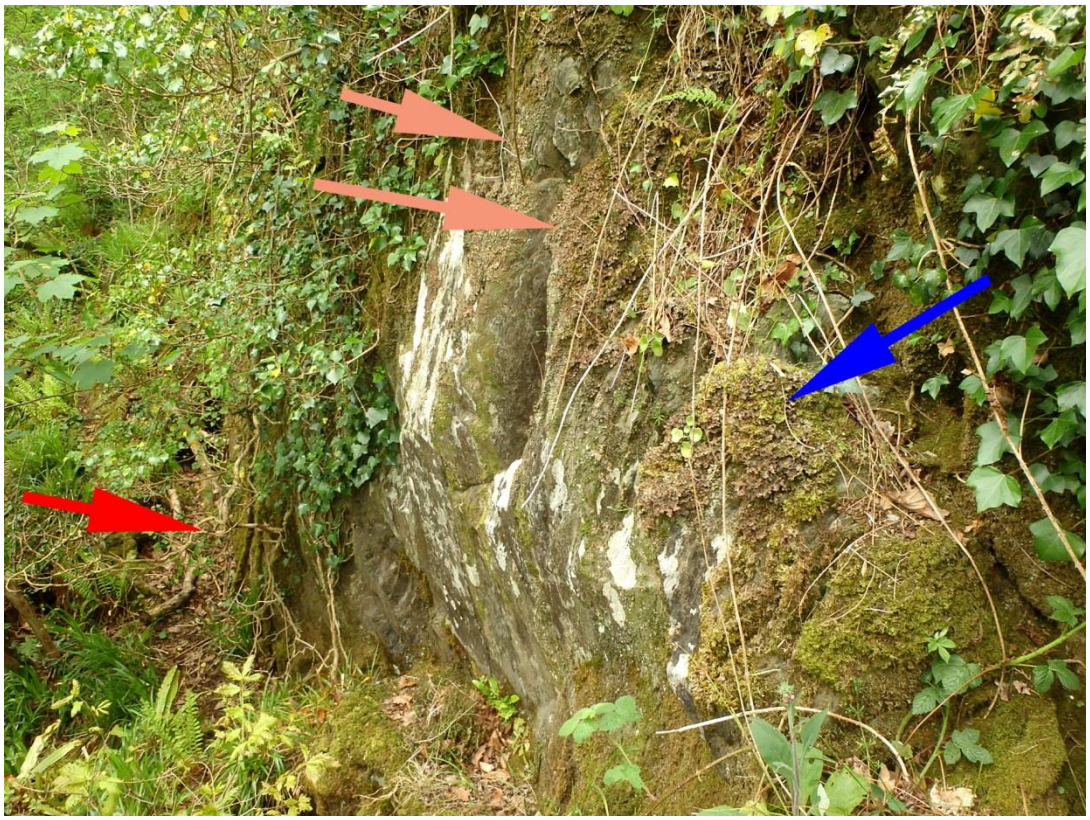

Fig. 19. *Porina effilata* is mainly on the lower part of the face (red arrow). Pink arrows: colonies of *Nephroma laevigatum*, blue arrow: colony of *Sticta canariensis*.

Fig. 20. *Porina effilata* grows on steep faces on thin bryophytes, especially *Marchesinia*; it occurs over much of the face in the photo, and also on face beyond left edge of photo.

Occurrence elsewhere in Wales

Only one other Welsh locality is known: Merioneth (V.C. 48), Bryn Bwbach, Ceunant Coch, grid ref. 23/6295.3642. It was recorded here by Alan Orange in May 2002, in small quantity on a slightly calcareous cliff face in woodland, with *Enterographa zonata*, *Verrucaria elaeina* and *Neckera complanata*.

Conclusion

This is a rare species, limited by a requirement for base-rich conditions, and for a mild oceanic climate. It is genuinely rare rather than overlooked, and should remain on the Section 7 list.

6. Discussion

Coedydd a Corsydd Aberteifi SSSI has a very good lichen flora in terms of species-numbers, and acheives a high score on the most widely applicable index of ecological continuity (the NIEC). There are good numbers of species graded either as Endangered, Vulnerable, or Near Threatened in Wales, and there are six Section 7 species. However, most of the notable species are present in small quantity, and the future of many is uncertain. The 1996 survey provided a good coverage of the site, but additional notable species were recorded in 2017. The difficult terrain in many places means that survey is not easy, and it is possible that additional notable species remain to be found.

The persistence of a rich lichen flora is due largely to the topography. The extensive steep slopes have probably meant that it would always have been difficult to clear-fell the whole site at once. In addition, some lichens may have been able to survive clear-felling on the slightly calcareous rock faces. The degree of shelter given by the gorge may also have been beneficial to lichens in woodland disturbed by felling. Despite this, it is likely that the woodlands have been heavily exploited in the past. The north side of the river also has many quarries, perhaps dating from the nineteenth century, and in addition, very small-scale quarrying seems to have been carried out in places. Quarrying is so widespread that it is difficult to know to what extent natural rock exposures occurred. Most of the remaining natural outcrops are very small. However, it is likely that natural exposures would have been the starting point for quarrying. The richness of a natural outcrop in Compartment 9, supporting several old-forest species and the rare *Porina effilata*, gives a hint of the flora that may have existed in the gorge before quarrying began. Although the quarries are long-abandoned, they have not been colonised by many of the notable species. Old-forest lichens are, by their nature, slow to colonise new areas. It is also likely that the quarried rock surface needs to be more weathered to make it suitable for certain lichens. The pit-like nature of most quarries also means that light levels are lower than on prominent natural exposures.

The woodland is currently virtually ungrazed, and in the absence of management a closed, shady woodland can be expected to cover the slopes, which is more or less the present condition. There are signs that conditions were locally

more open relatively recently. In Compartment 2, there are a number of oaks with an unusual, sprawling aspect which are probably the result of informal management or casual felling, and this area, at least in 1996, had a concentration of old-forest species on bark. The impression in 2017 was that the area had become more shady, partly due to the growth of young hollies and saplings of other trees, and several of the old-forest species could not be found (Fig. 21). These low, sprawling oaks allow more light to penetrate to ground level than normal woodland trees, which favours *Lobarion* species. In Compartment 8, there was also the impression that shade had increased since 1996, with the result that *Lobaria pulmonaria* was less common.

Despite the impression that shade may have increased in places, generally there has not been the explosive increase in saplings that has occurred in many Welsh woodlands where grazing has been withdrawn recently (Fig. 21). Probably the canopy was already relatively closed in 1996. Holly is a potentially damaging tree to the lichen interest, as it can smother the trunks of other trees, causing a heavy shade, and it can also cast a heavy shade on rock faces. Ivy is of concern on rock faces, where in the absence of grazing it can smother large areas, especially on natural outcrops, which are small. Despite the lack of grazing, ivy does not seem to be currently a significant problem on tree trunks.

Fortunately, at this site, natural tree-fall on steep slopes appears to occur occasionally, forming small glades and allowing increased light to rock faces (Fig. 27). In the long-term, this may be a viable way in which somewhat open conditions can be maintained for *Lobarion* species, which will not tolerate much shade. However, the *Lobarion* species are currently so rare at the site that they are unable to take advantage of the naturally-created glades. For this reason it is necessary to intervene, if possible, to ensure the survival of *Lobarion* species beyond their present bottleneck, in the hope that an old-growth woodland will ultimately arise which can be colonised. Without more intensive survey it is difficult to suggest specific places for management, except for some of the *Arthonia atlantica* sites, where it may be beneficial to remove small quantities of young holly or ivy. It may also be useful to remove some holly saplings in Compartment 2 if they are seen to be shading notable species.

Although the old-forest *Lobarion* species are generally associated with ancient woodland, not all of them require ancient trees. *Lobaria pulmonaria* was growing vigorously on a very well-lit, very young elm on moist level ground beside the river nearby. There were good colonies from approximately 1 to 2 m above ground, and no colonies were damaged by molluscs. This species was also seen on *Salix cinerea* here.

The reserve is mostly free of alien invasive species (apart from the archeophyte *Acer pseudoplatanus*, and a vigorous stand of *Fallopia japonica* by the river), but a colony of *Lonicera nitida* in an old quarry in Compartment 9 (a little north of point 9/3) should be destroyed, as this species can form dense thickets which exclude all ground flora and shade tree trunks.

In 1996 a number of ‘permanent’ quadrats were established, and photographic slides were deposited with Countryside Council for Wales. Unfortunately, these have been lost or discarded, so it has not been possible to

assess whether any quadrats could be relocated. However, it seems likely that many will be undetectable after a period of 21 years, due to loss of the screw markers, or to death of trees or limbs. A fallen ash in Compartment 8, on which was sited a quadrat on *Lobaria pulmonaria*, has almost certainly vanished.

7. References

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Table 1. Lichen species recorded in SSSI, all years	
species	notes
Acrocordia gemmata	1996: occasional; on oak, ash and beech, compartments 2, 4, 8, 9, and 12.
Agonimia octospora	1996: very rare; on one oak (9/10). 2017: On oak. 2/19, 6/8. Fig. 35.
Anisomeridium biforme	1996: occasional on oak, compartments 1, 2, 4, 9 and 12. 2017: Oak. 4.
Anisomeridium polypori	1996: rare or overlooked, on oak and on a cow skull, compartments 8 and 9. 2017: On oak. 2.
Anisomeridium robustum	1996: local, recorded on 24 oaks and 2 sycamore, compartments 4, 6, 8, 9 and 12. 2017: 4/3 oak trunk c. 50 cm page DBH, 4/5 oak, 8 oak.
Arthonia atlantica	1996: occasional on natural outcrops, compartments 2, 6, 9, 10 and 11. 2017: On slightly overhanging rocks, mostly on natural rock faces. 6/2, 6/3, 6/4, 6/9, 6/11, 6/12, 16/1, 16/2.
Arthonia cinnabarina	1996: local, mainly on young oak, also on ash, sycamore, and hazel; compartments 1, 2, 3, 4, 8, 9, 10, 11 and 12.
Arthonia elegans	1996: locally frequent on young oak, more abundant than A. cinnabarina; compartments 1, 2, 3, 9 and 10.
Arthonia endlicheri	1996: said to be locally frequent below natural rock overhangs (compartments 4, 10, 11 and others), rarely on dry, dead or living bark of oak (3 trees, 9/2, 9/9 and 9/16); however some records may have been due to confusion with *Llimonaea sorediata*. 2017: On rocks. 2/1, 2/5, 2/11, 9.
Arthonia leucopellaea	2017: On oak. 14/5.
Arthonia radiata	1996: on oak, ash, hazel and sycamore branches, compartments 2 and 10.
Arthonia spadicea	1996: occasional on oak, compartments 1, 2, 8, 9, 10 and 11.
Arthonia vinosa	1996: very rare; on base of oak stool (9/9), and on oak in compartment 12. 2017: Oak (2/9),
Arthopyrenia analepta [LF]	2017: Oak twigs. 2,
Arthopyrenia fraxini	1996: rare or overlooked; on oak and holly, compartments 4 and 6.
Bacidia arnoldiana	1996: very rare; on stone embedded in shaded bank by river, compartment 11.
Bacidia biatorina	1996: probably occasional on oak but usually sterile, compartments 6, 7, 9 and 12. 2017: On oaks. 2/4, 2/9, 2/10 c.fr., 2/12, 2/16, 4 Qp 1,
Bacidia carneoglauca	1996: very rare; on one vertical rock face near east end of compartment 11.
Bacidia fuscoviridis	2017: 6/7 natural exposure in small quantity.
Bacidia rubella	1996: rare; on oak (compartment 4, 8/3, 9/15, compartment 12). Fertile. 2017: 6/10 on oak.
Bacidia squamosella	2017: On Alnus by river terrace. 6.
Bacidia trachona	1996: occasional below rock overhangs; compartments 2, 4, 6, 9 and 11. 2017: On rock faces, frequent. 2, 4/8.

Bacidia viridifarinosa	1996: rather frequent on dry rocks and bark (mainly oak, rarely ash and sycamore); recorded on at least 27 trees; compartments 1, 2, 4, 6, 7, 8, 9, 11 and 12. 2017: On rocks, bark and stones. 2, 4/1, 4/2, 14, 15,
Bactrospora corticola	1996: local and occasional on dry bark of oak, recorded from 10 trees (2/11, 2/12, 4/11, 4/19, 4/20, compartment 4, 6/3, 6/21, compartment 9, compartment 12).
Baeomyces rufus	1996: rare; soil thrown up by roots of fallen tree in compartment 6, and soil by tracks in compartments 10 and 11.
Biatora britannica	1996: on dead trunk of young elm, compartment 8 (the type locality for this species).
Biatora epixanthoides	2017: 9/7 on moss on rock face.
Botrylepraria lesdainii	1996: rare, recorded 3 times on rock; compartments 2, 6 and 9, and on an old wall in compartment 8.
Calicium glaucellum	1996: very rare; on oak log in compartment 4.
Caloplaca arenaria	1996: rare; on rock in compartment 6, and on rocks by river in compartments 10 and 11.
Caloplaca citrina agg.	1996: very rare; on rock in compartment 2.
Caloplaca obscurella	2017: On Salix cinerea near river.
Catinaria atropurpurea	1996: rare on oak (2/13, 4/14, 4/18, 6/7, 9/36, compartment 9, 10/2, 11/4 and compartment 12). 2017: Oak (2/9), 2/15 rare, 6/10.
Cetrelia olivetorum	1996: rare; on sallow in meadow by river in compartment 5.
Chaenotheca brunneola	1996: very rare; on wood on base of oak stool by track in compartment 11.
Chaenotheca furfuracea	1996: very rare; on oak in compartment 1; sterile. 2017: On soil at tree base, N side of river.
Chaenotheca stemonea	1996: rare; on wood of oak stool (by 9/2), with *Lecanactis subabietina,* and on wood of oak stool by track at base of slope near west end of compartment 11 (11/2), with *Chaenotheca trichialis*. Sterile.
Chaenotheca trichialis	1996: very rare; on wood of oak stool by track at base of slope near west end of compartment 11 (11/2), with *C. stemonea.*
Chaenothecopsis sp.	1996: very rare; on dry oak bark (4/18, 4/20). 2017: On dry bark of oak trunks, 4/11, 14/4, 14/5, 14/6, 14/7, 14/8, 14/9. Apparently lichenised, with a white thallus. Probably an undescribed species. Fig. 33.
Chrysothrix candelaris	1996: occasional and in small quantities on oak, rarely on Abies sp. and on rock; compartments 1, 2, 3, 4, 6, 7, 9, 10 and 12.
Chrysothrix flavovirens	1996: occasional on dead wood of oak or pine; compartments 1, 2, 4 and 6.
Cladonia caespiticia	1996: occasional on stumps and on mossy rocks and soil banks; compartments 2, 3, 4, 6, 8, 9, 10 and 11.
Cladonia coniocraea	1996: rare on wood; compartments 2 and 4.
Cladonia digitata	1996: rare; on oak stump in compartment 9, and on soil bank in compartment 11.

Cladonia fimbriata	1996: very rare; on soil bank exposed by fallen tree in compartment 6.
Cladonia parasitica	1996: rare; on oak stumps; compartment 9, and by track in compartment 10.
Cladonia polydactyla	1996: occasional; on oak stumps, a pine trunk, and on soil banks; compartments 2, 3, 4, 7, 9, 10, 11. 2017: Wood of dead stem of oak (2/9),
Cladonia pyxidata	1996: very rare, on rocks (9/17).
Cliostomum griffithii	1996: rare; on oak in compartments 4 and 10, and on rocks in compartments 6 and 9.
Collema flaccidum	1996: rare; on sallow by river in compartment 9, and on rocks by river in compartment 11.
Collema subflaccidum	1996: rare; on ash (9/20) and in small quantity on rocks (9/17). 2017: rare on rocks (9/7, the same outcrop as 9/17 in 1996).
Cresponea premnea	1996: locally frequent on oak, very rarely on Abies; compartments 2 (7 trees), 4 (11 trees), 6 (frequent, on more than 8 trees), 7 (3 trees), 8 (3 trees), 9 (2 trees), and 12; occasional and in small quantities on rock (compartments 2, 4, 6, 8, 9, 10 and 11). 2017: Dry bark on oak trunks. 2/10, 2/12, 2/14, 2/20, 4/4 (c. 60 cm DBH), 4/6, 4/10, 4/11, 6/1 (c. 50 cm DBH), 6/6 (c. 35 cm DBH), 6 Qp 1, 14/1, 14/2, 14/3, 14/4, 14/5, 14/6, 14/7, 14/8, 14/9, 14 Qp 4, 15/1, 15/2, 15/3, 15/4, 15/5, 15 Qp 7, 16/1 (rock); rarely on ash: 2/21.
Cystocoleus ebeneus	1996: rare; on rocks in compartments 4 and 9.
Dactylospora parasitica [LF]	1996: on *Pertusaria hymenea* in compartments 4 and 9, and on *P. pertusa* in compartment 4..
Dermatocarpon luridum	1996: on rocks by river in compartments 9, 10 and 11.
Dimerella lutea	1996: rare; recorded on 11 oaks (compartment 1, 2/6, 2/15, 2/19, 4/9, compartment 4, compartment 6, by 6/6, 6/21, 9/37, 9/39). 2017: Oak (2/9), 2/17, 6/10.
Dimerella pineti	1996: rare; on oak, yew, and on rocks; compartments 1, 3, 7 and 9.
Diploicia canescens	2017: On oak at edge of woodland, 15/6.
Enterographa crassa	1996: frequent on bark, including that of oak, ash, sycamore, holly, beech and Abies, also locally frequent on natural rock outcrops; compartments 1, 2, 3, 4, 6, 7, 8, 9, 10, 11 and 12. 2017: On bark and on rock, both natural outcrops and old quarry faces. 2/1 (rock), 2/5, 14, 6/8.
Enterographa hutchinsiae	1996: occasional below natural outcrops, once recorded on an oak root below overhanging stool, and once on an ash root; compartments 1, 2, 3, 4, 9, 10 and 11. 2017: On rocks. 2/1, 2/11, 4/2, 4/8, 6/9, 15,
Enterographa zonata	1996: locally frequent on rocks; compartments 2, 3, 4, 6, 8, 9, 10 and 11. 2017: On rocks. 4, 6, 15,
Evernia prunastri	1996: probably frequent on branches; compartments 1, 2, 3, 4, 6 and 9. 2017: On fallen oak branch. 2, 4,
Flavoparmelia caperata	1996: frequent on branches; recorded on oak, beech, ash and sallow; compartments 2, 4, 6, 8 and 9. 2017: Oak twigs from canopy. 4/1, 6,

Fuscidea lightfootii	1996: on branches of alder, beech, sallow, sycamore and oak; compartments 1, 4, 6 and 9. 2017: Oak twigs from canopy. 4,
Graphina anguina	1996: rare; on oak in compartment 4, and on holly near north end of compartment 9.
Graphis elegans	1996: occasional on oak; compartments 1, 2, 3 and 4. 2017: Oak twigs from canopy. 4/1,
Graphis scripta	1996: occasional, on oak, sycamore, beech and hazel; compartments 1, 3, 4, 8, 11 and 12.
Gyalecta derivata	1996: very rare; on oak (9/11).
Gyalecta truncigena	1996: occasional on oak; compartments 2, 4, 6, 7, 8, 9 and 12.
Gyalideopsis anastomosans	1996: very rare; on rock (9/17). Fertile.
Haematomma ochroleucum var. porphyrium	1996: very rare; on rocks (9/17).
Hypogymnia physodes	1996: on twigs of alder, oak and sallow; compartments 1, 2 and 6. 2017: Oak twigs from canopy. 4/1, 6,
Hypogymnia tubulosa	1996: on beech branch in compartment 4, and on sallow in compartment 8. 2017: Oak branch from canopy, 6; on Salix cinerea, 8.
Hypotrachyna afrorevoluta	1996: [H. afrorevoluta/revoluta] rare; on oak in compartment 4 and on sallow in compartments 6 and 8. 2017: Oak branches (fallen). 2, 4/1, 6,
Hypotrachyna revoluta s.s.	2017: Oak twigs from canopy. 4, 6,
Ionaspis lacustris	1996: rare; on stones by stream in compartment 10.
Lecanactis abietina	1996: rare; on *Abies* in compartment 7.
Lecanactis subabietina	1996: occasional to locally frequent on dry bark and wood, and on rock and dead ivy stems below overhangs; compartments 1, 2, 3, 4, 6, 8, 9, 10 and 12. 2017: On rain-sheltered treee bases, rarely on rock. 2/6, 4 Qp 1, 14/6, 14/8, 15/5, 15 Qp 3,
Lecania chlorotiza	1996: occasional on shaded dry bark of oak; compartments 1, 2, 7, and 10. 2017: Underside of leaning elm, 6/2.
Lecania cuprea	1996: below rock overhang near north end of compartment 2.
Lecania hutchinsiae	1996: on rocks in Cwm Du in compartment 2. 2017: 9/7.
Lecanora argentata	1996: rare; on oak in compartments 1 and 9.
Lecanora campestris	1996: very rare; on rock in compartment 11.
Lecanora chlarotera	1996: rare and in small quantities on trees; compartments 1, 4, 9 and 11. 2017: On fallen oak branch. 2,
Lecanora confusa	1996: on oak branches in compartments 2 and 9, and on blackthorn in compartment 10. 2017: On fallen oak branch. 2, 4/1,
Lecanora ecorticata	1996: frequent on natural rock outcrops and in quarries; compartments 1, 2, 3, 4, 6, 8, 9, 10 and 11. 2017: On rain-sheltered rocks. 2/5, 4, 9, 15,
Lecanora expallens	1996: occasional on oak; compartments 1, 4 and 9. Confirmed by TLC.

Lecanora gangaleoides	1996: occasional on rocks; compartments 2, 3, 6, 9 and 10. 2017: On rock. 4/7, 6/2, 16/1,
Lecanora jamesii	2017: Salix cinerea, 8.
Lecanora orosthea	1996: rare on rocks, compartments 9, 10 and 11. 2017: 16/1 rock.
Lecidea doliiformis	1996: rare to occasional, recorded 9 times; on dry wood of oak logs and wood on oak stools; compartments 3, 6, 9, 10 and 11.
Lecidella elaeochroma	1996: on oak and ash branches; compartments 1, 4, 9 and 11. 2017: On fallen oak branch. 2,
Lecidella scabra	1996: rare on rocks, fertile; compartments 6, 9, 10 and 11. 2017: On rocks. 2,
Lecidella stigmataea	1996: rare on rocks; compartments 2 and 9.
Lepraria crassissima	1996: rare below rock overhangs; compartments 4, 8 and 9.
Lepraria eburnea	1996: rare; on rocks (9/17). Material contained alectorialic and protocetraric acids by TLC.
Lepraria incana	1996: frequent on rocks, occasional on bark; compartments 1, 2, 3, 4, 6, 7,8, 10, 11 and 12.
Lepraria lobificans	1996: occasional; on oak and sallow, rarely on rock; compartments 1, 4, 6, 9, 10 and 12.
Lepraria rigidula	1996: occasional; on oak, sallow, soil and rock; compartments 1, 8, 10 and 11.
Lepraria sylvicola	1996: [as L. jackii] occasional on oak. Material on soil and rock may have been L. humida, but there are no extant specimens or TLC records.
Lepraria umbricola	1996: very rare; on oak stump in compartment 1.
Lepraria vouauxii	1996: rare or overlooked, on oak in compartment 10.
Leptogium lichenoides	1996: rare; on rocks (e.g. 9/23) and on 2 ash (9/20, 9/24) in compartment 9. 2017: 6/12 on natural rock face, 9/7 rare on natural rock face.
Llimonaea sorediata	2017: Rain-sheltered rocks, natural and quarried faces. 2, 6/8.
Leptogium teretiusculum	2017: on rock, 9/1.
Lobaria pulmonaria	1996: very local; on at least 13 trees around the 'tump' in compartment 8, including oak, ash and one sycamore; all above head height except for one fallen ash. 2017: 8/1 high on sycamore, 8/2 recently fallen ash, near 8/3 on Salix cinerea, 8/4 good colonies on young elm.
Lobaria virens	1996: very rare; on low rocks (6/16) somewhat sheltered by ivy, covering an area c. 400 × 200 mm, with Bacidia trachona, Enterographa crassa and Porina chlorotica.
Loxospora elatina	1996: very rare; on oak in compartment 9.
Melanelixia glabratula	1996: occasional, on oak and ash; compartments 1, 2 and 9.
Melanelixia subaurifera	1996: frequent on branches; recorded on alder, oak, beech, sycamore, blackthorn and sallow; compartments 1, 2, 4, 6, 8, 9 and 10. 2017: On fallen oak branch. 2,
Melanohalea exasperata	2017: Oak branch from canopy. 6.
Micarea alabastrites	2017: Wood of dead stem of oak (2/9),

Micarea bauschiana	1996: occasional on rock below overhangs; compartments 1, 3, 4, 9 and 10.
Micarea botryoides	1996: rare on rocks and mosses below overhangs; compartments 4, 9, 10 and 11.
Micarea prasina	1996: locally frequent on dry wood of oak stumps; compartments 1, 2, 3, 4, 10 and 11. 2017: Wood of dead stem of oak (2/9),
Micarea subviridescens	1996: occasional on soil or moss on rocks and banks; compartments 1, 3, 6, 8, 9, 10 and 11. 2017: On natural outcrop. 2/1.
Milospium graphideorum [LF]	2017: Covering white thalli on dry oak bark, 14/9.
Mycobilimbia pilularis	1996: rare in compartment 9; on base of ash stool (9/12), locally frequent on rock (9/17), on rock and moss (9/19), and on ash (9/24). 2017: 9/7 rock face.
Mycobilimbia sabuletorum	1996: very rare; on rocks in compartment 9.
Nephroma laevigatum	1996: rare; on oak, ash and on rocks (2/17 oak, 9/12 ash, very small, 9/17 abundant on rocks, near 9/17 on ash, 9/28 ash, 9/33 oak, 9/35 ash, 11/4 oak). 2017: on rocks 9/17, fruiting.
Nephroma parile	1996: rare; on ash and oak (9/20 ash, 9/32 young ash, 9/33 oak, 9/35 ash, rare, 11/4 oak), also very rare on rock (9/17).
Normandina pulchella	1996: occasional on oak, rarely on ash and on rock; compartments 1, 2, 4, 6, 7, 9, 10 and 11. 2017: On rock (6/8) and bark.
Ochrolechia parella	1996: occasional on rocks; compartments 2, 3, 6 and 9. 2017: On rocks, frequent, with poorly developed apothecia. 2, 6, 9.
Opegrapha areniseda	2017: On rocks. 2,
Opegrapha corticola	1994: on large oak by stream, SPC. 1996: occasional on oak (compartment 2, 4/8, by 6/6, 6/14, 6/15, 6/17, 6/22, compartment 8, 9/9, 9/38, compartment 12). 2017: On oak. 2/15, 2/16, 6/8, 15/2,
Opegrapha gyrocarpa	1996: locally frequent on rock; compartments 2, 3, 4, 6, 8 and 11. 2017: On rocks, 2, 4,
Opegrapha lithyrga	2017: Near 6/9 on shaded overhanging rock face in old quarry.
Opegrapha multipuncta	1996: occasional on natural rock outcrops; compartments 3, 4, 6, 9 and 11. 2017: On rock. 4/7, 4/8, 6/12 on natural rock face.
Opegrapha ochrocheila	1996: rare; on wood of oak stool in compartment 11, and on dead bark of oak in compartment 12. 2017: Dead ivy stem on rock. 4/2, ash 9/3.
Opegrapha prosodea	1996: very rare; on sheltered base of an oak on top of a rock face, with *Cresponea premnea* (6/1).
Opegrapha sorediifera	1996: occasional; on oak, beech, hawthorn, alder and sallow; compartments 1, 2, 9, 10 and 11. 2017: Oak. 4.
Opegrapha varia	1996: occasional on oak, also on ivy stems; compartments 3, 4, 10, 12 and others. 2017: On oak. 2.
Opegrapha vermicellifera	1996: occasional; on oak, holly and sycamore; compartments 2, 6, 8 and 9.

Opegrapha vulgata	1996: frequent; on smooth bark of oak, ash, beech, sycamore and holly; compartments 1, 3, 4, 7, 8, 9 and 10.
Opegrapha xerica	2017: On oak. 6.
Pachyphiale carneola	1996: rare; on three oaks (6/8, 6/9, compartment 8).
Parmelia sulcata s.l.	1996: frequent on branches, on alder, oak, ash and sycamore; compartments 1, 2, 4, 6 and 9. 2017: On fallen oak branch. 2, 6. Specimen from oak twig by 6/4 confirmed as the cryptic species *P. encryptata*.
Parmeliella jamesii	1996: very rare; in small quantity on rocks (9/17).
Parmotrema perlatum	1996: occasional, mainly on branches, on oak, sallow and beech; compartments 1, 2, 4, 6, 8 and 9. 2017: Oak branches (fallen). 2, 6,
Peltigera horizontalis	1996: local and occasional, on oak, ash, on rocks and on logs (2/16 oak, 6/11 mossy rock, 9/17 rocks, locally abundant, near 9/17 fallen ash, 9/21 ash, 9/22 mossy elm log, 9/24 ash, abundant, 9/26 rocks, 9/27 oak, abundant, 9/29 oak, 9/35 ash). 2017: On oak. 2/16 [= 2/16 of 1996], 2/18, ash 4/12, ash 9/3.
Peltigera hymenina	1996: very rare; on mossy unshaded soil in compartment 8.
Peltigera membranacea	1996: very rare; on mossy unshaded soil in compartment 8.
Peltigera praetextata	1996: occasional, on oak, mossy bank and on rocks; compartments 2, 6, 9 and 11. 2017: On ash 4/12.
Pertusaria albescens	1996: rare; on oaks in compartments 4, 9 and 10.
Pertusaria amara	1996: rare; on sallow in compartment 8.
Pertusaria hemisphaerica	1996: very rare, on one oak beside track near north-eastern margin of compartment 12.
Pertusaria hymenea	1996: frequent; on oak, ash and sycamore; compartments 1, 2, 3, 4, 6, 9, 10 and 12. 2017: 15 Qp.
Pertusaria leioplaca	1996: on young oak trunks and on oak branches; compartments 1 and 2.
Pertusaria multipuncta	1996: frequent on branches, recorded on oak, beech and ash; compartments 1, 2, 4 and 9. 2017: Oak branches (fallen). 2, 4/1,
Pertusaria pertusa	1996: on oak, ash and beech; compartments 1, 2, 4, 6, 8 and 9.
Phaeographis dendritica	1996: occasional; on smooth bark on oak, beech and sycamore; compartments 1, 2, 10 and 12.
Pertusaria pseudocorallina	2017: 9/7 lightly shaded rocks.
Phaeographis smithii	1996: occasional; on oak, ash, holly and hawthorn; compartments 2, 4, 9 and 12.
Phlyctis agelaea	2017: On Salix cinerea in carr, abundant and locally dominant, 8. Third site in V.C.; quite possibly a recent arrival.
Phlyctis argena	1996: locally frequent, on oak and sallow; compartments 1, 4, 5, 6, 8 and 9.
Physcia aipolia	1996: on oak branches in compartments 2 and 4, and on blackthorn in compartment 10.
Physcia tenella	1996: on branches of oak, sycamore, sallow and blackthorn; compartments 4, 6, 8 and 10. 2017: Oak branch from canopy. 6.

Piccolia ochrophora	1996: very rare; on oak in compartment 8.
Placynthiella dasaea	1996: on mossy soil on log. New to vice-county (probably overlooked).
Porina aenea	1996: on ash in compartment 11.
Porina borreri	1996: rare; on oaks (2/10, 9/11).
Porina byssophila	2017: On rocks. 2/11, 6/8, 6/12, 9.
Porina chlorotica	1996: present, but over-recorded for *P. byssophila*. 2017: On rocks and stones. 4, 9.
Porina effilata	1996: very rare; on dry rock face (9/17). 2017: 9/7 good quantity on steep rock face (same as in 1996). Fig. 36.
Porina lectissima	2017: Near 6/9 on rock face in old quarry.
Porina leptalea	1996: rare; on alder in compartment 10. 2017: Rock. 6/2,
Porina rosei	1996: rare; on oak (2/10) and in small quantities on rock (9/17). 2017: On oaks. 2/12 (small amount on moss), 2/17, 2/19, ash 4/12, 9/7 rock face. Fig. 37.
Porpidia platycarpoides	1996: very rare; on rocks in compartment 3.
Porpidia tuberculosa	1996: rare; on rocks in compartments 2, 4, 9 and 11.
Psilolechia clavulifera	1994: on soil lump attached to rootlet in eroding overhang by path, S.P. Chambers.
Psilolechia lucida	1996: occasional on rocks and walls; compartments 1, 2, 9, 10 and 11. 2017: Rocks in old quarry, rare. 4.
Psoroglaena stigonemoides	1996: rare; on elder and on elm; compartments 6 and 9.
Punctelia reddenda	2017: On Salix cinerea, 6/6, near 6/7
Punctelia subrudecta	1996: rare; on sallow in compartment 8 and on oak in compartment 9. 2017: Oak twigs from canopy. 4/1,
Pyrenula acutispora	2017: On oak, 2/8.
Pyrenula chlorospila	1996: local on smooth bark of ash, holly and sycamore; compartments 1, 2, 3, 6, 8, 9 and 11.
Pyrenula macrospora	1996: locally abundant on smooth bark; recorded on ash, holly, service tree, sycamore and beech; compartments 1, 2, 3, 4, 6, 8, 9 and 11. 2017: Ash. 4.
Pyrrhospora quernea	1996: occasional on oak; compartments 2, 3, 4, 6, 8, 9 and 10. 2017: Oak, occasional in better-lit places, intolerant of shade. 15,
Ramalina farinacea	1996: on branches of oak, sycamore, sallow and blackthorn; compartments 1, 2, 5, 6 and 9. 2017: On fallen oak branch. 2,
Ramalina fastigiata	1996: on oak, ash and sycamore branches, and on sallow; compartments 4, 5, 6, 8, 9 and 10. 2017: On fallen oak branch. 2, 4,
Rinodina oxydata	1996: on rocks by river in compartment 10.
Rinodina roboris	1996: very local; on 5 oaks in compartment 6, and on rocks, or on ivy stems adjacent to rock faces, in compartments 2, 3, 4 and 6. 2017: 6/5 on rock in small quantity, 6/8 well-lit natural rock face, 6/10 on oak.
Schismatomma cretaceum	1996: rare; on Abies in compartment 7, and on oak in compartment 12 (on at least 3 trees). 2017: 15/2 large colony on oak (Fig. 29), 15/3 4 small thalli.

Schismatomma decolorans	1996: occasional, on oak and ash, rarely on rocks; compartments 3, 4, 6, 7, 8, 9 and 12. 2017: Oak (2/13), 4, 14, 15,
Schismatomma niveum	1996: rare; on 3 oaks in compartment 12.
Staurothele fissa	1996: on rocks by river, compartments 10 and 11.
Stenocybe septata [F]	1996: on holly, compartments 2 and 3.
Sticta canariensis	1996: very local on rocks and ash in compartment 9 (9/13 ash, 2 colonies; 9/17 abundant on large outcrop; 9/18 ash, with green morphotype attached; 9/25 ash, with green morphotype attached; 9/26 rocks). 2017: 6/12 on natural rock face, with attached green lobules, 9/7 rocks and adjacent oak, some attached green lobules.
Sticta limbata	1996: rare; on 7 trees and one rock outcrop (2/16 oak, 2/17 oak, rare; 2/18 oak, rare; 2/24 oak, 9/14 fallen dead ash, 1 thallus; 9/17 rock, rare; 9/20 ash; 9/30 young ash). 2017: 8/3 Salix cinerea, 8/5 Salix cinerea.
Sticta sylvatica	1996: rare; on 3 trees and on one rock face (2/17 oak, rare; 9/30 young ash; 9/31 young ash; compartment 9, very small on quarry face).
Strigula phaea	1996: rare; on one oak in compartment 8, and on 2 oaks and 2 elms in compartment 9. 2017: On sycamore in area with Lobaria, 8; and on two basic-barked oaks by quarries in woodland to N, 6.
Thelopsis rubella	2017: On oak 2/7.
Thelotrema lepadinum	1996: locally frequent in compartments 7 and 12, on oak, beech, sycamore and Abies; elsewhere rare (1 oak in compartment 1, 1 hazel in compartment 3, 2 oak in compartment 8). 2017: On Buxus, 8.
Tomasellia gelatinosa [F]	1996: on hazel in compartment 2.
Trapelia coarctata	1996: very rare; on stone on mound of soil thrown up by fallen tree in compartment 6.
Trapelia corticola	1996: on oak stump in compartment 3. 2017: Wood of dead stem of oak (2/9),
Trapelia involuta	1996: very rare; on rocks in compartment 9.
Trapeliopsis granulosa	1996: rare; on rocks by old track in compartments 4 and 11, and on oak log in compartment 6.
Trapeliopsis pseudogranulosa	1996: rare; on soil in compartments 9 and 11.
Usnea cornuta	1996: rare; on ash and sallow in compartment 8. 2017: 4/1 oak twigs from canopy, 6 Salix cinerea.
Usnea florida	1996: on oak branches in compartments 2 and 6, and on sallow in compartment 8. 2017: Oak twigs from canopy. 4/1,
Usnea fulvoreagens	2017: On oak twig (fallen from canopy), by 2/16.
Usnea subfloridana	1996: frequent on twigs and branches, including oak, alder, beech and sallow; compartments 1, 2, 3, 4, 5, 6, 8 and 9. 2017: 4/1 oak twigs from canopy, 6 Salix cinerea.
Usnea wasmuthii	1996: on sallow in compartments 5 and 8.
Verrucaria bulgarica	1996: very rare; on brick on tipped rubble near top of slope in compartment 2.

Verrucaria elaeina	1996: [as V. pinguicula] rare; on low wall by road by compartment 1, and on natural outcrops in compartments 2 and 9 (9/17). 2017: 6/8 on well-lit natural rock face in small quantity, 9.
Verrucaria praetermissa	1996: [as V. funckii] very local; on rocks in streamlets and beside river; compartments 9 and 10.
Xanthoria parietina	1996: very rare; on ash branch in compartment 4. 2017: On Salix cinerea twig, 6.
Xanthoria polycarpa	1996: very rare; on ash branch in compartment 4.
Number of species:	206
Number of species on bark and wood:	142

Numbers refer to field localities (see Table 3).
Locality numbers used in 1996 and 2017 are not comparable, see 1996 report for 1996 records.
LF = lichenicolous, non-lichenised.
F = non-lichenicolous, non-lichenised, but recorded by lichenologists.

Table 2. Notable lichen species recorded in 2017

	Woods (2010) Wales	Woods & Coppins (2012) GB	NR/NS	IR (Woods & Coppins 2012)	Sect. 42	NIEC (Coppins & Coppins 2002)
Porina effilata	EN	CR	NR	-	Sect. 42	-
Lobaria virens	EN	-	-	IR	-	NIEC
Agonimia octospora	VU	NT	NS	IR	-	NIEC
Chaenotheca stemonea	VU	-	NS	-	-	NIEC*
Lobaria pulmonaria	VU	-	-	IR	-	NIEC
Opegrapha prosodea	VU	NT	NS	IR	Sect. 42	-
Schismatomma cretaceum	VU	-	-	IR	-	-
Schismatomma niveum	VU	-		IR		NIEC
Sticta canariensis	VU	-	-	IR	Sect. 42	-
Strigula phaea	VU	-	NS	-	-	-
Arthonia atlantica	NT	NT	NR	-	Sect. 42	-
Arthonia vinosa	NT	-	-	-	-	NIEC
Bacidia biatorina	NT	-	-	-	-	NIEC
Bactrospora corticola	NT	-	NS	-	-	-
Cetrelia olivetorum	NT	-		-	-	-
Cresponea premnea	NT	-	-	IR	-	NIEC
Dimerella lutea	NT	-	-	-	-	NIEC
Lecania chlorotiza	NT	-	NS	-	Sect. 42	-
Mycobilimbia pilularis	NT	-	-	-	-	NIEC
Nephroma laevigatum	NT	-	-	IR	-	NIEC
Nephroma parile	NT	-	-	-	-	NIEC
Pachyphiale carneola	NT	-	-	-	-	NIEC

Parmeliella parvula	NT	-	-	IR	-	NIEC
Phlyctis agelaea	NT	NT	NS	-	-	-
Porina rosei	NT	NT	NS	IR	-	-
Punctelia reddenda	NT	-	-	-	-	NIEC
Sticta limbata	NT	-	-	IR	-	NIEC
Sticta sylvatica	NT	-	-	IR	-	NIEC
Thelopsis rubella	NT	-	-	-	-	NIEC
Thelotrema lepadinum	NT	-	-	-	-	NIEC
Pyrenula acutispora	ne	NT	NR	-	-	-
Usnea fulvoreagens	ne	ne	NR?	-	-	-
Biatora britannica	DD	-	NR	-	-	-
Porina byssophila	[LC]	-	-	-	-	-
Chaenothecopsis sp.	-	-	[NR]	-	-	-
Lepraria crassissima	-	-	NR	-	-	-
Micarea subviridescens	-	-	NR	-	-	-
Verrucaria bulgarica	-	-	NR	-	-	-
Arthonia endlicheri	-	-	NS?	-	-	-
Anisomeridium robustum	-	-	NS	-	-	-
Arthonia leucopellaea	-	-	NS	-	-	-
Bacidia carneoglauca	-	-	NS	-	-	-
Bacidia fuscoviridis	-	-	NS	-	-	-
Bacidia trachona	-	-	NS	-	-	-
Gyalecta derivata	-	-	NS	-	-	-
Lecania cuprea	-	-	NS	-	-	-
Lecidea doliiformis	-	-	NS	-	-	-
Lepraria eburnea	-	-	NS	-	-	-
Lepraria sylvicola	-	-	NS	-	-	-
Lepraria umbricola	-	-	NS	-	-	-
Opegrapha areniseda	-	-	NS	-	-	-
Opegrapha lithyrga	-	-	NS	-	-	-
Opegrapha xerica	-	-	NS	IR?	-	-
Psilolechia clavulifera	-	-	NS	-	-	-
Rinodina oxydata	-	-	NS	-	-	-
Usnea wasmuthii	-	-	NS	-	-	-
Calicium glaucellum	-	-	-	-	-	NIEC
Chaenotheca brunneola	-	-	-	-	-	NIEC*
Chaenotheca trichialis	-	-	-	-	-	NIEC*
Lecanactis subabietina	-	-	-	IR	-	NIEC
Lecanora jamesii	-	-	-	-	-	NIEC
Leptogium lichenoides	-	-	-	-	-	NIEC
Leptogium teretiusculum	-	-	-	-	-	NIEC
Loxospora elatina	-	-	-	-	-	NIEC
Opegrapha corticola	-	-	-	IR	-	NIEC
Peltigera horizontalis	-	-	-	-	-	NIEC
Pertusaria multipuncta	-	-	-	-	-	NIEC
Phaeographis dendritica	-	-	-	-	-	NIEC
Piccolia ochrophora	-	-	-	-	-	NIEC
Usnea florida	-	-	-	-	Sect. 42	NIEC

Abbreviations (see Methods section for full explanation):
NT = Near Threatened, VU = Vulnerable.
IR = International Responsibility, LC = Least Concern (only shown when differs from published source)..
NR = Nationally Rare (Great Britain), NS = Nationally Scarce,
NIEC = species used in calculation of New Index of Ecological Continuity.
* These Chaenotheca species score one together on NIEC.
ne = not evaluated.
[ ] = an assessment by the writers, when this differs from published sources.

Table 3. List of temporary locality numbers, 2017

These are numbers assigned during field survey, and may be referred to in the report.

number	GPS (latitude/longitude)	GPS accuracy (± m)	number in 1997 report	notes
2/1	-			Natural outcrop with Ente cra, Ente hut, Mica sub, Arth end.
2/4	52.06975 -04.63657			Oak with Baci bia.
2/5	52.06987 -04.63668			Old quarry, well-lit, Arth end, Leca eco, Baci tra.
2/6	near last			Old quarry, lower than last, Lecania.
2/7	52.07001 -04.63679	9		Oak in quarry, with Thelopsis rubella (tree has old tyre at base).
2/9	52.07001 -04.63724	11		Very low 'pollard' oak just N of quarry entrance, Baci bia, Cati atr, Arth vin, Dime lut, wood with Mica ala, Trap cor.
2/10	52.06962 -04.63662	9		Oak Baci bia, Cres pre.
2/11	same			Quarried face Pori bys, Baci vir, Ente hut, Baci tra, Arth end.
2/12	52.06969 -04.63684	11	2/10	Oak by rock face Cres pre, Pori ros (small amount on mossy bark near base), Baci bia. (No Agon oct seen),
2/14	52.06985 -04.63684	10		Oak Cres pre, Baci bia.
2/15	52.06971 -04.63700	9		Oak S lip of quarry, Opeg cor, Cati atr rare.
2/16	52.06981 -04.63730	17	2/16	Oak in narrow entrance to quarry, Pelt hor, Opeg cor, Baci bia; Usne flo on fallen twig (Sticta not found).
2/17	52.66985 -04.63737	11		Oak just N of quarry entrance, Pori ros, Dime lut.
2/18	52.06982 -04.63755	9		Sprawling oak, Pelt hor.
2/19	52.07034 -04.63791	9		Leaning oak in small quarry, Agon oct, Pori ros.
2/20	52.07020 -04.63794	11		Oak Cres pre.
2/21	52.07044 -04.63794	14		Ash by river Cres pre.
4/1	52.06853 -04.63572	12		Fallen branch with Usnea florida.
4/3	52.06782 -04.63645	13		Oak [c 48 cm DBH] Anis rob; nearby oak Leca sub, Baci bia.
4/4	52.06700 -04.63797	8		Oak [c 55 cm DBH] Cres pre.
4/5	52.06681 -04.63776	6		Large oak on boundary Anis rob.
4/6	52.06672 -04.633806	11		Oak Cres pre.
4/8	52.06615 -04.63966	6		Old quarry, Opeg mul, Ente hut, Baci tra.
4/10	52.06552 -04.64117	6		Youngish oak (c 32 cm DBH) Cres pre.

4/11	52.06549 -04.64123	8	Oak c. 50 cm DBH with Chaenothecopsis on dry bark at base (one stem of two), Cres pre.
4/12	52.06518 -04.64185	8	Ash by river, Pelt hor, Porin rosei on side of leaning trunk.
6/1	52.06537 -04.64067		Oak c. 50 cm DBH Cres pre.
6/2	52.06534 -04.64066	10	Natural (or partly so) outcrop, Arthonia atlantica good colonies, Ente hut, Baci tra.
6/3	52.06488 -04.64016	6	Outcrop, a few thalli of Arthonia atlantica.
6/4	52.06474 -04.63982	13	Outcrop with rare Arthonia atlantica.
6/5	52.06474 -04.64007	10	Outcrop with Arth end, Baci tra, Rinodina roboris (rare), Ente cra.
6/6	52.06177 -04.63883	15	Salix cinerea with Punctelia reddenda.
6/7	52.06221 -04.63939	20	Lecania chlorotiza on leaning elm beside flood plain.
6/8	52.06422 -04.63988	13	Well-lit natural rock face with Arth end, Llim sor, Rino rob and the moss Pterogonium gracile.
6/9	52.06443 -04.63987		Well-lit natural rock face with Arthonia atlantica.
6/10	52.06429 -04.63951	17	Two oaks, with Catinaria atropurpurea, Dimerella lutea, Rinodina roboris, Strigula phaea.
6/11	52.06419 -04.639455	12	Quarried face by old track, with Arthonia atlantica.
6/12	52.06416 -04.63946	13	Natural rock face with Sticta canariensis (good colonies), Leptogium lichenoides, Opegrapha multipuncta, Arthonia atlantica (small).
8/1	52.06086 -04.63727		Sycamore with Strigula, and with Lobaria pulmonaria high above ground.
8/2	52.06125 -04.63712		Fallen ash with badly grazed Lobaria pulmonaria, which would have been 7 m or more above ground.
8/3	52.06144 -04.63800	12	Salix cinerea shrubs on flood plain with Sticta limbata, Lobaria pulmonaria, Leptogium lichenoides.
8/4	near last		Very young elm with good colonies of Lobaria pulmonaria 1-2 m above ground, on moist ground by Salix carr.
8/5	52.06149 -04.63821	12	Salix cinerea with Sticta limbata.
14/1	52.05998 -04.63751	13	Oak Cres pre.
9/1	52.05766 -04.63237	9	Low outcrop becoming covered by ivy; Lept ter.
9/2	52.05748 -04.63235	9	Natural rock face 1.8 m, Arth end.
9/3	52.05805 -04.63346	8	Pelt hor abundant on horizontal ash stems in old quarry.
9/4	52.05860 -04.63345	8	Dense patch of alien Lonicera nitida in old quarry.
9/7	52.05777 -04.63305	7	Natural rock face, the best in the reserve, with Porina effilata, Porina hibernica, Nephroma laevigatum, Sticata canariensis, Mycobilimbia pilularis, Leptogium lichenoides, Biatora epixanthoides, Collema subflaccidum.
9/8	52.05772 -04.63291	7	Well-lit natural outcrop with abundant Sticta canariensis; a lot of outcrop is smothered in ivy.
9/9	52.05785 -04.63288	7	Natural outcrop with Nephroma laevigatum [almost certainly, but cannot get close; GPS from a few m upslope].
14/2	nearby		Oak Cres pre.
14/3	nearby		Oak Cres pre.
14/4	just NW of next		Oak Chaenothecopsis, Cres pre.
14/5	52.05985 -04.63726	19	Oak Chaenothecopsis, Arthonia, Cres pre.
14/6	52.05997 -04.63710	10	Oak Chaenothecopsis, Arthonia, Cres pre, Leca sub r.

14/7	52.05972 -04.63699	8	Oak Chaenothecopsis, Cres pre.
14/8	52.05971 -04.63692	10	Oak Chaenothecopsis, Cres pre, Leca sub.
14/9	52.05971 -04.63692	10	Oak Chaenothecopsis, Cres pre, Milospium graphideorum.
14/10	52.05741 -04.63531	12	Oak, Arthonia.
15/1	52.06212 -04.64063	10	Large oak Cres pre.
15/2	52.06465 -04.64285	17	Oak with excellent Schismatomma cretaceum; Cres pre, Opeg cor.
15/3	52.06457 -04.64292	11	Oak Schis cre 4 small thalli, Cres pre.
15/4	52.06456 -04.64296	13	Oak Cres pre, Leptogium teretiusculum very small.
15/5	52.06488 -04.64318	15	Oak Cres pre, Leca sub.
15/6	52.06740 -04.64211	14	Oak with Diploicia canescens.
16/1	52.06787 -04.63988	10	Arthonia atlantica on small natural outcrop by path.
16/2	52.06789 -04.63973	10	Arthonia atlantica in small amount on outcrop.

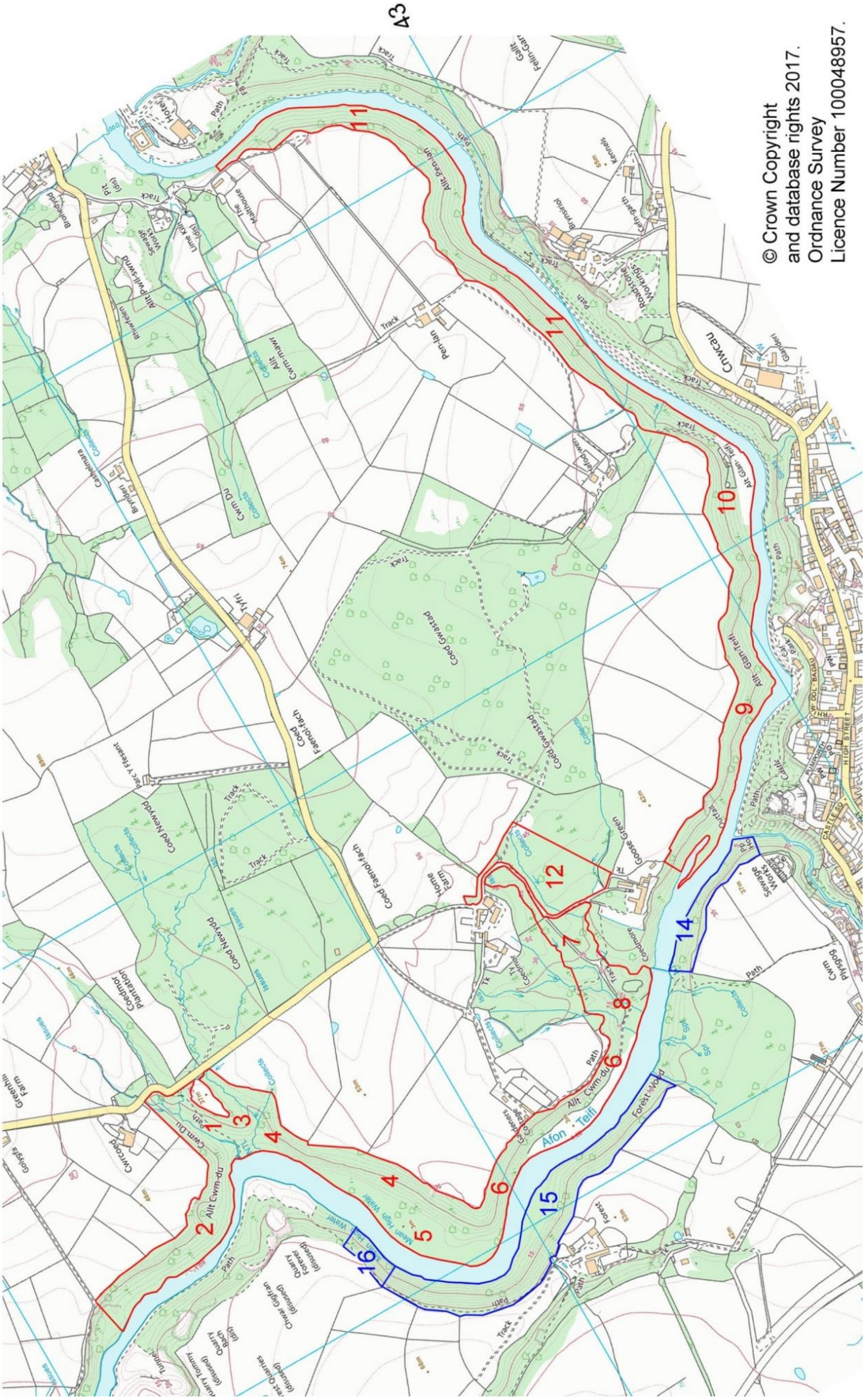

Fig. 21. Map of the study area. NNR boundary shown in red, with compartments indicated (see 1996 report for precise boundaries); blue indicates additional areas visited, with field numbers (14-16).

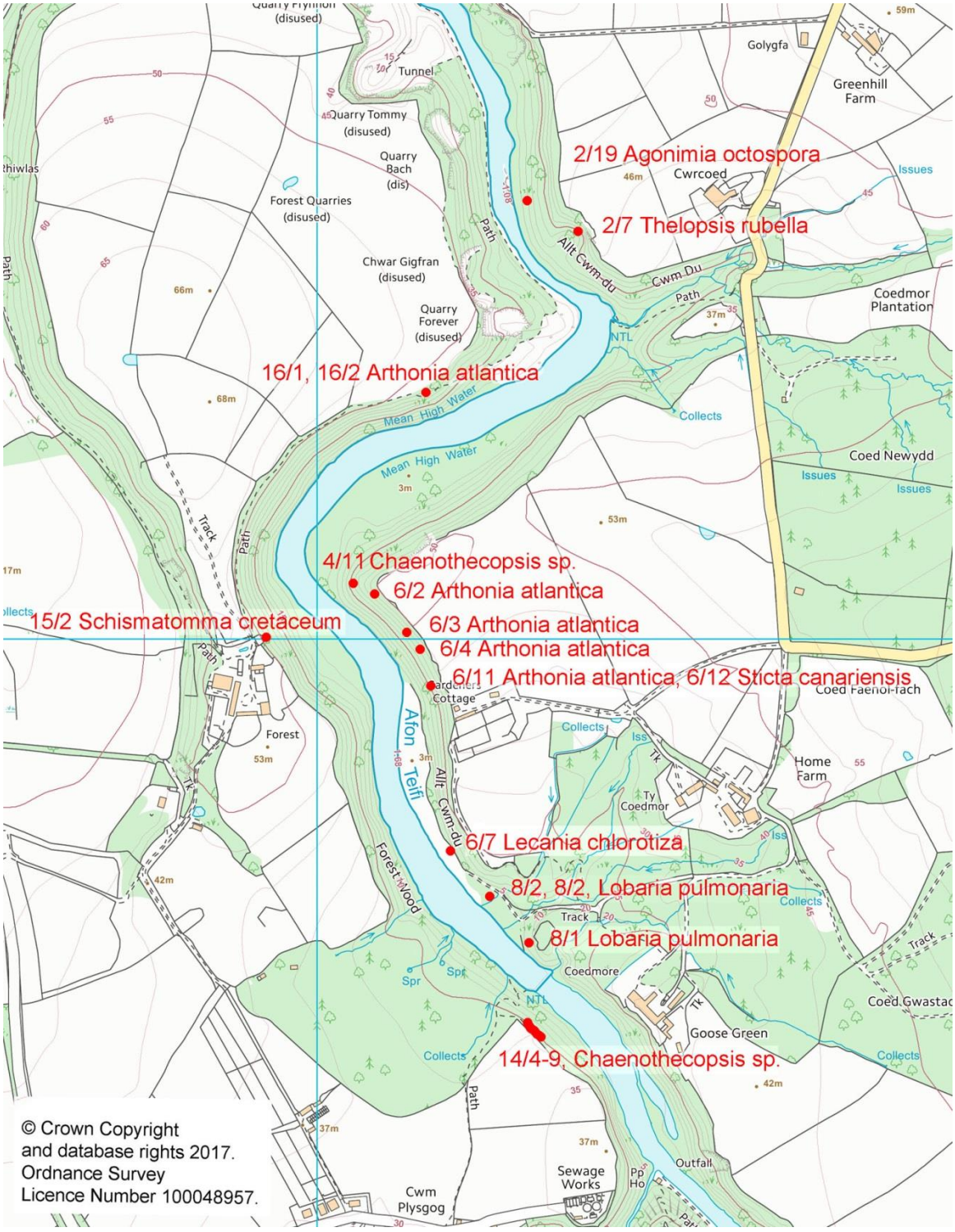

Fig. 22. Location of selected records made in 2017 (part 1).

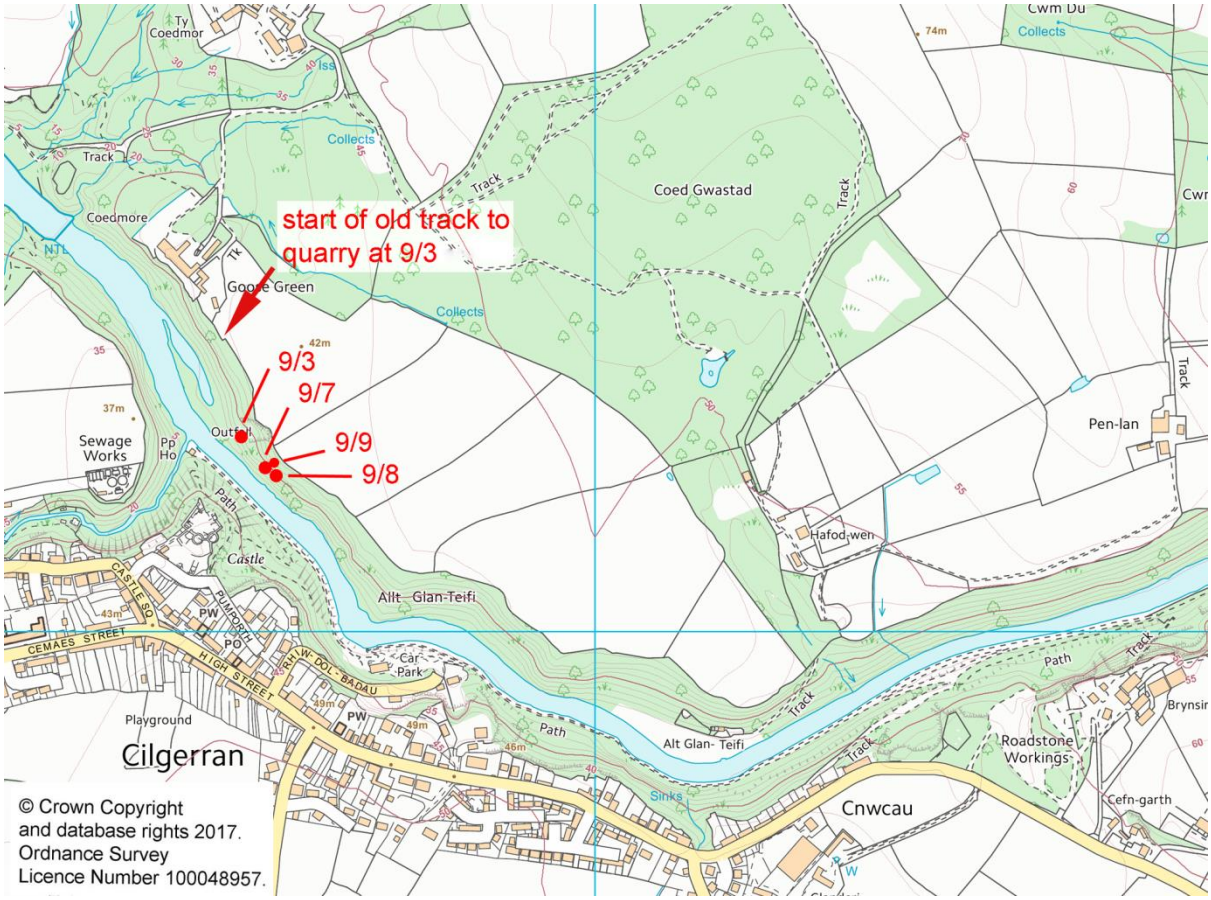

Fig. 23. Location of selected records made in 2017 (part 2). 9/3: *Peltigera horizontalis*; 9/7: natural rock face, the best in the reserve, with *Porina effilata*, *Porina rosei*, *Nephroma laevigatum*, *Sticta canariensis*, *Mycobilimbia pilularis*, *Leptogium lichenoides*, *Biatora epixanthoides*, *Collema subflaccidum*; 9/8: well-lit natural outcrop with abundant *Sticta canariensis*; 9/9: natural outcrop with *Nephroma laevigatum*.

Fig. 24. A ‘sprawling’ oak in Compartment 2, becoming shaded by young holly.

Fig. 25. A typical scene in many places: straight oaks up to *c*. 60 cm DBH, ground layer of *Luzula sylvatica*, few saplings. The tree to left has *Cresponea premnea*. Compartment 4.

Fig. 26.Old field wall at top of Compartment 4, probably built from stone quarried nearby in the woodland.

Fig. 27. Steep slope with tree falls, Compartment 6.

Fig. 28. Two oaks with Chaenothecopsis sp. at top of slope on south side of river (localities 14/4, 14/5).

Fig. 29. The chalk-white thallus of *Schismatomma cretaceum* on an oak beside footpath, locality 15/2.

Fig. 30. A rock face heavily shaded by holly; south side of river, near an *Arthonia atlantica* site.

Fig. 31. A very young elm (left of centre) that supported healthy colonies of *Lobaria pulmonaria*; locality 8/4.

Fig. 32. *Lobaria pulmonaria* in excellent condition on well-lit elm twig, locality 8/4.

Fig. 33. An apparently undescribed *Chaenothecopsis* species from oak bark. Scale = 0.5 mm.

Fig. 34 *Thelopsis rubella*, an NIEC species new to the reserve. Scale = 1 mm.

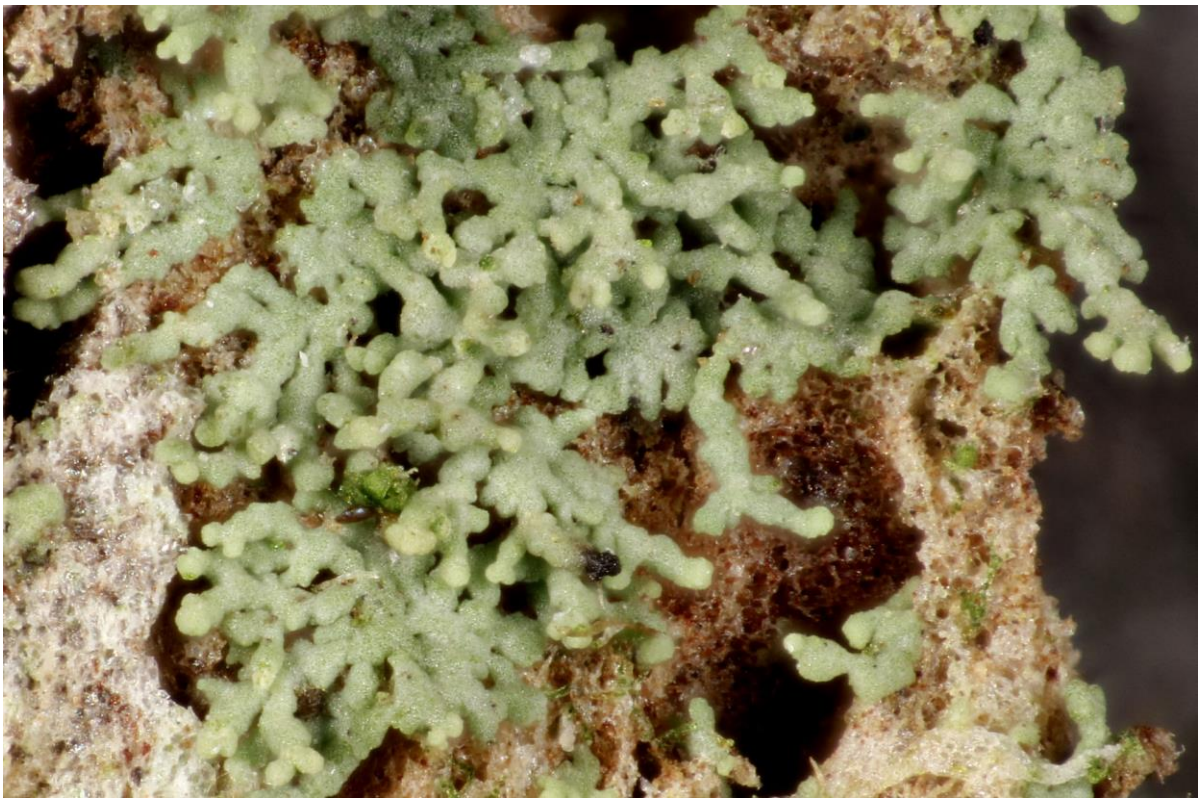

Fig. 35. *Agonimia octospora*. An NIEC species, found on a few oaks.

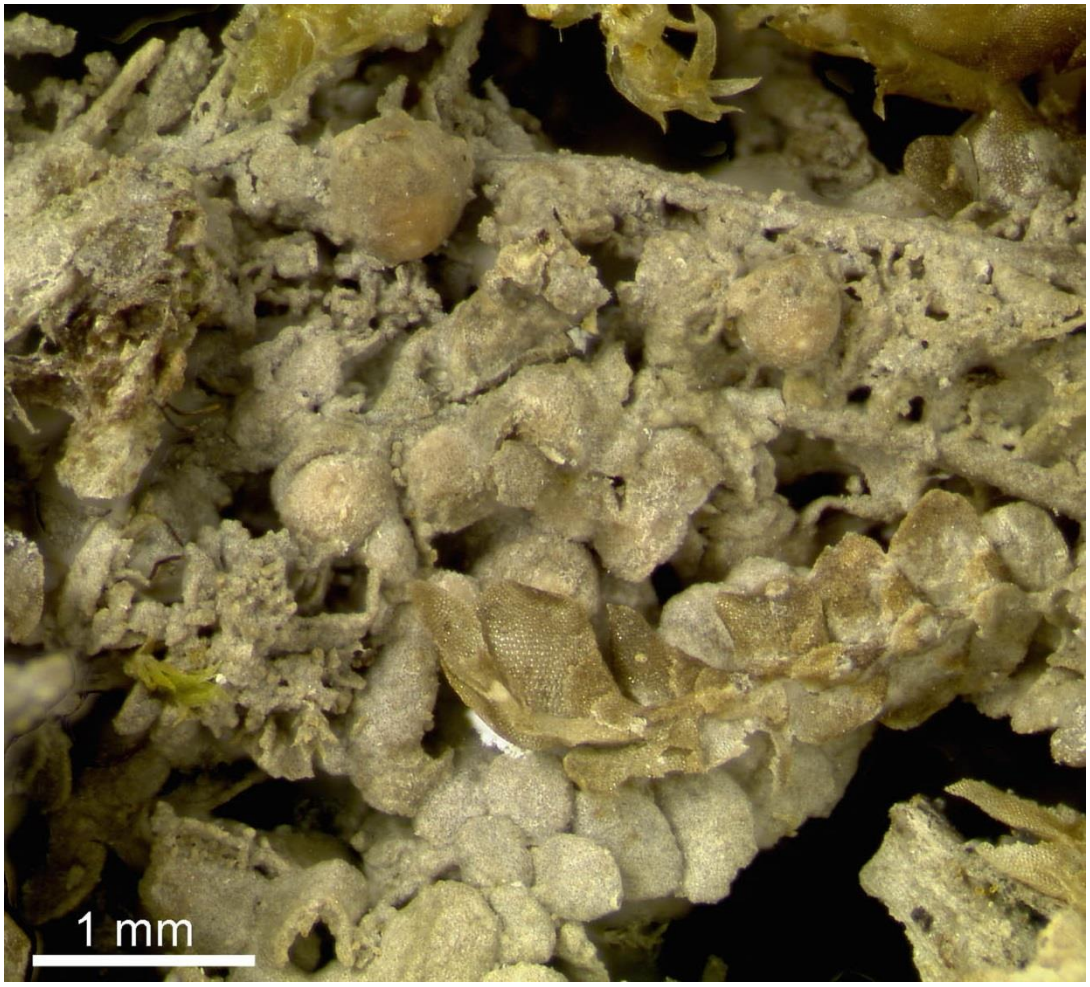

Fig. 36. *Porina effilata* overgrowing *Marchesinia mackaii*. Specimen collected in 1996.

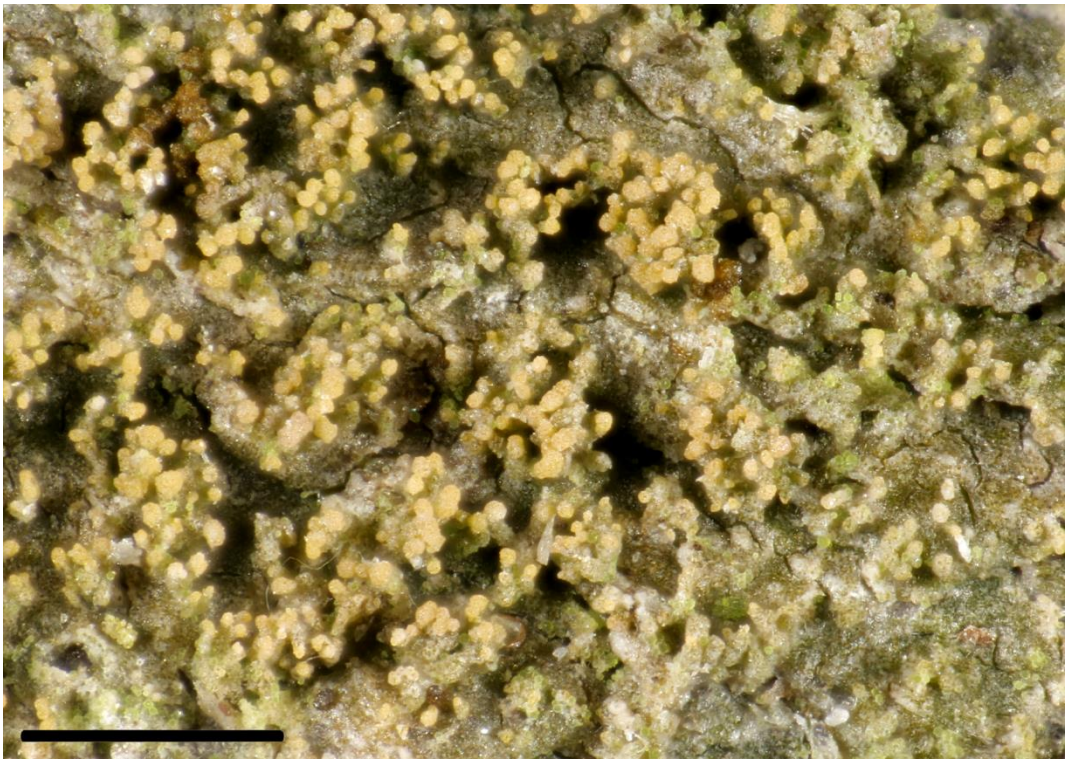
Fig. 37. *Porina rosei*, an NIEC species, here rowing on rock. Scale = 0.5 mm.